Power Systems

Racks and rack features

IBM

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This edition applies to IBM Power Systems servers that contain the POWER8 processor and to all associated models.

Contents

Safety notices

Safety notices may be printed throughout this guide:

- **DANGER** notices call attention to a situation that is potentially lethal or extremely hazardous to people.
- **CAUTION** notices call attention to a situation that is potentially hazardous to people because of some existing condition.
- **Attention** notices call attention to the possibility of damage to a program, device, system, or data.

World Trade safety information

Several countries require the safety information contained in product publications to be presented in their national languages. If this requirement applies to your country, safety information documentation is included in the publications package (such as in printed documentation, on DVD, or as part of the product) shipped with the product. The documentation contains the safety information in your national language with references to the U.S. English source. Before using a U.S. English publication to install, operate, or service this product, you must first become familiar with the related safety information documentation. You should also refer to the safety information documentation any time you do not clearly understand any safety information in the U.S. English publications.

Replacement or additional copies of safety information documentation can be obtained by calling the IBM Hotline at 1-800-300-8751.

German safety information

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

Laser safety information

IBM® servers can use I/O cards or features that are fiber-optic based and that utilize lasers or LEDs.

Laser compliance

IBM servers may be installed inside or outside of an IT equipment rack.

DANGER: When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:
- If IBM supplied the power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
  - For AC power, disconnect all power cords from their AC power source.
  - For racks with a DC power distribution panel (PDP), disconnect the customer's DC power source to the PDP.
- When connecting power to the product ensure all power cables are properly connected.

- For racks with AC power, connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
  - For racks with a DC power distribution panel (PDP), connect the customer's DC power source to the PDP. Ensure that the proper polarity is used when attaching the DC power and DC power return wiring.
- Connect any equipment that will be attached to this product to properly wired outlets.
- 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.
- Do not attempt to switch on power to the machine until all possible unsafe conditions are corrected.
- Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements.
- Do not continue with the inspection if any unsafe conditions are present.
- Before you open the device covers, unless instructed otherwise in the installation and configuration procedures: Disconnect the attached AC power cords, turn off the applicable circuit breakers located in the rack power distribution panel (PDP), and disconnect any telecommunications systems, networks, and modems.

DANGER:
- Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.

  To Disconnect:
  1. Turn off everything (unless instructed otherwise).
  2. For AC power, remove the power cords from the outlets.
  3. For racks with a DC power distribution panel (PDP), turn off the circuit breakers located in the PDP and remove the power from the Customer's DC power source.
  4. Remove the signal cables from the connectors.
  5. Remove all cables from the devices.

  To Connect:
  1. Turn off everything (unless instructed otherwise).
  2. Attach all cables to the devices.
  3. Attach the signal cables to the connectors.
  4. For AC power, attach the power cords to the outlets.
  5. For racks with a DC power distribution panel (PDP), restore the power from the Customer's DC power source and turn on the circuit breakers located in the PDP.
  6. Turn on the devices.

  Sharp edges, corners and joints may be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

(R001 part 1 of 2):

DANGER: Observe the following precautions when working on or around your IT rack system:
- Heavy equipment–personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices. In addition, do not lean on rack mounted devices and do not use them to stabilize your body position (for example, when working from a ladder).

- Each rack cabinet might have more than one power cord.
  - For AC powered racks, be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
  - For racks with a DC power distribution panel (PDP), turn off the circuit breaker that controls the power to the system unit(s), or disconnect the customer's DC power source, when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

(R001 part 2 of 2):

CAUTION:
- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- *(For sliding drawers.)* Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.

- *(For fixed drawers.)* This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.

CAUTION:
Removing components from the upper positions in the rack cabinet improves rack stability during relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building.

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must observe the following precautions:
  - Remove all devices in the 32U position (compliance ID RACK-001 or 22U (compliance ID RR001) and above.
  - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
  - Ensure that there are little-to-no empty U-levels between devices installed in the rack cabinet below the 32U (compliance ID RACK-001 or 22U (compliance ID RR001) level, unless the received configuration specifically allowed it.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- If the rack cabinet you are relocating was supplied with removable outriggers they must be reinstalled before the cabinet is relocated.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 mm (30 x 80 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:
  - Lower the four leveling pads.
  - Install stabilizer brackets on the rack cabinet.
  - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.

(R002)

(L001)

DANGER: Hazardous voltage, current, or energy levels are present inside any component that has this label attached. Do not open any cover or barrier that contains this label. (L001)

(L002)

DANGER: Rack-mounted devices are not to be used as shelves or work spaces. (L002)

(L003)
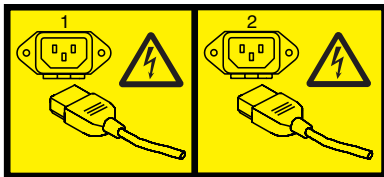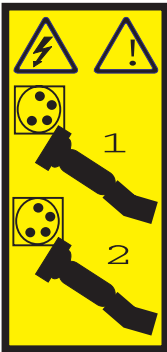
or

or
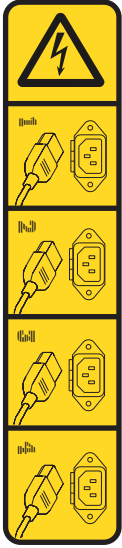
or
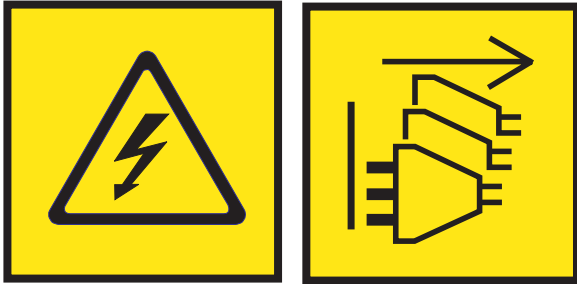
DANGER: Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)

(L007)

CAUTION: A hot surface nearby. (L007)

(L008)

CAUTION: Hazardous moving parts nearby. (L008)

All lasers are certified in the U.S. to conform to the requirements of DHHS 21 CFR Subchapter J for class 1 laser products. Outside the U.S., they are certified to be in compliance with IEC 60825 as a class 1 laser product. Consult the label on each part for laser certification numbers and approval information.

CAUTION:
This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

(C026)

CAUTION:
Data processing environments can contain equipment transmitting on system links with laser modules that operate at greater than Class 1 power levels. For this reason, never look into the end of an optical fiber cable or open receptacle. Although shining light into one end and looking into the other end of a disconnected optical fiber to verify the continuity of optic fibers many not injure the eye, this procedure is potentially dangerous. Therefore, verifying the continuity of optical fibers by shining light into one end and looking at the other end is not recommended. To verify continuity of a fiber optic cable, use an optical light source and power meter. (C027)

CAUTION:
This product contains a Class 1M laser. Do not view directly with optical instruments. (C028)

CAUTION:
**Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following information: laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam. (C030)**

CAUTION:
The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:
- ___ **Throw or immerse into water**
- ___ **Heat to more than 100°C (212°F)**
- ___ **Repair or disassemble**

Exchange only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call. (C003)

CAUTION:

Regarding IBM provided VENDOR LIFT TOOL:

- Operation of LIFT TOOL by authorized personnel only.
- LIFT TOOL intended for use to assist, lift, install, remove units (load) up into rack elevations. It is not to be used loaded transporting over major ramps nor as a replacement for such designated tools like pallet jacks, walkies, fork trucks and such related relocation practices. When this is not practicable, specially trained persons or services must be used (for instance, riggers or movers).
- Read and completely understand the contents of LIFT TOOL operator's manual before using. Failure to read, understand, obey safety rules, and follow instructions may result in property damage and/or personal injury. If there are questions, contact the vendor's service and support. Local paper manual must remain with machine in provided storage sleeve area. Latest revision manual available on vendor's web site.
- Test verify stabilizer brake function before each use. Do not over-force moving or rolling the LIFT TOOL with stabilizer brake engaged.
- Do not move LIFT TOOL while platform is raised, except for minor positioning.
- Do not exceed rated load capacity. See LOAD CAPACITY CHART regarding maximum loads at center versus edge of extended platform.
- Only raise load if properly centered on platform. Do not place more than 200 lb (91 kg) on edge of sliding platform shelf also considering the load's center of mass/gravity (CoG).
- Do not corner load the platform tilt riser accessory option. Secure platform riser tilt option to main shelf in all four (4x) locations with provided hardware only, prior to use. Load objects are designed to slide on/off smooth platforms without appreciable force, so take care not to push or lean. Keep riser tilt option flat at all times except for final minor adjustment when needed.
- Do not stand under overhanging load.
- Do not use on uneven surface, incline or decline (major ramps).
- Do not stack loads.
- Do not operate while under the influence of drugs or alcohol.
- Do not support ladder against LIFT TOOL.
- Tipping hazard. Do not push or lean against load with raised platform.
- Do not use as a personnel lifting platform or step. No riders.
- Do not stand on any part of lift. Not a step.
- Do not climb on mast.
- Do not operate a damaged or malfunctioning LIFT TOOL machine.
- Crush and pinch point hazard below platform. Only lower load in areas clear of personnel and obstructions. Keep hands and feet clear during operation.
- No Forks. Never lift or move bare LIFT TOOL MACHINE with pallet truck, jack or fork lift.
- Mast extends higher than platform. Be aware of ceiling height, cable trays, sprinklers, lights, and other overhead objects.
- Do not leave LIFT TOOL machine unattended with an elevated load.
- Watch and keep hands, fingers, and clothing clear when equipment is in motion.
- Turn Winch with hand power only. If winch handle cannot be cranked easily with one hand, it is probably over-loaded. Do not continue to turn winch past top or bottom of platform travel. Excessive unwinding will detach handle and damage cable. Always hold handle when lowering, unwinding. Always assure self that winch is holding load before releasing winch handle.
- A winch accident could cause serious injury. Not for moving humans. Make certain clicking sound is heard as the equipment is being raised. Be sure winch is locked in position before releasing handle. Read instruction page before operating this winch. Never allow winch to unwind freely. Freewheeling will cause uneven cable wrapping around winch drum, damage cable, and may cause serious injury. (C048)

Power and cabling information for NEBS (Network Equipment-Building System) GR-1089-CORE

The following comments apply to the IBM servers that have been designated as conforming to NEBS (Network Equipment-Building System) GR-1089-CORE:

The equipment is suitable for installation in the following:
- Network telecommunications facilities
- Locations where the NEC (National Electrical Code) applies

The intrabuilding ports of this equipment are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of this equipment *must not* be metallically connected to the interfaces that connect to the OSP (outside plant) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

Note: All Ethernet cables must be shielded and grounded at both ends.

The ac-powered system does not require the use of an external surge protection device (SPD).

The dc-powered system employs an isolated DC return (DC-I) design. The DC battery return terminal *shall not* be connected to the chassis or frame ground.

The dc-powered system is intended to be installed in a common bonding network (CBN) as described in GR-1089-CORE.

Racks and rack features

Learn about the procedures used to install racks and rack features.

You can perform these tasks or contact a service provider to perform the tasks for you. You might be charged a fee by the service provider for this service.

What's new in Racks and rack features

Read about new or significantly changed information in Racks and rack features since the previous update of this topic collection.

June 2017

Added information about the IBM Enterprise Slim Rack (7965-S42).

July 2016

Added information about connecting the dc Power Distribution Panel (PDP).

Added information about installing the rack with the rack bolt-down feature ERGC.

May 2016

Added information about connecting the dc Power Distribution Panel (PDP).

June 2015

Added links to system installation information for the IBM Power® System E850 (8408-E8E).

June 2014

Added information for IBM Power Systems™ servers that contain the POWER8® processor.

Installing the 7014-T00 and 7014-T42 racks and features

Use this information to install the 7014-T00 and 7014-T42 racks and to install the related components of the racks system.

Installing the 7014-T00 and 7014-T42 racks

Use this information to install the 7014-T00 and 7014-T42 racks.

If you are installing a rack security kit in this rack, see "Installing the rack security kit" on page 66 after you install the rack.

Before you install a rack, read the "Rack safety notices" on page 2.

Completing a parts inventory

Before you begin the rack installation, complete a parts inventory.

Complete a parts inventory before you install the unit in the rack.

1. Locate the kitting report in an accessory box.

2. Ensure that you received all of the features that you ordered and all of the parts on the kitting report.

If there are incorrect, missing, or damaged parts, contact IBM by using one of the following methods:
* Your IBM reseller
* IBM support (see the Directory of worldwide contacts website (http://www.ibm.com/planetwide) at IBM Directory of worldwide contacts - Country/region for contact information for your country
* IBM Rochester Manufacturing Automated Information Line at 1–800–300–8751 (United States only)

Rack safety notices

You need to read the rack safety notices before you install the equipment.

Before you install a rack, rack features, or a system or expansion unit into a rack, read the following safety information.

Attention: If you are installing equipment into a non-IBM rack, the rack must comply with the Electronics Industries Association (EIA) 310D specifications. Do not install the equipment into the rack if you do not have a rail kit that is designed for the equipment in the non-IBM rack. Installing a rail kit that was not designed for your equipment can damage the equipment or injure you.

(R001 part 1 of 2):

DANGER: Observe the following precautions when working on or around your IT rack system:
* Heavy equipment–personal injury or equipment damage might result if mishandled.
* Always lower the leveling pads on the rack cabinet.
* Always install stabilizer brackets on the rack cabinet.
* To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
* Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices. In addition, do not lean on rack mounted devices and do not use them to stabilize your body position (for example, when working from a ladder).

* Each rack cabinet might have more than one power cord.
    – For AC powered racks, be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
    – For racks with a DC power distribution panel (PDP), turn off the circuit breaker that controls the power to the system unit(s), or disconnect the customer's DC power source, when directed to disconnect power during servicing.
* Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
* An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

(R001 part 2 of 2):

CAUTION:
* Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.

- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- *(For sliding drawers.)* Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.

- *(For fixed drawers.)* This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.

Lift precautions:

18-32 kg (39.7-70.5 lbs)   32-55 kg (70.5-121.2 lbs)   ≥55 kg (≥121.2 lbs)

Positioning the rack
Proper rack positioning is needed to comply with safety and regulatory requirements.

To position the rack, complete the following steps:
1. Remove all the packing materials from the rack.
2. Position the rack.
3. Lock each caster by tightening the locking screw.
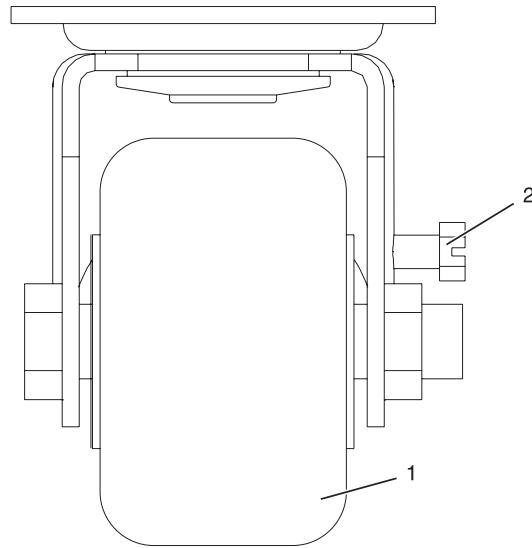
Item	Description
1	Caster
2	Locking screw

Figure 1. Tightening the locking screw

Use the following information to determine the next step:
- To bolt the rack to a concrete floor, go to "Attaching the rack to a concrete floor" on page 6.
- To bolt the rack to a concrete floor beneath a raised floor, go to "Attaching the rack to the concrete floor beneath a raised floor" on page 13.
- If you must level the rack, go to "Leveling the rack."

Leveling the rack

Some floors are not level. You must adjust the rack to ensure that it is level.

To level the rack, complete the following steps:
1. Loosen the jam nut on each leveling foot.
2. Rotate each leveling foot downward until it contacts the surface on which the rack is placed.
3. Adjust the leveling feet downward as needed until the rack is level. When the rack is level, tighten the jam nuts against the base.
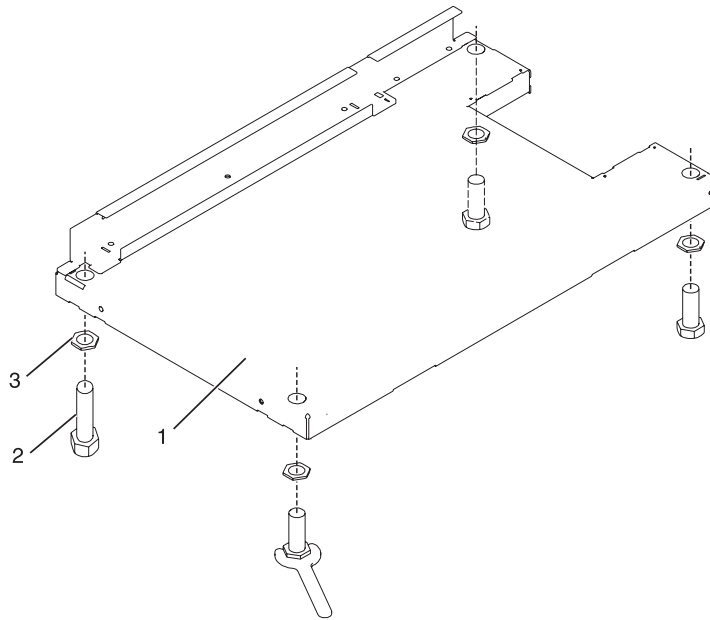
Item	Description
1	Rack Front (base)
2	Leveling Foot (quantity 4)
3	Jam Nut (quantity 4)

Figure 2. Adjusting the leveling feet

Attaching the stabilizer brackets

You might need to attach the stabilizer brackets to the rack. Determine whether stabilizer brackets are necessary and how to attach them if needed.

If the front or rear ac electrical outlets are going to be installed in the rack, you cannot attach the stabilizer brackets. The rack must be bolted to the floor. Stabilizer brackets are used only if you are not bolting the rack to the floor. If you are going to bolt the rack to the floor, go to "Attaching the rack to a concrete floor" on page 6, or for a raised floor environment go to "Attaching the rack to the concrete floor beneath a raised floor" on page 13.

To attach the stabilizer brackets to the bottom of the rack, complete the following steps:

1. Align the slots of one of the stabilizer brackets with the mounting holes at the bottom front of the rack.
2. Install the two mounting screws.
3. Ensure that the base of the stabilizer bracket rests firmly on the floor. Use the Allen wrench that was supplied with the rack to tighten the mounting screws alternately until they are tight.
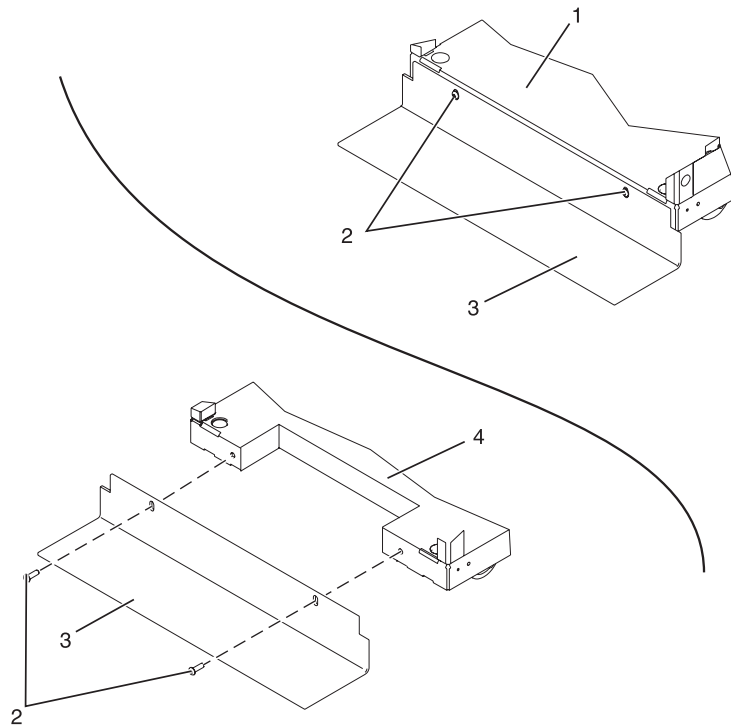
Item	Description	Item	Description
1	Rack front (base)	**3**	Stabilizer bracket
2	Stabilizer mounting screws	**4**	Rack rear (base)

Figure 3. Attaching the stabilizer brackets

4. To install the second stabilizer bracket on the rear of the rack, repeat steps 1 - 3.

Attaching the rack to a concrete floor

If you plan to install the front or rear ac electrical outlets in the rack, the rack must be bolted to the floor.

Obtain the services of a Professional Engineer or mechanical contractor to attach the rack to the concrete floor. The Professional Engineer or mechanical contractor must determine that the hardware to secure the rack to the concrete floor is sufficient to meet the requirements for the installation. IBM provides rack-mounting plates for installation of the rack to the concrete floor.

To attach the rack to a concrete floor, complete the following steps:

1. Put the rack in its predetermined location, and tighten the locking screws on the casters.
2. If they are installed, remove the top, left, and right trim panels. Trim panels are held in place with spring clips. See the following illustration.
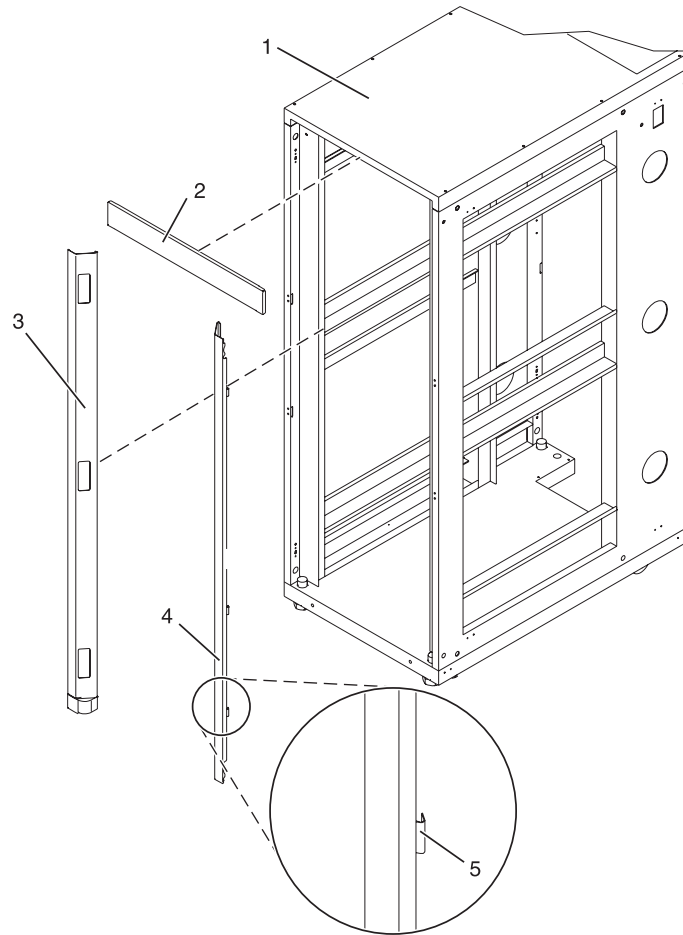
Figure 4. Removing the trim panels

1	Rack chassis
2	Top trim panel
3	Left-side trim panel
4	Right-side trim panel
5	Spring clip

3. If they are installed, remove the front and rear doors. If they are not installed, continue with 4. To remove a rack door, complete the following steps:

   a. Unlock and open the door.

   b. Grasp the door firmly with both hands and lift it up away from the hinges.

4. Locate the hardware mounting kit and the two mounting plates. Refer to the following illustration when you review the contents of the hardware mounting kit. The hardware mounting kit contains the following items:

   - 4 Rack-mounting bolts
   - 4 Thin washers
   - 8 Plastic isolator bushings
   - 4 Thick washers
   - 4 Spacers

5. If you are installing an ac-powered rack, temporarily install the lower plastic isolator bushings to help you locate the mounting locations for the mounting plate. After you locate the mounting plate,

remove the lower plastic isolator bushings.
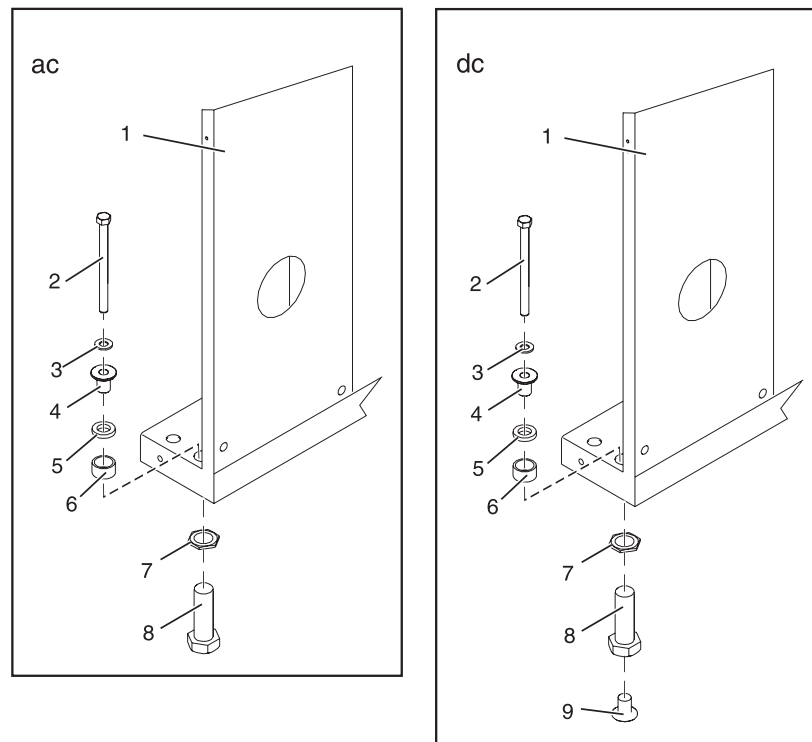
Figure 5. Rack bolt-down hardware

1	Rack chassis
2	Rack-mounting bolt
3	Thin washer
4	Top plastic isolator bushing
5	Thick washer
6	Spacer
7	Jam nut
8	Leveling foot
9	Lower plastic isolator bushing

   Note: The lower plastic isolator bushing is used only on dc powered systems.

ac   Typical leveling foot installation for an ac-powered rack

dc   Typical leveling foot installation for a dc-powered rack

6. Position the two mounting plates in the approximate mounting location under the rack.
7. Create a rack-mounting bolt assembly by adding the following items, in the order listed, to each rack-mounting bolt.
   a. Thin washer
   b. Top plastic isolator bushing
   c. Thick flat washer
   d. Spacer
8. Insert a rack-mounting bolt assembly through each of the leveling feet.

9. Reposition the rack-mounting plates under the four rack-mounting bolts so that the mounting bolts are centered directly over the threaded bolt holes.

10. Turn the rack-mounting bolts four complete turns into the mounting plate's threaded bolt holes.
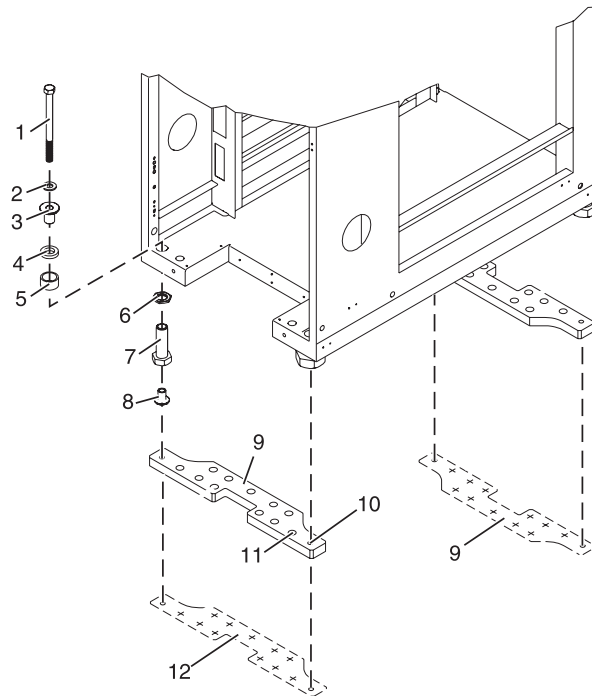
Figure 6. Securing the rack with the triangular brace to the floor

1	Rack-mounting bolt
2	Thin washer
3	Top plastic isolator bushing
4	Thick washer
5	Spacer
6	Jam nut
7	Leveling foot
8	Lower plastic isolator bushing

Note: The lower plastic isolator bushing is only used on dc powered systems.

9	Mounting plate
10	Threaded hole

Note: The threaded hole is used to secure the rack to the mounting plate.

11	Anchor bolt hole
12	Mounting plate

Note: The mounting plate is used as a template so that you can trace the pattern onto the floor.
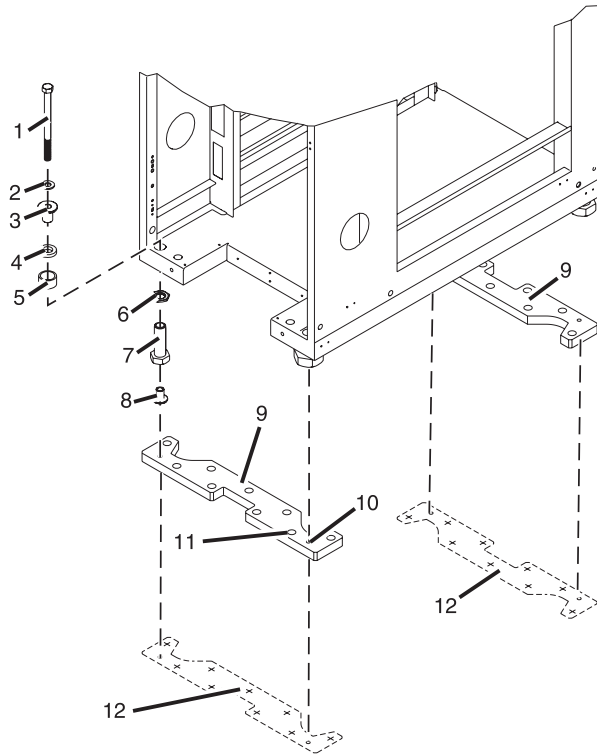
Figure 7. Securing the rack with the X brace to the floor

1	Rack-mounting bolt
2	Thin washer
3	Top plastic isolator bushing
4	Thick washer
5	Spacer
6	Jam nut
7	Leveling foot
8	Lower plastic isolator bushing

Note: The lower plastic isolator bushing is used only on dc powered systems.

9	Mounting plate
10	Threaded hole

Note: The threaded hole is used to secure the rack to the mounting plate.

11	Anchor bolt hole
12	Mounting plate

Note: The mounting plate is used as a template to trace a pattern onto the floor.

11. Mark the floor around the edges of both mounting plate.
12. Mark the plate bolt-down holes that are accessible through the opening in the rear of the rack.
13. Remove the rack-mounting bolt assemblies.
14. Remove the mounting plates from the marked locations.

15. If you are installing an ac-powered rack, remove the bottom isolator bushing from each of the leveling feet.
16. Loosen each of the locking screws on the casters.
17. Move the rack so that it is clear of both areas that were marked on the floor for the mounting plate locations.
18. Reposition the mounting plates within the marked areas.
19. Mark the floor at the center of all holes in both mounting plates, including the threaded holes.
20. Remove the two rack-mounting plates from the marked areas.
21. At the marked location of the threaded rack-mounting bolt holes, drill four clearance holes into the concrete floor. The holes must be approximately 1-inch deep to ensure that the bolts protrude past the thickness of the mounting plates.

    Note: You *must* use a minimum of two anchor bolts for each rack-mounting plate to securely attach the plate to the concrete floor. Because some of the holes in each rack-mounting plate might align with concrete reinforcement rods that are embedded in the concrete, some of the rack-mounting plate holes might not be usable.

    Note: If the hole locations selected at the rear of the rack are not accessible, you must use riggers to install bolts in the non-accessible hole locations. You must lift the rack to install them.
22. If you are installing a 7014-T42 rack with the X-brace feature, go to step 26.
23. Select at least two suitable hole locations (**A**) for each mounting plate bolt. Ensure that the selected locations are as close to the threaded bolt holes as possible. Drill holes at the selected locations into the concrete floor.

    Note: The quantity, location, size, and type of anchor bolts and concrete anchors *must* be determined by the Professional Engineer and the mechanical contractor who is installing the rack-mounting plate.
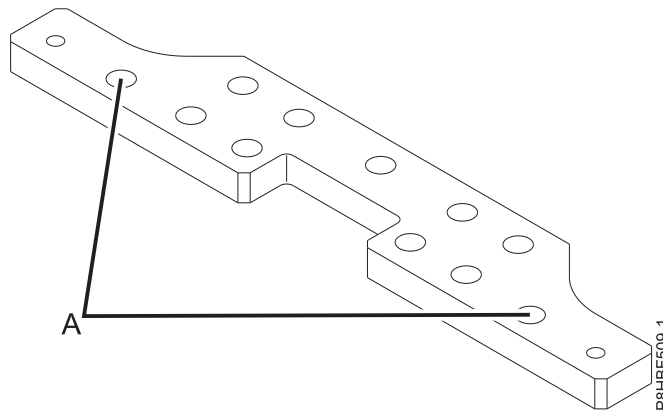
Figure 8. Two anchor locations

24. Install the concrete anchors.
25. Go to step 28 on page 12.
26. Select at least four suitable hole locations (**A**) for each mounting plate bolt. Select locations that are as close as possible to the threaded bolt holes. Drill holes at the selected locations into the concrete floor.
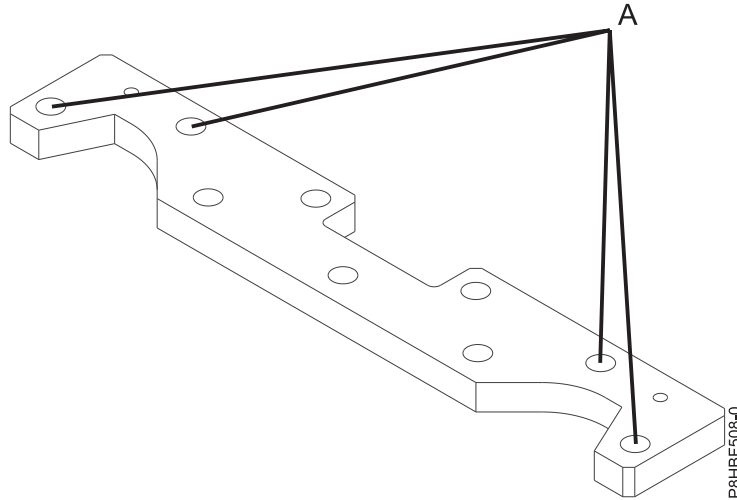
Figure 9. Bolt-down locations

27. Install the concrete anchors.
28. Position the front rack-mounting plate over the concrete anchors.
29. Install the anchoring bolts in the front rack-mounting plate but do not tighten.
30. Position the rack over the front rack-mounting plate.
31. Insert two of the rack-mounting bolts through a flat washer, a plastic isolator bushing and a thick washer, and through each of the front leveling feet.
32. Align the two rack-mounting bolts with the two tapped holes in the front mounting plate and turn three to four rotations.
33. Position the rear-mounting plate over the concrete anchors.
34. Install the anchoring bolts in the rear rack-mounting plate but do not tighten.
35. Insert two of the rack-mounting bolts through a flat washer, a plastic isolator bushing and a thick washer, and through each of the rear leveling feet.
36. Align the two rack-mounting bolts with the two tapped holes in the rear mounting plate and turn three to four rotations.
37. Torque the bolts that secure the front rack-mounting plate to the concrete floor. Torque requirements are provided by the professional engineer or the mechanical contractor.
38. Torque the bolts that secure the rear rack-mounting plate to the concrete floor. Torque requirements are provided by the professional engineer or the mechanical contractor.
39. Adjust the leveling feet downward as needed to take the load off the castors until they spin freely and until the rack is level. When the rack is level, tighten the jam nuts against the base of the rack.
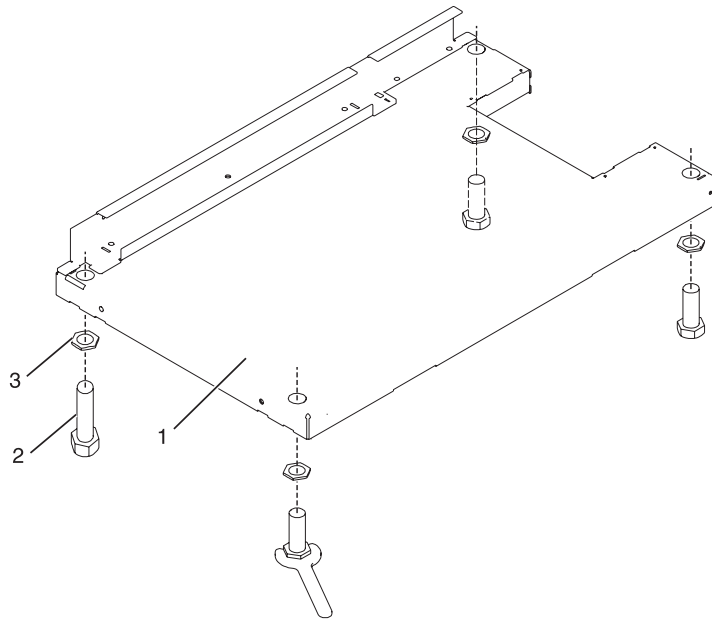
Figure 10. Adjusting the leveling feet

1	Rack front
2	Leveling foot
3	Jam nut

40. If you have multiple racks that are connected in a suite (bolted to each other), go to "Connecting multiple racks with rack-to-rack attachment kit" on page 20. Otherwise, torque the four bolts to 54 - 67 newton-meters (40 - 50 foot-pounds).

41. If you are not installing doors on your rack, install the top, left, and right trim panels.

42. Connect the power distribution system. For instructions, see "Connecting the power distribution system" on page 22.

43. After the rack is bolted down and you are going to attach a front electrical outlet, go to "Attaching the front or rear ac electrical outlet" on page 42.

44. If you are not going to attach a front electrical outlet and you are installing rack doors, go to "Attaching the rack doors" on page 64.

Attaching the rack to the concrete floor beneath a raised floor

If you plan to install front or rear ac electrical outlets in the rack, the rack must be bolted to the floor. Learn more about how to attach the rack to a concrete floor, which lays beneath a raised floor.

Obtain the services of a Professional Engineer or mechanical contractor to attach a rack in a raised floor environment. The Professional Engineer or mechanical contractor must determine that the hardware that is securing the rack to the concrete floor is sufficient to meet the requirements for the raised floor installation. IBM provides rack-mounting plates that are used for installation of the rack.

To attach the rack to a concrete floor beneath a raised floor, complete the following steps:

1. Put your rack in its predetermined location and tighten the locking screws on the casters.

2. Remove the top, left, and right trim panels. Trim panels are held in place with spring clips. See the following illustration.
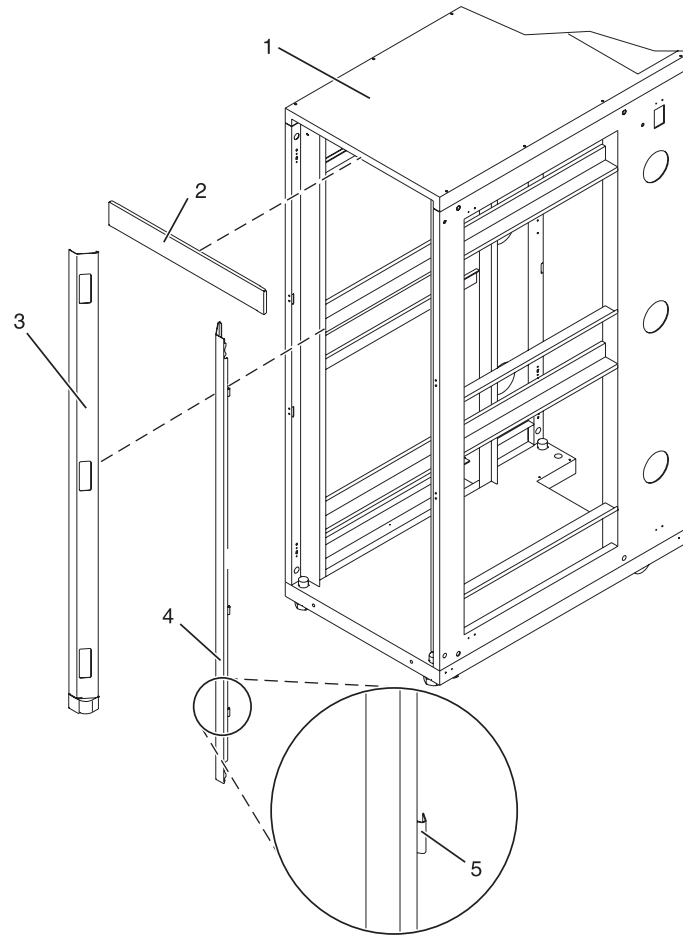
Figure 11. Removing the trim panels

Item	Description	Item	Description
1	Rack chassis	4	Right-side trim panel
2	Top trim panel	5	Spring clip
3	Left-side trim panel		

3. If installed, remove the front and rear doors. If they are not installed, continue with the next Step 4. To remove a rack door, complete the following steps:

   a. Unlock and open the door.

   b. Grasp the door firmly with both hands and lift it up away from the hinges.

   After you remove the rack doors, go to the next step.

4. Locate the hardware mounting kit and the two mounting plates. Refer to the following illustration. The hardware mounting kit contains the following items:

   • Four rack-mounting bolts

   • Four thin washers

   • Eight plastic isolator bushings

   • Four thick washers

   • Four spacers

5. If you are installing an ac-powered rack, temporarily install the lower plastic isolator bushings to help you locate the rack-mounting plate. After you locate the mounting plate, remove the lower plastic isolator bushings.

Figure 12. Rack bolt-down hardware

Item	Description		Item	Description
1	Rack chassis		**7**	Jam nut
2	Rack-mounting bolt		**8**	Leveling foot
3	Thin washer		**9**	Lower plastic isolator bushing (used only on dc powered systems)
4	Top plastic isolator bushing		**ac**	Typical leveling foot installation for an ac-powered rack
5	Thick washer		**dc**	Typical leveling foot installation for a dc-powered rack
6	Spacer			

6. Position the two mounting plates in the approximate mounting location under the rack.
7. Create a rack-mounting bolt assembly by adding the following items, in the order listed, to each rack-mounting bolt.
   a. Thin washer
   b. Top plastic isolator bushing
   c. Thick flat washer
   d. Spacer
8. Insert a rack-mounting bolt assembly through each of the leveling feet.
9. Reposition the rack-mounting plates under the four rack-mounting bolts so that the mounting bolts are centered directly over the threaded bolt holes.

10. Turn the rack-mounting bolts four complete turns into the mounting plate's threaded bolt holes.

Figure 13. Securing the rack with the triangular brace to the floor
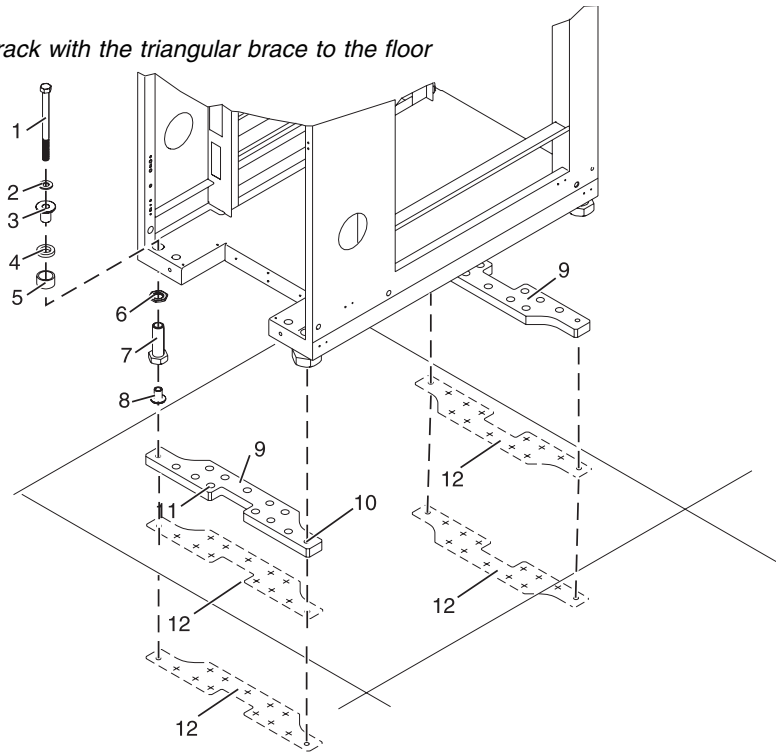
Item	Description	Item	Description
1	Rack-mounting bolt	7	Leveling foot
2	Thin washer	8	Lower plastic isolator bushing (used only on dc-powered systems)
3	Top plastic isolator bushing	9	Mounting plate
4	Thick washer	10	Threaded hole (used to secure the rack to mounting plate.)
5	Spacer	11	Anchor bolt hole
6	Jam nut	12	Traced pattern (use the mounting plate as a template to be trace onto the floor)

Figure 14. Securing the rack with the "X" brace to the floor
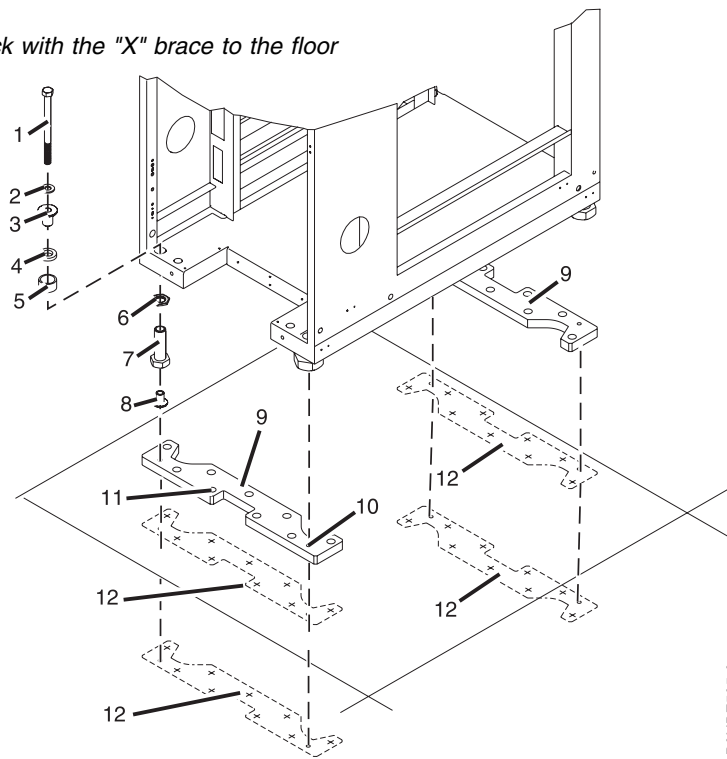
P8HBF505-0

Item	Description	Item	Description
1	Rack-mounting bolt	7	Leveling foot
2	Thin washer	8	Lower plastic isolator bushing (used only on dc-powered systems)
3	Top plastic isolator bushing	9	Mounting plate
4	Thick washer	10	Threaded hole (used to secure the rack to mounting plate.)
5	Spacer	11	Anchor bolt hole
6	Jam nut	12	Traced pattern (use the mounting plate as a template to be trace onto the floor)

11. Mark the raised-floor panel around the edges of the front and rear rack-mounting plates.

12. Mark the plate bolt-down holes that are accessible through the opening in the rear of the rack.

13. Remove the rack-mounting bolt assemblies.

14. Remove the rack-mounting plates from the marked locations.

15. If you are installing an ac-powered rack, remove the bottom isolator bushing from each of the leveling feet.

16. Loosen each of the locking screws on the casters.

17. Move the rack so that it is clear of both areas that were marked on the floor for the rack-mounting plate locations.

18. Reposition the mounting plates within the marked areas.

19. Mark the raised-floor panel at the center of each hole in the rack-mounting plates (including the threaded holes).

20. Remove the two rack-mounting plates from the marked locations on the raised floor panel.

21. At the marked location of the threaded rack-mounting bolt holes, drill four clearance holes into and through the raised floor. The holes ensure that the bolts protrude past the thickness of the rack-mounting plates.

    Note: You *must* use a minimum of two anchor bolts for each rack-mounting plate to securely attach the rack-mounting plate through the raised-floor panel to the concrete floor. Because some of the holes in each rack-mounting plate may align with concrete reinforcement rods that are embedded in the concrete, some of the rack-mounting plate holes might not be usable.

    Note: The quantity, location, size, or type of concrete anchors and hardware to install the rack-mounting plate *must* be determined by the Professional Engineer or the mechanical contractor.

    Note: If the hole locations selected at the rear of the rack are not accessible, you must use riggers to install the mounting hardware in the non-accessible hole locations. You must lift the rack to install the hardware.

22. If you are installing a 7014-T42 rack with the X brace feature, go to step 27. Otherwise, continue with step 23.

23. For each rack-mounting plate, select at least two suitable hole locations (**A**). Select the hole locations as close to the threaded hole areas as possible. Drill pass-through holes at the selected locations into the raised floor panels. Pass-through holes allow the mounting hardware to be inserted into the rack-mounting plate and pass through the raised floor panel to the concrete floor.
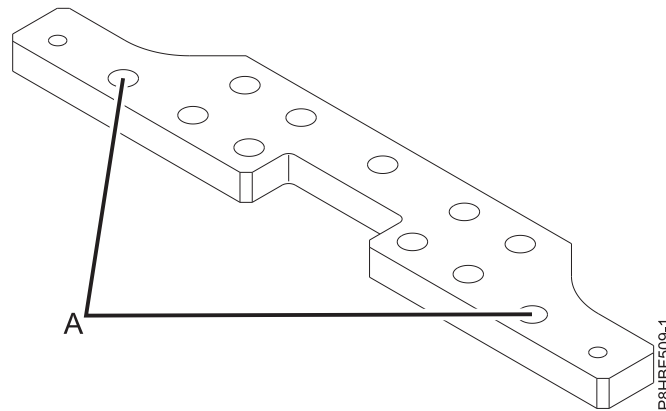
Figure 15. Bolt-down plate hole locations for rack with the triangular brace

24. Transfer the locations of the anchor bolt holes (exclude the clearance holes that you drilled for the rack-mounting bolts) from the raised-floor panel to the concrete floor directly beneath. Mark the hole locations on the concrete.

25. Drill holes in the concrete floor to secure the anchor bolts.

26. Go to step 30 on page 19.

27. For each rack-mounting plate, select at least four suitable hole locations (**A**). Select the hole locations as close to the threaded hole areas as possible. Drill pass-through holes at the selected locations into the raised floor panels. Insert the mounting hardware into the rack-mounting plate and pass through the raised floor panel to the concrete floor.

Figure 16. Bolt-down locations for the rack with the X-brace
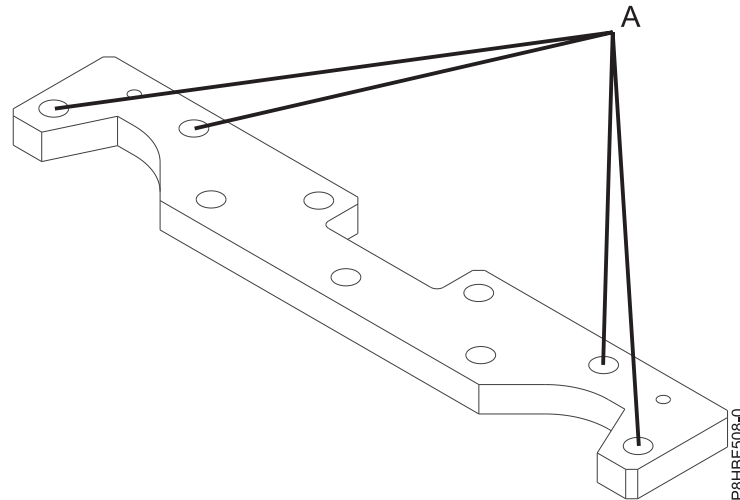
> **Note:** The quantity, location, size, and type of concrete anchors *must* be determined by the Professional Engineer or the mechanical contractor that is installing the rack-mounting plate.

28. Transfer the locations of the anchor bolt holes (exclude the clearance holes that you drilled for the rack-mounting bolts) from the raised-floor panel to the concrete floor directly beneath. Mark the hole locations on the concrete.

29. Drill holes in the concrete floor to secure the anchor bolts.

30. If the raised-floor panels were removed, position the raised-floor panels back into position over the anchor bolt holes.

31. Position the front rack-mounting plate within the marked area on the raised-floor panel.

32. Using your anchoring method, secure the front rack-mounting plate on top of the raised floor and through to the concrete floor, but do not tighten.

33. Replace all required raised panels to position the rack over the front mounting plate.

34. Position the rack over the front rack-mounting plate.

35. Insert two of the rack-mounting bolts through a flat washer, a plastic isolator bushing and a thick washer, and through each of the front leveling feet.

36. Align the two rack-mounting bolts with the two tapped holes in the front mounting plate and turn 3 to 4 rotations.

37. Position the rear-mounting plate over the holes in the raised floor.

38. Using your anchoring method, secure the rear rack-mounting plate on top of the raised floor and through to the concrete floor, but do not tighten.

39. Insert two of the rack-mounting bolts through a flat washer, a plastic isolator bushing and a thick washer, and through each of the rear leveling feet.

40. Align the two rack-mounting bolts with the two tapped holes in the rear mounting plate and turn 3 to 4 rotations.

41. Using torque requirements that are provided by the Professional Engineer or the mechanical contractor, torque the hardware that secures the front rack-mounting plate to the concrete floor.

42. Using torque requirements that are provided by the Professional Engineer or the mechanical contractor, torque the hardware that secures the rear rack-mounting plate to the concrete floor.

43. Replace all raised panels that you removed when you are aligning and securing the mounting plate hardware to the concrete floor.

44. Adjust the leveling feet downward as needed to take the load off the castors (ensure that they spin freely) and until the rack is level. When the rack is level, tighten the jam nuts against the base of the
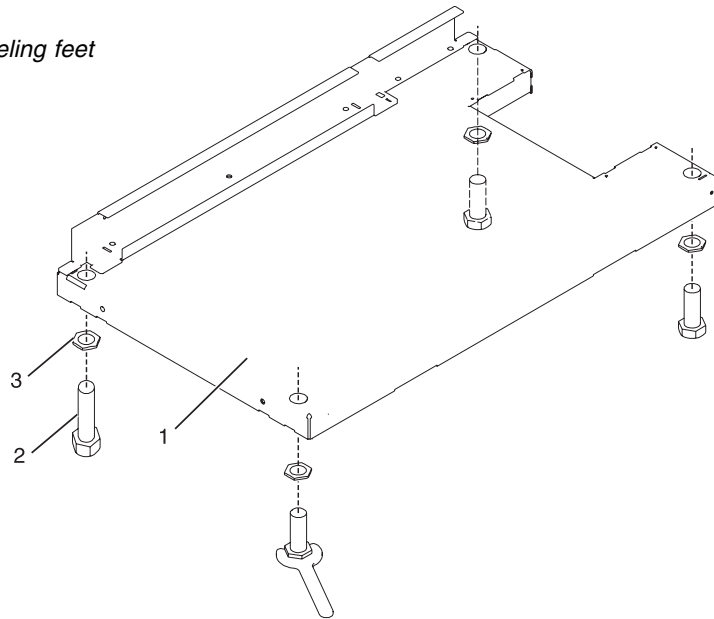
rack.

1	Rack front (base)
2	Leveling foot (quantity 4)
3	Jam nut (quantity 4)

45. If you have multiple racks that are connected as a suite (bolted to each other), go to "Connecting multiple racks with rack-to-rack attachment kit." Otherwise, torque the four bolts to 54 - 67 newton-meters (40 - 50 foot-pounds).
46. If you are not installing doors on your rack, install the top, left, and right trim panels.
47. Connect the power distribution system. For instructions, see "Connecting the power distribution system" on page 22.
48. After the rack is bolted down and you are going to attach a front electrical outlet, go to "Attaching the front or rear ac electrical outlet" on page 42.
49. If you are not going to attach a front electrical outlet and you are installing rack doors, go to "Attaching the rack doors" on page 64.

Connecting multiple racks with rack-to-rack attachment kit

You might need to connect multiple racks together.

To connect multiple racks with the rack-to-rack attachment kit, complete the following steps:

1. Read the "Rack safety notices" on page 2.
2. If they are installed, remove the side panels from each rack. Remove side panels only from the sides that connect to each other by completing the following steps:
   a. If the side panel ruggedized kit is installed, remove the screw that secures the panel.
   b. If the security kit is installed, slide the security bar to the unlocked position.
   c. Release the two panel-release tabs.
   d. Pull the panel up and away from the rack chassis. This motion releases the panel from the two lower J brackets.
   e. Store the side panels.
3. Remove the two Z brackets and the two J brackets. The brackets are used to hang the side panels.

4. Install the first two standoffs in the upper-left and lower-right corners of the first rack as shown in Figure 18.
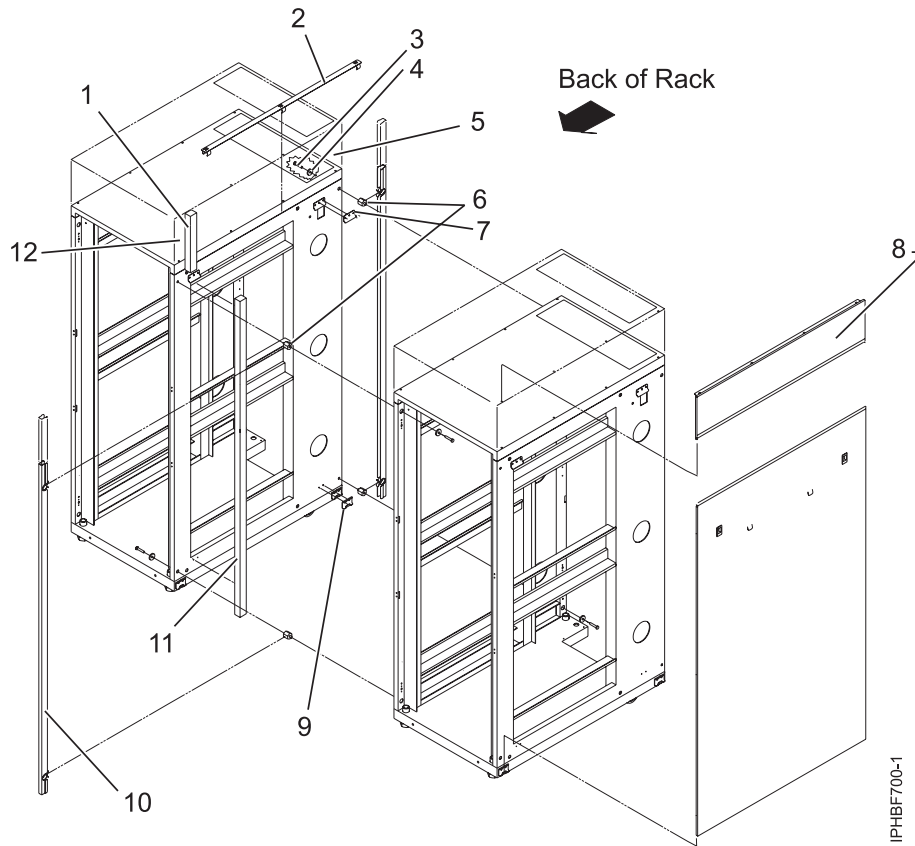
Figure 18. Removing the side panels, Z and J brackets, and installing standoffs and long foam to connect multiple racks

Item	Description
1	Short foam strip (only on a 42U rack)
2	Top trim strip
3	Screw
4	Washer
5	Rack top cover (only on a 42U rack)
6	Standoff
7	Z bracket
8	Rack top side cover (only on a 42U tall rack)
9	J bracket
10	Front and rear trim strips
11	Long foam strip

5. Install the second two standoffs in the upper-left and lower-right corners of the second rack as shown in Figure 18.
6. Attach the long foam as shown in Figure 18. For a model T42 rack, join the short foam to the end of the long foam, and adhere it to the frame length of the rack.
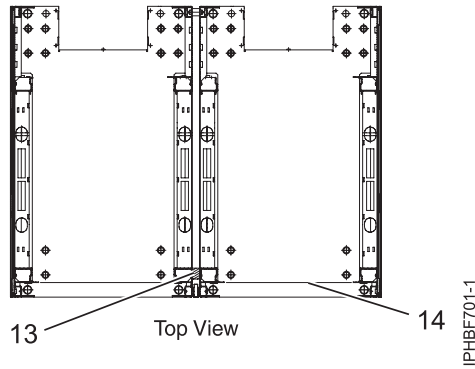
Figure 19. Foam strip locations (top view)

Item	Description
13	Foam strip
14	Rack frame

7. Position the racks together.
8. Align the standoff holes. Adjust the leveling feet to do align the standoff holes.
9. Install a screw and washer into all four positions, but do not tighten.
10. Level the racks after the racks are bolted together.
11. Tighten all four screws.
12. Snap on the trim pieces that go between the front and rear of the racks.
13. Snap on the trim piece that goes on top and between the racks.
14. Install rack filler panels to cover the open areas at the front of the racks. The rack front must also be sealed, including any gaps between equipment.
15. Connect the cables that go between the racks.
16. If the racks are secured to a rack mount plate, torque the four bolts that secure the rack to the rack mount plate to 54 - 67 newton-meters (40 - 50 foot-pounds).
17. If necessary, install a side panel on the end rack. For more information, see "Removing and replacing side panels" on page 72.
18. If you are installing stabilizer brackets, go to "Attaching the stabilizer brackets" on page 5.

Connecting the power distribution system

You can use a power distribution system to monitor the individual power loads of the devices that are plugged into it.

To connect a power distribution unit, see "Power distribution unit and Intelligent Switched High Function PDU" on page 46.

To connect the dc power distribution panel (feature code EPB8), see "Connecting the -48V dc Power Distribution Panel (PDP), feature code EPB8."

To connect the dc power distribution panel (feature code 6117), see "Connecting a -48V dc Power Distribution Panel (PDP), feature code 6117" on page 38.

Connecting the -48V dc Power Distribution Panel (PDP), feature code EPB8:

Some rack models (such as the 7014-T00) can support a dc power configuration for systems that require dc power. This procedure describes how to connect your power to the power distribution panel.

Note: You are responsible for providing and connecting the -48V dc power source and -48V dc power return cables from your source -48V dc to the bus bars in the power distribution panel. You are also responsible for connecting the ground cable to the rack frame.

Sections of the following instructions are from the copyrighted Telect Dual-Feed 600A Load Center Frame (600CB10 and 600CB12) User manual and are reproduced in part with the written permission of Telect, Inc. Details about the Telect Dual-Feed 600A Load Center Frame can be found in the Telect User manual. For more information, see https://www.telect.com/DesktopModules/TelectStore/Assets/136429-1%20Dual%20Feed%2060A%20Load%20Center%20Frame.pdf .

Connecting dc power to the PDP:

Learn more about how to connect your dc power to the PDP.

1. Remove the cable channel cover. To remove the cable channel cover, perform the following steps:

    a. Loosen the four retaining screws **(5)**.

    b. Align the larger openings in the cover **(6)** with the retaining screw heads.

    c. Lift the cover up to clear the retaining screws and remove it.
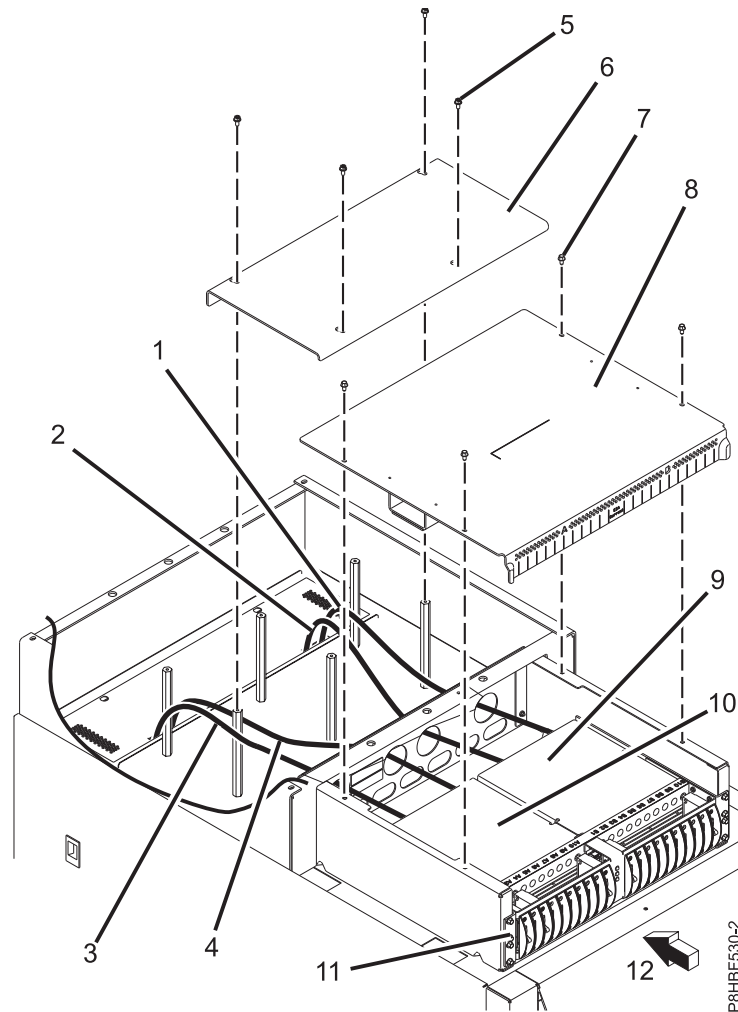
Figure 20. Power distribution panel

1   B side -48V DC return cable.

2	B side -48V DC input cable.
3	A side -48V DC return cable.
4	A side -48V DC input cable.
5	Cable channel cover retaining screw.
6	Cable channel cover.
7	Power distribution panel top cover retaining screw.
8	Power distribution panel top cover.
9	B-side shield.
10	A-side shield.
11	Power distribution panel.
12	Front of rack.

2. Remove the PDP top cover. To remove the top cover, perform the following steps:
   a. Remove the four retaining screws **(7)**.
   b. Remove the PDP cover.
3. Remove the **A** and **B** side plastic bus bar covers from the PDP. To remove the plastic bus bar covers from the PDP, perform the following tasks:
   a. Remove the two retaining screws from the **A** side cover.
   b. Remove the **A** side cover.
   c. Remove the two retaining screws from the **B** side cover.
   d. Remove the **B** side cover.

   DANGER

   > **The bus bar covers must be correctly reinstalled to protect against possible injury when maintenance is performed on the power distribution panel.**

4. If you are using alarm circuity, connect it now. If you are not using alarm circuitry, continue with step 5.

   Note: Ensure that the alarm wiring does not interfere with the installation of the left and right plastic bus bar covers.
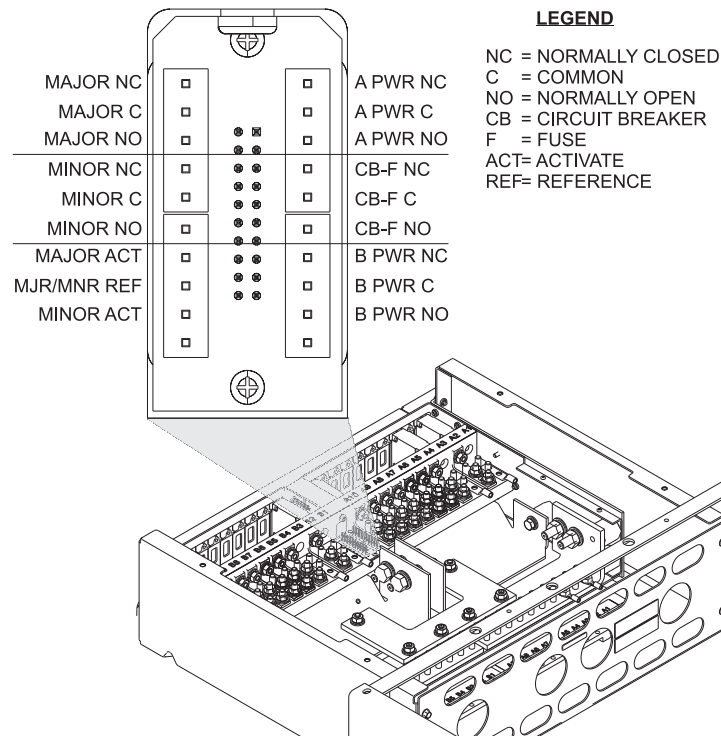
Figure 21. Alarm panel wiring connections

> a. Locate the alarm terminal. The alarm terminal is located near the top center of the PDP.
>
> b. Route the alarm cabling between the **A** and **B** -48V battery input connections and against the bottom of the PDP, so that you can install the **A** and **B** side plastic bus bar covers.
>
> c. Connect the alarm wiring to the alarm terminals.

5. Connect the dc power source to the PDP. To connect the dc power source to the PDP, perform the following steps:

> a. Go to your -48V dc power source. Turn off any -48V dc power sources that will be connected to the PDP.
>
> b. After the -48V dc power sources are turned off, ensure that there is a tag or label over the power source switches or fuses (lock-out/tag-out), to indicate to others that the power source has been turned off intentionally.
>
> **Attention:** Keep the power and signal cabling separated as much as possible to prevent any crosstalk.
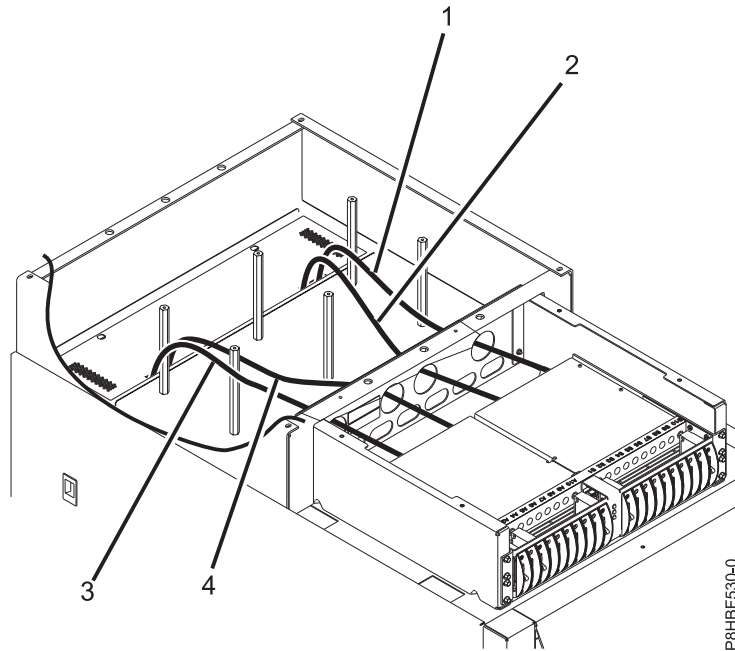
Figure 22. DC power cables

1	**B** side -48V DC return cable.
2	**B** side -48V DC input cable.
3	**A** side -48V DC return cable.
4	**A** side -48V DC input cable.

c. If you are installing on a raised floor, route the power cables up the rear of the rack to the PDP. If you are installing using overhead cables, route the power cables down to the PDP.

Attention: Ensure that any oxidation on the copper bus bars and copper terminals is removed.

Note: Lightly coat anti-oxidant on the input power cable lugs and on the -48V input (BATT) and return (RTN) terminals.

Note: Tighten the nuts that secure the input connections to the PDP to 17 newton-meters (150 inch-pounds/12.5 foot-pounds), maximum.

Figure 23. PDP cable connections

-48V DC Input
B feed

-48V DC Input
A feed

B10 B9 B8 B7 B6 B5 B4 B3 B2 B1   A10 A9 A8 A7 A6 A5 A4 A3 A2 A1

-48V return
B feed

Ground
connections

-48V return
A feed

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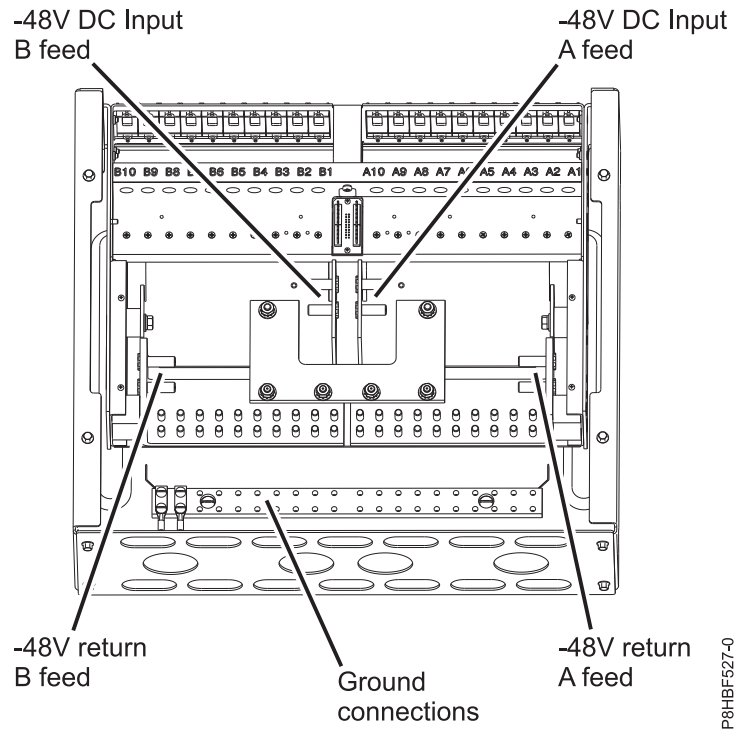
d. Connect the **A** feed of the -48V dc power to the **A** side input power connection (on the right side when viewed from the rear).

e. Connect the **A** feed of the -48V dc return to the **A** side return connection (right side when viewed from the rear).

f. Connect the **B** feed of the -48V dc power to the **B** side input power connection (left side when viewed from the rear).

g. Connect the **B** feed of the -48V dc return to the **B** side return connection (left side when viewed from the rear).
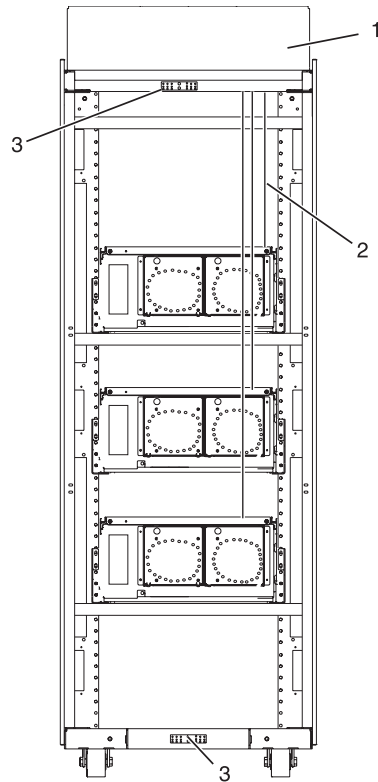
Figure 24. Cable connections

1	Rear of rack (dc)
2	Power cable, power return cable, and ground
3	Ground cable, installed at either the top or the bottom of the rack

6. Connect the power-source ground wire to the copper bar that is at the top or bottom of the rack. To connect the power-source ground wire to the copper bar, perform the following tasks:

   a. Ensure that the power-source ground wire is routed correctly for connection to the applicable copper ground bar.

      Note: Lightly coat anti-oxidant on the power-source ground wire lug, if required.

   b. If you are routing cables above the rack, connect the power-source ground wire to the copper bar on the top of the rack. Proceed to step 7.

   c. If you are routing cables underneath a raised floor, connect the power source ground wire to the copper bar on the bottom of the rack.

7. If the rack is on a raised floor, attach the -48 V dc power source cables to the rear of the rack with cable-restraint straps.

   Attention: If circuit breakers are installed, ensure that **all** PDP circuit breakers are in the **off** position.

8. Temporarily restore the **A** feed -48V dc power to the PDP.

9. Check the **A** feed voltage for proper polarity. If the polarity is correct, proceed to the next step. If it is not, correct the connections to obtain the proper voltage polarity and then continue with the next step.

10. Verify that:

    • A PWR LED on the front panel is green.

    • B PWR LED on the front panel is red.

Figure 25. Alarm panel wiring connections

LEGEND

NC = NORMALLY CLOSED
C   = COMMON
NO = NORMALLY OPEN
CB = CIRCUIT BREAKER
F   = FUSE
ACT= ACTIVATE
REF= REFERENCE

MAJOR NC
MAJOR C
MAJOR NO
MINOR NC
MINOR C
MINOR NO
MAJOR ACT
MJR/MNR REF
MINOR ACT

A PWR NC
A PWR C
A PWR NO
CB-F NC
CB-F C
CB-F NO
B PWR NC
B PWR C
B PWR NO

P8HBF524-0
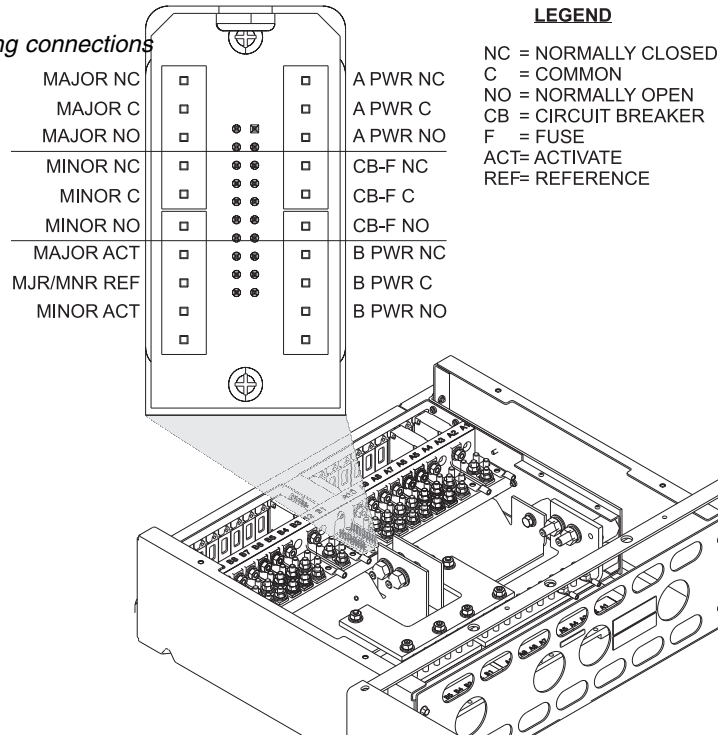
11. With A PWR LED green (normal operation) - but with B PWR LED red (off or failure operation) - test the A PWR relay and contact alarm terminal.

    • Ensure that there is continuity (0Ω) between Terminals **C** and **NC**.

    • Ensure that there is an open circuit (∞Ω) between Terminals **C** and **NO**.

12. Temporarily restore the **B** feed -48V dc power to the PDP.

13. Check the **B** feed voltage for proper polarity. If the polarity is correct, proceed to the next step. If polarity is incorrect, correct the connections to obtain the proper voltage polarity.

14. Verify the following:

    • A PWR LED on the front panel is green.

    • B PWR LED on the front panel is green.

15. If the B PWR LED is green (normal operation), test the B PWR relay and contact the alarm terminal.

    • Ensure that there is continuity (0Ω) between Terminals **C** and **NC**.

    • Ensure that there is an open circuit (∞Ω) between Terminals **C** and **NO**.

    Attention: Turn off **all** -48V dc power sources that are connected to the PDP.

16. After the -48V dc power sources are turned off, ensure that there is a tag or label over each of the power source switches or fuses (lock-out/tag-out) to indicate that the power source has been turned off intentionally.

17. If there are system components you must connect to the PDP, go to "Connecting the system component power to the PDP" on page 30. If there aren't any system components that need connecting, continue with the next step.

18. Replace the **A** and **B** side plastic bus bar covers that you removed in step 3. To replace the covers, perform the following tasks:

    a. Position the **A** side cover over the **A** side connections.

    b. Install the two retaining screws for the **A** side cover.

    c. Position the **B** side cover over the **B** side connections.

    d. Install the two retaining screws for the **B** side cover.

DANGER

> **The bus bar covers must be correctly reinstalled to protect against possible injury when maintenance is performed on the power distribution panel.**

19. Replace the PDP top that you removed. To replace the PDP top cover, perform the following tasks:
    a. Position the PDP top cover onto the PDP.
    b. Install the four retaining screws.
20. Install the cable channel cover that you removed. To install the cable channel cover, perform the following tasks:
    a. Position the cover over the retaining screws and align the larger openings in the cover with the retaining screw heads.
    b. Set the cover down over the retaining screws and slide it towards the rear of the rack so the screws are now located in the narrow slots.
    c. Tighten the four retaining screws.

    Attention: Ensure that all the circuit breakers are in the **off** position.
21. Restore power to both the **A** and **B** sides of the PDP.
22. Continue with "**Powering on the dc powered system components**" on page 38.

Connecting the system component power to the PDP:

Install the component -48V dc power cable assemblies into the PDP. Power cables are supplied with the IBM device that you want to install.

Note: If the device to be installed is not provided by IBM, you must provide your own dc power cables.

Note: Ensure that you remove any oxidation on the copper bus bars and copper terminals.

Note: Lightly coat anti-oxidant on the output power cable lugs and on the -48V output terminals and return bus bar terminals.

Note: Some system components identify the power supply alphabetically instead of numerically.

Note: Some devices require either the **A** or **B** side circuit breaker to control the device's power. If the device requires only an **A** or **B** side circuit breaker, confirm where the -48V dc power cable connects.

Attention: If the product to be connected to the PDP has two power supplies [1 (A) and 2 (B)], ensure that the connections are made to matching circuit breakers. For example, circuit breakers A2 and B2, A4 and B4.

Attention: If units that are already installed in the rack are powered on, ensure that you are ready for the new components to be connected to the PDP.

To connect the system component power to the PDP, complete the following task:
1. If you already applied dc power to the rack, continue with the next step. If you have not applied dc power to the rack, go to step 2.

    DANGER

    > **If you do not disconnect the -48V dc power sources to the rack, the cable installation *must* be completed by a qualified electrician.**

    a. Remove the cable channel cover. To remove the cable channel cover, complete the following tasks:

1) Loosen the four retaining screws.

2) Align the larger openings in the cover with the retaining screw heads.

3) Lift the cover up to clear the retaining screws and remove it.

b. Remove the PDP top cover. To remove the PDP top cover, complete the following tasks:

1) Remove the four retaining screws.

2) Remove the PDP cover.

DANGER

> **Ensure that you have turned off the -48V dc A power sources that are connected to the PDP before you continue.**

c. After the -48V dc **A** power sources are turned off, be sure that a tag or label is present over the **A** power source switch or fuse (lock-out/tag-out) to indicate that the **A** you intentionally turned off the power source.

d. Remove the **A** side plastic bus bar cover. To remove the **A** side plastic bus bar cover, complete the following tasks:

1) Remove the two retaining screws from **A** side cover.

2) Remove the **A** side cover.

e. Continue with step 2.

CAUTION:
Ensure that the circuit breaker the unit will be connected to has the proper current rating, so that the unit is properly protected.

2. Connect the dc power cable for power supply 1 (A) to the PDP. To connect the dc power cable for power supply 1 (A) to the PDP, complete the following task:

Note: Tighten the nuts that secure the output connections to 5.6 newton-meters (50 inch\pounds), maximum.

Note: Tighten the screws that secure the ground wire to the ground bus bar to 3 newton\meters (26.5 inch-pounds), maximum.

a. Connect the -48V dc wire to the first available circuit breaker lug on the **A** side.

b. Connect the -48V return wire to the position that matches the circuit breaker position on the PDP return, for example, if the -48V dc wire is connected to circuit breaker A3, connect the return wire to the A3 position on the return bus bar.

c. Connect the ground wire to the matching position on the copper ground bar.

d. Route the dc power cable to the system component and connect it to power supply 1 (A).

e. If you must connect more units or power supplies to the **A** side of the PDP, repeat step 2 for each additional unit/power supply.

   Attention: If there are more than two power supplies in the unit that is being installed, refer to the unit documentation to ensure that the dc wiring is connected properly. This ensures that you have power redundancy.

f. After all the **A** side connections are complete, replace the **A** side plastic cover. To replace the plastic cover, complete the following tasks:

1) Position the cover over the **A** side connections.

2) Install the two retaining screws for the **A** side cover.

3. If power was previously applied to the rack, restore the -48V dc **A** side power to the PDP. Otherwise, go to step 6.

DANGER

> Ensure that you turn off the -48V dc **B** power sources that are connected to the PDP.

4. After you turn off the -48V dc **B** power sources, ensure that a tag or label is placed over the **B** power source switch or fuse (lock-out/tag-out) to indicate that you intentionally turned off the **B** power source.

5. Remove the **B** side plastic bus bar covers. To remove the **B** side plastic bus bar covers, complete the following tasks:

   a. Remove the two retaining screws from **B** side cover.

   b. Remove the **B** side cover.

6. Connect dc power cable for power supply 2 (B) to the PDP.

   a. Connect the -48V dc wire to the circuit breaker lug on the **B** side that matches the **A**side position, for example, if the **A** side -48 V dc wire is connected to circuit breaker A3, connect the wire to the B3 position. If the B position is already used, connect the -48V dc wire to the first available circuit breaker lug on the **B** side.

   b. Connect the -48V return wire to the position that matches the circuit breaker position on the PDP return. For example, if the -48V dc wire is connected to circuit breaker B3, connect the return wire to the B3 position on the return bus bar.

   c. Connect the ground wire to the matching position on the copper ground bar.

   d. Route the dc power cable to the system component and connect it to power supply 2 (B).

   e. If you must connect more than one unit or power supply to the **B** side of the PDP, repeat step 6.

   Attention: If there are more than two power supplies in the unit that you are installing, refer to the unit documentation to ensure that the dc wiring is connected properly. This ensures that power is redundant.

   f. After all the **B** side connections are complete, replace the **B** side plastic cover. To replace the plastic cover, complete the following task:

   1) Position the cover over the **B** side connections.

   2) Install the two retaining screws for the **B** side cover.

   g. Replace the PDP top cover. To replace the PDP top cover, complete the following task:

   1) Position the PDP top cover onto the PDP.

   2) Install the four retaining screws.

   h. Install the cable channel cover. To install the cable channel cover, complete the following task:

   1) Position the cover over the retaining screws and align the larger openings in the cover with the retaining screw heads.

   2) Set the cover down over the retaining screws and slide it toward the rear of the rack so that the screws are now located in the narrow slots.

   3) Tighten the four retaining screws.

7. If power was previously applied to the rack, restore the -48V dc **B** side power to the PDP. If power was not previously applied to the rack, apply power to both the **A** and **B** sides of the PDP.

8. Continue with "Installing the system component circuit breakers in the PDP."

Installing the system component circuit breakers in the PDP:

Learn more about installing the component circuit breakers. Circuit breakers are supplied with the device that you are installing.

DANGER

> **Use only the circuit breakers that were provided with the device that you are installing. Using an incorrectly rated circuit breaker may create a safety hazard.**

Note: If the device you are installing is not provided by IBM, you must provide the properly sized circuit breakers.

Note: A few installed devices might require either the **A** or **B** side circuit breaker to control the device's power. If the device requires an **A** or **B** side circuit breaker, install the circuit breaker to match the location of the installed cable. For example, if the cable is at location A4, the circuit breaker must be installed in position A4.

Attention: Ensure that the circuit breaker is in the off position before you insert it into the circuit breaker panel.

1. Remove the bottom screw that holds the circuit breaker cover to the selected circuit breaker position on the **A** side of the PDP. Set the screw and cover aside.
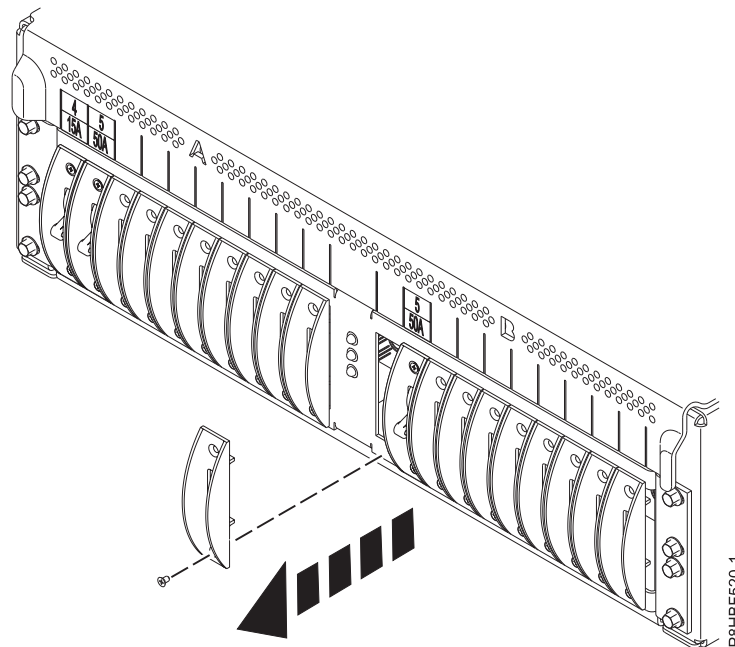

Figure 26. Circuit breaker cover (circuit breaker position shown is for reference only)

2. Use the screws that are provided with the circuit breaker to attach the cover that you removed in step 1 to the circuit breaker.
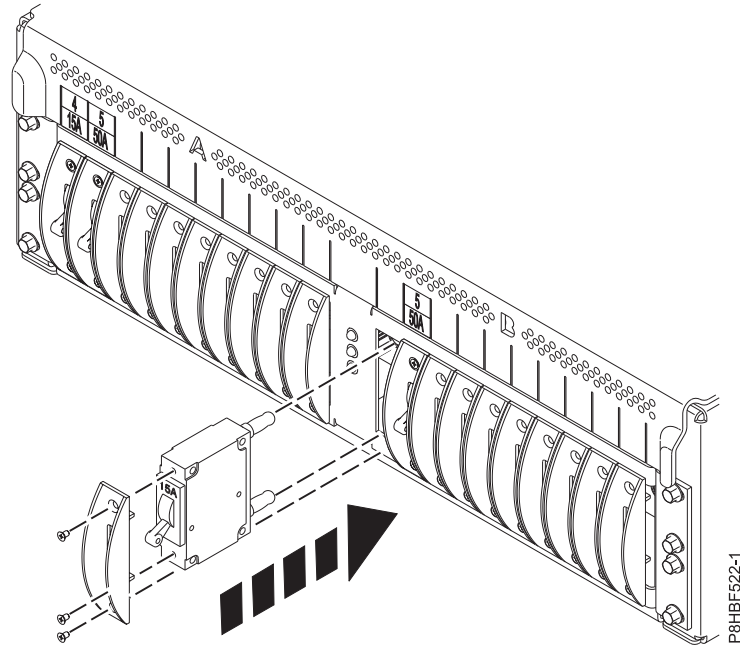
Figure 27. Circuit breaker installation (circuit breaker position shown is for reference only)

3. With the circuit breaker in the off position, insert it into the PDP position that matches the cable connection. The **Line** circuit breaker terminal must be at the top position. The front cover must be placed against the PDP panel. If the front cover is not against the PDP panel, press on it until it is placed against the panel.

4. Install the screw that you removed in step 1 to fasten the cover to the PDP.

5. Place an EIA location and current rating label in the small square above the circuit breaker position. To place these labels, complete the following steps:

   a. Select a label from the PDP label strip that matches the current rating of the circuit breaker that is installed, for example **30A**.

   b. Install the current label in the lower section of the small square.

   c. Select a label from the PDP label strip that matches the EIA location of the device that is supported by the circuit breaker, for example **17**.

   d. Install the EIA label in the upper section of the small square.
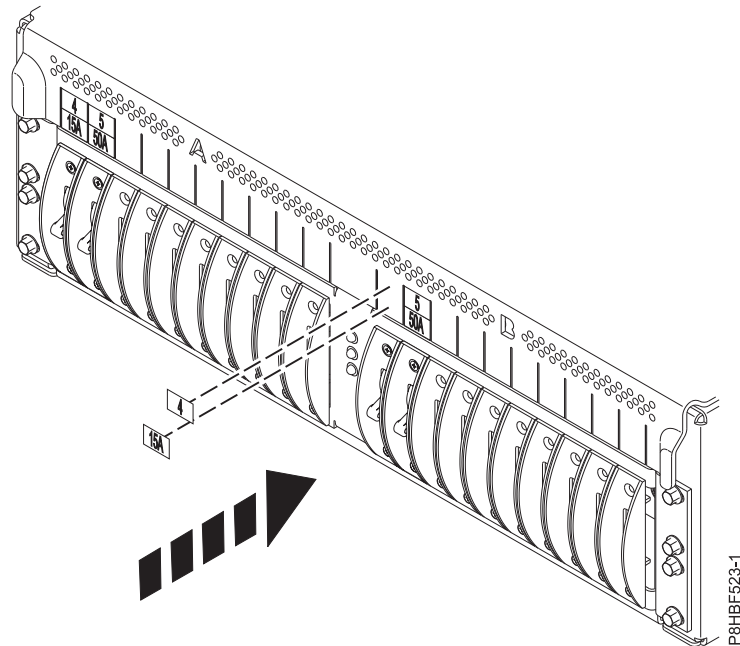
Figure 28. Labeling PDP circuit breakers (circuit breaker position shown is for reference only)

6. Repeat steps 1 - 5 for the **B** side circuit breaker.
7. Determine whether any additional circuit breakers must be installed. To install more than one circuit breaker, repeat steps 1 through 6.

Removing the system component circuit breakers from the PDP:

Learn more about removing and replacing a circuit breaker from PDP.

To remove the system component circuit breakers from the PDP, complete the following steps:
1. Ensure that all processes are shut down in the device that controls the circuit breakers.
2. Place the circuit breakers in the off position.
3. Remove the bottom screw that holds the circuit breaker cover to the selected circuit breaker position on the **A** side of the PDP.

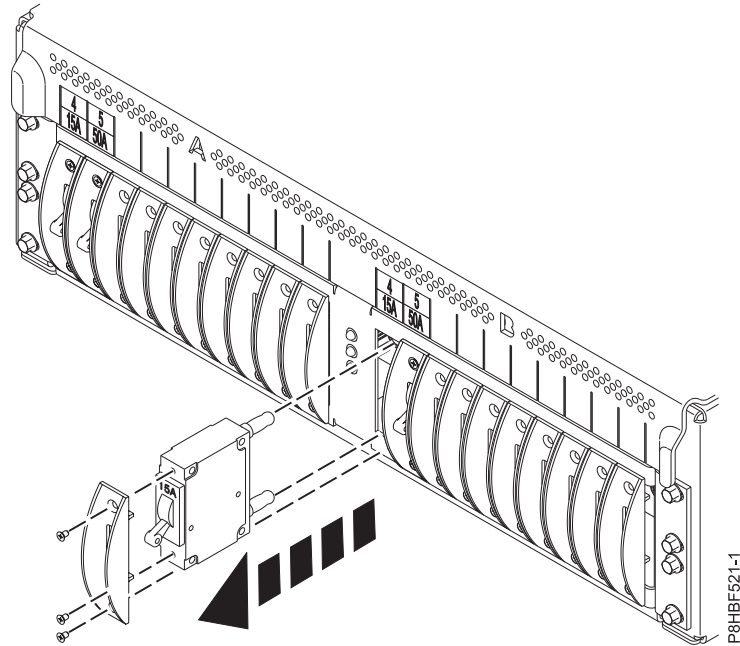*Figure 29. Circuit breaker removal (circuit breaker position shown is for reference only)*

4. Pull the cover and circuit breaker assembly from the PDP.
5. Remove the screws that hold the cover to the circuit breaker.
6. If a circuit breaker with the same current rating is to be reinstalled, go to "Installing the system component circuit breakers in the PDP" on page 32 and follow steps 2 - 3.
7. Secure the circuit breaker by using the screw that you removed in step 3.
8. If you are replacing a circuit breaker, go to "**Powering on the dc powered system components**" on page 38.
9. If you are installing a new circuit breaker with a different rating, go to "Installing the system component circuit breakers in the PDP" on page 32.
10. If you are not installing a circuit breaker, install the circuit breaker cover by using the screw that you removed in step 3.
11. Remove the current and EIA labels that are above the location from which the circuit breakers were removed.
12. Repeat steps 1 - 11 for all the circuit breakers that you want to remove.

Removing the system component power cables from the PDP:

To remove the -48V DC system component power cables from the PDP, use the following steps.

Note: Some system components identify the power supply alphabetically instead of numerically.

Note: Some devices require either the **A** or **B** side circuit breaker to device cable to be removed.

DANGER

> **If the circuit breakers that control the device remain in the PDP, ensure that they are in the "off" position. After the circuit breakers are turned off, be sure that a tag or label (lockout/tagout) over the circuit breakers is present to indicate that the power source is turned off intentionally.**

DANGER

> If you do not disconnect the -48V dc power sources to the rack the cable removal *must* be performed by a qualified electrician.

1. Remove the cable channel cover. To remove the cable channel cover, complete the following tasks:
   a. Loosen the four retaining screws.
   b. Align the larger openings in the cover with the retaining screw heads.
   c. Lift the cover up to clear the retaining screws and remove it.
2. Remove the PDP top cover. To remove the PDP top cover, complete the following tasks:
   a. Remove the four retaining screws.
   b. Remove the PDP cover.
3. If the cable to be removed is on the B-side only, go to step 9

   DANGER

   > Turn off the -48V dc A power sources that are connected to the PDP.

4. After you turn off the -48V dc A power sources, put a tag or label over the A power source switch or fuse (lock-out/tag-out) to indicate that you intentionally turned off the source for the A power.
5. Remove the A-side plastic bus bar covers from the PDP. To remove the A-side plastic bus bar covers from the PDP, remove the two retaining screws from the A-side cover.
6. Disconnect the dc power cable for power supply 1 (A) from the PDP. To disconnect the dc power cable for power supply 1, complete the following tasks:
   a. Disconnect the -48V dc wire from the circuit breaker lug on the **A** side. Reinstall the nuts and washers onto the studs.
   b. Disconnect the -48V return wire from the position that matches the circuit breaker position on the PDP return. For example, if the -48V dc wire was connected to circuit breaker A3, disconnect the return wire from the A3 position on the return bus bar. Reinstall the nuts and washers onto the studs.
   c. Disconnect the ground wire to the matching position on the copper ground bar. Reinstall the screws and washers into the copper ground bar.
   d. Disconnect the dc power cable from power supply 1 (A) and remove it.
   e. If you must disconnect more than one unit or power supply from the **A** side of the PDP, repeat step 6.
7. After all the A-side cables are removed, position the cover over the A-side connections and reinstall the two retaining screws.
8. Restore the -48V dc A-side power to the PDP.
9. If you must remove cables from the B side, continue with the next step. Otherwise, go to step 17 on page 38.

   DANGER

   > If cables are connected to the B side, turn off the -48V dc B power sources that are connected to the PDP.

10. After the -48V dc **B** power sources are turned off, put a tag or label over the **B** power source switch or fuse (lock-out/tag-out) to indicate that the **B** power source is turned off intentionally.
11. Remove the B side plastic bus bar covers from the PDP by removing the two retaining screws from the **B** side cover.
12. Disconnect the dc power cable for power supply 2 (**B**) from the PDP. To disconnect the dc power cable, complete the following tasks:

a. Disconnect the -48V dc wire from the circuit breaker lug on the **B** side. Reinstall the nuts and washers onto the studs.

b. Disconnect the -48V return wire from the position that matches the circuit breaker position on the PDP return. For example, if the -48V dc wire was connected to circuit breaker B3, the return wire must be disconnected from the B3 position on the return bus bar. Reinstall the nuts and washers onto the studs.

c. Disconnect the ground wire to the matching position on the copper ground bar. Reinstall the screws and washers into the copper ground bar.

d. Disconnect the dc power cable from power supply 2 (**B**) and remove it.

e. If more units or power supplies must be disconnected from the **B** side of the PDP, repeat 12 on page 37.

13. After all the B side cables are removed, replace the B side plastic cover by repositioning the cover over the **B** side connections and reinstalling the two retaining screws.

14. Replace the PDP top cover by repositioning the top cover on to the PDP and installing the four retaining screws.

15. Install the cable channel cover. To install the cable channel cover, complete the following tasks:

a. Position the cover over the retaining screws and align the larger openings in the cover with the retaining screw heads.

b. Set the cover down over the retaining screws and slide the cover toward the rear of the rack so that the screws are now located in the narrow slots.

c. Tighten the four retaining screws.

16. Restore the -48V dc **B** side power to the PDP.

17. Use the instruction manual that came with the device to complete the removal of the device.

18. If you are cabling a new device, see "Connecting the system component power to the PDP" on page 30.

Powering on the dc powered system components*:*

You might need to power on the dc powered system components.

Attention: Some devices have a power on toggle. When you switch the device circuit breakers in the **on** position, ensure that you take special precautions. If the device does not have a power on toggle, the device will power on as soon as the device circuit breaker is placed in the **on** position.

Note: Some devices use either the **A** or **B** side circuit breaker to control the power on the device.

Note: Before you power on the device, refer to the device installation manual to connect signal cables.

To power on the dc powered system components, complete the following tasks:

1. Switch the device's **A**-side circuit breaker to the **on** position.

2. Confirm that the **A**-side power supply on the device powers on.

3. If the device has a single power supply, use the device instruction manual to complete the installation. If the device has two or more power supplies, continue with the next step.

4. Switch the device's **B**-side circuit breaker to the **on** position.

5. Confirm that the **B**-side power supply on the device powers on properly.

6. Use the device's instruction manual to complete the installation.

Connecting a -48V dc Power Distribution Panel (PDP), feature code 6117:

Some rack models (such as the 7014-T00) can support a dc power configuration for systems that require dc power.

Note: You are responsible for providing and connecting the -48V dc power source and -48V dc power return cables from your source -48V dc to the bus bars in the power distribution panel. You are also responsible for connecting the ground cable to the rack frame.

1. Remove the six mounting screws from the top cover of the dc power distribution panel and remove the top cover.

2. Remove the cable channel cover. To remove the cable channel cover, complete the following steps:

   a. Loosen the four retaining screws.

   b. Align the larger openings in the cover with the retaining screw heads.

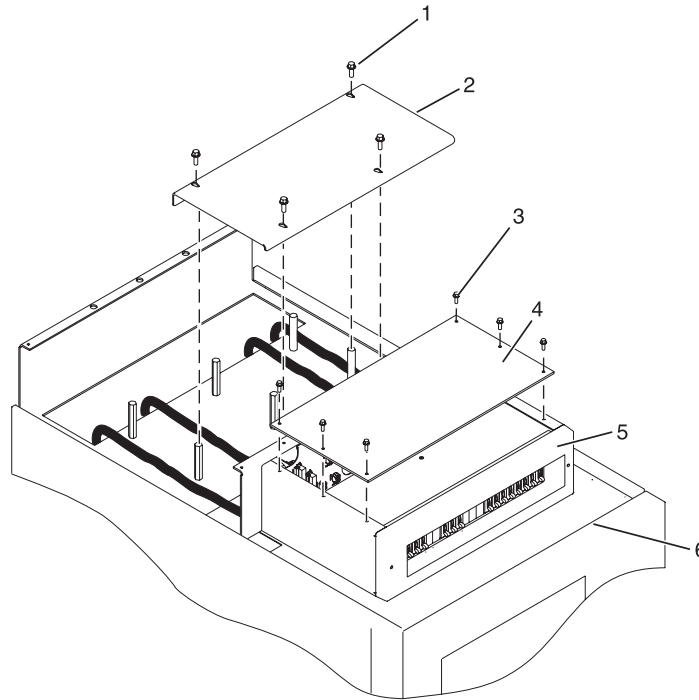   c. Lift the cover up to clear the retaining screws and remove it.

Figure 30. Removing the cable channel cover

Item	Description	Item	Description
1	Cable channel cover retaining screw	5	Shield
2	Cable channel cover	6	Power distribution panel
3	Power distribution panel top cover retaining screws		
4	Power distribution panel top cover		

3. Remove the -48 V dc bus bar shield from the power distribution panel.

   DANGER

   > **The bus bar shield must be correctly reinstalled over the -48 V dc return bus bars to protect against injury when the power distribution panel is serviced.**

4. Ensure that the following steps are completed when you connect the dc power source.

   a. At -48 V dc power source, turn off any -48 V dc power sources that you plan to connect to the power distribution panel.

   b. After the -48 V dc power sources are turned off, place a tag or label over the power source switches or fuses (lock-out/tag-out) to indicate that you turned off the power source intentionally.

> **Note:** Ensure that any oxidation on the copper bus bars is removed.

c. If this is a raised-floor installation and you are working at the rear of the rack, route the power cables up the rack's right side.

d. Ensure that the external -48 V dc power cable is connected correctly to the -48 V dc bus bar.

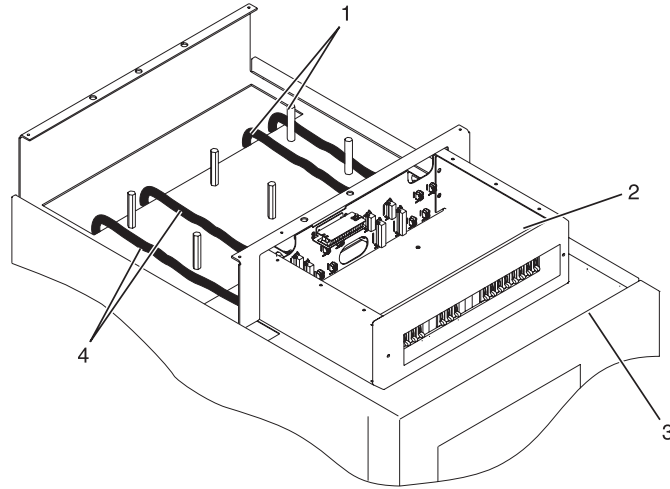e. Ensure that the external -48 V dc return cable is routed correctly and installed on the return bus bar.

Figure 31. Routing the power cables

Item	Description
1	-48 V dc power cable and return power cable
2	Power distribution panel
3	Front of rack
4	-48 V dc power cable and return power cable
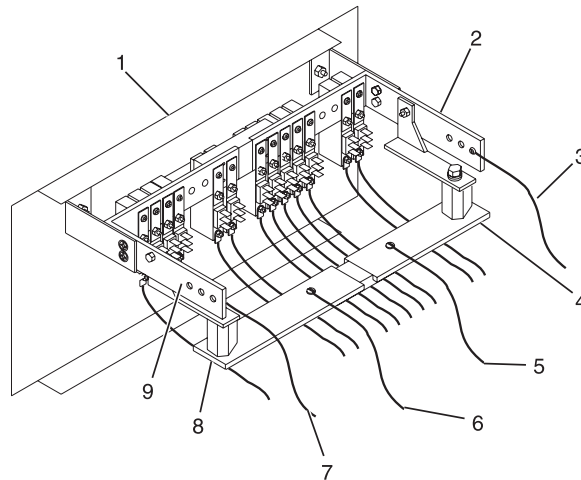
Figure 32. Return bus bar

Item	Description	Item	Description
1	Front of power distribution panel	6	(B) Return (-) power cable
2	(A) -48 V dc (-) bus bar	7	(B) -48 V dc (-) power cable
3	(A) -48 V dc (-) power cable	8	(B) Return (-) bus bar

Item	Description	Item	Description
4	(A) Return (-) bus bar	9	(B) -48 V dc (-) bus bar
5	(A) Return (-) power cable		

f. If you want to install a power status alarm, connect the alarm cable to the terminal board on the rear cover of the dc power distribution panel.

   Note: Ensure that you remove the oxidation on the copper bus bars.

g. Ensure that the power-source ground cable is routed correctly and connects the power-source ground cable to the copper bar at the lower-rear or upper-rear center of the rack.

h. If the rack is on a raised floor, attach the -48 V dc power source cables to the rear of the rack with cable-restraint straps.
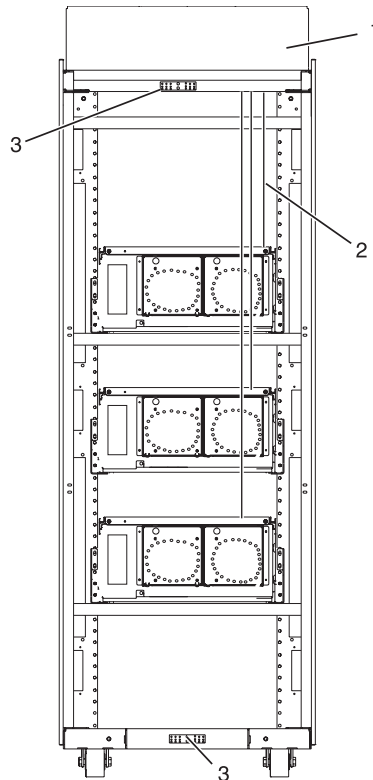
Figure 33. Cable locations

Item	Description
1	Rear view of rack (dc)
2	Power cable, power return cable, and ground
3	Ground cable (Install at either top or bottom of the rack)

5. Reinstall the -48 V dc bus bar shield.

6. Reinstall the top cover on the dc power distribution panel.
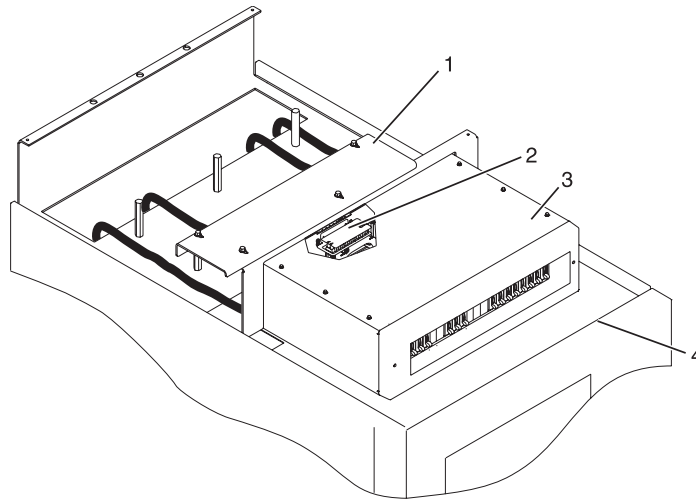
7. Reinstall the cable channel cover.

Figure 34. Reinstalling the cable channel cover

Item	Description
1	Cable channel cover
2	Terminal block (both sides)
3	Power distribution panel
4	Front of rack

Attaching the front or rear ac electrical outlet:

You might need to attach an ac outlet.

Attention: The front and rear ac outlet-mounting plates mount through the same mounting holes that secure the stabilizer brackets to the rack chassis. Therefore, if the rack must be bolted to the floor, the stabilizer brackets must be removed.

Install the ac outlet-mounting plates only after you bolt the rack to the floor and remove the stabilizer brackets.

The following items are installed at the site:
- The ac outlet-mounting plate, which provides the mounting location for an ac electrical outlet.
- The ac electrical outlets on the front or rear of the rack.
- The ESD Y ground cable.

Note: You are responsible for providing both the outlets and the power cables that attach to the power source. You are also responsible for connecting the ac outlet correctly. These items are not field-replaceable units (FRUs).

Installing the ac outlet-mounting plates with ac outlets:

If you choose to install ac mounting plates, complete the following tasks.

If you do not want to install ac outlets on the rack, go to "Installing the ac outlet-mounting plate without ac outlets" on page 44.

If you want to install ac outlets on the front or rear ac outlet-mounting plate, complete the following steps:

1. Determine the number of ac outlets that you are installing.
2. Confirm with your contractor that the number and location of ac outlets to be installed are correct.
3. Remove the blank filler plates from the ac outlet-mounting plates for the number of ac outlets that you are installing.
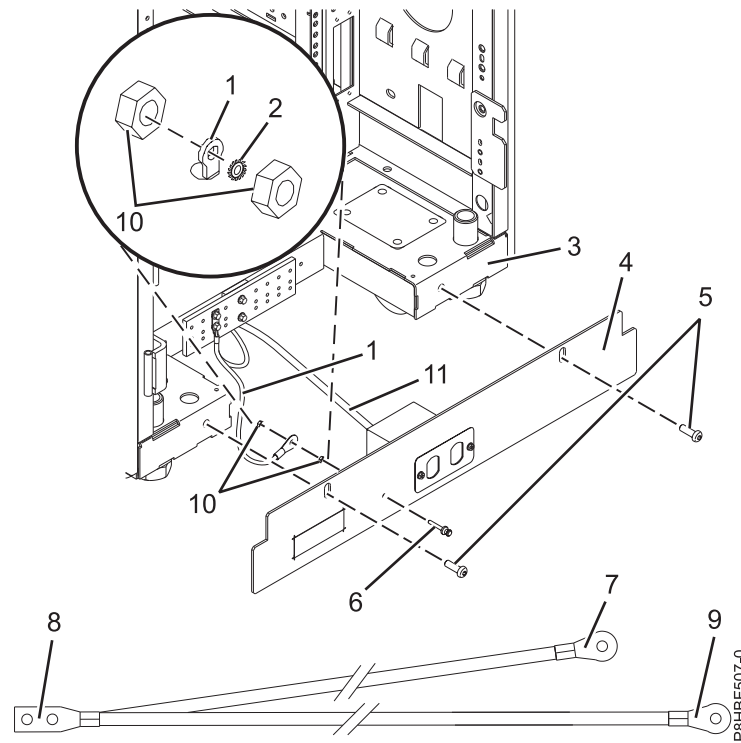4. Install the ac outlets on the ac outlet-mounting plate.

Figure 35. Installing the mounting plate

Item	Description	Item	Description
1	Ground cable	7	Ground connector (short end of ground cable)
2	Star washer	8	"Y" end of ground cable
3	Rear of rack	9	Long end of ground cable
4	Mounting plate	10	Ground lug nut (quantity 2)
5	Button-head screw	11	ac power cable from power source
6	Ground lug		

5. Ensure that the nut on the ground lug in the mounting plate is tight.
6. Locate the Y-shaped ground cable.

   Note: The remaining steps can be used to install ac outlets on the front or the rear of the rack.
7. Place the star washer onto the ground lug of the front ac outlet-mounting plate.
8. Place the lug on the long end of the ground cable onto the ground lug.
9. Place a ground lug nut onto the ground lug and securely tighten it.
10. Route the cable under the rack.
11. Position the front ac outlet-mounting plate onto the rack.
12. Install the front ac outlet-mounting plate screws (stabilizer mounting screws) into the mounting plate and through the mounting holes in the rack. Tighten the screws.
13. Place the star washer onto the ground lug of the rear ac outlet-mounting plate.

14. Place the lug on the short end of the ground cable onto the ground lug.
15. Place a ground lug nut onto the ground lug and securely tighten it.
16. Connect the Y-shaped end of the ground cable to the rack frame, either near the center in the rear of the rack or to the ground bus bar at the rear of the rack.
17. Position the rear ac outlet-mounting plate onto the rack.
18. Install the rear ac outlet-mounting plate screws (stabilizer mounting screws) into the mounting plate and through the mounting holes in the rack. Tighten the screws.

Installing the ac outlet-mounting plate without ac outlets:

If you choose to install an outlet plate without the outlets, complete the following tasks.
1. Ensure that the nut on the ground lug in the ac mounting plate is tight.
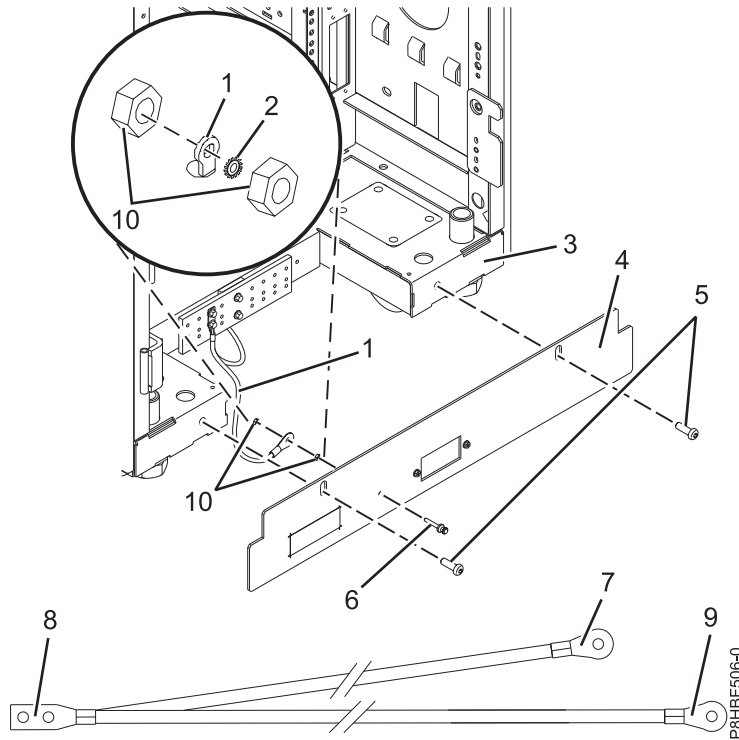
Figure 36. Installing the mounting plate

Item	Description	Item	Description
1	Ground cable	7	Ground connector (short end of ground cable)
2	Star washer	8	"Y" end of ground cable
3	Front of rack	9	Ground lug
4	Mounting plate	10	Ground lug nut (quantity 2)
5	Button-head screw		
6	Long end of ground cable		

2. Locate the Y-shaped ground cable.
3. Place the star washer onto the ground lug of the front ac outlet-mounting plate.
4. Place the lug on the long end of the ground cable onto the ground lug.
5. Place a ground lug nut onto the ground lug and securely tighten it.
6. Route the cable under the rack.

7. Position the front ac outlet-mounting plate onto the rack.
8. Install the front ac outlet-mounting plate screws (stabilizer mounting screws) into the mounting plate and through the mounting holes in the rack. Securely tighten the screws.
9. Place the star washer onto the ground lug of the rear ac outlet-mounting plate.
10. Place the lug on the short end of the ground cable onto the ground lug.
11. Place a ground lug nut onto the ground lug and securely tighten it.
12. Connect the Y-shaped end of the ground cable to the rack frame, either near the center in the rear of the rack or to the ground bus bar at the rear of the rack.
13. Position the rear ac outlet-mounting plate onto the rack frame.
14. Install the rear ac outlet-mounting plate screws (stabilizer mounting screws) into the mounting plate and through the mounting holes in the rack. Securely tighten the screws.

For instructions about how to install front or rear ac outlet mounting plates with ac outlets, see "Installing the ac outlet-mounting plates with ac outlets" on page 42.

Checking the ac outlets:

To help ensure safety and reliable operation, check the ac outlets.

Before you begin, ensure that you have a multimeter to check voltages and an approved ground-impedance tester to test the grounding resistances. Do not use a multimeter to measure grounding resistance.

Before you plug the rack into the ac power source, complete the following checks on the ac power source:
1. Turn off the branch circuit breaker that powers the rack. To the circuit breaker switch, attach tag S229-0237, which reads `Do Not Operate.`

   Note: All measurements are made with the receptacle faceplate in the usual installed position.
2. Some receptacles are enclosed in metal housings. For this type of receptacle, complete the following steps:
   a. Using a multimeter, check for less than 1 volt from the receptacle case to any grounded metal structure in the building, such as a raised-floor metal structure, water pipe, building steel, or similar.
   b. Using a multimeter, check for less than 1 volt from the receptacle ground pin to a grounded point in the building.

      Note: If the receptacle case or faceplate is painted, ensure that the probe tip penetrates the paint and makes good electrical contact with the metal.
   c. Using a multimeter, check the resistance from the receptacle ground pin to the receptacle case. Check the resistance from the ground pin to the building ground. The readings should be less than 1.0 ohm, which indicates the presence of a continuous grounding conductor.
3. If any of the checks that you made in step 2 are not correct, remove the power from the branch circuit and make the wiring corrections. Recheck the receptacle after the wiring is corrected.
4. Use a ground-impedance tester to check for infinite resistance between the ground pin of the receptacle and each of the phase pins. The test checks for a wiring short to ground or a wiring reversal.
5. Use a ground-impedance tester to check for infinite resistance between the phase pins. The test checks for a wiring short.
6. Turn on the branch circuit breaker.
7. Use a multimeter to measure for the appropriate voltages between phases. If no voltage is present on the receptacle case or grounded pin, the receptacle is safe to touch.
8. Using a multimeter, verify that the voltage at the ac outlet is correct.

Power distribution unit and Intelligent Switched High Function PDU:

The power distribution unit (PDU), power distribution unit plus (PDU+) or Intelligent Switched High Function PDU can be installed in the 7014-T00, 7014-T42, and 7965-S42 racks. The PDU monitors the individual power loads of the devices that are plugged into it.

Installing the PDU, PDU+, or Intelligent Switched PDU in the side of a rack:

Learn how to install the power distribution unit (PDU), power distribution unit plus (PDU+), or Intelligent Switched PDU vertically in the side of a rack.

Tip: Removing the rack doors and side panels makes installing the PDU easier.

To install the PDU model in a single EIA vertical mounting space in the side of the rack, complete the following steps:

1. Read the "Rack safety notices" on page 2.
2. Choose one of the following options to install your PDU model:
   - To install the PDU or Intelligent Switched PDU, go to step 5.
   - To install the PDU+, continue with step 3.
3. Align the vertical-mounting brackets **(A)** to the front of the PDU+. Make sure that you attach the brackets so that the power outlets face the rear of the rack.
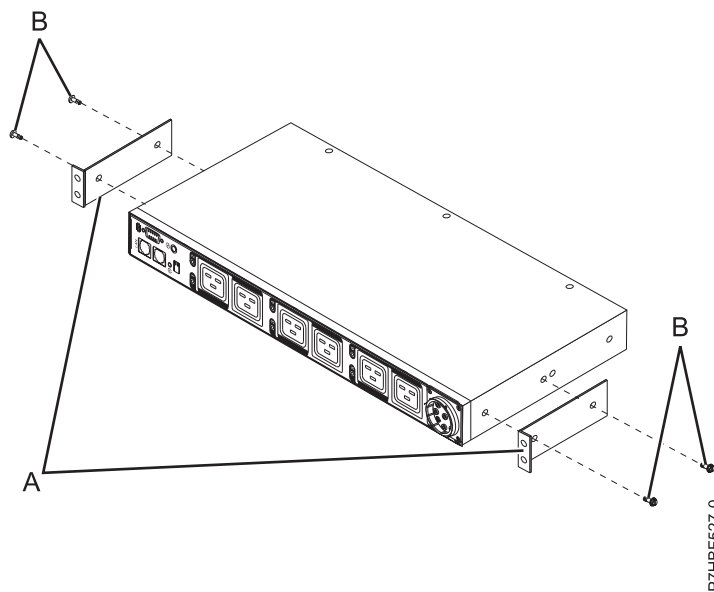
Figure 37. Aligning the vertical-mounting brackets to the front of the PDU+

4. Attach the brackets **(A)** to the PDU+ with two M3x5 screws **(B)** per bracket. Use screws that were provided with the rack mounting kit.
5. Attach nut clips **(A)** to the four locations on the rack mounting flanges where you want to attach the PDU model. Use nut clips that were provided with the rack mounting kit. See the following figure.
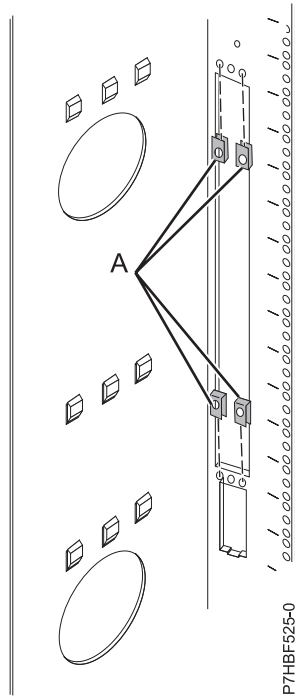
Figure 38. Attaching nut clips to the rack mounting flanges from the rear of the rack

6. Align the PDU model with the opening in the side of the rack. Then, while you hold the PDU model in place, attach the brackets to the nut clips in the rack mounting flanges with four M5 screws **(A)** as shown in the following figure. Use screws that were provided with the rack mounting kit.
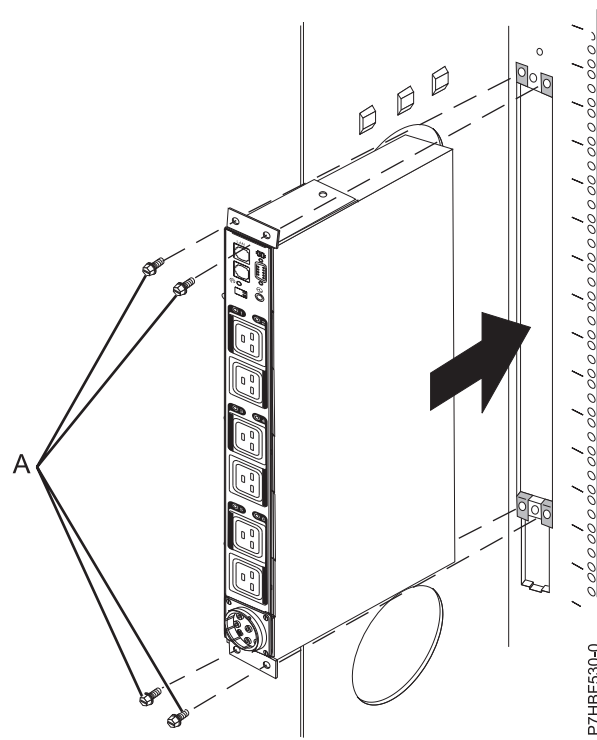

Figure 39. Aligning the PDU+ with the opening in the side of the rack, seen from the rear of the rack

Attention: You must ensure that the main input power is disconnected from the power source before you connect or disconnect the input power cord from the PDU model.

7. If the PDU model was provided with a detached power cord, connect the power cord now. Align the connector on the power cord **(A)** that was provided with the PDU model with the connector on the front of the unit **(A)**, turning as necessary for key alignment. Then, turn the connector twist-lock **(B)** clockwise until it locks into place.
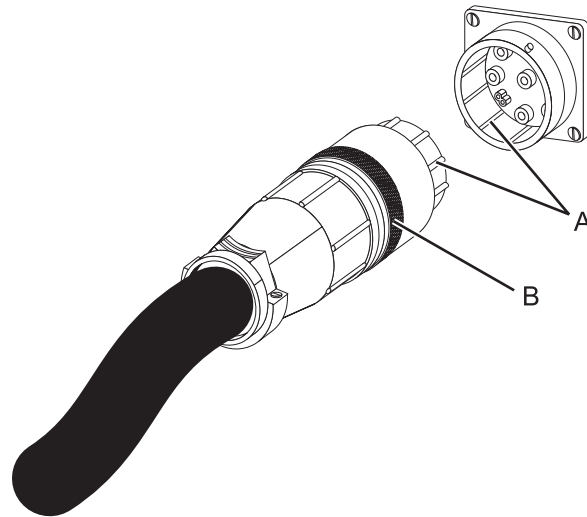
Figure 40. Aligning the connector on the power cord with the PDU model

8. Route the power cord from the PDU model toward the rack side braces. Then, route the power cord along a side brace toward the rear of the rack and secure the power cord with the cable straps that are provided with the PDU model.

9. Route the power cord toward a dedicated power source. Use the provided cable straps to secure the power cord along the way. Use the openings in the rack, if the power cord must exit the rack to connect to a power source.

   Attention: To prevent damage to a power device and other connected devices, always connect the power device to an authorized power source for that device.

10. Connect the power cord to a properly wired and grounded dedicated power source. Then, connect the servers or rack PDU in the rack to the power outlets on the PDU model.

11. Route all of the other power cables neatly, and secure the power cables with cable straps.

12. If you removed the side covers or doors, reinstall them.

Installing the PDU, PDU+, or Intelligent Switched PDU horizontally in a rack:

Learn how to install the power distribution unit (PDU), power distribution unit plus (PDU+), or Intelligent Switched PDU horizontally in the side of a rack.

Tip: Removing the rack doors and side panels might make installing the PDU easier.

To install the PDU model in a single EIA horizontal mounting space in the rack, complete the following steps:

1. Read the "Rack safety notices" on page 2.

2. Identify an open mounting space that is the size of a single EIA in the rack where you are installing the PDU model. Attach the nut clips to the top and bottom holes of the EIA, on each side of the rack. Use the nut clips that were provided with the rack mounting kit.

3. If you are installing a PDU, continue with the next step. Otherwise, for a PDU+, go to step 6. For the Intelligent Switched PDU, go to step 7.

4. Align the PDU with the opening of the rack. Then, while you hold the PDU in place, attach the PDU mounting brackets to the nut clips in the rack with four M6 screws. Use screws that were provided with the rack mounting kit.

5. Go to step 15 for power cord attachment.

6. Align the vertical-mounting brackets **(A)** to the front of the PDU+ as shown in the following figure. Make sure that you attach the brackets so that the power outlets face the rear of the rack.
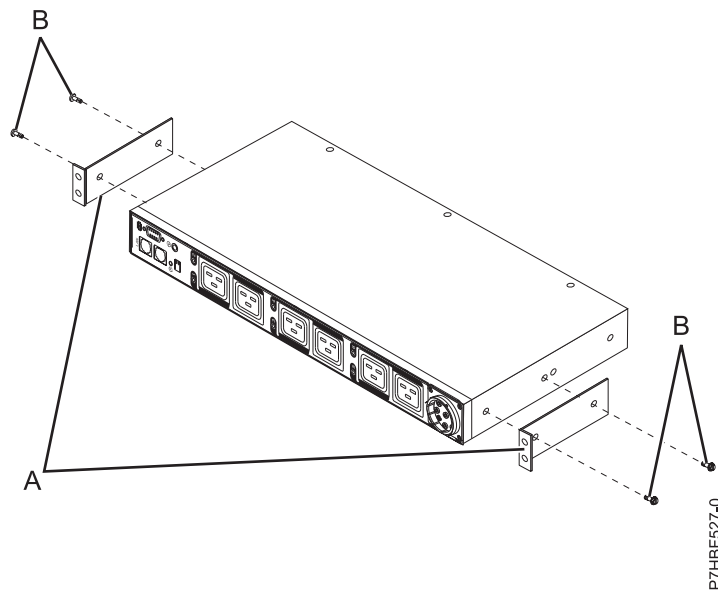

Figure 41. Aligning the vertical-mounting brackets to the front of the PDU+

7. Attach the brackets **(A)** to the PDU+ or Intelligent Switched PDU with two M3x5 screws **(B)** per bracket. Use screws that were provided with the rack mounting kit.

8. If you are installing the PDU or PDU+ long mounting brackets, align the long mounting brackets **(A)** with the holes in the rear of the PDU, and attach the brackets to the PDU model with two M3 pan-head screws **(B)** with captive lock washers per bracket. Use screws that were provided with the rack mounting kit.
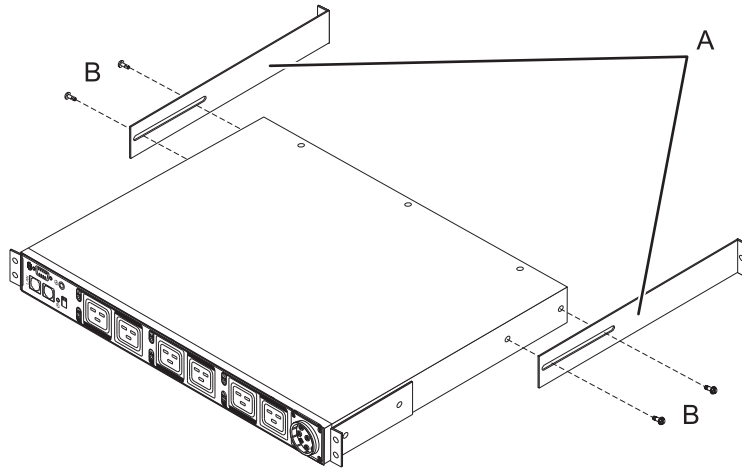
Figure 42. Attaching the long mounting brackets to the PDU and PDU+

If you are installing the Intelligent Switched PDU adjustable mounting rails, complete the following tasks:

a. Assemble the adjustable mounting rail by using the four screws that are included with the mounting kit.

b. Attach the adjustable mounting rails to each side of the PDU chassis by using the six screws that are included with the mounting kit.

9. Identify an open mounting space that is the size of a single EIA in the rack where you are installing the PDU model. At the rear of the rack, attach nut clips to the top and bottom holes of the EIA on each side of the rack. Use nut clips that were provided with the rack mounting kit.

   Note: If your rack has square mounting holes, attach cage nuts instead of nut clips to the specified EIA locations. Use cage nuts that were provided with the rack mounting kit.

10. Hold the PDU model at a slight angle and carefully insert it into a mounting space that is a single EIA unit within the rack cabinet. Pushing in slightly on both of the long mounting brackets helps clear the brackets from the rack flanges.

11. Align the end of the PDU model with the short mounting brackets with the outside of the rack flanges. Use two M6 screws **(A)** if cage nuts are used or M5 screws if nut clips are used per bracket to attach the brackets to the nut clips or cage nuts on the rack flanges. Use screws that were provided with the rack mounting kit.
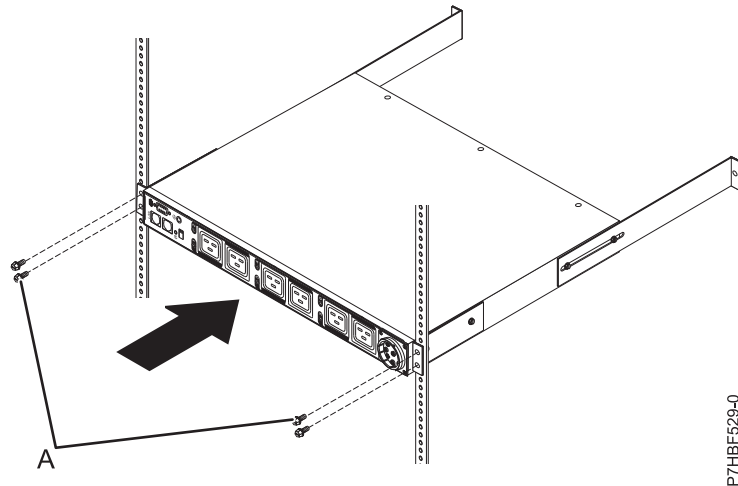
Figure 43. Attaching the front of the PDU+ or Intelligent Switched PDU in the rack

12. If the side covers are installed, continue with step 13. If you removed the side covers, go to step 14.
13. Secure the long mounting brackets and the blank filler panel (A) to the rack cabinet by completing the following steps:
    a. Adjust the long mounting brackets to fit the depth of the rack cabinet.
    b. Place a mark on both rails at the rear of the PDU, PDU+, or Intelligent Switched PDU.
    c. Remove the two M6 screws (A) if cage nuts are used, or M5 screws that secure the PDU, PDU+, or Intelligent Switched PDU to the rack flanges.
    d. Carefully remove the PDU, PDU+, or Intelligent Switched PDU from the rack frame.
    e. Position the marks on the rails so that they are at the rear of the PDU, PDU+, or Intelligent Switched PDU.
    f. Tighten the M3 pan-head screws that secure the long mounting brackets to the PDU, PDU+, or Intelligent Switched PDU model.
    g. Hold the PDU, PDU+, or Intelligent Switched PDU model at a slight angle and carefully insert it into a mounting space that is a single EIA unit within the rack cabinet. Pushing in slightly on both of the long mounting brackets helps clear the brackets from the rack flanges.
    h. Align the end of the PDU, PDU+, or Intelligent Switched PDU model with the short mounting brackets with the outside of the rack flanges. Ensure that the rails align properly with the front rack flanges. If not, mark and readjust the mounting rails length by removing the PDU, PDU+, or Intelligent Switched PDU and repeating steps 13b through 13g. Use two M6 screws (A) if cage nuts are used or M5 screws if nut clips are used per bracket to attach the brackets to the nut clips or cage nuts on the rear rack flanges.
    i. Make sure that the long mounting brackets are aligned with the inside of the rack flanges.
    j. Align the blank filler panel (**A**) on the outside of the rack flanges, as shown in Figure 43.
    k. Attach the filler panel to the rack flanges and then to the long mounting bracket with one M6 screw (B) per bracket. Use the screws that were provided with the rack mounting kit.
    l. Proceed with step 15 on page 52.
14. Secure the long mounting brackets and the blank filler panel (**A**) to the rack cabinet by completing the following steps:
    a. Adjust the long mounting brackets to fit the depth of the rack cabinet.
    b. Tighten the M3 pan-head screws that secure the long mounting brackets to the PDU, PDU+, or Intelligent Switched PDU model.
    c. Make sure that the long mounting brackets are aligned with the inside of the rack flanges.
    d. Align the blank filler panel (**A**) on the outside of the rack flanges.

e. Attach the filler panel to the rack flanges and then to the long mounting bracket with one M6 screw **(B)** per bracket. Use screws that were provided with the rack mounting kit.
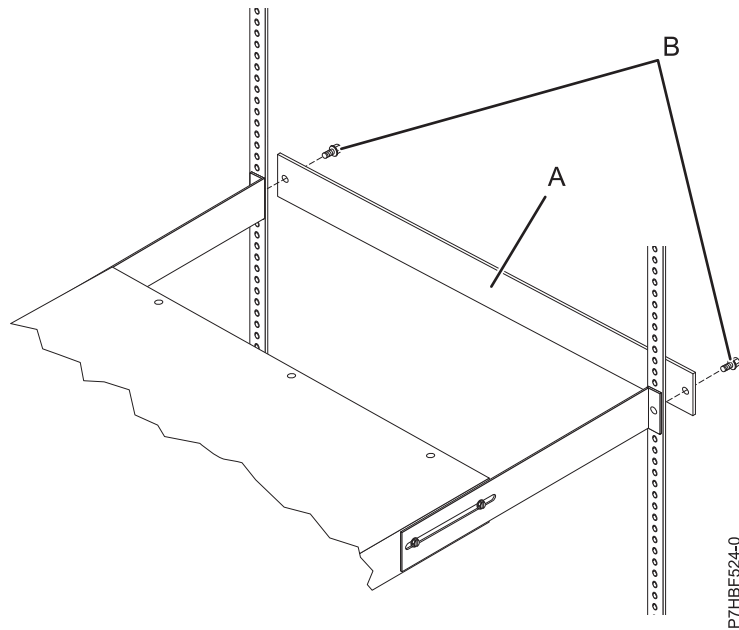

Figure 44. Attaching the brackets and filler panel to the rack

15. If the PDU, PDU+, or Intelligent Switched PDU model was provided with a detached power cord, connect the power cord now. Align the connector on the power cord **(A)** that was provided with the PDU, PDU+, or Intelligent Switched PDU model with the connector on the front of the unit **(A)**, turning as necessary for key alignment. Then, turn the twist-lock **(B)** on the connector clockwise until it locks into place.

    Attention: Before you connect or disconnect the input power cord from the PDU, PDU+, or Intelligent Switched PDU model, you must disconnect the main input power.
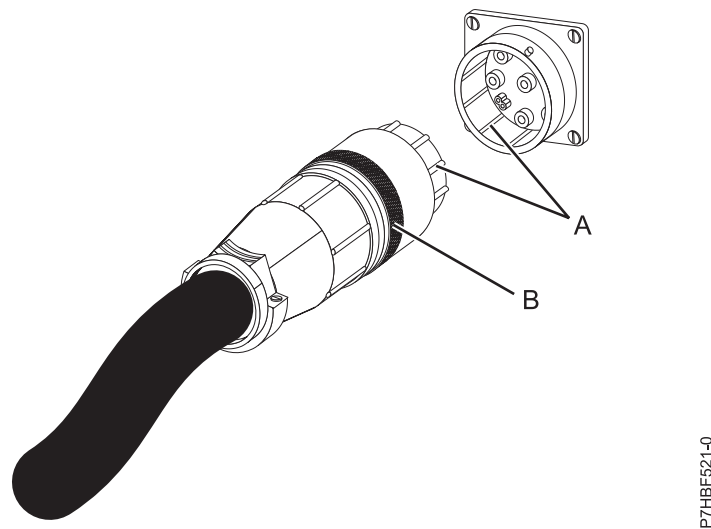

Figure 45. Aligning the connector on the power cord with the PDU, PDU+, or Intelligent Switched PDU model

16. Route the power cord from the PDU, PDU+, or Intelligent Switched PDU model toward the rack side braces. Route the power cord along a side brace toward the rear of the rack and secure the power cord with the cable straps that are provided with the PDU, PDU+, or Intelligent Switched PDU.

17. 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: To prevent damage to a power device and other connected devices, always connect the power device to an authorized power source for that device.

18. Connect the power cord to a properly wired and grounded dedicated power source. Then, you can connect the servers or rack PDU, PDU+, or Intelligent Switched PDU in the rack to the power outlets on the PDU, PDU+, or Intelligent Switched PDU model.

19. Route all of the other power cables neatly, and secure the power cables with cable straps.

20. If the side covers or doors were removed, reinstall them.

Cabling the Intelligent Switched PDU to a console:

Cable the Intelligent Switched PDU to a console, LAN, and PDU environment sensor.

To cable the Intelligent Switched PDU to a console, use a DB9-to-RJ-45 cable to connect the serial (COM) connector on a workstation or notebook computer to the RS-232 connector on the PDU. The following illustration shows how to connect a notebook computer to a 1U PDU.
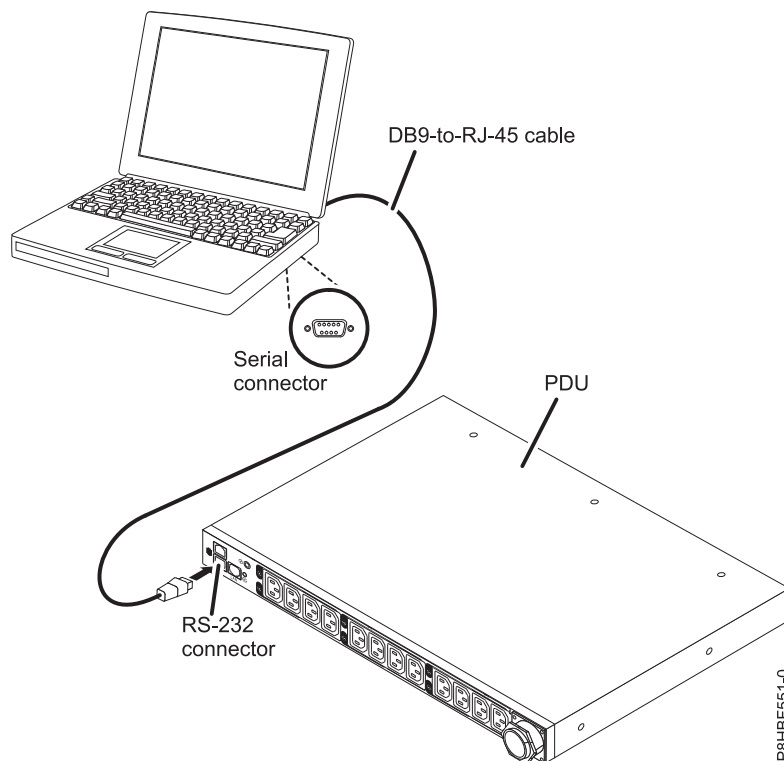
Figure 46. Connecting a notebook computer to a 1U PDU.

If your workstation or notebook computer does not have a DB9 serial connector, you can use a DB9-to-USB converter cable to connect the PDU to a workstation or notebook computer. To connect the PDU to a workstation or notebook computer by using a DB9-to-USB converter cable, complete the following steps:

1. Obtain a DB-9-to-USB converter cable (must be purchased separately).

2. On the workstation or notebook computer that you are connecting to the PDU, install the device drivers for the DB-9-to-USB converter cable, by using the instructions that come with the converter cable.

3. Connect the DB9-to-RJ-45 cable that comes with the PDU to the RJ-45 console connector on the PDU, as shown in the previous illustration.

4. Connect the DB9 connector end of the converter cable to the cable that you connected to the PDU in step 3.

5. Connect the USB connector end of the converter cable to the workstation or notebook computer. Communication is now established with the PDU through the COM port that is created by the converter cable.

Connecting the Intelligent Switched PDU to a LAN:

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

Use an Ethernet cable to connect a router or switch to the Ethernet connector on the PDU. You can then monitor the PDU from a workstation or notebook computer that is connected to the same network.

The following illustration shows how to connect a router or switch to an Intelligent Switched PDU.
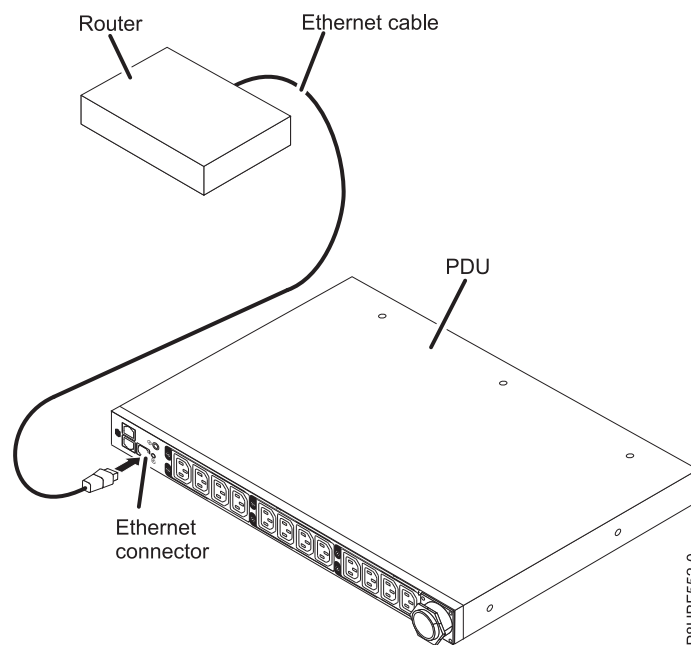
Figure 47. Connecting a router or switch to an Intelligent Switched PDU

Connecting Intelligent Switched PDU to a PDU environment sensor:

The PDU environment sensor that comes with the PDU has a built-in temperature and humidity sensor. The sensor enables remote monitoring of the temperature and humidity of the PDU operating environment. Connect the PDU environment sensor to the environment sensor connector on the PDU.

The following illustration shows how to connect a PDU environment sensor to an Intelligent Switched PDU.
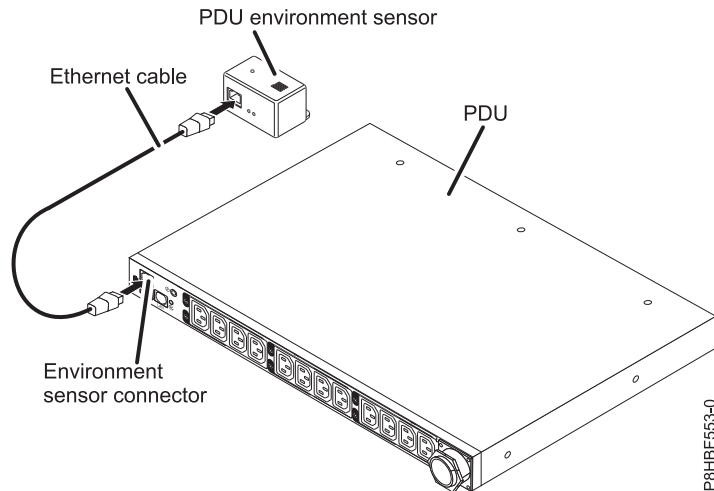
Figure 48. Connecting a router or switch to a PDU environment sensor

Connecting output devices:

The PDU power outlets are used to connect devices such as workstations, servers, and printers.

You can monitor the power status of a connected device either manually or remotely through the RS-232 and Ethernet connectors. Connect a device that you want to monitor to a power outlet on the PDU with the power cord that comes with the device.

Setting up power monitoring using the PDU+:

You can monitor the power status for any device that is connected to the power distribution unit plus (PDU+), either manually or remotely, through the PDU+ web interface.

Note: All of the Configuration Utility configuration options are available through the web interface after the PDU+ is set up on the local network.

For more information about installing the PDU or PDU+ into a rack, see "Installing the PDU, PDU+, or Intelligent Switched PDU in the side of a rack" on page 46 or "Installing the PDU, PDU+, or Intelligent Switched PDU horizontally in a rack" on page 48.

Using the IBM DPI Configuration Utility:

Learn how to use the IBM Distributed power interconnect (DPI) Configuration Utility to configure the power distribution unit plus (PDU+) settings, such as the IP address, network parameters, access control table, and trap receivers table.

Connecting the console:
You can configure the PDU+ by using a workstation or notebook computer that is connected to the PDU+. Connect the DB9-to-RJ-45 cable provided with the PDU+ to the RJ-45 console connector on the PDU+, and to a RS-232 serial (COM) connector on a workstation or notebook computer.

Configuration Utility menu options:
The following options are shown on the Configuration Utility main menu:

IBM DPI Settings
When you select IBM DPI Settings, the IBM DPI Configuration Utility window is displayed with the following options:

Set the IP Address, Gateway Address and MIB System Group
 View and change the IP address, date, time, and MIB system information.

Set IBM DPI Control Group
 Set the administrator user name, password, and access protocols.

Set Write Access Managers
 Set up a list of users who can access and control the PDU+.

Set Trap Receivers
 Configure remote network management system (NMS) servers to receive traps.

Set Date and Time
 Adjust the date and time information for the PDU+.

Set Superuser Name and Password
 Set the user name and password of the administrator who will use a web browser to configure the PDU+.

E-mail Notification
 Set up a list of users who will be alerted with event messages if an unusual event is triggered on the PDU+ system.

Set Multi-Users
 Configure other user and password logins and the read and write access levels.

Set IBM DPI Information
 Configure the PDU+ logging interval, refresh rate, and custom name fields for the load groups.

Settings and Event Log Summary
 View all PDU+ configuration settings.

Reset Configuration to Default
 Reset all system settings to their factory default values.

Restart HD-PDU
 Restart the PDU+.

Setting the IP address:

Important: You must set the IP address before you can use the web interface or access the PDU+ in an IP network (LAN/WAN). Contact your system administrator if you do not know the IP address.

To set the IP address, complete the following steps:
1. In the Configuration Utility main menu, enter the menu option for **IBM DPI Settings**.
2. Enter the menu option for **Set the IP Address, Gateway Address and MIB System Group**.

Using the web interface to configure the PDU+:

Learn how to use the web interface to configure and monitor the power distribution unit plus (PDU+) remotely. The PDU+ provides a graphical user interface that you can view from a web browser. Using a web browser, you can access and monitor the PDU+ power outlets and output devices remotely from a workstation or notebook computer.

Starting the web interface:
To start the web interface, complete the following steps:
1. Start a web browser from a workstation or notebook computer, and enter the IP address of the PDU+ in the **address** field. The **Connect to** window is displayed.

 Note: For more information about setting the IP address of the system, see "Setting the IP address."

2. In the **User name** field, type USERID. The user name must be all uppercase letters.
3. In the **Password** field, type passw0rd The password must be all lowercase letters with a zero, not O.
4. Click **OK**. The main status page is displayed.

The main status page displays a graphical representation of the PDU+ power outlets and input status:

- The left pane displays the menus and submenus for the PDU+.
- The right pane shows the status of the outlets, input voltage, output voltage, frequency, current and power, watt-hour consumption, and cumulative kilowatt hour power consumption. If you connect an environmental monitored probe, the temperature and humidity environment conditions are displayed.

Each menu page provides online help to assist you with configuring the PDU+. Click the **Help** icon at the top of each page to view the help.

Changing the basic settings:

Use the System menu to configure the PDU+ system parameters such as the superuser name, password, IP address, date, and time.

Changing the superuser name and password:

You can set the user name and password of the administrator configuring the PDU+ on the **Configuration Utility** window.

To change the superuser name and password, complete the following steps:
1. From the main status page, in the left navigation pane, click **System**.
2. Click **Configuration**.

Identifying the PDU+ and Web/SNMP card:

You can view the PDU+ and Web/SNMP card information on the **Identification of Power Management** window.

To view the power management information of the PDU+ and Web/SNMP card, complete the following steps:
1. From the main status page, in the left navigation pane, click **System**.
2. Click **Identification** to view the PDU+ and Web/SNMP card information.

Adding users:

You can add users who can access and control the PDU+ on the Multi-User Configuration page.

To create a list of users who can access and control the PDU+, complete the following steps:
1. From the main status page, in the left navigation pane, click **System**.
2. Click **Multi-User** to add users who can view the PDU+ status or users who can change the PDU+ settings.

Changing the date and time:

You can change the date and time of the PDU+ on the **Date and Time** window.

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

To change the date and time, complete the following steps:

1. From the main status page, in the left navigation pane, click **System**.
2. Click **Date and Time** to view and modify the system date and time. You can set the date and time manually, synchronize it with the computer time, or synchronize it with an NTP server.

Changing event alerts:

You can change event alerts on the **SNMP Trap Receivers** window.

To configure the PDU+ to send e-mail or SNMP trap alerts to specified users when specific events occur, complete the following steps:

1. From the main status page, in the left navigation pane, click **System**.
2. Click **Trap Receivers** to create a list of users or workstations that you want to receive SNMP trap messages. You can specify the IP addresses of up to eight trap receivers, the community information, type of trap, severity of trap, and description of the events that cause the traps.
3. Click **Email Notification** under **System** to create a list of up to four users that you want to alert.

Changing the network information:

Use the Network menu to change the network information for the PDU+, for example, the IP address.

Changing the network configuration:

You can view or change the network configuration on the **Network Configuration**window.

To view or change the network configuration of the PDU+, complete the following steps:

1. From the main status page, in the left navigation pane, click **Network**.
2. Click **Configuration** to set the PDU+ IP address, gateway address, subnet mask, and Domain Name System (DNS) address.
3. Click **Control** to configure TCP/IP settings.
4. Click **Access Control** to set access control to prevent unauthorized users from accessing the PDU+.

History and event log summaries:

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

Viewing the history log:

You can view the complete history of the PDU+ inputs and outputs on the **History Log** window.

To view the history of the PDU+, complete the following steps:

1. From the main status page, in the left navigation pane, click **Logs**.
2. Click **History**. Each event log file shows the time, date, and description of all the events that occurred on the PDU+.

Viewing the event log:

You can view the complete record of the PDU+ events on the **Event Log** window.

To view the complete record of the PDU+ events, complete the following steps:

1. From the main status page, in the left navigation pane, click **Logs**.
2. Click **Events**. Each log file shows a record of the input power and output power of each outlet.

Monitoring the power status by using the Intelligent Switched PDU:

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

Note: All of the PDU Configuration Utility configuration menu choices are available through the web interface after the PDU is set up on the local network.

Note: You can use Telnet or any other terminal program to configure the PDU after the IP address is set.

Setting up the Intelligent Switched PDU Using the IBM PDU Configuration Utility:

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

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

1. Connect a workstation or notebook computer to the PDU. Connect one end of a DB9-to-RJ-45 cable to the RS-232 connector on the PDU and the other end to an RS-232 serial (COM) connector on a workstation or notebook computer.
2. To start HyperTerminal and set up a connection between the workstation or notebook computer and the IBM PDU Configuration Utility on the PDU, select **Start > Programs > Accessories > Communications > HyperTerminal**. The **Connection Description** window opens. In the **Name** field, type the name for the connection and select an icon for the connection. Click **OK**. The **Connect To** window opens.
3. From the **Connect using** list, select the COM port that is connected to the PDU. Click **OK**. The **Properties** window opens.
4. Select **115200** from the **Bits per second** list and select **None** from the **Flow control** list. Click **OK**.
5. A blank window opens. Press Enter. The **IBM PDU Configuration Utility login** window opens.
6. Type the default login ID ADMIN and the password 1001. Press Enter. The **IBM PDU Configuration Utility main menu** window opens.
7. In the main menu window, press 2 to set up the network parameters. The **Setup Network Information** window opens.
8. Enable or disable DHCP. Press either 1 or 2 as applicable. The default is **Disable**. Then, type the IP address, gateway IP address, and subnet mask. Press Enter.
9. Press 1 to view the PDU default configuration information.
10. Press any key to return to the main menu. Continue to use the PDU Configuration Utility. Alternately, use the web interface to configure and monitor the PDU remotely.

Power-on sequencing (some models):

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

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

- **Device dependency:** Some applications require the power-on sequence function. For example, a system includes device A, device B, and device C and requires that device A is powered on first, then device B, and then device C. If the devices do not follow the sequence when powered on, the system does not function correctly.

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

To use the power-on sequence function, you must set the following parameters by using either a serial or Ethernet interface:
- GlobalDelayTimer (range: 0 - 3600 seconds; data type: integer). All PDU outlets are controlled by this global timer.

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

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

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

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

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

The outlets that were on before the PDU was turned off (or lost power) are back on in a sequence that is determined by the timers. If the timer values are zero, the only delay is the PDU boot-up time, which is 10 seconds. If values in the delay timers are present, the turn on time is the sum of following three values:
- PDU boot-up time (10 seconds)
- GlobalDelayTimer value
- IndividualDelayTimer value

The following example shows what you can expect to see when power to the PDU is restored after a power outage.
- PDU boot-up time = 10 seconds
- GlobalDelayTimer = 5 seconds
- The previous outlet state for the PDU is:

  Outlet 1 On
  Outlet 2 On
  Outlet 3 On
  Outlet 4 Off
  Outlet 5 On
  Outlet 6 On
  Outlet 7 On
  Outlet 8 On
  Outlet 9 On

Outlet 10 Off
Outlet 11 On
Outlet 12 Off

- The IndividualDelayTimer for each outlet has the following settings:

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

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

Table 1. Power-on timing

Outlet number	Outlet power-on timing	Comment
1	16th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
2	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
3	18th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
4	Off	Previous state is Off
5	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
6	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
7	19th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
8	16th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
9	17th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
10	Off	Previous state is Off
11	20th second	Total Delay time = bootup time + GlobalDelayTimer + IndividualDelayTimer
12	Off	Previous state is Off

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

Accessing SNMP through the Ethernet port:

Set the parameters for the power-on sequence function by using an Ethernet port and the SNMP interface.

To set the parameters for the power-on sequence function by using an Ethernet port and the SNMP interface, complete the following steps:
1. Open your MIB browser (for example, iReasoning).
2. Set the GlobalDelayTimer parameter with the object identifier (OID) as shown in the following illustration.
3. Set the IndividualDelayTimer parameter with the OID.

Accessing Telnet through the Ethernet port:

Set the parameters for the power-on sequence function by using an Ethernet port and the Telnet interface.

To set the parameters for the power-on sequence function by using an Ethernet port and the Telnet interface, complete the following steps:
1. Log in as ADMIN/1001.
2. Type 1 for System Configuration.
3. Type 3 for Outlet Global Delay Timer and PDU Location.
4. Type 15 to define the Outlet Global Delay Timer.
5. Type the value for the New Outlet Global Delay Timer.
6. Type 0 to return to the previous menu.
7. Type 4 for the Outlet Name and Individual Delay Timer.
8. Type the outlet number and enter the outlet name and its IndividualDelayTimer value.

Accessing HyperTerminal through the serial port:

Set the parameters for the power-on sequence function by using a serial port (HyperTerminal interface).

To set the parameters for the power-on sequence function by using a serial port (HyperTerminal interface), complete the following steps:
1. Make sure that the serial port configuration is `115200,8-N-1-None`.
2. Log in as `ADMIN/1001`.
3. Select the IBM PDU Configuration Utility menu and type 8 to select **Set PDU Location and Outlet Information**.
4. Enter the GlobalDelayTimer value.
5. On the main menu, enter the IndividualDelayTimer values for each outlet.

Using the web interface:

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

Starting the web interface:

Start the web interface.

To start the web interface, complete the following steps:
1. Start a web browser from a workstation or notebook computer and enter the IP address of the PDU in the address field.
2. Type ADMIN in the **User Name** field, in all uppercase letters. Type 1001 in the Password field.
3. Click **Login**. The main status page displays the PDU power outlets and input status per load segment.

Power management relay setting:

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

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

Environment status and configuration:

If a PDU environment sensor is connected to the PDU, you can view the temperature and humidity information.

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

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

Modifying the basic settings:

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

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

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

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

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

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

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

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

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

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

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

Changing the network configuration:

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

Event and history log summaries:

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

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

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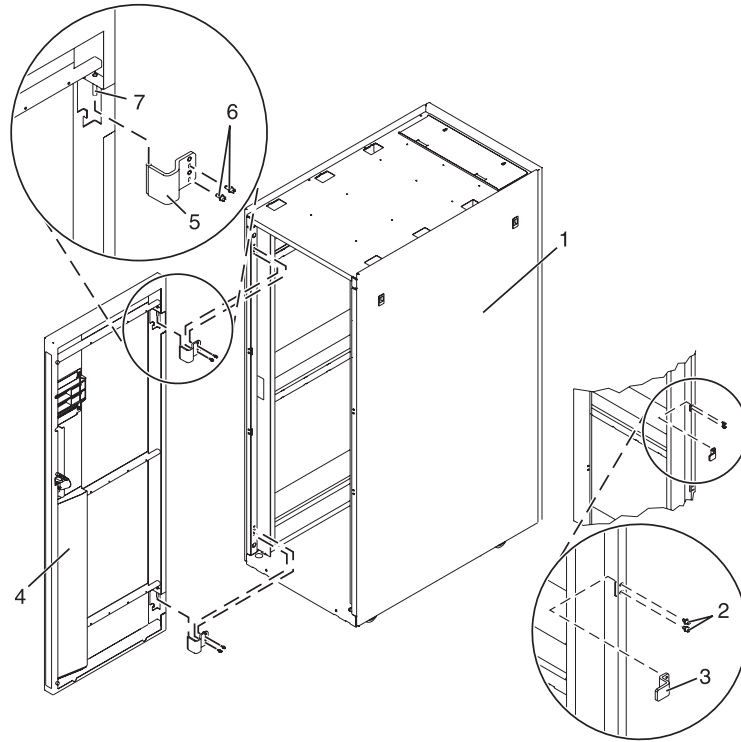
Attaching the rack doors

Learn how to attach the rack doors.

Depending on the model of the rack, the front door might be an option.

Figure 49. Attaching the rack door

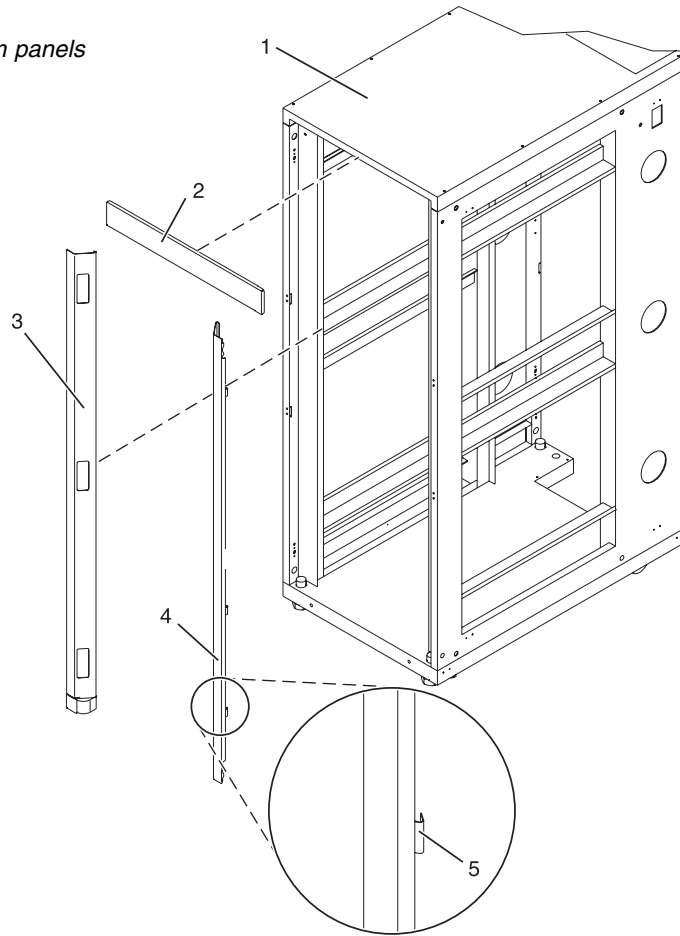**Attaching a high-perforation front door:**

You might need to attach a front door to the rack.

To install the high-perforation front door, complete the following steps:

1. Read the "Rack safety notices" on page 2.
2. Remove the top, left, and right trim panels. For more information about removing the left and right trim panels from a 7014-T00, 7014-T42, see "Removing and replacing 7014-T00 or 7014-T42 trim

Figure 50. Removing the trim panels

Item	Description		Item	Description
1	Rack chassis		4	Right-side trim panel
2	Top trim panel		5	Spring clip
3	Left-side trim panel			

3. Install the door latch on the right and the door hinges on the left.
4. For a high-perforation front door, align the door over the rack hinge, then move up the hinge pin on the door, and lower the hinge pin into the hinge.
5. Adjust the latch so the door latches securely.

Installing the rack security kit

You might need to install the rack security kit.

To install a rack security kit (feature 6580) that consists of the security lock and security slide bars, complete the following steps:

1. Read the "Rack safety notices" on page 2.
2. Verify the inventory in the rack security kit.
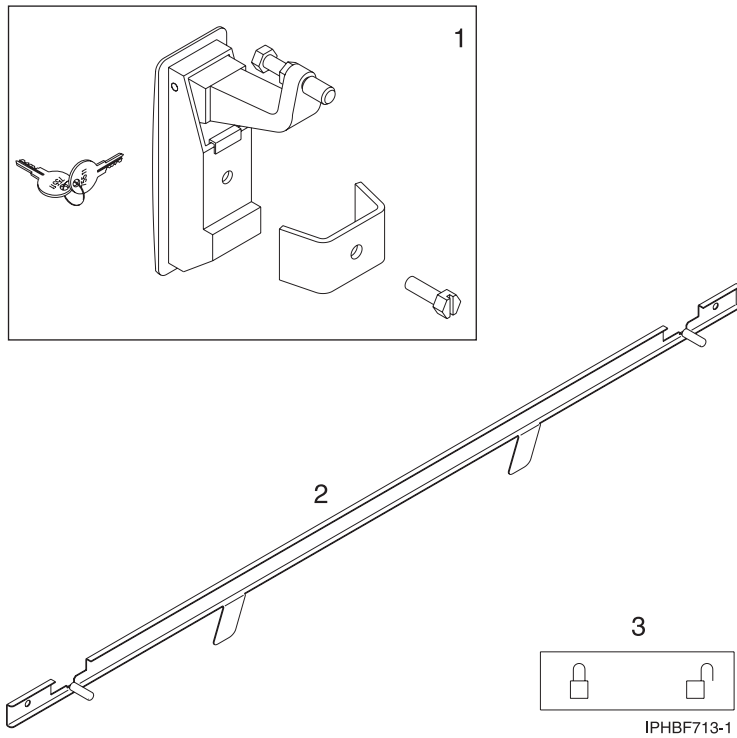
Figure 51. Rack security kit inventory

Item	Description
1	Two lock hardware kits. Each kit contains: - Rack lock - Bracket - Screw - Two keys
2	Two security slide bars
3	Two locked/unlocked stickers

3. Remove the existing door latch.
    a. Open the front rack door.
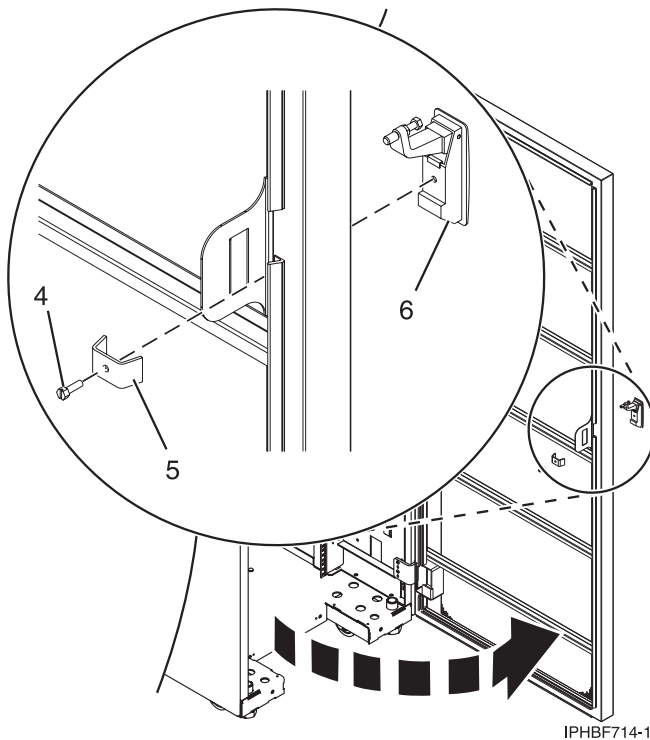   b. On the inside of the door, remove the screw **(4)** in Figure 52 on page 68 that secures the latch to the rack door.

Figure 52. Removing the existing door latch

   c. Remove the bracket **(5)**.

   d. From the outside of the door, remove the door latch **(6)**.

Note: If the rack is equipped with the ruggedized kit, remove the jam nut **(1)** and hex nut **(2)** from the existing door latch and reinstall both nuts on the new door lock latch, as shown in the following figure.
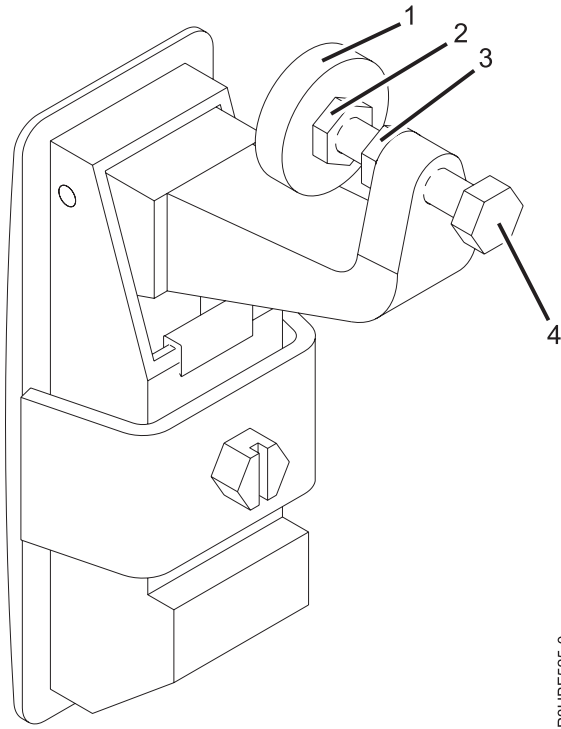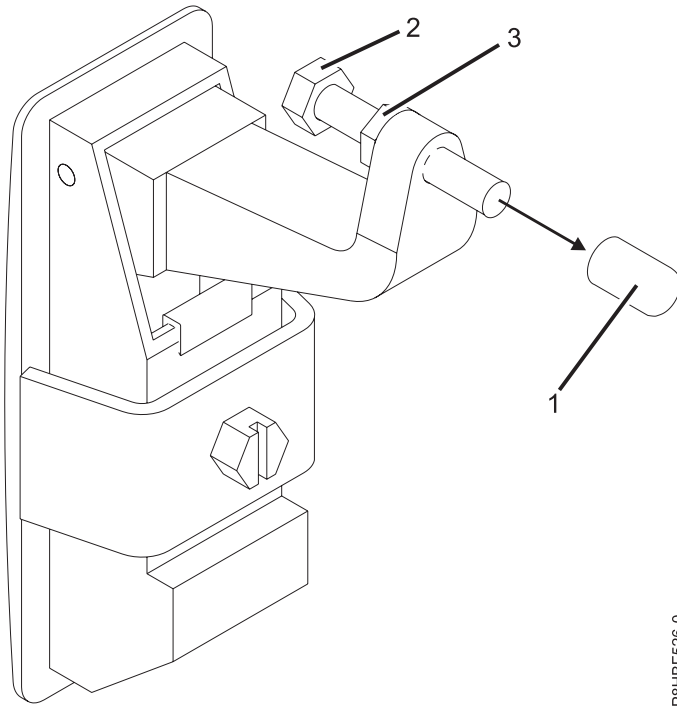
Figure 53. Ruggedized latch

Item	Description
1	Jam nut
2	Hex nut
3	Hex nut
4	Screw

4. If the door latch has the ruggedized latch, continue with step 5 on page 70. If you must install the standard latch, go to step 6 on page 70.

Figure 54. Standard latch

Item	Description
1	End cap
2	Screw
3	Hex nut

5. Assemble the ruggedized latch. To assemble the ruggedized latch, perform the following tasks:

   Note: Refer to the Standard latch figure 51 for steps 5a through 5d and the Ruggedized latch figure 50 for steps 5e through 5i.

   a. Remove the end cap **(1)** from the new latch and discard.
   b. Loosen the hex nut **(3)**.
   c. Remove the screw **(2)** from the new latch.
   d. Remove the nut **(3)** from the screw.
   e. Insert the screw **(4)** into the new latch in the reverse orientation.
   f. Screw the hex nut **(3)** onto the screw **(4)**.
   g. Screw the hex nut **(2)** onto the screw **(4)**.
   h. Screw the jam nut **(1)** onto the screw **(4)**. The jam nut **(1)** must be flush with the end of the screw **(4)**.
   i. Tighten the hex nut **(2)** against the jam nut **(1)**.

6. Install the locking latch.

   a. Insert the keyed rack lock into the latch slot on the front of the door **(6)** in Figure 52 on page 68.
   b. Secure the lock by attaching the lock bracket **(5)** with the screw **(4)**, on the inside of the door.

7. Repeat steps 3 on page 67 and 6 to install the second lock on the rear rack door.

8. Adjust the screw **(4)** in figure 50 to secure the door. The door rubber bumpers must be snug against the frame when the door is latched.

9. Tighten the hex nut **(3)** in figure 50 against the latch to prevent the screw **(4)** from loosening.

10. Install a security slide bar on the right side of the rack.

   Note: Each slide bar rail has two long tabs on the bottom of the rail. The slide bar rails are identical and can be installed on either the right or left side cover panel.

   a. Unlatch right-side cover panel and lean the panel back so that you can access the top of the panel.

   b. Ensure that the flat side of the slide bar rail **(7)** in Figure 55, faces the inside of the cover panel **(8)**. Insert the two tabs **(9)** on the slide bar rail into the two vertical support channels **(10)** on the side cover panel.

   Note: When installed correctly, the slide rail moves from front to rear.

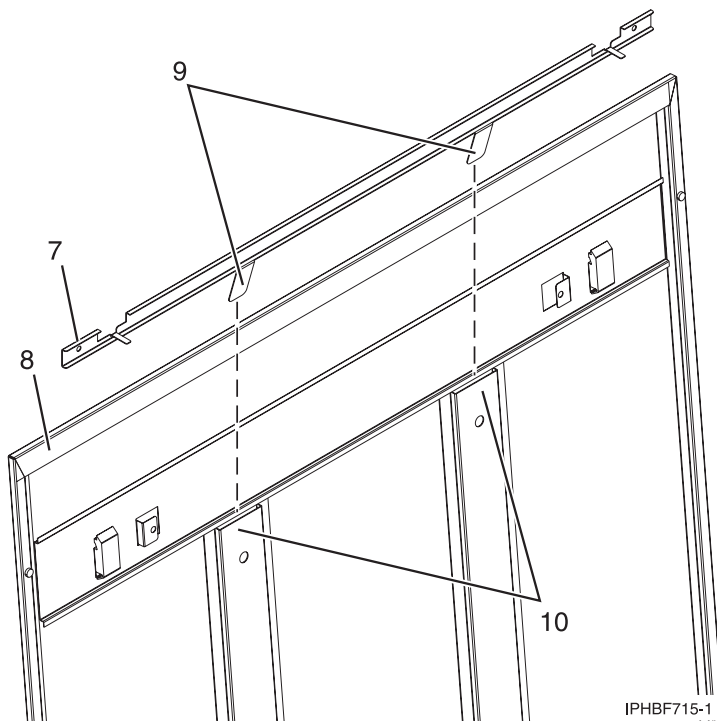*Figure 55. Installing a security slide bar*

   c. Reinstall the side panel cover on to the rack.

   d. Lock the side panel covers by sliding the bars to the front of the rack.

   e. Put a locked/unlocked sticker on the inside of the cover panel so that when the slide bar is in the locked position, the tab is over the locked symbol **(11)**, as shown in Figure 56 on page 72, and over the unlocked symbol **(12)**, when the slide bar is unlocked.
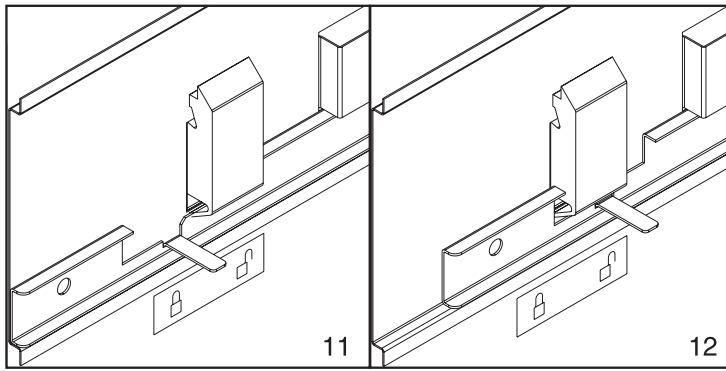
Figure 56. Placing the locked/unlocked sticker on the cover panel

     f. Repeat the procedure for the left side of the rack.

Removing and replacing side panels

Learn how to remove and replace a side panel on a rack.

Removing a 7014-T00 or 7014-T42 side panel:

Use the procedure in this section to remove a side panel on a rack.

To remove a side panel, complete the following steps:

1. If the security kit is installed, slide the security bar to the unlocked position.

   Note: If your rack uses a ruggedized kit, you must remove the securing screw to allow each side panel to be removed.

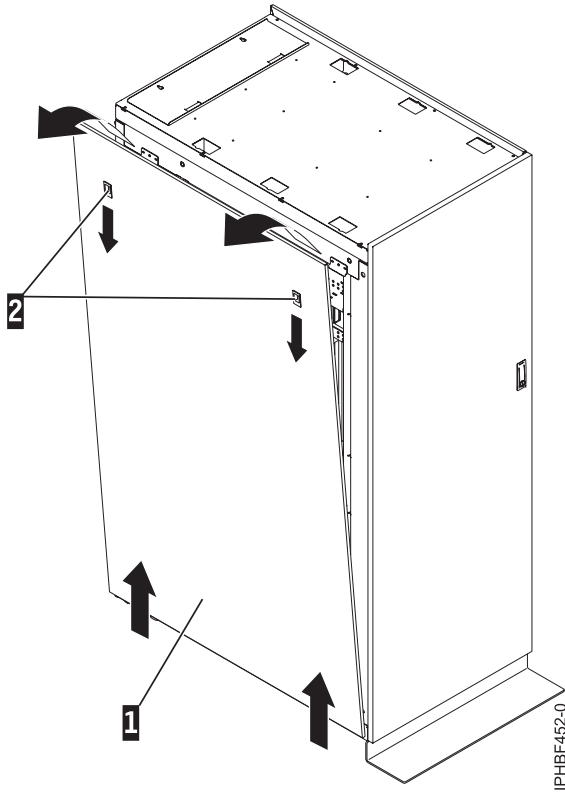2. Unlock the side panels by pulling down on both locking latches to release the latches.

Figure 57. Removing the side panel

3. Tilt the top of the side panel slightly toward you.
4. Pull the panel up and away from the rack chassis. The panel relases from the two lower J brackets.
5. Repeat this procedure for the other side panel.

Replacing a 7014-T00 or 7014-T42 side panel:

Replace a side panel on a rack.

To replace a side panel, complete the following steps:
1. Tilt the top of the side panel slightly toward you.

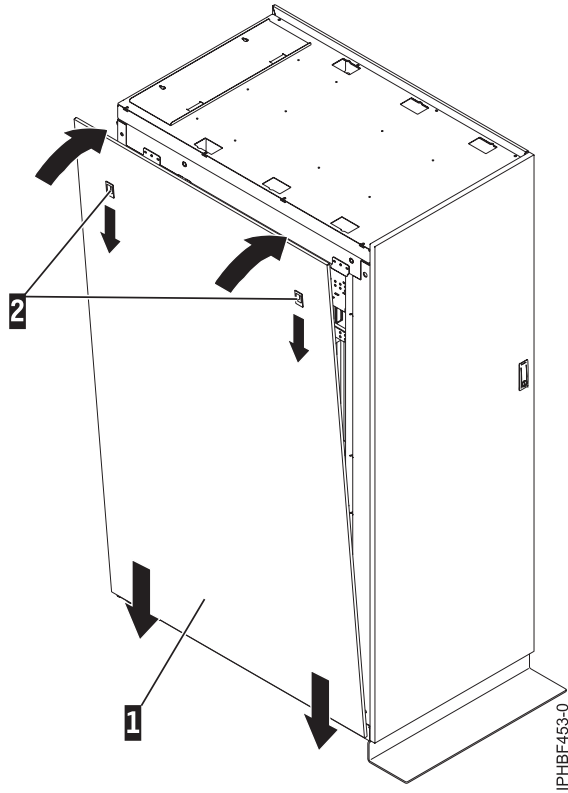2. Place the bottom of the side panel onto the J brackets on the bottom of the rack.

Figure 58. Replacing the side panel

3. Slide the top of the side panel into place and close the locking latches.

   Note: If your rack uses ruggedized kit, you must install a securing screw into each side panel that was installed.

4. If the security kit is installed, slide the security bar to the locked position.

## Removing and replacing 7014-T00 or 7014-T42 trim panels

Racks that are installed with multiple processor drawer systems can use front trim panels instead of doors. For racks that use trim panels, a reduced-interference panel type must be installed when certain expansion unit models are present. Remove the existing trim panels from the rack and replace them with the reduced-interference panel type.

Removing the 7014-T00 or 7014-T42 trim panels:

For racks that use trim panels instead of doors, a reduced-interference panel type must be installed when certain expansion unit models are present.

To remove the existing rack trim panels, complete the following steps:

1. Place both hands on the center of the right side trim panel.
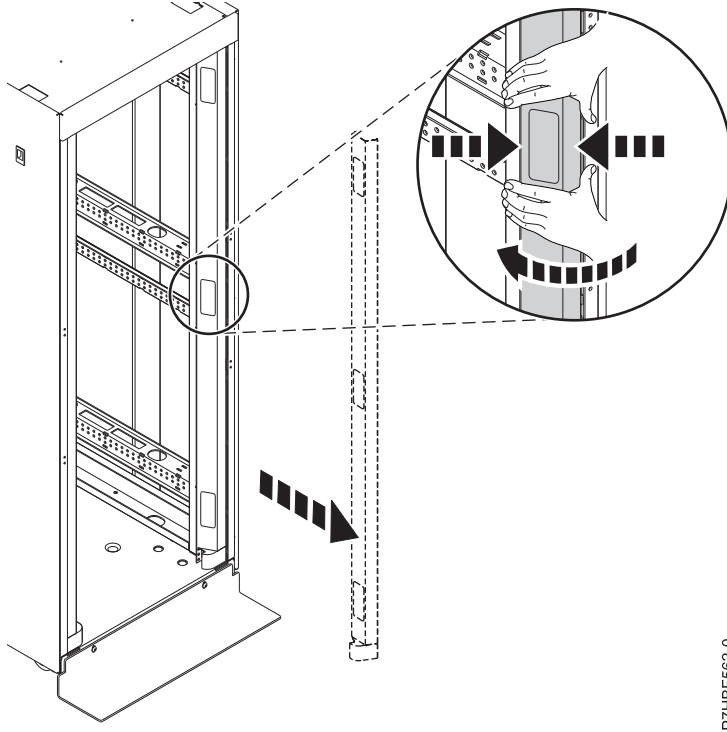
Figure 59. Removing the rack trim panel

2. Squeeze inward firmly with your fingertips to release the spring clips that hold the panel in place.
3. Rotate your hands in slightly until the panel is disengaged.
4. Remove the panel and set it aside.
5. Repeat this procedure to remove the left side trim panel.

Replacing the 7014-T00 or 7014-T42 trim panels:

For racks that use trim panels instead of doors, a reduced-interference panel type must be installed when certain expansion unit models are present.

To install the trim panels, complete the following steps:

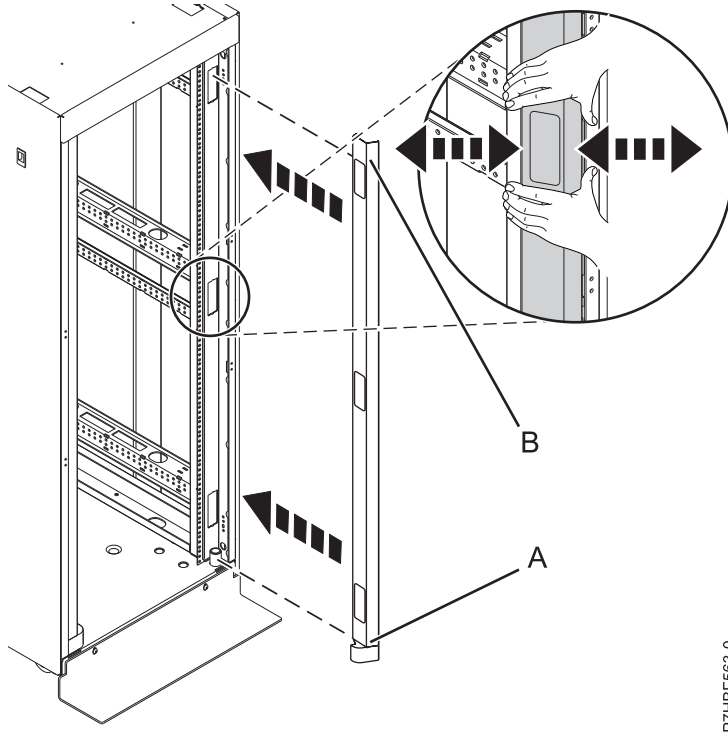1. Align the bottom plate **(A)** of the right side trim panel to the bottom of the rack.

Figure 60. Installing the rack trim panel

2. Align the top of the trim panel **(B)** and squeeze slightly with your fingertips.
3. After the trim panel is in the correct location, release the pressure to allow the spring clips to hold the panel in place.
4. Repeat this procedure to install the left side trim panel.

Removing and replacing the rack top cover

You might need to remove or replace the rack top cover.

Removing the rack top cover:

The top 6U of the rack can be temporarily detached to make it easier to move through doors or into elevators. You can reattach the top 6U to the rack frame to provide the full 42U rack capacity. The rack is approximately 11 inches (28 cm) shorter with the top removed.

Note: You must use a 10 mm 6 point (pt) socket with an extension bar to remove the screws from the top cover. Other tools might cause the screw heads to become rounded and difficult to remove.
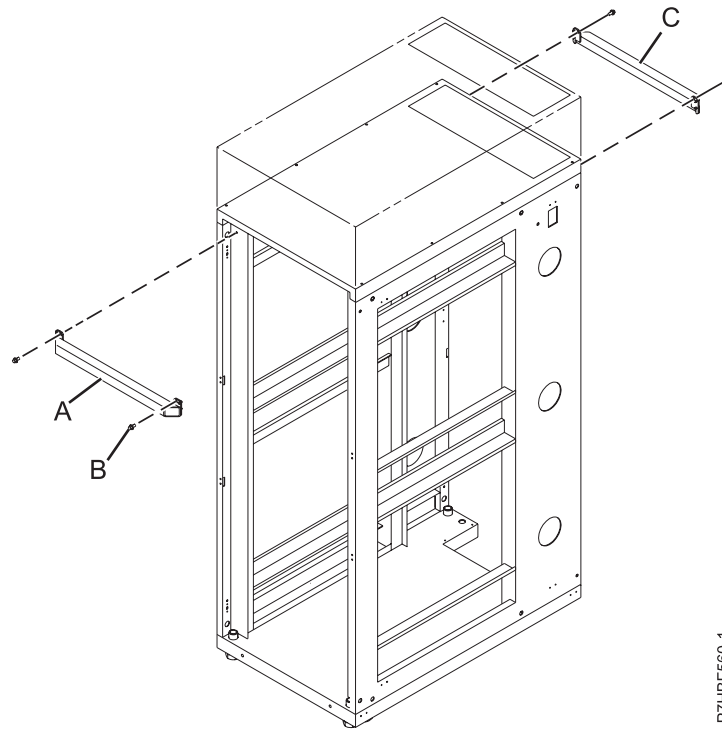
To remove the rack cover from the rack, complete the following steps:

1. If the top, left, and right trim panels are installed remove them otherwise remove the front door.

   Note: If the rack is locked, unlock the doors. Unlock the side panels by sliding the security bar to the unlocked position.
2. Remove the rear door.
3. Remove the side panels. For more information, see "Removing and replacing side panels" on page 72.
4. Remove one screw from the right side of the top cover and one screw from the left side of the top cover. Do for both the front and rear of the cover.

5. Locate the front **(A)** and rear **(C)** rack braces that were provided in the shipping container. Fasten each rack brace at the top of the front and rear of the rack, just below the top cover.

6. Use the four screws **(B)** that were removed from the top cover to secure each rack brace to the rack, as shown in Figure 61.
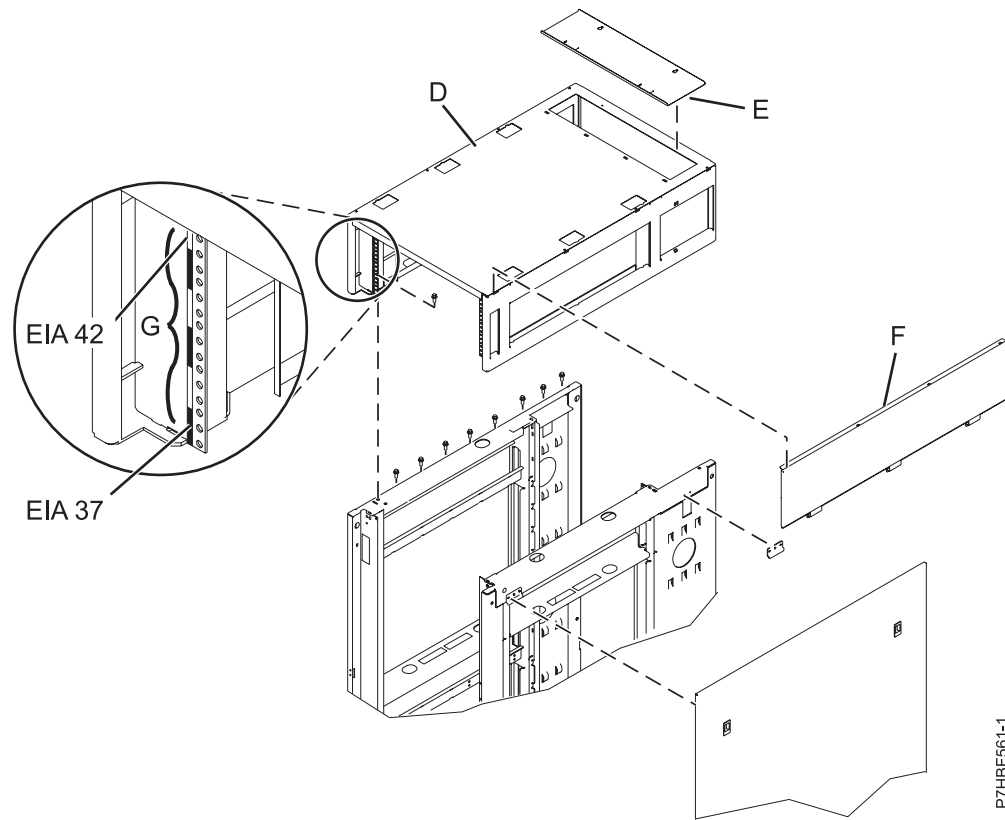

Item	Description
A	Front rack brace
B	Retaining screws (two screws for each brace)
C	Rear rack brace

Figure 61. Securing the rack brace

7. Remove the remaining six screws from the left and right sides of the top cover **(D)**. The screws are accessible through the three small rectangular openings on each side of the rack top cover.

Item	Description
D	Top cover
E	Cable access cover
F	Side cover (quantity 2)
G	EIA label

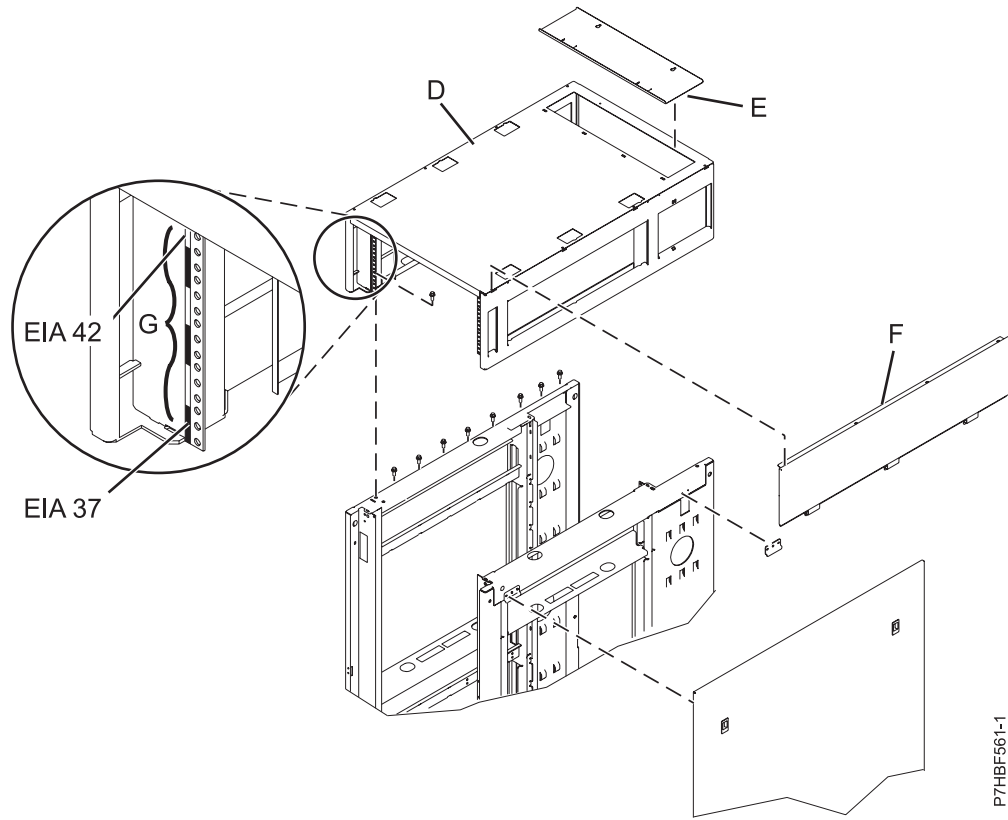*Figure 62. Removing the top cover*

8. Lift off the top cover.

Replacing the rack top cover:

You might need to replace the rack top cover. Use this procedure to perform this task.

Note: You must have a 10 mm 6 point (pt) box socket with an extension bar to replace the screws into the rack top cover. Other tools might cause the screw heads to become rounded and unable to be removed again.

To replace the rack top cover, complete the following steps:
1. Position the rack top cover **(D)** on the rack.
2. Install the six screws at the left and right sides of the rack top cover. Install the screws inside the three small rectangular openings on each side of the rack top cover.
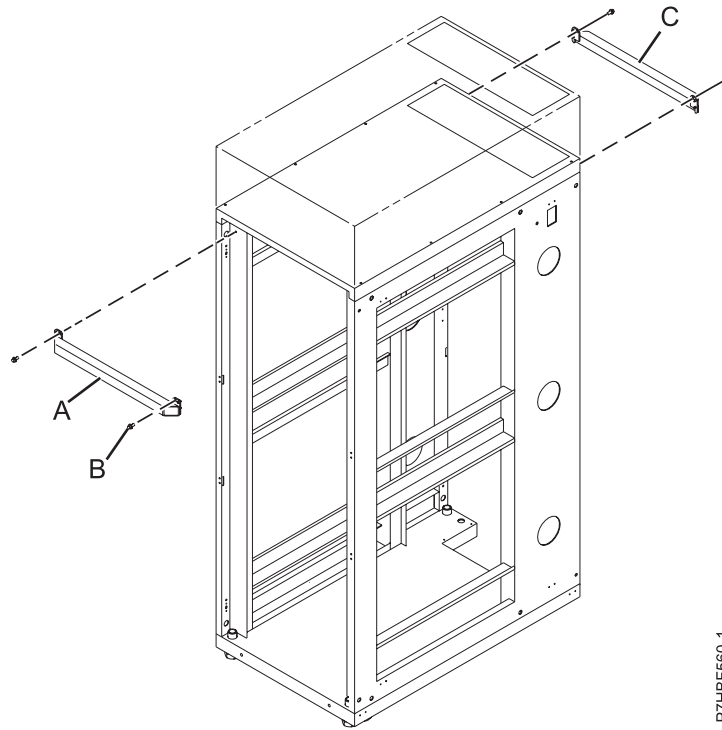
Item	Description
D	Top cover
E	Cable access cover
F	Side cover (quantity 2)
G	EIA label

Figure 63. Replacing the top cover

Note: You must have A 10 mm 6 point (pt) box socket with an extension bar to replace the screws into the rack top cover. Other tools might cause the screw heads to become rounded and unable to be removed again.

3. Remove the rack braces **(A)** and **(C)** by unfastening them at the top of the rack, just below the top cover. Remove the braces at the front and rear of the rack.

P7HBF560-1

Item	Description
A	Front rack brace
B	Retaining screws (quantity 2 for each brace)
C	Rear rack brace

Figure 64. Replacing the top cover

4. Install the four screws **(B)** you removed from the rack braces into the four remaining locations for the top cover to base frame attachment.

5. Torque the screws to 28 – 31 N-m (248 - 274 in lb, 21 - 23 ft lb).

6. Ensure that proper airflow within the rack is maintained. Install rack filler panels to cover open areas at the front of the rack. Seal all gaps in the front of the rack, including the gaps between pieces of equipment.

Installing the IBM Enterprise Slim Rack (7965-S42) rack and features

Use this information to install the 7965-S42 rack and to install the related components of the racks system.

Before you install a rack, read the "Rack safety notices" on page 2.

Completing a parts inventory

Perform a parts inventory.

Complete a parts inventory before you install the unit in the rack.

1. Locate the kitting report in an accessory box.

2. Ensure that you received all of the features that you ordered and all of the parts on the kitting report.

If there are incorrect, missing, or damaged parts, contact one of the following:

- Your IBM reseller
- IBM support (see the Directory of worldwide contacts website (http://www.ibm.com/planetwide) at IBM Directory of worldwide contacts - Country/region for contact information for your country
- IBM Rochester Manufacturing Automated Information Line at 1–800–300–8751 (United States only)

Rack safety notices

You need to read the rack safety notices before you install the equipment.

Before you install a rack, rack features, or a system or expansion unit into a rack, read the following safety information.

Attention: If you are installing equipment into a non-IBM rack, the rack must comply with the Electronics Industries Association (EIA) 310D specifications. Do not install the equipment into the rack if you do not have a rail kit that is designed for the equipment in the non-IBM rack. Installing a rail kit that was not designed for your equipment can damage the equipment or injure you.

(R001 part 1 of 2):

DANGER: Observe the following precautions when working on or around your IT rack system:
- Heavy equipment–personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices. In addition, do not lean on rack mounted devices and do not use them to stabilize your body position (for example, when working from a ladder).

- Each rack cabinet might have more than one power cord.
  - For AC powered racks, be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
  - For racks with a DC power distribution panel (PDP), turn off the circuit breaker that controls the power to the system unit(s), or disconnect the customer's DC power source, when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.
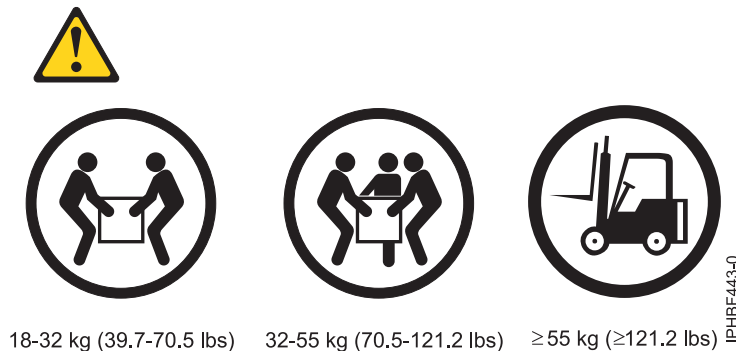
(R001 part 2 of 2):

CAUTION:
- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.

- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- *(For sliding drawers.)* Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.

- *(For fixed drawers.)* This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.

Lift precautions:

18-32 kg (39.7-70.5 lbs)   32-55 kg (70.5-121.2 lbs)   ≥55 kg (≥121.2 lbs)

Positioning and leveling the rack

Proper rack positioning and leveling is needed to comply with safety and regulatory requirements.

To position and level the rack, perform the following steps:

1. Remove all the packing materials from the rack.
2. Position the rack. If you are connecting multiple racks for a 24-inch pitch, continue with "Connecting multiple racks with the rack-to-rack attachment kit for a 24-inch pitch." If you are connecting multiple racks for a 600 mm pitch, continue with "Connecting multiple racks with the rack-to-rack attachment kit for a 600 mm pitch" on page 85. If you are not connecting multiple racks, see "Attaching the stabilizer bracket" on page 87.

Connecting multiple racks with the rack-to-rack attachment kit for a 24-inch pitch

You might need to connect multiple racks together.

Connect multiple racks to each other by using a rack-to-rack attachment kit for 24-inch racks. To perform this task, you must have the rack-to-rack attachment kit.

Ensure that you have the following bolts:
- M8x35 (front rack)
- M8x45 (rear rack)
- 13 mm socket

To use the rack-to-rack attachment kit to attach 24-inch racks, complete the following steps:
1. Read the "Rack safety notices" on page 2.
2. If they are installed, remove the side panels from each rack. Remove side panels only from the sides that you are attaching to each other by completing the following steps:
   a. Remove the screws on the top and insides of the rack.
   b. Pull the panel up and away from the rack chassis. This motion releases the panel from the lower J bracket.
   c. Store the side panels.
3. Remove the J-bracket screws **(A)** and bracket **(B)**.
4. Use two screws **(D)** to install the spacer bracket (**C,** in front). Align and install the rear spacer bracket **(C)**, as shown in Figure 65 on page 84.
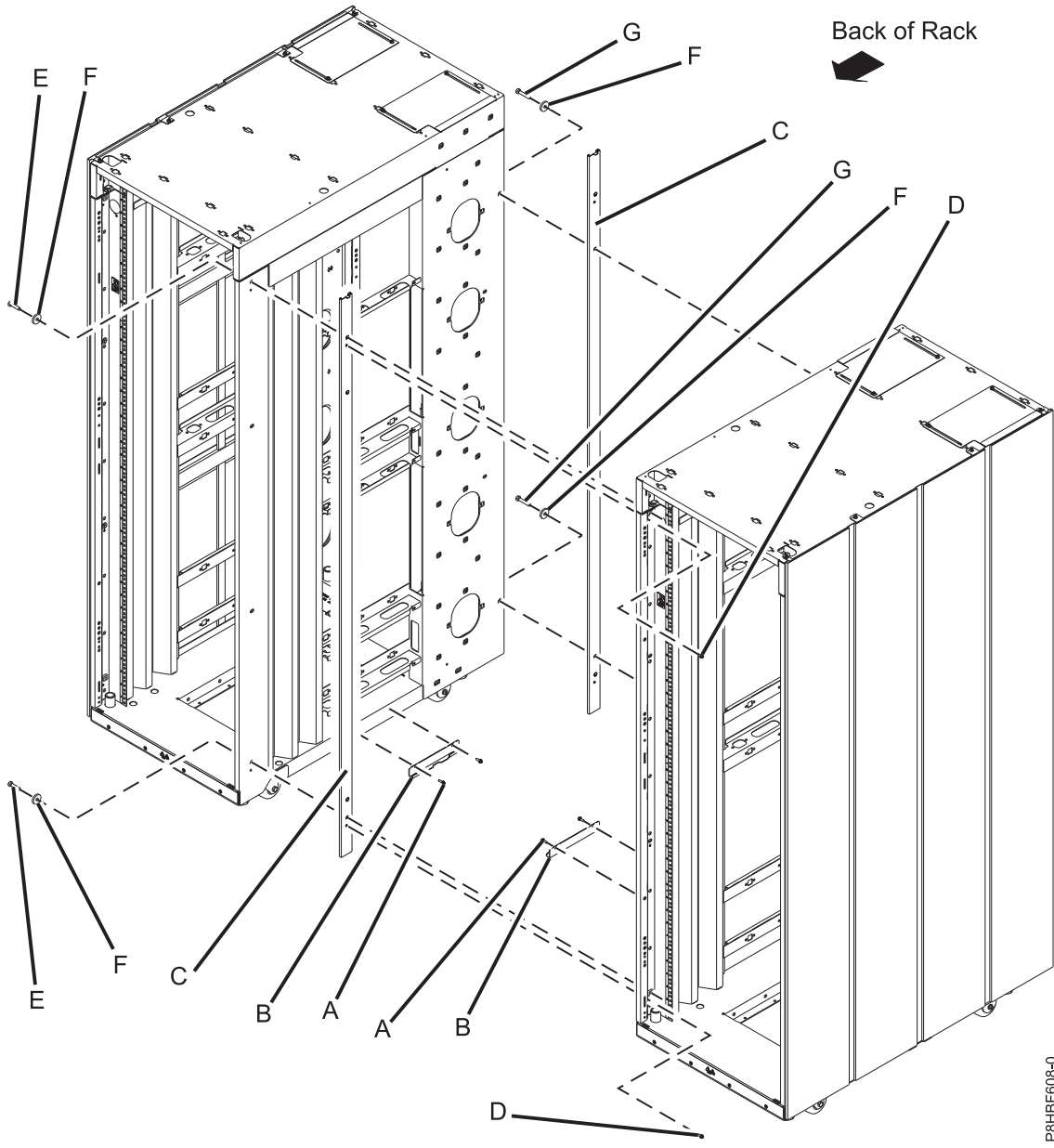
Figure 65. Removing the side panels, bracket, and standoffs to connect multiple racks

Item	Description
A	M5x16 Hex flange screw
B	J bracket
C	Spacer bracket
D	M5 hex flange screws
E	M8x35 screw
F	Washer
G	M8x45 screw

5. Position the racks together.
6. Align the rack holes. If the rack holes do not align, adjust the leveling feet.

7. Install a screw **(E/G)** and washer **(F)** into all four positions, but do not tighten.

8. Ensure that all your racks are aligned, and then tighten all four screws.

9. Connect the cables that go between the racks.

10. If necessary, install a side panel on the end rack. For more information, see "Installing the side cover" on page 96.

11. If you are installing stabilizer brackets, go to "Attaching the stabilizer bracket" on page 87.

Connecting multiple racks with the rack-to-rack attachment kit for a 600 mm pitch
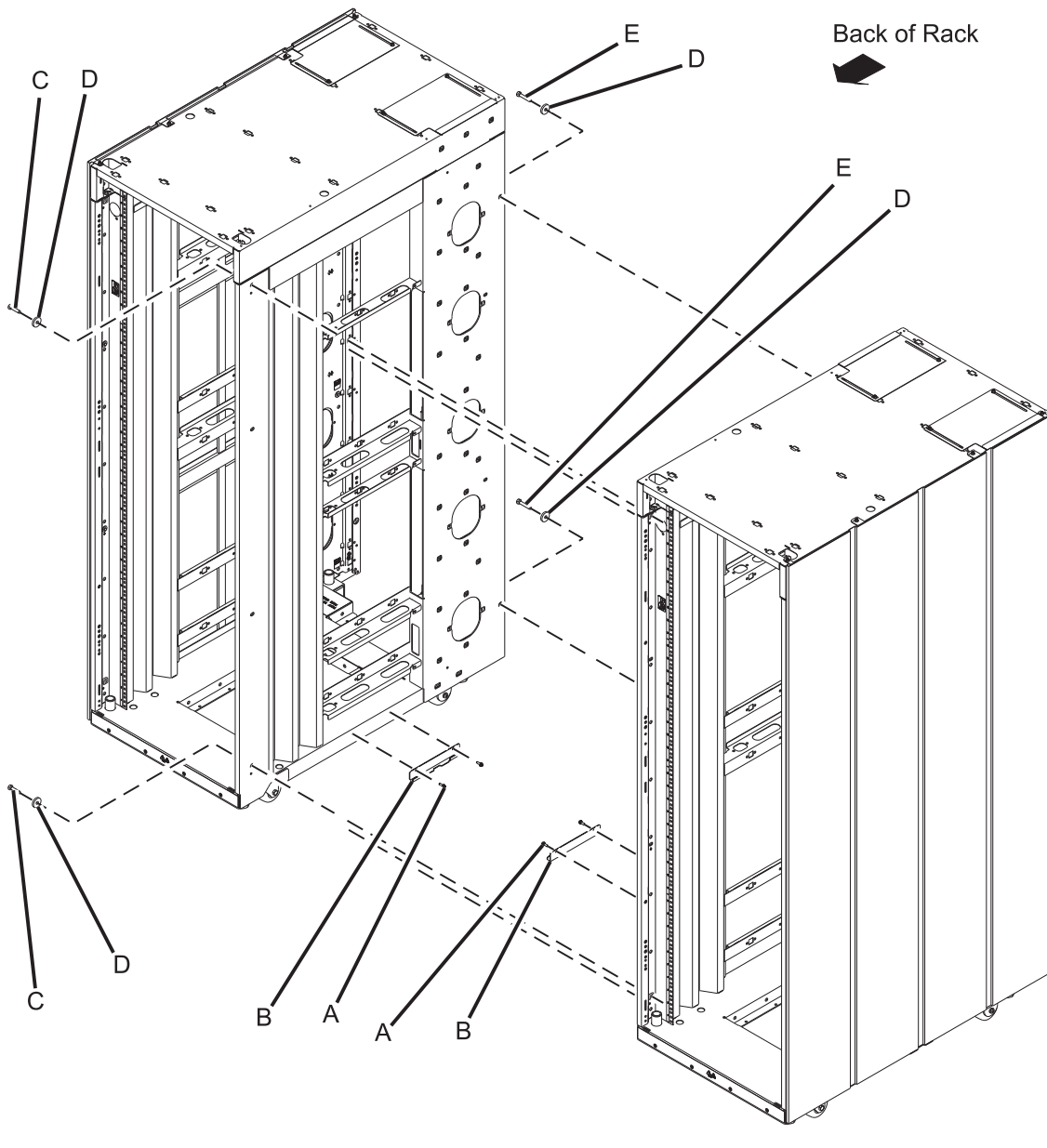
You might need to connect multiple racks together.

Connect multiple racks to each other using a rack-to-rack attachment kit for 600 mm racks. To perform this task, you must use the rack-to-rack attachment kit.

Ensure that you have the following bolts:
- M8x30 (front rack)
- M8x45 (rear rack)
- 13 mm socket

To connect multiple racks with the rack-to-rack attachment kit for 600 mm racks, complete the following steps:

1. Read the "Rack safety notices" on page 2.

2. If they are installed, remove the side panels from each rack. Remove side panels only from the sides that you are attaching to each other by completing the following steps:

   a. Remove the screws on the top and insides of the rack.

   b. Pull the panel up and away from the rack chassis. This motion releases the panel from the lower J bracket.

   c. Store the side panels.

3. Remove the J-bracket screws **(A)** and bracket **(B)**.

Figure 66. Removing the side panels, bracket, and installing standoffs to connect multiple racks

Item	Description
A	Bracket Screw
B	J bracket
C	M8x30 screw
D	Washer
E	M8x45 screw

4. Position the racks together.
5. Align the standoff holes. If the standoff holes do not align, adjust the leveling feet.
6. Install a screw **(C/E)** and washer **(D)** into all four positions, but do not tighten.
7. Ensure that all of the racks are aligned and then tighten all four screws.

8. Connect the cables that go between the racks.
9. If necessary, install a side panel on the end rack. For more information, see "Installing the side cover" on page 96.
10. If you are installing stabilizer brackets, go to "Attaching the stabilizer bracket."

Attaching the stabilizer bracket

Install the stabilizer bracket, if the rack is not bolted to the floor.

To attach the stabilizer bracket to the bottom of the rack, complete the following steps:

1. If you are connecting multiple racks for a 24-inch pitch, continue with "Connecting multiple racks with the rack-to-rack attachment kit for a 24-inch pitch" on page 82. If you are connecting multiple racks for a 600 mm pitch, continue with "Connecting multiple racks with the rack-to-rack attachment kit for a 600 mm pitch" on page 85. If you are not, continue with the next step.
2. Loosen the jam nut **(3** in Figure 67**)** on each leveling foot.
3. Rotate each leveling foot **(2)** downward until it contacts the surface on which the rack is placed.

Figure 67. Adjusting the leveling feet
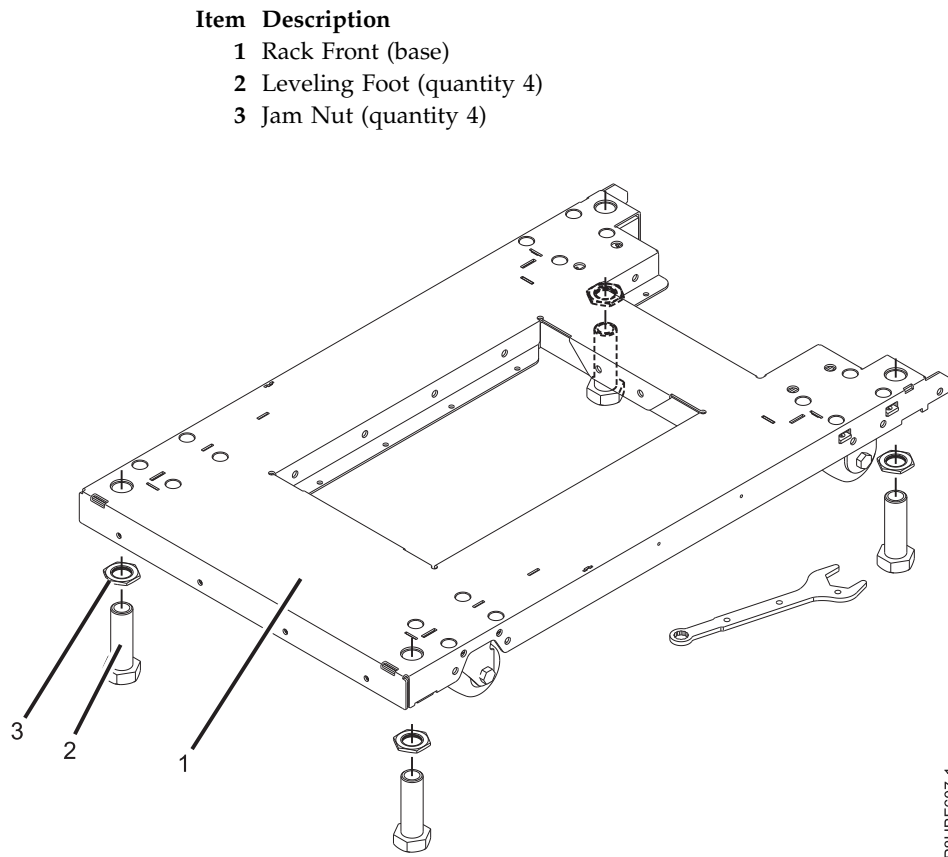
Item	Description
1	Rack Front (base)
2	Leveling Foot (quantity 4)
3	Jam Nut (quantity 4)

4. Adjust the leveling feet downward as needed until the rack is level. When the rack is level, tighten the jam nuts against the base.
5. Align the slots of one of the stabilizer brackets **(3)** with the mounting holes **(2)** at the bottom front of the rack.
6. Install the four mounting screws **(2)** loosely into the holes **(2)** on the stabilizer bracket **(3)**, and ensure that the base of the stabilizer **(3)** rests firmly on the floor.
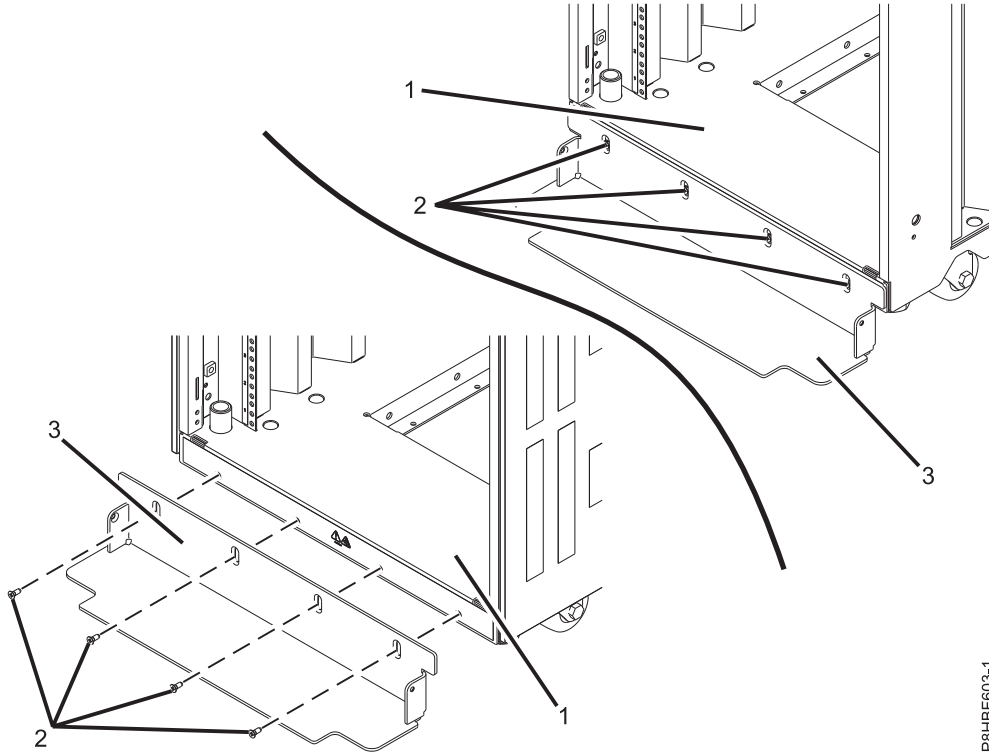
Figure 68. Installing the stabilizer bracket

7. Use a #2 Phillips screwdriver to torque the screws to 2.5 N-m (1.84 ft lb).

Connecting the power distribution system

You can use a power distribution system to monitor the individual power loads of the devices that are plugged into it.

To connect a power distribution unit, see "Power distribution unit and Intelligent Switched High Function PDU" on page 46.

Installing the rack doors

You might need to install front or rear doors on the rack.

Installing a front door or high-end appearance door to the rack

You might need to install a door to the rack.

Note: The doors lock and latch for safety and security.

To install the front door, complete the following steps:

1. Read the "Rack safety notices" on page 2.
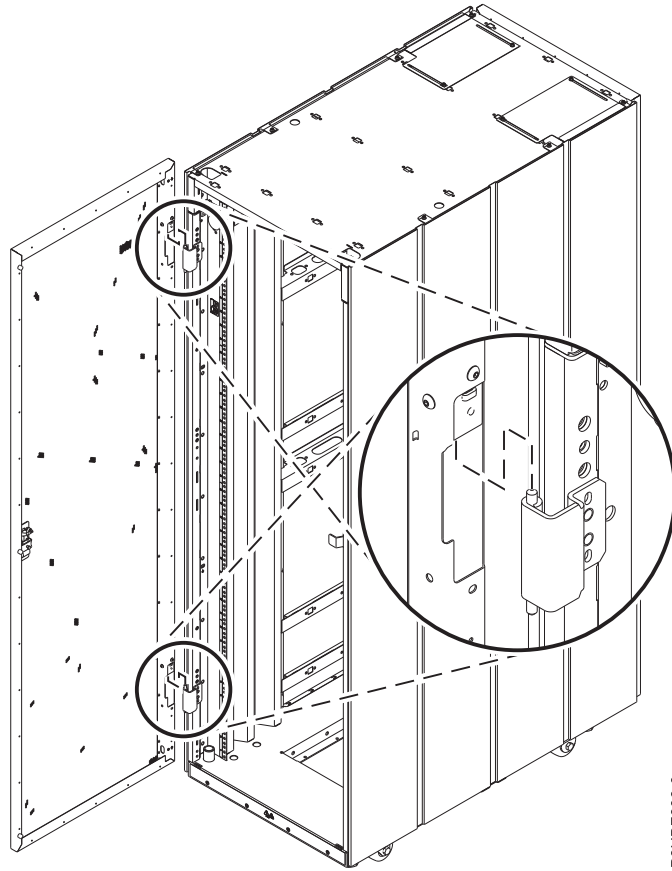2. Align the door over the rack hinge.

Figure 69. Aligning the door over the rack hinge

3. Lower the door onto the pin.
4. Adjust the latch so the door latches securely.

Changing the side on which your rear door opens

You might want to change the way that the door opens on the rear of the rack.

To change the way that the door opens on the rear of the rack, complete the following steps:

1. Read the "Rack safety notices" on page 2.
2. If it is already installed, remove the door.
3. Determine whether you want the door to open to the right or left. If you want to change the way that the door opens, move the rack hinges **(A)** to the other side of the rack. If you move the rack hinges, remove the latch bracket **(B)** and install it on the other side of the rack.
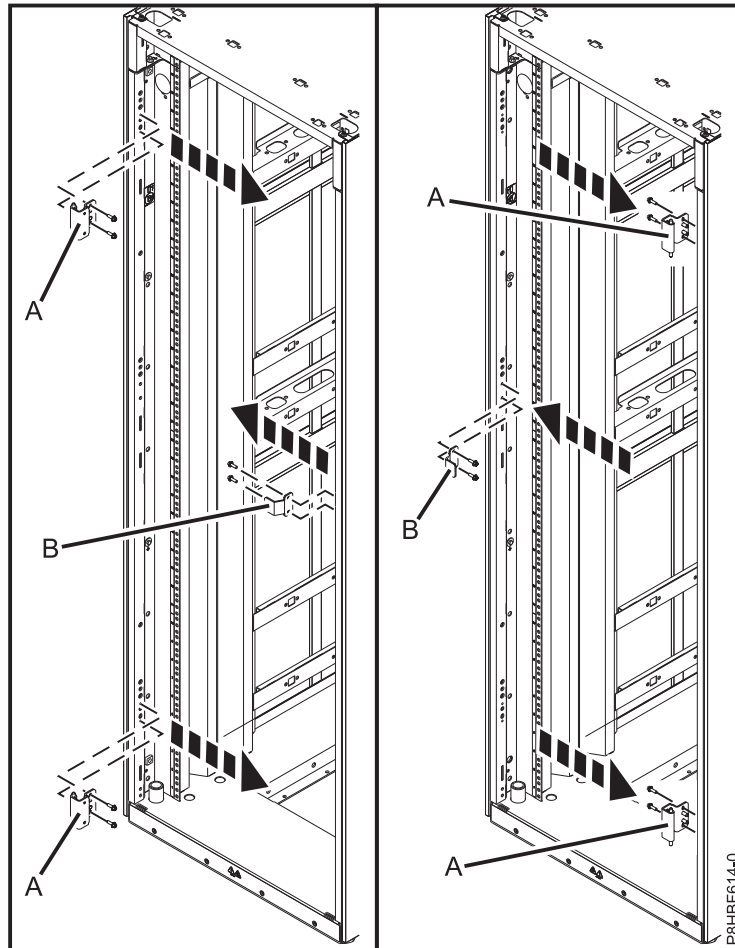
Figure 70. Moving the rack hinges

4. On the rack door, remove the two screws **(A)** that keep the door hinge bracket in place. Move the door hinge bracket **(B)** down on both the top and bottom of the door.

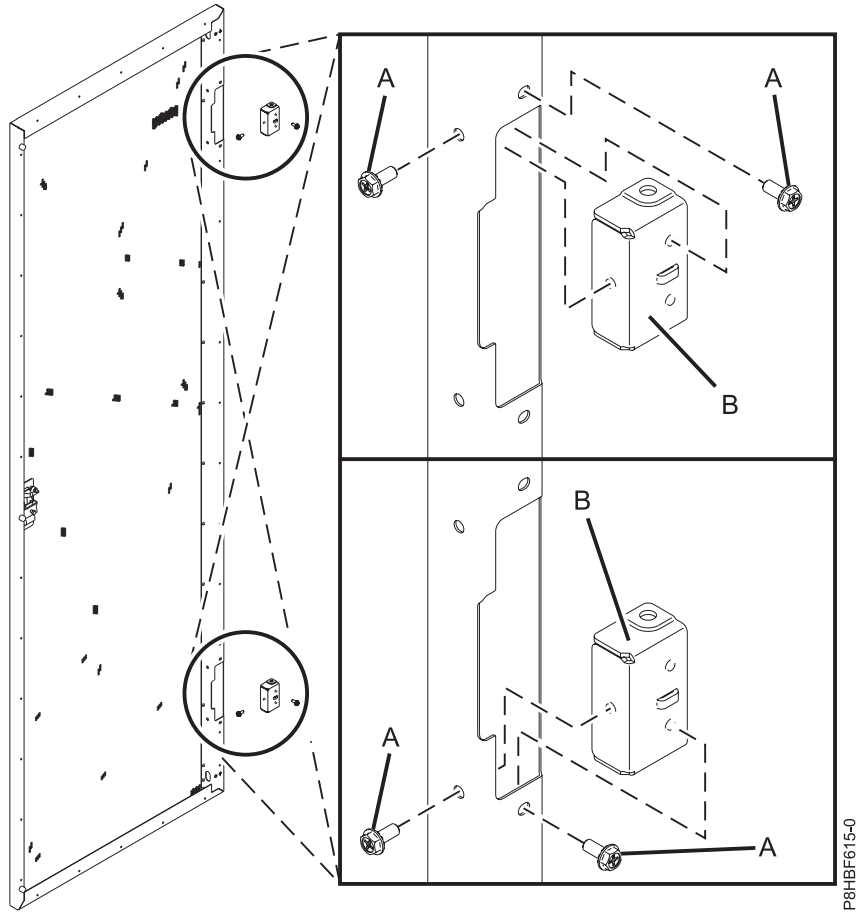5. Install the door hinge bracket by tightening the screws **(A)**.

Figure 71. Installing the door hinge

6. Loosen the bolt that secures the latch to the door **(A)** and release the latch retention bracket **(B)**.
   Rotate the latch 180 degrees **(C)**. Tighten the bolt and latch retention bracket.
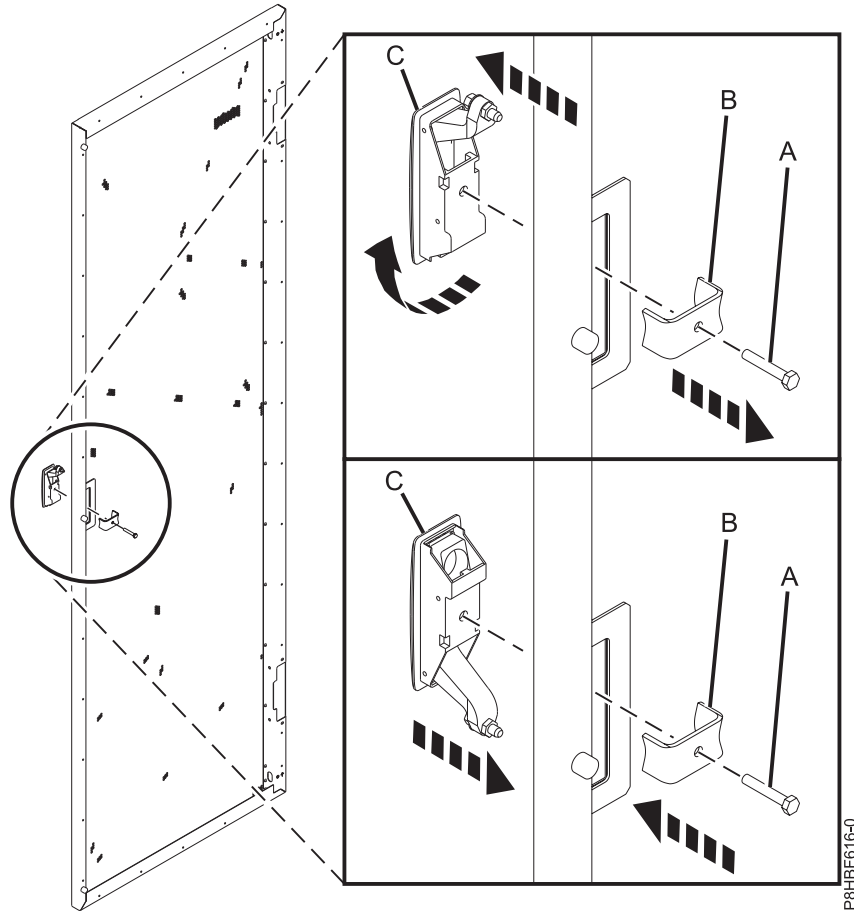
Figure 72. Reorienting the door latch

7. Install the door back onto the hinge.
8. Adjust the latch such that the door latches securely.

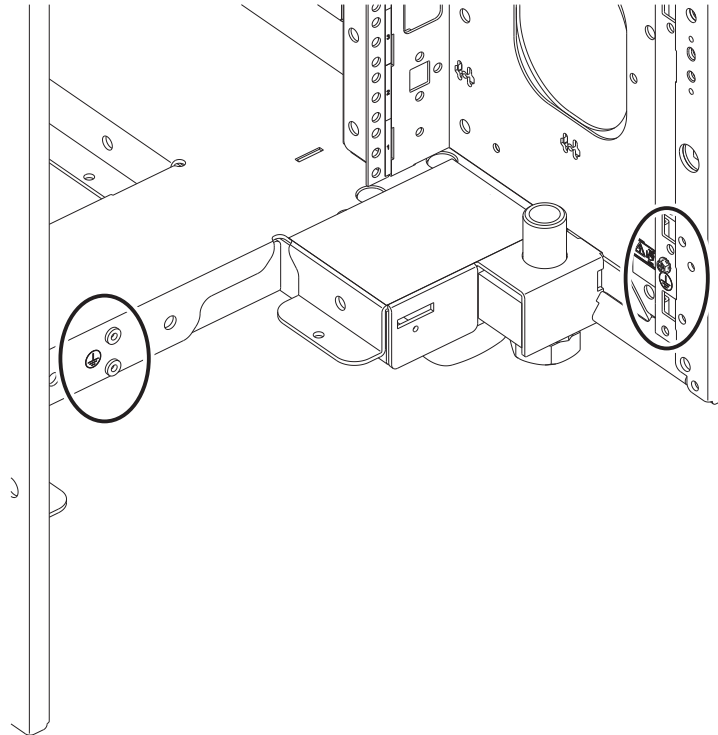# Earth (ground) bonding the rack

Electrical bonding is the practice of intentionally electrically connecting all exposed metallic non-current-carrying items in a room or building as protection from electric shock. The following sections provide instructions for earth (ground) bonding the rack side covers and the front and rear doors to the rack frame.

Rack frame connection points

Two connection points are available on the rack frame.

These connection points are identified by the international earth (ground) symbol.

The following figure shows the ground points on the rack frame.

Figure 73. Ground points on the rack frame

Earth (ground) bonding the side covers to the rack frame

The rack side covers shipped from IBM already grounded. If you remove and replace the side covers, ground the covers again by installing the bolts.

Door ground connection points

The earth (ground) connection points on the front and rear doors are located in each of the hinge side corners.

The connection points are identified by the international earth (ground) symbol.

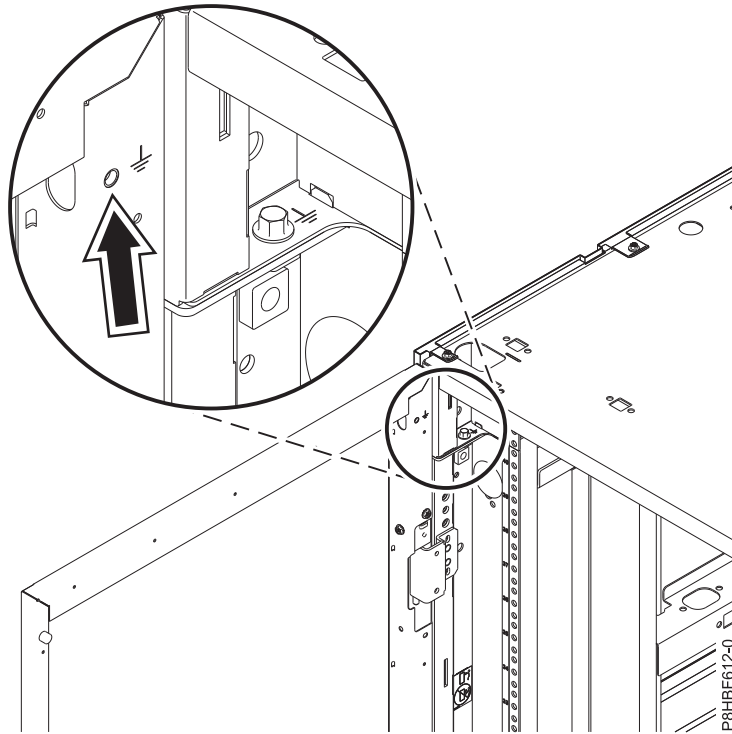The following figure shows a ground connection point on the door.

Figure 74. Grounding connection point on the door

Earth bonding the front and rear doors to the rack frame

You might need to bond the front and rear doors to the frame.

Before you begin, ensure that you have the following items:

- 8 AWG copper wire with either solid green or green-yellow insulation
- Wire with approximately 0.5 inches (1.25 cm) of insulation that is stripped from each end of the wire.
- A ring-type connector that is secured to each end of the wire, according to the instructions that come with the connectors.
- M5 bolt and external star washers
- M6 external star washers

Note: You must use a 6-point (pt) socket with an extension bar to remove the bolts from the top cover. Other tools might cause the bolt heads to become rounded and difficult to remove.

To earth (ground) bond the rack front and rear doors to the rack frame, complete the following steps:

1. On the rack door, locate the earth (ground) connection point. The following figure shows a ground connection point on the door.
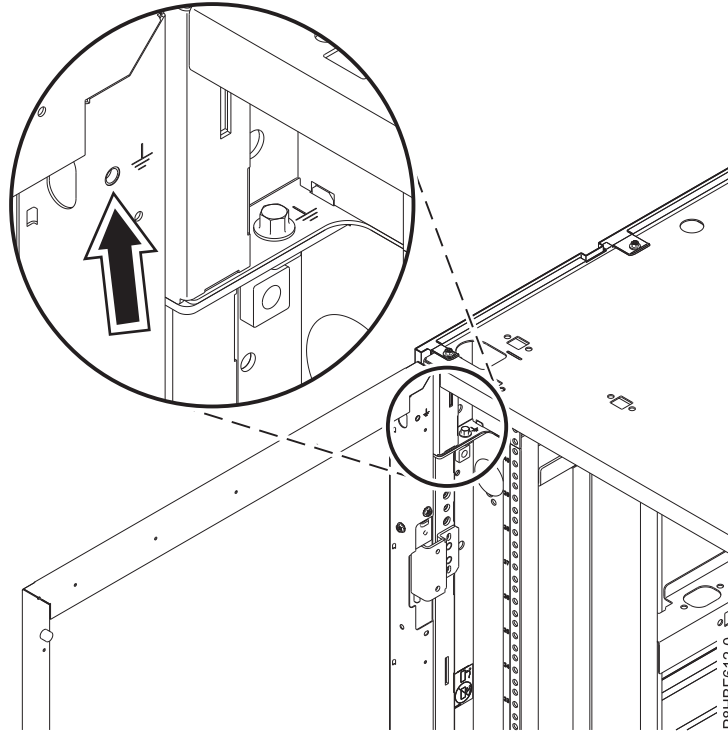
Figure 75. Ground point on the door
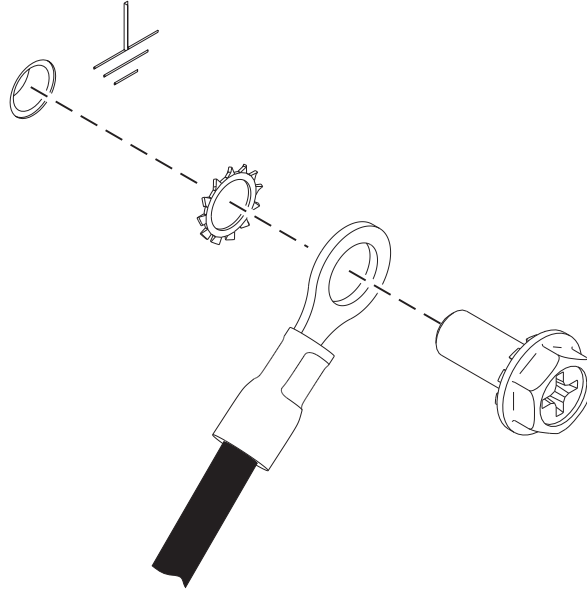
2. Using an 8 mm 6-point socket, remove an M6 bolt on the rack. Use the connection point screw that is closest to the door hinge.

   Note: The ground points are at each corner of the rack.

3. Place one ring terminal and then one external star washer on the bolt. The following figure shows the order in which the screw, ring terminal, and external star washer are installed.

P8HBF621-0

Figure 76. Ring terminal and external star washer

4. Use the external star washer and m5 bolt to secure the wire to the door ground point.
5. Place the other wire connector ring on the screw and add the M6 external star washer, as shown in Figure 76.
6. Use a hex socket to tighten the screw into the connection point on the rack frame.
7. Repeat steps 1 on page 94 - 6 to earth (ground) bond the other door.

Installing the side cover

You might need to install a side cover on your rack.

To install a side cover, complete the following tasks:
1. Ensure that the J-bracket on the bottom of the rack is in place. If a J-bracket is not installed on the bottom of the rack, install it now.
2. Tilt the side cover so that the bottom tab of the cover aligns with the J-bracket in the rack.
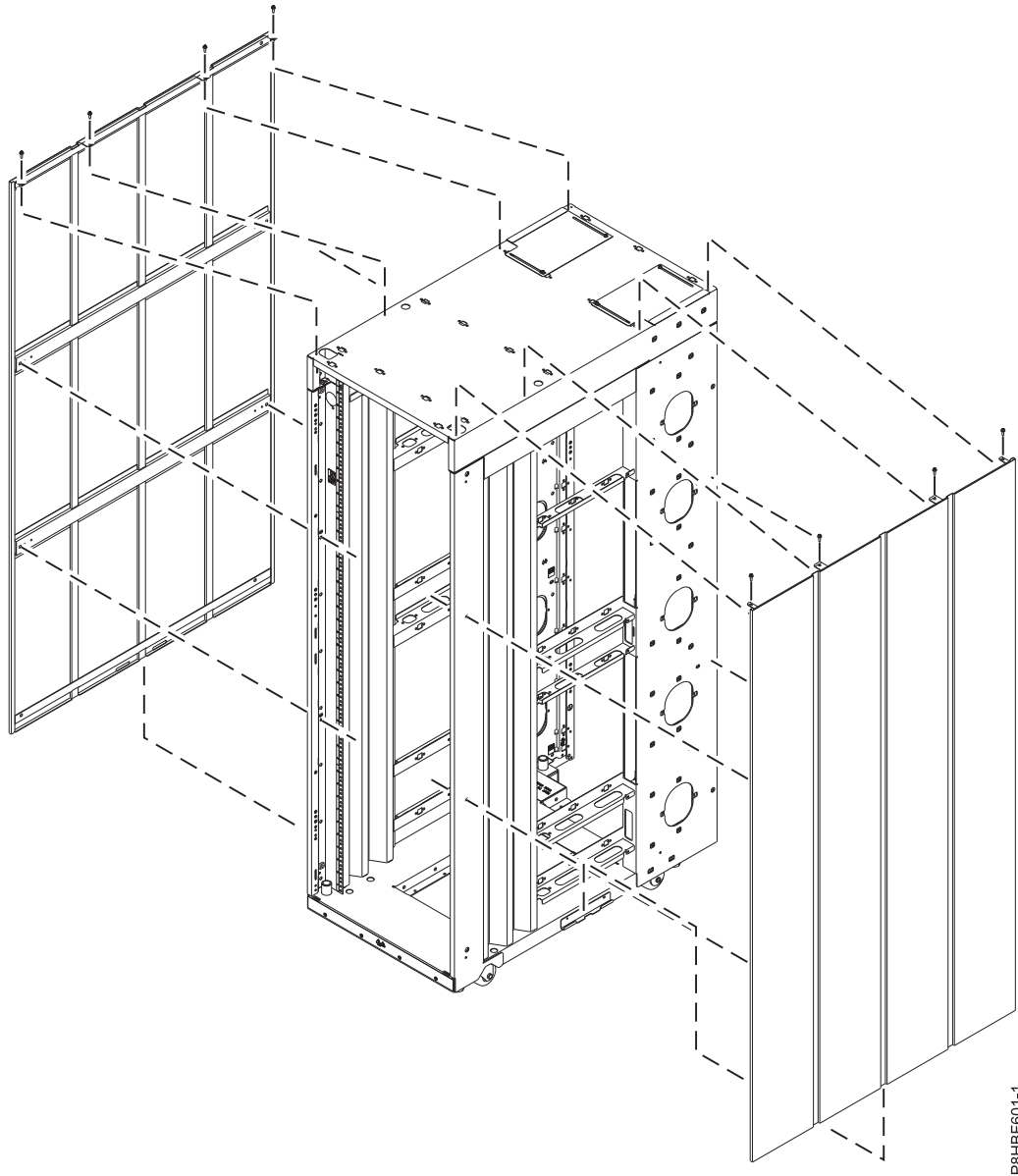
Figure 77. Installing the side covers

3. Raise the cover until it is flush with the rack, and the four holes in the top of the cover align with the four holes in the top of the rack.

4. Install eight screws into each of the holes (four on the top and four on the inside) to secure the cover to the rack.
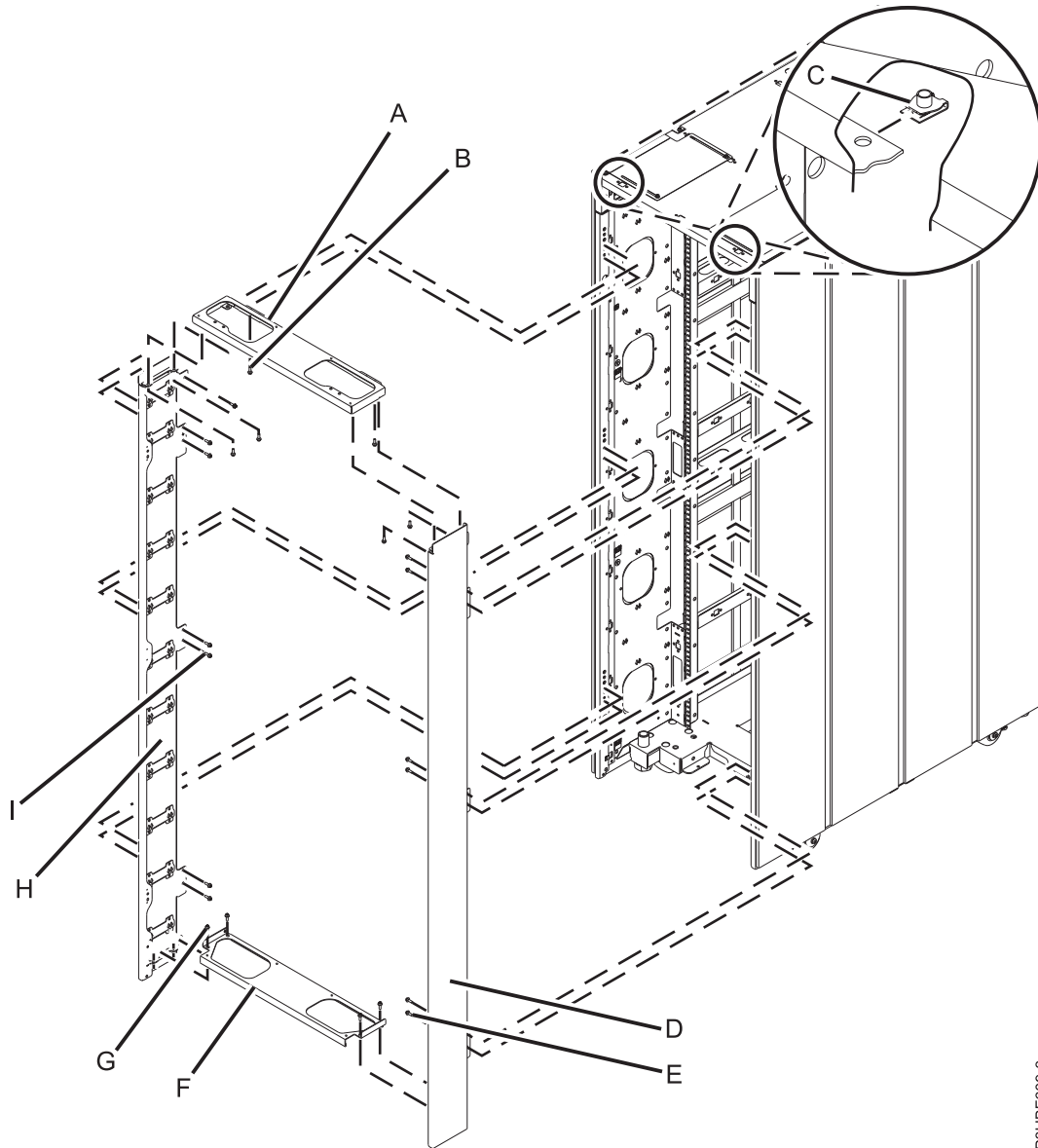
Installing an extender to the rack

You might need to install an extender on your rack.

To install an extender to the rack, complete the following tasks:

1. Prepare the rack for the extension kit installation.

   To prepare the rack for the extension kit installation, perform the following tasks:

   a. Allow for enough space, at the rear of the rack, for component installation.

b. Lift the rear door off the hinges, and then remove the door from the rack.

c. Using a #2 Phillips head screwdriver, remove the screws that secure the top and bottom hinges to the rack.

d. Using a #2 Phillips head screwdriver, remove the screws that secure the rear latch plate.

2. Install the left extension panel. To install the left extension panel, perform the following tasks:

Figure 78. Installing the extender

a. Align the left extension panel **(H)** with the rack corner post.

b. Using a #2 Phillips head screwdriver, tighten the seven M5 screws with captive star washer **(I)** into the rack.

3. Install the right extension panel. To install the right extension panel, perform the following tasks:

a. Align the right extension panel **(D)** with the right side covers.

b. Using a #2 Phillips head screwdriver, tighten the seven M5 screws with captive star washer **(E)** into the rack.

4. Install the top cap. To install the top cap, perform the following task:
   a. Align the top cap **(A)** with the installed extension panels.
   b. Using a #2 Phillips head screwdriver, insert and tighten the M5 screws with captive star washers **(B)** into each of the screw holes.
   c. Install the nut clips **(C)**.
5. Install the bottom cap. To place the bottom cap, perform the following task:
   a. Align the bottom cap **(F)** with the installed extension panels.
   b. Using a #2 Phillips head screwdriver, insert and tighten the M5 screws **(G)** with captive star washers into each of the screw holes.
6. Install the rear hinge assemblies (top and bottom) and the latch plate that you previously removed from the frame onto the extension panel.

Removing the rack top cover

The top 2U of the rack can be temporarily detached to make it easier to move through doors or into elevators.

You can reattach the top 2U to the rack frame to provide the full 42U rack capacity. The rack is approximately 4.25" shorter with the top removed.

Note: You must use a 6-point (pt) box socket with an extension bar to remove the screws from the top cover. Other tools might cause the screw heads to become rounded and difficult to remove.

To remove the rack top cover, complete the following steps:
1. Remove the front door.
2. Remove the rear door.
3. Remove the side panels.
4. Locate the front and rear rack braces, M6 nut clips, and M6 screws. Fasten each rack brace at the top of the front and rear of the rack, just below the top cover.
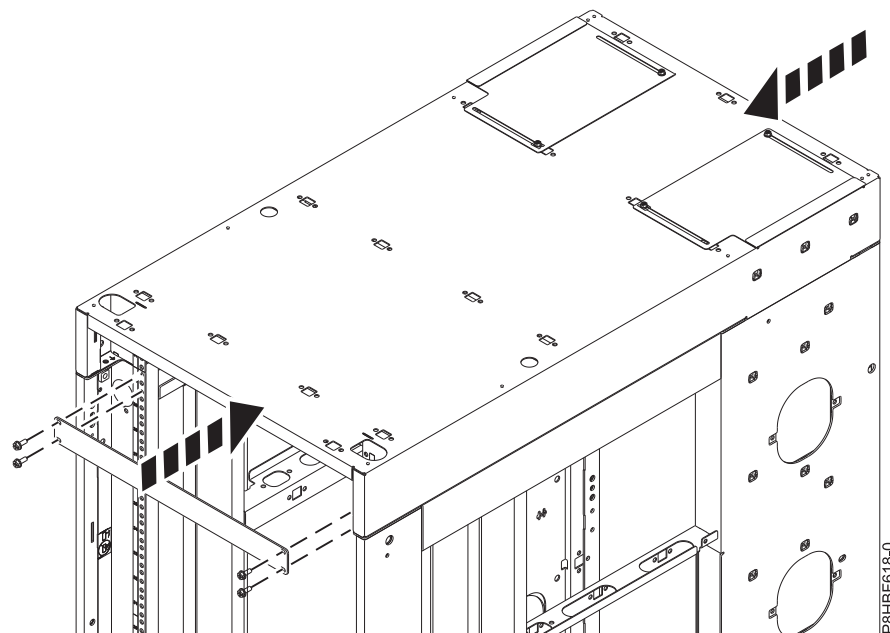

Figure 79. Fastening the rack braces

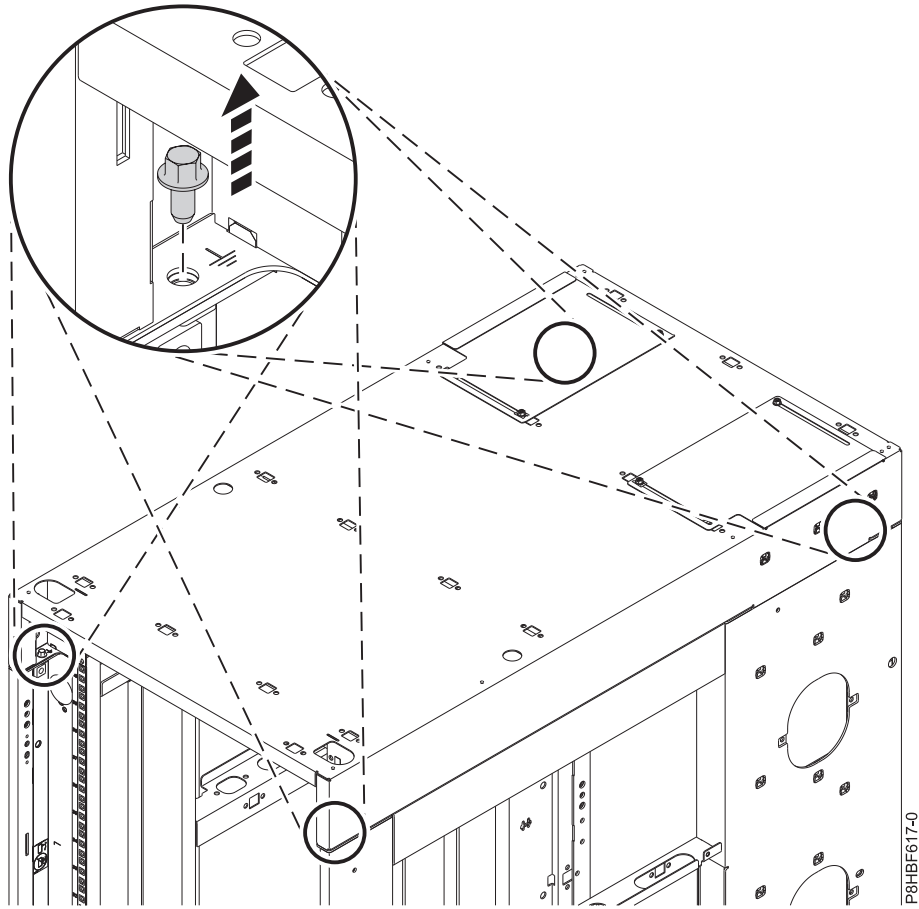5. Remove the four corner screws from the top cover.

Figure 80. Removing the corner screws

6. Remove the remaining screws from the top cover.
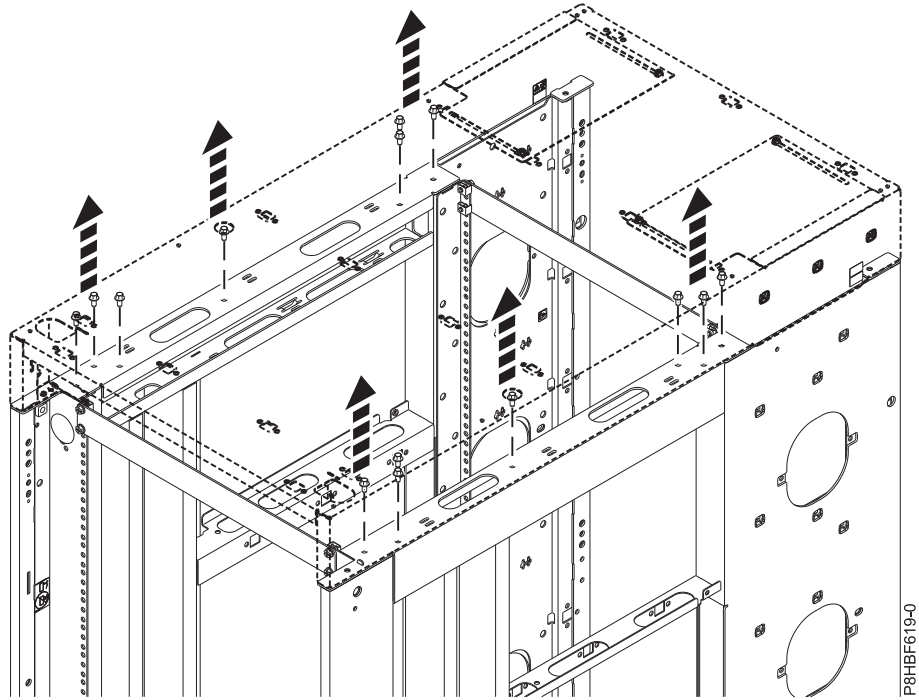
Figure 81. Removing the remaining screws

7. Lift off the top cover.
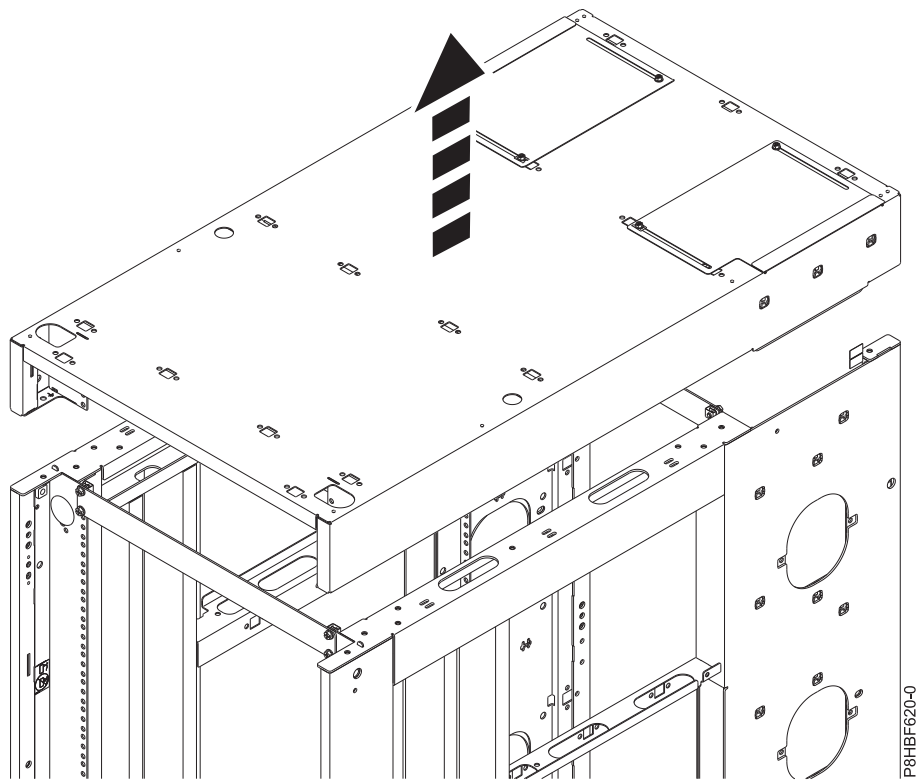
Figure 82. Lifting the top cover

Replacing the top cover

You might need to replace the rack top cover.

Note: You must use a 6-point (pt) socket with an extension bar to install the bolts for the top cover. Other tools might cause the bolt heads to become rounded and difficult to remove.

To replace the rack top cover onto the rack, complete the following steps:

1. Position the rack top cover on the rack.
2. Install the screws.
3. Torque the screws to 5.6 N-m (4.13 ft lb).
4. Remove the rack braces by unfastening them at the top of the rack, just below the top cover. Remove the braces at the front and rear of the rack.
5. Install rack filler panels to cover open areas at the front of the rack. Seal all gaps in the front of the rack, including the gaps between pieces of equipment. Rack airflow is maintained when the gaps are sealed.

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Accessibility features assist users who have a disability, such as restricted mobility or limited vision, to use information technology content successfully.

Overview

The IBM Power Systems servers include the following major accessibility features:
- Keyboard-only operation
- Operations that use a screen reader

The IBM Power Systems servers use the latest W3C Standard, WAI-ARIA 1.0 (www.w3.org/TR/wai-aria/), to ensure compliance with US Section 508 (www.access-board.gov/guidelines-and-standards/ communications-and-it/about-the-section-508-standards/section-508-standards) and Web Content Accessibility Guidelines (WCAG) 2.0 (www.w3.org/TR/WCAG20/). To take advantage of accessibility features, use the latest release of your screen reader and the latest web browser that is supported by the IBM Power Systems servers.

The IBM Power Systems servers online product documentation in IBM Knowledge Center is enabled for accessibility. The accessibility features of IBM Knowledge Center are described in the Accessibility section of the IBM Knowledge Center help (www.ibm.com/support/knowledgecenter/doc/ kc_help.html#accessibility).

Keyboard navigation

This product uses standard navigation keys.

Interface information

The IBM Power Systems servers user interfaces do not have content that flashes 2 - 55 times per second.

The IBM Power Systems servers web user interface relies on cascading style sheets to render content properly and to provide a usable experience. The application provides an equivalent way for low-vision users to use system display settings, including high-contrast mode. You can control font size by using the device or web browser settings.

The IBM Power Systems servers web user interface includes WAI-ARIA navigational landmarks that you can use to quickly navigate to functional areas in the application.

Vendor software

The IBM Power Systems servers include certain vendor software that is not covered under the IBM license agreement. IBM makes no representation about the accessibility features of these products. Contact the vendor for accessibility information about its products.

Related accessibility information

In addition to standard IBM help desk and support websites, IBM has a TTY telephone service for use by deaf or hard of hearing customers to access sales and support services:

TTY service
800-IBM-3383 (800-426-3383)
(within North America)

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Electronic emission notices

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

Class A Notices

The following Class A statements apply to the IBM servers that contain the POWER8 processor and its features unless designated as electromagnetic compatibility (EMC) Class B in the feature information.

Federal Communications Commission (FCC) Statement

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

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

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

Industry Canada Compliance Statement

CAN ICES-3 (A)/NMB-3(A)

European Community Compliance Statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU 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 non-recommended modification of the product, including the fitting of non-IBM option cards.

European Community contact:
IBM Deutschland GmbH
Technical Regulations, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 800 225 5426
email: halloibm@de.ibm.com

Warning: 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.

VCCI Statement - Japan

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

The following is a summary of the VCCI Japanese statement in the box above:

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

Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.

（一社）電子情報技術産業協会　高調波電流抑制対策実施
要領に基づく定格入力電力値： Knowledge Centerの各製品の
仕様ページ参照

This statement explains the Japan Electronics and Information Technology Industries Association (JEITA) statement for products less than or equal to 20 A per phase.

高調波電流規格　JIS C 61000-3-2 適合品

This statement explains the JEITA statement for products greater than 20 A, single phase.

高調波電流規格　JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。
・回路分類　：6（単相、ＰＦＣ回路付）
・換算係数　：0

This statement explains the JEITA statement for products greater than 20 A per phase, three-phase.

Electromagnetic Interference (EMI) Statement - People's Republic of China

Declaration: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may need to perform practical action.

Electromagnetic Interference (EMI) Statement - Taiwan

The following is a summary of the EMI Taiwan statement above.

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

IBM Taiwan Contact Information:

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

Electromagnetic Interference (EMI) Statement - Korea

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

Germany Compliance Statement

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

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaatenund hält die Grenzwerte der EN 55022 / EN 55032 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

EN 55022 / EN 55032 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: "Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC Richtlinie 2014/30/EU) für Geräte der Klasse A

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

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:
IBM Deutschland GmbH
Technical Relations Europe, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 (0) 800 225 5426
email: HalloIBM@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 / EN 55032 Klasse A.

Electromagnetic Interference (EMI) Statement - Russia

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

Class B Notices

The following Class B statements apply to features designated as electromagnetic compatibility (EMC) Class B in the feature installation information.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult an IBM-authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM-authorized dealers. IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate this equipment.

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

Industry Canada Compliance Statement

CAN ICES-3 (B)/NMB-3(B)

European Community Compliance Statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU 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 non-recommended modification of the product, including the fitting of non-IBM option cards.

European Community contact:
IBM Deutschland GmbH
Technical Regulations, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 800 225 5426
email: halloibm@de.ibm.com

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取扱説明書に従って正しい取り扱いをして下さい。　　　　ＶＣＣＩ－Ｂ

Japan Electronics and Information Technology Industries Association Statement

This statement explains the Japan JIS C 61000-3-2 product wattage compliance.

（一社）電子情報技術産業協会　高調波電流抑制対策実施
要領に基づく定格入力電力値： Knowledge Centerの各製品の
仕様ページ参照

This statement explains the Japan Electronics and Information Technology Industries Association (JEITA) statement for products less than or equal to 20 A per phase.

高調波電流規格　JIS C 61000-3-2 適合品

This statement explains the JEITA statement for products greater than 20 A, single phase.

高調波電流規格　JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対
策ガイドライン」対象機器（高調波発生機器）です。
・回路分類 ：６（単相、ＰＦＣ回路付）
・換算係数 ：０

This statement explains the JEITA statement for products greater than 20 A per phase, three-phase.

高調波電流規格 JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。
- 回路分類 ： 5（3相、ＰＦＣ回路付）
- 換算係数 ： 0

IBM Taiwan Contact Information

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

Germany Compliance Statement

Deutschsprachiger EU Hinweis: Hinweis für Geräte der Klasse B EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2014/30/EU zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaatenund hält die Grenzwerte der EN 55022/ EN 55032 Klasse B ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung von IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung von IBM gesteckt/eingebaut werden.

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2014/30/EU in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC Richtlinie 2014/30/EU) für Geräte der Klasse B

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

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
International Business Machines Corp.
New Orchard Road
Armonk, New York 10504

Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:
IBM Deutschland GmbH
Technical Relations Europe, Abteilung M456
IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 (0) 800 225 5426
email: HalloIBM@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022/ EN 55032 Klasse B.

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