Power Systems

Installing the System and Ordered Parts for the IBM Power System IC922 (9183-22X)

Note

Before using this information and the product it supports, read the information in “Safety notices” on page v, “Notices” on page 127, the *IBM Systems Safety Notices* manual, G229-9054, and the *IBM Environmental Notices and User Guide*, Z125–5823.

This edition applies to IBM® Power Systems servers that contain the POWER9™ 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.
- When performing a machine inspection: 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 attempt to switch power to the machine until all possible unsafe conditions are corrected. 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.
- 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 if provided, unless the earthquake option is to be installed.
- 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).

  
- Stability hazard:
  - The rack may tip over causing serious personal injury.
  - Before extending the rack to the installation position, read the installation instructions.
  - Do not put any load on the slide-rail mounted equipment mounted in the installation position.
  - Do not leave the slide-rail mounted equipment in the installation position.
- 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 1 of 2)

(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 or if the rack is not bolted to the floor. 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. (R001 part 2 of 2)

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 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 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 2083 mm (30 x 82 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 or in an earthquake environment bolt the rack to the floor.
  - 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)

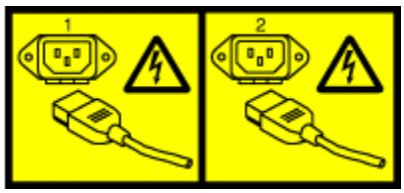
DANGER: Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices. In addition, do not lean on rack-mounted devices and do not use them to stabilize your body position (for example, when working from a ladder). Stability hazard:

- The rack may tip over causing serious personal injury.
- Before extending the rack to the installation position, read the installation instructions.

- Do not put any load on the slide-rail mounted equipment mounted in the installation position.
- Do not leave the slide-rail mounted equipment in the installation position.

(L002)

(L003)



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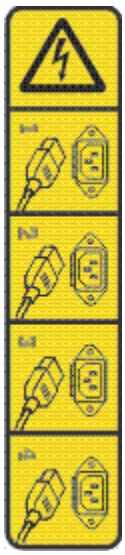

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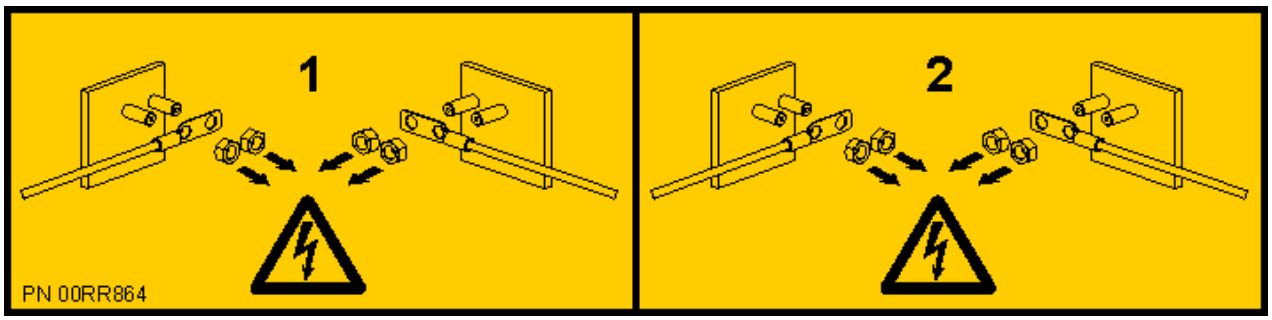


DANGER: Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)

(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 may 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)

(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 degrees C (212 degrees 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 raise, lower or slide platform load shelf unless stabilizer (brake pedal jack) is fully engaged. Keep stabilizer brake engaged when not in use or motion.
- 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 platforms, tilt riser, angled unit install wedge or other such accessory options. Secure such platforms -- riser tilt, wedge, etc options to main lift shelf or forks in all four (4x or all other provisioned mounting) 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 [adjustable angling platform] option flat at all times except for final minor angle 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 (unless the specific allowance is provided for one following qualified procedures for working at elevations with this 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.
- This TOOL must be maintained correctly for IBM Service personnel to use it. IBM shall inspect condition and verify maintenance history before operation. Personnel reserve the right not to use TOOL if inadequate. (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.

Installing and configuring the 9183-22X

Use this information to install and configure the IBM Power® System IC922 (9183-22X) system and to install customer-installable hardware features. This information also provides removal and replacement procedures for customer-replaceable hardware features, such as memory modules or fans.

Before you install a feature, ensure that the software that is required to support the feature is installed on the system. For information about software prerequisites, see the Power Systems Prerequisites website (https://www14.software.ibm.com/support/customercare/iprt/home). If the required software is not installed, go to the Fix Central website (http://www.ibm.com/support/fixcentral/) to download it, and then install it before you continue.

Installing these features is a customer task. You can complete this task yourself, or contact a service provider to complete the task for you. You might be charged a fee by the service provider for this service. See the International Information Bulletin for Customers - Installation of IBM Machines (Publication number: SC27-6601-00) that is available from the IBM Publications Center (http://www-05.ibm.com/e-business/linkweb/publications/servlet/pbi.wss). This bulletin provides a list of the key IBM system installation activities and a list of activities that might be billable.

Installing the 9183-22X system

Find information about installing, cabling, and setting up the IBM Power System IC922 (9183-22X) server.

Prerequisites for installing the rack-mounted server

Learn about the prerequisites for installing the server.

Before you begin

Read the following documents before you install the server:

- The latest version of this document is maintained online, see Installing the IBM Power System IC922 (9183-22X) (http://www.ibm.com/support/knowledgecenter/POWER9/p9iaf/p9iaf_install_kickoff.htm).
- To plan your server installation, see Planning for the system (http://www.ibm.com/support/knowledgecenter/POWER9/p9ia4/p9ia4_90x_kickoff.htm).

Procedure

Ensure that you have the following items before you start the installation:

- Phillips screwdriver
- Flat-head screwdriver
- Box cutter
- Electrostatic discharge (ESD) wrist strap
- Rack with two Electronic Industries Association (EIA) units (2U) of space

Completing inventory for your server

Use this information to complete inventory for your server.

Procedure

1. Verify that you received all the boxes you ordered.
2. Unpack the server components as needed.

3. Complete a parts inventory before you install each server component by following these steps:
   a. Locate the inventory list for your server.
   b. Ensure that you received all the parts that you ordered.

      Note: Your order information is included with your product. You can also obtain the order information from your marketing representative or the IBM Business Partner.

      If you have incorrect, missing, or damaged parts, consult any of the following resources:

      - Your IBM reseller.
      - IBM Rochester manufacturing automated information line at 1-800-300-8751 (United States only).
      - The Directory of worldwide contacts website http://www.ibm.com/planetwide. Select your location to view the service and support contact information.

Determining and marking the location in the rack

You might need to determine where to install the system unit into the rack.

Procedure

1. Read the Rack safety notices (http://www.ibm.com/support/knowledgecenter/POWER9/p9hbf/p9hbf_racksafety.htm).
2. Determine where to place the system unit in the rack. As you plan for installing the system unit in a rack, consider the following information:
   - Organize larger and heavier units into the lower part of the rack.
   - Plan to install system units into the lower part of the rack first.
   - Record the Electronic Industries Alliance (EIA) locations in your plan.

   Note: The server is two EIA units high. An EIA unit is 44.55 mm (1.75 in.) in height. The rack contains three mounting holes for each EIA unit of height. This system unit, therefore, is 89 mm (3.5 in.) high and covers six mounting holes in the rack.
3. If necessary, remove the filler panels to allow access to the inside of the rack enclosure where you plan to place the system unit, as shown in Figure 1 on page 3.

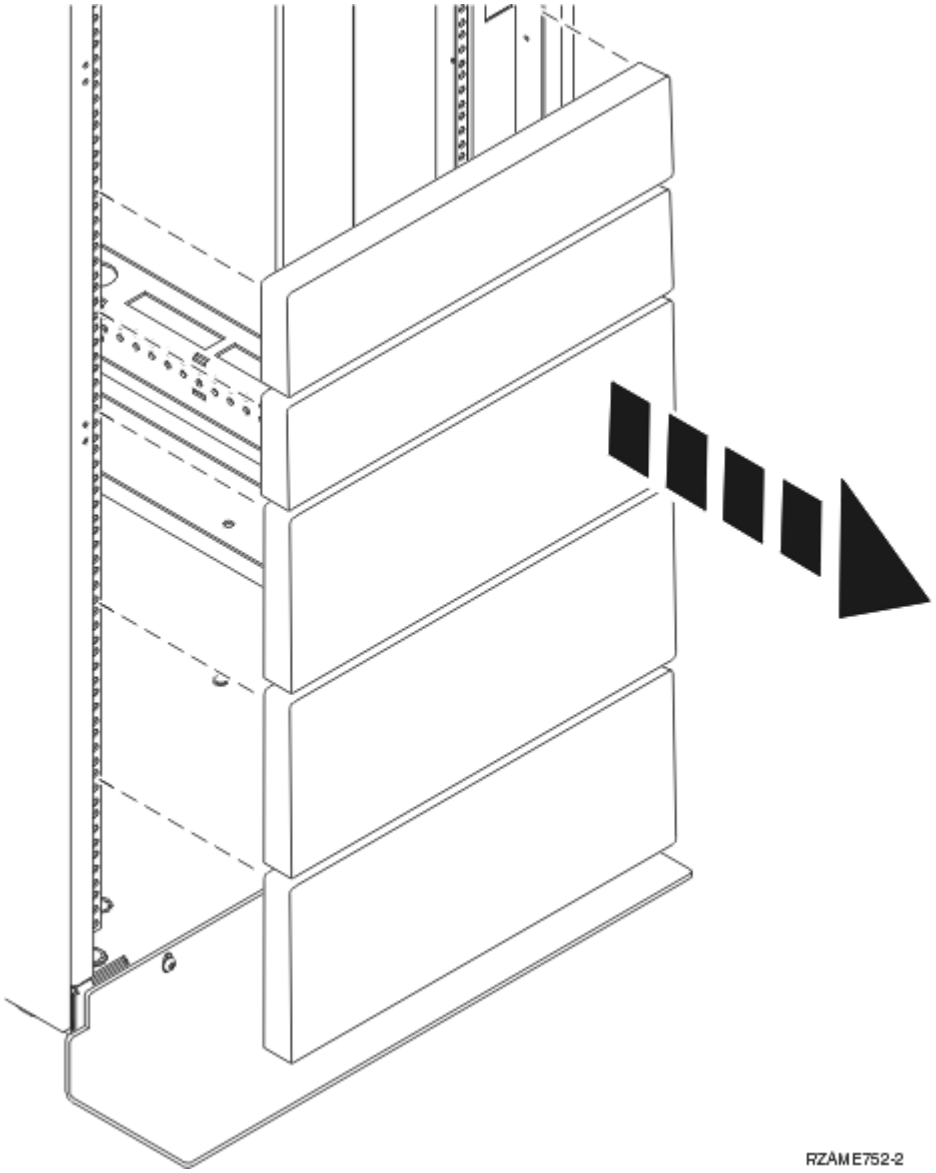


Figure 1. Removing the filler panels

4. Facing the front of the rack and working from the right side, use tape, a marker, or pencil to mark the lower hole of each EIA unit.

   Mark the rack such that the mark can also be seen from the rear of the rack.
5. Mark the corresponding hole on the left side of the rack.
6. Go to the rear of the rack.
7. On the right side, find the EIA unit that corresponds to the bottom EIA unit marked on the front of the rack.
8. Mark the bottom EIA unit.
9. Mark the corresponding hole on the left side of the rack.

Attaching the slide rails to the rack

You might need to attach the mounting hardware to the rack. Use the procedure to complete this task. The information is intended to promote safety and reliable operation, and includes illustrations of the related hardware components and shows how these components relate to each other.

Procedure

1. At the front of the rack, align the pins on end of the left rail (**1**) with the rear of the rack.

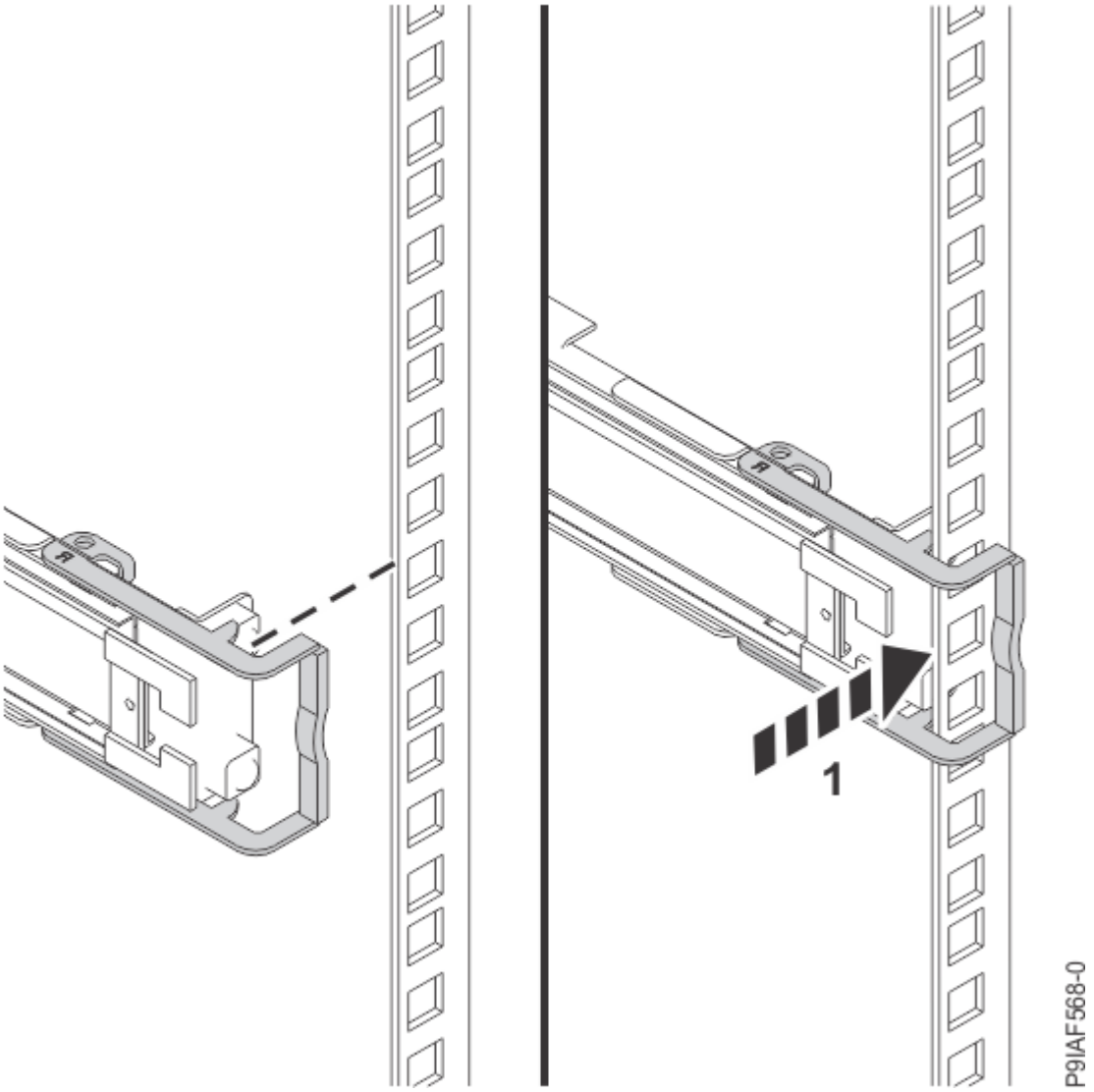


Figure 2. Aligning the end of the left rail to the rear of the rack

2. Swivel the rail retention bracket out. Push the rails into the rear rack flanges (**2**) until they click into place (**3**). Swivel the rail retention bracket so that it locks onto the rack flange.

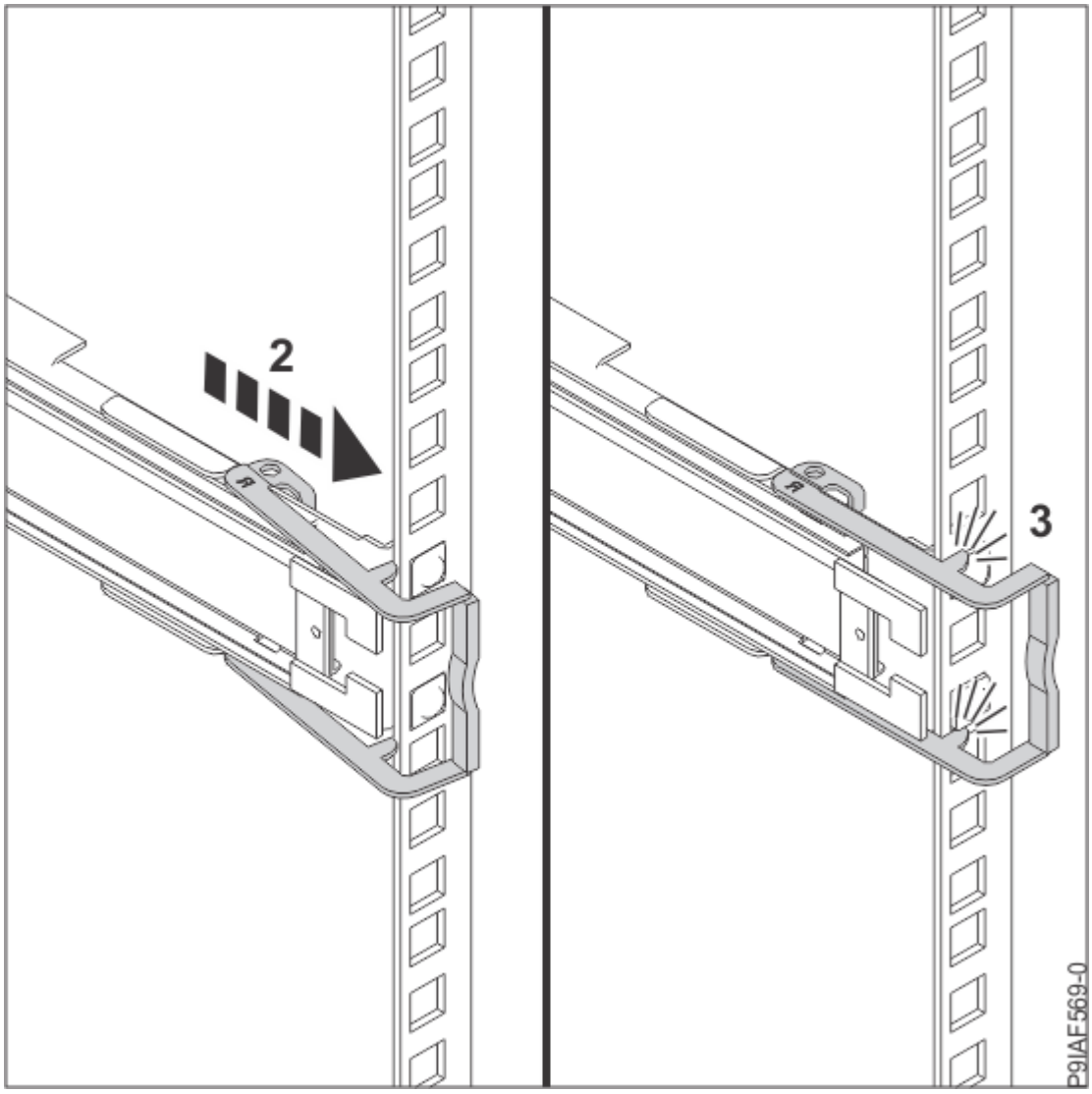


Figure 3. Pushing the rails into the rear rack flanges

3. Swivel the rail retention bracket out (**1**) and pull the front of the rail toward the front of the rack, until the pins are aligned with the correct holes in the rack (**2**). Swivel the rail retention bracket so that it locks onto the rack flange (**3**).

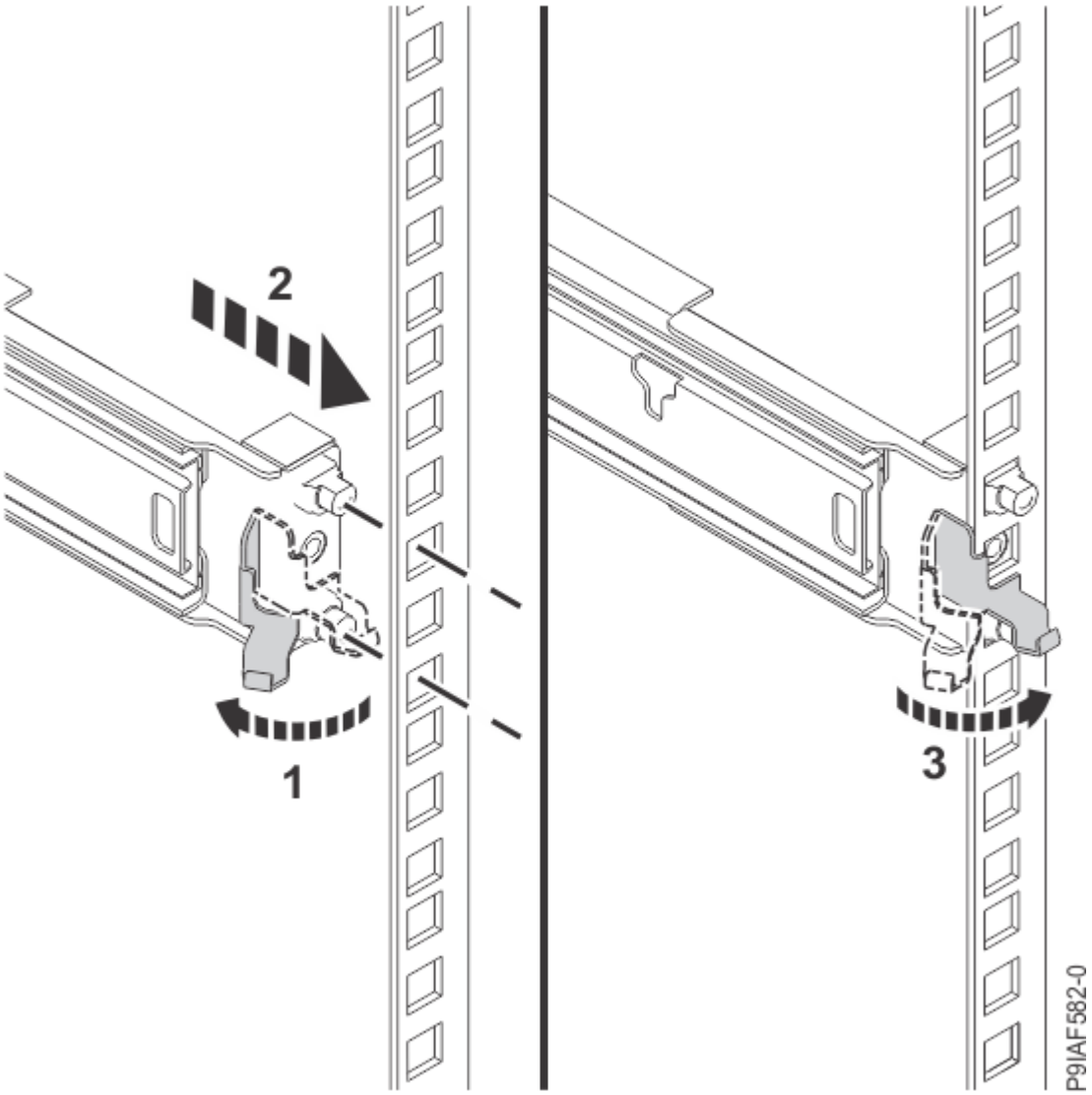


Figure 4. Attaching the rails to the front of the rack

4. Repeat steps “1” on page 4 - “3” on page 5 for the right rail.

Installing the 9183-22X system into the rack

Learn how to install the IBM Power System IC922 (9183-22X) system into the rack by using slide rails.

About this task

Note: This system requires two people to install the system into the rack.

Procedure

1. Remove the shipping cover on the rear and the front of the system, if present.
2. Extend the slide rails forward until they click twice into place.
3. Carefully lift the server and tilt it into position over the slide rails so that the rear nail heads on the server line up with the rear slots on the slide rails.
4. Slide the server down until the rear nail heads slip into the two rear slots.
5. Slowly lower the front of the server until the other nail heads slip into the other slots on the slide rails. Ensure that the front latch slides over the nail heads.

6. Press in the release latches on the slide rails and push the server all the way into the rack until it clicks into place.

Installing the cable-management arm and connecting and routing power cables

The cable-management arm is used to efficiently route cables so that you have proper access to the rear of the system. After you install the cable-management arm, connect and route power cables.

About this task

Note: If you are installing more than one system now, install the cable-management arm after you install the other systems into the rack.

Procedure

1. Ensure that you have the following parts.

Item	Description
A	Inner cable management arm tab
B	Inner mounting bracket
C	Outer cable management arm tab
D	Outer mounting bracket
E	CMA latch
F	Outer cable management arm tab

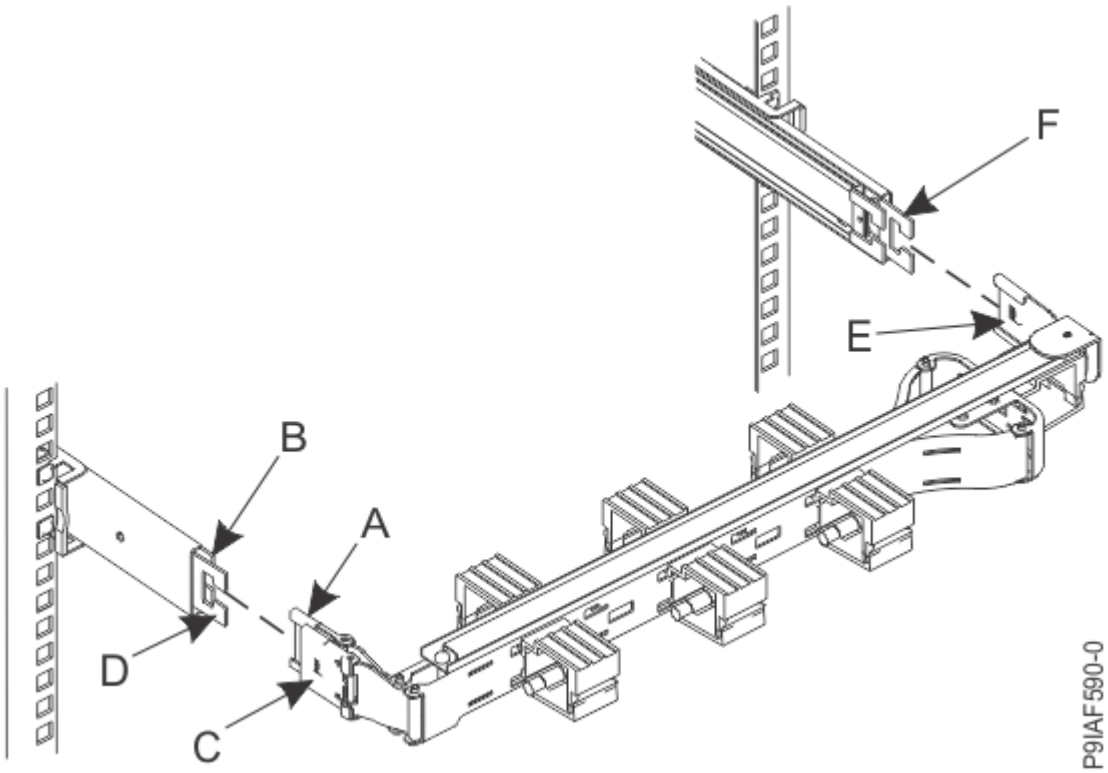


Figure 5. Relative positions of the parts of the cable-management arm before assembly

2. If you are installing the system into a 7014-T42 or 9363-RC4 rack, continue with step “10” on page 10.

3. Insert the inner cable management arm tab **(A)** to the inner mounting bracket **(B)** until the outer mounting bracket **(D)** clicks into place.

   Note: To avoid damage when the system is placed in the service position, ensure that the middle pin is between each arm.

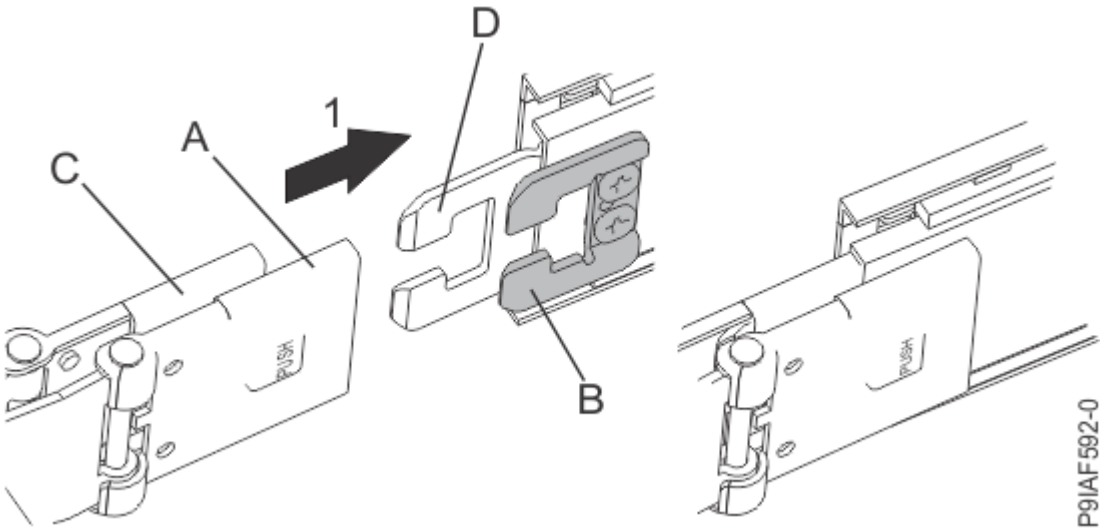


Figure 6. Inserting the mounting brackets

4. On the opposite side of the rack, insert the reversible CMA latch **(E)** to the outer cable management arm tab **(F)** until it clicks into place.

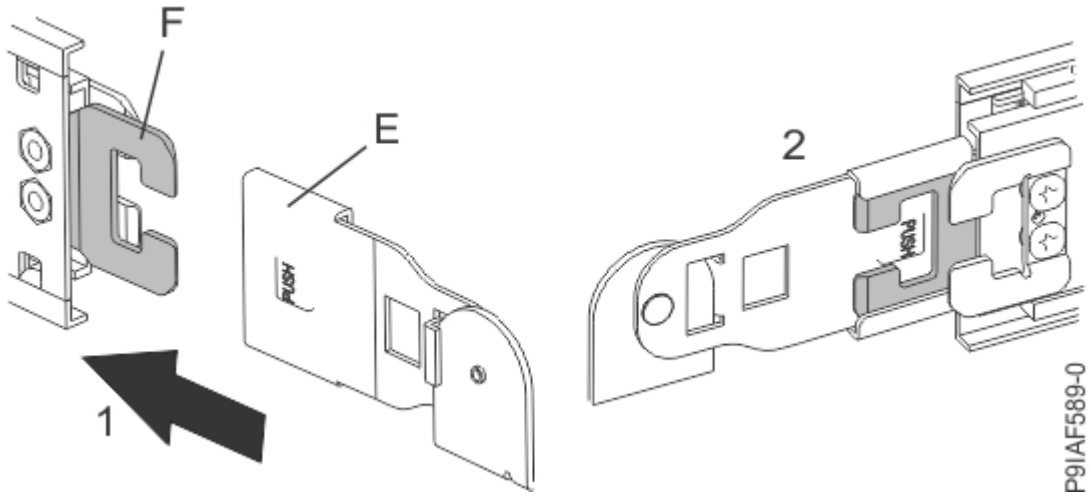


Figure 7. Attaching the CMA latch to the cable management arm to the outer cable management arm tab

5. If present, remove and discard any plug that covers the ports on the rear of the system. The port covers ensure that you are reminded that you must reset the Administrator password on your managed system upon initial system IPL. For more information about setting the baseboard management controller (BMC) **Admin** password, see Setting the password.
6. Plug the power cords into the power supplies.

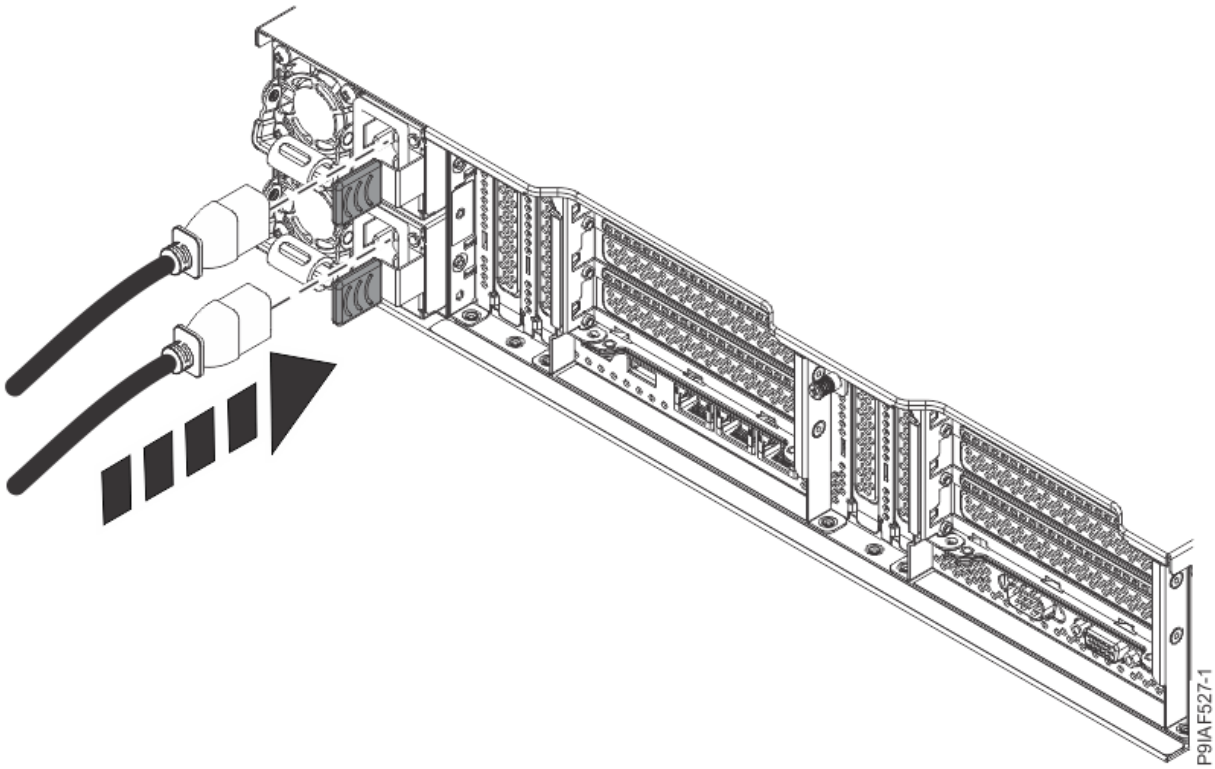


Figure 8. Connecting the power cords to the system

7. Attach all other cables to the rear of the server.

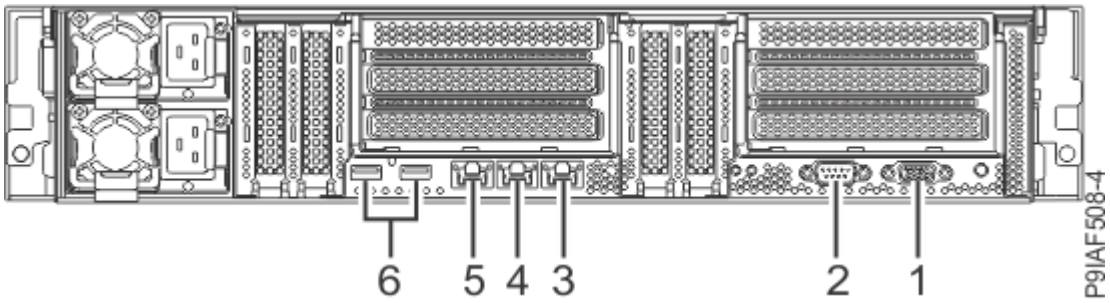


Figure 9. Rear view of the system with ports displayed

Table 1. Port descriptions	
Identifier	**Description**
1	Video Graphics Array (VGA) **Note:** Cables up to 3 meters are supported.
2	Serial **Note:** Cables up to 3 meters are supported.
3	Dedicated BMC Ethernet. Use this port for the BMC/IPMI interface (eth1).
4	Shared BMC Ethernet. (eth0)
5	USB 3.0 **Note:** Cables up to 3 meters are supported. The USB 3.0 port on the front of the system has the same restriction.

8. Route the cables through the cable management arm. To route the cables through the cable management arm, open the baskets, route the cables through the arm, and then re-latch the baskets until they are fully seated.
9. Plug the system power cords and the power cords for any other attached devices into the alternating current (AC) power source. You have finished installing the cable management arm and connecting and routing power cables.
10. If you are installing the system into a 7014-T42 or 9363-RC4 rack, the cable management arm must be mounted so that it hinges on the left of the rear of the system. You must also perform additional tasks so that the rack rear door will close. To install the cable management arm on a 7014-T42 or 9363-RC4 rack, complete the following steps:
    a. Insert the inner cable management arm tab **(A)** to the inner mounting bracket **(B)** until the outer mounting bracket **(D)** clicks into place.

       Note: To avoid damage when the system is placed in the service position, ensure that the middle pin is between each arm.

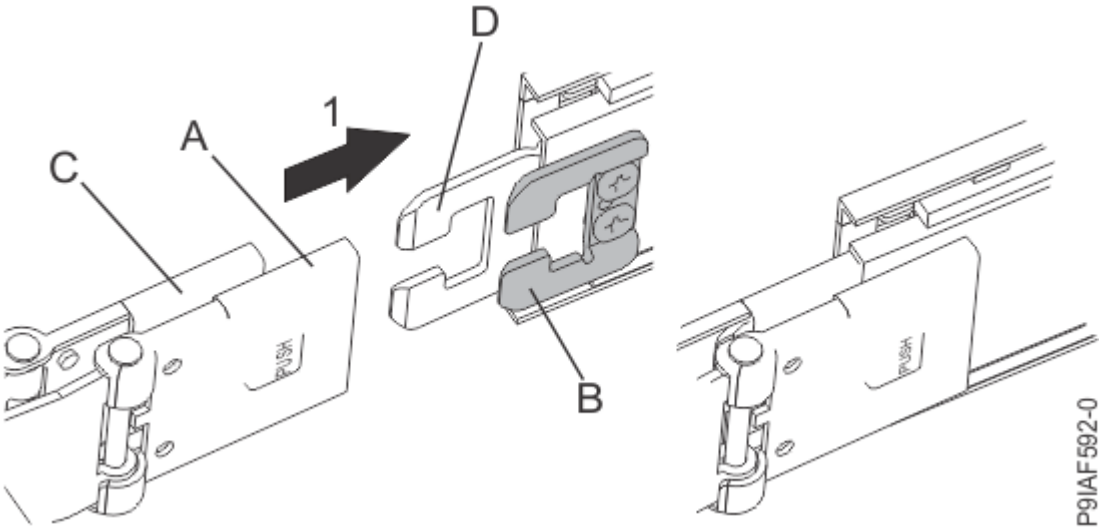


Figure 10. Inserting the mounting brackets

    b. On the opposite side of the rack, insert the reversible CMA latch (E) to the outer cable management arm tab (F) until it clicks into place.

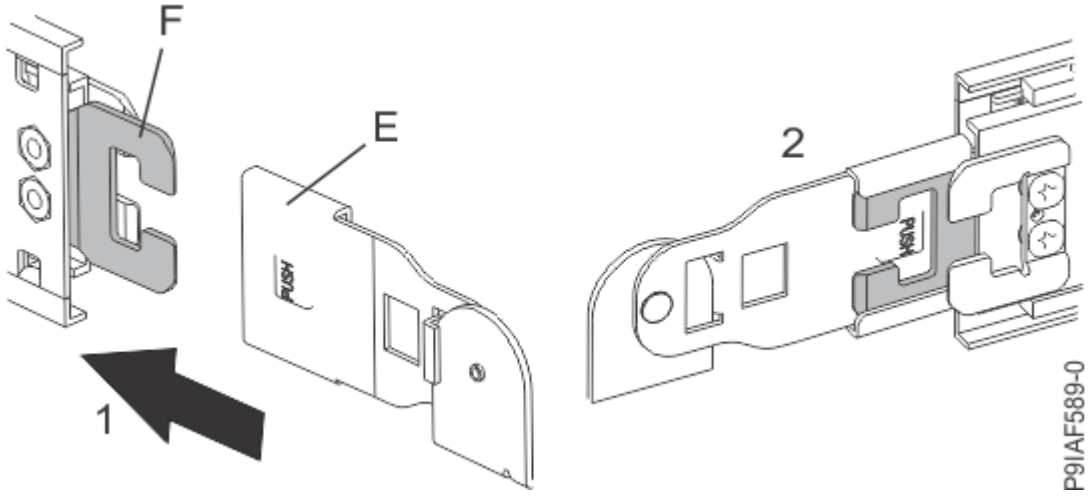


Figure 11. Attaching the extension tab to the cable management arm to the outer cable management arm tab

    c. Remove the three outer cable management arm baskets from the rear of the cable management arm.

d. If present, remove and discard any plug that covers the ports on the rear of the system. The port covers ensure that you are reminded that you must reset the Administrator password on your managed system upon initial system IPL. For more information about setting the baseboard management controller (BMC) **Admin** password, see Setting the password.

e. Plug the power cords into the power supplies.

f. Attach all cables to the rear of the server.

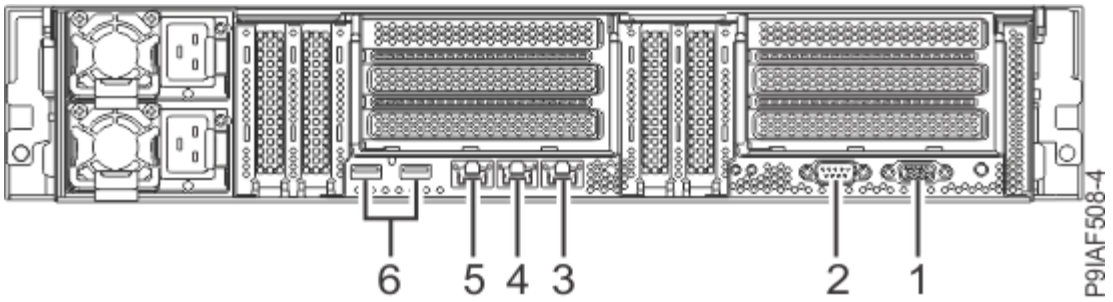


Figure 12. Rear view of the system with ports displayed

Table 2. Port descriptions

Identifier	Description
1	Video Graphics Array (VGA) **Note:** Cables up to 3 meters are supported.
2	Serial **Note:** Cables up to 3 meters are supported.
3	Dedicated BMC Ethernet. Use this port for the BMC/IPMI interface (as PHY0).
4	Shared BMC Ethernet.
5	USB 3.0 **Note:** Cables up to 3 meters are supported. The USB 3.0 port on the front of the system has the same restriction.

g. Route the cables through the cable management arm.

h. At each point where you removed the cable management arm baskets, attach a hook-and-loop closure around all cables. This ensures that the cables are secured to the rear of the cable management arm.

i. Plug the system power cords and the power cords for any other attached devices into the alternating current (AC) power source. You have finished installing the cable management arm and connecting and routing power cables.

Completing the server setup

Learn how to complete the server setup.

Before you begin

IBM® Power Systems™ servers use a baseboard management controller (BMC) for system service management, monitoring, maintenance, and control. For more information, see Managing OpenBMC-based systems (http://www.ibm.com/support/knowledgecenter/POWER9/p9eih/p9eih_openbmc_kickoff.htm).

Note: To enable system firmware update and other service tasks, the BMC must be connected to the network.

Procedure

1. Connect your server to a VGA monitor and keyboard.

   Note: The VGA port displays text. It does not support graphics. Cables up to 3 meters are supported.
2. Go to Getting fixes (http://www.ibm.com/support/knowledgecenter/POWER9/p9ei8/p9ei8_fixes_kickoff.htm) and update the system firmware with the most recent level of firmware.
3. You can receive important technical information and updates for specific IBM Support tools and resources by subscribing to receive updates. To subscribe to receive updates, complete the following steps:
   a) Go to the IBM Support Portal.
   b) Log in by using your IBM ID and password and click **Sign in**.
   c) Click **Support notifications**.
   d) Click **Browse for a product**.
   e) Select **Power** > **Firmware**, find your machine type and model and click **Subscribe**.
   f) Exit the **Browse for a product** screen.
   g) Click **Delivery preferences** to set email preferences and click **Submit**.
   h) Click **Edit** to select the types of documentation updates that you want to receive and click **Submit**.
4. You can install the Linux® operating system on bare metal systems, or on non-virtualized systems. For these systems, the operating system runs directly on the Open Power Abstraction Layer (OPAL) firmware.

   For more information about installing the Linux operating system on bare metal systems, see Installing Linux on bare metal systems (https://www.ibm.com/support/knowledgecenter/linuxonibm/liabw/liabw9kickoff.htm).

Setting up a preinstalled server

Use this information to learn how to set up a server that is preinstalled in the rack.

Prerequisites for installing the rack-mounted server

Learn about the prerequisites for installing the server.

Before you begin

Read the following documents before you install the server:

- The latest version of this document is maintained online, see Installing the IBM Power System IC922 (9183-22X) (http://www.ibm.com/support/knowledgecenter/POWER9/p9iaf/p9iaf_install_kickoff.htm).
- To plan your server installation, see Planning for the system (http://www.ibm.com/support/knowledgecenter/POWER9/p9ia4/p9ia4_90x_kickoff.htm).

Procedure

Ensure that you have the following items before you start the installation:

- Phillips screwdriver
- Flat-head screwdriver
- Box cutter
- Electrostatic discharge (ESD) wrist strap
- Rack with two Electronic Industries Association (EIA) units (2U) of space

Completing inventory for your server

Use this information to complete inventory for your server.

Procedure

1. Verify that you received all the boxes you ordered.
2. Unpack the server components as needed.
3. Complete a parts inventory before you install each server component by following these steps:
   a. Locate the inventory list for your server.
   b. Ensure that you received all the parts that you ordered.

      Note: Your order information is included with your product. You can also obtain the order information from your marketing representative or the IBM Business Partner.

      If you have incorrect, missing, or damaged parts, consult any of the following resources:

      - Your IBM reseller.
      - IBM Rochester manufacturing automated information line at 1-800-300-8751 (United States only).
      - The Directory of worldwide contacts website http://www.ibm.com/planetwide. Select your location to view the service and support contact information.

Removing the shipping bracket and connecting power cords for your preinstalled server

Before you set up a server, you must remove the shipping brackets and connect the power cords.

Procedure

1. Remove the screws that secure the shipping brackets to the chassis.
2. Plug the power cords into the power supplies.

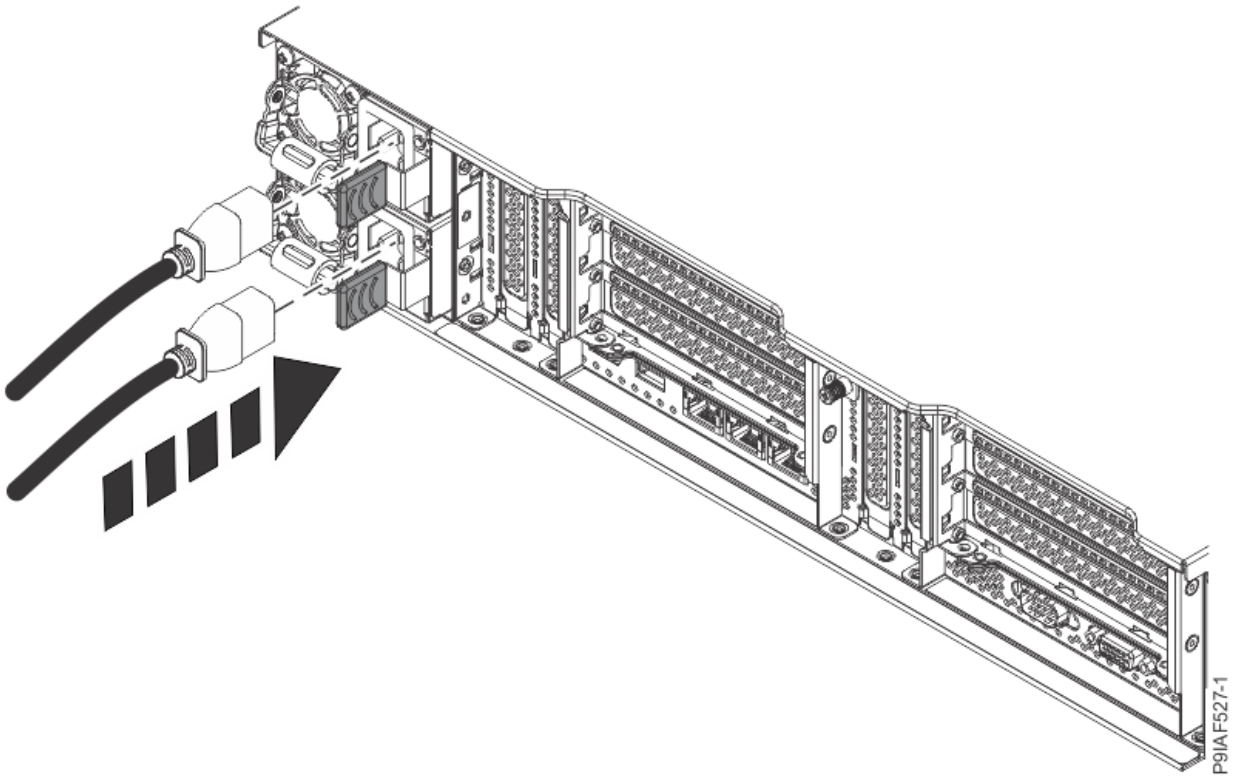


Figure 13. Connecting the power cords to the system

3. Attach all other cables to the rear of the server.

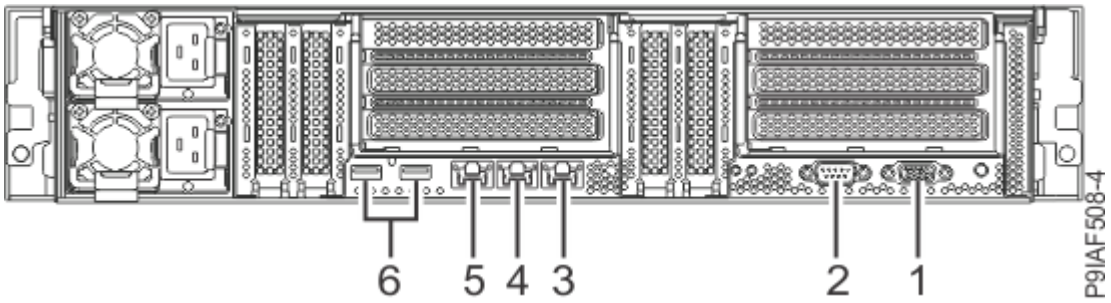


Figure 14. Rear view of the system with ports displayed

Table 3. Port descriptions

Identifier	Description
1	Video Graphics Array (VGA) **Note:** Cables up to 3 meters are supported.
2	Serial **Note:** Cables up to 3 meters are supported.
3	Dedicated BMC Ethernet. Use this port for the BMC/IPMI interface (eth1).
4	Shared BMC Ethernet. (eth0)
5	USB 3.0 **Note:** Cables up to 3 meters are supported. The USB 3.0 port on the front of the system has the same restriction.

4. Plug the system power cords and the power cords for any other attached devices into the alternating current (AC) power source. You have finished installing the cable management arm and connecting and routing power cables.

Completing the server setup

Learn how to complete the server setup.

Before you begin

IBM® Power Systems™ servers use a baseboard management controller (BMC) for system service management, monitoring, maintenance, and control. For more information, see Managing OpenBMC-based systems (http://www.ibm.com/support/knowledgecenter/POWER9/p9eih/p9eih_openbmc_kickoff.htm).

Note: To enable system firmware update and other service tasks, the BMC must be connected to the network.

Procedure

1. Connect your server to a VGA monitor and keyboard.

   Note: The VGA port displays text. It does not support graphics. Cables up to 3 meters are supported.
2. Go to Getting fixes (http://www.ibm.com/support/knowledgecenter/POWER9/p9ei8/p9ei8_fixes_kickoff.htm) and update the system firmware with the most recent level of firmware.
3. You can receive important technical information and updates for specific IBM Support tools and resources by subscribing to receive updates. To subscribe to receive updates, complete the following steps:
   a) Go to the IBM Support Portal.
   b) Log in by using your IBM ID and password and click **Sign in**.
   c) Click **Support notifications**.
   d) Click **Browse for a product**.
   e) Select **Power** > **Firmware**, find your machine type and model and click **Subscribe**.
   f) Exit the **Browse for a product** screen.
   g) Click **Delivery preferences** to set email preferences and click **Submit**.
   h) Click **Edit** to select the types of documentation updates that you want to receive and click **Submit**.
4. You can install the Linux operating system on bare metal systems, or on non-virtualized systems. For these systems, the operating system runs directly on the Open Power Abstraction Layer (OPAL) firmware.

   For more information about installing the Linux operating system on bare metal systems, see Installing Linux on bare metal systems (https://www.ibm.com/support/knowledgecenter/linuxonibm/liabw/liabw9kickoff.htm).

Installing a front hard disk drive or solid-state drive in the 9183-22X system

To install a front hard disk drive or solid-state drive, complete the steps in this procedure.

About this task

You can install front hard disk drive or solid-state drive in a system that is powered on and running.

Installing disk drive backplanes, PCIe drive adapters, and cables must be done by IBM service.

Drives can be installed in a position that supports that drive.

Procedure

1. Attach the electrostatic discharge (ESD) wrist strap.

   The ESD wrist strap must be connected to an unpainted metal surface until the service procedure is completed, and if applicable, until the service access cover is replaced.

   Attention:

   - Attach an electrostatic discharge (ESD) wrist strap to the front ESD jack, to the rear ESD jack, or to an unpainted metal surface of your hardware to prevent the electrostatic discharge from damaging your hardware.
   - When you use an ESD wrist strap, follow all electrical safety procedures. An ESD wrist strap is used for static control. It does not increase or decrease your risk of receiving electric shock when using or working on electrical equipment.
   - If you do not have an ESD wrist strap, just prior to removing the product from ESD packaging and installing or replacing hardware, touch an unpainted metal surface of the system for a minimum of 5 seconds. If at any point in this service process you move away from the system, it is important to again discharge yourself by touching an unpainted metal surface for at least 5 seconds before you continue with the service process.

2. To install a single drive in a location that already has a drive backplane, complete the following procedure.

   a) Unlock the drive filler handle **(B)** by pushing the handle release **(A)** down. The handle **(B)** snaps out towards you. If the handle does not snap out all the way, the drive filler does not slide out of the system.

      See the following figure.

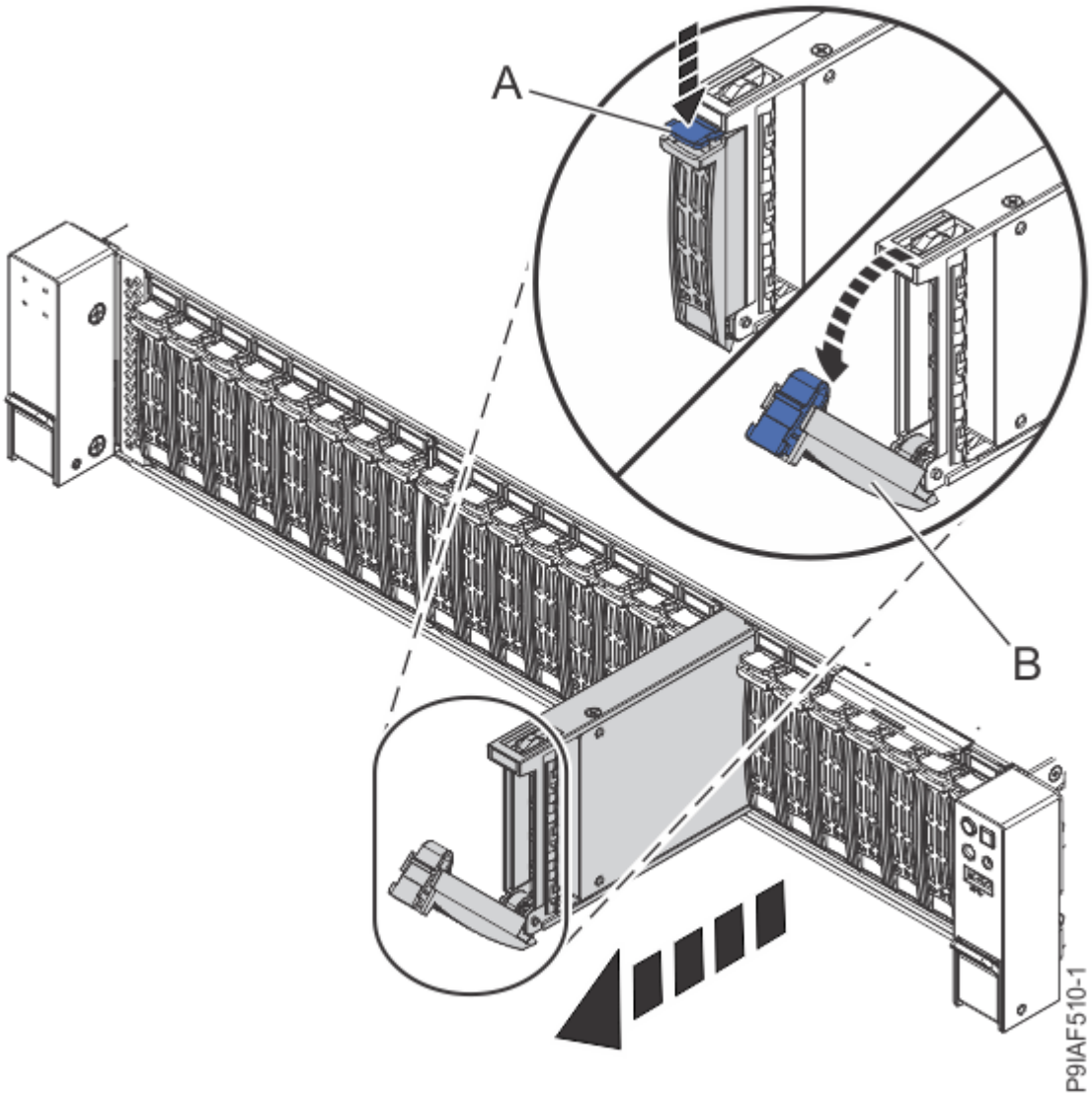


Figure 15. Removing a drive filler

b) Hold the drive by the top and bottom edges as you position the drive, and insert it into the drive slot.

Important: Ensure that the drive is fully seated and is all the way into the system.

c) Lock the drive bay handle **(A)** by pushing in the handle release as shown in the following figure.

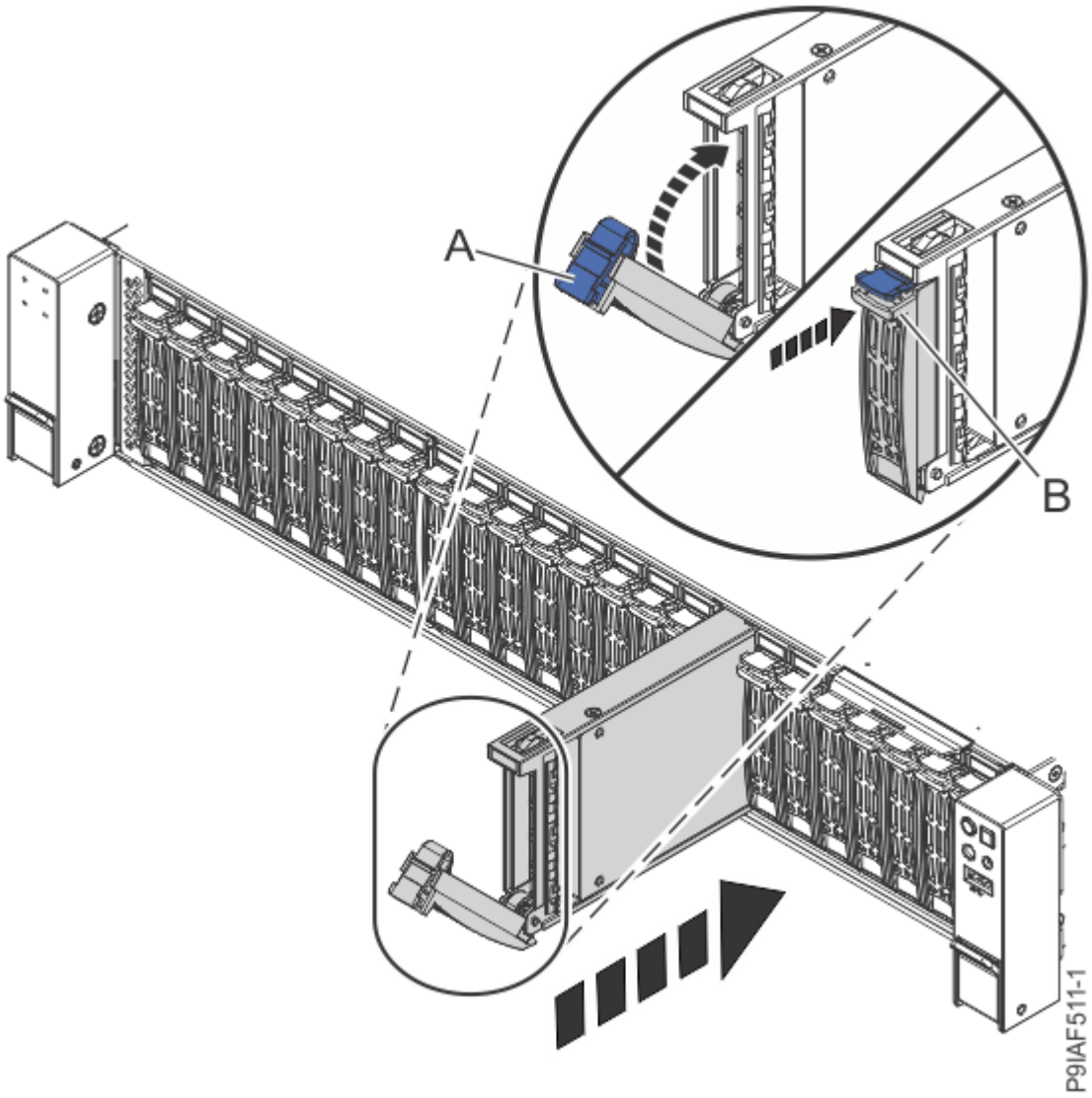


Figure 16. Replacing a drive

Installing or upgrading memory modules in the 9183-22X system

Find information about installing or upgrading memory modules in the IBM Power System IC922 (9183-22X) server.

Memory module plugging rules in the 9183-22X system

Learn the memory module placement rules for the system.

The considerations for installing memory modules in the system follow.

- The system supports up to 32 DDR4 RDIMM memory modules.
- The system supports memory module sizes 16 GB, 32 GB, and 64 GB for a total of 2 TB of memory.
- The system does not support mixing memory module feature codes.

The following table lists the supported memory module feature codes.

Table 4. Memory module feature codes

Supported feature codes (FC)	**Size**
EM62	16 GB

Table 4. Memory module feature codes (continued)	
Supported feature codes (FC)	**Size**
EM63	32 GB
EM64	64 GB

Memory module slot locations and population order

Memory modules must be placed in specific locations based on the number and size of memory modules in the system. Use the following figure and table to determine where to place memory modules in the 9183-22X system.

The following figure shows the locations for memory modules in the 9183-22X system.

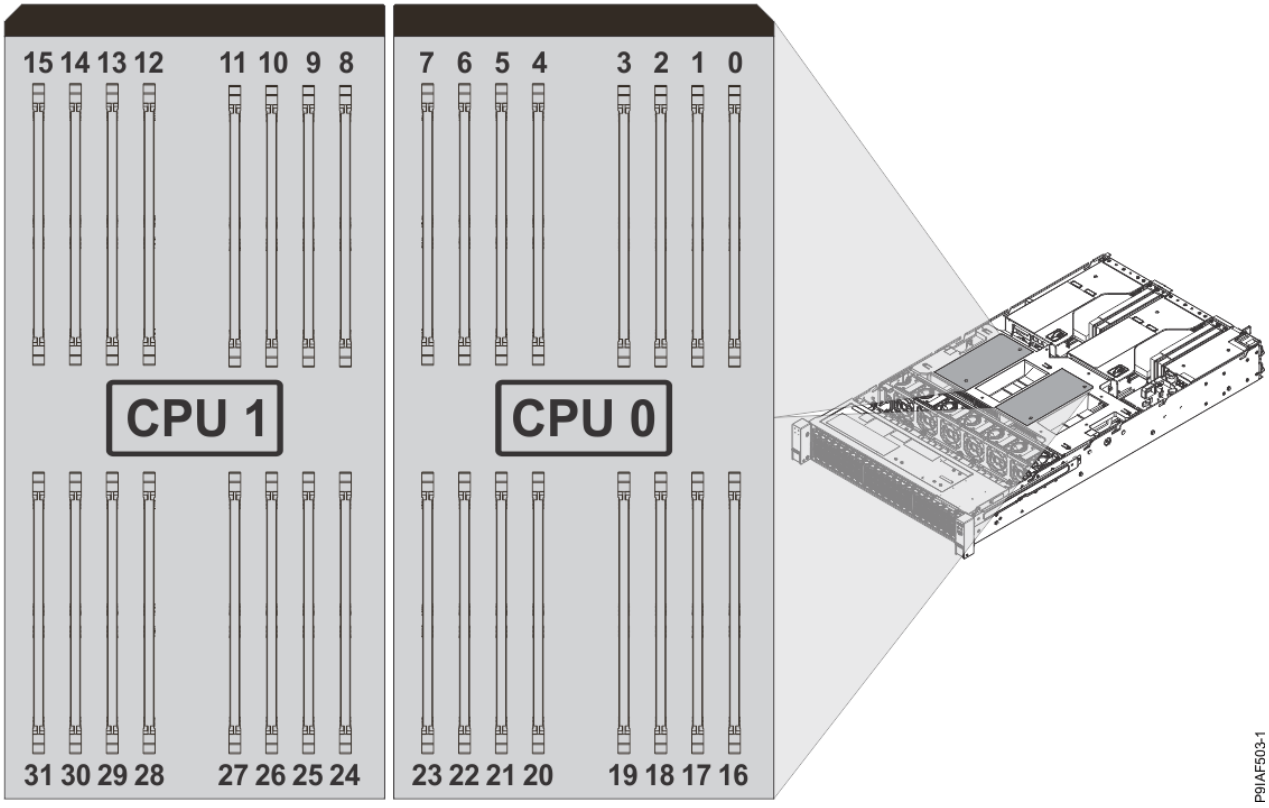


Figure 17. Memory module slot locations

The following table shows the order in which memory modules must be placed in the 9183-22X system.

Table 5. Memory module population order. Memory module slot locations and number of DIMMs.																
	CPU 1 memory module slot locations								**CPU 0 memory module slot locations**							
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
	31	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**
4 DIMMs			Y								Y					
			Y								Y					
8 DIMMs			Y					Y			Y					Y
			Y			Y					Y			Y		

Table 5. Memory module population order. Memory module slot locations and number of DIMMs. *(continued)*																
	CPU 1 memory module slot locations								**CPU 0 memory module slot locations**							
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
	31	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**	**16**
12 DIMMs	Y		Y					Y	Y		Y					Y
	Y		Y			Y			Y		Y			Y		
16 DIMMs	Y		Y			Y		Y	Y		Y			Y		Y
	Y		Y			Y		Y	Y		Y			Y		Y
24 DIMMs	Y		Y			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y
	Y		Y			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y
32 DIMMs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Installing memory modules in the 9183-22X system

To install memory modules, complete the steps in this procedure.

Before you begin

See “Memory module plugging rules in the 9183-22X system” on page 18 to ensure that you follow the rules for memory module placement.

Power off the system and place it in the service position. For instructions, see “Preparing the 9183-22X system to remove and replace internal parts” on page 99.

Procedure

1. Attach the electrostatic discharge (ESD) wrist strap.

   The ESD wrist strap must be connected to an unpainted metal surface until the service procedure is completed, and if applicable, until the service access cover is replaced.

   Attention:

   - Attach an electrostatic discharge (ESD) wrist strap to the front ESD jack, to the rear ESD jack, or to an unpainted metal surface of your hardware to prevent the electrostatic discharge from damaging your hardware.
   - When you use an ESD wrist strap, follow all electrical safety procedures. An ESD wrist strap is used for static control. It does not increase or decrease your risk of receiving electric shock when using or working on electrical equipment.
   - If you do not have an ESD wrist strap, just prior to removing the product from ESD packaging and installing or replacing hardware, touch an unpainted metal surface of the system for a minimum of 5 seconds. If at any point in this service process you move away from the system, it is important to again discharge yourself by touching an unpainted metal surface for at least 5 seconds before you continue with the service process.

2. Lift the air baffle **(A)** straight up as shown in the following figure.

   Place the air baffle on a clean area.

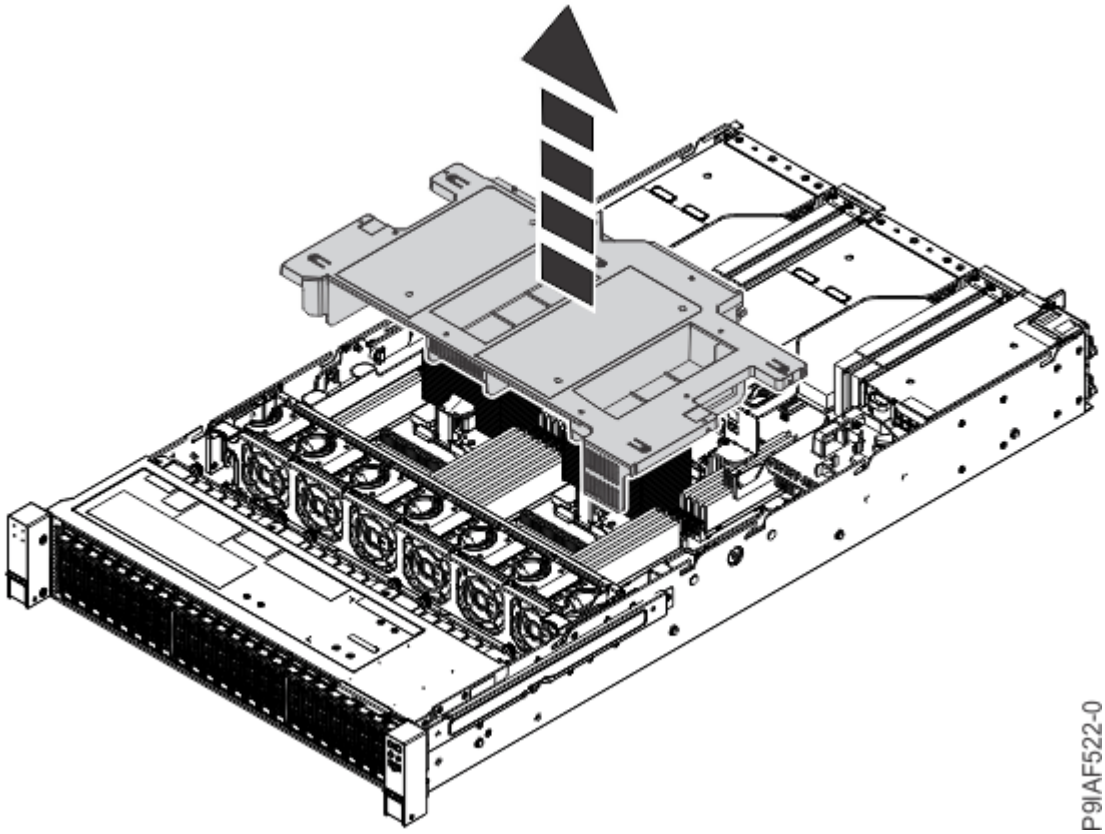


Figure 18. Removing the air baffle

3. Locate the memory module to install. The following figure shows the location of memory modules in the system.

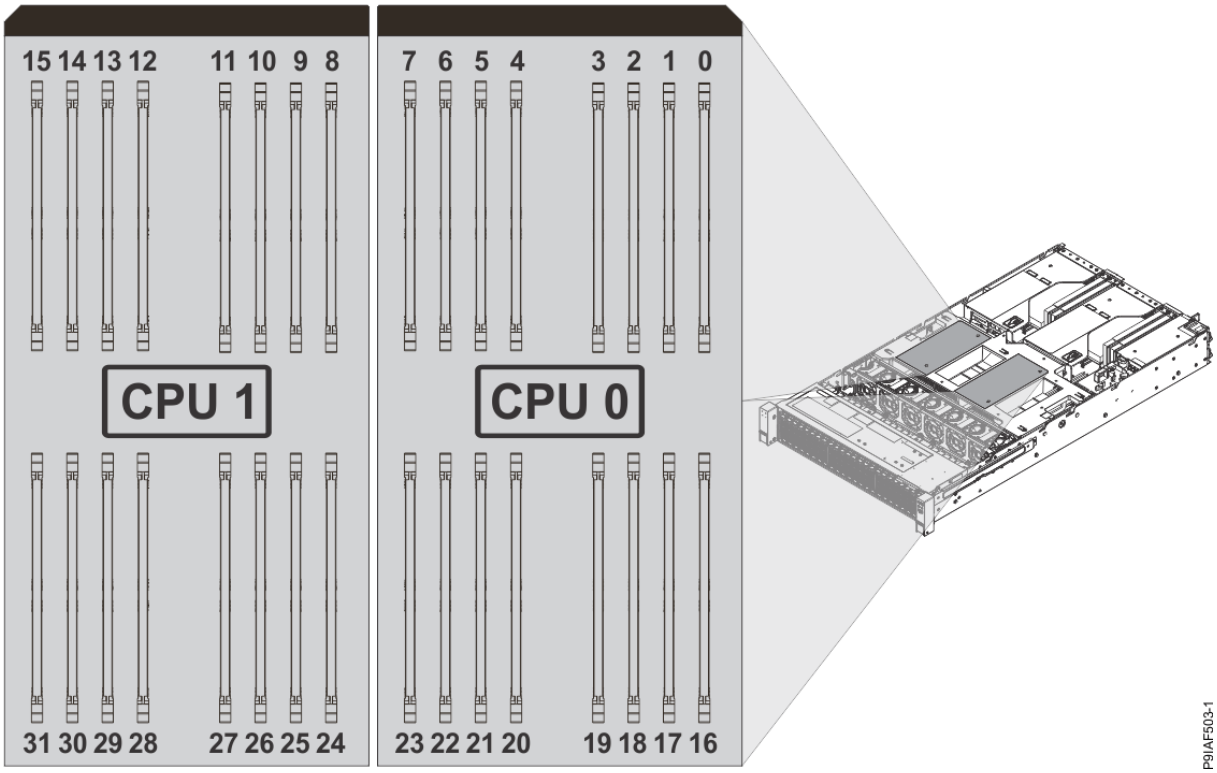


Figure 19. Locating the memory modules

4. If the memory socket is covered by the drive cables and the drive cable holder on the left side of the system, complete the following procedure.
   a) Remove the drive cables from the drive cable holder.
      Let the cables rest on the system processor heat sink.
   b) Retract the retaining pin **(A)** as shown in the following figure.

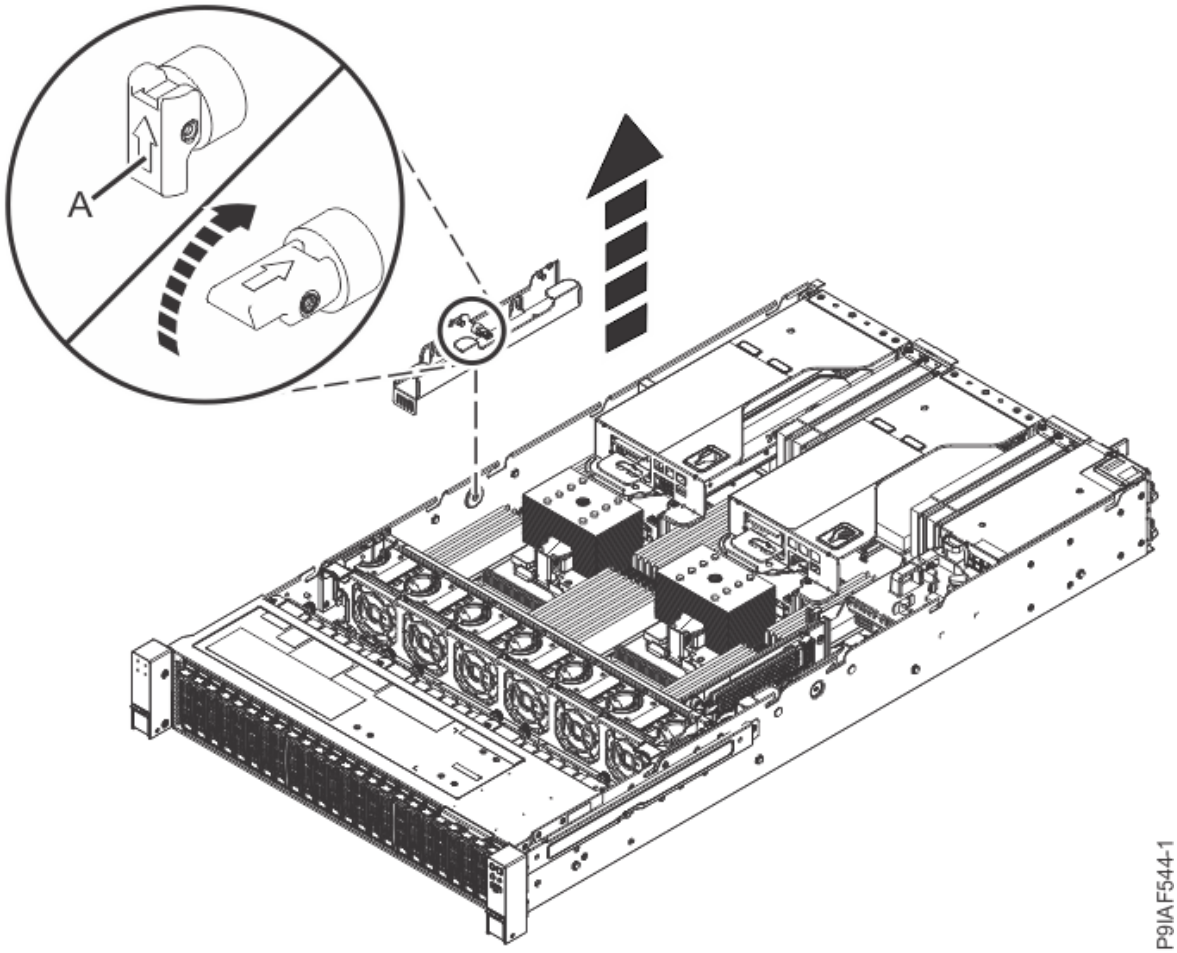


Figure 20. Retracting the retaining pin and removing the left cable holder

   c) Lift the drive cable holder out of the system.
5. If the memory socket is covered by a PCIe riser at the rear of the system, move the PCIe riser out of the way by using the following procedure.
   a) Leave the cables plugged into the PCIe adapters.
   b) Lift the PCIe riser up, out of the system as shown in the following figure.

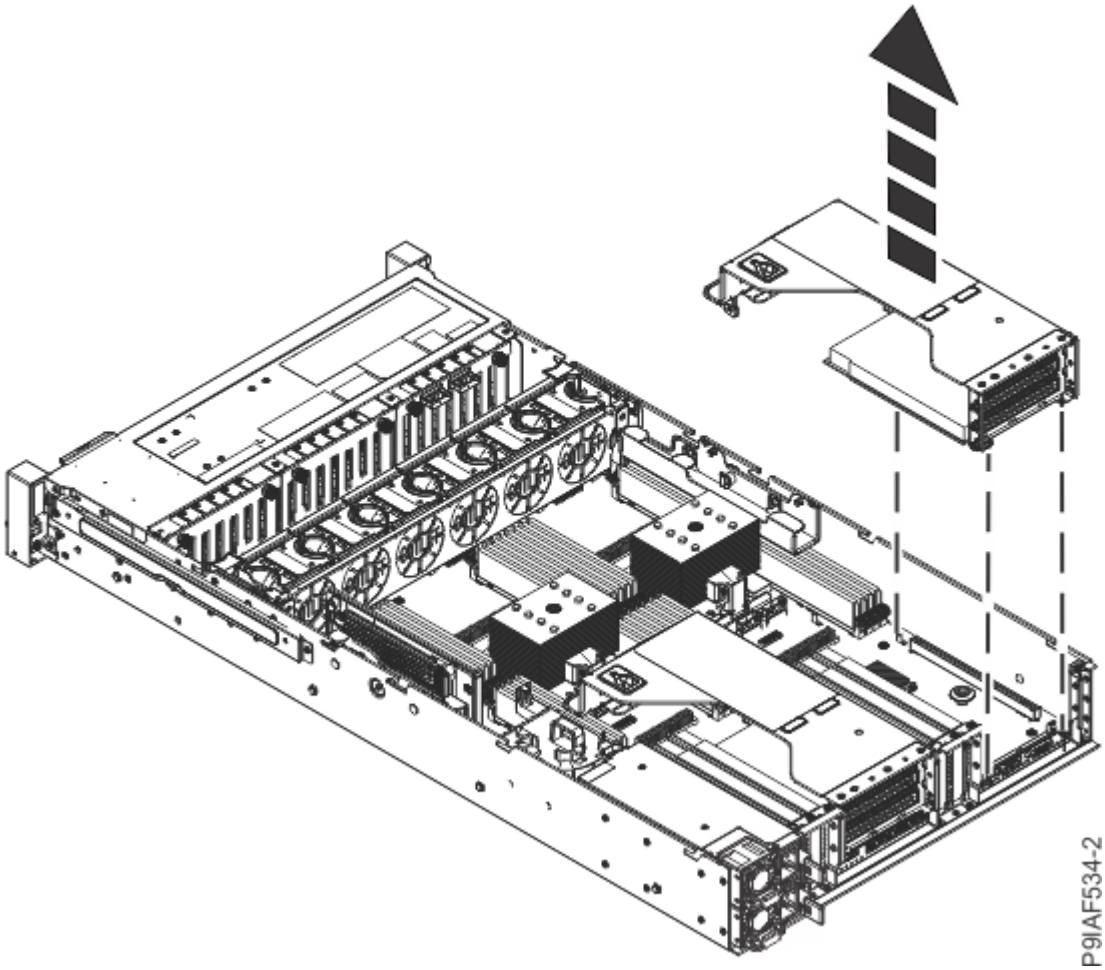


Figure 21. Removing the PCIe riser

c) Move the PCIe riser out of the way, so you can access the memory modules.

6. If the memory socket is covered by the power distribution board on the right side of the system, complete the following steps to remove the power distribution board.

   Removing the power distribution board requires that the power supplies be partially removed from the system.

   a) Remove the drive cables from the drive cable holder.

   b) Retract the retaining pin **(A)** as shown in the following figure.

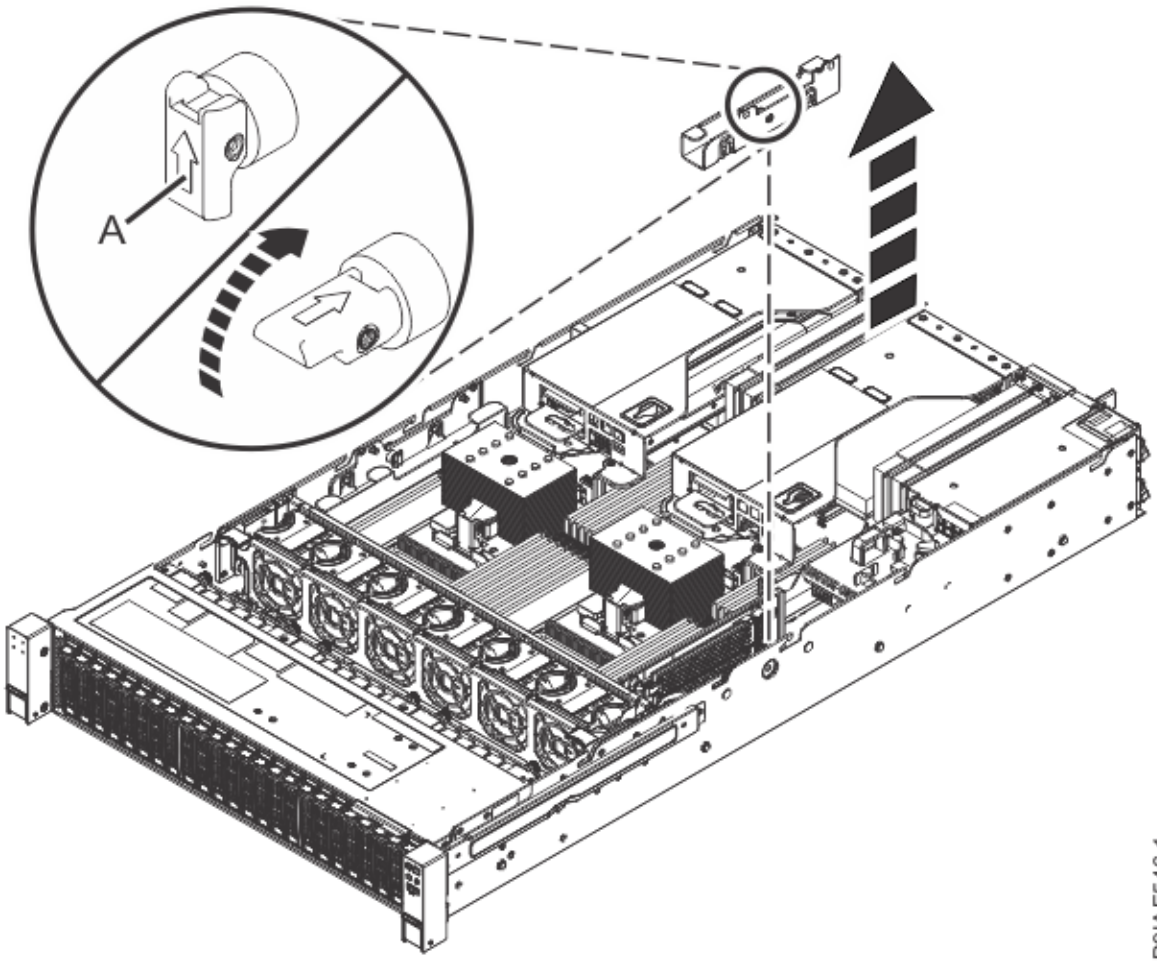


Figure 22. Retracting the retaining pin and removing the right cable holder

c) Lift the drive cable holder out of the system.

d) Remove the cables from the top of the power distribution board.

e) To remove the power distribution board, unlatch tab **(A)**, unplug, and lift the power distribution board from the system backplane as shown in the following figure.

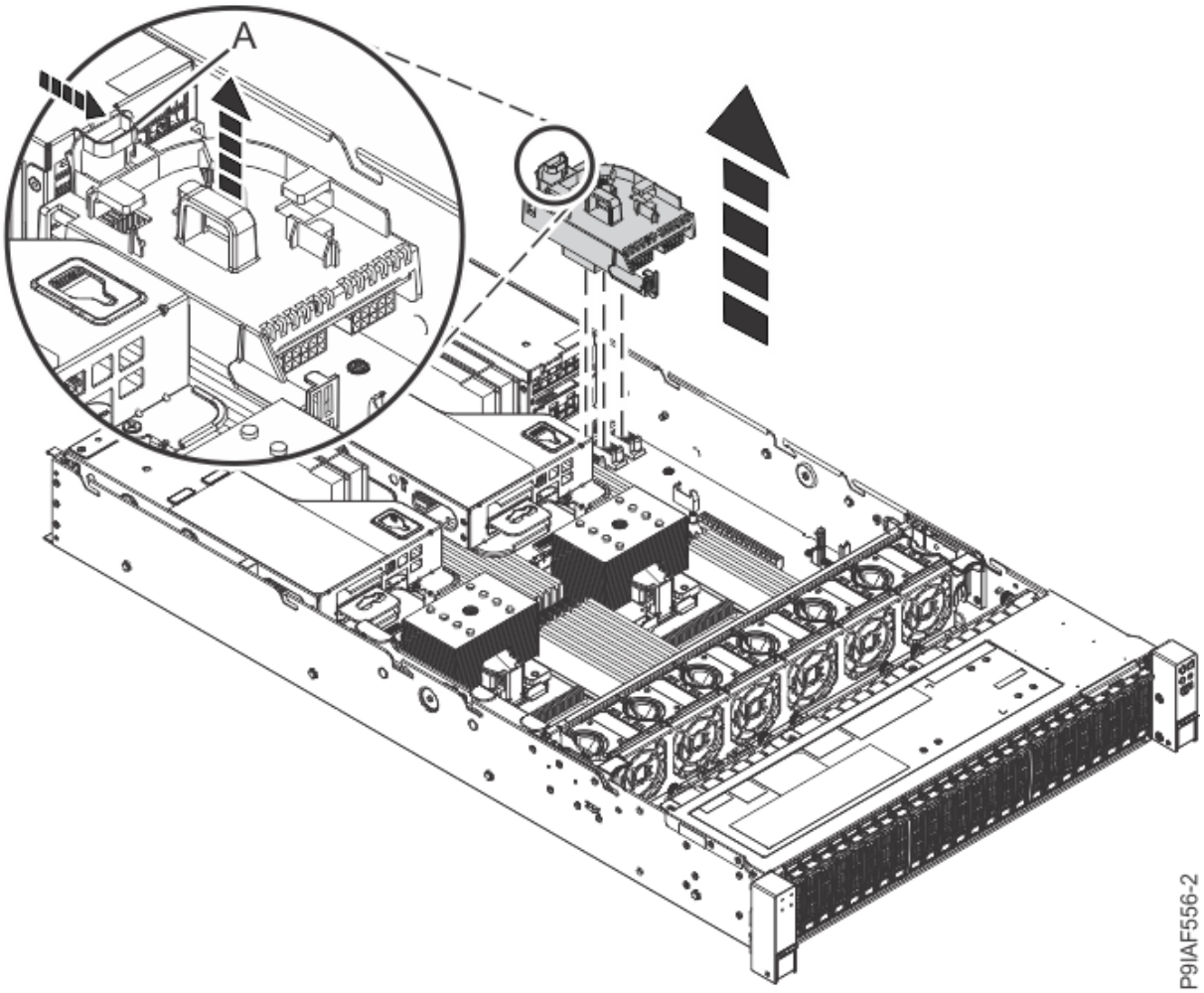


Figure 23. Removing the power distribution board

7. To install the memory module, complete the following steps:
   a) Push the locking tabs to the open position, away from the slot, in the direction shown in the following figure.

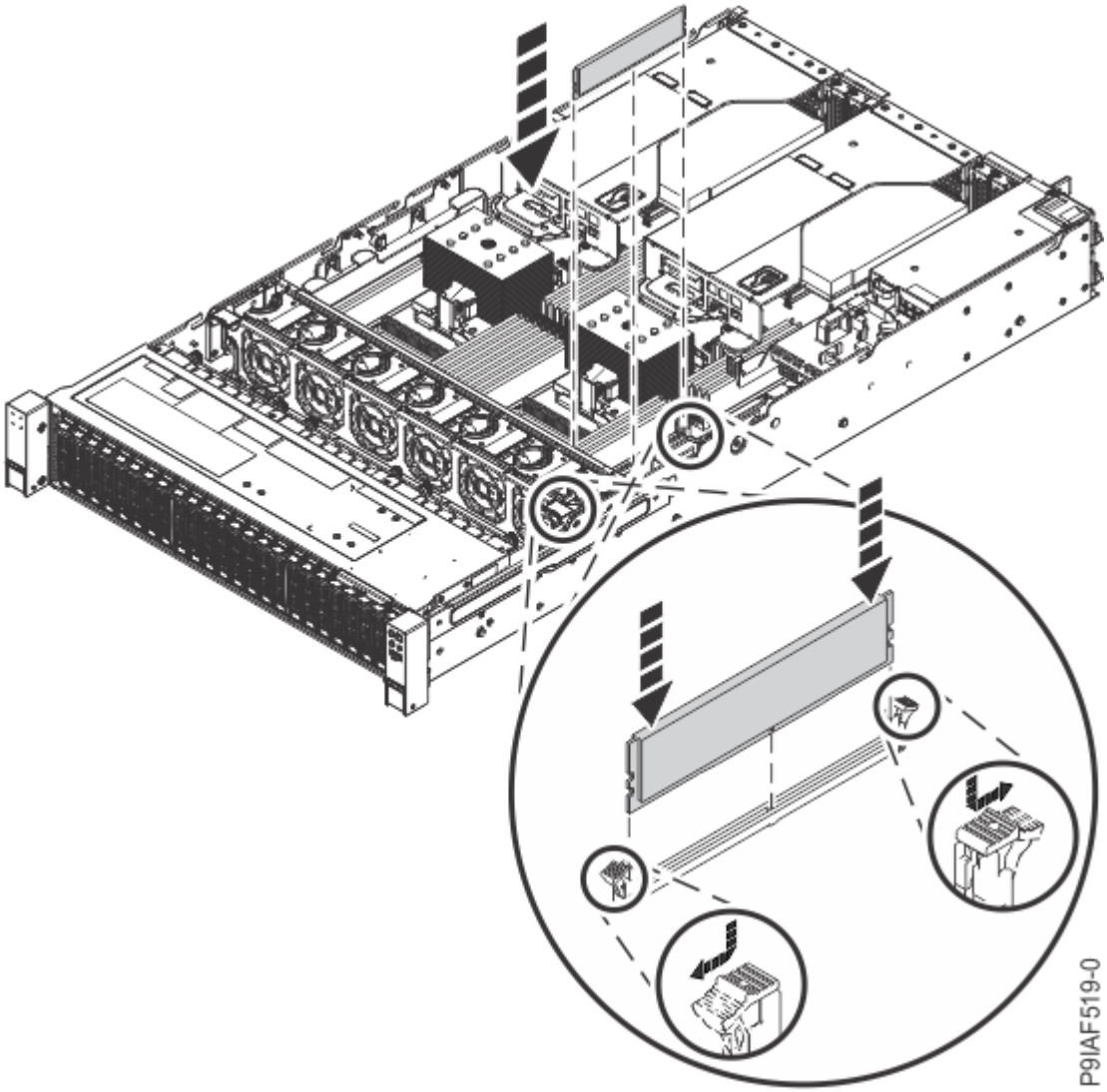


Figure 24. Installing a memory module

b) Grasp the memory module along its edges and align it with the slot.

Attention: The memory module is keyed to prevent it from being installed incorrectly. Note the location of the key tab within the memory module connector before you attempt to install it.

c) Press firmly on each side of the memory module until the locking tab locks in place with an audible click.

8. If you removed a PCIe riser, replace the PCIe riser by using the following procedure.
   a) Move the PCIe riser back into place.
   b) Insert the PCIe riser into the system backplane as shown in the following figure.

      Insert the riser, by using the slots and alignment pins **(A)** to properly insert the riser. Push the riser firmly into the system backplane.

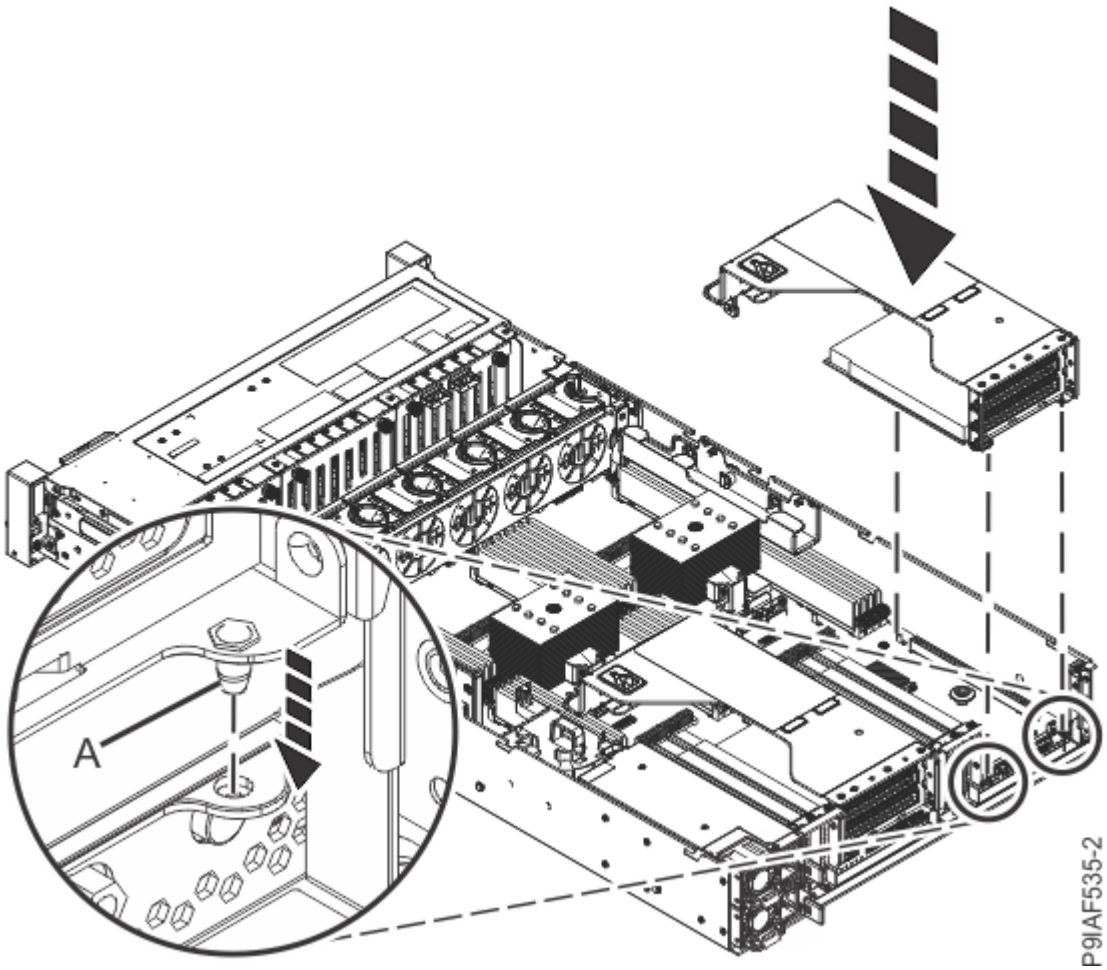


Figure 25. Inserting the PCIe adapter riser

9. If you removed the drive cable holder on the left side of the system, replace the holder by using the following procedure.
   a) Replace the drive cable holder in the system. Ensure that the alignment pins match the slots in the holder.
   b) Reset the retaining pin **(A)** to lock the holder in place as shown in the following figure.

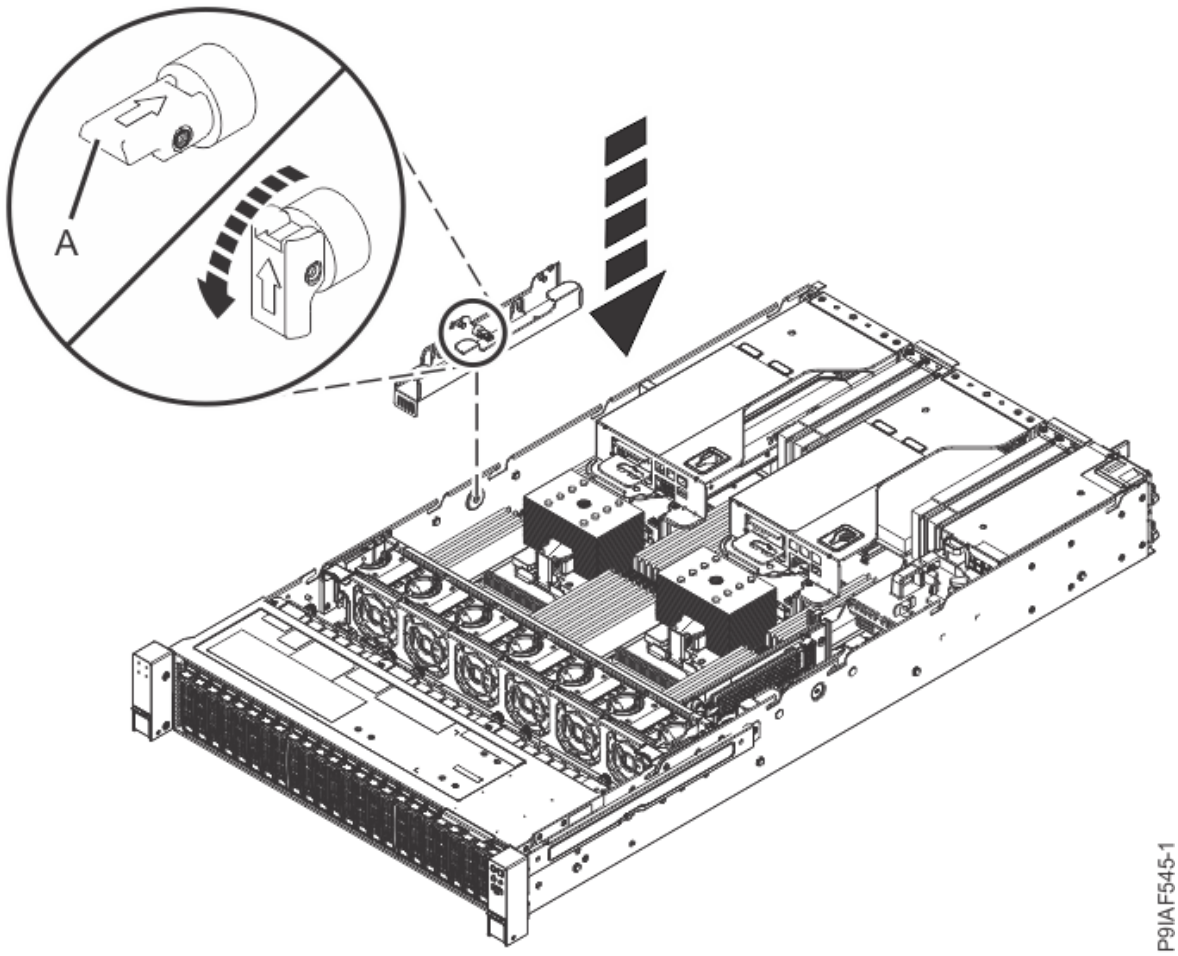


Figure 26. Replacing the left cable holder and resetting the retaining pin

c) Replace the drive cables into the drive cable holder.

10. If you removed the power distribution board from the right side of the system, replace the power distribution board by using the following procedure.

a) Replace the power distribution board by plugging it into the system backplane, as shown in the following figure. Use the alignment pins on the side of the chassis to ensure that the power distribution board is placed properly. Ensure that tab **(A)** clicks into place to secure the power distribution board.

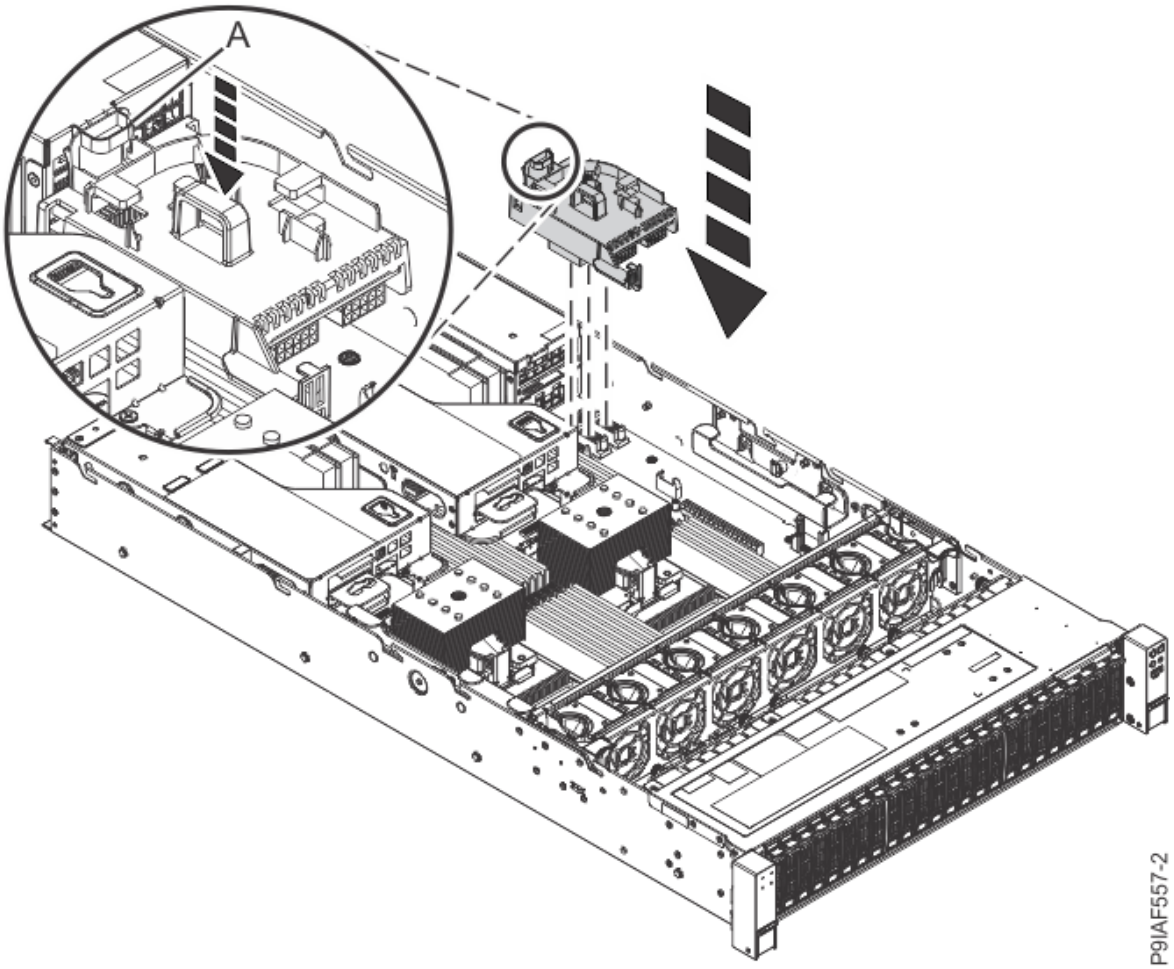


Figure 27. Replacing the power distribution board

b) Replace the cables into the top of the power distribution board.

a) Replace the drive cable holder in the system. Ensure that the alignment pins match the slots in the holder.

b) Reset the retaining pin **(A)** to lock the holder in place as shown in the following figure.

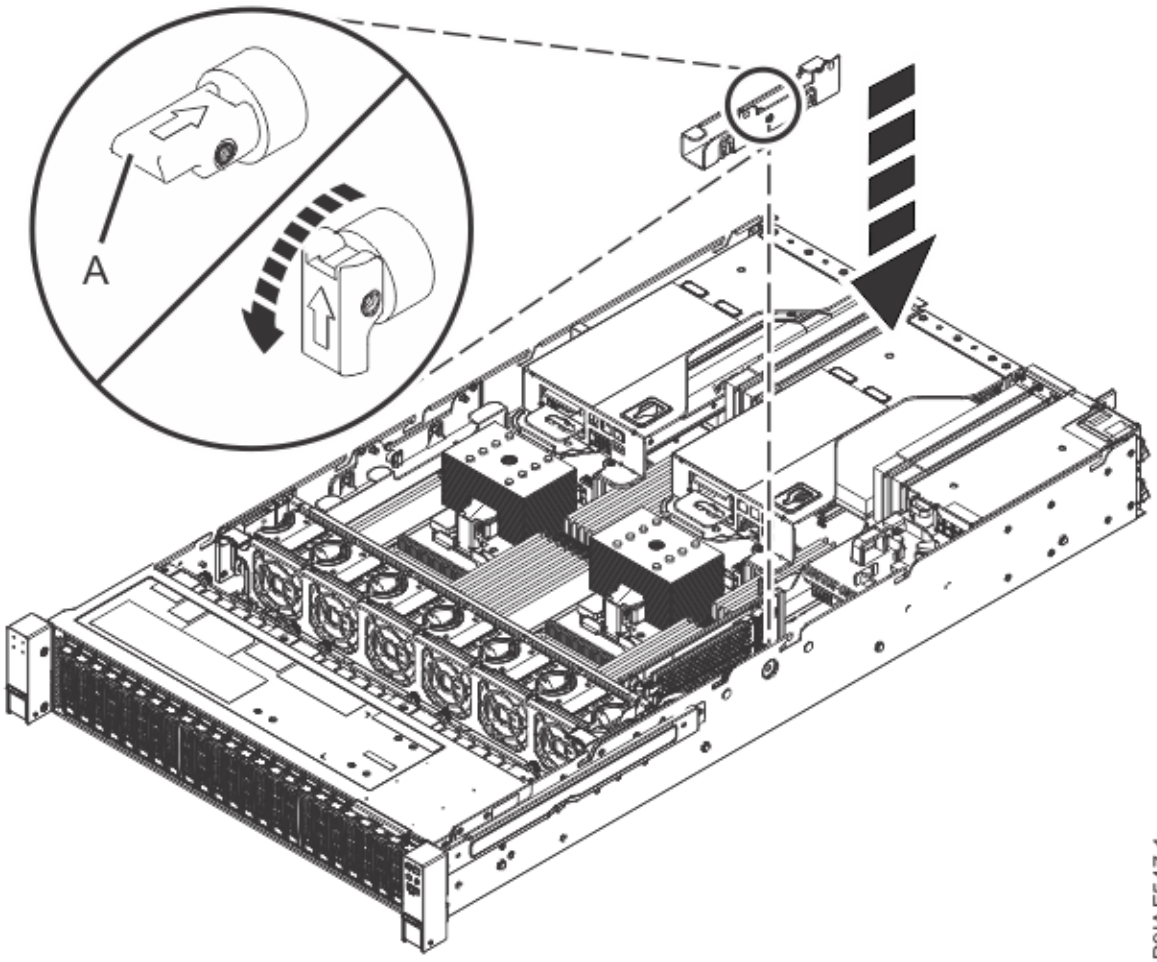


Figure 28. Replacing the right cable holder and resetting the retaining pin

c) Replace the drive cables into the drive cable holder.

11. Replace the air baffle **(A)** straight down into the chassis as shown in the following figure. Ensure that the pins inside the system side walls align properly with the slots in the cover **(B)**.

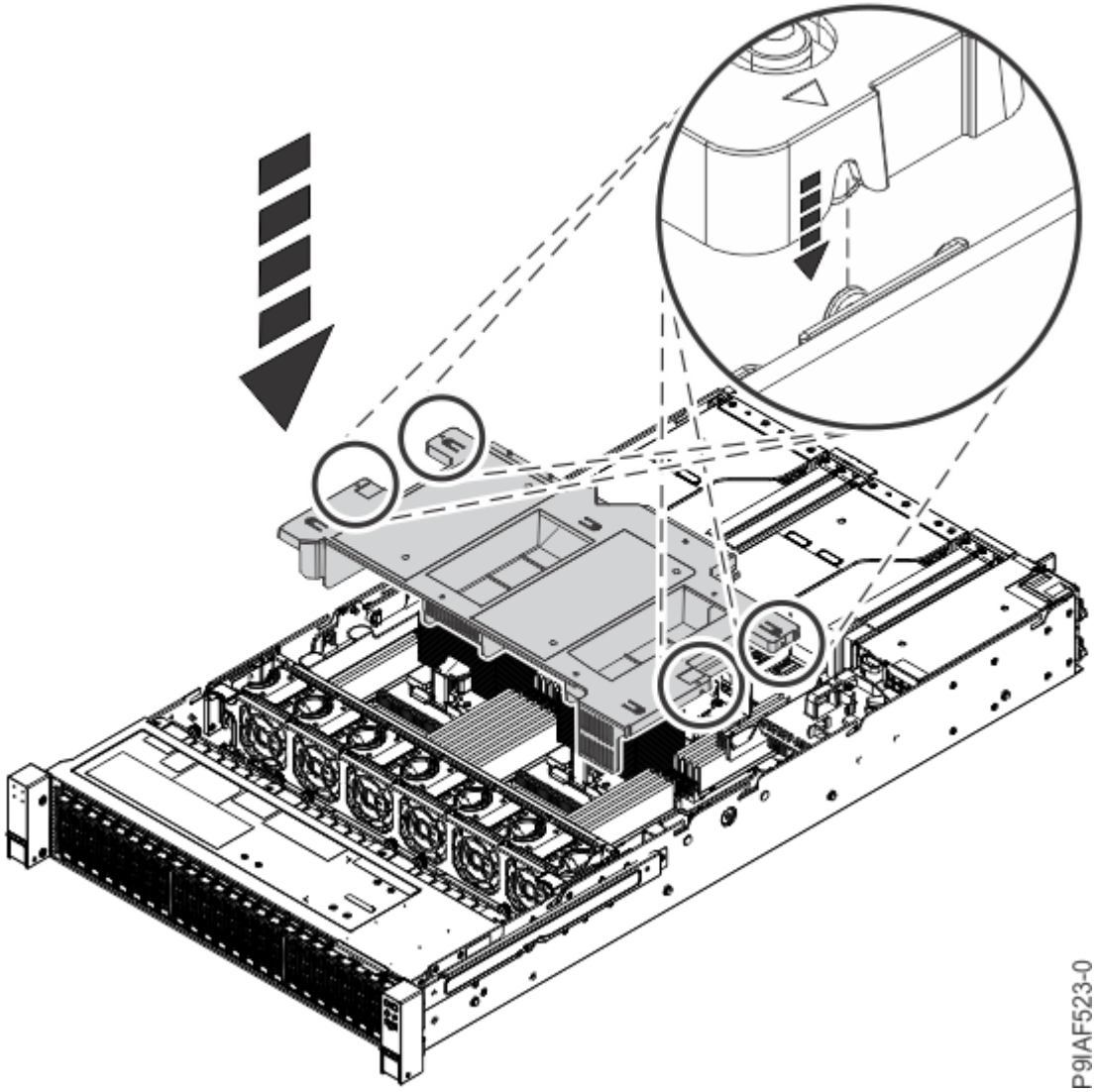


Figure 29. Replacing the air baffle

What to do next

Prepare the system for operation. For instructions, see “Preparing the 9183-22X system for operation after you remove and replace internal parts” on page 103.

Installing PCIe adapters in the 9183-22X system

Find information about installing, using, and managing Peripheral Component Interconnect Express (PCIe) adapters for the IBM Power System IC922 (9183-22X) system.

PCIe adapter placement rules and slot priorities for the 9183-22X system

Find information about the placement rules and slot priorities for the Peripheral Component Interconnect Express (PCIe) adapters that are supported for the system.

PCIe slot descriptions

The system provides PCIe generation 3 and PCIe generation 4 slots. Table 6 on page 32 lists the PCIe adapter slots and details for the system as viewed from the rear, from left to right. Figure 30 on page 32 shows the rear view of the system with the PCIe adapter slots. The system supports full-height, full-length, and half-length PCIe adapters.

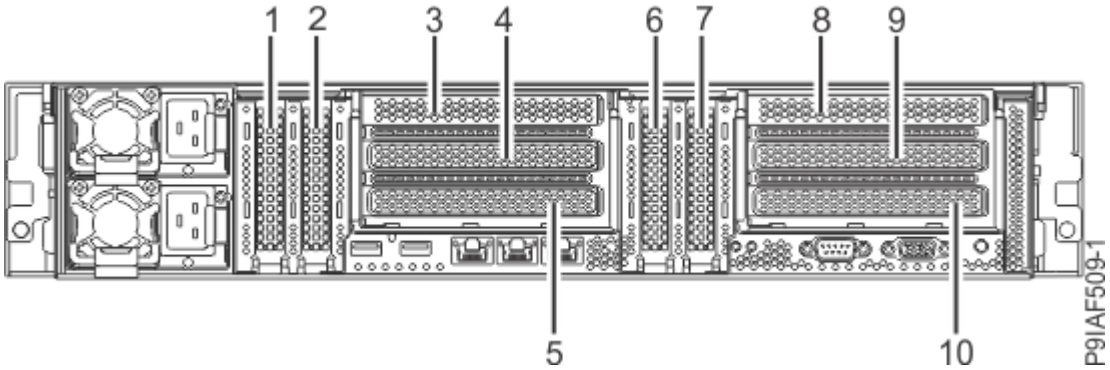


Figure 30. Rear view of a system with PCIe slots indicated

Table 6. PCIe slots and descriptions for the system

Slot identification	Description	Adapter size	Processor module	Coherent Accelerator Processor Interface (CAPI) 2.0
1	PCIe4 x16	Half-height, Half-length	CPU 0	Yes
2	PCIe3 x16	Half-height, Half-length	CPU 0	No
3	PCIe3 x16	Full-height, (¾ length)	CPU 0	No
4	PCIe3 x16	Full-height, (¾ length) **Note:** Supports double-wide adapters.	CPU 0	Yes
5	PCIe3 x8	Full-height, Half-length	CPU 0	No
6	PCIe4 x16	Half-height, Half-length	CPU 1	Yes
7	PCIe3 x16	Half-height, Half-length	CPU 1	No
8	PCIe3 x16	Full-height, (¾ length)	CPU 1	No
9	PCIe3 x16	Full-height, (¾ length) **Note:** Supports double-wide adapters.	CPU 1	Yes
10	PCIe3 x8	Full-height, Half-length	CPU 1	No

PCIe adapter placement rules

Use this information to select slots for installing PCIe adapters in the system. Table 7 on page 32 provides information about the adapters, the slot priorities in the system they are supported on, and the maximum number of adapters that can be installed in the supported system. The link that appears in the feature code column provides more technical information specific to the PCIe adapter.

Table 7. PCIe adapter slot priorities and maximum adapters supported in the system

Feature code	Description	Slot priorities (slot identification 1-10)	Maximum number of adapters supported
EC2R	PCIe3 2-port 10 Gb NIC and RoCE SR/Cu adapter (FC EC2R and FC EC2S; CCIN 58FA); Adapter part number: 01FT759	1, 6, 2, 7	4

Table 7. PCIe adapter slot priorities and maximum adapters supported in the system (continued)			
Feature code	**Description**	**Slot priorities (slot identification 1-10)**	**Maximum number of adapters supported**
EC2S	PCIe3 2-port 10 Gb NIC and RoCE SR/Cu adapter (FC EC2R and FC EC2S; CCIN 58FA); Adapter part number: 01FT759	3, 8, 4, 9, 5, 10	6
EC2T	PCIe3 2-port 25/10 Gb NIC and RoCE SR/CU capable adapter (FC EC2T and FC EC2U; CCIN 58FB); Adapter FRU number: 01FT753	1, 6, 2, 7	4
EC2U	PCIe3 2-port 25/10 Gb NIC and RoCE SR/CU capable adapter (FC EC2T and FC EC2U; CCIN 58FB); Adapter FRU number: 01FT753	3, 8, 4, 9, 5, 10	6
EC62	PCIe4 x16 1-Port EDR 100 GB InfiniBand ConnectX-5 CAPI capable adapter (FC EC62 and FC EC63; CCIN 2CF1); Adapter FRU number: 00WT179	1, 6	2
EC64	PCIe4 x16 2-Port EDR 100 GB InfiniBand ConnectX-5 CAPI capable adapter (FC EC64 and FC EC65; CCIN 2CF2); Adapter FRU number: 00W176	1, 6	2
EK41	Broadcom HBA 9300-8i PCIe3 X8 with 2 mini SAS cables (FC EK41); Adapter FRU number: 02WG017	5, 10	2
EK43	Broadcom HBA 9305-16i PCIe3 X8 with 4 mini SAS cables (FC EK43); Adapter FRU number: 02WG020	5 **Note:** If you install a Broadcom HBA 9305-16i PCIe3 x8 adapter (FC EK43), you must remove all of the NVIDIA T4 PCIe GPU accelerator adapters (FC EK4L) from the system. FC EK4L adapters are not supported when a FC EK43 adapter is installed in the system.	1
EK47	EK47 Broadcom MegaRAID 9361-8i SAS3 X8 - 2 GB cache controller and CacheVault Power Module with 2 mini SAS cables (FC EK47); Adapter FRU number: 02DE365	5, 10 **Note:** If the adapter is in slot 5, place the CacheVault in slot 2. If the adapter is in slot 10, place the CacheVault in slot 7.	2

Table 7. PCIe adapter slot priorities and maximum adapters supported in the system (continued)

Feature code	Description	Slot priorities (slot identification 1-10)	Maximum number of adapters supported
EK4L	NVIDIA T4 PCIe GPU accelerator adapter (FC EK4L); Adapter FRU number: 02CM988	1, 6, 2, 7 **Note:** If you install a Broadcom HBA 9305-16i PCIe3 x8 adapter (FC EK43), you must remove all of the NVIDIA T4 PCIe GPU accelerator adapters (FC EK4L) from the system. FC EK4L adapters are not supported when a FC EK43 adapter is installed in the system.	4
EK4M	NVIDIA T4 PCIe GPU accelerator adapter (FC EK4M); Adapter FRU number: 02CM978	4, 9	2
EL3Z	PCIe2 2-port 10 GbE BaseT RJ45 adapter (FC EL3Z, FC EL55, FC EN0W, and FC EN0X; CCIN 2CC4); Adapter FRU number: 00E2714	1, 6, 2, 7	4
EL43	PCIe3 16 Gb 2-port Fibre Channel adapter (FC EL43, FC EL5B, FC EN0A, and FC EN0B; CCIN 577F); Adapter part number: 00E3496	1, 6, 2, 7	4
EL4L	PCIe2 4-port 1 GbE adapter (FC 5260, FC 5899, FC EL4L, and FC EL4M; CCIN 576F); Adapter part number: 74Y4064	3, 8, 4, 9, 5, 10	6
EL4M	PCIe2 4-port 1 GbE adapter (FC 5260, FC 5899, FC EL4L, and FC EL4M; CCIN 576F); Adapter part number: 74Y4064	1, 6, 2, 7	4
EL55	PCIe2 2-port 10 GbE BaseT RJ45 adapter (FC EL3Z, FC EL55, FC EN0W, and FC EN0X; CCIN 2CC4); Adapter FRU number: 00E2714	3, 8, 4, 9, 5, 10	6
EL5B	PCIe3 16 Gb 2-port Fibre Channel adapter (FC EL43, FC EL5B, FC EN0A, and FC EN0B; CCIN 577F); Adapter part number: 00E3496	3, 8, 4, 9, 5, 10	6
EL5U	PCIe3 8x 2-port Fibre Channel (32 Gb/s); (FC EL5U, FC EL5V, FC EN1A, and FC EN1B; CCIN 578F); Adapter FRU number: 01FT704	3, 8, 4, 9, 5, 10	6
EL5V	PCIe3 8x 2-port Fibre Channel (32 Gb/s); (FC EL5U, FC EL5V, FC EN1A, and FC EN1B; CCIN 578F); Adapter FRU number: 01FT704	1, 6, 2, 7	4
EN0S	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715	3, 8, 4, 9, 5, 10	6

Table 7. PCIe adapter slot priorities and maximum adapters supported in the system (continued)			
Feature code	**Description**	**Slot priorities (slot identification 1-10)**	**Maximum number of adapters supported**
EN0T	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715	1, 6, 2, 7	4
EN0U	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715	3, 8, 4, 9, 5, 10	6
EN0V	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715	1, 6, 2, 7	4

PCIe adapter information by feature type for the 9183-22X system

Find information about the Peripheral Component Interconnect Express (PCIe) adapters that are supported for the system.

The table shows the available adapters by feature code (FC), description, customer card identification number (CCIN), adapter FRU number, and provides a link to more details for each adapter.

Important:

- This document does not replace the latest sales and marketing publications and tools that document supported features.
- If you are installing a new feature, ensure that you have the software and utilities that are required to support the new feature and determine whether you must install any adapter firmware updates. The latest version of adapter firmware and utilities can be downloaded from Fix Central (http://www.ibm.com/support/fixcentral/).

Table 8. PCIe adapters supported in the 9183-22X system	
Feature code	**Description**
EC2R	PCIe3 2-port 10 Gb NIC and RoCE SR/Cu adapter (FC EC2R and FC EC2S; CCIN 58FA); Adapter part number: 01FT759
EC2S	PCIe3 2-port 10 Gb NIC and RoCE SR/Cu adapter (FC EC2R and FC EC2S; CCIN 58FA); Adapter part number: 01FT759
EC2T	PCIe3 2-port 25/10 Gb NIC and RoCE SR/CU capable adapter (FC EC2T and FC EC2U; CCIN 58FB); Adapter FRU number: 01FT753
EC2U	PCIe3 2-port 25/10 Gb NIC and RoCE SR/CU capable adapter (FC EC2T and FC EC2U; CCIN 58FB); Adapter FRU number: 01FT753
EC62	PCIe4 x16 1-Port EDR 100 GB InfiniBand ConnectX-5 CAPI capable adapter (FC EC62 and FC EC63; CCIN 2CF1); Adapter FRU number: 00WT179
EC64	PCIe4 x16 2-Port EDR 100 GB InfiniBand ConnectX-5 CAPI capable adapter (FC EC64 and FC EC65; CCIN 2CF2); Adapter FRU number: 00W176
EK41	Broadcom HBA 9300-8i PCIe3 X8 with 2 mini SAS cables (FC EK41); Adapter FRU number: 02WG017

Table 8. PCIe adapters supported in the 9183-22X system (continued)	
Feature code	**Description**
EK43	Broadcom HBA 9305-16i PCIe3 X8 with 4 mini SAS cables (FC EK43); Adapter FRU number: 02WG020
EK47	EK47 Broadcom MegaRAID 9361-8i SAS3 X8 - 2 GB cache controller and CacheVault Power Module with 2 mini SAS cables (FC EK47); Adapter FRU number: 02DE365
EK4L	NVIDIA T4 PCIe GPU accelerator adapter (FC EK4L); Adapter FRU number: 02CM988
EK4M	NVIDIA T4 PCIe GPU accelerator adapter (FC EK4M); Adapter FRU number: 02CM978
EL3Z	PCIe2 2-port 10 GbE BaseT RJ45 adapter (FC EL3Z, FC EL55, FC EN0W, and FC EN0X; CCIN 2CC4); Adapter FRU number: 00E2714
EL43	PCIe3 16 Gb 2-port Fibre Channel adapter (FC EL43, FC EL5B, FC EN0A, and FC EN0B; CCIN 577F); Adapter part number: 00E3496
EL4L	PCIe2 4-port 1 GbE adapter (FC 5260, FC 5899, FC EL4L, and FC EL4M; CCIN 576F); Adapter part number: 74Y4064
EL4M	PCIe2 4-port 1 GbE adapter (FC 5260, FC 5899, FC EL4L, and FC EL4M; CCIN 576F); Adapter part number: 74Y4064
EL55	PCIe2 2-port 10 GbE BaseT RJ45 adapter (FC EL3Z, FC EL55, FC EN0W, and FC EN0X; CCIN 2CC4); Adapter FRU number: 00E2714
EL5B	PCIe3 16 Gb 2-port Fibre Channel adapter (FC EL43, FC EL5B, FC EN0A, and FC EN0B; CCIN 577F); Adapter part number: 00E3496
EL5U	PCIe3 8x 2-port Fibre Channel (32 Gb/s); (FC EL5U, FC EL5V, FC EN1A, and FC EN1B; CCIN 578F); Adapter FRU number: 01FT704
EL5V	PCIe3 8x 2-port Fibre Channel (32 Gb/s); (FC EL5U, FC EL5V, FC EN1A, and FC EN1B; CCIN 578F); Adapter FRU number: 01FT704
EN0S	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715
EN0T	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715
EN0U	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715
EN0V	PCIe2 4-port (10 Gb + 1 GbE) SR+RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715

PCIe2 4-port 1 GbE adapter (FC 5260, FC 5899, FC EL4L, and FC EL4M; CCIN 576F)

Learn about the specifications and operating system requirements for the feature code (FC) 5260, FC 5899, FC EL4L, and EL4M adapters.

Overview

FC 5260, FC EL4M, FC 5899, and FC EL4L are the same adapter with different feature codes. FC 5260 and EL4M are low-profile adapters and the FC 5899 and EL4L are full-height adapters.

These adapters provide four 1-Gb Ethernet ports that can be configured to run at 1000 megabits per second (Mbps) (or 1 gigabit per second (Gbps)), 100 Mbps, or 10 Mbps. The adapter connects to a network that uses unshielded twisted pair (UTP) cable for distances of up to 100 meters (328.08

feet). The adapter supports AIX® Network Installation Management (NIM) boot capability. The adapter conforms to the IEEE 802.3ab 1000Base-T standard. The adapter supports jumbo frames when running at the 1000 Mbps speed.

Each of the Ethernet ports can be connected by using:

- CAT5e (or later) UTP cables for 1000 Mbps network attachment
- CAT5 or CAT3 UTP cables for 100 Mbps or 10 Mbps network attachment

The cables are attached to the copper RJ45 connectors. Each port is independent of one another and supports full-duplex or half-duplex. The half-duplex mode does not support a speed of 1000 Mbps.

The adapter provides the following features:

- Supports interrupt moderation to deliver increased performance while significantly reducing processor utilization
- Supports dual port operation in almost any PCIe slot, except x1
- Supports auto-negotiation, full-duplex only
- Supports integrated media-access control (MAC) and physical layer (PHY)
- Supports Fast EtherChannel (FEC) with the existing software
- Supports gigabit EtherChannel (GEC) with the existing software
- Supports IEEE 802.3ad (Link Aggregation control protocol)
- Supports IEEE 802.1Q VLANs
- Supports IEEE 802.3 z, ab, u, x flow control support
- Supports IEEE 802.1p
- Supports IEEE 802.3ab for TX
- Supports TCP checksum offload transmission control protocol (TCP), user datagram protocol (UDP), Internet Protocol (IP) for IPv4 and IPv6
- Supports TCP segmentation or large send offload
- Supports EEPROM-SPI and single EEPROM
- Supports interrupt levels INTA and MSI
- Hardware certifications FCC B, UL, CE, VCCI, BSMI, CTICK, MIC
- Network Controller (MAC) Intel 82571EB

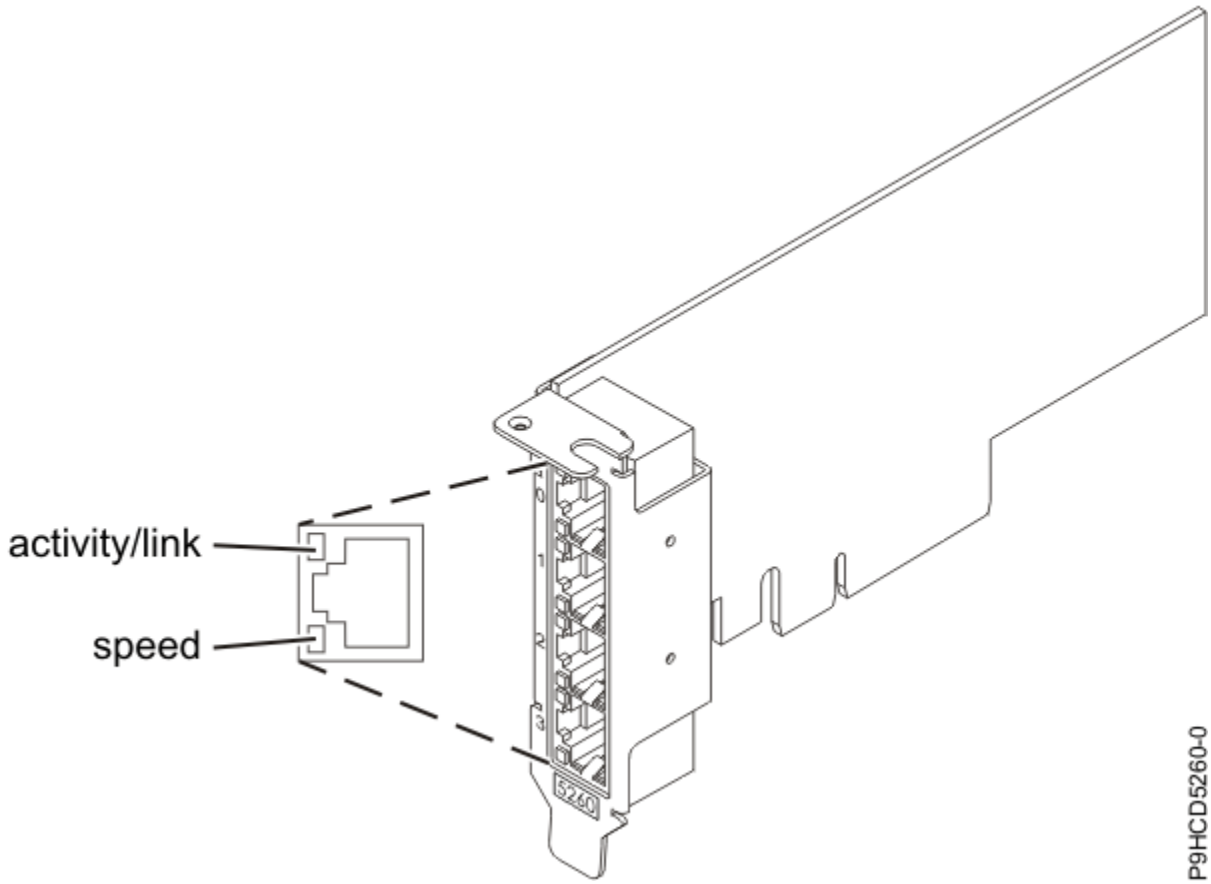


Figure 31. FC 5260 and FC EL4M PCIe2 4-port 1 GbE adapter

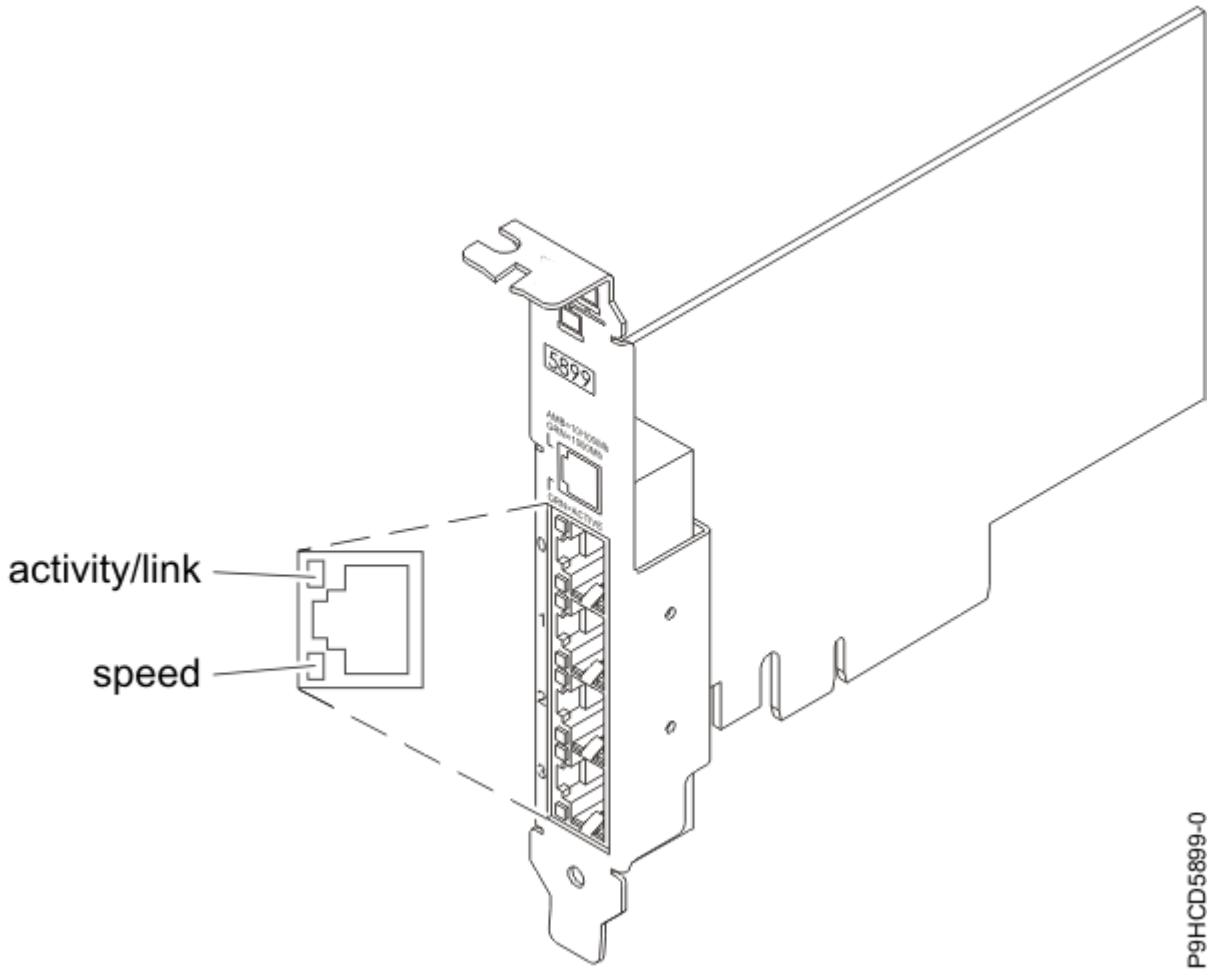


Figure 32. FC 5899 and FC EL4L PCIe2 4-port 1 GbE adapter

Specifications

Item
Description

Adapter FRU number
74Y4064

Wrap plug
10N7405

Note: Wrap plugs are not included with the card and cannot be purchased from IBM.

I/O bus architecture
PCIe2 x4

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage
3.3 V

Form factor
short, low-profile

Connector information

- Two RJ-45 ports

- Two LED adapter status indicators per port, for link activity and speed

Cables

4-pair, CAT5e, UTP cables are connected to copper RJ45 connectors.

Attributes provided

- PCIe x4, generation-1 or generation-2
- 4-Port machine access code (MAC)
- High performance IPV4/IPV6 checksum offload
- Supports large send and large receive
- Multiple queues
- VIOS

Adapter LED states

The LEDs on the adapter provide information about the operation status of the adapter. The LEDs are visible through the mounting bracket. Figure 31 on page 38 shows the location of the LEDs. Table 9 on page 40 describes the different LED states and what those states indicate.

Table 9. Adapter LEDs and descriptions

LED	Light	Description
Speed	Yellow	10 Mbps or 100 Mbps
	Green	1000 Mbps or 1 Gbps
Activity/link	Green flashing	Active link or data activity
	Off	No link The absence of a link can indicate a defective cable, defective connector, or a configuration mismatch.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe3 2-port 10 Gb NIC & RoCE SR/Cu adapter (FC EC2R and EC2S; CCIN 58FA)

Learn about the specifications and operating system requirements for feature code (FC) EC2R and EC2S adapters.

Overview

FC EC2R and EC2S are both the same adapter with different feature codes. FC EC2R is a low-profile adapter and FC EC2S is a full-height adapter.

The PCIe3 2-port 10 Gb NIC & RoCE SR/Cu Adapter is a PCI Express (PCIe) generation 3 (Gen3) x8 adapter. The adapter provides two 10 Gb SFP+ ports and supports both the Ethernet network interface controller (NIC) function and RDMA over Converged Ethernet (RoCE). The adapter can support significantly greater bandwidth with low latency using RoCe. It also minimizes CPU overhead by more efficiently using memory access. This offloads the CPU from I/O networking tasks, improving performance and scalability.

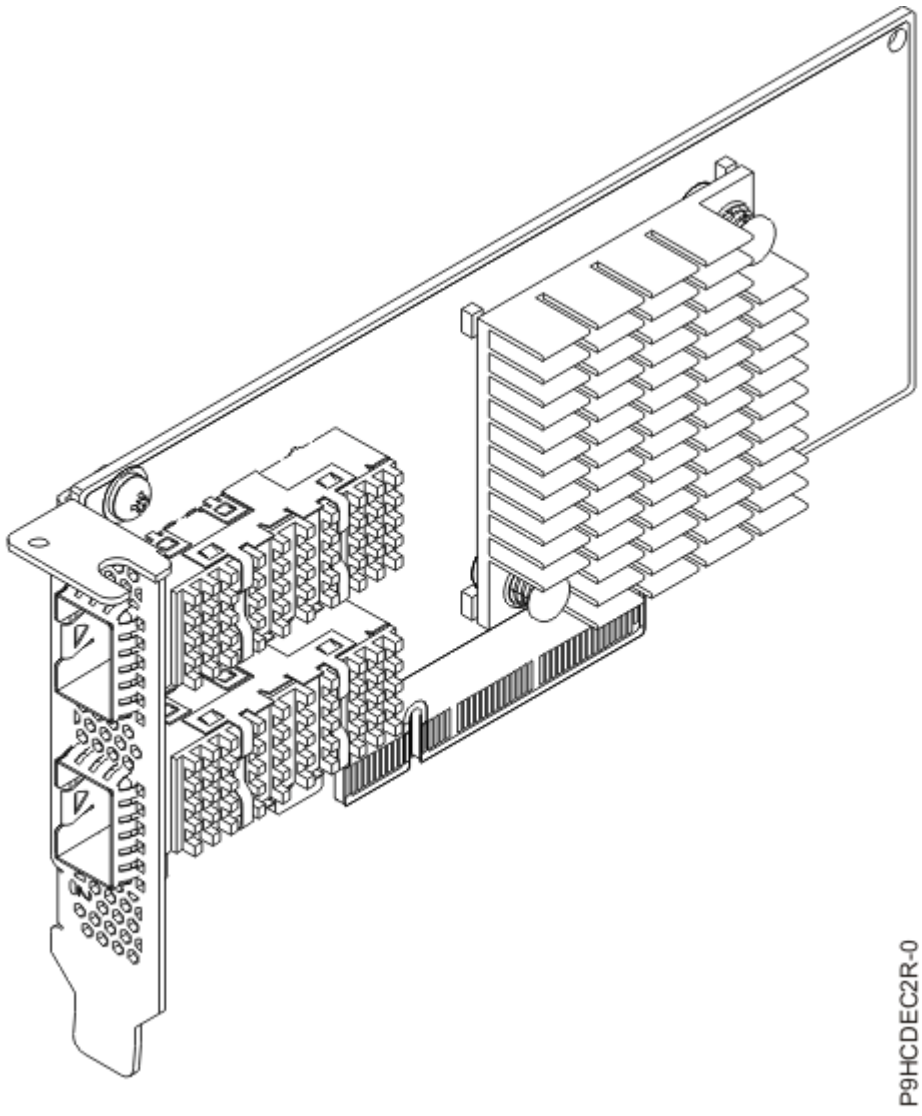


Figure 33. PCIe3 LP 2-port 10 Gb NIC & RoCE SR/Cu Adapter (FC EC2R)

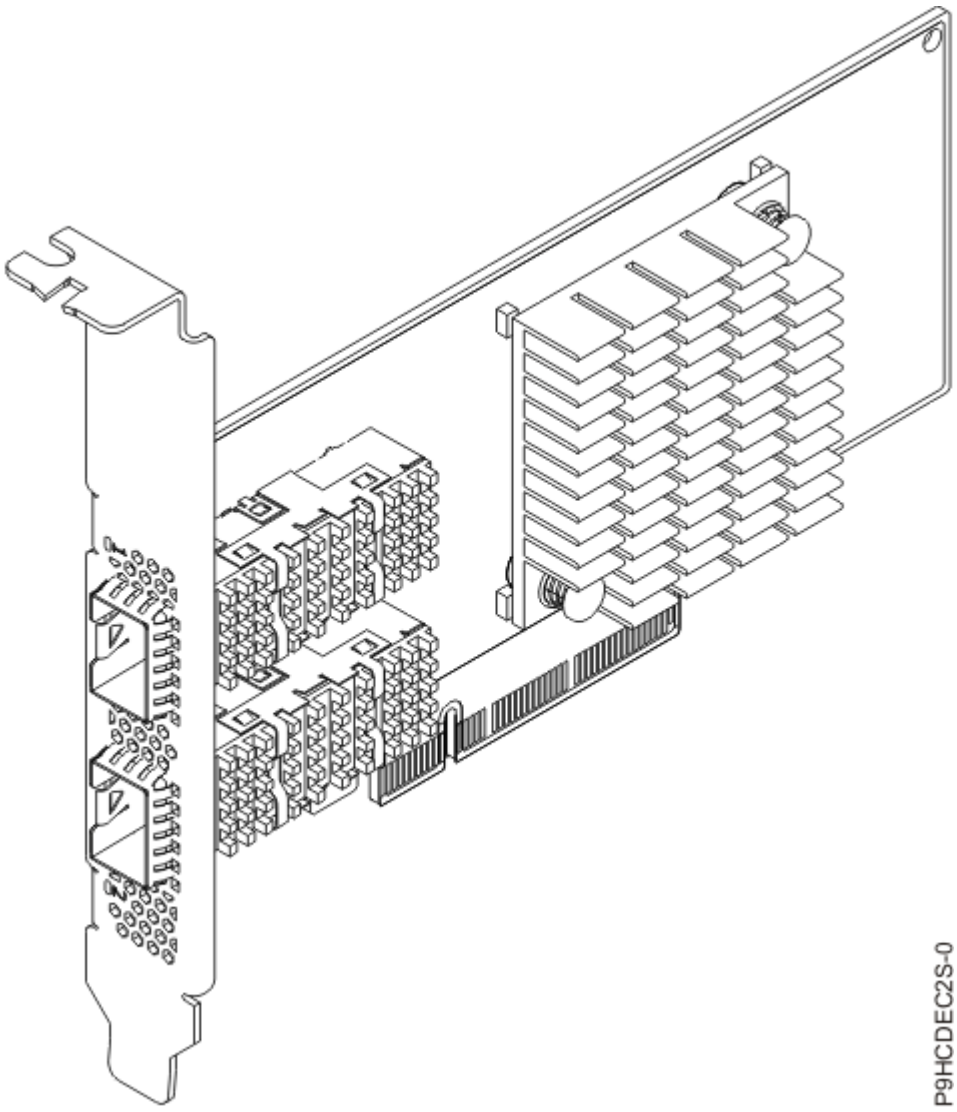


Figure 34. PCIe3 2-port 10 Gb NIC & RoCE SR/Cu Adapter (FC EC2S)

Specifications

Item
Description

Adapter FRU number
01FT759

Wrap Plug FRU number
74Y7010 (Twinax wrap plug)

12R9314 (Optical wrap plug)

I/O bus architecture
PCIe3 x8

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage
3.3 V, 12 V

Form factor

Short, low-profile (FC EC2R)

Short, with full-height tailstock (FC EC2S)

Attributes provided

RDMA over Converged Ethernet (RoCE)

Dual port 10 Gb Ethernet network connectivity

Supports 10 Gb Ethernet SFP+ connectivity

Supports 10 Gb SFP+ SR connectivity with a 10 Gb optical transceiver (IBM® P/N 77P9336, purchased separately)

AIX® Network Installation Management (NIM) support

PCI Express 3.0 (up to 8 GT/s) x8

PCIe Gen 3.0 compliant, 1.1 and 2.0 compatible

IEEE 802.3ae (10 Gb Ethernet), IEEE 802.3ad (Link Aggregation and Failover), IEEE 802.3az (Energy Efficient Ethernet), IEEE 802.1Q/P (VLAN Tagging), IEEE 802.10au (Congestion Notification), IEEE 802.1Qbg, IEEE 802.3Qaz D0.2 (ETS), IEEE 802.1Qbb D1.0 (PFC), IEEE 1588v2 (PTP)

Jumbo frame support up to 9.6 KB

VXLAN and NVGRE Overlay Network offload support

TCP/UDP/IP stateless offload

TCP/UDP checksum offload

TCP segmentation offload

PowerVM SR-IOV support. For more information see, PowerVM® SR-IOV FAQs.

Cables

For 10 GbE, IBM® offers Direct Attach Copper (DAC) cables up to 5 M. SFP based transceivers are included on each end of these cables. For more information about adapter cabling, see the “Cable and Transceiver information” on page 43.

Transceivers

IBM® qualifies and supports SFP+ optical transceiver (FC EB46) to install into the adapter. Customers can also use their own optical cabling and SFP+ optical transceiver for the other end. The 10 Gb optical transceiver is capable up to 300 M through the OM3 cable or 82 M through OM2 cable. Either one or both of the adapter’s two SFP+ ports can be populated.

Cable and Transceiver information

Use multimode fiber optic cables with shortwave lasers that adhere to the following specifications:

- OM3 or OM4: Multimode 50/125 micron fiber, 2000 MHz x km bandwidth
- OM2: Multimode 50/125 micron fiber, 500 MHz x km bandwidth
- OM1: Multimode 62.5/125 micron fiber, 200 MHz x km bandwidth

Because core sizes are different, OM1 cables can only be connected to other OM1 cables. For best results, OM2 cables must not be connected to OM3 or OM4 cables. However, if an OM2 cable is connected to an OM3 or OM4 cable, the characteristics of the OM2 cable apply to the entire length of the cables. The following table shows the supported distances for the different fiber optic cable types at different link speeds.

Table 10. Cable type and distance (10 Gb/s)			
Rate	**Cable type and distance**		
10 Gb/s	OM1	OM2	OM3
	0.5 m to 33 m (1.64 ft to 108.26 ft)	0.5 m to 82 m (1.64 ft to 269.02 ft)	0.5 meters to 300 meters (1.64 ft to 984.25 ft)

Table 11. Optical transceivers and cables	
Feature code	**Description**
EB46	10 Gb optical transceiver (purchased separately)
EN01	10 Gb/s 1 m (3.3 ft) copper active twinax Ethernet cable
EN02	10 Gb/s 3 m (9.8 ft) copper active twinax Ethernet cable
EN03	10 Gb/s 5 m (16.4 ft) copper active twinax Ethernet cable

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe3 2-port 25/10 Gb NIC & RoCE SFP28 adapter (FC EC2T and FC EC2U; CCIN 58FB)

Learn about the specifications and operating system requirements for feature code (FC) EC2T and FC EC2U adapters.

Overview

FC EC2T and EC2U are both the same adapter with different feature codes. FC EC2T is a low-profile adapter, and FC EC2U is a full-height adapter.

The PCIe3 2-PORT 25/10 Gb NIC & RoCE SFP28 Adapter (FC EC2T and EC2U) is a PCI Express® (PCIe) generation 3 (Gen3) x8 adapter. The adapter provides two 25 Gb SFP28 ports. The adapter supports both the Ethernet network interface controller (NIC) function and RDMA over Converged Ethernet (RoCE). Using RoCE, the adapter can support significantly greater bandwidth with low latency. It also minimizes

CPU overhead by more efficiently using memory access. This offloads the CPU from I/O networking tasks, improving performance and scalability.

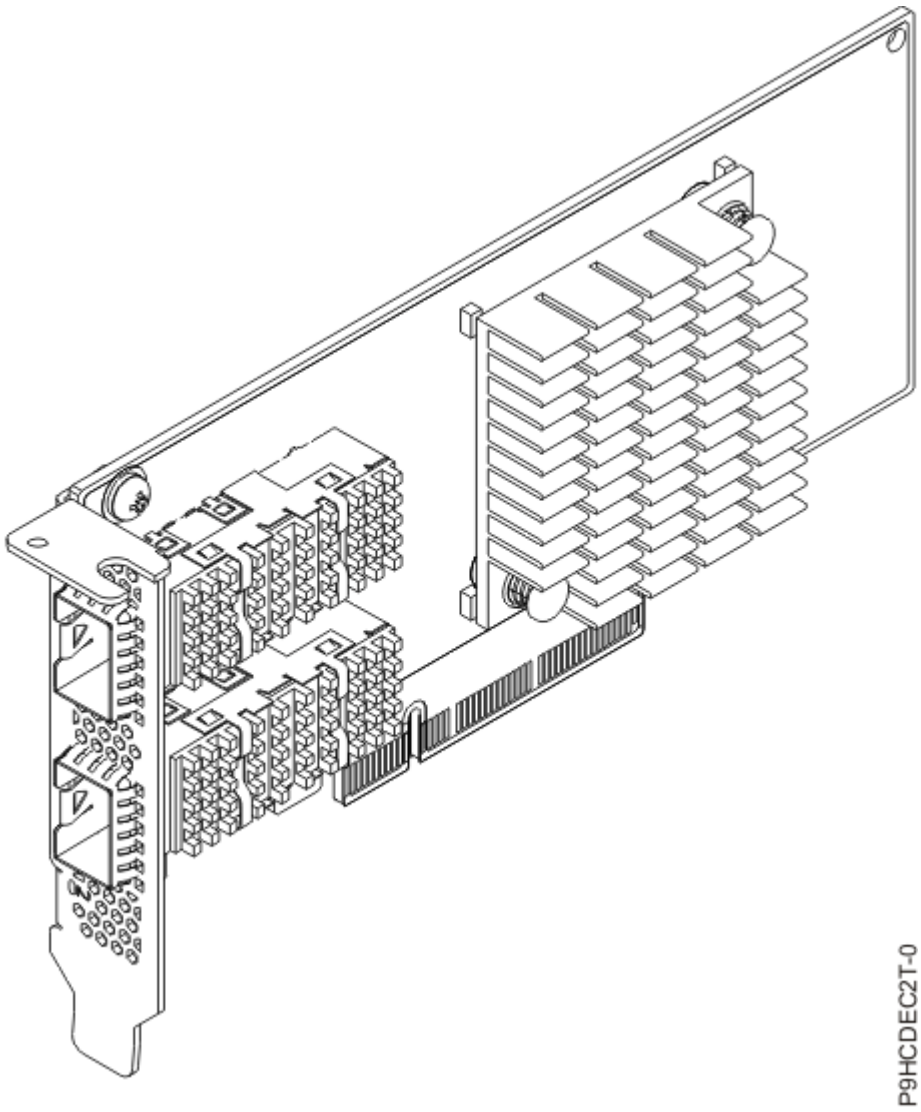


Figure 35. PCIe3 LP 2-port 25/10 Gb NIC & RoCE SFP28 Adapter (FC EC2T)

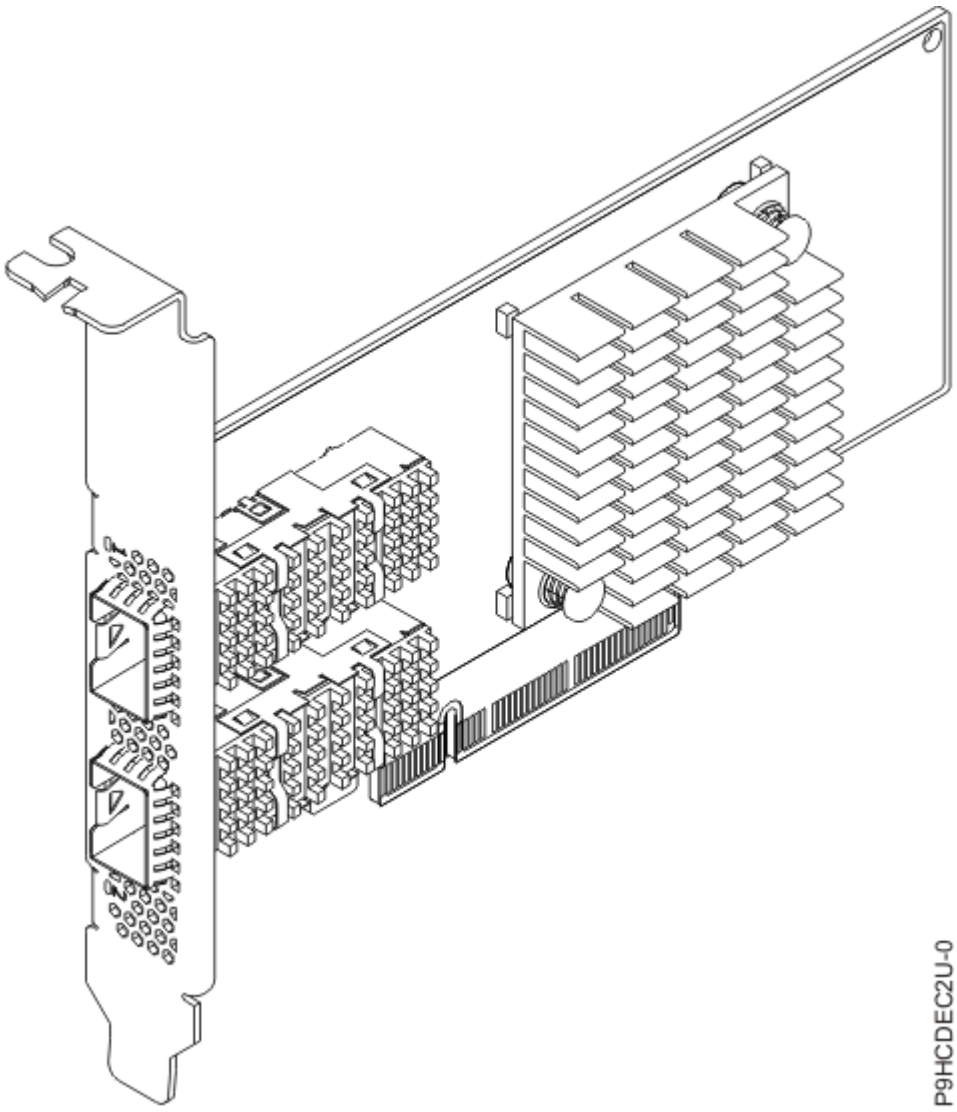


Figure 36. PCIe3 2-port 25/10 Gb NIC & RoCE SFP28 Adapter (FC EC2U)

Specifications

Item
Description

Adapter FRU number
01FT753

Wrap Plug FRU number
74Y7010 (Twinax wrap plug)

12R9314 (Optical wrap plug)

I/O bus architecture
PCIe3 x8

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage
3.3 V, 12 V.

Form factor

Short, low-profile (FC EC2T).

Short, with full-height tailstock (FC EC2U).

Attributes provided

RDMA over Converged Ethernet (RoCE).

Dual port 25 Gb/10 Gb Ethernet network connectivity.

Supports 25 Gb Ethernet SFP28 connectivity.

Supports 10 Gb Ethernet SFP+ connectivity.

Supports 25 Gb SFP28 SR connectivity with a 25 Gb optical transceiver (IBM P/N 03GH278, purchased separately).

Supports 10 Gb SFP+ SR connectivity with a 10 Gb optical transceiver (IBM P/N 01FT829, purchased separately).

Supports 1 Gb RJ45 connectivity with a 1000BASE-T transceiver (IBM P/N 03FP283, purchased separately). Supports 1 Gb and full-duplex only. PowerVM® SR-IOV not supported for 1 Gb.

AIX Network Installation Management (NIM) support.

PCI Express 3.0 (up to 8 GT/s) x8.

PCIe Gen 3.0 compliant, 1.1 and 2.0 compatible.

IEEE 802.3ae (25Gb or 10Gb Ethernet), IEEE 802.3ad (Link Aggregation & Failover), IEEE 802.3az (Energy Efficient Ethernet), IEEE 802.1Q/P (VLAN Tagging), IEEE 802.10au (Congestion Notification), IEEE 802.1Qbg, IEEE 802.3Qaz D0.2 (ETS), IEEE 802.1Qbb D1.0 (PFC), IEEE 1588v2 (PTP).

Jumbo frame support up to 9.6 KB.

VXLAN and NVGRE Overlay Network offload support.

TCP/UDP/IP stateless offload.

TCP/UDP checksum offload.

TCP segmentation offload.

PowerVM SR-IOV support for 10 Gb and higher speeds.. For more information see, PowerVM SR-IOV FAQs.

Cables

For 25 GbE, IBM offers SFP28 Passive Copper 25 Gb Ethernet cables up to 2 m. SFP28 based transceivers are included on each end of these cables.

For 10 GbE, IBM offers Direct Attach Copper (DAC) cables up to 5 m. SFP-based transceivers are included on each end of these cables. For more information about adapter cabling, see “Cable and Transceiver information” on page 48.

Transceivers

For 25 GbE, IBM qualifies and supports SFP28 optical transceiver (FC EB47) to install into the adapter. Customers can also use their own optical cabling and SFP28 optical transceiver for the other end. The 25 Gb optical transceiver is capable up to 100 m through the OM4 cable or 70 M through OM3 cable. Either one or both of the adapter’s two SFP28 ports can be populated.

For 10 GbE, IBM qualifies and supports SFP+ optical transceiver (FC EB46) to install into the adapter. Customers can also use their own optical cabling and SFP+ optical transceiver for the other end. The 10 Gb optical transceiver is capable up to 300 M through the OM3 cable or 82 m through OM2 cable. Either one or both of the adapter’s two SFP28 ports can be populated.

For 1000BASE-T, IBM qualifies and supports the RJ45 transceiver (FC EB48) to install into the adapter. Customers can also use their own Cat 5e STP cabling. The 1000BASE-T transceiver is capable up to 100 m through the Cat 5e STP cable. Both of the adapter’s two RJ45 ports can be populated, but mixing 1 Gb with higher speeds is not supported. 100 Mbps or 10 Mbps speeds and half-duplex are not supported. PowerVM SR-IOV is not supported on ports with FC EB48 installed.

Cable and Transceiver information

Use multimode fiber optic cables with shortwave lasers that adhere to the following specifications:

- OM3 or OM4: Multimode 50/125 micron fiber, 2000 MHz x km bandwidth
- OM2: Multimode 50/125 micron fiber, 500 MHz x km bandwidth
- OM1: Multimode 62.5/125 micron fiber, 200 MHz x km bandwidth

Because core sizes are different, OM1 cables can only be connected to other OM1 cables. For best results, OM2 cables must not be connected to OM3 or OM4 cables. However, if an OM2 cable is connected to an OM3 or OM4 cable, the characteristics of the OM2 cable apply to the entire length of the cables. The following table shows the supported distances for the different fiber optic cable types at different link speeds.

Table 12. Cable type and distance (10 Gb/s)

Rate	**Cable type and distance**		
10 Gb/s	OM1	OM2	OM3
	0.5 m to 33 m (1.64 ft to 108.26 ft)	0.5 m to 82 m (1.64 ft to 269.02 ft)	0.5 meters to 300 meters (1.64 ft to 984.25 ft)

Table 13. Cable type and distance (25 Gb/s)

Rate	**Cable type and distance**		
25 Gb/s	OM2	OM3	OM4
	0.5 m to 20 m (1.64 ft to 65.62 ft)	0.5 m to 70 m (1.64 ft to 229.66 ft	0.5 m to 100 m (1.64 ft to 984.25 ft)

Table 14. Optical transceivers and cables

Feature code	**Description**
EB46	10 Gb optical transceiver (purchased separately)
EB47	25 Gb optical transceiver (purchased separately)
EB48	1 Gb RJ45 transceiver (purchased separately)
EB4J	25 Gb/s 0.5 m (1.6 ft) SFP28 passive copper 25 Gb Ethernet cable
EB4K	25 Gb/s 1.0 m (3.3 ft) SFP28 passive copper 25 Gb Ethernet cable
EB4L	25 Gb/s 1.5 m (4.9 ft) SFP28 passive copper 25 Gb Ethernet cable
EB4M	25 Gb/s 2.0m (6.6-ft) SFP28 passive copper 25 Gb Ethernet cable
EB4P	[100 Gb/s to 4x25 Gb/s] 2.0 m (6.6-ft) QSFP28 passive copper to SFP28 4x25 Gb Ethernet split cable
EN01	10 Gb/s 1 m (3.3 ft) copper active twinax Ethernet cable
EN02	10 Gb/s 3 m (9.8 ft) copper active twinax Ethernet cable
EN03	10 Gb/s 5 m (16.4 ft) copper active twinax Ethernet cable
EN03	10 Gb/s 5 m (16.4 ft) copper active twinax Ethernet cable

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached

devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe4 x16 1-Port EDR 100 GB IB ConnectX-5 CAPI Capable Adapter (FC EC62 and EC63; CCIN 2CF1)

Learn about the specifications and operating system requirements for feature code (FC) EC62 and EC63 adapters.

Overview

FC EC62 and EC63 are both the same adapter with different feature codes. FC EC62 is a low-profile adapter and FC EC63 is a full-height adapter.

The PCIe4 x16 1-Port enhanced data rate (EDR) 100 GB Infiniband (IB) ConnectX-5 CAPI Capable Adapter is a PCI Express (PCIe) generation 4 (Gen4) x16 adapter. The adapter enables higher HPC performance with new Message Passing Interface (MPI) offloads, such as MPI Tag Matching and MPI AlltoAll operations, advanced dynamic routing, and new capabilities to perform various data algorithms.

Note: The Virtual Protocol Interconnect (VPI) feature is not supported on this adapter. The adapter must be used only as an InfiniBand adapter.

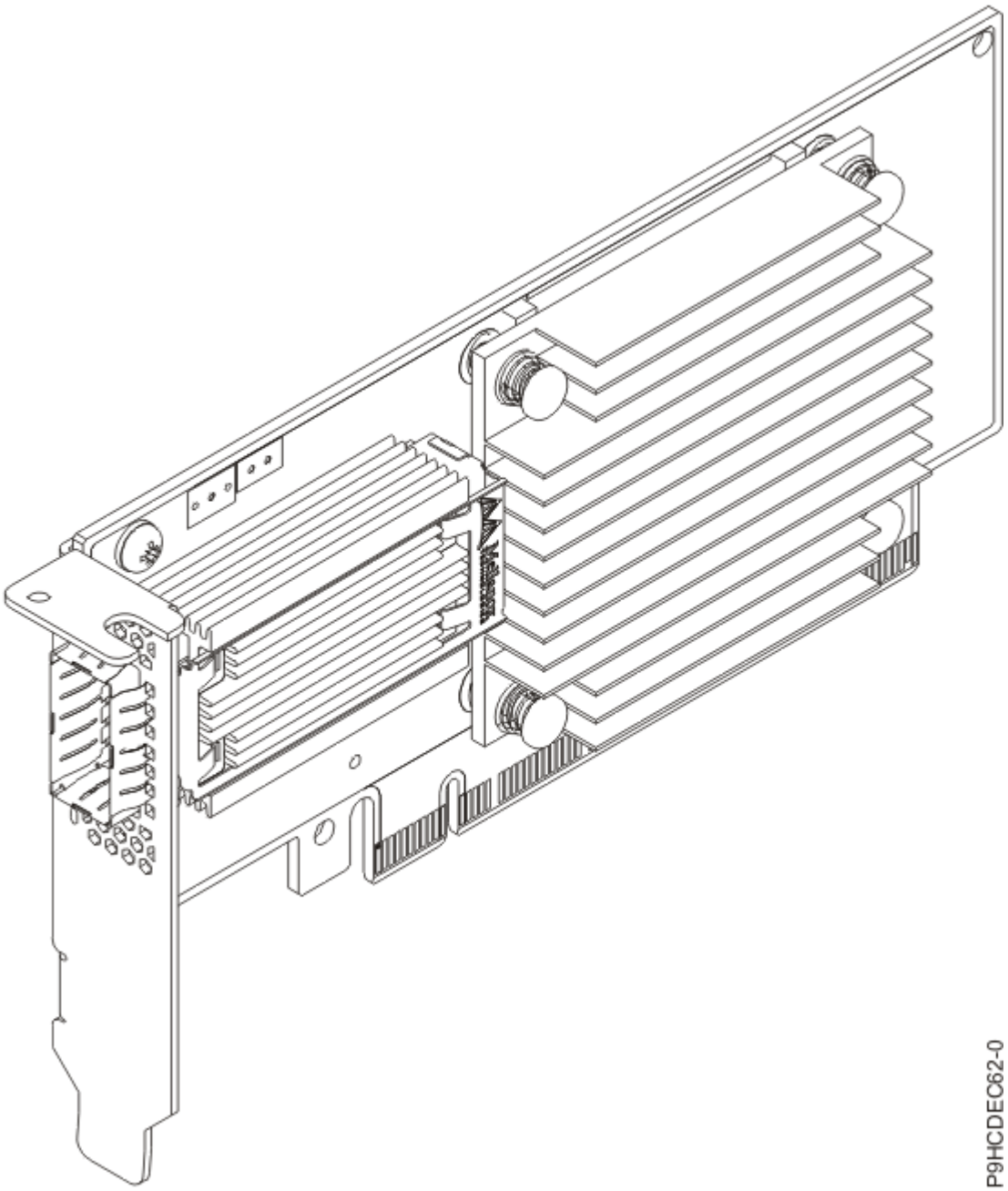


Figure 37. PCIe4 x16 1-Port EDR 100 GB IB ConnectX-5 CAPI Capable Adapter

Specifications

Item
Description

Adapter FRU number
00WT179

I/O bus architecture
PCIe4 x16

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Thermal requirement
If you have an 8335-GTG, 8335-GTH, or 8335-GTX system, you might be required to set the thermal mode of the system to a setting other than the default setting, depending on your system, adapter, and cable type. For details, see Determining and setting the thermal mode for an 8335-GTG, 8335-GTH, or 8335-GTX system.

Voltage
3.3 V, 12 V

Form factor
Short, low-profile (FC EC62)

Short, with full-height tailstock (FC EC63)

Attributes provided
EDR 100 Gb/s InfiniBand or 100 Gb/s Ethernet per port

PCIe4 Support

IBM CAPI v2 support

Tag Matching and Rendezvous Offloads

Hardware-based I/O virtualization

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe4 x16 2-Port EDR 100 GB IB ConnectX-5 CAPI Capable Adapter (FC EC64 and EC65; CCIN 2CF2)

Learn about the specifications and operating system requirements for feature code (FC) EC64 and EC65 adapters.

Overview

FC EC64 and EC65 are both the same adapter with different feature codes. FC EC64 is a low-profile adapter and FC EC65 is a full-height adapter.

PCIe4 x16 2-Port EDR 100 GB IB ConnectX-5 CAPI Capable Adapter is a PCI Express (PCIe) generation 4 (Gen4) x16 adapter. The adapter enables higher HPC performance with new Message Passing Interface (MPI) offloads, such as MPI Tag Matching and MPI AlltoAll operations, advanced dynamic routing, and new capabilities to perform various data algorithms.

Note: The Virtual Protocol Interconnect (VPI) feature is not supported on this adapter. The adapter must be used only as an InfiniBand adapter.

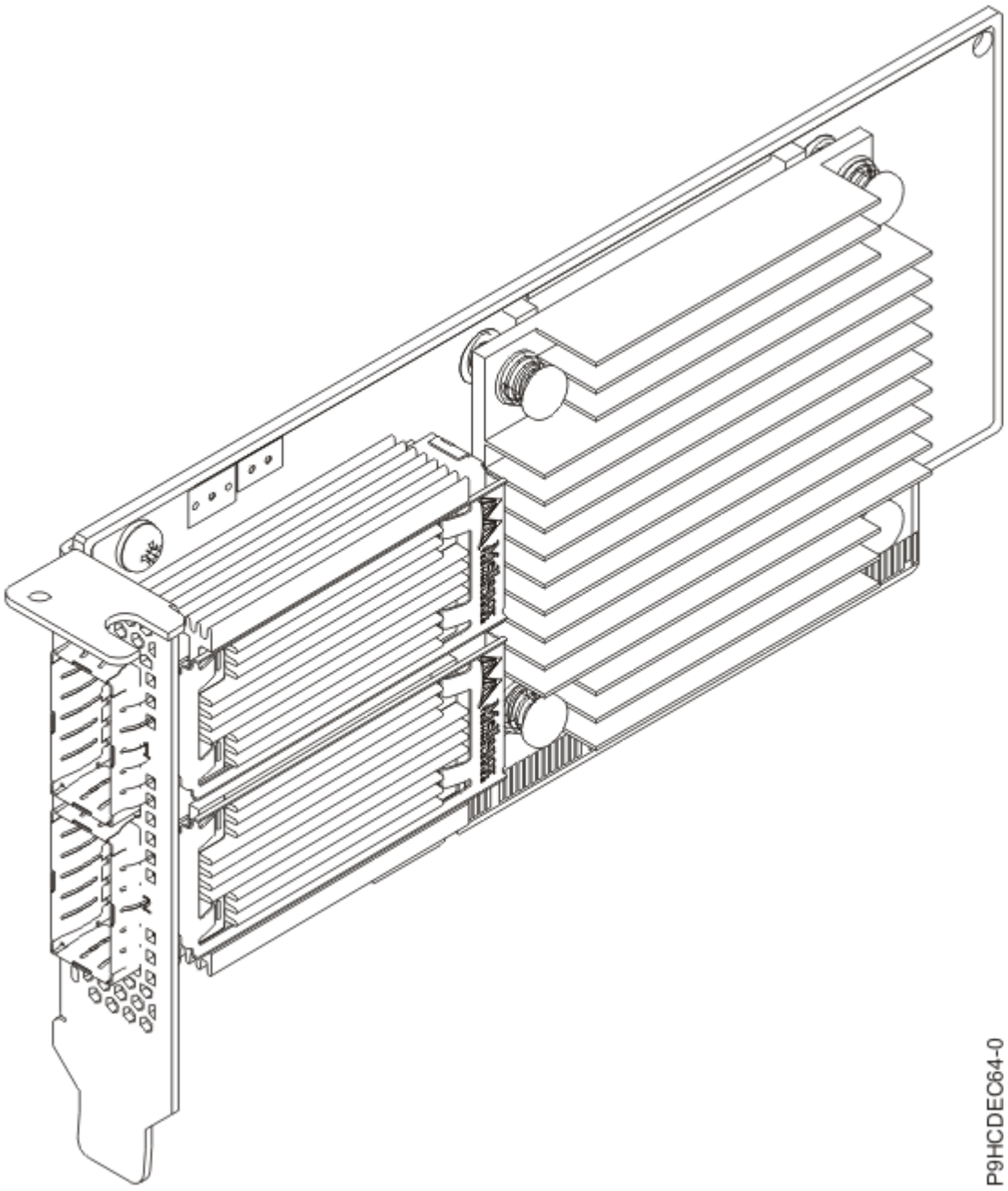


Figure 38. PCIe4 x16 2-Port EDR 100 GB IB ConnectX-5 CAPI Capable Adapter

Specifications

Item
Description

Adapter FRU number
00WT176

I/O bus architecture
PCIe4 x16

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Thermal requirement
If you have an 8335-GTG, 8335-GTH, or 8335-GTX system, you might be required to set the thermal mode of the system to a setting other than the default setting, depending on your system, adapter, and cable type. For details, see Determining and setting the thermal mode for an 8335-GTG, 8335-GTH, or 8335-GTX system.

Voltage
3.3 V, 12 V

Form factor
Short, low-profile

Attributes provided
EDR 100 Gb/s InfiniBand per port

PCIe4 Support

IBM CAPI v2 support

Tag Matching and Rendezvous Offloads

Hardware-based I/O virtualization

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe4 2-port 100 GbE RoCE x16 adapter (FC EC66 and EC67; CCIN 2CF3)

Learn about the specifications and operating system requirements for feature code (FC) EC66 and EC67 adapters.

Overview

FC EC66 is a full-height adapter and FC EC67 is a low-profile adapter.

The PCIe4 2-port 100GbE RoCE Adapter is a PCI Express (PCIe) generation 4 (Gen4) x16 adapter. The adapter provides two 100GbE QSFP28 ports. The PCIe4 2-port 100GbE RoCE Adapter supports both NIC (Network Interface Controller) and IBTA RoCE standards. RoCE is Remote Direct Memory Access (RDMA) over Converged Ethernet. Using RoCE, the adapter can support significantly greater bandwidth with low latency. It also minimizes the CPU overhead by more efficiently using memory access. This offloads the CPU from I/O networking tasks, improving performance and scalability.

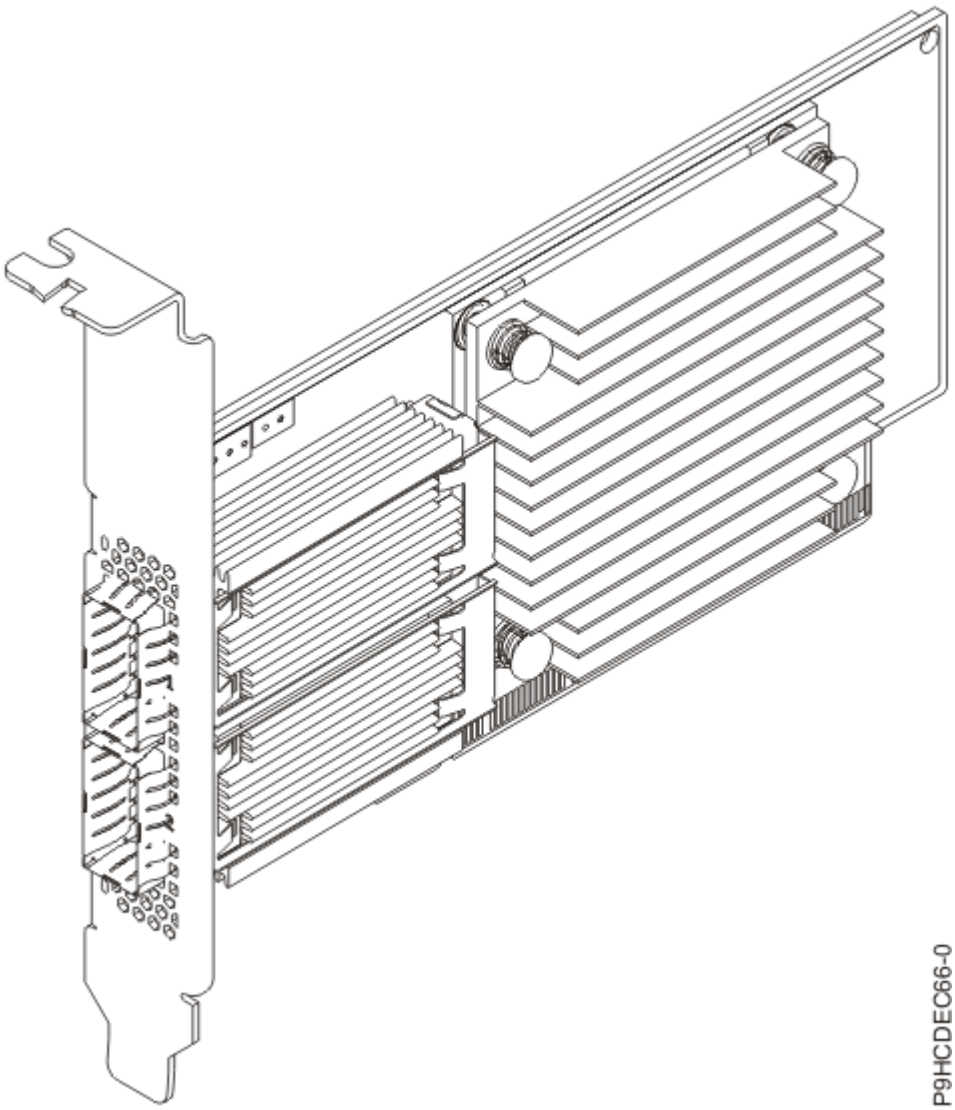


Figure 39. 2-port 100 GbE RoCE En Connectx-5 Gen4 PCIe x16 adapter (FC EC66)

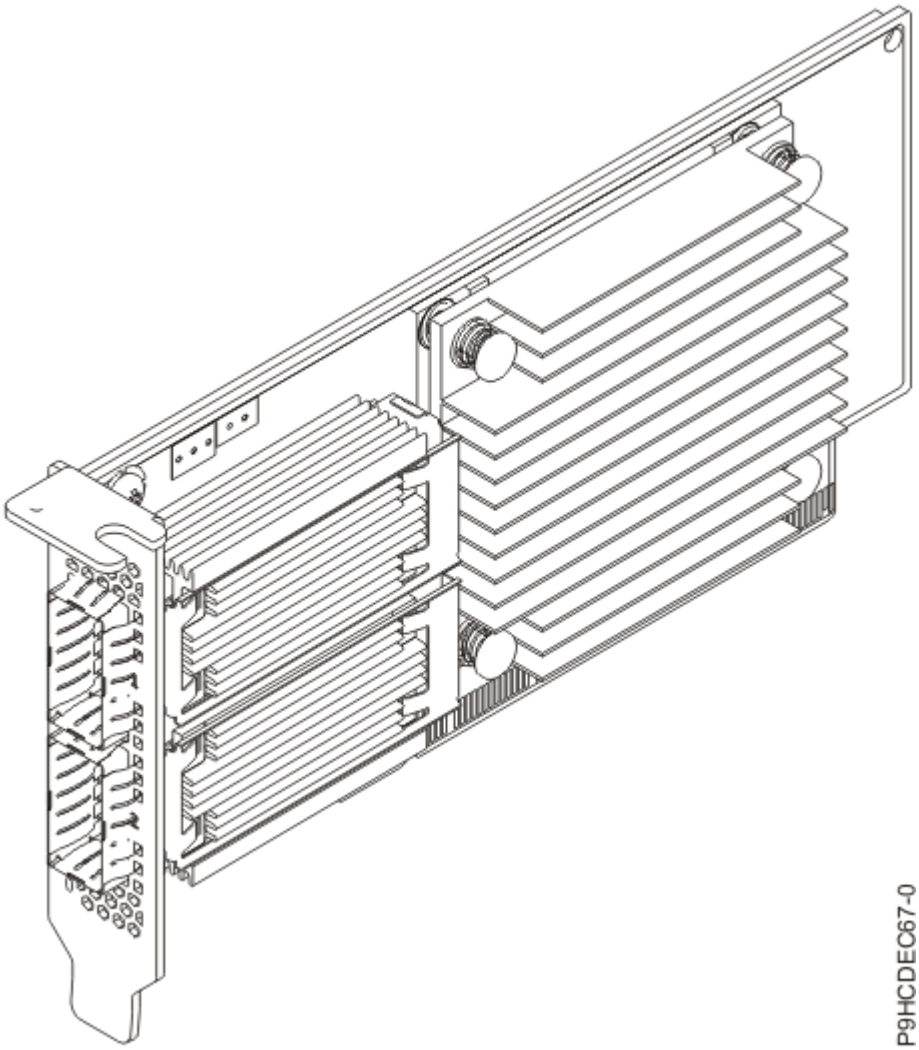


Figure 40. 2-port 100 GbE RoCE En Connectx-5 Gen4 PCIe x16 adapter (FC EC67)

Specifications

Item
Description

Adapter FRU number
01FT742

I/O bus architecture
PCIe4 x16

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Cables

For 100G, IBM offers either Direct Attach Copper (DAC) cables up to 2 M or Active Optical Cables (AOC) up to 100 M. QSFP28 based transceivers are included on each end of these cables. For more information about adapter cabling, see the (CHANGE TO LINK) Cable and transceiver matrix.

Note: For 40G, IBM offers DAC cables up to 3 M. QSFP+ base transceivers are included on each end of these cables. See FC EB2B and EB2H for a 1 M and 3 M copper cables.

Transceivers

IBM qualifies and supports QSFP28 optical transceiver (FC EB59) to install into the adapter. Customers can also use their own optical cabling and QSP28 optical transceiver for the other end. This is a 100GBASE-SR4 based active optical transceiver capable up to 100 M through the OM4 cable or 70 M through OM3 cable. Either one or both of the adapter's two QSP28 ports can be populated. When two ports are filled, both can have copper cables or optical cables. Additionally, one of the cables can be copper and the other can be optical. IBM® also offers QSFP+ optical transceiver (FC EB27 or FC EB57) to install into the adapter and allowing the customer to use their own optical cabling and QSFP+ optical transceiver for the other end.

Cable and transceiver matrix

Table 15. Cable and transceiver matrix

Feature	Description
EB59	100GBASE-SR4 optical transceiver MTP/MPO cable (purchased separately) • FC EB2J - 10 M • FC EB2K - 30 M
EB5J	QSFP28 Passive Copper 100 Gb Ethernet Cable - .5 M
EB5K	QSFP28 Passive Copper 100 Gb Ethernet Cable - 1 M
EB5L	QSFP28 Passive Copper 100 Gb Ethernet Cable - 1.5 M
EB5M	QSFP28 Passive Copper 100 Gb Ethernet Cable - 2 M
EB5R	QSFP28 AOC 100 Gb Ethernet Cable - 3 M
EB5S	QSFP28 AOC 100 Gb Ethernet Cable - 5 M
EB5T	QSFP28 AOC 100 Gb Ethernet Cable - 10 M
EB5U	QSFP28 AOC 100 Gb Ethernet Cable - 15 M
EB5V	QSFP28 AOC 100 Gb Ethernet Cable - 20 M
EB5W	QSFP28 AOC 100 Gb Ethernet Cable - 30 M
EB5X	QSFP28 AOC 100 Gb Ethernet Cable - 50 M
EB5Y	QSFP28 AOC 100 Gb Ethernet Cable - 100 M
EB2B	1 M Passive QSFP+ to QSFP+
EB2H	3 M Passive QSFP+ to QSFP+
EB27 or EB57	QSFP+ 40G BASE-SR4 optical transceiver MTP/MPO cable (purchased separately) • FC EB2J - 10 M • FC EB2K - 30 M

Voltage

3.3 V, 12 V

Form factor

Short, with full-height tailstock (FC EC66)

Short, low-profile (FC EC67)

Attributes provided

PCI Express 4.0 (up to 16GT/s) x16

PCIe Gen 4.0 compliant (1.1, 2.0, and 3.0 compatible)

RDMA over Converged Ethernet (RoCE)

Dual-port of 100 Gb/s Ethernet per port

NIC and RoCE are concurrently supported

RoCE supported on linux and AIX (7.2, and later)

NIC supported on all OSes

TCP/UDP/IP stateless offload

LSO, LRO, and checksum offload

NIM boot support

The adapter is based on the Mellanox ConnectX-5 adapter, which uses the ConnectX-5 EN Network Controller

Backward compatible with 40 Gb Ethernet when using compatible cables and transceivers

Improves performance and scalability by offloading the CPU from I/O networking tasks

Minimizes CPU overhead by more efficiently using memory access

PowerVM SR-IOV support. For more information see, PowerVM® SR-IOV FAQs.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

Broadcom HBA 9300-8i PCIe3 x8 adapter with 2 mini SAS cables (FC EK41)

Learn about the specifications and operating system requirements for the feature code (FC) FC EK41 adapter.

Overview

The Broadcom HBA 9300-8i PCIe3 adapter is a PCIe generation 3 (Gen3) x8 adapter. The adapter provides increased connectivity and maximum performance for high-end servers and appliances. The FC EK41 is a full height adapter.

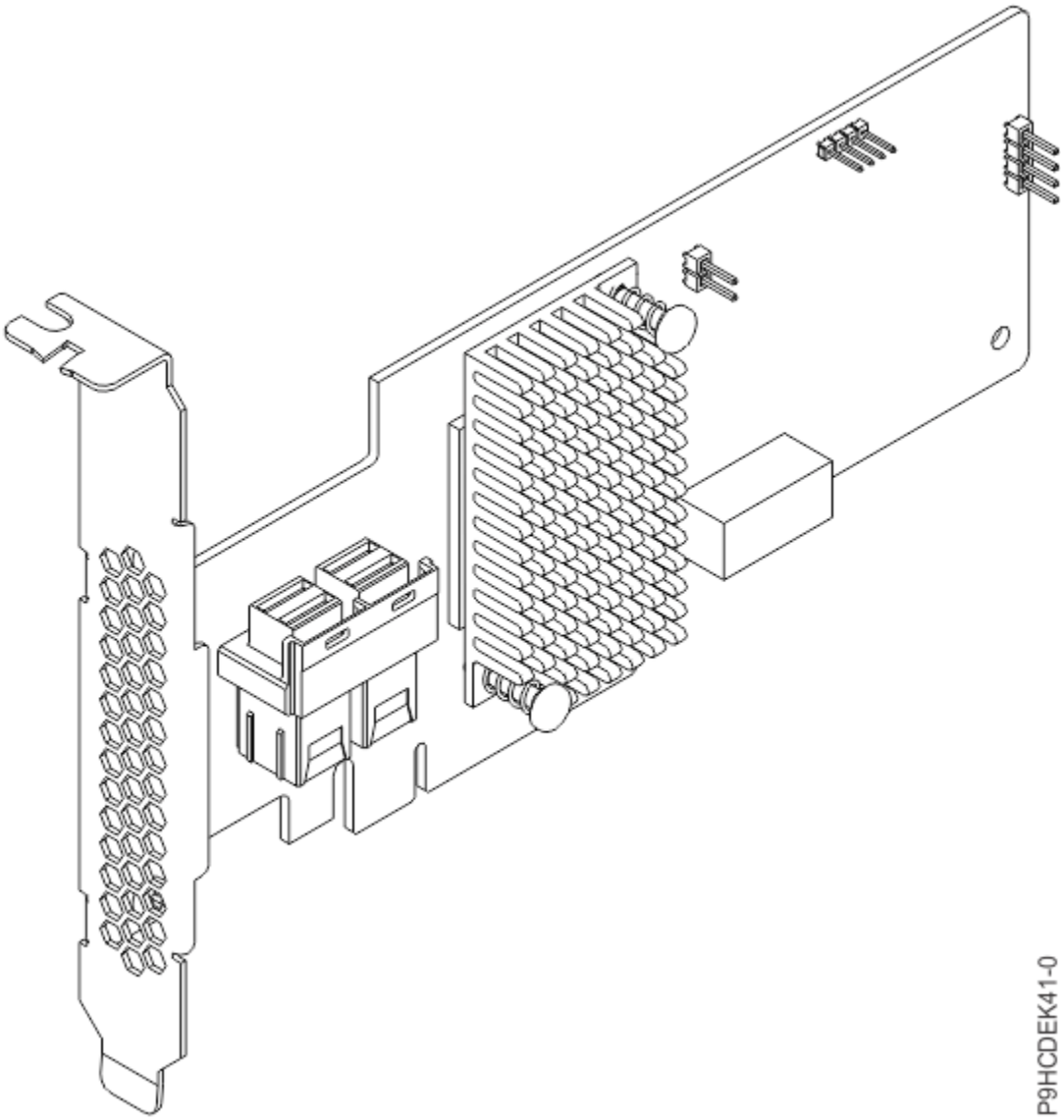


Figure 41. Broadcom HBA 9300-8i PCIe3 x8 adapter

For more information about the Broadcom HBA 9300-8i PCIe3 X8 adapter with 4 mini SAS cables, refer to the Broadcom website (https://www.broadcom.com/products/storage/host-bus-adapters/sas-9300-8i). Refer to sections: **Specifications**, **Documentation**, and **Downloads**.

Specifications

Item
Description

Adapter FRU number
02WG017

I/O bus architecture
PCIe3 x8.

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system on which you are working.

Voltage
3.3 V, 12 V.

Form factor
Short, low-profile.

Attributes provided
Supports SSDs and HDDs.

Eight lanes of PCIe3 adapters provide fast signaling for high-bandwidth applications.

Supports 3.0 Gb/s, 6.0 Gb/s, and 12 Gb/s SAS data transfer rates per lane.

Cables
Attach any necessary cables to the add-on card.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature. You must also determine whether any prerequisites must be met for this feature and for devices that are attached to the adapter. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries, firmware, and utilities can be downloaded from Fix Central (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM SSIC (System Storage® Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- For support details, see the Linux Alert website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

Broadcom HBA 9305-16i PCIe3 X8 with 4 mini SAS cables (FC EK43)

Learn about the specifications and operating system requirements for the feature code (FC) EK43 adapter.

Overview

The Broadcom host bus adapter (HBA) 9305-16i PCIe3 X8 with 4 mini SAS cables is a PCIe generation 3 (Gen3) x8 adapter. The adapter provides increased connectivity and maximum performance for high-end servers and appliances.

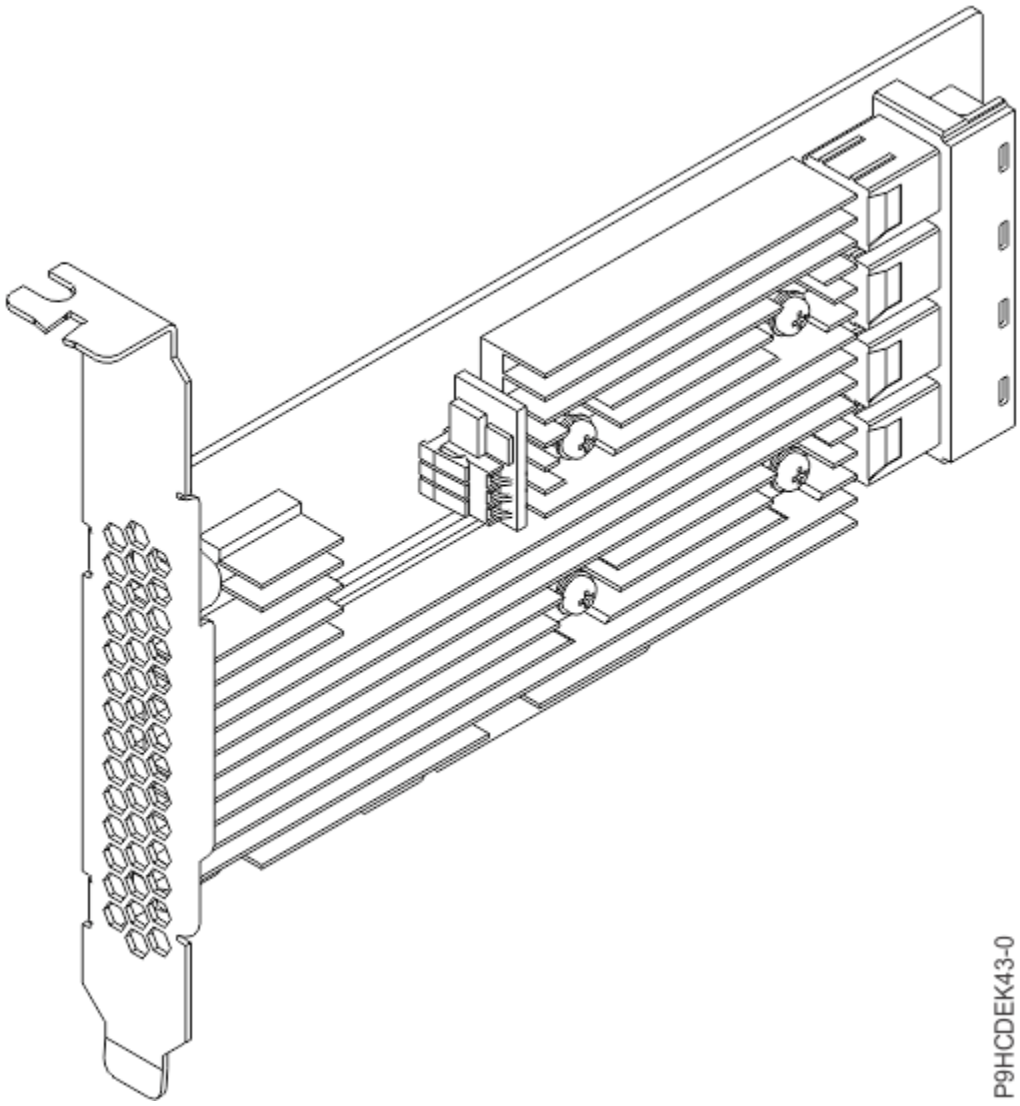


Figure 42. Broadcom HBA 9305-16i PCIe3 x8 adapter

For more information about the Broadcom HBA 9305-16i PCIe3 X8 adapter with 4 mini SAS cables, refer to the Broadcom website (https://www.broadcom.com/products/storage/host-bus-adapters/sas-9305-16i). Refer to sections: **Specifications**, **Documentation**, and **Downloads**.

Specifications

Item
Description

Adapter FRU number
02WG020.

I/O bus architecture
PCIe3 x8.

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system on which you are working.

Voltage
3.3 V, 12 V.

Form factor
Short, low-profile.

Attributes provided
Supports SSDs and HDDs.

Eight lanes of PCIe3 adapters provide fast signaling for high-bandwidth applications.

Supports 3.0 Gb/s, 6.0 Gb/s, and 12 Gb/s SAS data transfer rates per lane.

Cables
Attach any necessary cables to the add-on card.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature. You must also determine whether any prerequisites must be met for this feature and for devices that are attached to the adapter. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries, firmware, and utilities can be downloaded from Fix Central (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- For support details, see the Linux Alert website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

EK47 Broadcom MegaRAID 9361-8i SAS3 X8 - 2 GB cache controller and CacheVault Power Module with 2 mini SAS cables (FC EK47)

Learn about the specifications and operating system requirements for the feature code (FC) EK47 adapter.

Overview

The Broadcom MegaRAID 9361-8i SAS3 X8 controller - 2 GB cache controller and CacheVault Power Module with 2 mini SAS cables is a PCIe generation 3 (Gen3) x8 adapter. The adapter provides increased connectivity and maximum performance for high-end servers and appliances.

Notes:

- The Broadcom MegaRAID 9361-8i adapter supports SED (Self-Encrypting Drives) by using a security key (FC EKWD) and optional passphrase. However, the passphrase option is not supported on Power platforms and must not be used. Setting a passphrase makes the adapter unusable. The only way to recover the adapter will be to install the adapter in a system that supports this feature. You must enter the passphrase from the BIOS in this system and then remove the passphrase.
- For more information about SED support about the Broadcom MegaRAID 9361-8i adapter, see the 12 Gb/s MegaRAID SAS Software User Guide on the Broadcom website.

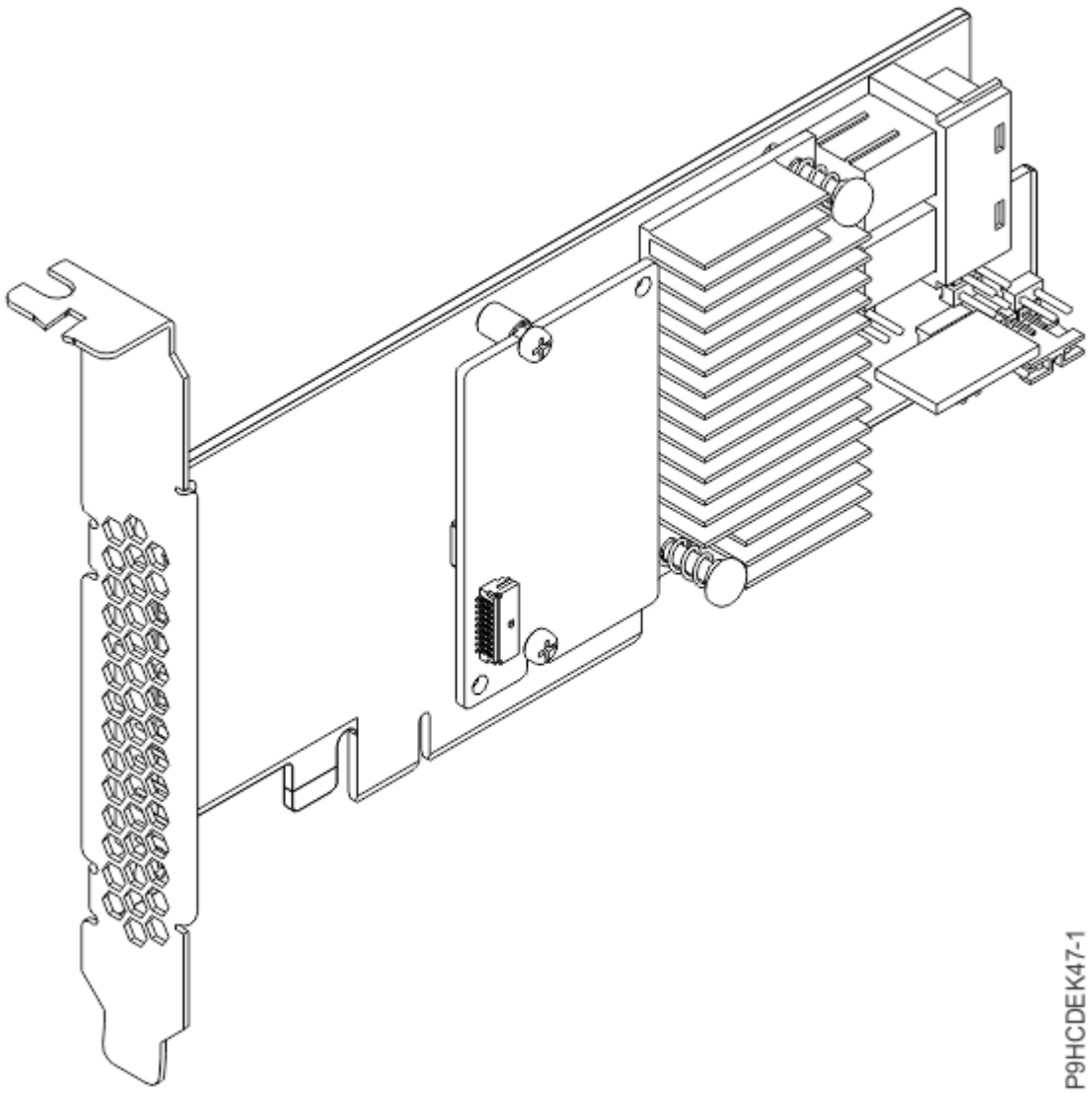


Figure 43. Broadcom 9361-8i SAS3 X8 adapter

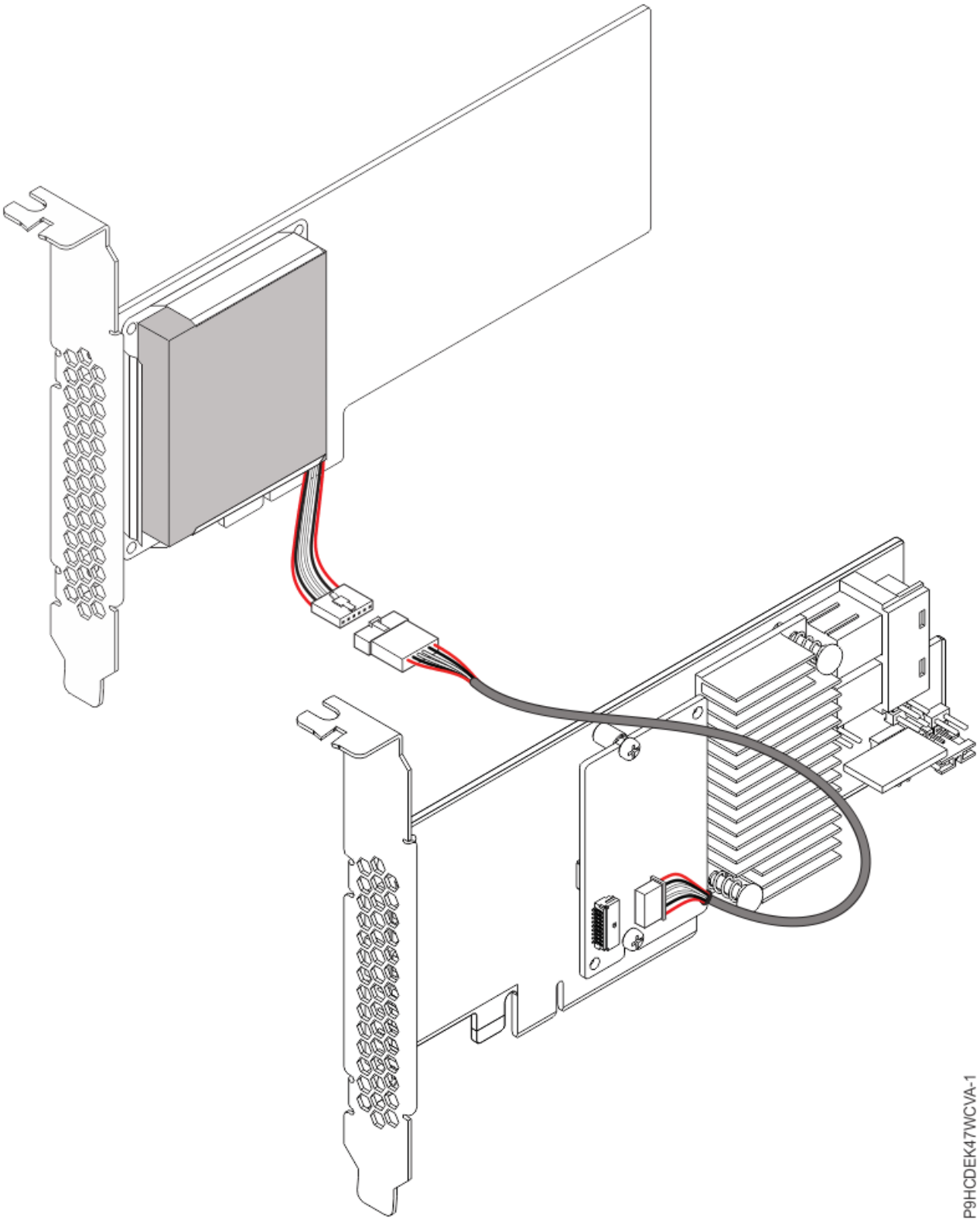


Figure 44. Connecting the Broadcom MegaRAID 9361-8i SAS3 X8 adapter by cable to the CacheVault Power Module

For more information about the Broadcom MegaRAID 9361-8i SAS3 X8 adapter, refer to the Broadcom website (https://www.broadcom.com/products/storage/raid-controllers/megaraid-sas-9361-8i). Use the links **Specifications**, **Documentation**, and **Downloads**.

Specifications

Item
Description

Adapter FRU number
02DE365

CacheVault Power Module FRU number
02WG039

I/O bus architecture
PCIe3 x8.

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system on which you are working.

Voltage
3.3 V, 12 V.

Form factor
Short, low-profile.

Attributes provided
Supports SSDs and HDDs.

Eight lanes of PCIe3 adapters provide fast signaling for high-bandwidth applications.

Supports 3.0 Gb/s, 6.0, Gb/s and 12 Gb/s SAS data transfer rates per lane.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature. You must also determine whether any prerequisites must be met for this feature and for devices that are attached to the adapter. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries, firmware, and utilities can be downloaded from Fix Central (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- For support details, see the Linux Alert website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

NVIDIA T4 PCIe GPU accelerator adapter (FC EK4L and FC EK4M)

Learn about the specifications and operating system requirements for the feature code (FC) EK4L and FC EK4M adapter.

Overview

The NVIDIA T4 PCIe GPU accelerator adapter is a single slot 6.6-inch PCI Express (PCIe) generation 3 (Gen3) universal deep learning accelerator based on the TU104 NVIDIA graphics processing unit (GPU). The adapter can be used in either an x8 or x16 PCIe slot in the system. The NVIDIA T4 adapter has 16 GB GDDR6 memory and a maximum power limit of 70 W. The FC EK4L is a short, low-profile adapter. The FC EK4M is a short adapter with a full-height tail stock.

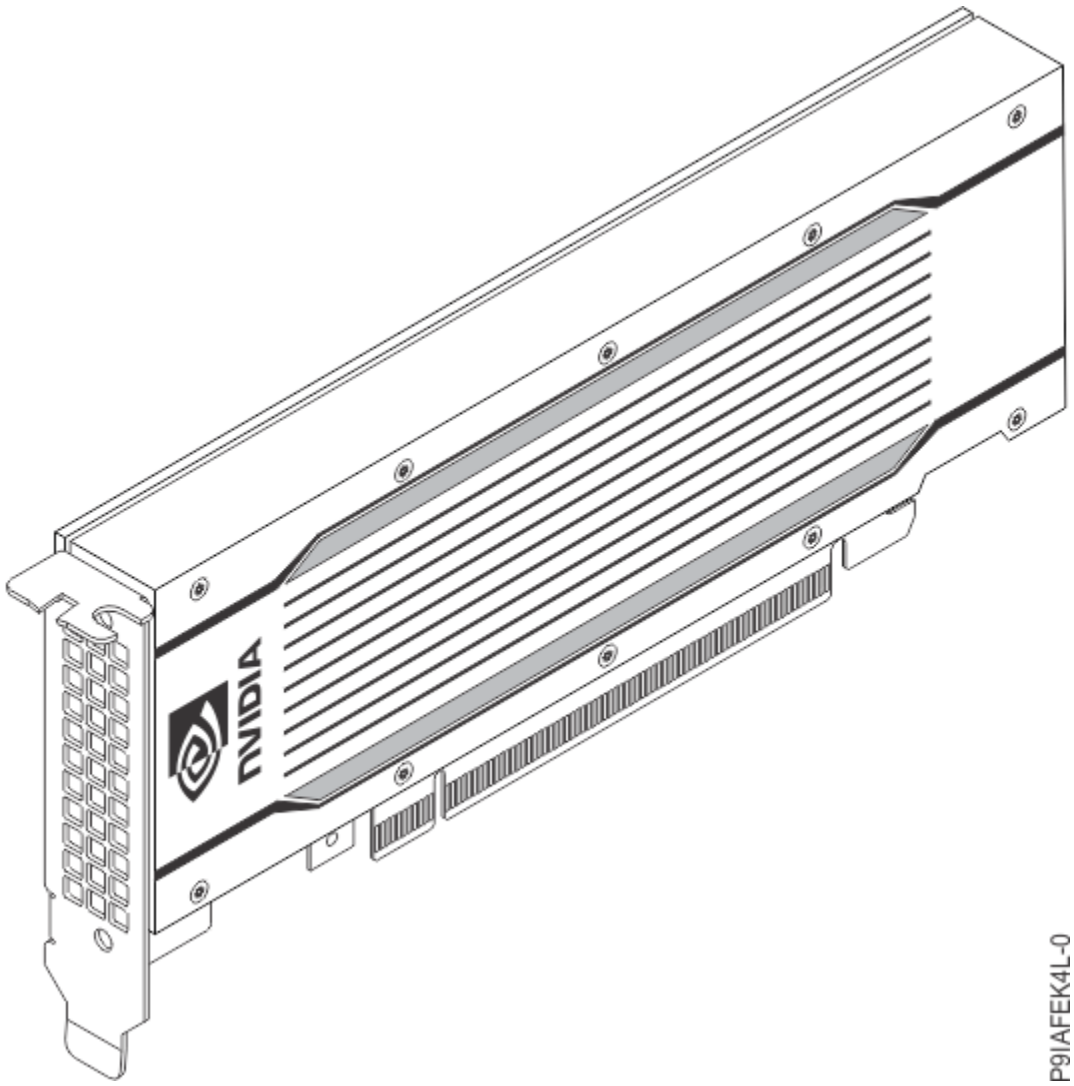


Figure 45. FC EK4L low-profile NVIDIA T4 PCIe GPU accelerator adapter

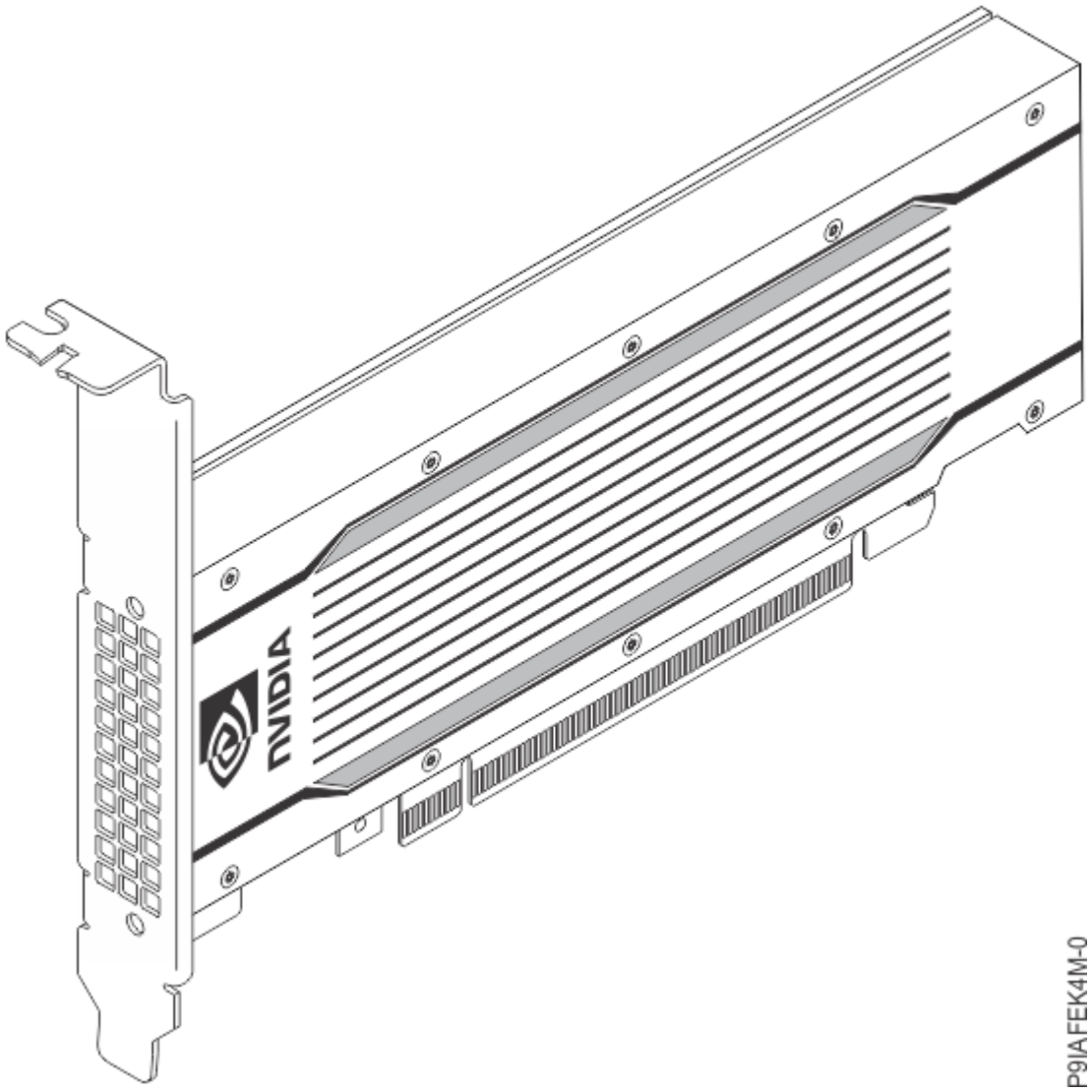


Figure 46. FC EK4M full-height NVIDIA T4 PCIe GPU accelerator adapter

Specifications

Item
Description

Adapter FRU number
Low-profile: 02CM988, high-profile: 02CM978.

I/O bus architecture
PCIe3 x16

Slot requirement
For more information about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system that you are working on.

Voltage
3.3 V, 12 V

Form factor
Short, low-profile (FC EK4L)

Short, with full-height tail stock (FC EK4M)

Attributes provided

The adapter is offered as a passively cooled board that requires system air flow to operate the card within its thermal limits.

Ideal for distributed computing environments.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe3 16 Gb 2-port Fibre Channel adapter (FC EL43, FC EL5B, FC EN0A, and FC EN0B; CCIN 577F)

Learn about the specifications and operating system requirements for the feature code (FC) EL43, EL5B, FC EN0A, and FC EN0B adapter.

Overview

The PCIe3 16 Gb 2-port Fibre Channel adapter is an x8, generation 3 (gen3), PCIe adapter. This adapter is a high-performance x8 short form adapter also referred to as a PCIe Host Bus Adapter (HBA). The adapter provides two ports of 16 Gb Fibre Channel capability using SR optics. Each port can provide up to 16 Gb Fibre Channel functions simultaneously.

The FC EL43 and FC EN0B adapters are short, low-profile adapters and the FC EL5B and FC EN0A are short, regular height adapters.

Each port provides single initiator capability over a fibre link or with NPIV, multiple initiator capability is provided. The ports are SFP+ and include an optical SR transceiver. The ports have little connector-type (LC) and utilize shortwave laser optics. The adapter operates at link speeds of 4, 8 and 16 Gbps and will automatically negotiate to the highest speed possible. LEDs on each port provide information on the status and link speed of the port.

The adapter connects to a Fibre Channel switch at 4 Gb, 8 Gb or 16 Gb. It can directly attach to a device without a switch at 16 Gb. Attachment without a switch is not supported at 4 Gb or 8 Gb.

N_Port ID Virtualization (NPIV) capability is supported through VIOS.

The adapter has the following features:

- The adapter is compliant with the PCIe base and Card Electromechanical (CEM) 2.0 specifications with the following characteristics:
  - Provides an x8 lane link interface at 14.025 Gbps, 8.5 Gbps, or 4.25 Gbps (automatic negotiation with system)
  - Provides support for one Virtual Channel (VC0) and one Traffic Class (TC0)

  - Provides configuration and I/O memory read and write, completion, and messaging capabilities
  - Provides support for 64-bit addressing
  - Provides error correction code (ECC) and error protection functions
  - Provides link cyclic redundancy check (CRC) on all PCIe packets and message information
  - Provides a large payload size of 2048 bytes for read and write functions
  - Provides a large read request size of 4096 bytes
- The adapter is compatible with 4, 8, and 16 Gb Fibre Channel interface with the following characteristics:
  - Provides for automatic negotiation between 4 Gb, 8 Gb, or 16 Gb link attachments
  - Provides support for the following Fibre Channel topologies: point-to-point (16Gb only) and fabric
  - Provides support for Fibre Channel class 3
  - Provides a maximum Fibre Channel throughput that is achieved by using full duplex hardware support
- The adapter provides an end-to-end data path parity and CRC protection, including internal data path random-access memory (RAM)
- Provides architectural support for multiple upper layer protocols
- Provides comprehensive virtualization capabilities with support for N_Port ID Virtualization (NPIV) and virtual fabric (VF)
- Provides support for message signaled interrupts extended (MSI-X)
- Provides support for 255 VFs and 1024 MSi-X
- Provides an internal, high-speed static random-access memory (SRAM) memory
- Provides ECC protection of local memory that includes single-bit correction and double-bit protection
- Provides an embedded shortwave optical connection with diagnostics capability
- Provides support for an on-board context management by firmware:
  - Up to 8192 FC port logins
  - I/O multiplexing down to the Fibre Channel frame level
- Provides data buffers capable of supporting 64+ buffer-to-buffer (BB) credits per port for shortwave applications
- Provides link management and recovery that is handled by firmware
- Provides on-board diagnostic capability accessible by an optional connection
- Provides a performance up to 16 Gbps full duplex

The following figures show the adapter.

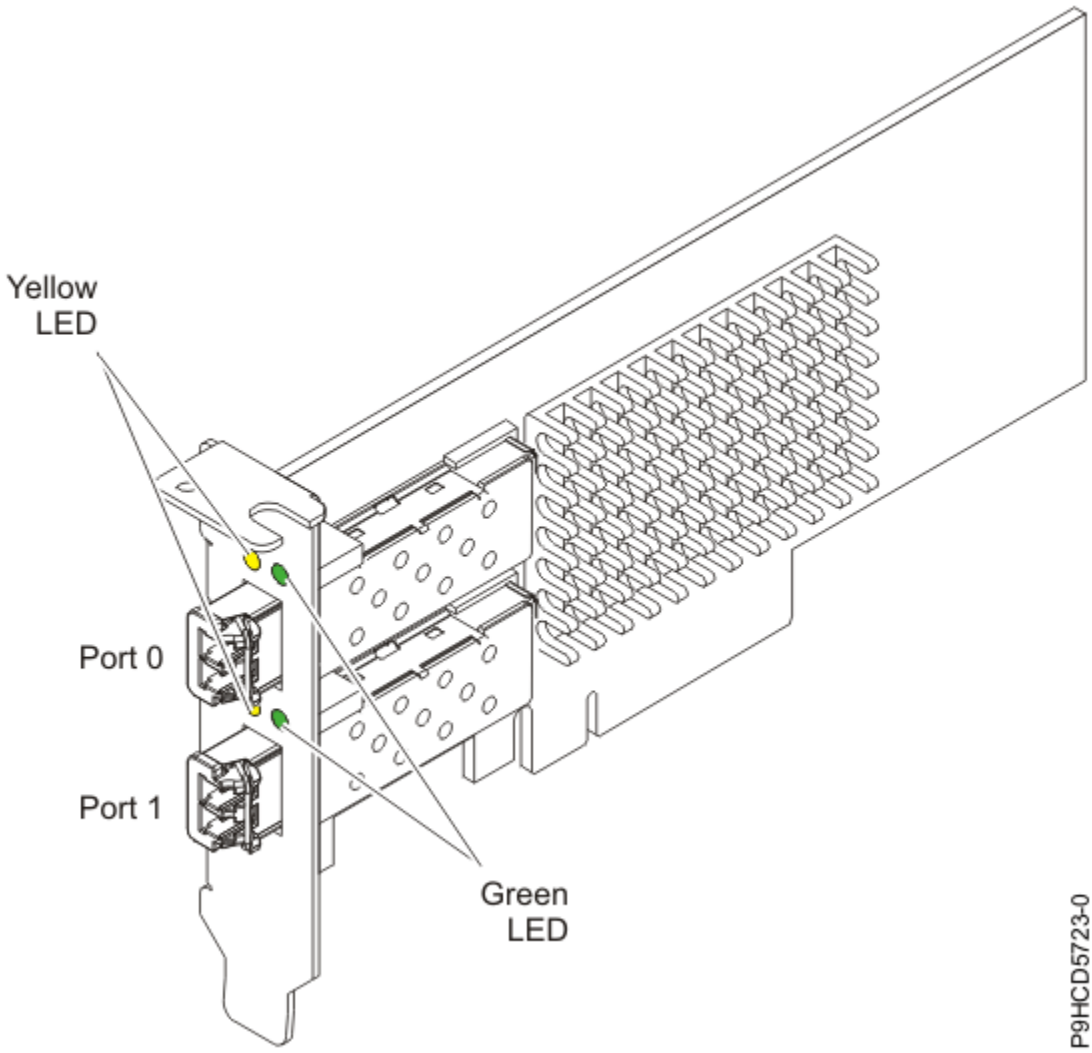


Figure 47. PCIe3 16 Gb 2-port Fibre Channel adapter (FC EL43 and EN0B)

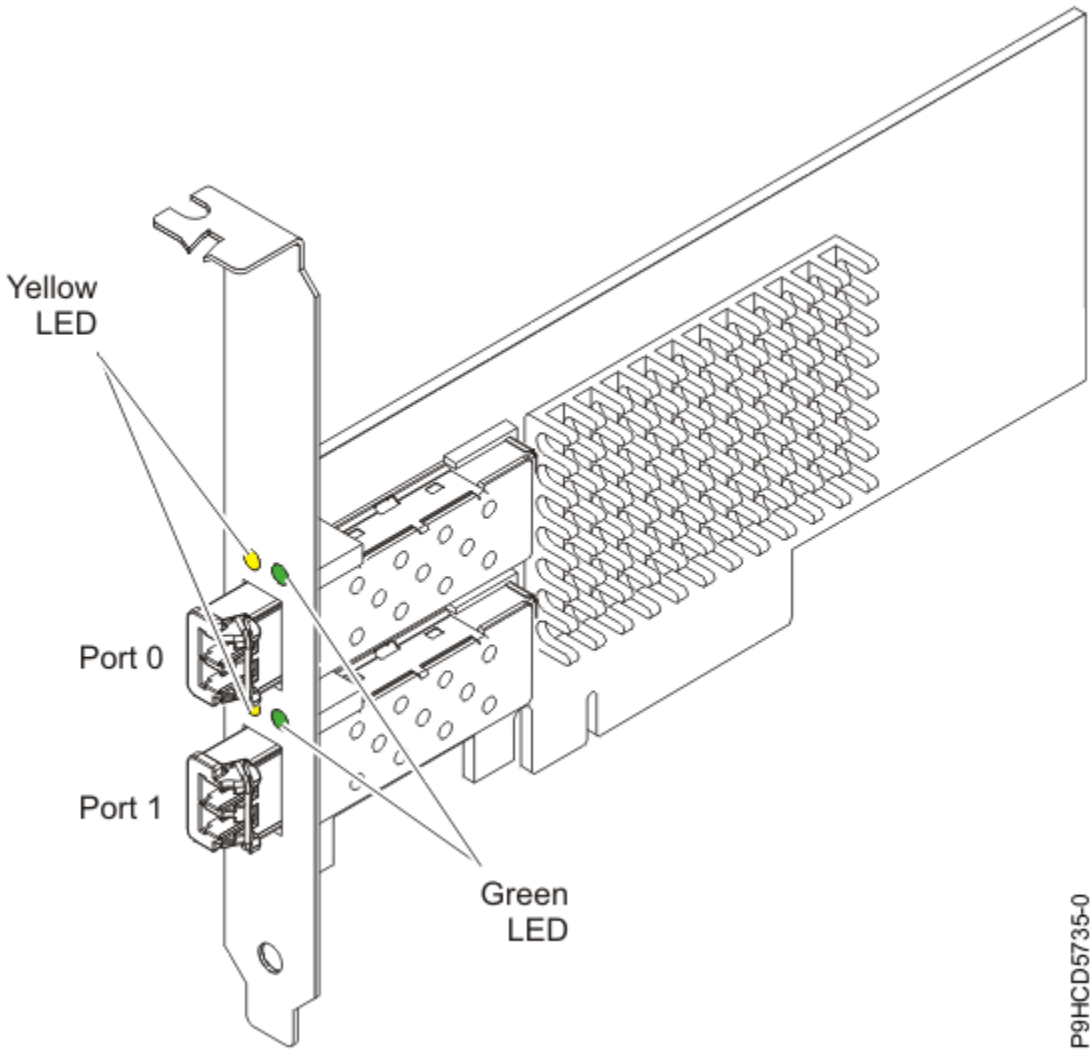


Figure 48. PCIe3 16 Gb 2-port Fibre Channel adapter (FC EL5B and EN0A)

Specifications

Item
Description

Adapter FRU number
00E3496

Wrap plug FRU number
12R9314

Note: The wrap plug is included with the card, and can also be purchased from IBM.

I/O bus architecture
PCIe base and CEM 3.0, x8 PCIe bus interface

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage
3.3 V, 12 V

Form factor
Short, MD2

FC compatibility
4, 8, 16 Gb

Cables
Cables are the responsibility of the customer. Use multimode fiber optic cables with shortwave lasers that adhere to the following specifications:

- OM4: Multimode 50/125 micron fiber, 4700 MHz x km bandwidth
- OM3: Multimode 50/125 micron fiber, 2000 MHz x km bandwidth
- OM2: Multimode 50/125 micron fiber, 500 MHz x km bandwidth
- OM1: Multimode 62.5/125 micron fiber, 200 MHz x km bandwidth

Because core sizes are different, OM1 cables can only be connected to other OM1 cables. For best results, OM2 cables must not be connected to OM3 cables. However, if an OM2 cable is connected to an OM3 cable, the characteristics of the OM2 cable apply to the entire length of the cables.

The following table shows the supported distances for the different cable types at the different link speeds.

Table 16. Supported distances for cables

Header	**Cable type and distance**			
Rate	OM1	OM2	OM3	OM4
4 Gbps	0.5 - 70 m (1.64 - 229.65 ft)	0.5 - 150 m (1.64 - 492.12 ft)	0.5 - 380 m (1.64 - 1246.71 ft)	0.5 - 400 m (1.64 - 1312.34 ft)
8 Gbps	0.5 - 21 m (1.64 - 68.89 ft)	0.5 - 50 m (1.64 - 164.04 ft)	0.5 - 150 m (1.64 - 492.12 ft)	0.5 - 190 m (1.64 - 623.36 ft)
16 Gbps	0.5 - 15 m (1.64 - 49.21 ft)	0.5 - 35 m (1.64 - 114.82 ft)	0.5 - 100 m (1.64 - 328.08 ft)	0.5 - 125 m (1.64 - 410.10 ft)

Adapter LED states

Green and yellow LEDs can be seen through openings in the mounting bracket of the adapter. Green indicates firmware operation, and yellow signifies port activity. Table 17 on page 71 summarizes normal LED states. A 1 Hz pause occurs when the LED is off between each group of fast flashes (2, 3 or 4). Observe the LED sequence for several seconds to ensure that you correctly identify the state.

Table 17. Normal LED states

Green LED	**Yellow LED**	**State**
On	2 fast flashes	4 Gbps link rate: normal, link active
On	3 fast flashes	8 Gbps link rate: normal, link active
On	4 fast flashes	16 Gbps link rate: normal, link active

Power-on-self-test (POST) conditions and results are summarized in Table 18 on page 71. These states can be used to identify abnormal states or problems.

Table 18. POST conditions and results

Green LED	**Yellow LED**	**State**
Off	Off	Wake-up failure of the adapter board

Table 18. POST conditions and results (continued)		
Green LED	**Yellow LED**	**State**
Off	On	POST failure of the adapter board
Off	Slow flash	Wake-up failure monitor
Off	Fast flash	Failure in post
Off	Flashing	Postprocessing in progress
On	Off	Failure while functioning
On	On	Failure while functioning
Slow flash	Off	Normal, link down
Slow flash	On	Not defined
Slow flash	Slow flash	Offline for download
Slow flash	Fast flash	Restricted offline mode, waiting for restart
Slow flash	Flashing	Restricted offline mode, test active
Fast flash	Off	Debug monitor in restricted mode
Fast flash	On	Not defined
Fast flash	Slow flash	Debug monitor in test fixture mode
Fast flash	Fast flash	Debug monitor in remote debug mode
Fast flash	Flashing	Not defined

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe2 4-port (10 Gb + 1 GbE) SR / Copper SFP +RJ45 adapter (FC EN0S, FC EN0T, FC EN0U, and FC EN0V; CCIN 2CC3)

Learn about the specifications and operating system requirements for the feature code (FC) EN0S, FC EN0T, FC EN0U, and FC EN0V adapters.

Overview

The PCIe2 4-port (10 Gb + 1 GbE) SR / Copper SFP +RJ45 adapter is a PCI Express (PCIe) generation 2 (Gen2) x8, short form-factor adapter.

- The FC EN0S and EN0U are short, full height adapters. FC EN0S is an SR adapter whereas FC EN0U is a Copper SFP adapter.
- The FC EN0T and EN0V are short, low-profile adapters. FC EN0T is an SR adapter whereas FC EN0V is a Copper SFP adapter.

The adapter provides two 10 Gb SR optical ports and two 1 Gb RJ45 ports. This adapter provides a PCIe 2.0 host bus interface. The adapter supports the Ethernet network interface controller (NIC) function. The adapter is a high-performance adapter that consolidates traffic for networking. The link aggregation and failover features of the adapter make it suitable for critical network applications that require redundancy and high availability.

The four-port adapter provides two 10 Gb small form-factor pluggable (SFP+) optical SR transceiver ports and two 1 Gb RJ45 Ethernet ports. The two 10 Gb SR ports have little connector (LC) duplex-type connectors. The optical transceiver uses shortwave laser optics and is attached with MMF-850nm fiber cabling with LC connectors. See “Cables” on page 76 for more information about the optical cables. Each 10 Gb port provides Ethernet connectivity with a nominal data rate of 10 Gbps (gigabits per second). Figure 49 on page 74 shows the FC EN0S and FC EN0U adapter. Figure 50 on page 75 shows the FC EN0T and FC EN0V adapter.

Each of the 1 Gb RJ45 port provides Ethernet connectivity at a data rate of 1 Gbps. Each of the 1 Gb ports is connected with a 4-pair, CAT-5 unshielded twisted pair (UTP) cable or with a cable of higher specification, and is supported for distances of up to 100 meters. In addition to 1 Gb (1000 Mb) networks, 100 Mb networks are also supported.

The adapter provides the following features:

- The adapter is a PCIe2 NIC network convergence adapter.
- The 10 Gb SR ports can function in the NIC mode.
- The adapter can be used as the host local area network (LAN) adapter.
- The adapter supports interrupt moderation to deliver increased performance while significantly reducing processor utilization
- The adapter supports dual port operation in any PCIe4 or PCIe3 slot
- The adapter supports auto-negotiation, full-duplex only.
- The adapter supports multiple media-access control (MAC) per interface.
- The adapter supports integrated media-access control (MAC) and physical layer (PHY).
- The adapter supports the following standards for the different ports and functions:
  - IEEE 802.3ae in the 10 GbE ports
  - 802.3ab in the 1 GbE ports
  - Ether II and IEEE 802.3 for encapsulated frames
  - 802.1p for setting up priority levels in tagged VLAN frames
  - 802.1Q for VLAN tagging
  - 802.3x for flow control
  - 802.3ad for load-balancing and failover
  - IEEE 802.3ad and 802.3 for link aggregation

- The adapter provides message signal interrupts (MSI), MSI-X, and support of legacy pin interrupts.
- The adapter supports jumbo frames up to 9.6 KB.
- The adapter supports gigabit EtherChannel (GEC) with the existing software.
- The adapter supports TCP checksum offload transmission control protocol (TCP), user datagram protocol (UDP), TCP segmentation Offload (TSO) for IPv4 and IPv6.
- Supports TCP segmentation or large send offload
- Supports EEPROM-SPI and single EEPROM

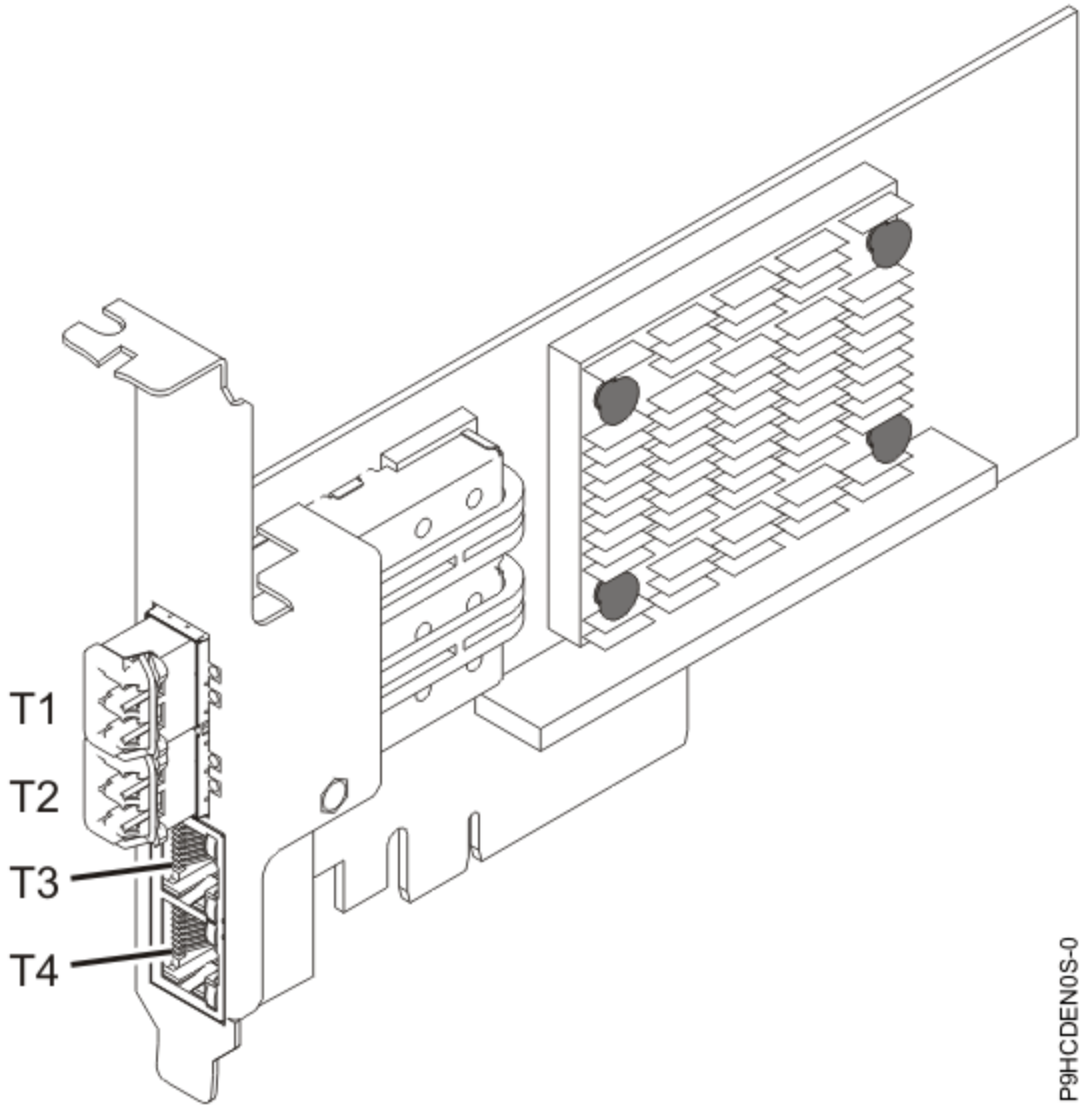


Figure 49. PCIe2 4-Port (10 Gb + 1 GbE) SR / Copper SFP +RJ45 adapter (FC EN0S and FC EN0U)

Note: The ports are numbered from top to bottom as T1, T2, and so on for the AIX and IBM i operating systems.

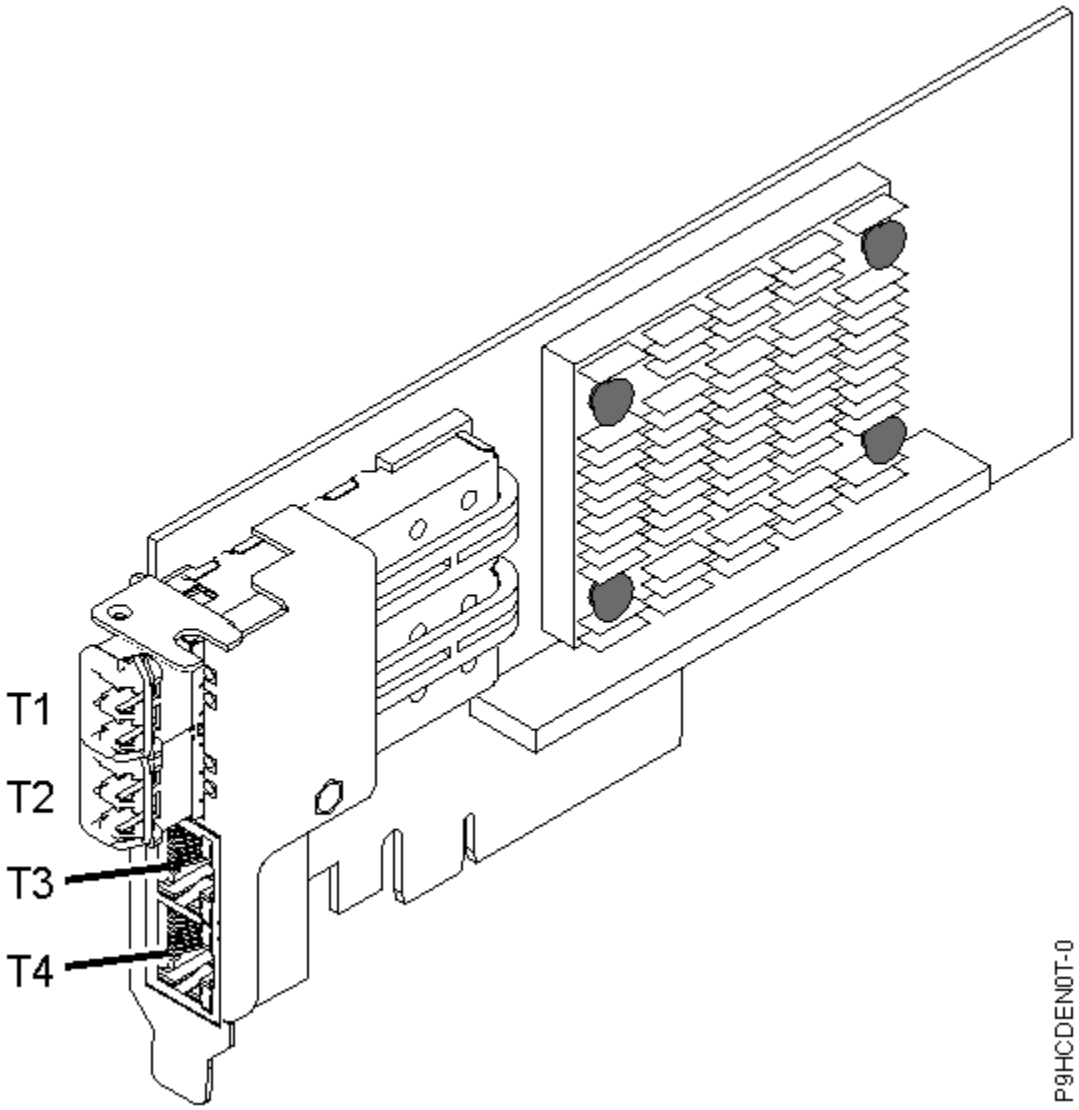


Figure 50. PCIe2 LP 4-port (10Gb+1GbE) SR / Copper SFP +RJ45 adapter (FC EN0T and FC EN0V)

Note: The ports are numbered from top to bottom of the adapter as T1, T2, and so on for the AIX and IBM i operating systems.

Specifications

Item
Description

Adapter FRU number
00E2715

Regular-height tailstock part number: 00E2863

Low-profile tailstock part number: 00E2720

Wrap plug FRU number
12R9314 (SFP+ SR wrap plug)

10N7405 (1 Gb UTP wrap plug)

Note: These wrap plugs are not included with the card. 12R9314 (FC ECW0) is the only wrap plug that can be purchased from IBM.

I/O bus architecture
PCIe2 x8

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage
3.3 V

Form factor
Short, with full-height tailstock

Cables
See "Cables" on page 76 for details.

Cables

Use multimode fiber optic cables with shortwave lasers that adhere to the following specifications:

- OM3 or OM4: Multimode 50/125 micron fiber, 2000 MHz x km bandwidth
- OM2: Multimode 50/125 micron fiber, 500 MHz x km bandwidth
- OM1: Multimode 62.5/125 micron fiber, 200 MHz x km bandwidth

Because core sizes are different, OM1 cables only can be connected to other OM1 cables. For best results, OM2 cables must not be connected to OM3 or OM4 cables. However, if an OM2 cable is connected to an OM3 or OM4 cable, the characteristics of the OM2 cable apply to the entire length of the cables. The following table shows the supported distances for the different fiber optic cable types at different link speeds.

Table 19. Supported distances for multimode fiber optic cables

Header	**Cable Type and Distance**		
Rate	OM1	OM2	OM3
10 Gbps	0.5 meters to 33 meters (1.64 feet to 108.26 feet)	0.5 meters to 82 meters (1.64 feet to 269.02 feet)	0.5 meters to 300 meters (1.64 feet to 984.25 feet)

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

This adapter requires the following drivers:

- AIX: `devices.pciex.e4148a1614109304` for SFP+ optical ports and `devices.pciex.e4148a1614109404` for RJ45 ports

- Linux: bnx2x driver

PCIe2 2-port 10 GbE BaseT RJ45 adapter (FC EL3Z, FC EL55, FC EN0W, and FC EN0X; CCIN 2CC4)

Learn about the specifications and operating system requirements for the feature code (FC) EL3Z, FC EL55, FC EN0W, or FC EN0X adapter.

Overview

The PCIe2 2-port 10 GbE BaseT RJ45 adapter is a PCI Express (PCIe) generation 2, x8 adapter. The FC EL3Z and FC EN0X are short form-factor, low-profile adapters. The FC EL55 and FC EN0W are regular height adapters that are low profile capable. The adapters provide two 10 Gb RJ45 ports and a PCIe 2.0 host bus interface. The adapters support the Ethernet network interface controller (NIC) function. The adapters are high-performance adapters that consolidate traffic for networking. The link aggregation and failover features of the adapters make them suitable for critical network applications that require redundancy and high availability.

The ports default to auto negotiate the highest speed either at 10 Gb (10G BaseT), 1Gb (1000 BaseT), or 100 Mb (100 BaseT) full duplex. Each RJ45 port can be configured independent of the other port. The RJ45 ports use 4-pair CAT-6A cabling for distances of up to 100 meters or CAT-6 cabling for distances up to 37 meters. CAT-5 cabling is not supported.

The adapter provides the following features:

- The adapter is a PCIe2 NIC network convergence adapter.
- The 10 Gb RJ45 ports can function in the NIC mode.
- The adapter can be used as the host local area network (LAN) adapter.
- The adapter supports interrupt moderation to deliver increased performance while significantly reducing processor utilization
- The adapter supports dual port operation in any PCIe3 or PCIe2 slot.
- The adapter supports auto-negotiation, full-duplex only.
- The adapter supports multiple media-access control (MAC) per interface.
- The adapter supports integrated media-access control (MAC) and physical layer (PHY).
- The adapter supports the following standards for the different ports and functions:
  - IEEE 802.3ae in the 10 GbE ports
  - 802.3ab in the 1 GbE ports
  - Ether II and IEEE 802.3 for encapsulated frames
  - 802.1p for setting up priority levels in tagged VLAN frames
  - 802.1Q for VLAN tagging
  - 802.3x for flow control
  - 802.3ad for load-balancing and failover
  - IEEE 802.3ad and 802.3 for link aggregation
- The adapter provides message signal interrupts (MSI), MSI-X, and support of legacy pin interrupts.
- The adapter supports jumbo frames up to 9.6 KB.
- The adapter supports gigabit EtherChannel (GEC) with the existing software.
- The adapter supports TCP checksum offload transmission control protocol (TCP), user datagram protocol (UDP), TCP segmentation Offload (TSO) for IPv4 and IPv6.
- Supports TCP segmentation or large send offload
- Supports EEPROM-SPI and single EEPROM

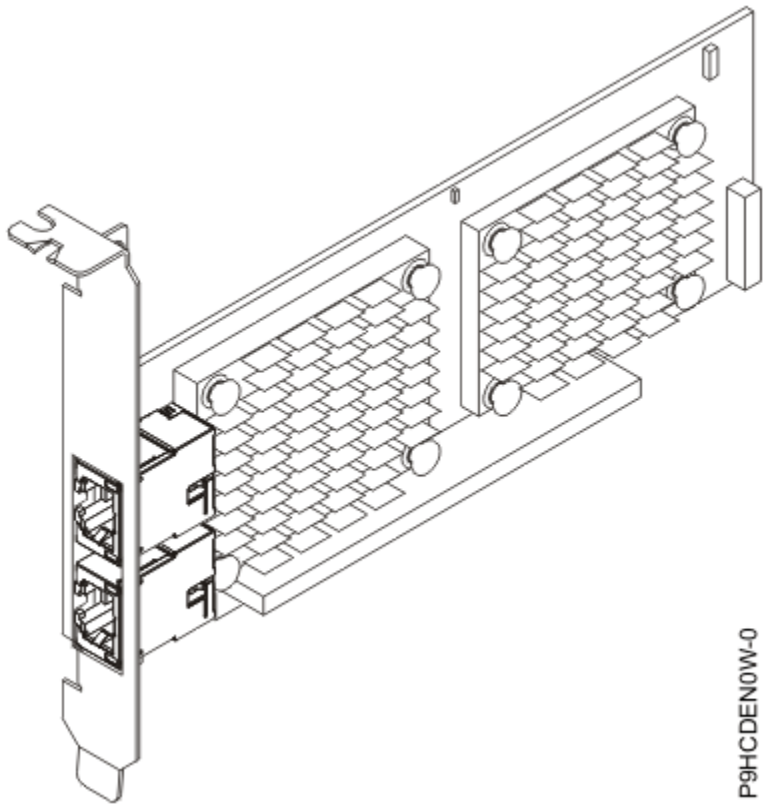


Figure 51. PCIe2 2-port 10 GbE BaseT RJ45 adapter (FC EL55 or FC EN0W)

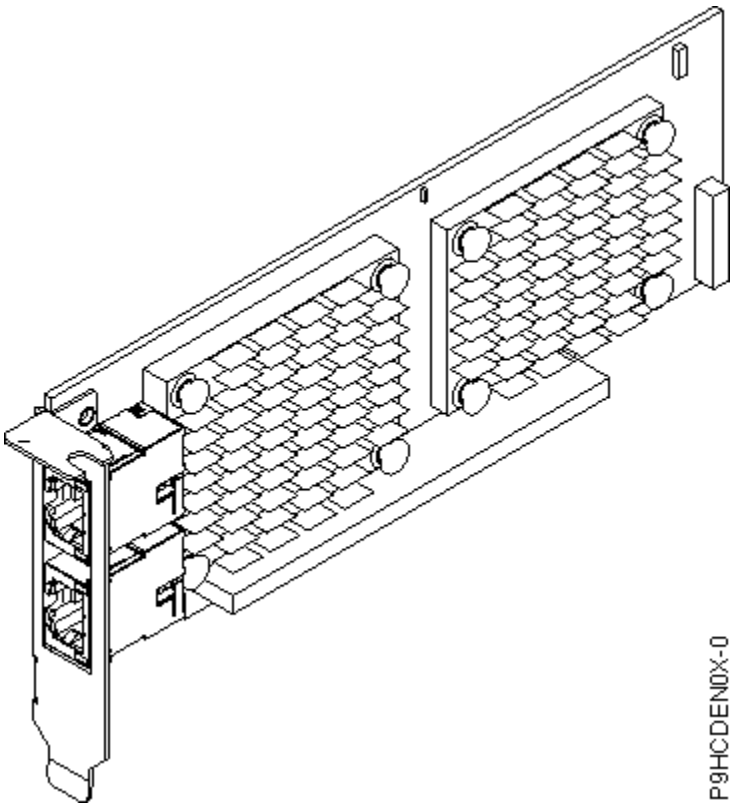


Figure 52. PCIe2 LP 2-port 10 GbE BaseT RJ45 adapter (FC EL3Z or FC EN0X)

Specifications

Item
Description

Adapter FRU number
00E2714

Regular-height tailstock part number: 00E2862.

Low-profile tailstock part number: 00E2721.

Wrap plug FRU number
10N7405 (RJ45 wrap plug).

Note: Wrap plugs are not included with the card and cannot be purchased from IBM.

I/O bus architecture
PCIe2 x8.

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Cables
CAT-6 cable.

CAT-6A cable.

Voltage
3.3 V.

Form factor
Short, low-profile.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

This adapter requires the following drivers:

- AIX: `devices.pciex.e4148e1614109204`
- Linux: `bnx2x driver`

PCIe3 x8 2-port Fibre Channel (32 Gb/s); (FC EN1A, EN1B, EL5U, and EL5V; CCIN 578F)

Learn about the specifications and operating system requirements for feature code (FC) EN1A, EN1B, EL5U, and EL5V adapters.

Overview

FC EN1A, EN1B, EL5V, and EL5U are electronically identical. FCs EN1A and EL5U are full-height adapters, and FCs EN1B and EL5V are low-profile adapters.

The PCIe3 x8 2-port Fibre Channel (32 Gb/s) Adapter is a PCI Express (PCIe) generation 3 (Gen3) x16 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. This adapter is a high performance adapter that is based on the Emulex LPe32000-series PCIe host bus adapter (HBA). The adapter provides two ports of 32 Gb Fibre Channel capability that uses SR optics. Each port can provide up to 32 Gb Fibre Channel functions simultaneously. Each port provides single initiator capability over a fiber link or with NPIV, multiple initiator capabilities is provided. The ports are SFP+ and include an optical SR transceiver. The ports have LC type connectors and use shortwave laser optics. The adapter operates at link speeds of 4, 8, 16, and 32 Gbps and automatically negotiates to the highest speed possible. Each port has two LED indicators that are on the bracket next to each connector. These LEDs communicate boot status and give a visual indication of the operating state. The LEDs have five defined state; solid on, solid off, slow flash, fast flash, and steady flashing. The slow flash rate is 1 Hz. The fast blink is 4 Hz, and the flashing refers to an irregular on/off transition that reflects test progress. The operator must observe the LED sequence for several seconds to ensure that the operating state is correctly identified.

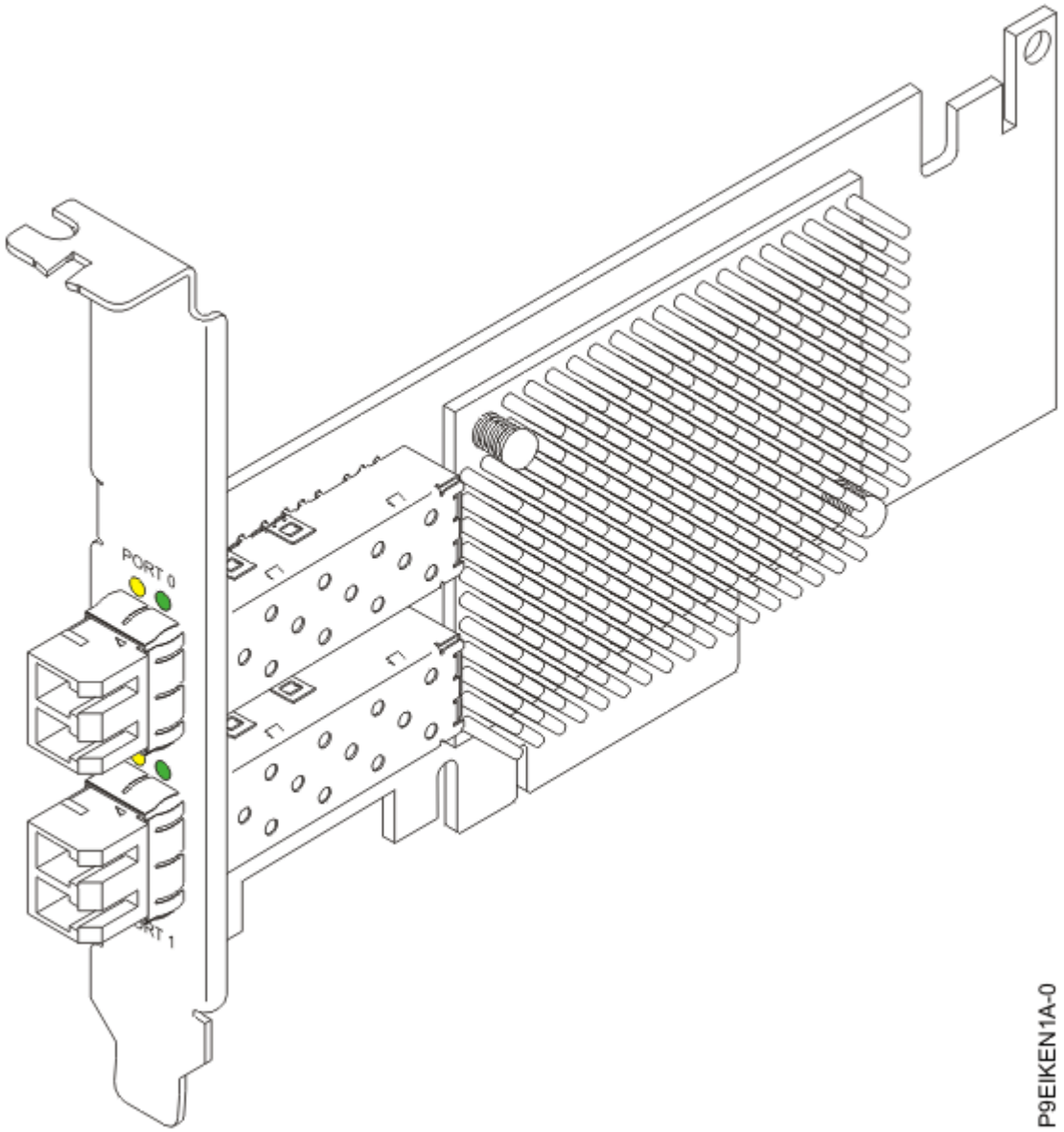


Figure 53. PCIe3 x8 2-port Fibre Channel (32 Gb/s)

Specifications

Item
Description

Adapter FRU number
01FT704

I/O bus architecture
PCIe3 x16.

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage
3.3 V, 12 V.

Form factor
Short, low-profile.

Maximum number

For details about the maximum number of adapters that are supported, see Adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Attributes provided

32 Gb/s of throughput.

Enhanced diagnostics and manageability.

Unparalleled performance and more efficient port usage.

Single initiator capability over a fiber link or with NPIV.

Multiple initiator capabilities.

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

PCIe3 x8 4-port Fibre Channel (16 Gb/s); (FC EL5W, EL5X, EN1C, and EN1D; CCIN 578E)

Learn about the specifications and operating system requirements for feature code (FCs) EL5W, EL5X, EN1C, and EN1D (EL5X) adapters.

Overview

The FC EN1C (EL5W) and EN1D (EL5X) are electronically identical. FC EN1C (EL5W) is a full-height adapter and FC EN1D (EL5X) is a low-profile adapter.

The PCIe3 x8 4-port fibre Channel (16 Gb/s) Adapter is a PCI Express (PCIe) generation 3 (Gen3) x8 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. This adapter is a high-performance adapter that is based on the Emulex LPe31004-series PCIe host bus adapter (HBA). The adapter provides four ports of 16 Gb Fibre Channel capability that uses SR optics. Each port can provide up to 16 Gb Fibre Channel functions simultaneously. Each port provides single initiator capability over a fibre link or with NPIV, multiple initiator capability is provided. The ports are SFP+ and include an optical SR transceiver. The ports have LC type connectors and use shortwave laser optics. The adapter operates at link speeds of 4, 8, and 16 Gbps and automatically negotiates to the highest speed possible. Each port has two LED indicators that are located on the bracket next to each connector. These LEDs communicate boot status and give a visual indication of the operating state. The LEDs have five defined state; solid on, solid off, slow blink, fast blink, and flashing. The slow blink rate is 1 Hz, the fast blink is 4 Hz, and the flashing refers to an irregular on/off transition that reflects test progress. The operator should observe the LED sequence for several seconds to ensure that the operating state is correctly identified.

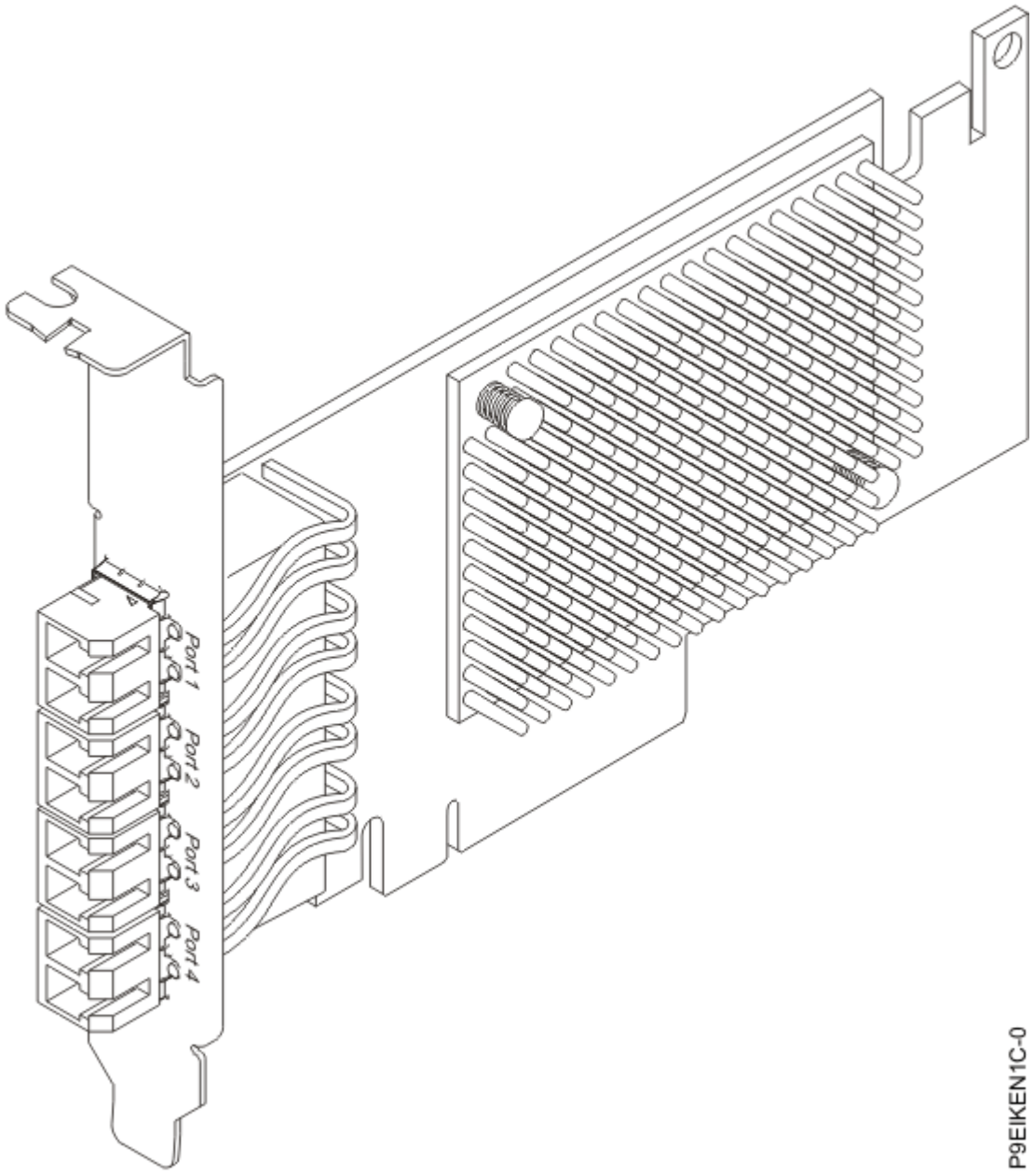


Figure 54. PCIe3 x8 4-port fibre Channel (16 Gb/s)

Specifications

Item
Description

Adapter FRU number
01FT699

12R9314

I/O bus architecture
PCIe3 x8

Slot requirement
For details about slot priorities, maximums, and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage
3.3 V, 12 V

Form factor
Short, low-profile

Maximum number
For details about the maximum number of adapters that are supported, see Adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER9/p9eab/p9eab_mtm_pciplacement.htm) and select the system you are working on.

Attributes provided
Enhanced diagnostics and manageability

Unparalleled performance and more efficient port utilization

Single initiator capability over a fibre link or with NPIV

16 Gb/s of throughput per port

Multiple initiator capability

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and you must determine any prerequisites that must be met for this feature and the attached devices. For information about operating system and partition requirements, see one of the following topics:

- The latest version of enabling libraries and utilities can be downloaded from the Fix Central website (http://www.ibm.com/support/fixcentral/).
- Power Systems Prerequisites website (http://www14.software.ibm.com/support/customercare/iprt/home).
- IBM System Storage Interoperation Center (SSIC) website (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss).
- The latest version of the device driver or IBM Power RAID adapter utilities (iprutils) can be downloaded from the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html).
- For information about important notices for Linux on IBM Power Systems, see the Linux on IBM website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).

Installing a PCIe adapter in the 9183-22X system

To install a PCIe adapter, complete the steps in this procedure.

Before you begin

Power off the system and place it in the service position. For instructions, see “Preparing the 9183-22X system to remove and replace internal parts” on page 99.

Notes:

- If you are installing or replacing a Broadcom 93xx adapter (FC EK41, FC EK43, or FC EK47), it must be installed in slot 5 or 10. If you are installing an FC EK47 Broadcom adapter, you must install the CacheVault Power Module in slot 2 (if you use slot 5 to install the adapter) or slot 7 (if you use slot 10 to install the adapter).
- If a CacheVault power module is attached to the adapter, install or replace the CacheVault power module and cable. For details, see the Broadcom web site (https://www.broadcom.com/products/storage/raid-controllers/megaraid-sas-9361-8i). Select **Documentation** > **Quick Installation Guides** > **LSICVM02 Kit Quick Installation Guide**.

About this task

Attention: For safety and airflow purposes, if you remove parts from the system, you must ensure that:

- PCIe tailstock fillers are present.
- System airflow baffle is present.

Procedure

1. Attach the electrostatic discharge (ESD) wrist strap.

   The ESD wrist strap must be connected to an unpainted metal surface until the service procedure is completed, and if applicable, until the service access cover is replaced.

   Attention:

   - Attach an electrostatic discharge (ESD) wrist strap to the front ESD jack, to the rear ESD jack, or to an unpainted metal surface of your hardware to prevent the electrostatic discharge from damaging your hardware.
   - When you use an ESD wrist strap, follow all electrical safety procedures. An ESD wrist strap is used for static control. It does not increase or decrease your risk of receiving electric shock when using or working on electrical equipment.
   - If you do not have an ESD wrist strap, just prior to removing the product from ESD packaging and installing or replacing hardware, touch an unpainted metal surface of the system for a minimum of 5 seconds. If at any point in this service process you move away from the system, it is important to again discharge yourself by touching an unpainted metal surface for at least 5 seconds before you continue with the service process.

2. Lift the air baffle **(A)** straight up as shown in the following figure.

   Place the air baffle on a clean area.

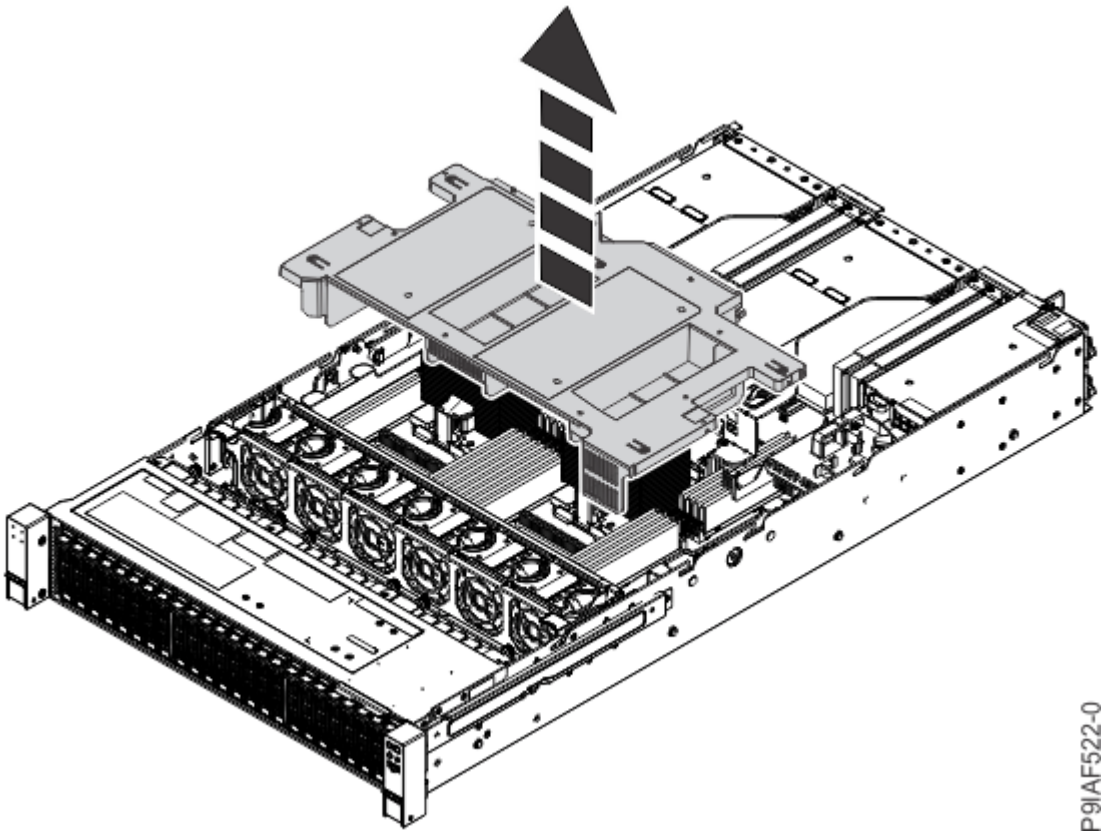


Figure 55. Removing the air baffle

3. Determine where the PCIe adapter is plugged.
   - If the PCIe adapter is plugged into the system backplane, continue with step “4” on page 86.
   - If the PCIe adapter is plugged into a PCIe riser, continue with step “7” on page 87.
4. Remove the PCIe slot cover from the system backplane by removing the tailstock screw and lifting the tailstock filler.

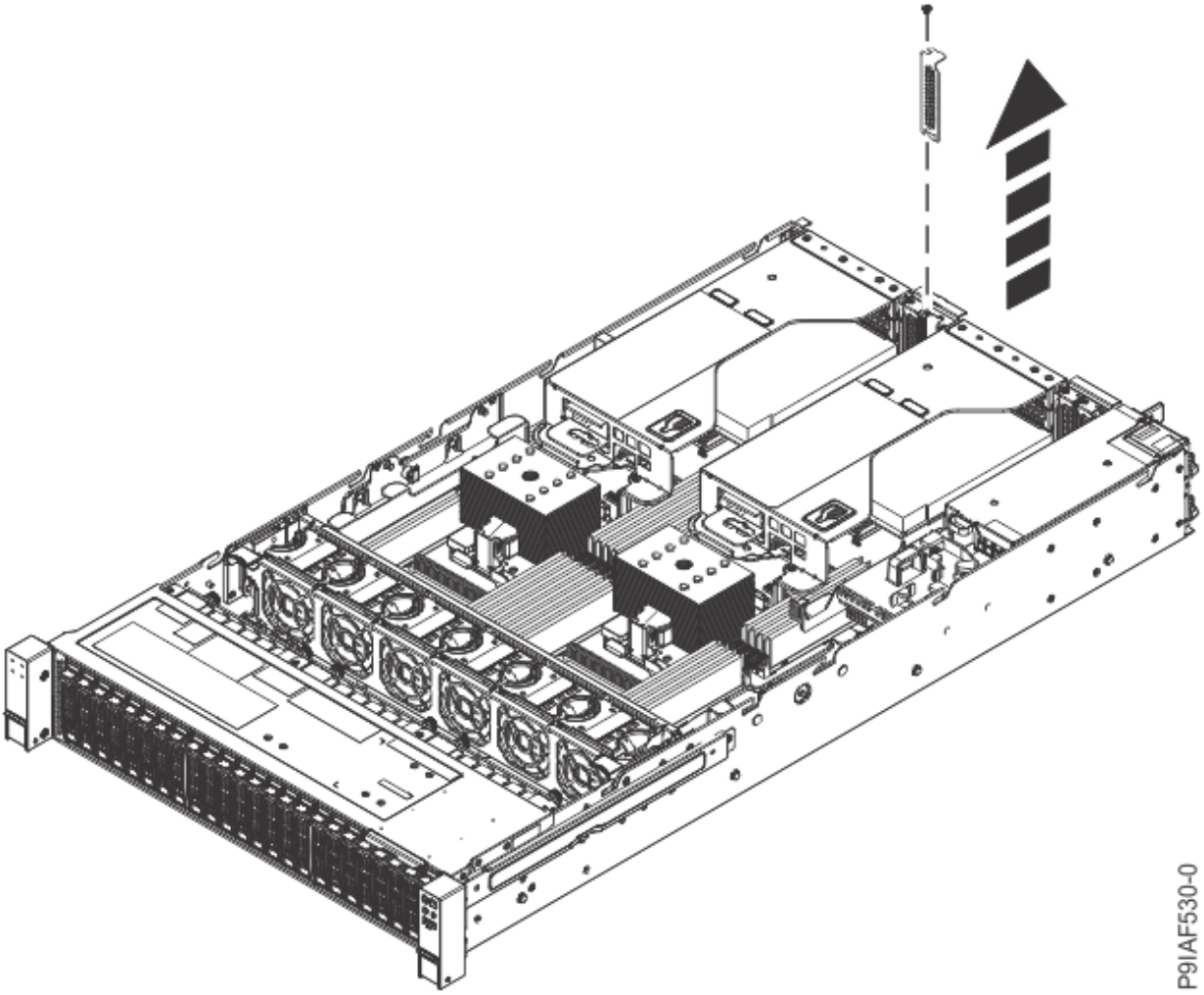


Figure 56. Removing the PCIe tailstock filler

5. If needed, label and remove any plugs that extend out of the PCIe adapter.
6. Insert the PCIe adapter, aligning it properly and inserting it fully into the slot as shown in the following figure. Replace the tailstock screw to secure the PCIe adapter to the system.

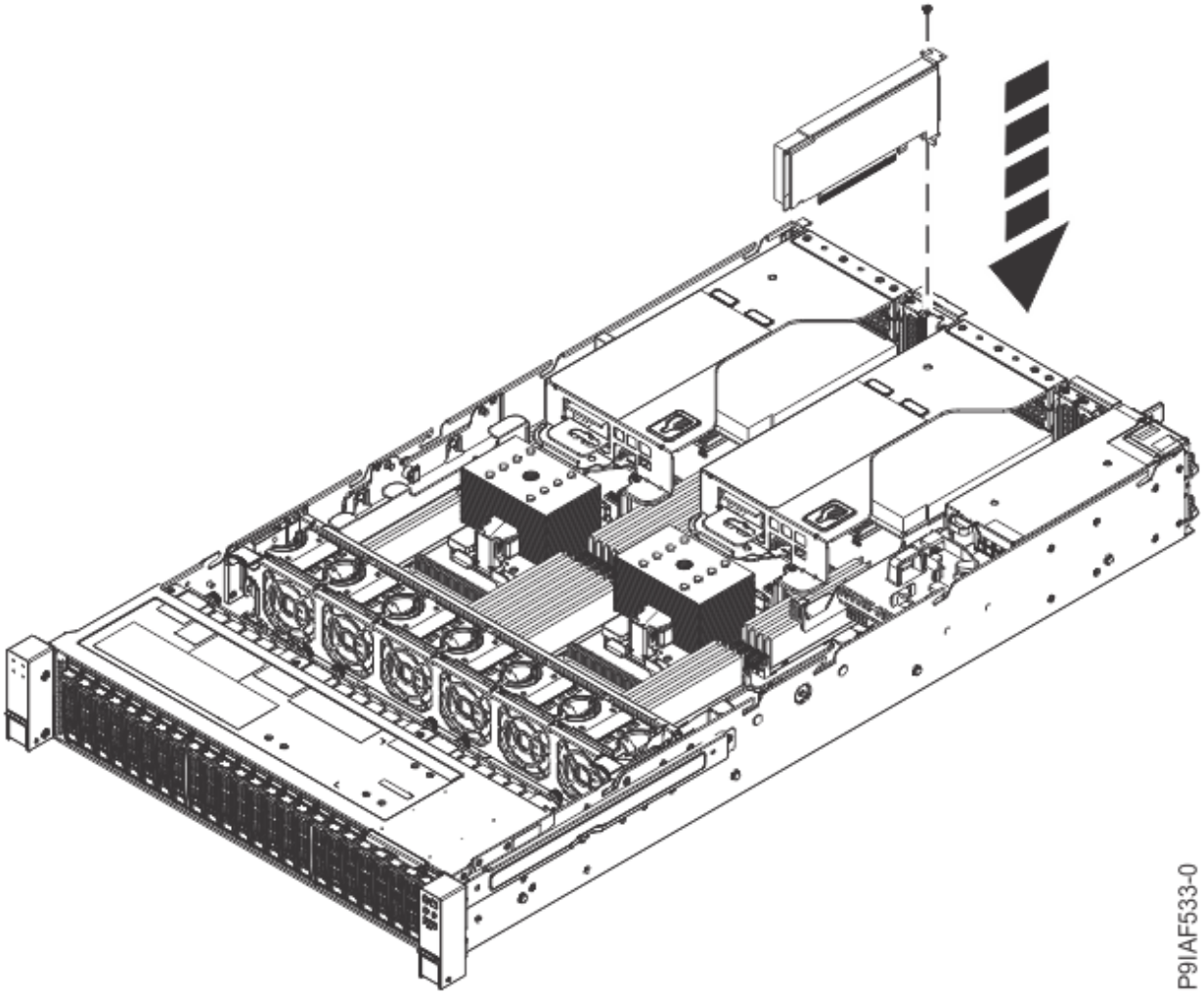


Figure 57. Inserting a PCIe adapter

Continue with step “8” on page 90.

7. To insert a PCIe adapter into a PCIe riser, complete the following steps:
   a) Lift the PCIe riser up, out of the system as shown in the following figure.

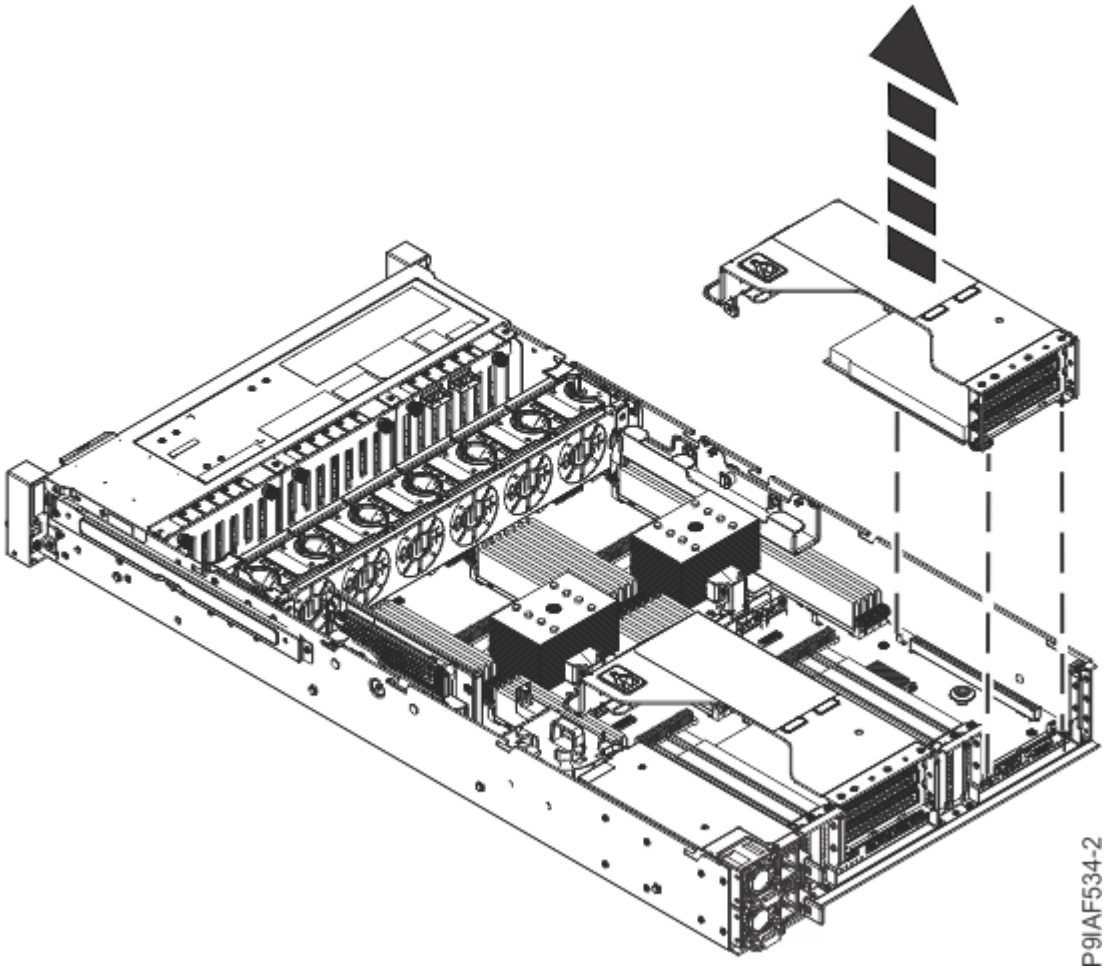


Figure 58. Removing the PCIe riser

b) Removing the tailstock screw and remove the PCIe tailstock filler **(A)** from the riser **(B)** as shown in the following figure.

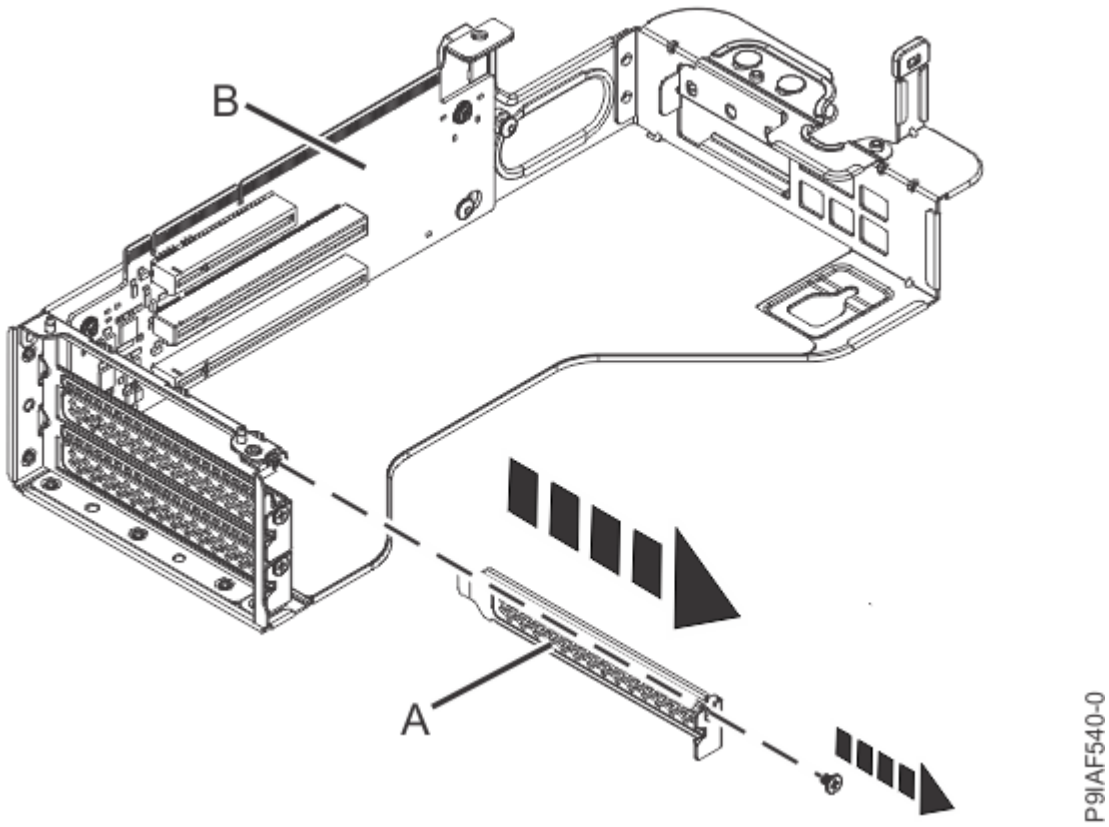


Figure 59. Removing a PCIe tailstock filler from a riser

c) Insert the PCIe adapter **(A)** into the proper slot in the PCIe riser **(B)** as shown in the following figure. Replace the tailstock screw to secure the PCIe adapter to the PCIe riser.

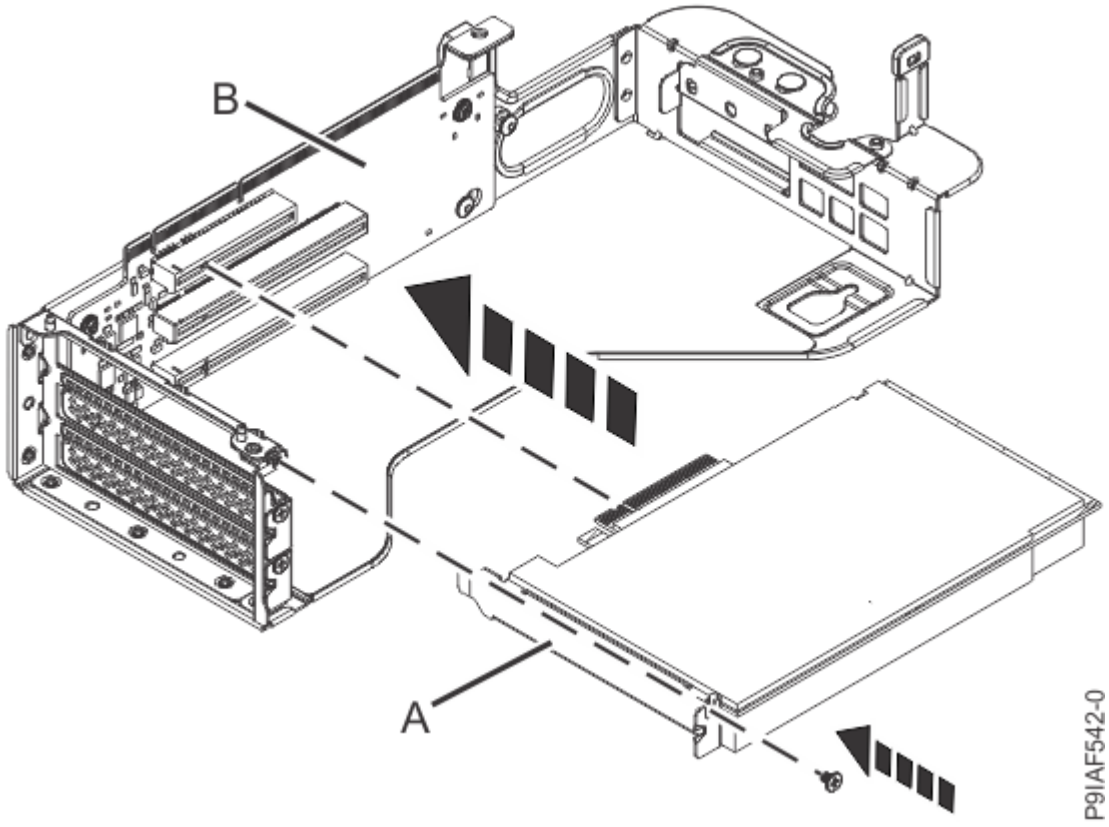


Figure 60. Inserting a PCIe adapter into the PCIe riser

d) Insert the PCIe riser into the system backplane as shown in the following figure.

Insert the riser, by using the slots and alignment pins **(A)** to properly insert the riser. Push the riser firmly into the system backplane.

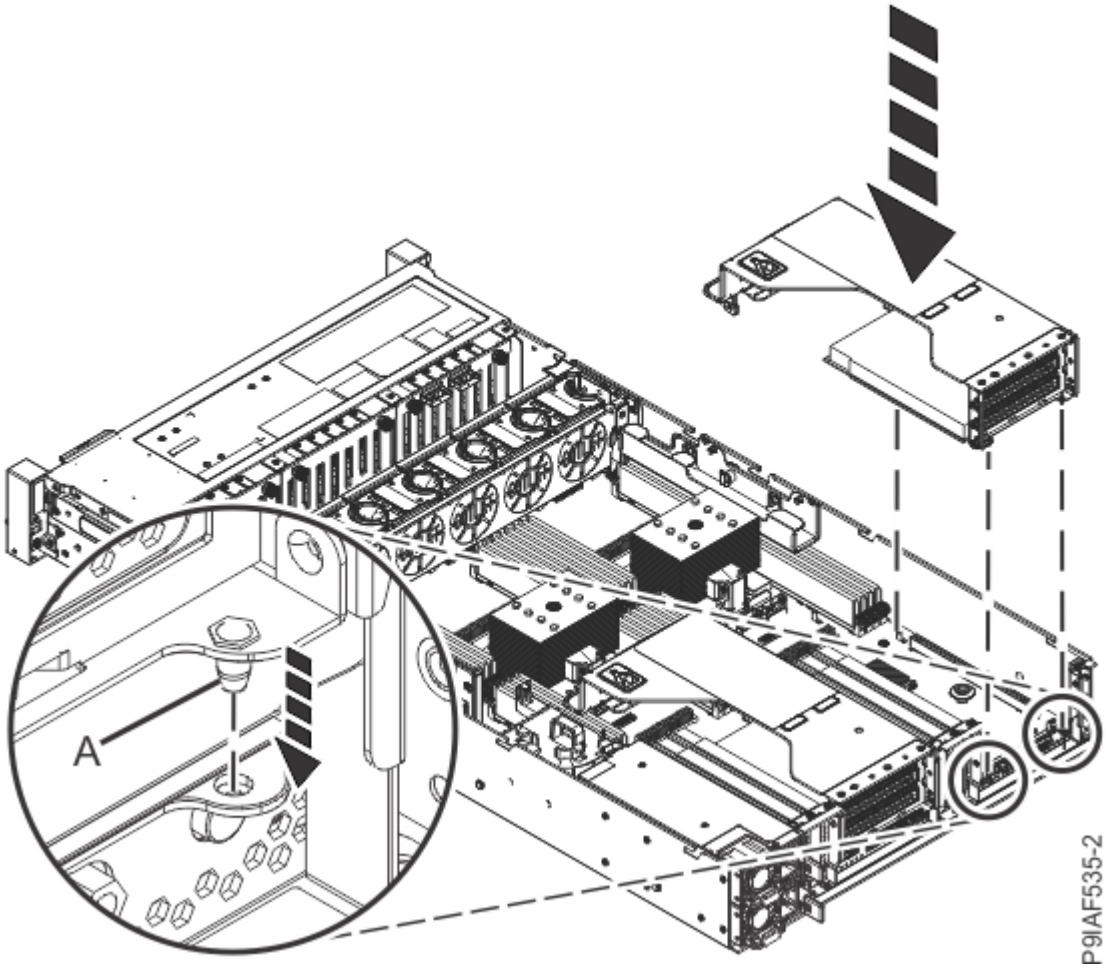


Figure 61. Inserting the PCIe adapter riser

8. Replace any plugs that you removed from the PCIe adapter. Insert the cables into the PCIe adapter.
9. Replace the air baffle **(A)** straight down into the chassis as shown in the following figure.

   Ensure that the pins inside the system side walls align properly with the slots in the cover **(B)**.

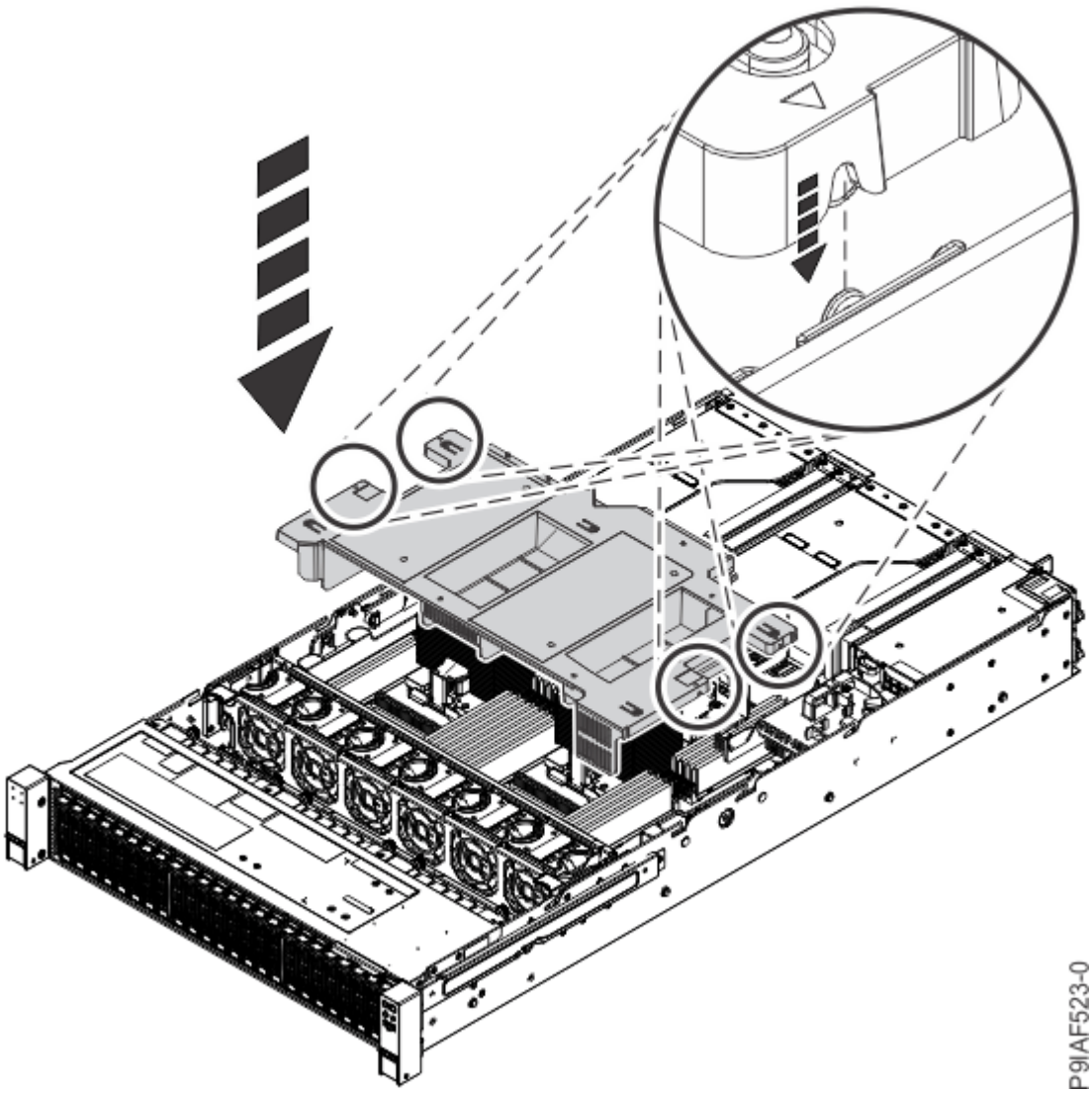


Figure 62. Replacing the air baffle

What to do next

Prepare the system for operation. For instructions, see “Preparing the 9183-22X system for operation after you remove and replace internal parts” on page 103.

Common procedures for servicing or installing features in the 9183-22X system

Learn about the common procedures related to installing, removing, and replacing features in the system.

Before you begin

Observe these precautions when you are installing, removing, or replacing features and parts in the IBM Power System IC922 (9183-22X) server.

About this task

These precautions are intended to create a safe environment to service your system and do not provide steps for servicing your system. The installation, removal, and replacement procedures provide the step-by-step processes that are required to service your system.

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.
- When performing a machine inspection: 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 attempt to switch power to the machine until all possible unsafe conditions are corrected. 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.
- 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 if provided, unless the earthquake option is to be installed.

- 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).

- Stability hazard:
  - The rack may tip over causing serious personal injury.
  - Before extending the rack to the installation position, read the installation instructions.
  - Do not put any load on the slide-rail mounted equipment mounted in the installation position.
  - Do not leave the slide-rail mounted equipment in the installation position.
- 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 1 of 2)

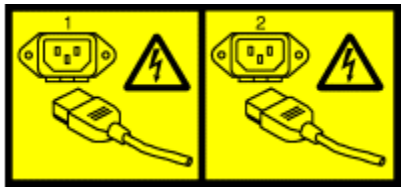
(R001 part 2 of 2):

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 or if the rack is not bolted to the floor. 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. (R001 part 2 of 2)

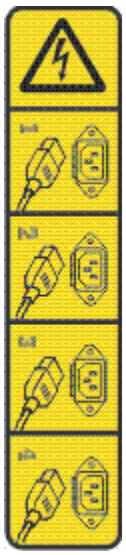
(L003)



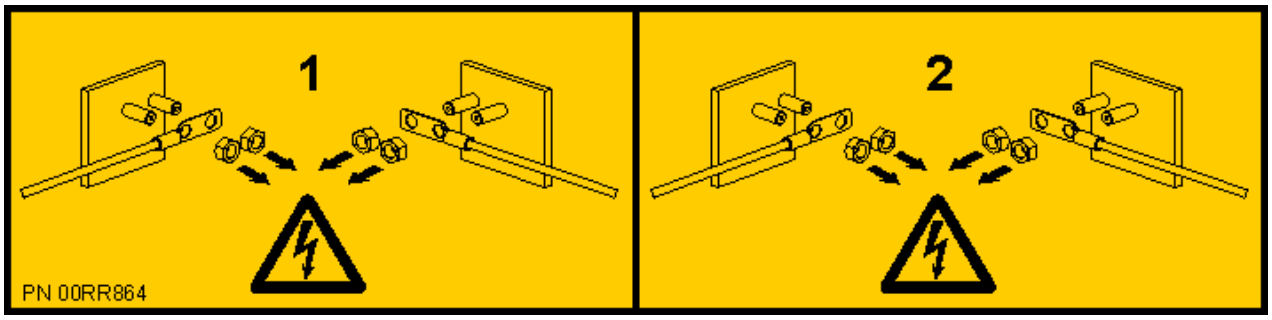
or

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)

(L005)

CAUTION: Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in splattered metal, burns, or both. (L005)

Procedure

Before you begin a replacement or installation procedure, do these tasks:

1. If you are installing a new feature, ensure that you install the required software to support the new feature. See IBM Prerequisite.
2. If you are installing or replacing something that might put your data at risk, ensure, wherever possible, that you have a current backup of your system or logical partition (including operating systems, licensed programs, and data).
3. Review the installation or replacement procedure for the feature or part.
4. Note the significance of color on your system.

   Blue on a part of the hardware indicates a touch point where you can grip the hardware to remove it from or install it in the system, open or close a latch, and so on.
5. Ensure that you have access to a medium flat-blade screwdriver, a Phillips screwdriver, and a pair of scissors.
6. If parts are incorrect, missing, or visibly damaged, do the following steps:
   - If you are replacing a part, contact the provider of your parts or next level of support.
   - If you are installing a feature, contact one of the following service organizations:
     - The provider of your parts or next level of support.
     - In the United States, the IBM Rochester Manufacturing Automated Information Line (R-MAIL) at 1-800-300-8751.

   In countries and regions outside of the United States, see the Directory of worldwide contacts (http://www.ibm.com/planetwide).
7. If you encounter difficulties during the installation, contact your service provider, your IBM reseller, or your next level of support.
8. Ensure that the top cover is on when the system is running for thermal performance.

Identifying the system that contains the part to replace

Learn how to determine which IBM Power System IC922 (9183-22X) server or enclosure has the part you want to replace.

About this task

If the part does not have problem indicator LED, you need to use a troubleshooting program such as **`impitool`** to identify the issue.

LEDs on the 9183-22X system

Use this information as a guide to the LEDs on the IBM Power System IC922 (9183-22X) server.

The LEDs indicate various system statuses. Refer to the following figures

- The green power-on LED indicates the power status.
  - A constant light indicates full system power to the unit.
  - A flashing light indicates standby power to the unit.
- The blue identify LED is used to identify the system that requires service.
- The red fault LED indicates a problem in the system. After a part is repaired, the fault LED takes a minute to turn off.
- On the front drives, a constant green light indicates that the drive is present; a flashing green light indicates activity. An amber light indicates a problem.
- On the power supplies, a constant green light indicates that the system is powered on; a flashing green light indicates that the system is in standby status.
- On the fans, the amber fault LED indicates a problem.

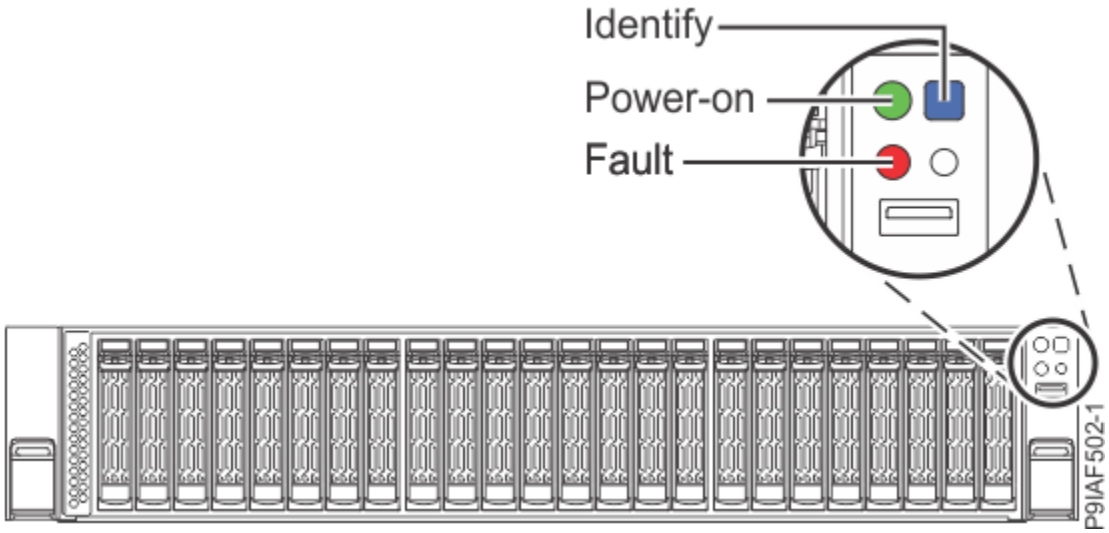


Figure 63. Front control panel LEDs

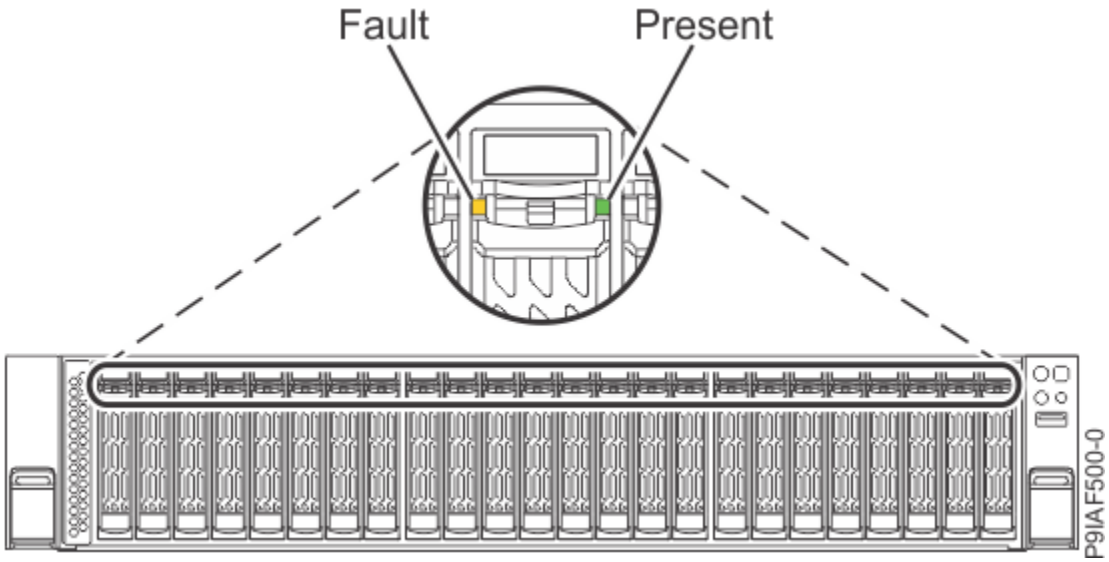


Figure 64. Front drive LEDs

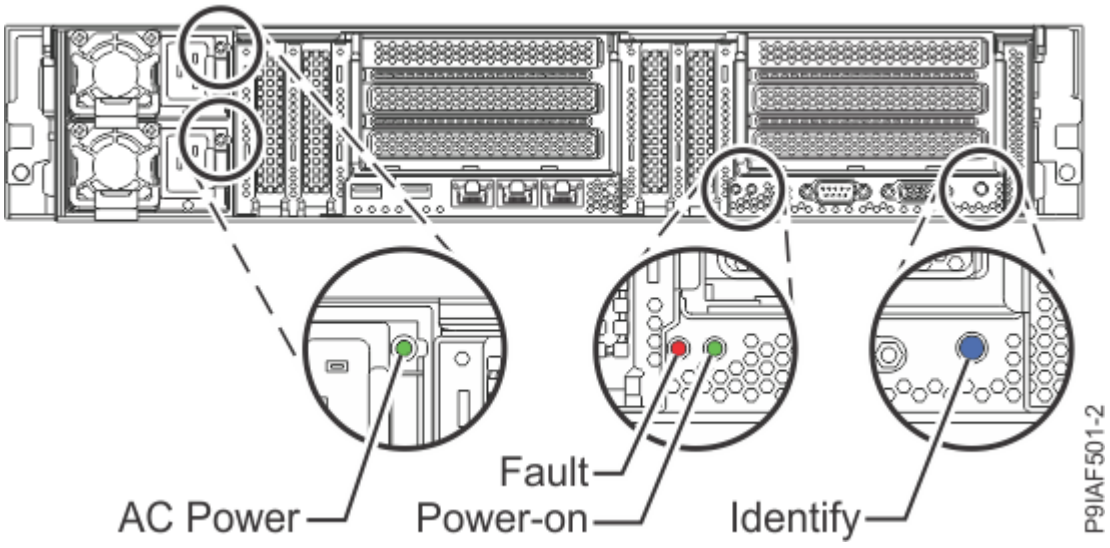


Figure 65. Rear LEDs

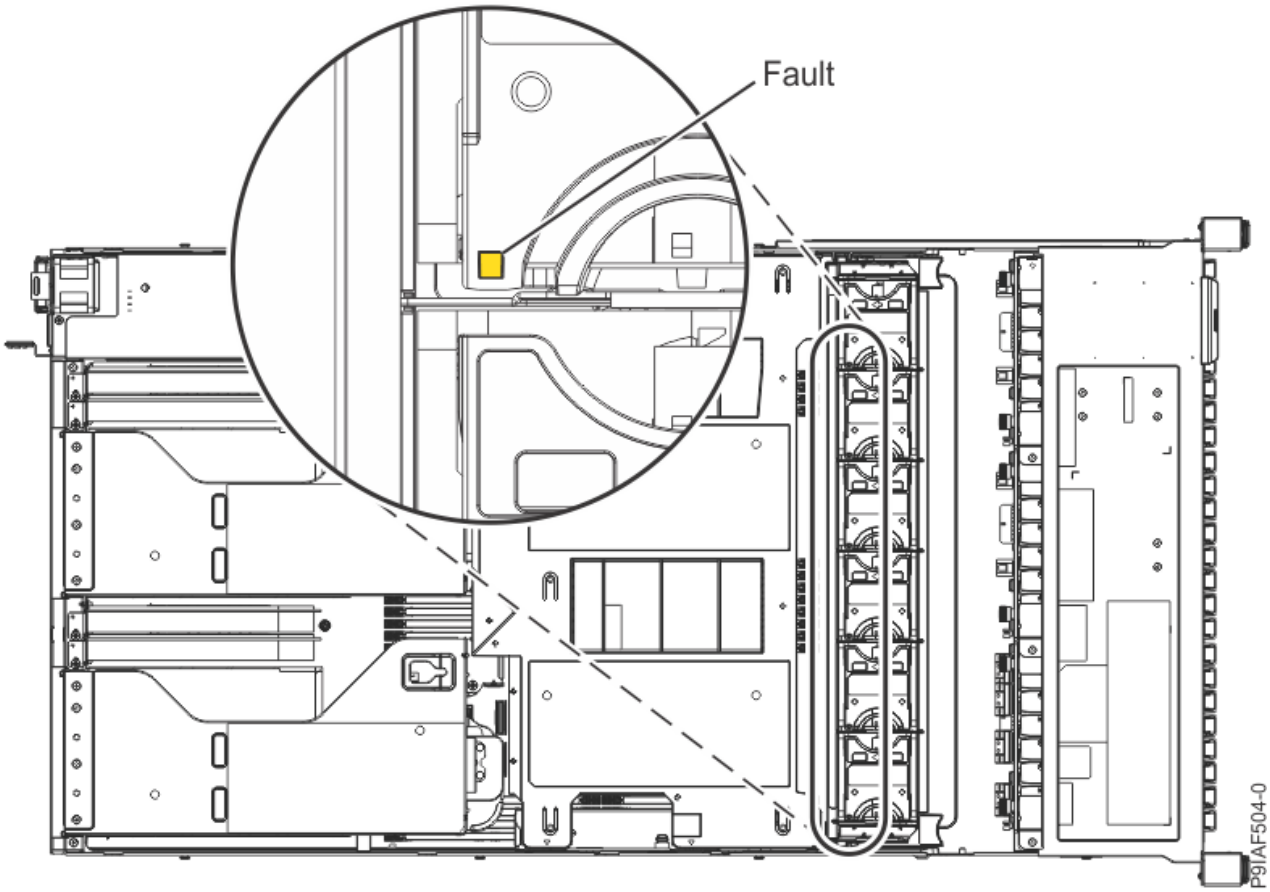


Figure 66. Fan LEDs

Identifying the 9183-22X system that needs servicing

Learn how to turn on the blue identify LED to help you find the system that needs servicing.

Procedure

- You can activate the blue system identify LED by pressing the **Identify LED** button on the control panel for at least half a second.

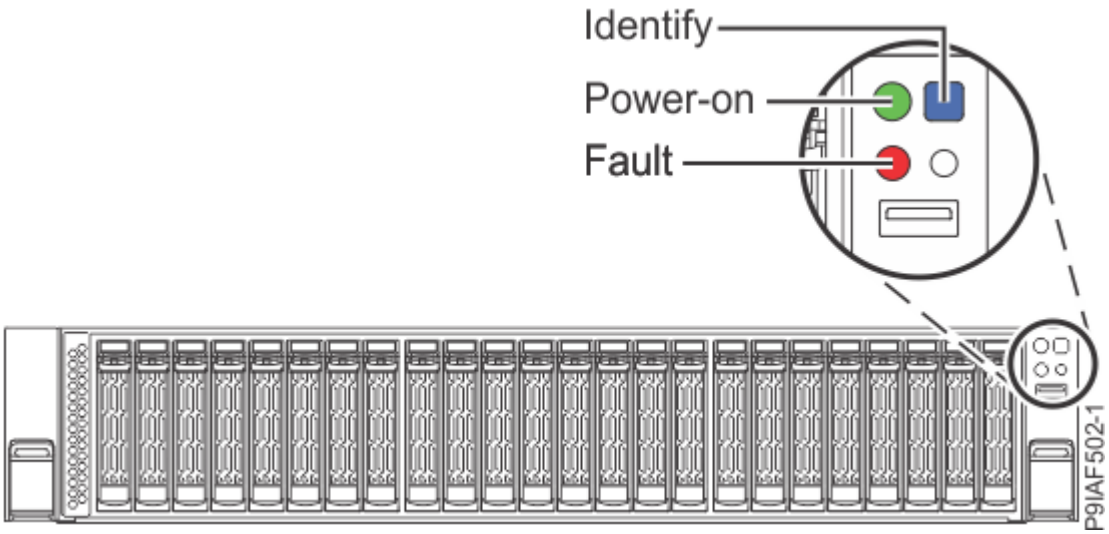


Figure 67. Locating the Identify LED button

- You can use the following command to activate the blue system identify LED:

```
openbmctool -U <username> -P <password> -H <BMC IP address or BMC host name> chassis
identify on
```

To turn off the blue system identify LED, use the following command:

```
openbmctool -U <username> -P <password> -H <BMC IP address or BMC host name> chassis
identify off
```

To check the status of the blue system identify LED, use the following command:

```
openbmctool -U <username> -P <password> -H <BMC IP address or BMC host name> chassis
identify status
```

Preparing the 9183-22X system to remove and replace internal parts

To prepare the system to remove and replace internal parts, complete the steps in this procedure.

Procedure

1. Complete the prerequisite tasks. For instructions, see “Before you begin” on page 91.
2. Identify the part and the system that you are working on. For instructions, see “Identifying the system that contains the part to replace” on page 96.
3. Attach the electrostatic discharge (ESD) wrist strap.

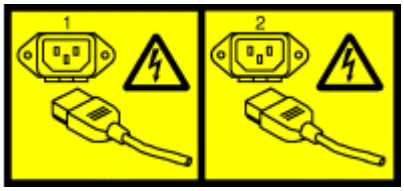
   The ESD wrist strap must be connected to an unpainted metal surface until the service procedure is completed, and if applicable, until the service access cover is replaced.

   Attention:

   - Attach an electrostatic discharge (ESD) wrist strap to the front ESD jack, to the rear ESD jack, or to an unpainted metal surface of your hardware to prevent the electrostatic discharge from damaging your hardware.
   - When you use an ESD wrist strap, follow all electrical safety procedures. An ESD wrist strap is used for static control. It does not increase or decrease your risk of receiving electric shock when using or working on electrical equipment.
   - If you do not have an ESD wrist strap, just prior to removing the product from ESD packaging and installing or replacing hardware, touch an unpainted metal surface of the system for a minimum of 5 seconds. If at any point in this service process you move away from the system, it is important to again discharge yourself by touching an unpainted metal surface for at least 5 seconds before you continue with the service process.
4. Stop the system. For instructions, see “Stopping the 9183-22X system” on page 106.
5. Disconnect the power source from the system by unplugging the system. For instructions, see “Disconnecting power cords from the 9183-22X system” on page 113.

   Note: The system might be equipped with redundant power supply. Before you continue with this procedure, ensure that all power to your system is disconnected.

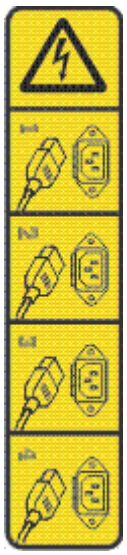
   (L003)

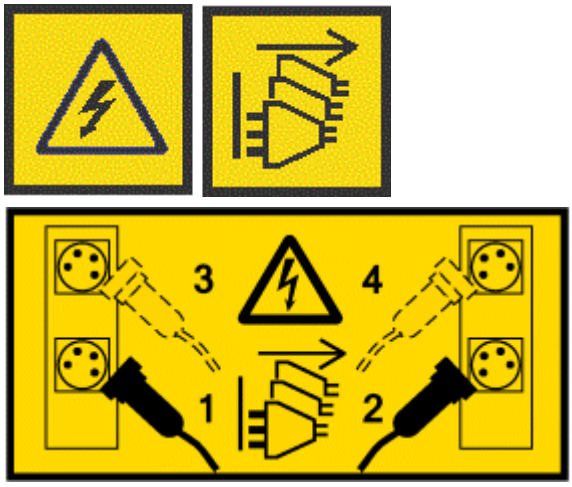
   or

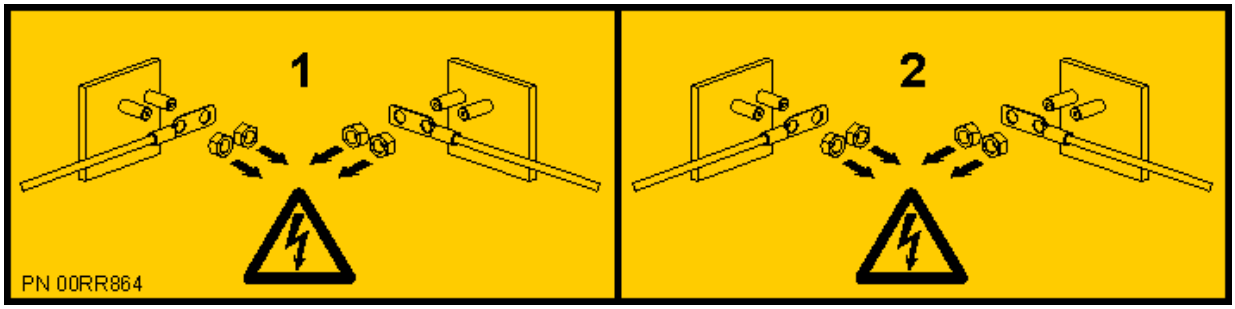
or

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)

(L005)

CAUTION: Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in splattered metal, burns, or both. (L005)

6. If the power distribution board needs to be removed, if the system backplane needs to be removed, or if DIMM 0 needs to be installed, removed, or replaced; partially remove the two power supplies. Pull them out about 2.5 cm (1 in); you do not need to remove them from the system. For instructions, see “Removing a power supply from the 9183-22X system” on page 121.
7. Loosen the cover screw **(B)** at the rear of the system as shown in the following figure.

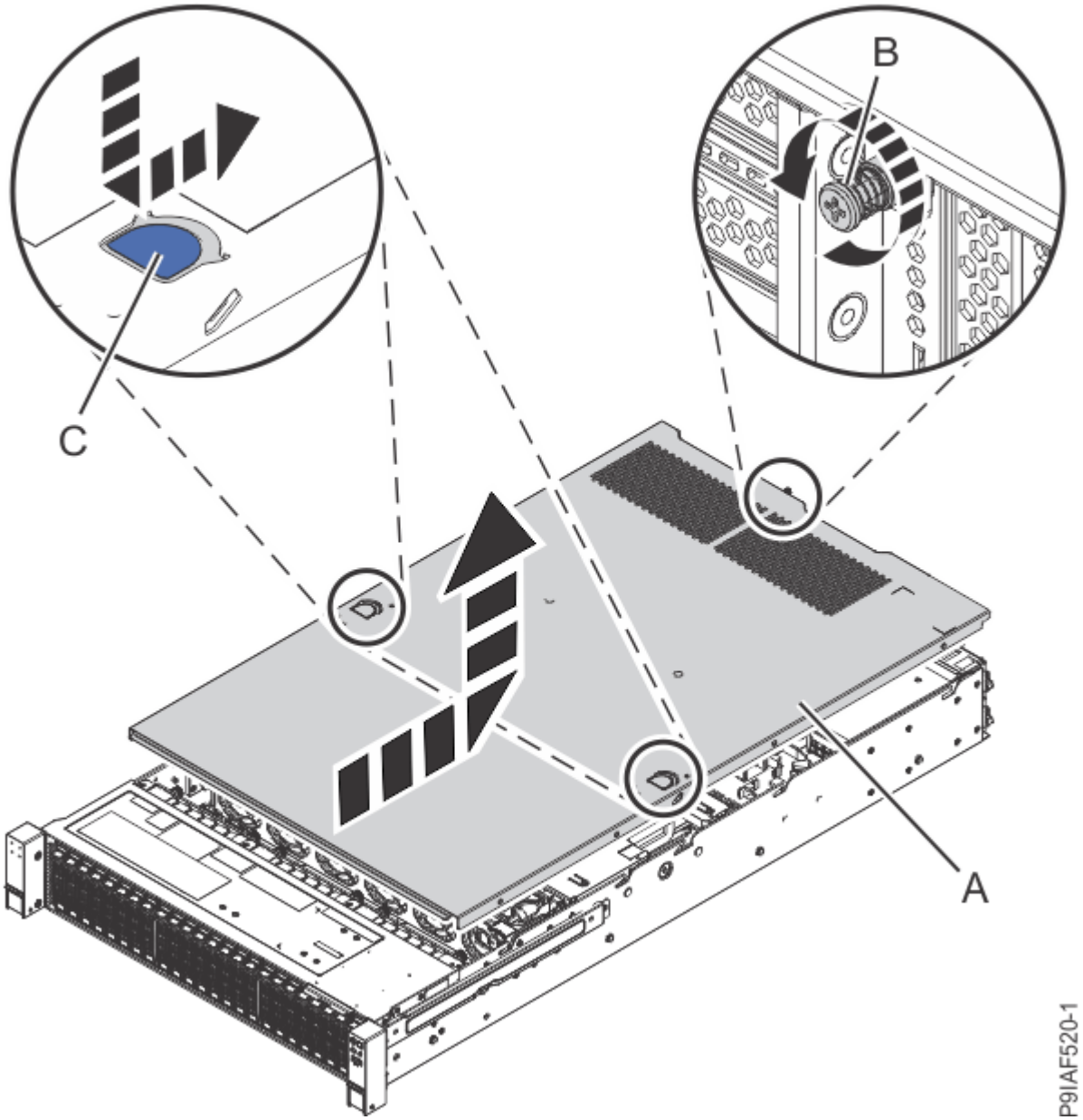


Figure 68. Loosening the cover screw

8. Place the system into the service position. For instructions, see "Placing a 9183-22X system into the service position" on page 111.

CAUTION: Do not place any object on top of a rack-mounted device unless that rack-mounted device is intended for use as a shelf. (R008)

(L012)

CAUTION: Pinch hazard. (L012)

9. Remove the service access cover. For instructions, see “Removing the service access cover from a 9183-22X system” on page 109.

Preparing the 9183-22X system for operation after you remove and replace internal parts

To prepare the system for operation after you remove and replace internal parts, complete the steps in this procedure.

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap on and that the ESD clip is plugged into a ground jack or connected to an unpainted metal surface. If not, do so now.
2. Replace the service access cover. For instructions, see “Installing the service access cover on a 9183-22X system” on page 110.
3. Place the system into the operating position. For instructions, see “Placing a 9183-22X system into the operating position” on page 112.

(L012)

CAUTION: Pinch hazard. (L012)

4. Tighten the cover screw **(C)** at the rear of the system as shown in the following figure.

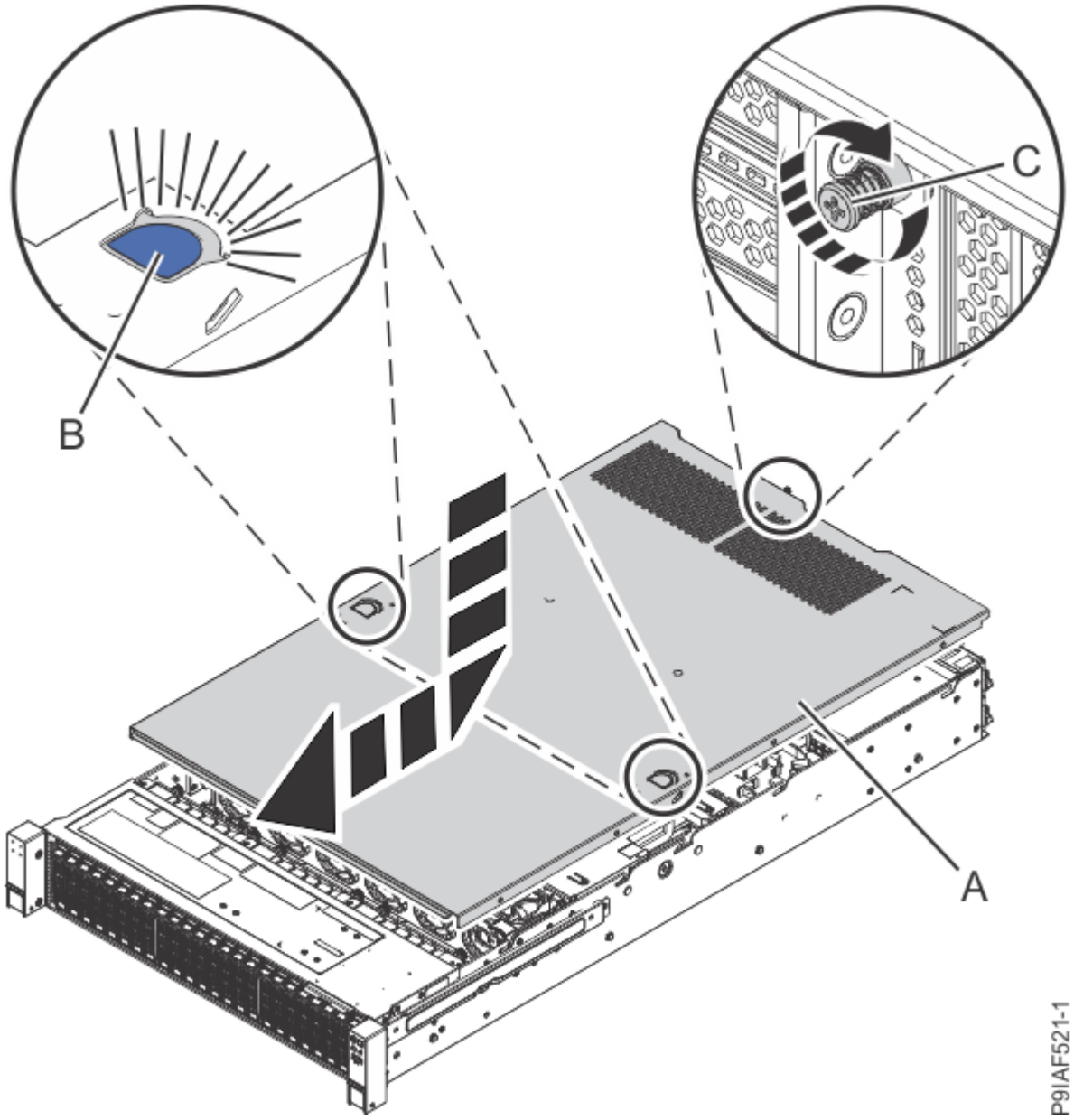


Figure 69. Tightening the cover screw

5. Ensure that both of the power supplies are fully seated into the system. For instructions, see "Replacing a power supply in the 9183-22X system" on page 124.
6. Reconnect the power cords to the system. For instructions, see "Connecting power cords to the 9183-22X system" on page 115.
7. Restart the system. For instructions, see "Starting the 9183-22X system " on page 105.
8. If you installed or replaced a PCIe adapter, update the adapter firmware.

   See Getting firmware fixes for vendor I/O adapters from the vendor website (www.ibm.com/support/knowledgecenter/POWER9/p9ei8/p9ei8_update_other_adapter.htm).
9. Verify the installed part.

   See Verifying a repair (www.ibm.com/support/knowledgecenter/POWER9/p9ei3/p9ei3_verifyrepair.htm).

Starting and stopping the 9183-22X system

Find information about starting and stopping the IBM Power System IC922 (9183-22X) server to perform a service action or system upgrade operation.

Starting the 9183-22X system

You use the power switch to start the system.

About this task

Attention: For safety, airflow purposes and thermal performance, the service access cover must be installed and fully seated before you power on the system.

You can use this procedure to power on the system, or you can use a console to power on the system.

Procedure

1. Before you press the power-on switch, ensure that the power supplies are connected to the system unit and verify the following items:
   - All system power cables are connected to a power source.
   - The power-on LED as shown in the following figure, is flashing. A flashing light indicates standby power to the unit.
2. Press the power-on switch that is shown in the following figure.

   Note: It might take several minutes for the power-on LED to begin flashing. Do not continue to press the power-on switch.

   The power-on LED stops flashing and remains on, indicating that the system power is on. The system cooling fans first run at a high speed, and after approximately 30 seconds, return to operating speed.

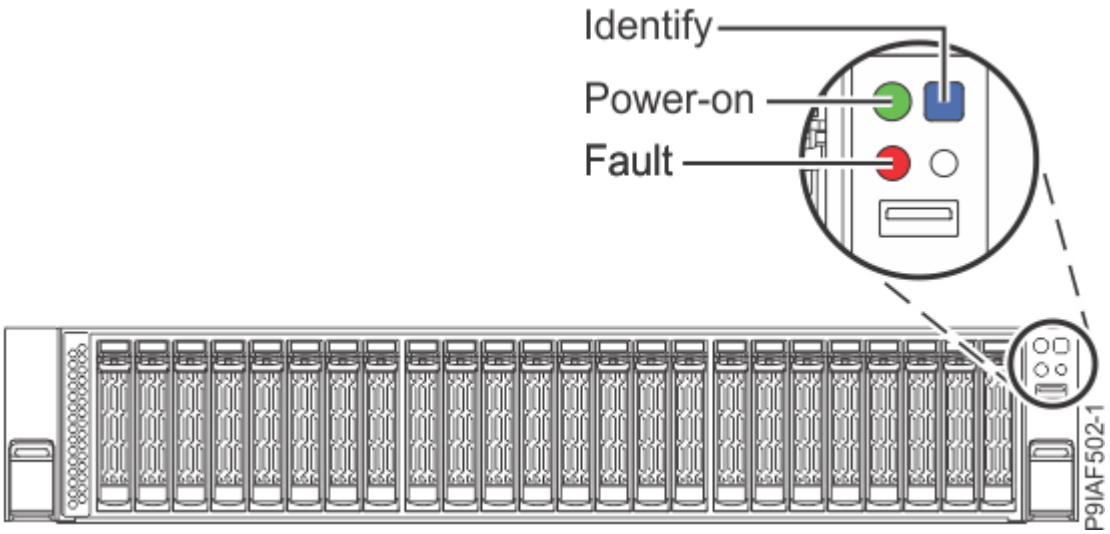


Figure 70. Locating the Power-on switch and Power-on LED

What to do next

If you press the power-on switch and the system does not start, contact your next level of support or your service provider.

Stopping the 9183-22X system

You can use the power switch or a command to stop the system.

Procedure

- You can press and hold the power switch to stop and power off the system as shown on the following figure.

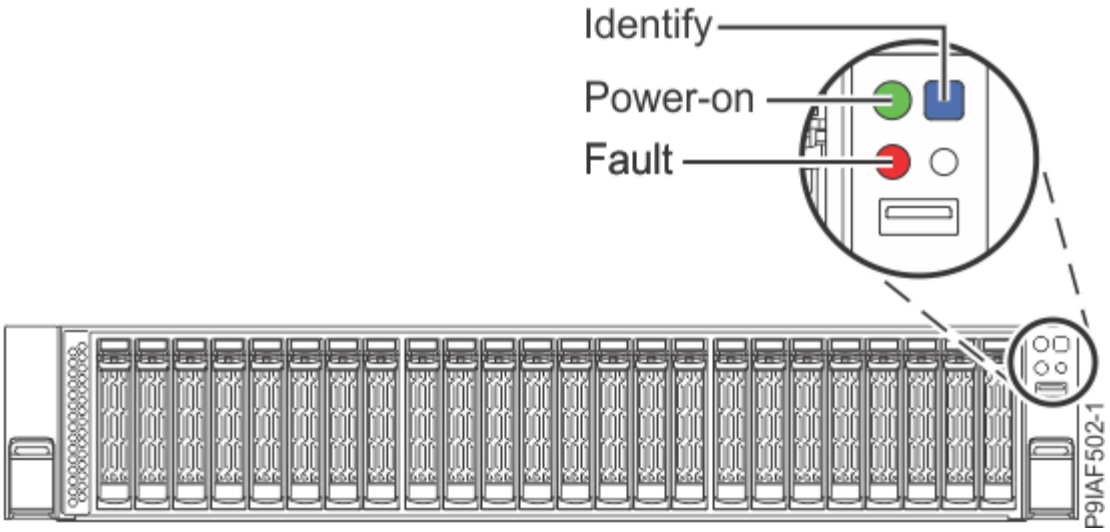


Figure 71. Locating the Power-on switch and Power-on LED

- You can use the Linux **shutdown** command to stop and power off the system.

  For example, the following command shuts down the system in 10 minutes and sends the message "Repairs coming" to the users.

  ```
  shutdown -P +10 "Repairs coming"
  ```

  The `-P` setting instructs the system to shut down and then power off. The + indicates the time in minutes before the shutdown occurs.

Drive commands for the 9183-22X system

Learn about the storage drive commands for the system.

StorCLI commands available at the operating system

Learn about the StorCLI commands that are available at the operating system.

To show a summary of the drive and controller status:

```
storcli show
```

To show a list of all controllers and drives that need attention:

```
storcli show all
```

To show information about the drives:

```
storcli /cx[/eall]/sall show
```

To locate a physical disk by turning on the identify LED:

```
storcli /cx[/ex]/sx start locate
```

To turn off the identify LED:

```
storcli /cx[/ex]/sx stop locate
```

To prepare a drive for removal:

```
storcli /cx[/ex]/sx spindown
```

To view the adapter settings:

```
storcli /c0 show personality
```

To change the adapter settings:

```
storcli /c0 set personality=JBOD|RAID
```

To check the firmware level of the *MegaRAID* adapter:

```
storcli /c0 show all|egrep  "Bios Version|Firmware Package|Firmware Version"
```

To update the firmware level of the *MegaRAID* adapter:

```
storcli /cx download file=mrxxxxfw.rom
```

StorCLI commands available at petitboot

Learn about the StorCLI commands that are available at petitboot.

For details on managing RAID arrays, see "Chapter 6: StorCLI" in the MegaRAID SAS Software User Guide (docs.broadcom.com/docs/DB15-001199-02).

See How to use Petitboot bootloader (www.ibm.com/support/knowledgecenter/linuxonibm/liabw/liabppetitboot.html).

StorCLI commands available at petitboot:

```
storcli show
storcli show all
storcli show ctrlcount
storcli /cx show
storcli /cx show all [logfile[=filename]]
storcli /cx show bootdrive
storcli /cx show jbod
storcli /cx set jbod=<on|off> [force]
storcli /cx set bios [state=<on|off>] [Mode=<SOE|PE|IE|SME>] [abs=<on|off>]
            [DeviceExposure=<value>]
storcli /cx show bios
storcli /cx show safeid
storcli /cx show rehostinfo
storcli /cx show ASO
storcli /cx add vd r[0|1|5|6|00|10|50|60]
        [Size=<VD1_Sz>,<VD2_Sz>,..|all] [name=<VDNAME1>,..]
        drives=e:s|e:s-x|e:s-x,y,e:s-x,y,z [PDperArray=x][SED]
        [pdcache=on|off|default][pi][DimmerSwitch(ds)=default|automatic(auto)|
        none|maximum(max)|MaximumWithoutCaching(maxnocache)][WT|WB|AWB][nora|ra]
        [direct|cached] [cachevd] [Strip=<8|16|32|64|128|256|512|1024>]
         [AfterVd=X] [EmulationType=0|1|2] [Spares = [e:]s|[e:]s-x|[e:]s-x,y]
        [force][ExclusiveAccess] [Cbsize=0|1|2 Cbmode=0|1|2|3|4|7]
storcli /cx add vd each r0 [name=<VDNAME1>,..] [drives=e:s|e:s-x|e:s-x,y]
        [SED] [pdcache=on|off|default][pi] [DimmerSwitch(ds)=default|
        automatic(auto)|none|maximum(max)|MaximumWithoutCaching(maxnocache)]
        [WT|WB|AWB] [nora|ra] [direct|cached] [EmulationType=0|1|2]
        [Strip=<8|16|32|64|128|256|512|1024>] [ExclusiveAccess]
        [Cbsize=0|1|2 Cbmode=0|1|2|3|4|7]
storcli /cx/vx show
storcli /cx/vx show all [logfile[=filename]]
storcli /cx/vx del [discardcache] [force]
storcli /cx delete config [force]
storcli /cx/ex show
storcli /cx/ex show all
storcli /cx/ex show status [extended]
storcli /cx/ex show phyerrorcounters
storcli /cx/ex download src=<filepath> [forceActivate]
storcli /cx[/ex]/sx show
```

```
storcli /cx[/ex]/sx show all
storcli /cx[/ex]/sx start locate
storcli /cx[/ex]/sx stop locate
storcli /cx[/ex]/sx set bootdrive=<on|off>
storcli /cx[/ex]/sx download src=<filepath> [satabridge] [mode= 5|7] [force]
storcli /cx set securitykey=xxxxxxxx {passphrase=xxxx} {keyid=xxx}
storcli /cx set securitykey keyid=xxx
storcli /cx compare securitykey=xxxxxxxxxx
storcli /cx delete securitykey
storcli /cx set securitykey=xxxxxxxx oldsecuritykey=xxxxxxxx
        {passphrase=xxxx} {keyid=xxx}
storcli /cx/fall show [all] [securityKey = xxx]
storcli /cx/fall del|delete [securityKey = xxx]
storcli /cx/fall import [preview] [securityKey = xxx]
storcli /cx set factory defaults
storcli /cx download file=<filepath> [fwtype=<val>] [ResetNow] [nosigchk]
        [noverchk] [force]
storcli /cx show personality
storcli /cx set personality=RAID|HBA|JBOD
storcli /cx show AliLog [logfile[=filename]]
storcli /cx get config file=<fileName>
storcli /cx set config file=<fileName>
storcli /cx/cv show
storcli /cx/cv show all
storcli /cx/px show
storcli /cx/px show all
```

To show a summary of the drive and controller status:

```
storcli show
```

To show a list of all controllers and drives that need attention:

```
storcli show all
```

NVMe commands

Learn about the NVMe commands.

If the `nvme` command is not installed, download the utility from NVMe management command line interface (github.com/linux-nvme/nvme-cli). Follow the installation instructions available on that site.

To determine which drive you want to replace, use the command:

```
nvme list
```

If you are searching for a failed drive, you can check each drive using the command:

```
nvme smart-log <device>
```

To turn on the identify LED, use the command:

```
dd if=/dev/nvmeX of=/dev/null
```

You can also use the `ledctl` command from the optional `ledmon` package:

```
ledctl locate=/dev/rsnvmeX
```

To get the device serial number for verification, use the command:

```
nvme id-ctrl /dev/nvmeX | grep -i sn
```

To take the device offline so that it can be removed:

```
sh -c"echo 0 >/sys/block/nvmeX/device/delete"
```

SAS3FLASH command

Learn about the SAS3FLASH command for the adapters 9300-8i & 9305-16i (feature codes EK41 and EK43).

For details on using the SAS3FLASH command, see https://www.broadcom.com/products/storage/host-bus-adapters/sas-9305-16i#downloads (www.broadcom.com/products/storage/host-bus-adapters/sas-9305-16i#downloads). Look under the "Management Software and Tools" section, for the SAS3FLASH_P15 archive.

See How to use Petitboot bootloader (www.ibm.com/support/knowledgecenter/linuxonibm/liabw/liabppetitboot.html).

Sensor status

You can check the sensor status to quickly determine the general health of the system without using the event codes.

To view the sensor status, use the following command:

```
openbmctool -U <username> -P <password> -H <BMC IP address or BMC host name> fru status
```

To view the sensor status and any corresponding event codes, use the following command:

```
openbmctool -U <username> -P <password> -H <BMC IP address or BMC host name> fru status -v
```

Sensors that have a status of **present** and **functional** do not require a service action. Sensors that have a status of **present** and **not functional** require a service action.

Some occurrences of errors in the system might not appear in the sensor status. After you view the sensor status, look for event codes to determine whether a service action is required.

Removing and replacing covers for the 9183-22X system

Find information about removing and replacing covers for the IBM Power System IC922 (9183-22X) system.

Removing the service access cover from a 9183-22X system

To remove the service access cover, complete the steps in this procedure.

Procedure

1. Ensure that you removed both power supplies from the system.

   For instructions, see “Preparing the 9183-22X system to remove and replace internal parts” on page 99.

   (L005)

   CAUTION: Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in splattered metal, burns, or both. (L005)
2. At the rear of the system, loosen the cover screw **(B)** that fastens the cover to the chassis.
3. While you press down on latches **(C)**, slide the cover **(A)** towards the rear of the system unit. When the front of the service access cover clears the frame ledge, lift the cover up and off the system unit.

Attention: For proper cooling and airflow, replace the cover before you power on the system.

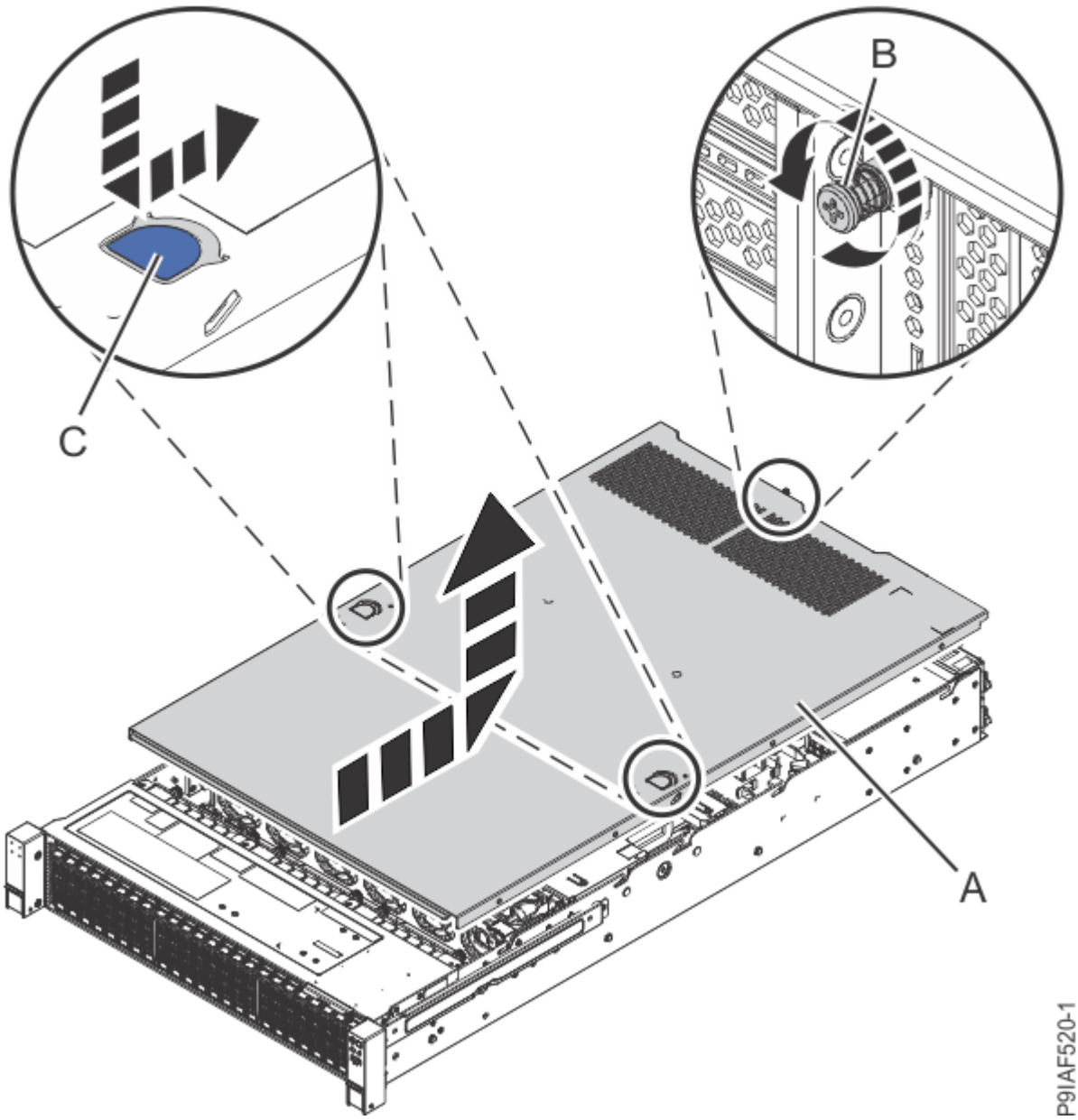


Figure 72. Removing the cover

Installing the service access cover on a 9183-22X system

To replace the service access cover, complete the steps in this procedure.

About this task

Attention: For safety, airflow purposes and thermal performance, the service access cover must be installed and fully seated before you power on the system.

Procedure

1. Place the cover **(A)** on the system unit such that the alignment pins on the cover are aligned to the slots on the chassis. Slide the cover to the front of the system until the blue release latches **(B)** lock in to place.

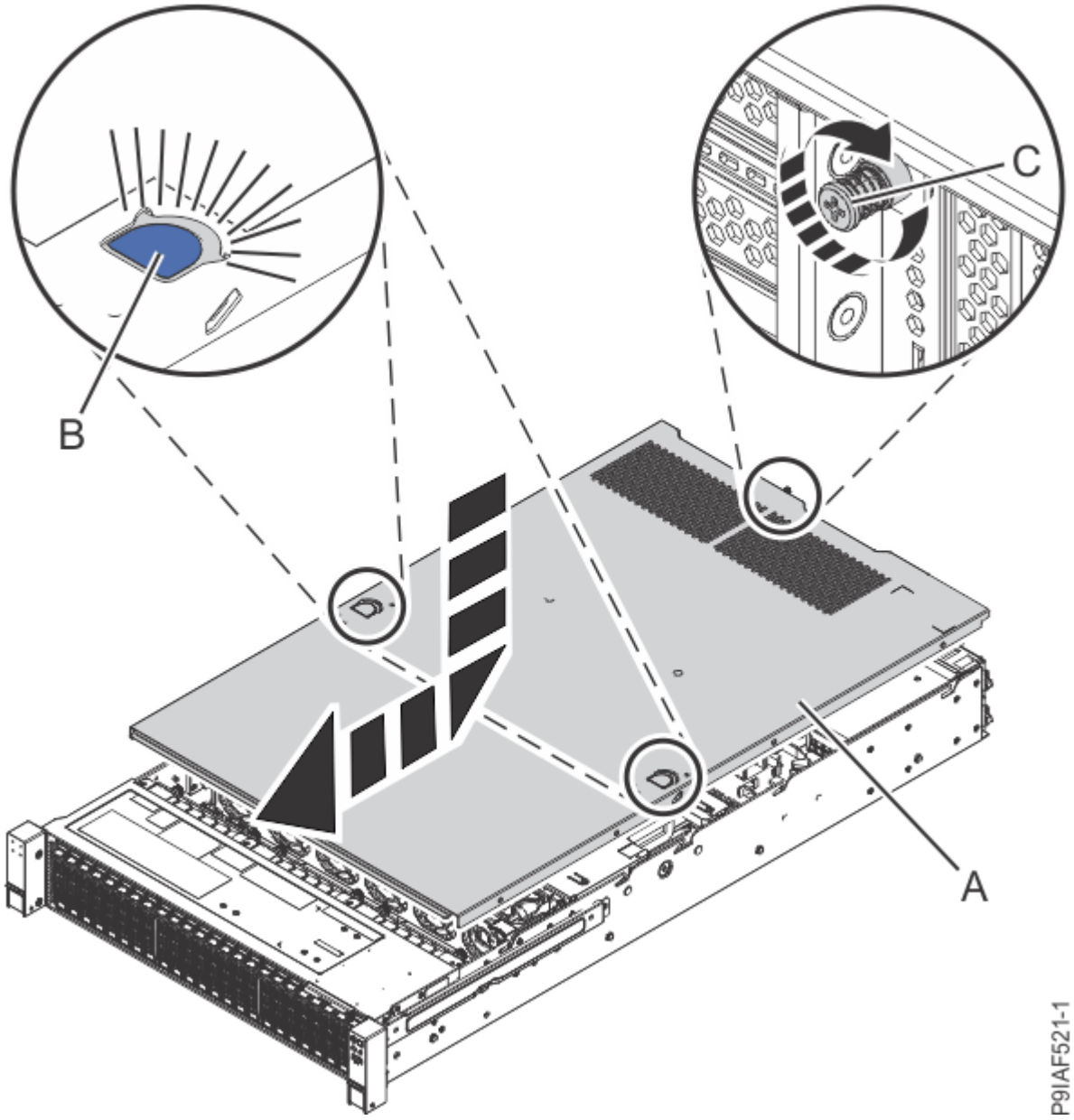


Figure 73. Installing the cover

2. Fasten the cover screw **(C)** at the rear of the cover.

Service and operating positions for the 9183-22X system

Find information about placing the IBM Power System IC922 (9183-22X) server into the service or operating position.

Placing a 9183-22X system into the service position

To place a system into the service position, complete the steps in this procedure.

Before you begin

Notes:

- When you place the system into the service position, you must ensure that all stability plates are firmly installed to prevent the rack from toppling. Ensure that only one system unit is in the service position at a time.

- Ensure that the cables at the rear of the system unit do not catch or bind as you pull the system unit forward in the rack.
- When the slide rails are fully extended, the rail safety latches lock into place. This action prevents the system from being pulled out too far.

Procedure

1. If present, remove the screws on either side of the system that secure the system to the rack.
2. Push down the front latches **(A)** that secure the system unit to the rack as shown in the following figure.

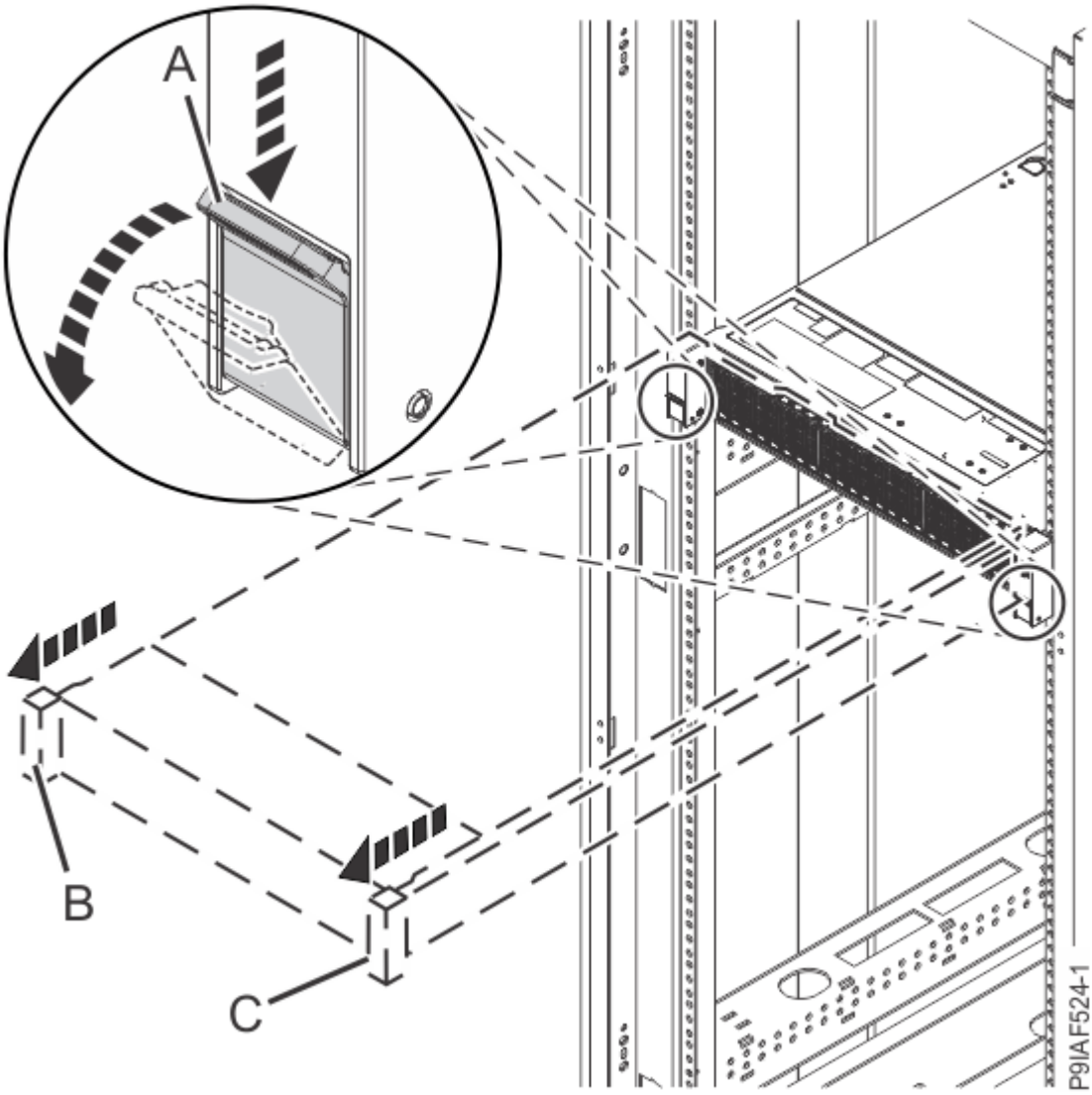


Figure 74. Placing the system into the service position

3. Grasp the EIA holders at **(B)** and **(C)** (above the latches, do not pull the system by using the latches) to pull the system out of the rack until both rails lock into place.

Placing a 9183-22X system into the operating position

To place a system into the operating position, complete the steps in this procedure.

Before you begin

When you place the system in the operating position, ensure that the cables at the rear of the system do not catch or bind as you push the system unit back into the rack.

Procedure

1. Press in the rail safety latches **(A)** on both rails.
2. Push the system unit back into the rack until both release latches lock into position, as shown in the following figure.

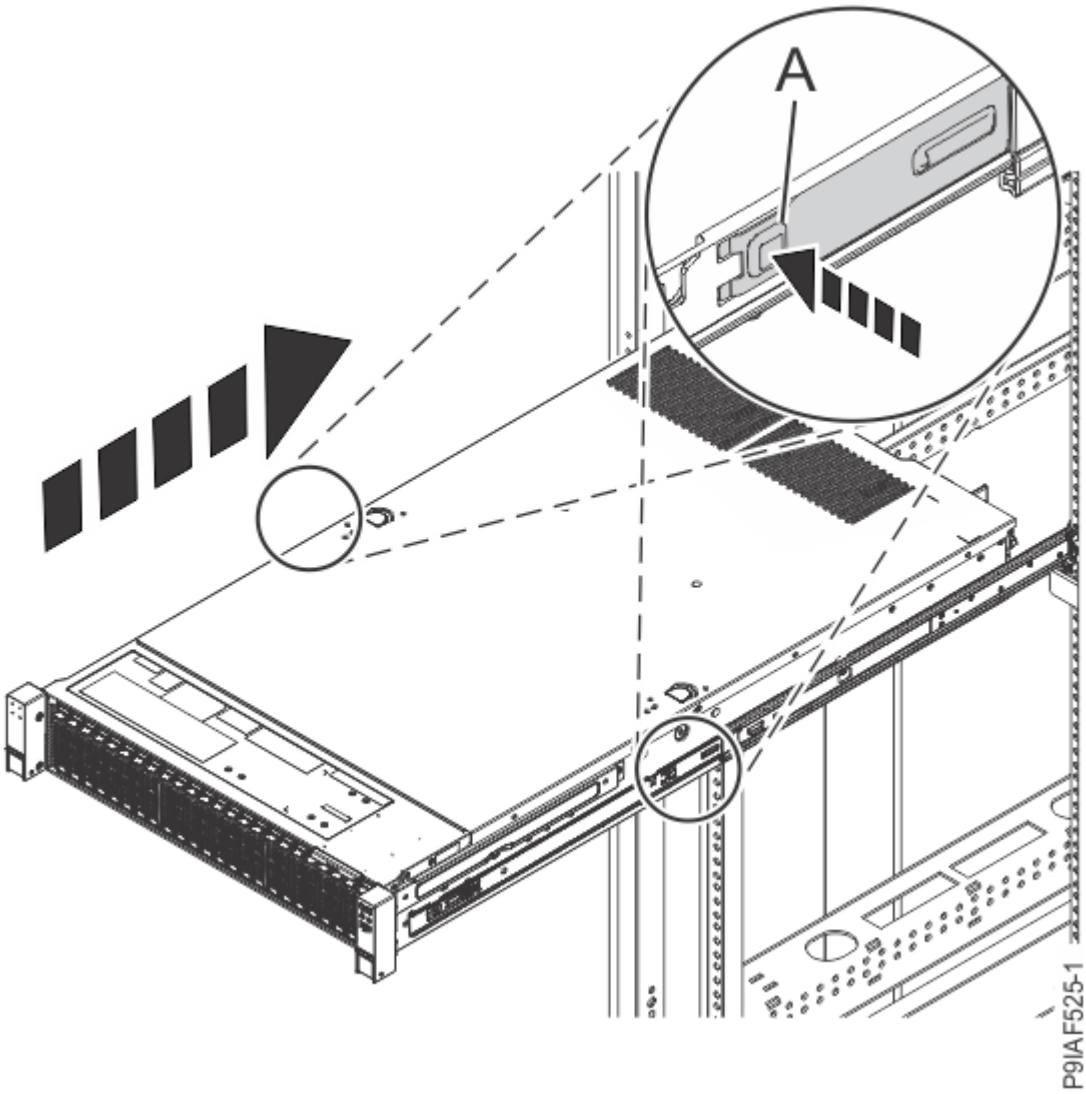


Figure 75. Placing the system into the operating position

3. If wanted, replace the screws on either side of the system that secure the system to the rack.

Removing and replacing power cords in the 9183-22X system

Find information about removing and replacing power cords in the IBM Power System IC922 (9183-22X) server.

Disconnecting power cords from the 9183-22X system

To disconnect a power cord, complete the steps in this procedure.

Procedure

1. Open the rear rack door on the system unit that you are servicing.
2. Identify the system unit that you are servicing in the rack.
3. Unfasten the hook-and-loop fasteners that tie the power cords to the power supply handle.

Note how the power is looped, you need to make that same loop when you reattach the power cords.

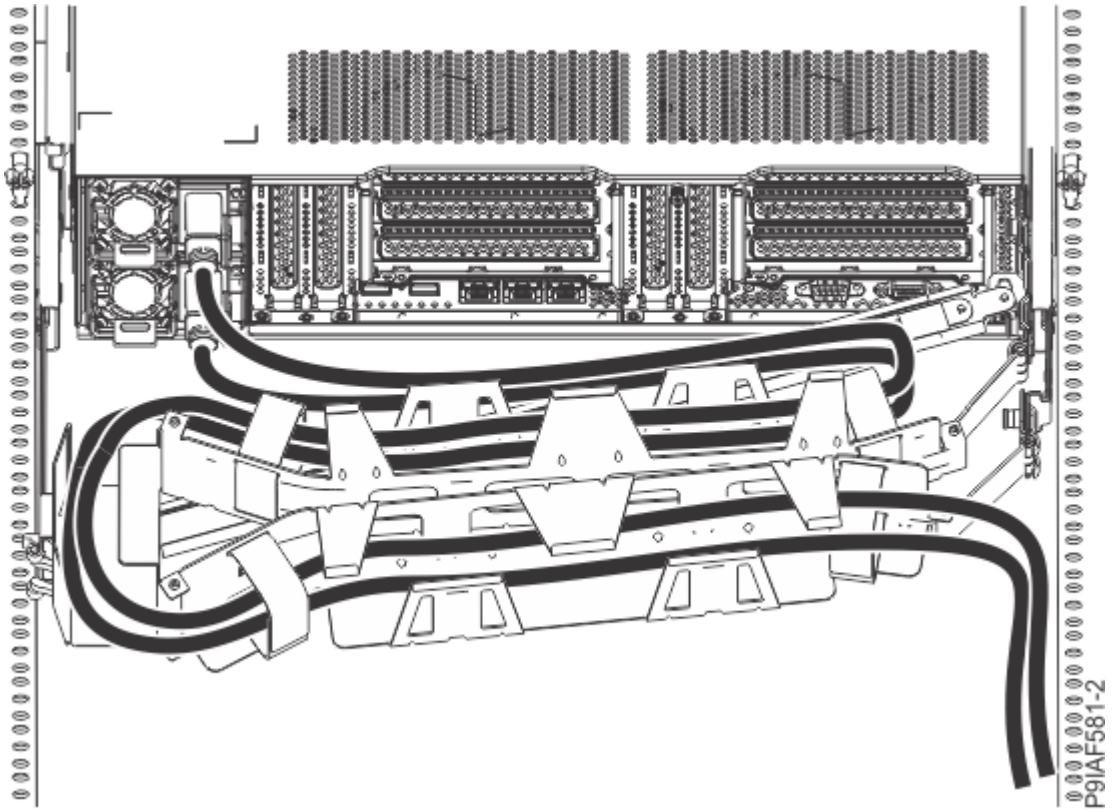


Figure 76. Routing the power cord loop in the cable management arm

4. Disconnect the power cords from the system unit as shown in the following figure.

   Note: This system might be equipped with two or more power supplies. If the removing and replacing procedures require the power to be off, then ensure that all the power sources to the system are disconnected.

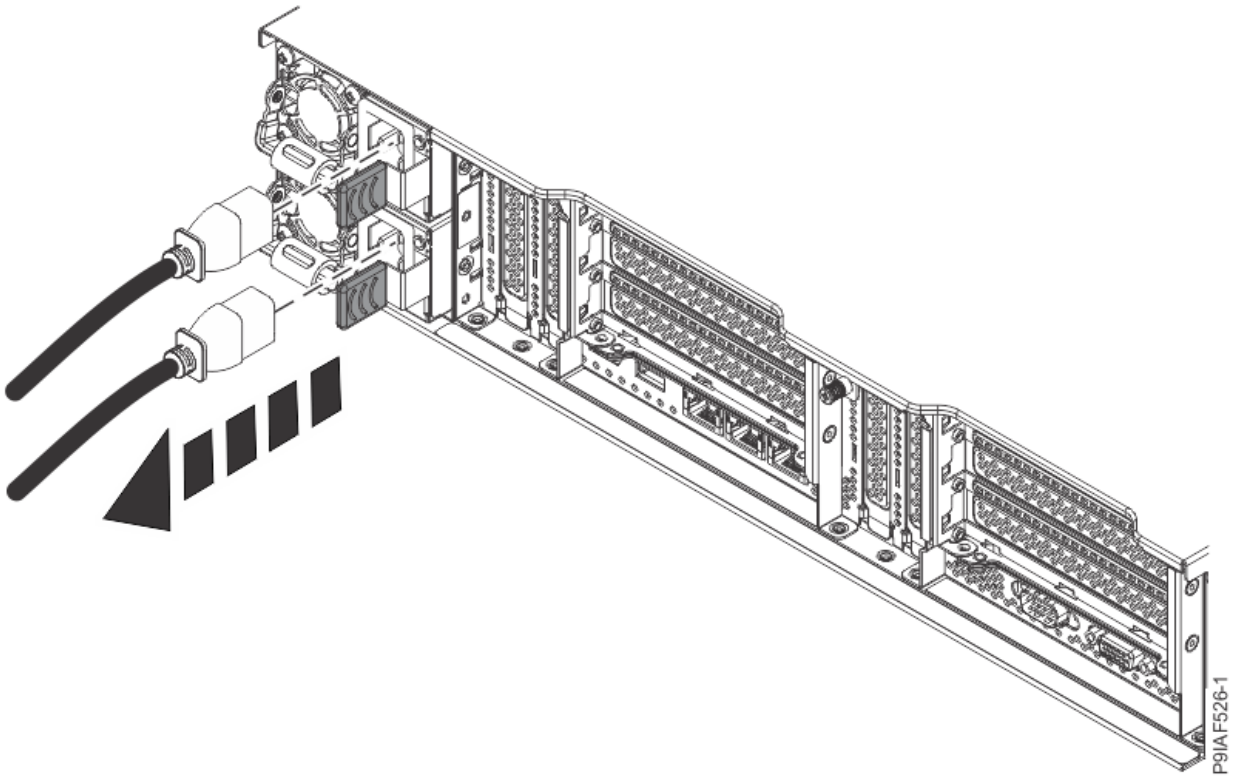


Figure 77. Removing the power cords from the system

Connecting power cords to the 9183-22X system

To connect a power cord, complete the steps in this procedure.

Procedure

1. Open the rear rack door on the system unit that you are servicing.
2. Using your labels, reconnect the power cords to the system unit as shown in the following figure.

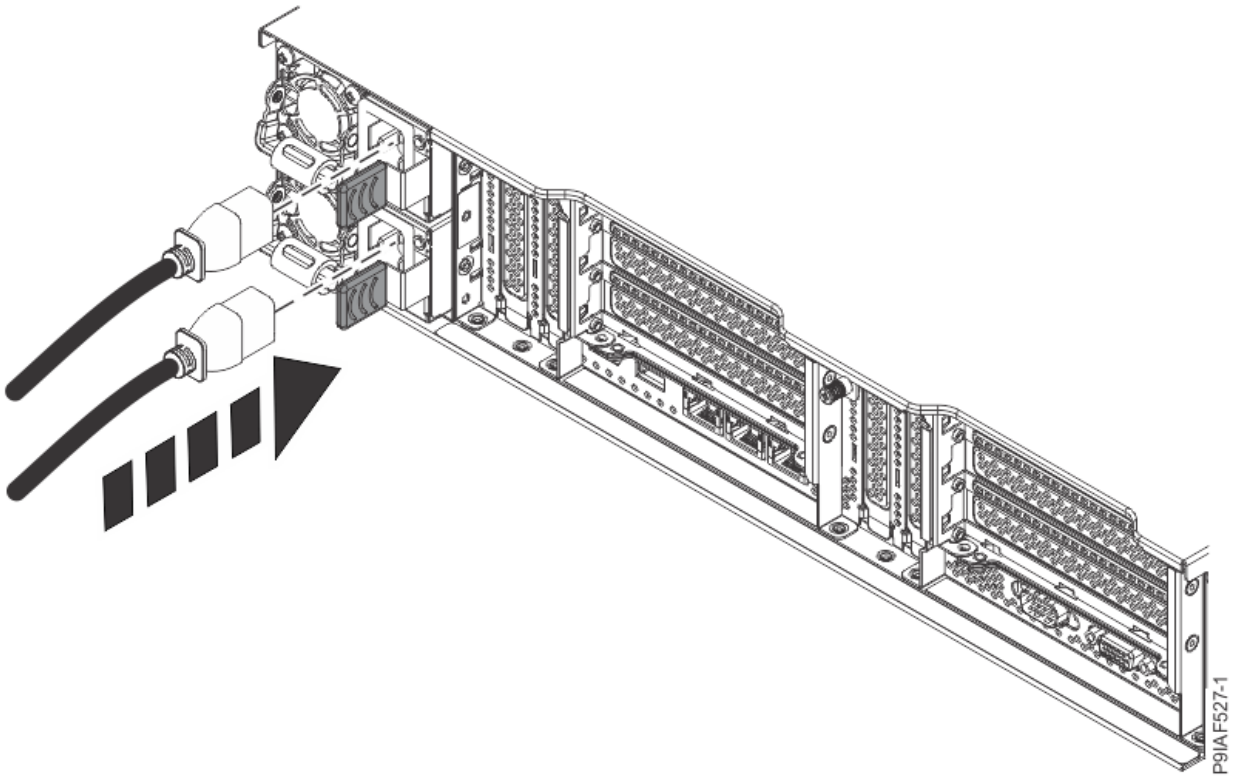


Figure 78. Connecting the power cords to the system

3. Loop and attach the power cords to the power supply handle.

   Note how the power is looped; be sure to maintain at least a 5 cm (2 in.) diameter loop. Use the hook-and-loop fastener to tie the power cord to the power supply handle.

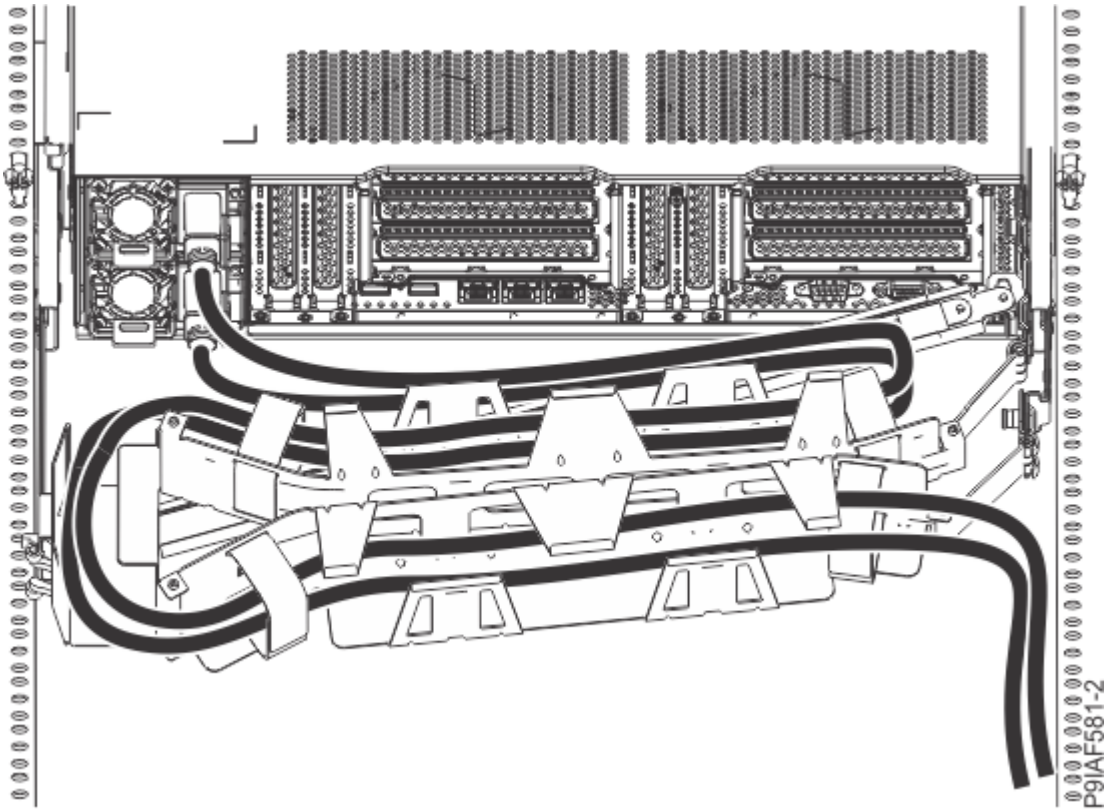


Figure 79. Routing the power cord loop in the cable management arm

4. Close the rack door at the rear of the system.

Updating the system firmware level of the BMC on the system backplane to OP940.20, or later, in a 9183-22X system

To update the system firmware level of the BMC on the system backplane to OP940.20, or later, complete the steps in this procedure.

Procedure

1. Are you able to connect the BMC on the system backplane to the network with a Dynamic Host Configuration Protocol (DHCP) IP address?

If	Then
Yes	Update the system firmware level of the BMC on the system backplane to OP940.20, or later. For instructions, see Updating the system firmware by using the OpenBMC tool. If you are not able to update the system firmware level, continue with the next step.
No	Continue with the next step.

2. Power off the system and place it in the service position. For instructions, see “Preparing the 9183-22X system to remove and replace internal parts” on page 99.
3. Attach the electrostatic discharge (ESD) wrist strap.

   The ESD wrist strap must be connected to an unpainted metal surface until the service procedure is completed, and if applicable, until the service access cover is replaced.

   Attention:

   - Attach an electrostatic discharge (ESD) wrist strap to the front ESD jack, to the rear ESD jack, or to an unpainted metal surface of your hardware to prevent the electrostatic discharge from damaging your hardware.
   - When you use an ESD wrist strap, follow all electrical safety procedures. An ESD wrist strap is used for static control. It does not increase or decrease your risk of receiving electric shock when using or working on electrical equipment.
   - If you do not have an ESD wrist strap, just prior to removing the product from ESD packaging and installing or replacing hardware, touch an unpainted metal surface of the system for a minimum of 5 seconds. If at any point in this service process you move away from the system, it is important to again discharge yourself by touching an unpainted metal surface for at least 5 seconds before you continue with the service process.
4. Remove the PCIe risers. See Removing a PCIe riser from the 9183-22X system.
5. Move the system processor jumpers on the system backplane from the original system processor jumper positions that are shown in Figure 80 on page 118 to the new system processor jumper positions that are shown in Figure 81 on page 118.

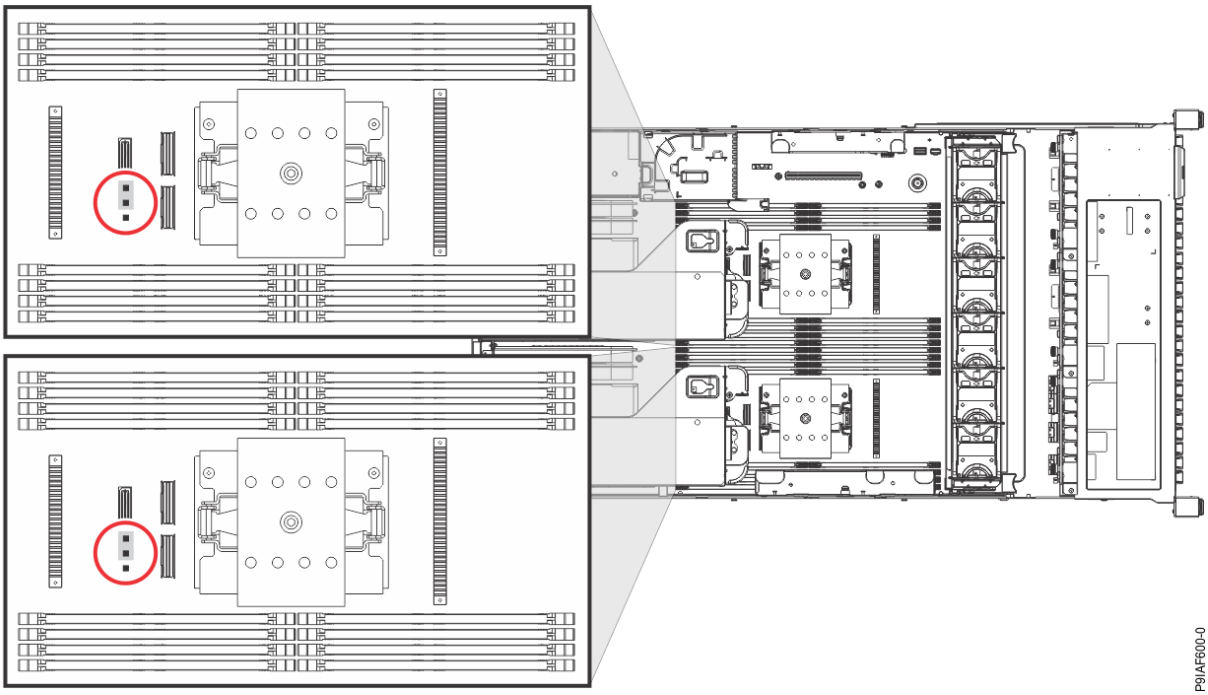


Figure 80. Original system processor jumper positions

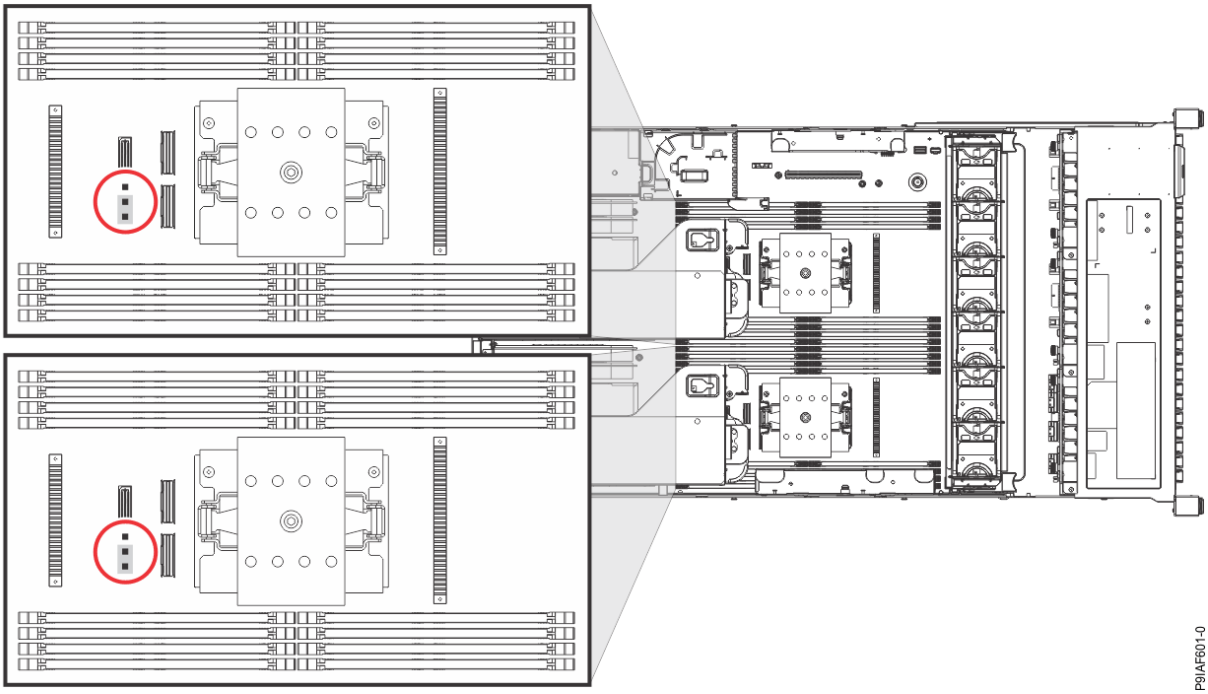


Figure 81. New system processor jumper positions

6. Install the PCIe risers. See Replacing a PCIe riser from the 9183-22X system.
7. Prepare the system for operation. For instructions, see “Preparing the 9183-22X system for operation after you remove and replace internal parts” on page 103.
8. Update the system firmware level of the BMC on the system backplane to OP940.20, or later. For instructions, see Updating the system firmware by using the OpenBMC tool.

   Note: If you are not able to update the system firmware level, contact your next level of support.
9. Power off the system and place it in the service position. For instructions, see “Preparing the 9183-22X system to remove and replace internal parts” on page 99.

10. Attach the electrostatic discharge (ESD) wrist strap.

    The ESD wrist strap must be connected to an unpainted metal surface until the service procedure is completed, and if applicable, until the service access cover is replaced.

    Attention:

    - Attach an electrostatic discharge (ESD) wrist strap to the front ESD jack, to the rear ESD jack, or to an unpainted metal surface of your hardware to prevent the electrostatic discharge from damaging your hardware.
    - When you use an ESD wrist strap, follow all electrical safety procedures. An ESD wrist strap is used for static control. It does not increase or decrease your risk of receiving electric shock when using or working on electrical equipment.
    - If you do not have an ESD wrist strap, just prior to removing the product from ESD packaging and installing or replacing hardware, touch an unpainted metal surface of the system for a minimum of 5 seconds. If at any point in this service process you move away from the system, it is important to again discharge yourself by touching an unpainted metal surface for at least 5 seconds before you continue with the service process.
11. Remove the PCIe risers. See Removing a PCIe riser from the 9183-22X system.
12. Move the system processor jumpers on the system backplane from the new system processor jumper positions that are shown in Figure 82 on page 119 to the original system processor jumper positions that are shown in Figure 83 on page 120.

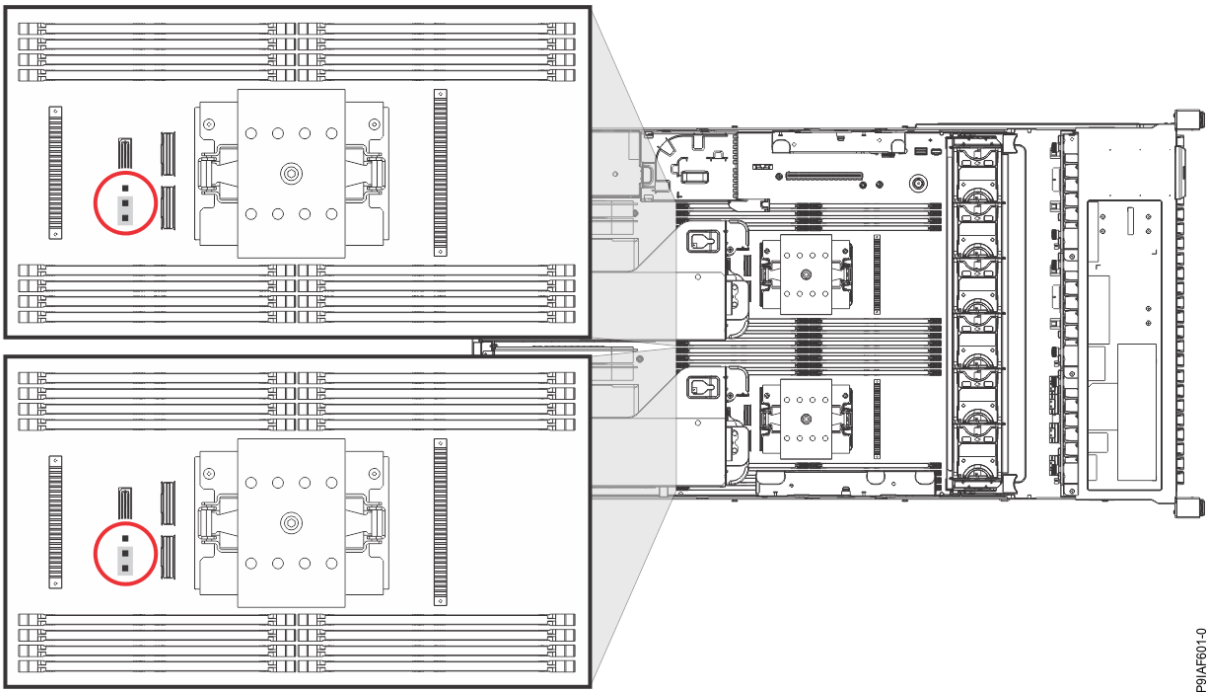


Figure 82. New system processor jumper positions

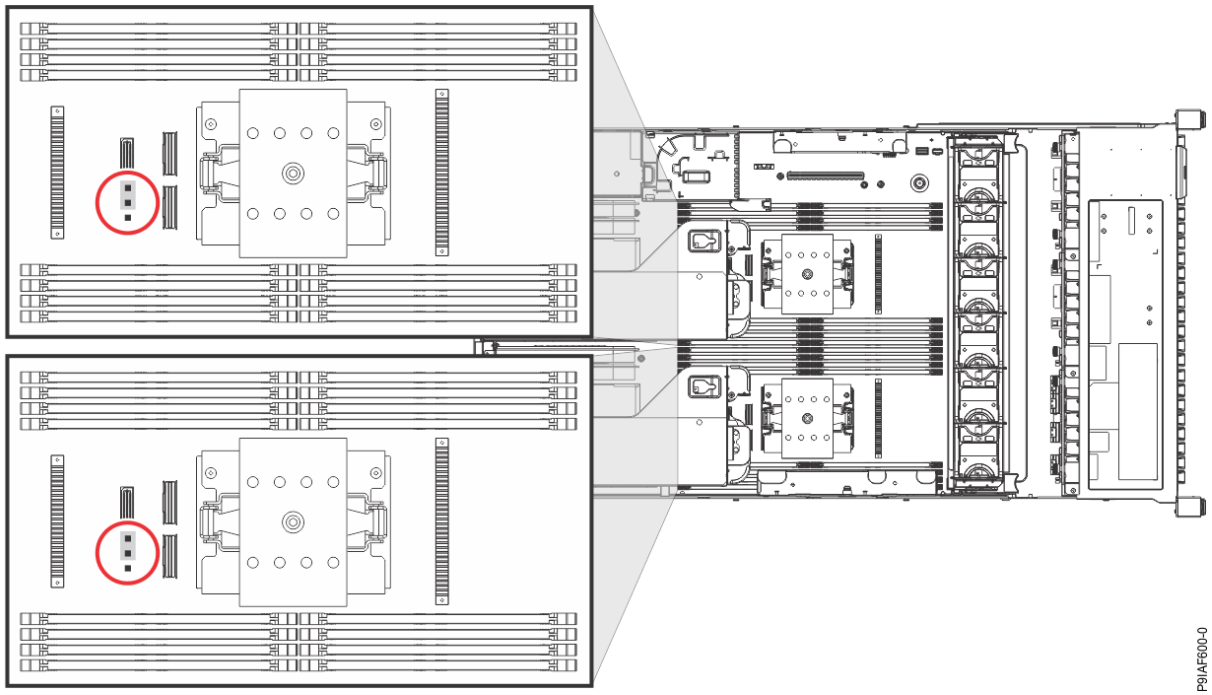


Figure 83. Original system processor jumper positions

13. Install the PCIe risers. See Replacing a PCIe riser from the 9183-22X system.
14. Prepare the system for operation. For instructions, see “Preparing the 9183-22X system for operation after you remove and replace internal parts” on page 103.

Additional procedures

Removing and replacing a power supply in the 9183-22X system

Find information about removing and replacing power supplies in the IBM Power System IC922 (9183-22X) server.

Removing a power supply from the 9183-22X system

To remove a power supply from the system, complete the steps in this procedure.

About this task

If one of the power supplies failed on a system, the power supply can be replaced while the system is running.

Procedure

1. Attach the electrostatic discharge (ESD) wrist strap.

   The ESD wrist strap must be connected to an unpainted metal surface until the service procedure is completed, and if applicable, until the service access cover is replaced.

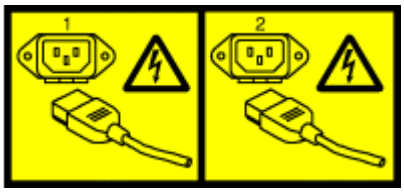
   Attention:

   - Attach an electrostatic discharge (ESD) wrist strap to the front ESD jack, to the rear ESD jack, or to an unpainted metal surface of your hardware to prevent the electrostatic discharge from damaging your hardware.
   - When you use an ESD wrist strap, follow all electrical safety procedures. An ESD wrist strap is used for static control. It does not increase or decrease your risk of receiving electric shock when using or working on electrical equipment.
   - If you do not have an ESD wrist strap, just prior to removing the product from ESD packaging and installing or replacing hardware, touch an unpainted metal surface of the system for a minimum of 5 seconds. If at any point in this service process you move away from the system, it is important to again discharge yourself by touching an unpainted metal surface for at least 5 seconds before you continue with the service process.

2. Disconnect the power source from the system by unplugging the system. For instructions, see “Disconnecting power cords from the 9183-22X system” on page 113.

   Note: The system might be equipped with redundant power supply. Before you continue with this procedure, ensure that all power to your system is disconnected.

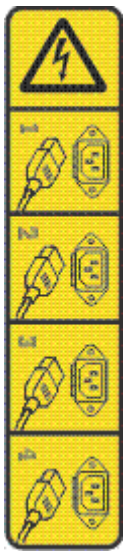
   (L003)

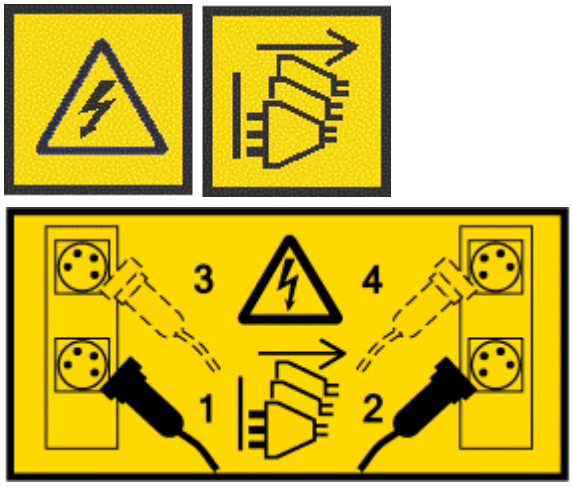
   or

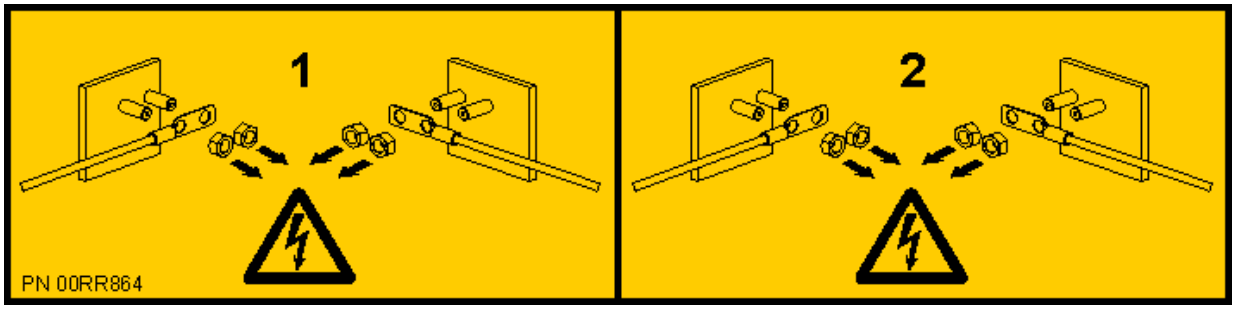
or

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)

(L005)

CAUTION: Hazardous energy present. Voltages with hazardous energy might cause heating when shorted with metal, which might result in splattered metal, burns, or both. (L005)

3. Remove the power supplies from the system as shown in the following figure.
   a) To release a power supply from its position in the system, pull the locking-tab **(A)** to the left.
   b) Grasp the power supply handle with one hand, and pull the power supply **(B)** partially out of the system.
   c) Place your other hand underneath the power supply and pull the power supply out of the system and place it on an ESD mat.
   d) Repeat steps “3.a” on page 123 - “3.c” on page 123 for the other power supply.

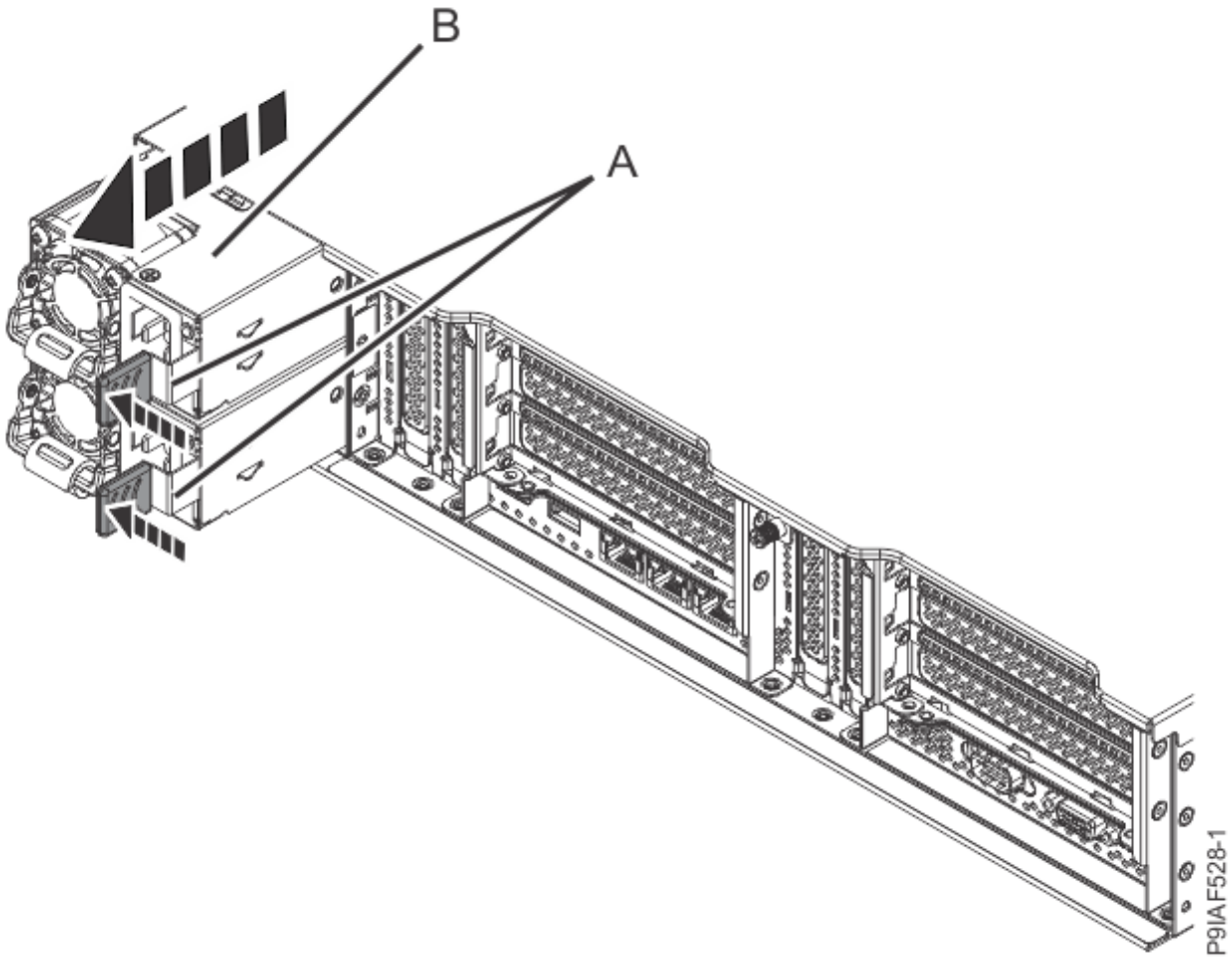


Figure 84. Removing the power supplies from the system

Replacing a power supply in the 9183-22X system

To replace a power supply in the system, complete the steps in this procedure.

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap on and that the ESD clip is plugged into a ground jack or connected to an unpainted metal surface. If not, do so now.
2. Replace the power supplies as shown in the following figure.
   a) Place your other hand underneath the power supply.
   b) Align the power supply **(A)** with the bay, so that the fan is to the left.
   c) Slide the power supply into the system until the latch **(B)** locks in place.
   d) Repeat steps “2.a” on page 124 - “2.c” on page 124 for the other power supply.

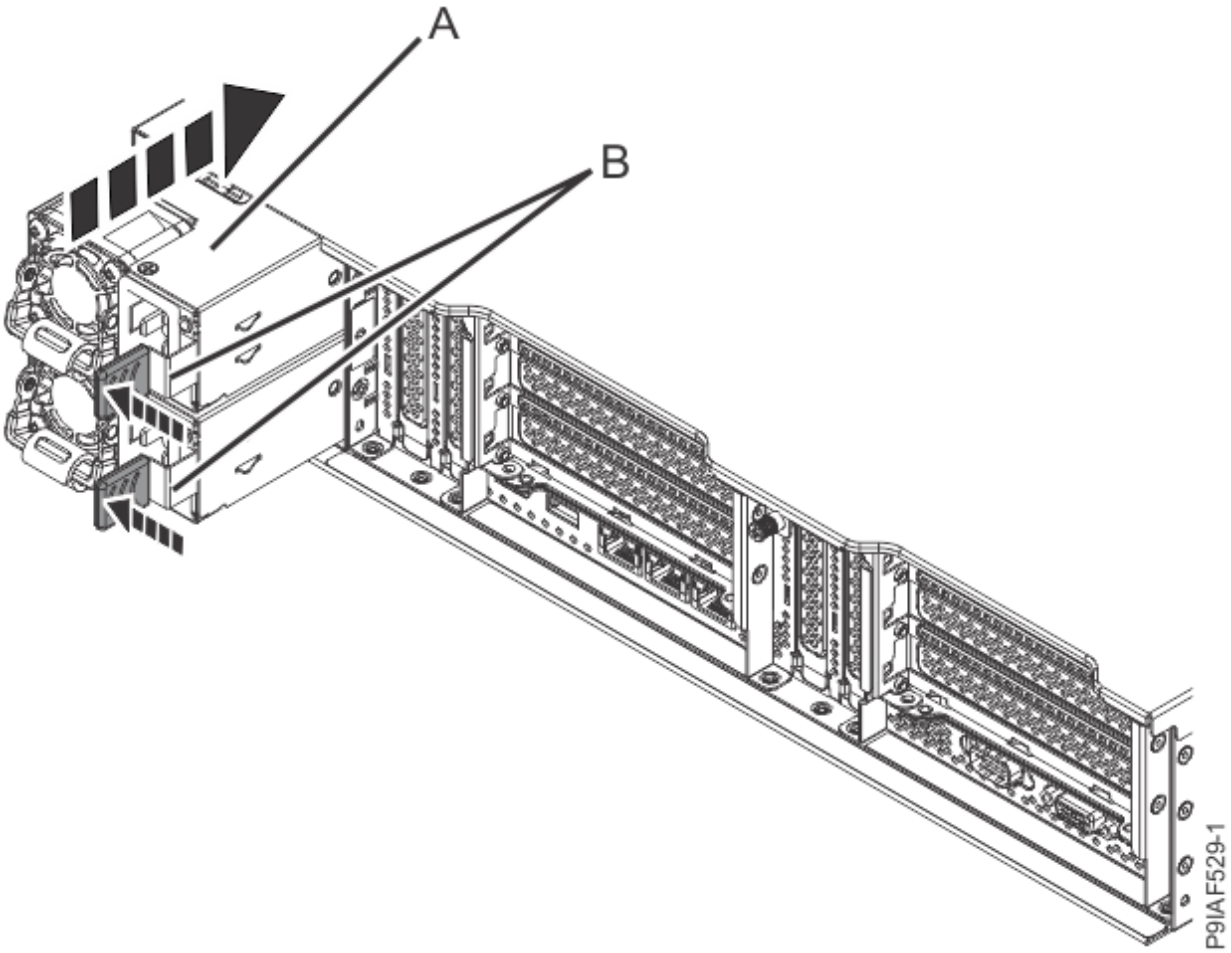


Figure 85. Replacing the power supplies in the system

3. Reconnect the power cords to the power supplies.
   For instructions, see "Connecting power cords to the 9183-22X system" on page 115.

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- Operations that use a screen reader

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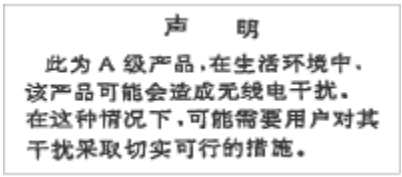

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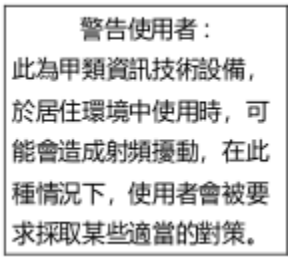

IBM Taiwan Contact Information:

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

United States Federal Communications Commission (FCC) Notice

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. Proper cables and connectors are available from IBM-authorized dealers. 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.

Responsible Party:
International Business Machines Corporation
New Orchard Road
Armonk, NY 10504
Contact for FCC compliance information only: fccinfo@us.ibm.com

Class B Notices

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

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

Canada Notice

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

European Community and Morocco Notice

This product is in conformity with the protection requirements of Directive 2014/30/EU of the European Parliament and of the Council on the harmonization 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.

German Notice

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:
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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 55032 Klasse B

Japan Electronics and Information Technology Industries Association (JEITA) Notice

（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 applies to 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 applies to 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 applies to 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

Japan Voluntary Control Council for Interference (VCCI) Notice

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Taiwan Notice

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台北市松仁路7號3樓
電話：0800-016-888

United States Federal Communications Commission (FCC) Notice

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 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.

Responsible Party:

International Business Machines Corporation
New Orchard Road
Armonk, New York 10504
Contact for FCC compliance information only: fccinfo@us.ibm.com

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