Power Systems

Installing the IBM Power System LC921 (9006-12C)

IBM

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IBM

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.
- Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements.
- Do not continue with the inspection if any unsafe conditions are present.
- Before you open the device covers, unless instructed otherwise in the installation and configuration procedures: Disconnect the attached AC power cords, turn off the applicable circuit breakers located in the rack power distribution panel (PDP), and disconnect any telecommunications systems, networks, and modems.

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

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

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

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

(R001 part 1 of 2):

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

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

(R001 part 2 of 2):

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

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

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

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

(R002)

(L001)

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

(L002)

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

(L003)
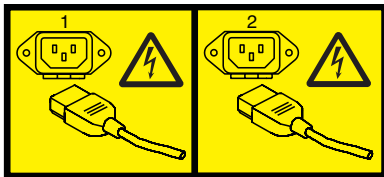
or
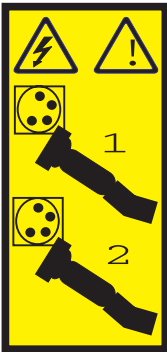
or

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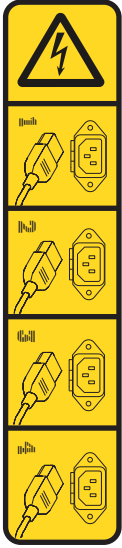
or
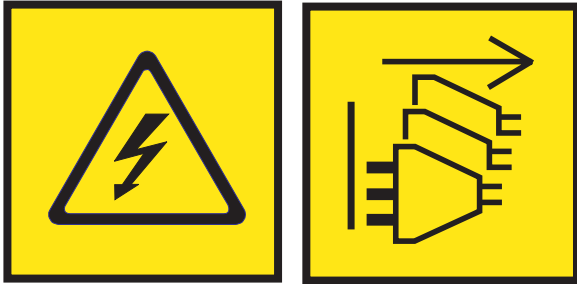
DANGER: Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)

(L007)

CAUTION: A hot surface nearby. (L007)

(L008)

CAUTION: Hazardous moving parts nearby. (L008)

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

CAUTION:
This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

(C026)

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

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

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

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

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

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

CAUTION:

Regarding IBM provided VENDOR LIFT TOOL:

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

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

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

The equipment is suitable for installation in the following:

- Network telecommunications facilities
- Locations where the NEC (National Electrical Code) applies

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

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

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

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

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

Installing and configuring your system and system features

Use this information to install and configure POWER9 processor-based systems 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.

Note: 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 IBM Power System LC921 (9006-12C) system

Learn how to install, cable, and set up your 9006-12C system.

Prerequisites for installing the rack-mounted 9006-12C system

Use the information to understand the prerequisites that are required for installing the system.

About this task

You might need to read the following documents before you begin to install the server:
- The latest version of this document is maintained online, see Installing the IBM Power System 9006-12C (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_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 starting your 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 system

Use this information to complete inventory for your system.

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 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 for the 9006-12C system

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/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 units into the lower part of the rack first.
   - Record the Electronic Industries Alliance (EIA) locations in your plan.
3. If necessary, remove the filler panels to allow access to the inside of the rack enclosure where you plan to place the unit, as shown in Figure 1 on page 3
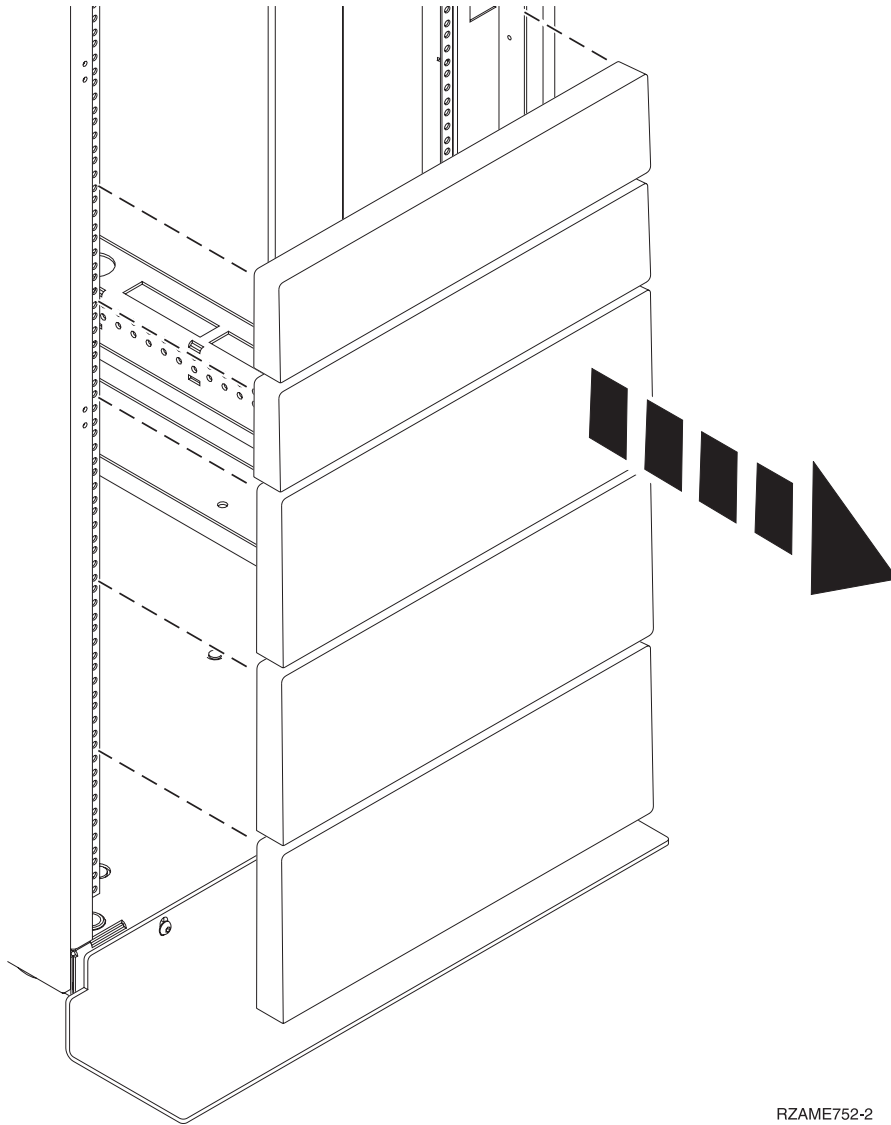
RZAME752-2

Figure 1. Removing the filler panels

4. Determine to place the system in the rack. Record the EIA location.
5. 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.
6. Repeat step 5 for the corresponding holes located on the left side of the rack.
7. Go to the rear of the rack.
8. On the right side, find the EIA unit that corresponds to the bottom EIA unit marked on the front of the rack.
9. Mark the bottom EIA unit.
10. Mark the corresponding holes on the left side of the rack.

Attaching the rails to the system chassis and to the rack

You must install the rails onto the chassis and into the rack. Use this procedure to perform this task.

About this task

Attention: To avoid rail failure and potential danger to yourself and to the unit, ensure that you have the correct rails and fittings for your rack. If your rack has square support flange holes or screw-thread support flange holes, ensure that the rails and fittings match the support flange holes that are used on your rack. Do not install mismatched hardware by using washers or spacers. If you do not have the correct rails and fittings for your rack, contact your IBM reseller.

Note: The system requires 1 EIA rack unit (1U) of space.

Ensure that you have the parts you need to install the rails. The following parts are included with the rail kit:
- Slide rail screws, used to attach the two parts of each slide rail
- Slide rail rack screws, used to secure the rails to the rack
- Rails
- 10-32 x 0.25" screws, used to attach the rails to system chassis

Procedure

1. Remove the rail pieces from the packaging and put them on a work surface.
2. Connect the two parts of each rack slide rail. To connect the two parts of the rack slide rail, perform the following tasks:
   a. Identify the two pieces of the left rack slide rail. Align the short and long pieces (**C**). Ensure that the rack rail pins are pointing in the same direction (**A**) and (**D**).
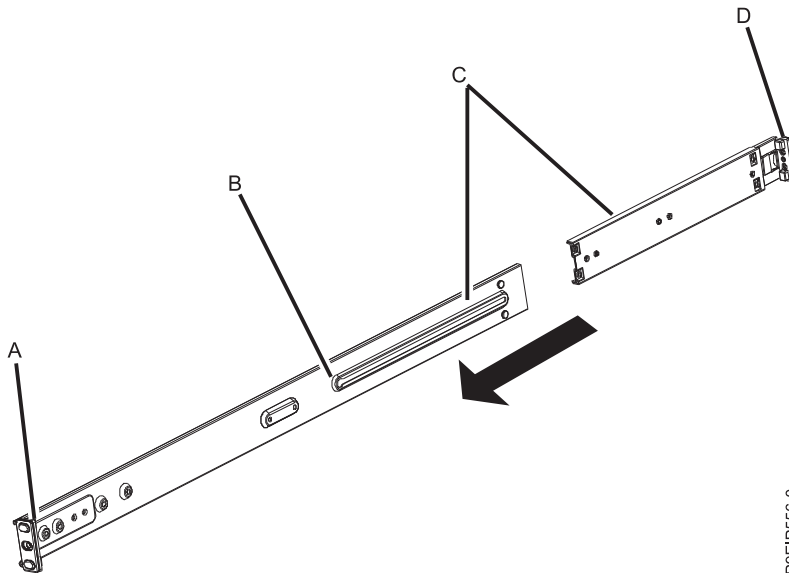
   b. The shorter piece of the rack slide rail has a metal pin. Insert the pin into the hole in the longer piece of the rack slide rail (**B**). Slide the shorter piece of the rack rail into the longer piece of the rack rail.
   c. Align the holes in the two pieces of the rack slide rails. Using a Philips-head screwdriver, attach the two parts by loosely screwing two rail screws through the holes in the rack slide rail.

      Note: Do not tighten the rack slide rail screws.
   d. Repeat these steps for the right slide rail.
3. Attach the chassis rails to the system chassis. To attach the chassis rails to the system chassis, perform the following tasks:

a. On the left side of the system, align the metal tabs on the left side of the system chassis with the square holes on the left chassis slide rail. Slide the chassis slide rail toward the front of the rack until the chassis slide rail clicks into place.

b. Attach the system chassis slide rail to the system chassis by screwing in the two screws that were supplied in the rail kit.

c. Repeat these steps for the right system chassis slide rail.

4. Install the rack slide rails into the rack.

a. Move to the front of the rack.

b. Select the left rack slide rail, and locate the EIA unit that you previously marked. Each slide rail is also marked **Back**, to designate the rear of the rack. Ensure that you are holding the front end of the rack slide rail.

c. Extend the rail from the front of the rack to the back of the rack and align the rack slide rail pins with the holes in the rack flange that you previously marked.

d. Push the rack rail pins into the rear rack flange until the rear rack rail latch clicks into place.

e. Pull the front of the rack rail toward the front of the rack rail flange. Align the slide rail pins with the holes in the rail flange and pull them until the rail latch clicks into place.

f. Using a screwdriver, Tighten the rail screws that you installed in step 2.

g. Repeat these steps for the right slide rail.

5. Secure the rails to the rack.

a. Move to the rear of the rack.

b. Slide each washer onto to each of the longer screws that is included with the rail kit.

c. Screw a screw and washer through the middle hole of each rail on each side of the rear of the rack.

Installing the system into the rack and connecting and routing power cables

After you install the system onto the rails in the rack, connect and route power cables.

About this task

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

Procedure

1. Remove the protective plastic film from the top of the system chassis.

2. Move to the front of the rack.

3. Using two people, lift the system and align the system chassis rails on each side of the chassis with the rack slide rails.

4. While one person is supporting the weight of the system, have the second person gently push the system into the rack, until you hear each slide rail click into place.

5. Push the system toward the rear of the rack until the system.

6. Secure the system to the rack by screwing a screw through the handles on each side of the system chassis.

7. Plug the power cords into the power supplies.
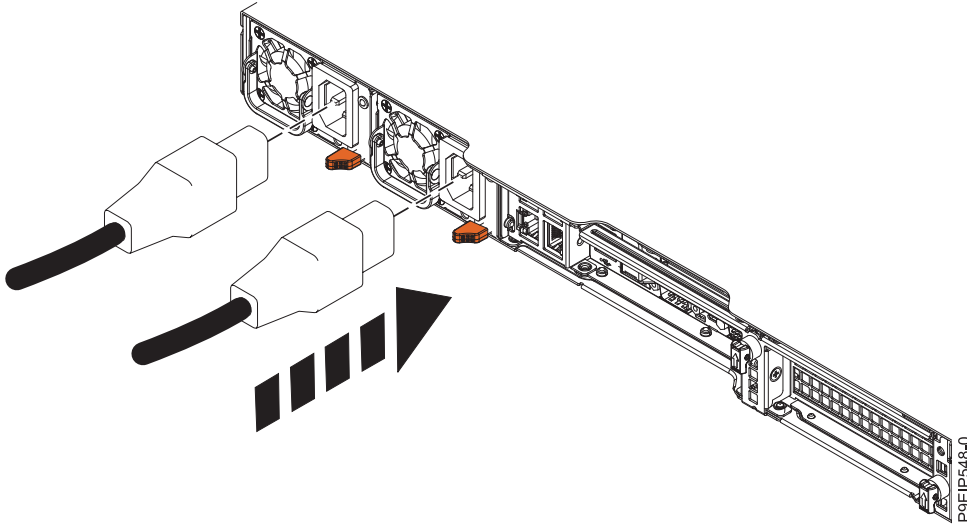
Figure 2. Plugging the power cords into the power supplies

8. Attach all cables to the rear of the server.
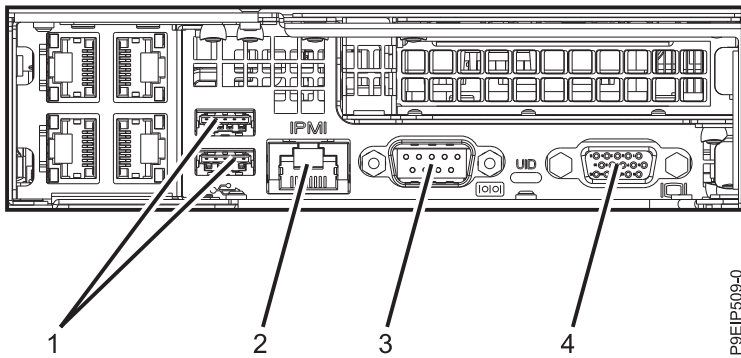
Figure 3. Rear ports

Table 1. Input and output ports

Identifier	Description
1	USB 2.0 used for keyboard and mouse.
	Certain USB drives might be too wide to fit properly into the USB ports on the rear of the system. Test the fit your USB drive before proceeding.
2	Ethernet Intelligent Platform Management Interface (IPMI)
3	Serial IPMI
4	Video Graphics Array (VGA) used for monitor. Only the 1024 x 768 at 60 Hz VGA setting is supported. Only up to a 3-meter cable is supported. Text based capability is only supported at this time.

9. Plug the system power cords and the power cords for any other attached devices into the alternating current (AC) power source.
10. Continue with "Completing server setup" on page 7.

Completing server setup

Learn how to complete server setup.

Procedure

1. Connect your server to a VGA terminal and keyboard or a console. Only the 1024x768 at 60 Hz VGA setting is supported. Only up to a 3 meter cable is 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(http://www.ibm.com/support/knowledgecenter/linuxonibm/liabw/liabwkickoff.htm).

Installing drives in the 9006-12C system

Learn how to install storage drives in the IBM Power® System LC921 (9006-12C) system.

About this task

You can install the following types of drives in the system:
- SATA drives connected to the SATA controller ports on the system backplane
- Disk on module (DOM) drives
- SAS drives connected to a SAS RAID adapter
- NVMe drives connected to an NVMe adapter
- 3.5-inch drives
- 2.5-inch drives by using an adapter

Drive installation details for the 9006-12C system

Find information about the drive installation options for the IBM Power System LC921 (9006-12C) system.

SATA Drives

The 9006-12C system can support four SATA drives. The SATA drives can be installed into the front drive bay locations. SATA drive cables connect the disk drive backplane to the SATA sockets on the system backplane.

You can plug SATA drive on module (DOM) drives directly into the system backplane. Up to two SATA DOM drives can be installed. Use the two orange SATA connectors.

SAS Drives

By using SATA/SAS RAID adapters, the 9006-12C system can support up to four SATA/SAS drives.

Use SAS cables to connect the SAS ports on the PCIe adapter cards to the SAS ports on the disk drive backplane.

If you are installing a RAID adapter, see the adapter documentation for information on configuring the drives.

Sample SAS configuration:
- Feature code EKAA RAID adapter supporting four front-mounted SATA/SAS drives.
- Two SATA DOMs plugged into the system backplane.

NVMe Enabled System and Drives

When the system has an NVMe adapter, the system supports NVMe drives. The first two NVMe drives need to be plugged into drive locations 1 and 2 as shown in Figure 4. The second two NVMe drives need to be plugged into drive locations 3 and 4.

NVMe drives are only supported on host operating systems. NVMe drives are not supported by guest operating systems. On systems with RHEL 7.3 or later, or Ubuntu 16.04 or later, NVMe drives can be used as bootable drives. Port 1 of the internal NVMe host bus adapter must be plugged into NVMe port 1 on the disk drive backplane.
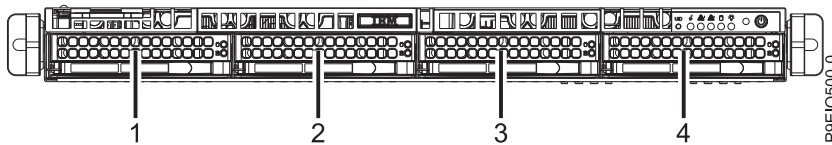
Figure 4. NVMe drive locations

Sample NVMe configuration:
- Four NVMe front-mounted drives with the NVMe adapter.
- Two SATA DOMs plugged into the system backplane.

Installing a drive in the 9006-12C system

Follow these steps to install a drive in the IBM Power System LC921 (9006-12C) system.

Before you begin

You can install SATA and SAS drives with the system powered on and running.

When installing NVMe drives, the system needs to be powered down; for instructions, see "Stopping the 9006-12C or 9006-22C system" on page 110.

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. Unlock the drive bay handle **(B)** by pushing in the handle release **(A)** as shown in Figure 5. The handle **(B)** snaps out towards you. If the handle does not snap out all the way, the drive does not slide out of the system.
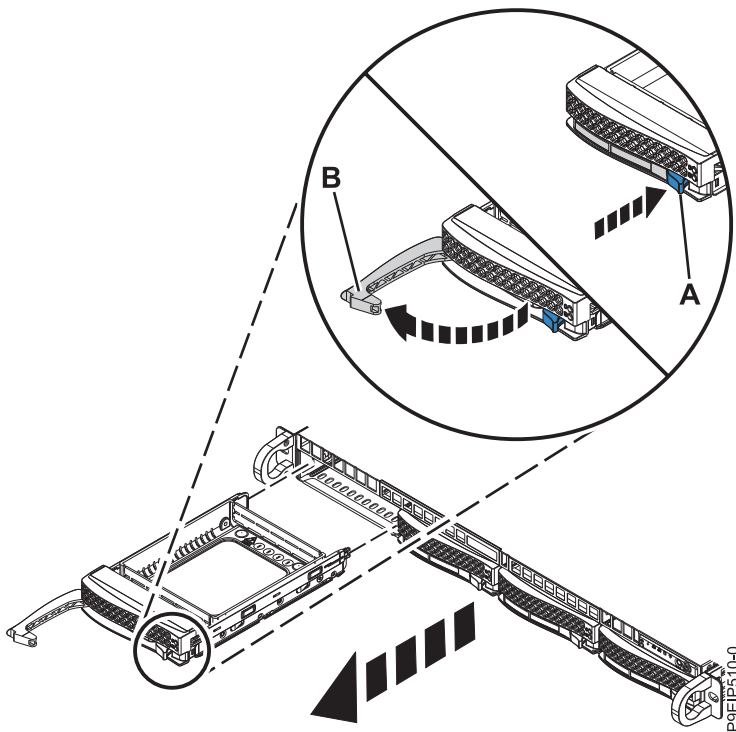
Figure 5. Removing a drive

3. If you are installing more than one drive, remove those drive trays.

4. For 3.5-inch drives, remove the plastic filler from the carrier. For 2.5-inch drives in a 3.5-inch opening, there is a 2.5-inch tool-less drive carrier.

5. Install a drive into the tray. Orient the drive such that the connectors are pointing to the rear of the drive.

   - A 3.5-inch drive fills the tray, as shown in Figure 6 on page 10. Fasten the drive to the sides of the tray with four screws (two screws on each side).
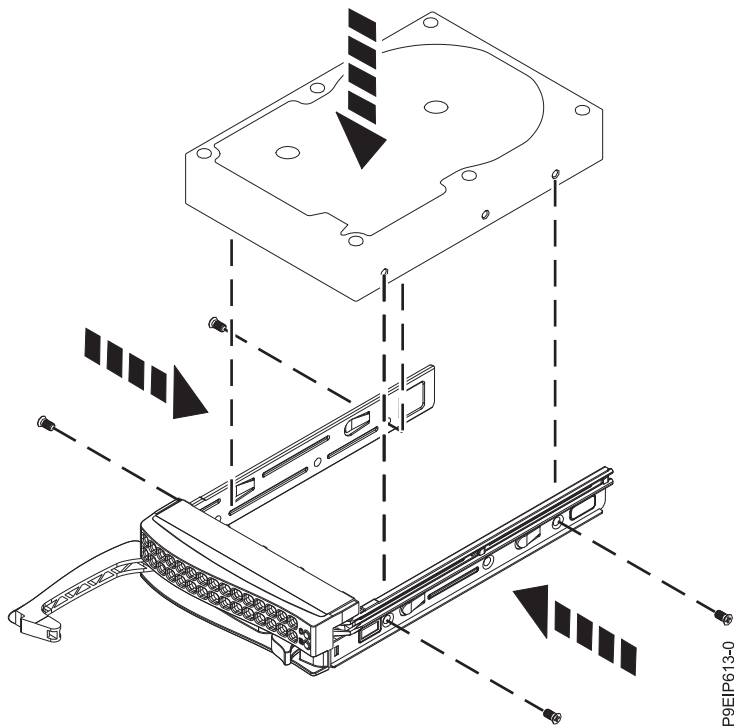
Figure 6. Mounting the 3.5-inch drive in the tray

- A 2.5-inch drive slides into the rear of the tool-less drive carrier.
  a. Turn the tray upside down as shown in Figure 7.
  b. Open the retention spring **(B)** as shown in Figure 8 on page 11.
  c. Place the 2.5-inch drive **(A)** into the tray, aligning the pins with the screw holes in the drive.
  d. When the pins are aligned, close the retention spring, allowing the pins to secure the drive in the tray.
  e. Turn the tray right side up.
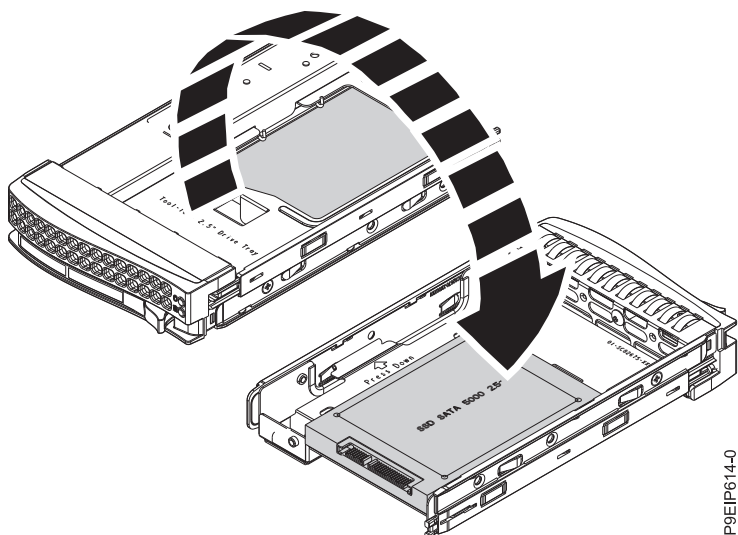
Figure 7. Turning the 2.5-inch tray upside-down

A

B

Press Down
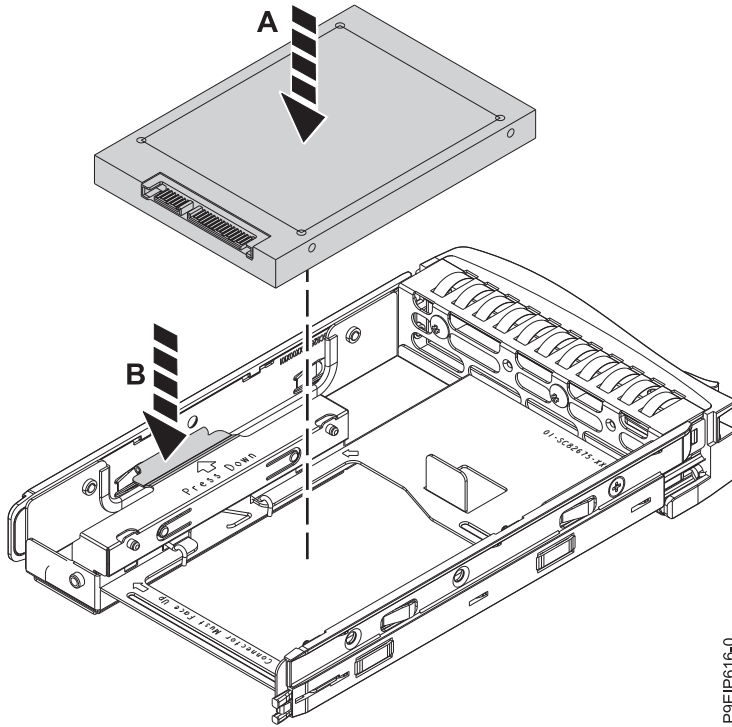
P9EIP616-0

Figure 8. Mounting the 2.5-inch drive in the tray

6. Support the drive by the bottom 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.
7. Lock the drive bay handle **(A)** by pushing in the handle release as shown in Figure 9 on page 12.
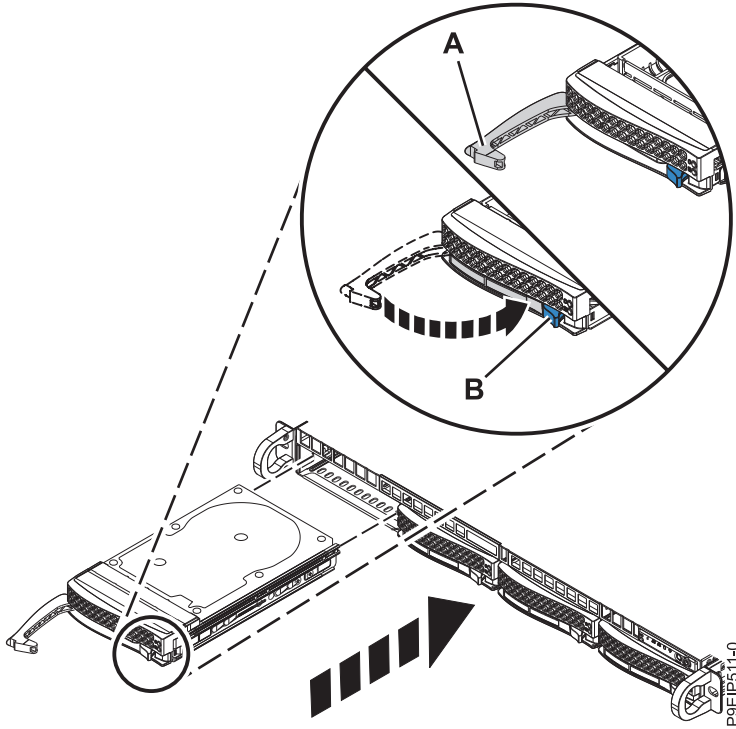
Figure 9. Disk drive lock detail

8. If you installed an NVMe drive, power the system back on. For instructions, see "Starting the 9006-12C or 9006-22C system" on page 109.

9. For a non-RAID drive, configure the installed drive for your environment. If the drive is part of a RAID configuration, skip this step, the drive is detected and configured when inserted.

    After you insert the new drive, you need to rescan for the device.

    Ubuntu Linux operating system
    > To run the **rescan-scsi-bus** command in the Ubuntu Linux operating system, log in to the system as the root user, and run the following command:
    >
    > ```
    > rescan-scsi-bus
    > ```
    >
    > The **rescan-scsi-bus** tool is available in the scsitools package; install the package by using the following command:
    >
    > ```
    > sudo apt-get install scsitools
    > ```

    Red Hat Enterprise Linux (RHEL) version 7.2
    > To run the rescan command in the REHL version 7.2 operating system, log in to the system as the root user, and run the command:
    >
    > ```
    > rescan-scsi-bus.sh -a
    > ```
    >
    > The **rescan-scsi-bus** tool is available in the *sg3_utils* package; install the package by using the following command:
    >
    > ```
    > yum install sg3_utils
    > ```
    >
    > You can also want to refer to: Adding a Storage Device or Path(https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Storage_Administration_Guide/logical-unit-add-remove.html).

10. Load or restore data from your backup media.

Installing a drive on module in the 9006-12C system

Learn how to install a drive on module (DOM) in the IBM Power System LC921 (9006-12C) system.

Before you begin

Power off the system and place it in the service position. For instructions, see "Preparing the 9006-12C system to remove and replace internal parts" on page 106.

About this task

You can plug SATA drive on module (DOM) drives directly into the system backplane. Up to two SATA DOM drives can be installed. Use the two orange SATA connectors.

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. Install the DOM into the system backplane, in positions **(A)**, as shown in Figure 10 on page 14. Depending on the DOM model, you may also have to plug in a small power cord for the DOM. Ensure you plug the connectors in properly.

Figure 10. Installing a DOM

3. Prepare the system for operation. For instructions, see "Preparing the 9006-12C system for operation after you remove and replace internal parts" on page 108.

4. For a non-RAID drive, configure the installed drive for your environment. If the drive is part of a RAID configuration, skip this step, the drive is detected and configured when inserted.

   After you insert the new drive, you need to rescan for the device.

   Ubuntu Linux operating system
   > To run the **rescan-scsi-bus** command in the Ubuntu Linux operating system, log in to the system as the root user, and run the following command:
   >
   > ```
   > rescan-scsi-bus
   > ```
   >
   > The **rescan-scsi-bus** tool is available in the scsitools package; install the package by using the following command:
   >
   > ```
   > sudo apt-get install scsitools
   > ```

   Red Hat Enterprise Linux (RHEL) version 7.2
   > To run the rescan command in the REHL version 7.2 operating system, log in to the system as the root user, and run the command:
   >
   > ```
   > rescan-scsi-bus.sh -a
   > ```
   >
   > The **rescan-scsi-bus** tool is available in the *sg3_utils* package; install the package by using the following command:
   >
   > ```
   > yum install sg3_utils
   > ```
   >
   > You can also want to refer to: Adding a Storage Device or Path(https://access.redhat.com/documentation/en-US/Red_Hat_Enterprise_Linux/7/html/Storage_Administration_Guide/logical-unit-add-remove.html).

5. Load or restore data from your backup media.

Installing a graphics processing unit in the 9006-12C system

Follow these steps to install a graphics processing unit in the IBM Power System LC921 (9006-12C) system.

Before you begin

Power off the system and place it in the service position. For instructions, see "Preparing the 9006-12C system to remove and replace internal parts" on page 106.

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. The GPU can share the PCIe riser card with other PCIe adapters. Label and remove any cables and plugs that extend out of the adapters.

3. Remove the PCIe riser as shown in Figure 11 on page 16.

   a. Retract the retaining pins **(A)** so that the arrows on the tabs point to the system.

   b. Lift the PCIe riser from the system.
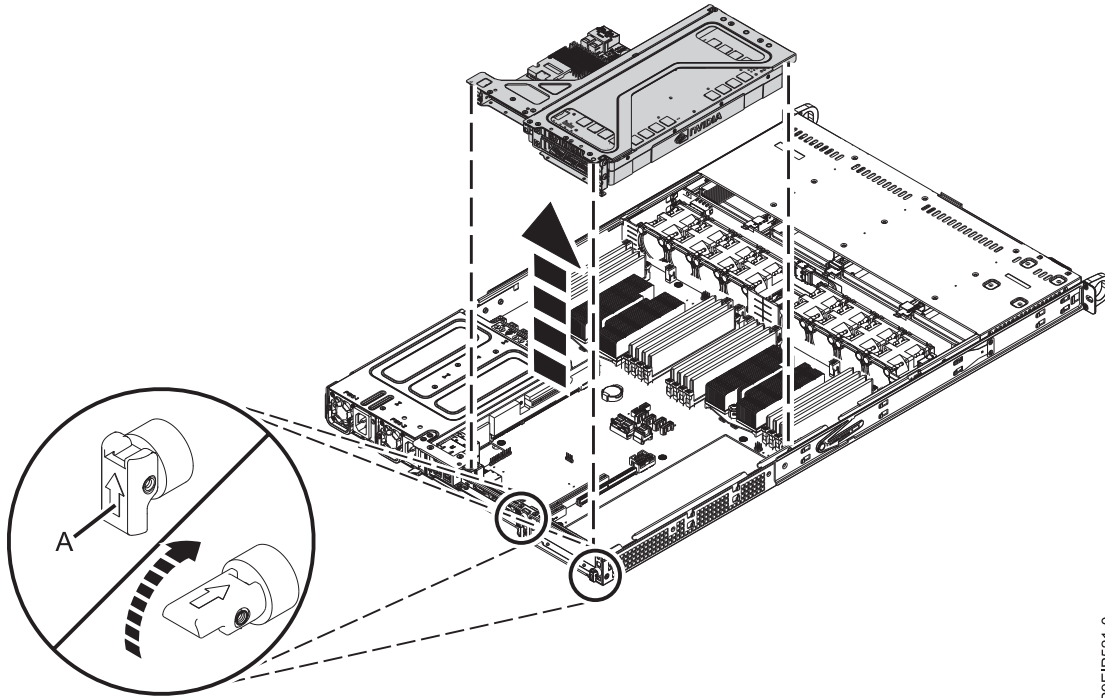
Figure 11. Removing the PCIe riser

4. Place the PCIe adapter riser on an ESD surface.
5. Plug the GPU **(A)** into the PCIe adapter riser **(B)** as shown in Figure 12. Secure the GPU tailstock with one or two screws as needed.
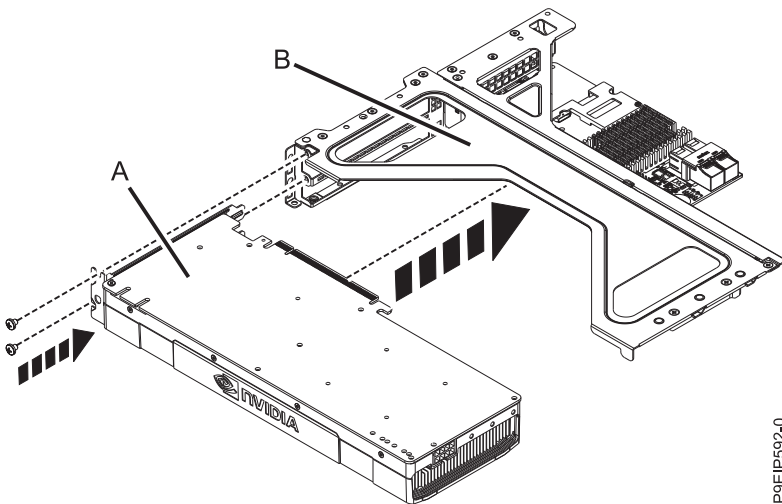
Figure 12. Inserting the GPU into the riser

6. Place the PCIe adapter riser and the cards it contains into the system backplane as shown in Figure 13 on page 17.
   a. Ensure that the PCIe holder release pins **(B)** are retracted, so the arrows point into the system.
   b. Use the alignment pins **(A)** and slots to help you properly insert the riser cards and replace the cover
   c. Reset the retaining pins to secure the PCIe cage.
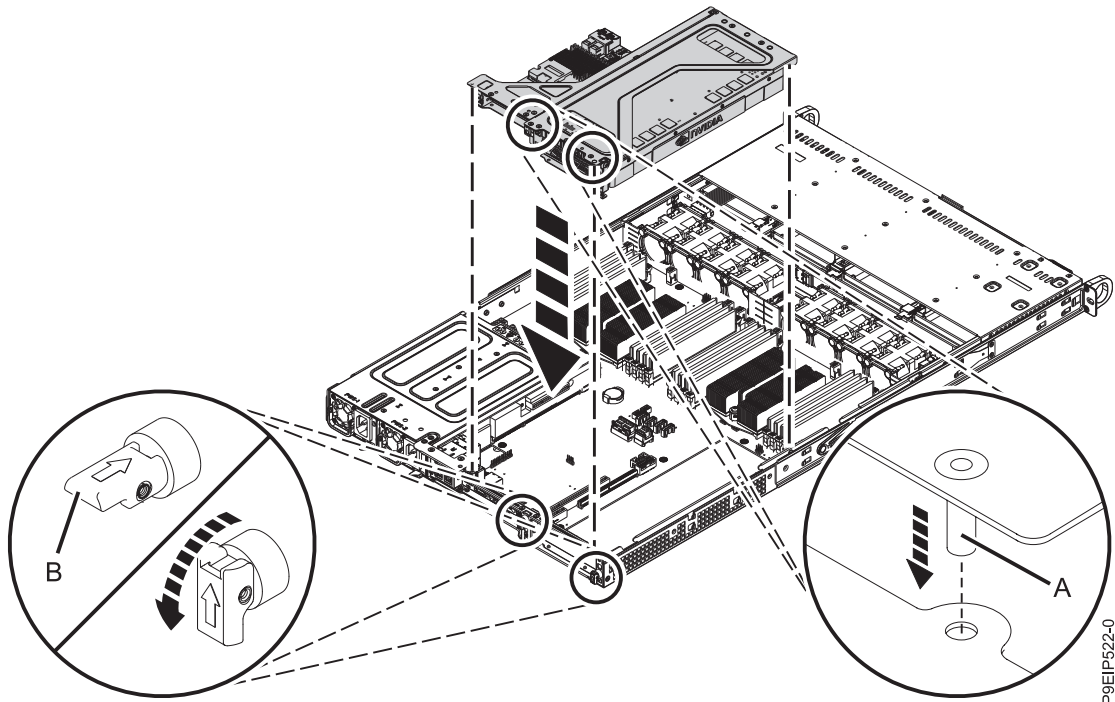
Figure 13. Replacing the PCIe riser

7. Using your labels, replace any cables and plugs that you removed from the adapters.

8. Plug the GPU power cable into the system backplane as shown in Figure 14 on page 18. Ensure that the cable latch clip snaps into place on the connector.
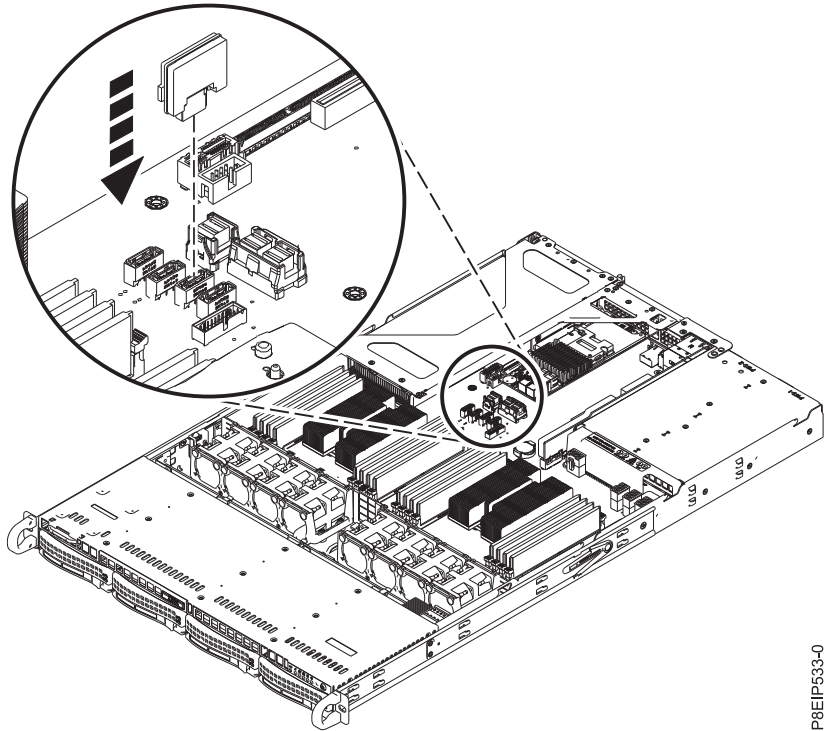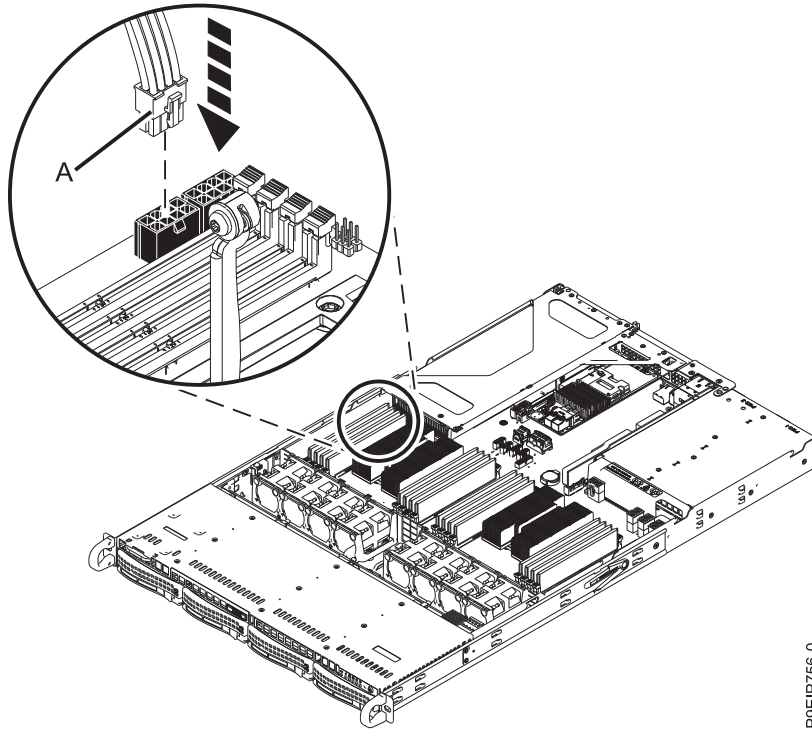
Figure 14. Plugging the GPU power cable into the system backplane

What to do next

Prepare the system for operation. For instructions, see "Preparing the 9006-12C system for operation after you remove and replace internal parts" on page 108.

Installing memory in the 9006-12C system

Learn how to install memory in the IBM Power System LC921 (9006-12C) system.

Placement rules for memory in the 9006-12C or 9006-22C system

Learn about the configurations and rules that apply to adding memory to the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) system.

- The system supports, 2, 4, 6, 8, 10, 12, 14, or 16 memory DIMMs (dual inline memory modules)
- The memory DIMMs can be 8, 16, 32, or 64 GB
- You must add pairs of memory DIMMs.
- Memory pairs must have the same size & type.
- Memory pairs can have different memory sizes and types from other memory pairs
- The memory DIMMs must be added in a sequence.
- For a two processor system, use Table 2 and Figure 15 on page 19 to determine the memory placement.
- For a single processor system, use Table 3 on page 19 and Figure 16 on page 20.

Table 2. Two processor memory plugging sequence

Slot Location	Plugging Sequence	Notes
P1-A1 and P1-B1	1	Minimum memory allowed
P2-A1 and P2-B1	2	
P1-C1 and P1-D1	3	

Table 2. Two processor memory plugging sequence (continued)

Slot Location	Plugging Sequence	Notes
P2-C1 and P2-D1	4	Maximum memory band-width for two system processor systems when using 2R DIMMs
P1-A2 and P1-B2	5	
P2-A2 and P2-B2	6	
P1-C2 and P1-D2	7	
P2-C2 and P2-D2	8	Maximum memory band-width for two system processor systems when using 1R DIMMs
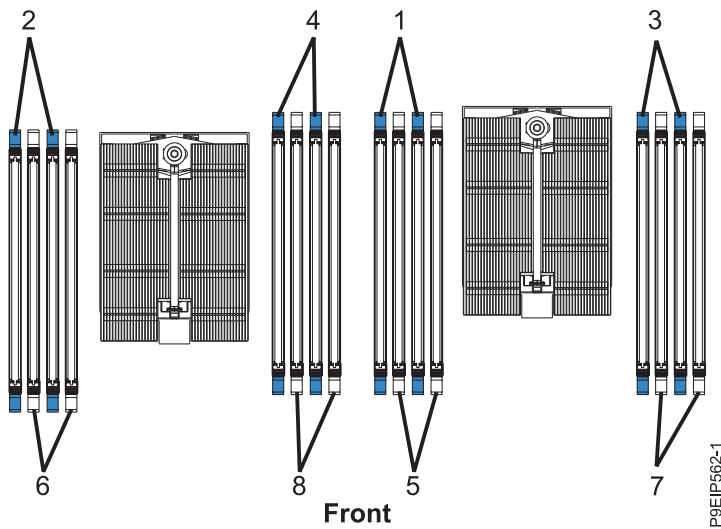
Figure 15. Two processor memory plugging sequence

Table 3. Single processor memory plugging sequence

Slot Location	Plugging Sequence	Notes
P1-A1 and P1-B1	1	Minimum memory allowed
P1-C1 and P1-D1	2	Maximum memory band-width for single system processor systems when using 2R DIMMs
P1-A2 and P1-B2	3	
P1-C2 and P1-D2	4	Maximum memory band-width for single system processor systems when using 1R DIMMs
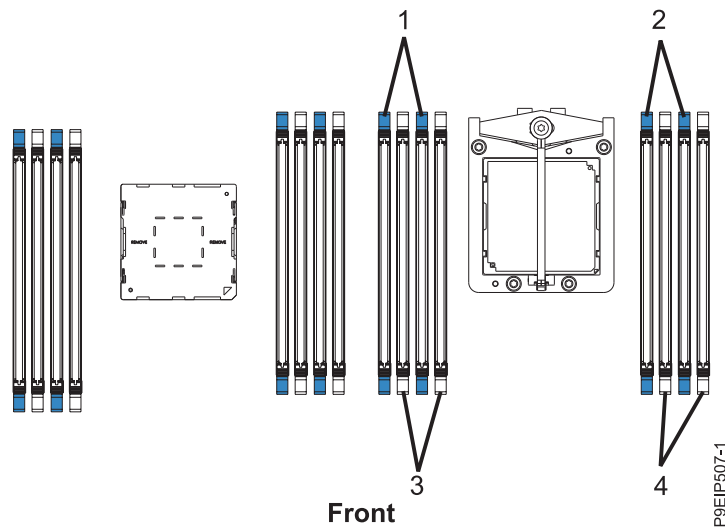
Figure 16. Single processor plugging sequence

Installing memory in the 9006-12C system

Learn how to install memory in the IBM Power System LC921 (9006-12C) system.

Before you begin

Power off the system and place it in the service position. For instructions, see "Preparing the 9006-12C system to remove and replace internal parts" on page 106.

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. Determine the slot in which you want to install the memory. See "Placement rules for memory in the 9006-12C or 9006-22C system" on page 18 to understand the plugging rules and to ensure that you plug the memory into the system in the correct sequence.

3. Depending on the memory location, you might need to remove the system processor air baffles. Carefully unsnap and lift the processor air baffle from the system.
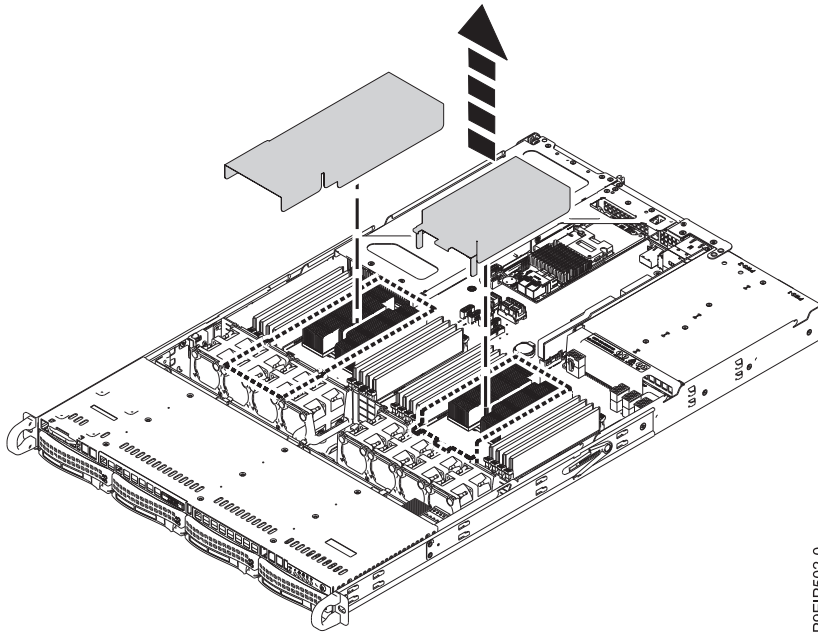
P9EIP502-0

Figure 17. Removing the processor air baffle

4. Push the DIMM locking tabs away from the socket.
5. Insert the memory DIMM.
   a. Grasp the memory DIMM along its edges and align it with the slot on the system backplane.

      Attention: Memory is keyed to prevent it from being installed incorrectly. Note the location of the key tab within the memory connector before you attempt to install it.
   b. Press firmly on each side of the memory DIMM until the locking tab locks in place with an audible click.
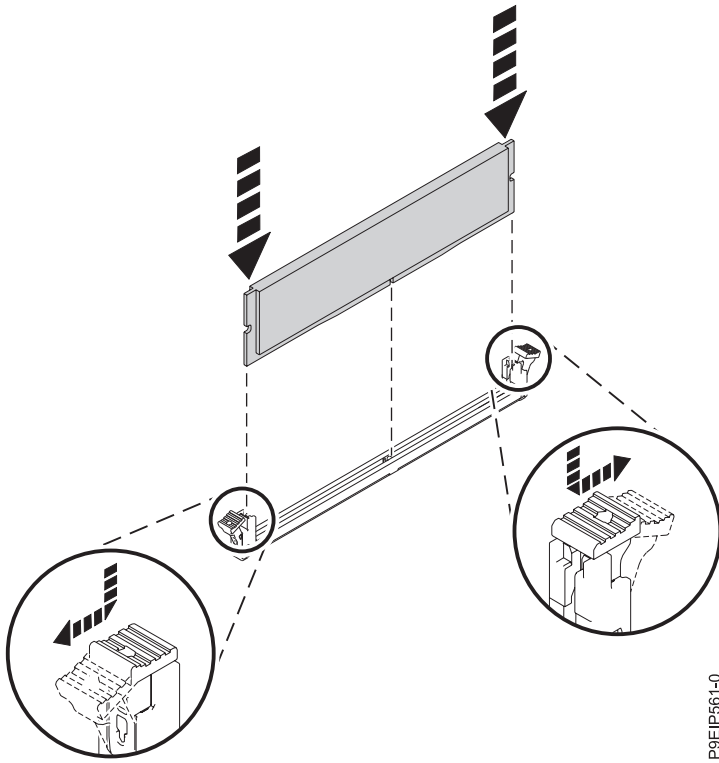
P9EIP561-0

Figure 18. Inserting the memory DIMM

6. If you removed the system processor air baffle, replace it. Insert the edge of the baffle into the fan support. Then, carefully press the baffle down into place.
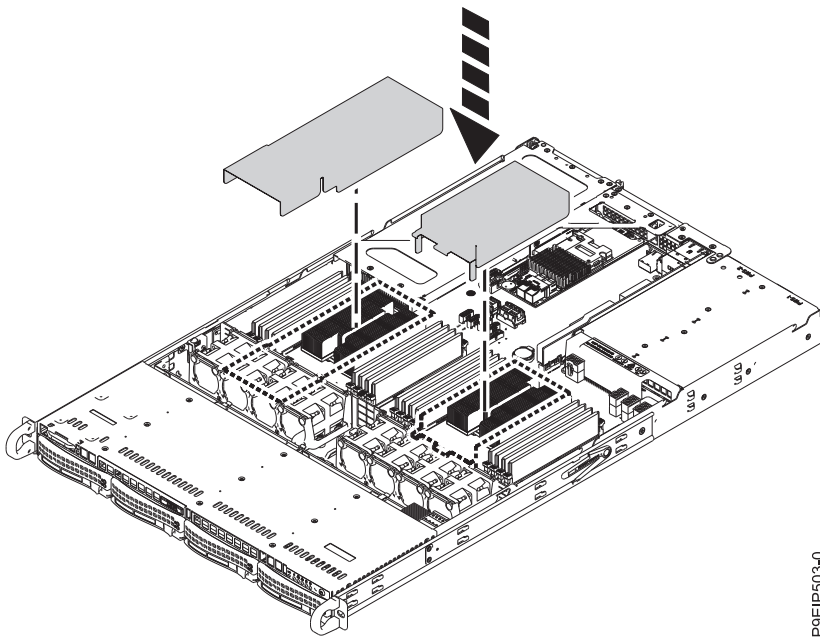
P9EIP503-0

Figure 19. Installing the processor air baffle

What to do next

Prepare the system for operation. For instructions, see "Preparing the 9006-12C system for operation after you remove and replace internal parts" on page 108.

Installing a PCIe adapter in the 9006-12C system

Learn how to install Peripheral Component Interconnect Express (PCIe) adapters into the system.

About this task

Installing this feature 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.

The features listed in Table 4 are electromagnetic compatibility (EMC) Class B features. See the Class B Notices in the Hardware Notices section.

Table 4. Electromagnetic compatibility (EMC) Class B features

Feature	Description
EKAA	Broadcom (LSI) MegaRAID 9361-8i SAS3 Controller with 8 Internal Ports (1 GB Cache) PCIe3.0 x8 LP with cables (Adapter FRU number: AOC-K-9361-8IS-IB001 and AOC-K-9361-8IB-IB001)
EKAJ	NVIDIA Tesla K80 24 GB GPU Accelerator (Adapter FRU number: AOC-KIT-NVK80-IB001)
EKA3	Intel 82575EB Dual-port Gigabit Ethernet Controller PCIe x4.0 LP (Adapter FRU number: AOC-SG-I2)
EKAT	AlphaData ADM-PCIE-9V3 CAPI2.0 FPGA (Xilinx VU3P) Dev Kit PCIe4 x8 (Adapter FRU Number: ADM-PCIE-KU3)

PCIe adapter placement rules and slot priorities for the 9006-12C system

Find information about the placement rules and slot priorities for the Peripheral Component Interconnect Express (PCIe) adapters that are supported for the IBM Power System LC921 (9006-12C).

PCIe slot descriptions

The 9006-12C system provides PCIe generation 3 slots. Full-length, half-length, or short (low-profile) adapters can be installed. Figure 20 shows the rear view of the system with the PCIe adapter slots. Table 5 on page 24 lists the PCIe adapter slot locations and details for the 9006-12C system.
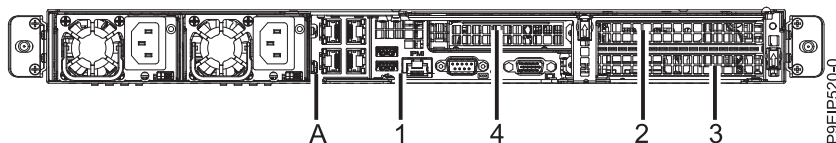
Figure 20. Rear view of an 9006-12C system with PCIe slots indicated

Table 5. PCIe slot locations and descriptions for the 9006-12C system

Slot location	Description	Adapter size	PCI host bridge (PHB)	Coherent Accelerator Processor Interface (CAPI)
CPU1-PEC1 UIO (Slot 1)	PCIe3 x8	Half-height, half-length, internal	Processor Module 1, PHB0	Yes
CPU2-PEC0 WIO (Slot 2)	PCIe3 x16	Double-wide, full-height, full-length	Processor Module 1, PHB0	Yes
CPU2-PEC2 WIO (Slot 3)	PCIe3 x16	Full-height, full-length	Processor Module 2, PHB1	Yes
CPU2-PEC1 WIO-R (Slot 4)	PCIe3 x8	Half-height, half-length	Processor Module 2, PHB1	No

PCIe adapter placement rules

Use this information to select slots for installing PCIe adapters in the 9006-12C system. Table 6 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. You can click the link that appears in the feature code column for more technical information specific to the PCIe adapter.

Table 6. PCIe adapters supported in the 9006-12C system

Feature code	Description	9006-12C (1 processor)		9006-12C (2 processors)	
		Slot priority	Maximum number of adapters supported	Slot priority	Maximum number of adapters supported
EKA0	PCIe3 x4 Intel x550 10GBase-T Converged Network Adapter with Dual RJ45 Ports (Adapter FRU number: AOC-STGS-I2T)	Not supported	Not supported	4, 3, 2	3
EKA1	Cavium (Qlogic) BCM57840 4-port SFP+ 10 Gb Ethernet Adapter PCIe3.0 x8 LP (Adapter FRU number: AOC-STG-B4S)	Not supported	Not supported	4, 3, 2	3
EKA2	Intel 82599ES Ethernet Converged Network Adapter x520-DA2 Dual-port 10G/1G SFP+ PCIe2.0 x8 LP (Adapter FRU number: AOC-STGN-I2S)	Not supported	Not supported	4, 3, 2	3
EKA3	Intel 82575EB Dual-port Gigabit Ethernet Controller PCIe x4.0 LP (Adapter FRU number: AOC-SG-I2)	Not supported	Not supported	4, 3, 2	3

Table 6. PCIe adapters supported in the 9006-12C system (continued)

Feature code	Description	9006-12C (1 processor)		9006-12C (2 processors)	
		Slot priority	Maximum number of adapters supported	Slot priority	Maximum number of adapters supported
EKAA	Broadcom (LSI) MegaRAID 9361-8i SAS3 Controller with 8 Internal Ports (1 GB Cache) PCIe3.0 x8 LP with cables (Adapter FRU number: AOC-K-9361-8IS-IB001 and AOC-K-9361-8IB-IB001)	1	1	1, 4, 3, 2	1
EKAB	SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables (Adapter FRU number: AOC-K-S3008L-L8iS-IB001 and AOC-K-S3008L-L8iB-IB001)	1	1	1, 4, 3, 2	1
EKED	Broadcom (LSI) 9300-8E SAS3 HBA PCIe3.0 x8 LP Adapter (Adapter FRU number: AOC-SAS3-9300-8E)	Not supported	Not supported	4, 3, 2	3
EKAF	Emulex LPE16002B-M6-O Dual-port 16 Gb Fibre Channel Card PCIe3.0 x8 LP (Adapter FRU number: AOC-LPE16002B-M6-Of)	Not supported	Not supported	4, 3, 2	3
EKAG	SMC Quad-port NVMe Host Bus Adapter (PEX9733) PCIe3.0 x8 LP with cables (Adapter FRU number: AOC-K-SLG3-4E2PS and AOC-K-SLG3-4E2PB-IB001)	1	1	1, 4, 3, 2	1
EKAH	SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables(Adapter FRU number: AOC-K-9361-8I2S-IB001 and AOC-K-9361-8I2B-IB001)	1	1	1, 4, 3, 2	1

Table 6. PCIe adapters supported in the 9006-12C system (continued)

Feature code	Description	9006-12C (1 processor)		9006-12C (2 processors)	
		Slot priority	Maximum number of adapters supported	Slot priority	Maximum number of adapters supported
EKAL	Mellanox MCX456A-ECAT ConnectX-4 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe3.0 x16 LP (Adapter FRU number: AOC-MCX456A-ECAT-IB001)	Not supported	Not supported	2, 3	2
EKAM	Mellanox MCX415A-CCAT ConnectX-4 EN 100 GbE Single-port QSFP28 PCIe3.0 x16 LP (Adapter FRU number: AOC-MCX415A-CCAT-IB001)	Not supported	Not supported	2, 3	2
EKAP	Qlogic QLE2562 Dual-port 8 Gb Fibre Channel Adapter PCIe x8 LP (Adapter FRU number: AOC-QLE2562)	Not supported	Not supported	4, 3, 2	2
EKAQ	Qlogic QLE2692OP Dual-port 16 Gb Fibre Channel Adapter PCIe3 x8 LP (Adapter FRU number: AOC-QLE2692OP-IB001)	Not supported	Not supported	4, 3, 2	2
EKAU	Mellanox MCX4121A-ACAT ConnectX-4 Lx EN 25 GbE Dual-port SFP28 PCIe3.0 x8 LP (Adapter FRU number: AOC-MCX4121A-ACAT-IB001)	Not supported	Not supported	4, 3, 2	3
EKAW	Mellanox MCX414A-BCAT ConnectX-3 Pro EN Dual-port 40/56 GbE PCIe3.0 x8 LP (Adapter FRU Number: 00E4974)	Not supported	Not supported	4, 3, 2	3
EKAY	Mellanox MCX556A-EDAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe4.0 x16 LP (Adapter FRU number: MCX556A-EDAT)	Not supported	Not supported	2, 3	2

Table 6. PCIe adapters supported in the 9006-12C system (continued)

Feature code	Description	9006-12C (1 processor)		9006-12C (2 processors)	
		Slot priority	Maximum number of adapters supported	Slot priority	Maximum number of adapters supported
EKAZ	NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables (Adapter FRU number: AOC-KIT-NVTP100-IB001)	Not supported	Not supported	2	1
EKFD	Mellanox MCX555A-ECAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Single-port QSFP28 PCIe3.0 x16 LP (Adapter FRU number: MCX555A-ECAT)	Not supported	Not supported	2, 3	2
EKFE	Emulax 32 GB x8 Fiber Channel (Adapter FRU number: xx)	Not supported	Not supported	4, 3, 2	3
EKFF	Broadcom 5719 QP 1G (1G/100M/10M) Network Interface Card PCIe x4 LP (Adapter FRU number: xx)	Not supported	Not supported	4, 3, 2	3
EKFH	Intel XL710 Ethernet Converged Network Adapter Quad-port 10G/1G SFP+ PCIe3.0 x8 LP (Adapter FRU number: AOC-STG-I4S)	Not supported	Not supported	4, 3, 2	3
EKFL	FlashGT+ HBA to connect 2.5" NVMe Nallatech Adapter with Xilinx KU15P FPGA PCIe4.0 x8 Dual-slot LP (Adapter FRU number: xx)	Not supported	Not supported	2-3	1
EKFP	Intel XL710/X557 10GBase-T Converged Network Adapter Quad-port (10G/1G/100M speeds) PCIe3.0 x8 LP (Adapter FRU number: AOC-STG-I4T)	Not supported	Not supported	4, 3, 2	3
EKGC	Broadcom (LSI) 9305-16E SAS3 HBA PCIe3.0 x8 LP (Adapter FRU number: AOC-SAS3-9305-16E)	Not supported	Not supported	4, 3, 2	3

Table 6. PCIe adapters supported in the 9006-12C system (continued)

Feature code	Description	9006-12C (1 processor)		9006-12C (2 processors)	
		Slot priority	Maximum number of adapters supported	Slot priority	Maximum number of adapters supported
EKSQ	Samsung PM1725a NVMe 1.6 TB 5DWPD PCIe3.0 x8 LP Adapter (Adapter FRU number: HDS-AVT-MZPLL1T6HEHP003)	1	1	4, 3, 2, 1	4
EKSR	Samsung PM1725a NVMe 3.2 TB 5DWPD PCIe3.0 x8 LP Adapter (Adapter FRU number: HDS-AVT-MZPLL3T2HMLS003)	1	1	4, 3, 2, 1	4

PCIe adapter information by feature type for the 9006-12C

Find information about the Peripheral Component Interconnect Express (PCIe) adapters that are supported for the IBM Power System LC921 (9006-12C).

The table shows the available adapters by feature code (FC), description, 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/).
- For more information regarding PCIe adapter identification and I/O firmware levels for each adapter, see the IBM Power 9006-12C and 9006-22C I/O Firmware (https://www.ibm.com/developerworks/community/wikis/home?lang=en_us#!/wiki/W51a7ffcf4dfd_4b40_9d82_446ebc23c550/page/IBM%20Power%209006-12C%20and%209006-22C%20IO%20Firmware) topic on the Linux on POWER® community wiki.

Table 7. PCIe adapters supported in the 9006-12C system

Feature code	Description
EKA0	PCIe3 x4 Intel x550 10GBase-T Converged Network Adapter with Dual RJ45 Ports (Adapter FRU number: AOC-STGS-I2T)
EKA1	Cavium (Qlogic) BCM57840 4-port SFP+ 10 Gb Ethernet Adapter PCIe3.0 x8 LP (Adapter FRU number: AOC-STG-B4S)
EKA2	Intel 82599ES Ethernet Converged Network Adapter x520-DA2 Dual-port 10G/1G SFP+ PCIe2.0 x8 LP (Adapter FRU number: AOC-STGN-I2S)
EKA3	Intel 82575EB Dual-port Gigabit Ethernet Controller PCIe x4.0 LP (Adapter FRU number: AOC-SG-I2)
EKAA	Broadcom (LSI) MegaRAID 9361-8i SAS3 Controller with 8 Internal Ports (1 GB Cache) PCIe3.0 x8 LP with cables (Adapter FRU number: AOC-K-9361-8IS-IB001 and AOC-K-9361-8IB-IB001)

Table 7. PCIe adapters supported in the 9006-12C system (continued)

Feature code	Description
EKAB	SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables (Adapter FRU number: AOC-K-S3008L-L8iS-IB001 and AOC-K-S3008L-L8iB-IB001)
EKAF	Emulex LPE16002B-M6-O Dual-port 16 Gb Fibre Channel Card PCIe3.0 x8 LP (Adapter FRU number: AOC-LPE16002B-M6-Of)
EKAG	SMC Quad-port NVMe Host Bus Adapter (PEX9733) PCIe3.0 x8 LP with cables (Adapter FRU number: AOC-K-SLG3-4E2PS and AOC-K-SLG3-4E2PB-IB001)
EKAH	SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables(Adapter FRU number: AOC-K-9361-8I2S-IB001 and AOC-K-9361-8I2B-IB001)
EKAL	Mellanox MCX456A-ECAT ConnectX-4 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe3.0 x16 LP (Adapter FRU number: AOC-MCX456A-ECAT-IB001)
EKAM	Mellanox MCX415A-CCAT ConnectX-4 EN 100 GbE Single-port QSFP28 PCIe3.0 x16 LP (Adapter FRU number: AOC-MCX415A-CCAT-IB001)
EKAP	Qlogic QLE2562 Dual-port 8 Gb Fibre Channel Adapter PCIe x8 LP (Adapter FRU number: AOC-QLE2562)
EKAQ	Qlogic QLE2692OP Dual-port 16 Gb Fibre Channel Adapter PCIe3 x8 LP (Adapter FRU number: AOC-QLE2692OP-IB001)
EKAT	AlphaData ADM-PCIE-9V3 CAPI2.0 FPGA (Xilinx VU3P) Dev Kit PCIe4 x8 (Adapter FRU Number: ADM-PCIE-KU3)
EKAU	Mellanox MCX4121A-ACAT ConnectX-4 Lx EN 25 GbE Dual-port SFP28 PCIe3.0 x8 LP (Adapter FRU number: AOC-MCX4121A-ACAT-IB001)
EKAW	Mellanox MCX414A-BCAT ConnectX-3 Pro EN Dual-port 40/56 GbE PCIe3.0 x8 LP (Adapter FRU Number: 00E4974)
EKAY	Mellanox MCX556A-EDAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe4.0 x16 LP (Adapter FRU number: MCX556A-EDAT)
EKAZ	NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables (Adapter FRU number: AOC-KIT-NVTP100-IB001)
EKED	Broadcom (LSI) 9300-8E SAS3 HBA PCIe3.0 x8 LP Adapter (Adapter FRU number: AOC-SAS3-9300-8E)
EKFE	Emulax 32 GB x8 Fiber Channel (Adapter FRU number: xx)
EKFF	Broadcom 5719 QP 1G (1G/100M/10M) Network Interface Card PCIe x4 LP (Adapter FRU number: xx)
EKFH	Intel XL710 Ethernet Converged Network Adapter Quad-port 10G/1G SFP+ PCIe3.0 x8 LP (Adapter FRU number: AOC-STG-I4S)
EKFL	FlashGT+ HBA to connect 2.5" NVMe Nallatech Adapter with Xilinx KU15P FPGA PCIe4.0 x8 Dual-slot LP (Adapter FRU number: xx)
EKFP	Intel XL710/X557 10GBase-T Converged Network Adapter Quad-port (10G/1G/100M speeds) PCIe3.0 x8 LP (Adapter FRU number: AOC-STG-I4T)
EKGC	Broadcom (LSI) 9305-16E SAS3 HBA PCIe3.0 x8 LP (Adapter FRU number: AOC-SAS3-9305-16E)
EKSQ	Samsung PM1725a NVMe 1.6 TB 5DWPD PCIe3.0 x8 LP Adapter (Adapter FRU number: HDS-AVT-MZPLL1T6HEHP003)
EKSR	Samsung PM1725a NVMe 3.2 TB 5DWPD PCIe3.0 x8 LP Adapter (Adapter FRU number: HDS-AVT-MZPLL3T2HMLS003)

PCIe3 x4 Intel x550 10GBase-T Converged Network Adapter with Dual RJ45 Ports (FC EKA0)

Learn about the specifications and operating system requirements for feature code (FC) EKA0 adapters.

Overview

ThePCIe3 x4 Intel x550 10GBase-T Converged Network Adapter with Dual RJ45 Ports is a PCI Express (PCIe) generation 3 (Gen3) x4 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. The adapter has an auto-negotiation feature between 1 GbE and 10 GbE that offers compatibility with earlier versions for a smooth transition to 10 GbE.

Figure 21. PCIe3 x4 Intel x550 10GBase-T Converged Network Adapter with Dual RJ45 Ports

Specifications

Item   Description

Adapter FRU number

   AOC-STGS-I2T (Designed to comply with RoHS requirement)

I/O bus architecture

   PCIe3 x4

Slot requirement

   For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Cables

   RJ-45 Category-6 up to 55 M

Supported Systems

   POWER8 and POWER9 processor-based systems
   • 9006-12C and 9006-22C

Voltage

    3.3V, 12 V

Form factor

    Short, low-profile

Attributes provided

    Direct Cache Access (DCA) to avoid cache misses

    TCP/UDP Segmentation Offload

    Support for Virtual Machine Device Queues (VMDq and Next-generation VMDq)

    Preboot eXecuation Environment (PXE) support

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

* The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
* IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
* IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
* The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Cavium (Qlogic) BCM57840 4-port SFP+ 10 Gb Ethernet Adapter PCIe3.0 x8 LP Adapter (FC EKA1)

Learn about the specifications and operating system requirements for the feature code (FC) EKA1 adapter.

Overview

The PCIe3 x4 Intel x550 10GBase-T Converged Network Adapter with Dual RJ45 Ports 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. The adapter offers a broad selection of networking features including TCP offload, support for PXE boot and virtualized environments (VMDq and PC-SIG SRIOV), and Energy Efficient Ethernet (IEEE 802.3az).
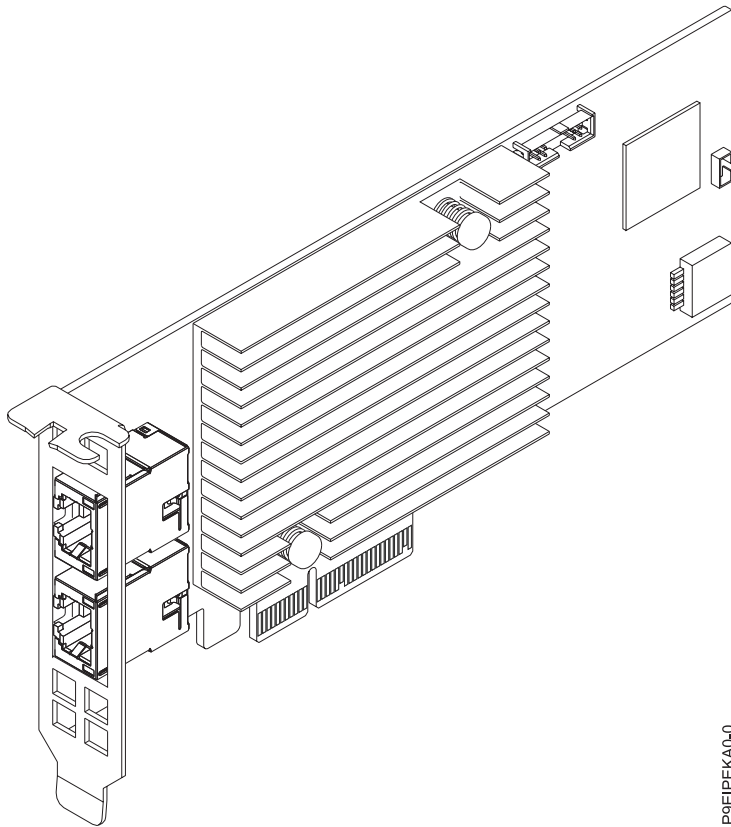
P9EIPEKA1-0
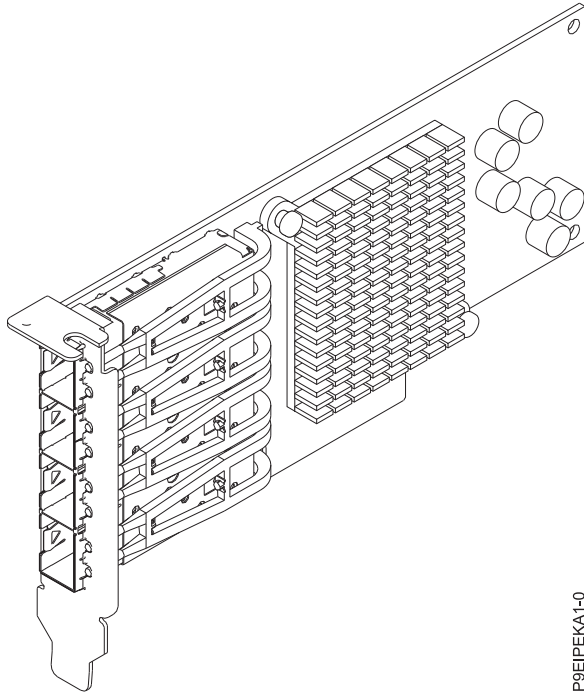
Figure 22. PCIe3 x4 Intel x550 10GBase-T Converged Network Adapter with Dual RJ45 Ports Adapter

Specifications

Item   Description

Adapter FRU number

AOC-STG-B4S (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems

- 9006-12C and 9006-22C

Voltage

3.3V, 12 V

Form factor

Short, low-profile

Attributes provided

External PHY support

TCP Offload Engine (TOE)

IPv6 acceleration

SR-IOV with up to 64 Virtual Functions (VFs) for Guest Operating Systems (GOS) per port

Transceivers and cables

LC-LC fiber-optic cables (with required optional transceivers)

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Intel 82599ES Ethernet Converged Network Adapter x520-DA2 Dual-port 10G/1G SFP+ PCIe2.0 x8 LP (FC EKA2)

Learn about the specifications and operating system requirements for the feature code (FC) EKA2 adapter.

Overview

TheIntel 82599ES Ethernet Converged Network Adapter x520-DA2 Dual-port 10G/1G SFP+ PCIe2.0 x8 LP is a PCI Express (PCIe) generation 2 (Gen2) x8 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. The adapter offers a broad selection of features including iSCSI remote boot support, load balancing on multiple CPUs, and Fibre Channel over Ethernet (FCoE) support.
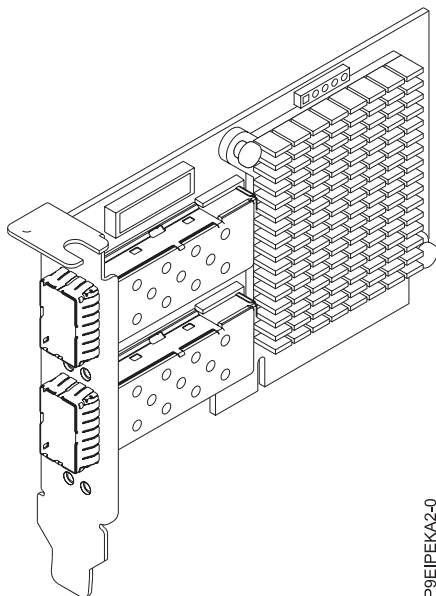

Figure 23. IIntel 82599ES Ethernet Converged Network Adapter x520-DA2 Dual-port 10G/1G SFP+ PCIe2.0 x8 LP

Specifications

Item   Description

Adapter FRU number

   AOC-STGN-I2S (Designed to comply with RoHS requirement)

I/O bus architecture

   PCIe2 x8

Slot requirement

   For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement
   rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/
   p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C.
   (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/
   p9eip22c_pcie_slot_details.dita)

Supported systems

   POWER8 and POWER9 processor-based systems
   • 9006-12C and 9006-22C

Voltage

   3.3V, 12 V

Form factor

   Short, low-profile

Attributes provided

   Preboot eXecution Environment (PXE) support

   Direct Cache Access (DCA) to avoid cache misses

   IPv6 offloading

   VMDq, Next-generation VMDq (64 queues per port) and PC-SIG SR-IOV implementation

Transceivers and cables

   FC EKC0: 3 M 10 Gb SFP+ SR Cable Fiber Active Optical Cable (AOC)

   FC EKC1: 3 M 10 Gb SFP+ Copper Passive

   FC EKC2: 10/1 Gb SFP+ SR Optical Transceiver

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 that you determine whether any prerequisites must be met for this feature and attaching
devices. To check for operating system and partition requirements, see one of the following links:

• The latest version of enabling libraries and utilities may be downloaded from Fix Central.
  (http://www.ibm.com/support/fixcentral/)

• IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)

• IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/
  ssic/interoperability.wss)

• The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/
  lopdiags/info/LinuxAlerts.html)

Intel 82575EB Dual-port Gigabit Ethernet Controller PCIe x4.0 LP (FC EKA3)

Learn about the specifications and operating system requirements for feature code (FC) EKA3 adapters.

Overview

The Intel 82575EB Dual-port Gigabit Ethernet Controller PCIe x4.0 LP is a PCI Express (PCIe) generation
2 (Gen2) x4 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. The adapter
offers a high-performing PCIe 10/100/1000 Ethernet connection. It also improves flexibility and

performance in a virtualized environment in multi-core systems by lowering interrupt overhead and providing sorted multiple data queue paths.
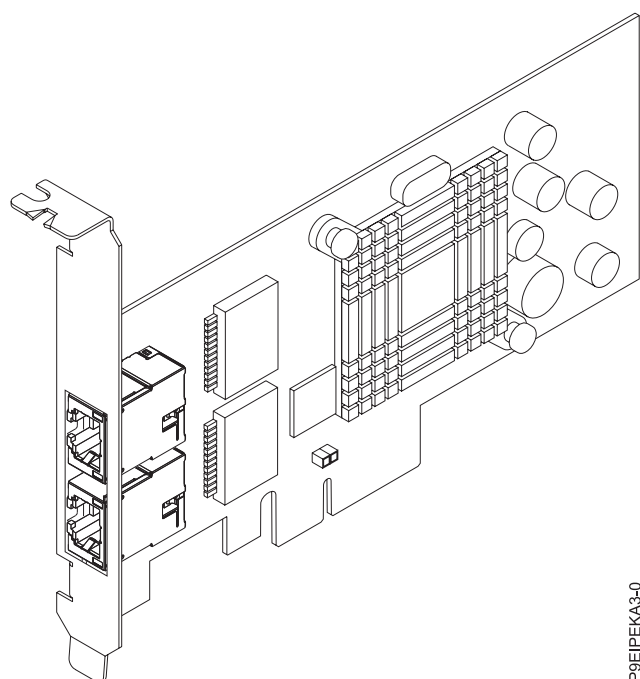
Figure 24. IIntel 82575EB Dual-port Gigabit Ethernet Controller PCIe x4.0 LP

Specifications

Item   Description

Adapter FRU number

AOC-SG-I2 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe2 x4

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems
* 9006-12C and 9006-22C

Voltage

3.3V, 12 V

Attributes provided

Preboot eXecution Environment (PXE) support

Intel I/O Acceleration Technology (I/O AT)

Direct Cache Access (DCA)

Low-latency interrupts

Transceivers and cables

Supported cable length is more than 100 M

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Broadcom (LSI) MegaRAID 9361-8i SAS3 Controller with 8 Internal Ports (1 GB Cache) PCIe3.0 x8 LP with cables (FC EKAA and EKEA)

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

Overview

FC EKAA and EKEA are both the same adapter with different feature codes. FC EKAE is only supported on 9006-12C. FC EKEA, alternatively, is only supported on 9006-22C.

The Broadcom (LSI) MegaRAID 9361-8i SAS3 Controller with 8 Internal Ports (1 GB Cache) PCIe3.0 x8 LP with cables 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. The adapter features 8 internal SAS connectors for high-performance storage connectivity. This Redundant Array of Independent Disks (RAID) adapter is built on the LSI Logic SAS IC and MegaRAID technology. It also supports high capacity storage applications using high-performance RAID architecture, including hardware RAID 5 and 6.

Important: RAID mode is the adapter default and needs to be configured by the customer before drives are shown to the OS for install. The adapter can be set up in JBOD (Just a Bunch of Disks) mode.

Figure 25. Broadcom (LSI) MegaRAID 9361-8i SAS3 Controller with 8 Internal Ports (1 GB Cache) PCIe3.0 x8 LP with cables

Specifications

Item   Description

Adapter FRU number

FC EKAA: AOC-K-9361-8IS-IB001 (Designed to comply with RoHS requirement)

FC EKEA: AOC-K-9361-8IB-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems
• 9006-12C and 9006-22C

Voltage

3.3V, 12 V

Form factor

Short, low-profile

Attributes provided

Port independent auto-negotiation

Automatically negotiates PCIe link widths

Supports 1.5, 3.0, 6.0 and 12 Gb/s SAS and SATA data transfer rates

Advanced array configuration and management utilities

Set JBOD mode on the adapter

Before you set up the adapter in JBOD mode, download the LSI Storage Command Line Tool (storcli64) RAID utility from Fix Central.

To set up the adapter in JBOD mode, complete the following steps:

1. Boot the system to the Petitboot main menu.
2. Copy the storcli64 RAID utility to Petitboot by using mount from the shell:

   `-t nfs -n -o nolock <LCB IP>:<path to storcli64> /mnt`

3. Set the adapter up in JBOD mode.
4. Show the controller summary:

   `storcli64 /c0 show`

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables (FC EKAB and EKEB)

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

Overview

FC EKAB and EKEB are both the same adapter with different feature codes. FC EKAB is only supported on 9006-12C. FC EKEB, alternatively, is only supported on 9006-22C.

The SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables is a PCI Express (PCIe) generation 3 (Gen3) x8 adapter. The adapter can be placed in either a x8 or x16 PCIe slot in the system. The 12 Gb/s 8-Port SAS Internal RAID Adapter features 8 internal SAS connectors for high-performance storage connectivity.
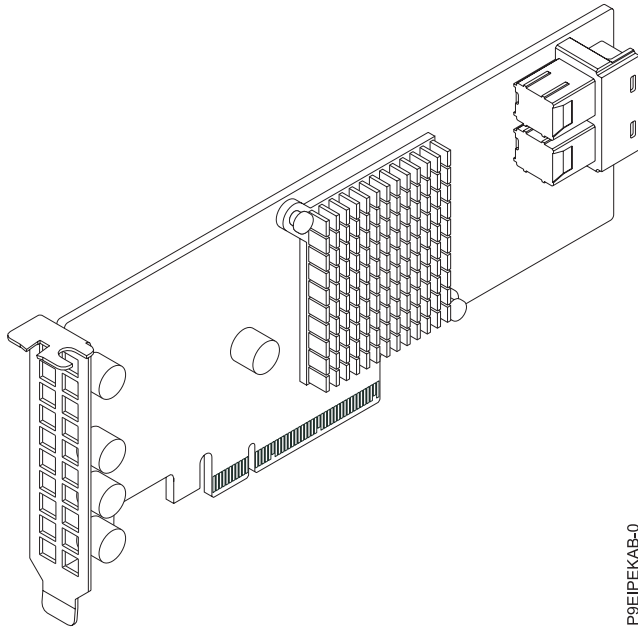
Figure 26. SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables

Specifications

Item   Description

Adapter FRU number

>   FC EKAB: AOC-K-S3008L-L8iS-IB001 (Designed to comply with RoHS requirement)

>   FC EKEB: AOC-K-S3008L-L8iB-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

>   PCIe3 x8

Slot requirement

>   For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems

>   POWER8 and POWER9 processor-based systems
>   • 9006-12C and 9006-22C

Voltage

>   3.3V, 12 V

Form factor

>   Short, low-profile

Attributes provided

>   Port independent auto-negotiation

>   Supports MegaRAID Storage Manager software

>   Supports 3.0, 6.0 and 12 Gb/s SAS and SATA data transfer rates

>   Supports SSP, SMP, STP and SATA protocols

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Broadcom (LSI) 9300-8E SAS3 HBA PCIe3.0 x8 LP Adapter (FC EKED)

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

Overview

The Broadcom (LSI) 9300-8E SAS3 HBA PCIe3.0 x8 LP 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. The adapter provides increased connectivity and maximum performance for high-end servers and appliances.

P9EIPEKAD-0

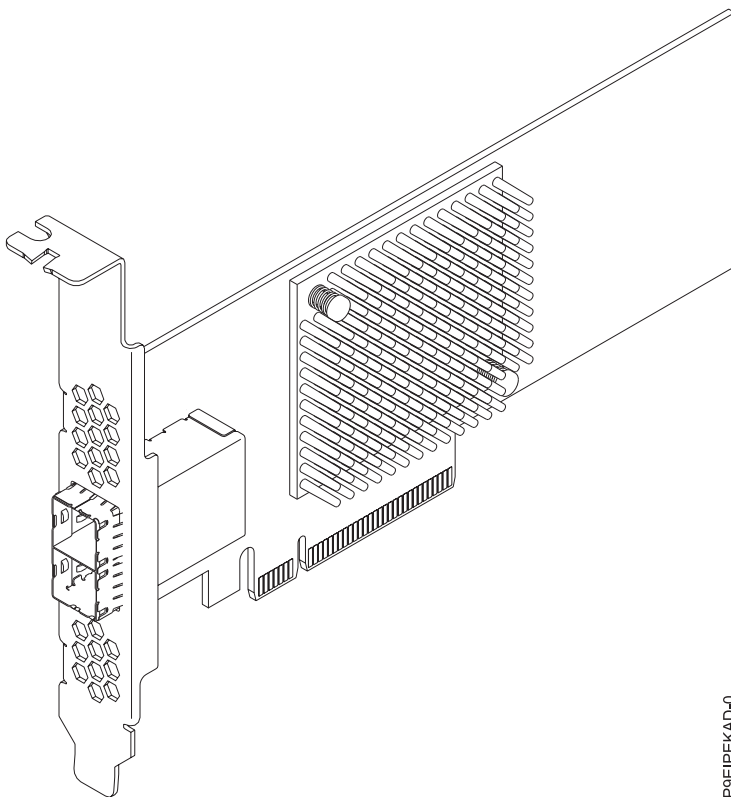*Figure 27. Broadcom (LSI) 9300-8E SAS3 HBA PCIe3.0 x8 LP Adapter*

Specifications

Item   Description

Adapter FRU number
> AOC-SAS3-9300-8E (Designed to comply with RoHS requirement)

I/O bus architecture
> PCIe3 x8

Slot requirement
> For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems
> POWER8 and POWER9 processor-based systems
> - 9006-12C and 9006-22C

Voltage
> 3.3V, 12 V

Form factor
> Short, low-profile

Attributes provided
> Supports SSDs, HDDs, and tape drives
>
> Eight lanes of PCIe3 provides 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 and that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

PCIe3 x8 Dual-port Internal NVMe Host Bus Adapter (FC EKAE and EKEE)

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

Overview

FC EKAE and EKEE are both the same adapter with different feature codes. FC EKAE is only supported on 9006-12C and does not include cables. FC EKEE, alternatively, is only supported on 9006-22C and includes cables.

The PCIe3 x8 Dual-port Internal NVMe Host Bus 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. The adapter features two

internal NVMe connectors (SFF 8643) for high-performance storage connectivity. This HBA card is built on the PLX PE8718 PCIe switch IC technology and proven NVMe technology.

Important: RAID mode is the adapter default and needs to be configured by the customer before drives are shown to the OS for install. The adapter can be set up in JBOD (Just a Bunch of Disks) mode.
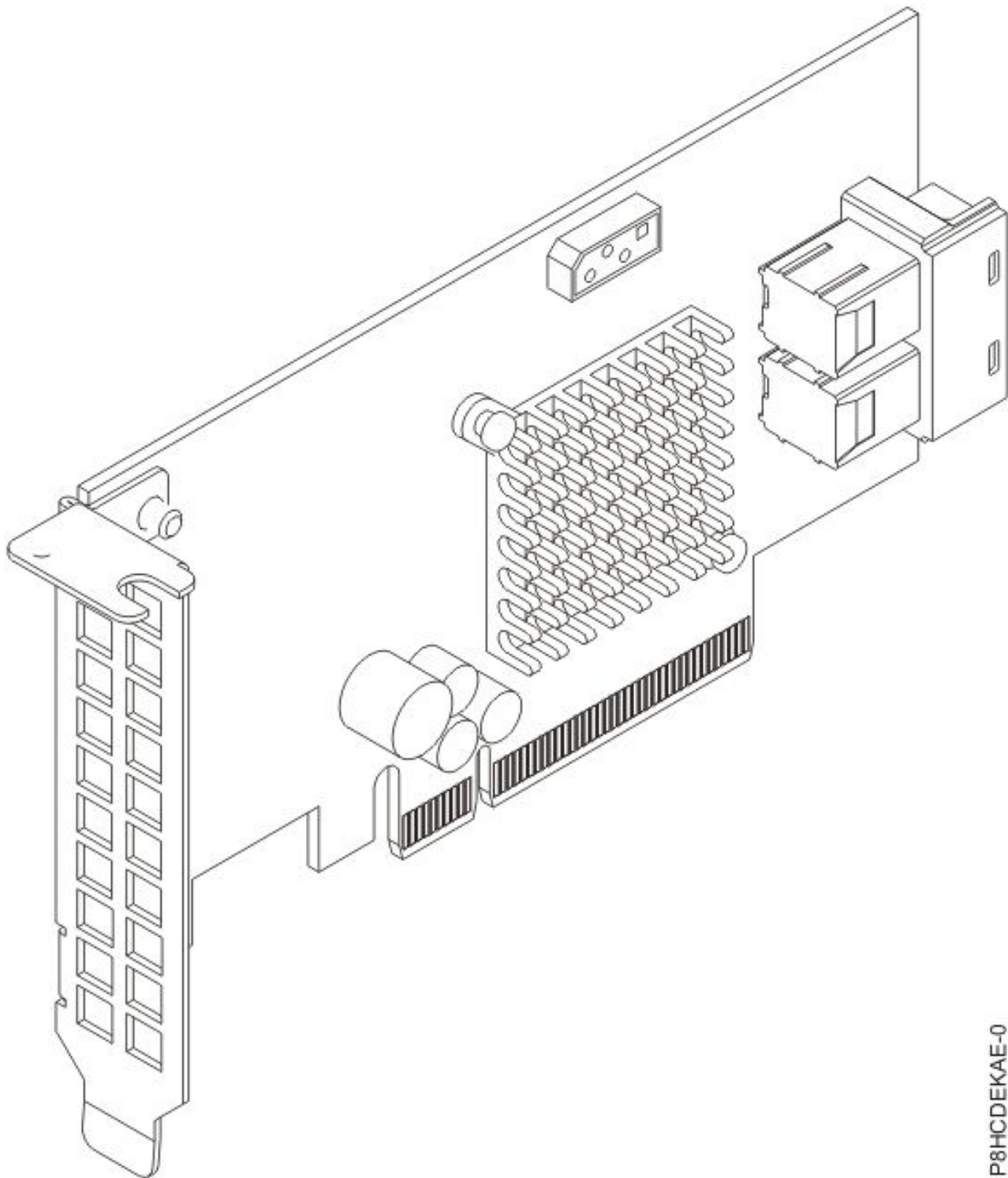
Figure 28. PCIe3 x8 Dual-port Internal NVMe Host Bus Adapter

Specifications

Item   Description
Adapter FRU number

       FC EKAE: AOC-K-SLG3-2E4S-IB001 (Designed to comply with RoHS requirement)

       FC EKEE: AOC-K-SLG3-2E4B-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture
> PCIe3 x8

Slot requirement
> For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems
> POWER8 and POWER9 processor-based systems
> * 9006-12C and 9006-22C

Voltage
> 3.3 V, 12 V

Form factor
> Short, low-profile

Attributes provided
> Four internal lanes per port and 3.2 Gb/s per port
>
> Supports two physical NVMe devices
>
> Pure host bus adapter (HBA)
>
> Supports 3.0 Gb/s, 6.0 Gb/s, and 12 Gb/s SAS and SATA data transfer rates

Set JBOD mode on the adapter

Before you set up the adapter in JBOD mode, download the LSI Storage Command Line Tool (storcli64) RAID utility from Fix Central.

To set up the adapter in JBOD mode, complete the following steps:
1. Boot the system to the Petitboot main menu.
2. Copy the storcli64 RAID utility to Petitboot by using mount from the shell:

   `-t nfs -n -o nolock <LCB IP>:<path to storcli64> /mnt`
3. Set up the adapter in JBOD mode.
4. To display the controller summary, enter the following command:

   `storcli64 /c0 show`

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

* The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
* IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
* IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ ssic/interoperability.wss)
* The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/ lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Emulex LPE16002B-M6-O Dual-port 16 Gb Fibre Channel Card PCIe3.0 x8 LP (FC EKAF)

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

Overview

The Emulex LPE16002B-M6-O Dual-port 16 Gb Fibre Channel Card PCIe3.0 x8 LP 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. The adapter features auto-negotiation, LDAP support and has a data transfer rate of 14.025 Gb/s.
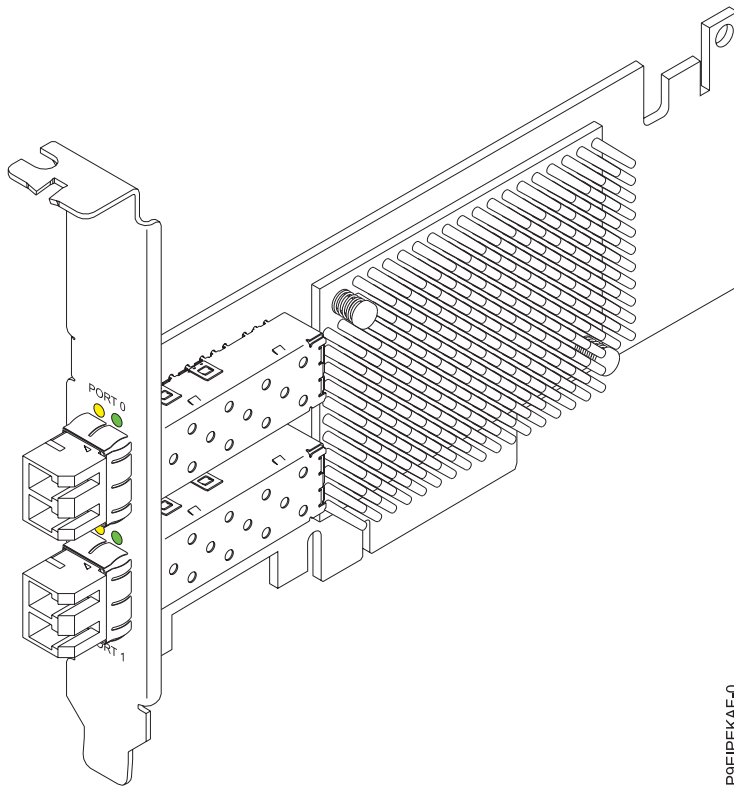
Figure 29. Emulex LPE16002B-M6-O Dual-port 16 Gb Fibre Channel Card PCIe3.0 x8 LP

Specifications

Item   Description

Adapter FRU number
> AOC-LPE16002B-M6-O (Designed to comply with RoHS requirement)

I/O bus architecture
> PCIe3 x8

Slot requirement
> For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems
> POWER8 and POWER9 processor-based systems
>
> • 9006-12C and 9006-22C

Voltage
> 3.3 V, 12 V

Form factor
> Short, low-profile

Attributes provided
> Auto-negotiation
>
> LDAP support
>
> Data transfer rate of 14.025 Gb/s

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

SMC Quad-port NVMe Host Bus Adapter (PEX9733) PCIe3.0 x8 LP with cables (FC EKAG and EKEG)

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

Overview

FC EKAG and EKEG are both the same adapter with different feature codes. FC EKAG is supported only on the 9006-12C. FC EKEG, alternatively, is supported only on the 9006-22C, and both include cables.

The SMC Quad-port NVMe Host Bus Adapter (PEX9733) PCIe3.0 x8 LP with cables 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. The adapter features four internal NVMe connectors for high-performance storage connectivity. This host bus adapter (HBA) card is built on the PLX9733 PCIe switch IC technology and proven NVMe technology.
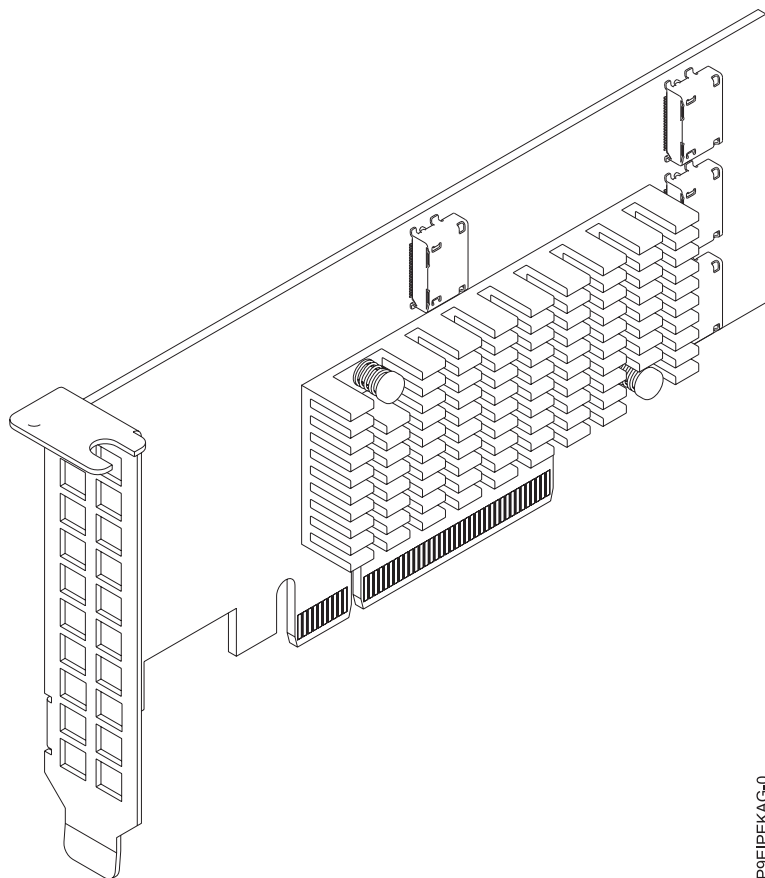
Figure 30. SMC Quad-port NVMe Host Bus Adapter (PEX9733) PCIe3.0 x8 LP with cables

Specifications

Item   Description

Adapter FRU number

FC EKAG: AOC-K-SLG3-4E2PS-IB001 (Designed to comply with RoHS requirement)

FC EKEG: AOC-K-SLG3-4E2PB-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems

• 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

Supports four physical NVMe devices

Pure host bus adapter (HBA)

Supports 3.0 Gb/s, 6.0 Gb/s, and 12 Gb/s SAS transfer rates

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

* The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
* IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
* IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
* The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables (FC EKAH and EKEH)

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

Overview

FC EKAH and EKEH are both the same adapter with different feature codes. FC EKAH is only supported on 9006-12C. FC EKEH, alternatively, is only supported on 9006-22C.

The SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables 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. TThe adapter features 8 internal SAS connectors for high-performance storage connectivity. This Redundant Array of Independent Disks (RAID) adapter is built on the LSI Logic SAS IC and MegaRAID technology. It also supports high capacity storage applications using high-performance RAID architecture, including hardware RAID 5 and 6.

Important: RAID mode is the adapter default and needs to be configured by the customer before drives are shown to the OS for install. The adapter can be set up in JBOD (Just a Bunch of Disks) mode.

Figure 31. SMC AOC-K-S3008L-L8i 12 Gbps SAS3/RAID 0,1 and 10 PCIe3.0 x8 LP with cables

P8HCDEKAE-0

Specifications

Item   **Description**

Adapter FRU number

     FC EKAH: AOC-K-9361-8I2S-IB001 (Designed to comply with RoHS requirement)

     FC EKEH: AOC-K-9361-8I2B-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture
   PCIe3 x8
Slot requirement
   For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)
Supported Systems
   POWER8 and POWER9 processor-based systems
   • 9006-12C and 9006-22C
Voltage
   3.3 V, 12 V
Form factor
   Short, low-profile
Attributes provided
   Port independent auto-negotiation

   Automatically negotiates PCIe link widths

   Supports 1.5, 3.0, 6.0 and 12 Gb/s SAS and SATA data transfer rates

   Advanced array configuration and management utilities

Set JBOD mode on the adapter

Before you set up the adapter in JBOD mode, download the LSI Storage Command Line Tool (storcli64) RAID utility from Fix Central.

To set up the adapter in JBOD mode, complete the following steps:
1. Boot the system to the Petitboot main menu.
2. Copy the storcli64 RAID utility to Petitboot by using mount from the shell:

   `-t nfs -n -o nolock <LCB IP>:<path to storcli64> /mnt`
3. Set up the adapter in JBOD mode.
4. To display the controller summary, enter the following command:

   `storcli64 /c0 show`

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:
• The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
• IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
• IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ ssic/interoperability.wss)
• The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/ lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

NVIDIA Tesla K80 24 GB GPU Accelerator (FC EKAJ)
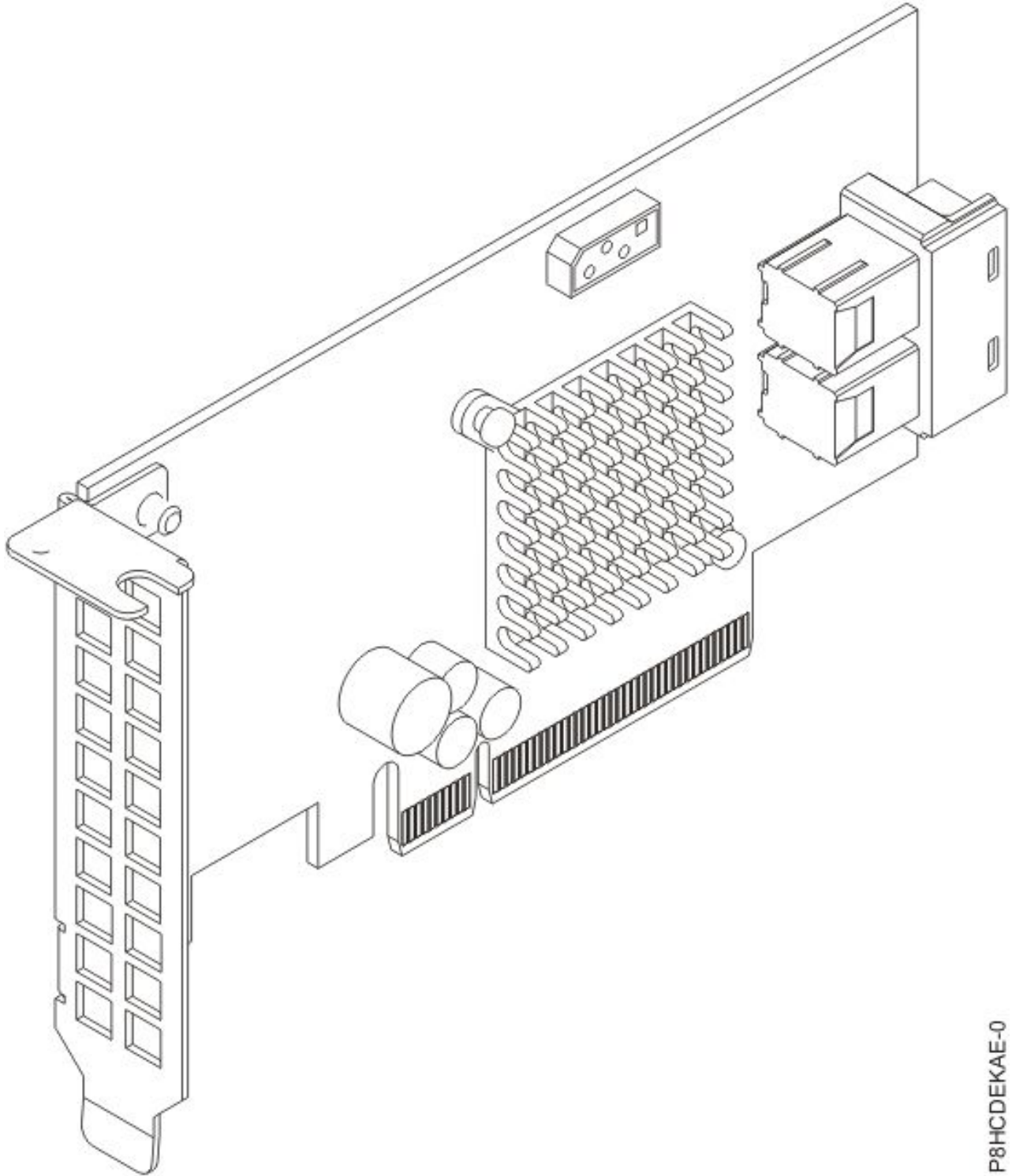
Learn about the specifications and operating system requirements for the feature code (FC) EKAJ adapter.

Overview

The NVIDIA Tesla K80 24 GB GPU Accelerator is a PCI Express (PCIe) generation 3 (Gen3) x16 adapter. The adapter has a double-wide, full-height form-factor and takes up two x16 PCIe slots in the system. The NVIDIA Tesla K80 24GB GPU Accelerator is designed for demanding computational tasks, combining 24 GB of memory with fast memory bandwidth and compute performance for single and double precision workloads. It is equipped with the latest NVIDIA GPU Boost technology and monitors GPU usage to maximize throughput and outperform CPUs by up to 10x.
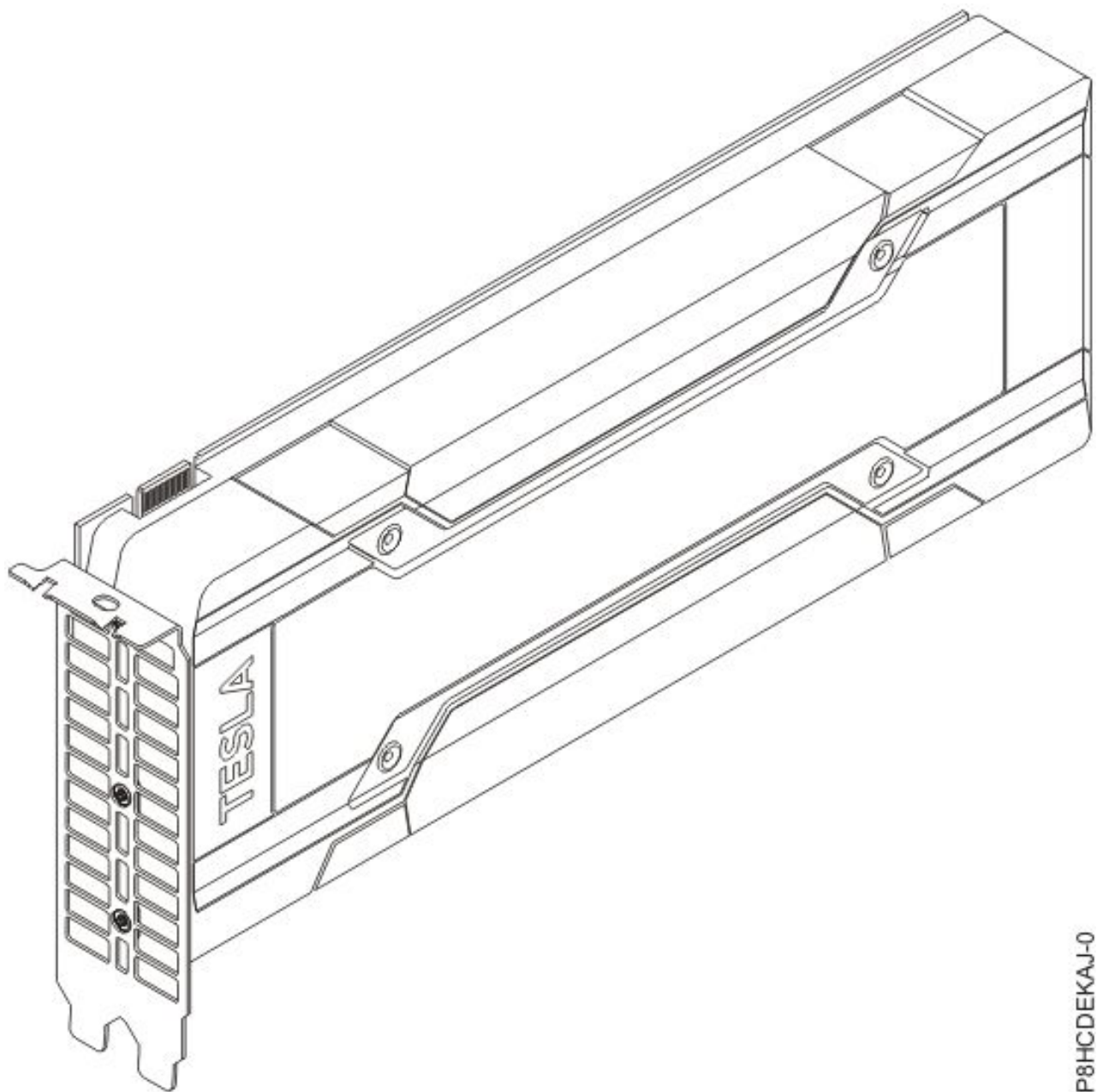
Figure 32. NVIDIA Tesla K80 24 GB GPU Accelerator

Specifications

Item   Description
Adapter FRU number
      AOC-KIT-NVK80-IB001 (Designed to comply with RoHS requirement)
I/O bus architecture
      PCIe3 x16
Slot requirement
      For details about slot priorities 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.
Supported Systems
      POWER8 and POWER9 processor-based systems
      • 9006-12C and 9006-22C
Voltage
      3.3V, 12 V
Form factor
      Double-wide, full-height
Attributes
      Dynamic Parallelism

      Error Correcting Codes (ECC) Memory

      Kepler GPU Architecture

      Hyper-Q

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 that you determine whether any prerequisites must be met for this feature and attaching
devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central.
  (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/
  ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/
  lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC
readme (https://ibm.biz/BdrgTZ).

Mellanox MCX456A-ECAT ConnectX-4 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe3.0 x16 LP Adapter (FC EKAL)

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

Overview

The Mellanox MCX456A-ECAT ConnectX-4 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28
PCIe3.0 x16 LP 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. The adapter supports EDR 100 Gb/s InfiniBand and 100
Gb/s Ethernet connectivity. It also provides flexible solutions for high-performance, Web 2.0, cloud, data
analytics, database, and storage platforms.
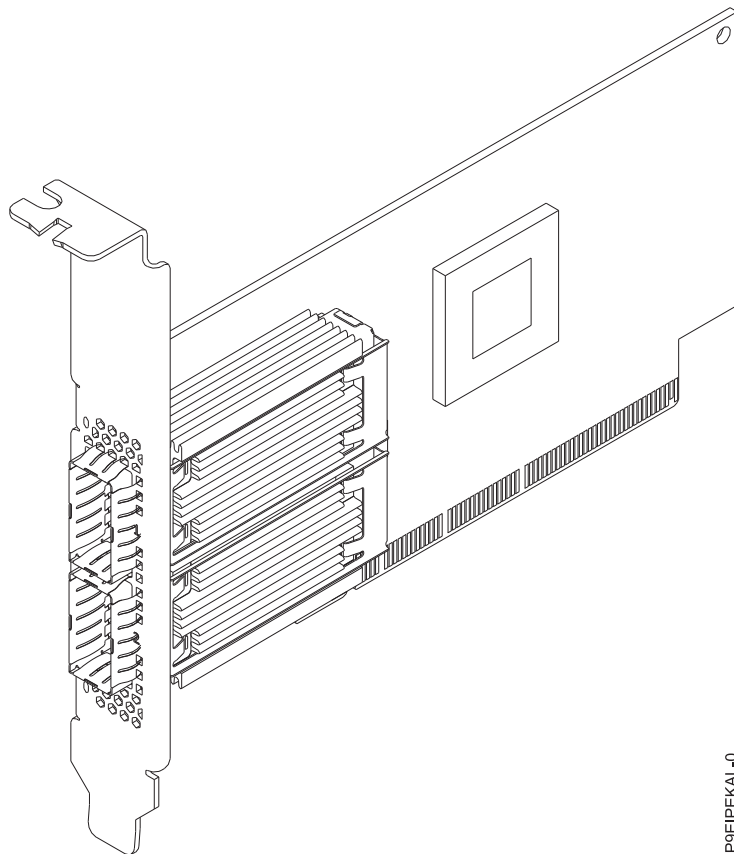
*Figure 33. Mellanox MCX456A-ECAT ConnectX-4 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe3.0 x16
LP Adapter*

Specifications

Item   Description
Adapter FRU number
>	AOC-MCX456A-ECAT-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture
>	PCIe3 x16

Slot requirement
>	For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement
>	rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/
>	p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C.
>	(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/
>	p9eip22c_pcie_slot_details.dita)

Supported Systems
>	POWER8 and POWER9 processor-based systems
>	• 9006-12C and 9006-22C

Voltage
>	3.3V, 12 V

Form factor
>	Short, with full-height tailstock

Attributes provided

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

Supports 2 physical NVMe Devices

Single and dual-port options available

Hardware-based I/O virtualization

Transceivers and cables

Mellanox LinkX 10, 25, 40, 50 and 100Gb/s Direct Attach Copper cables (DACs), Copper Splitter cables, Active Optical Cables (AOCs) and Transceivers. For information regarding Mellanox LinkX cables and transceivers, see LinkX™ InfiniBand Direct Attach Copper Cables.(http://www.mellanox.com/products/interconnect/infiniband-copper-cables.php)

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Mellanox MCX415A-CCAT ConnectX-4 EN 100GbE Single-port QSFP28 PCIe3.0 x16 LP Adapter (FC EKAM)

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

Overview

The Mellanox MCX415A-CCAT ConnectX-4 EN 100GbE single-port QSFP28 PCIe3.0 x16 LP 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. The adapter supports 100 Gb/s Ethernet per port and provides flexible solutions for high-performance, Web 2.0, cloud, data analytics, database, and storage platforms.

P9EIPEKAM-0
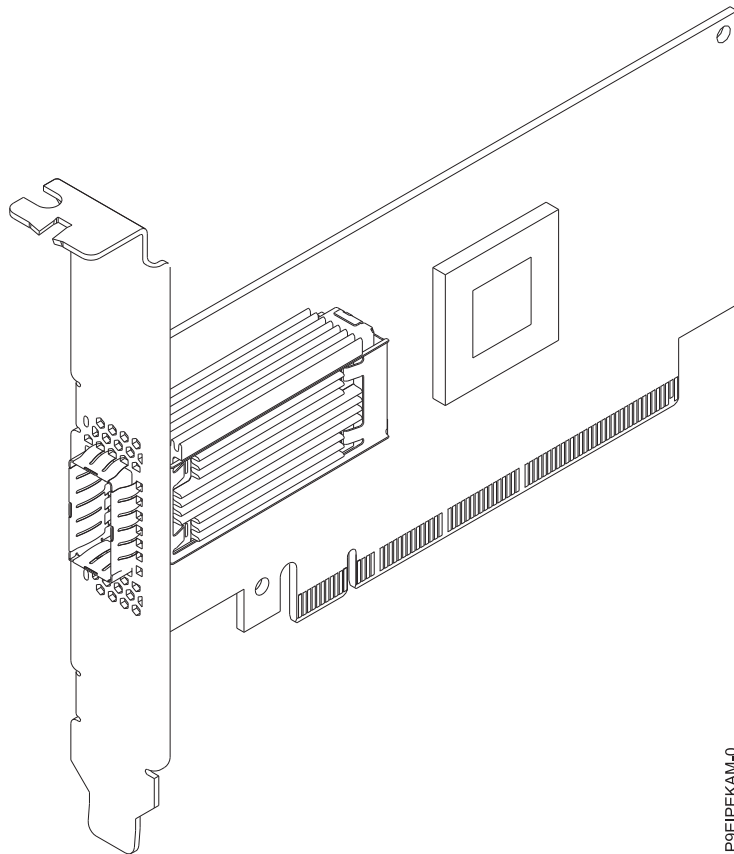
Figure 34. Mellanox MCX415A-CCAT ConnectX-4 EN 100GbE single-port QSFP28 PCIe3.0 x16 LP Adapter

Mellanox MCX415A-CCAT ConnectX-4 EN 100GbE single-port QSFP28 PCIe3.0 x16 LP Adapter

Specifications

Item   Description

Adapter FRU number

   AOC-MCX415A-CCAT-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

   PCIe3 x16

Slot requirement

   For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported systems

   POWER8 and POWER9 processor-based systems

   • 9006-12C and 9006-22C

Voltage

   3.3V, 12 V

Form factor

   Short, with full-height tailstock

Attributes provided

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

   Supports two physical NVMe devices

   Single and dual-port options available

Hardware-based I/O virtualization

Transceivers and cables

Mellanox LinkX 10, 25, 40, 50 and 100Gb/s Direct Attach Copper cables (DACs), Copper Splitter cables, Active Optical Cables (AOCs) and Transceivers. For information regarding Mellanox LinkX cables and Transceivers, see LinkX™ InfiniBand Direct Attach Copper Cables(http://www.mellanox.com/products/interconnect/infiniband-copper-cables.php)

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Mellanox MCX415A-CCAT ConnectX-4 EN 100 GbE Single-port QSFP28 PCIe3.0 x16 LP Adapter (FC EKAP)

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

Overview

The Mellanox MCX415A-CCAT ConnectX-4 EN 100 GbE Single-port QSFP28 PCIe3.0 x16 LP Adapter is a PCI Express (PCIe) generation 3 (Gen2) x8 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. The adapter offers dual-channel performance, auto-negotiation and StarPower technology.
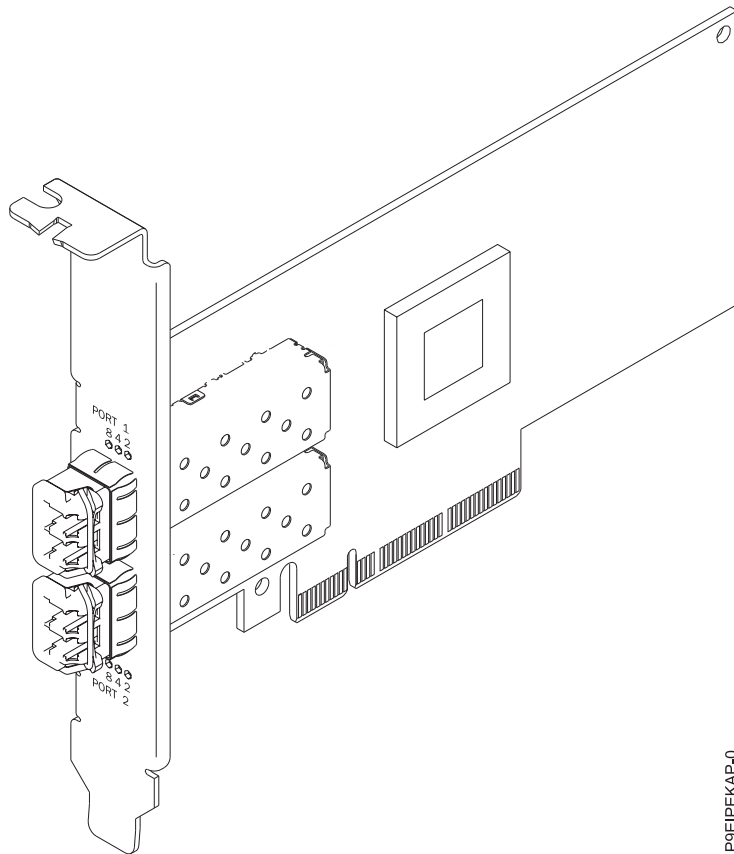
Figure 35. Mellanox MCX415A-CCAT ConnectX-4 EN 100 GbE Single-port QSFP28 PCIe3.0 x16 LP Adapter

Specifications

Item   **Description**

Adapter FRU number

AOC-QLE2562 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems
- 9006-12C and 9006-22C

Voltage

3.3V, 12 V

Form factor

Short, low-profile

Attributes provided

StarPower technology

Auto-negotiation

Quality of Service (QoS)

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Qlogic QLE2692OP Dual-port 16 Gb Fibre Channel Adapter PCIe3 x8 LP (FC EKAQ)

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

Overview

The Qlogic QLE2692OP Dual-port 16 Gb Fibre Channel Adapter PCIe3 x8 LP 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. The adapter provides advanced storage networking features capable of supporting demanding virtualized and private cloud environments. The PCIe3 x8 Qlogic QLE2692OP Dual-port 16Gb Fibre Channel Adapter can also deliver up to 1.3 million IOPS (Input/Output Operations per Second) fuel high performance in all-flash arrays (AFAs) and high-density virtualized environments.
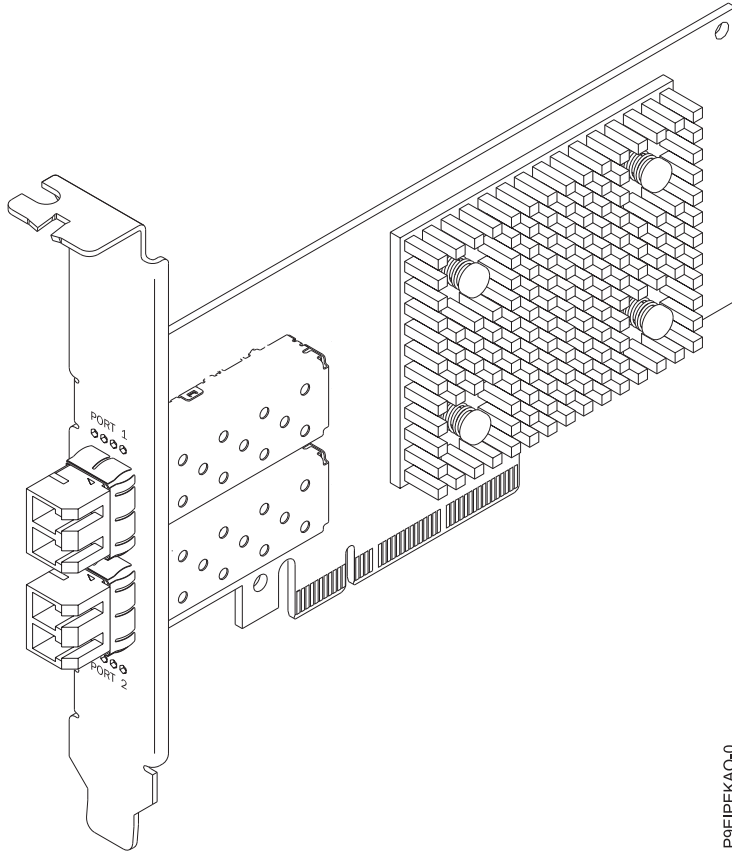
Figure 36. Qlogic QLE2692OP Dual-port 16 Gb Fibre Channel Adapter PCIe3 x8 LP Adapter

Specifications

Item   Description

Adapter FRU number

AOC-QLE2692OP-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported systems

POWER8 and POWER9 processor-based systems

• 9006-12C and 9006-22C

Voltage

3.3V, 12 V

Form factor

Short, low-profile

Attributes provided

Up to 1.3 million IOPS fuel high performance in AFAs and high density virtualized environments

Enhanced reliability, diagnostics, and accelerated deployment powered by QLogic StarFusion technology

Port isolation design offers deterministic and scalable performance on each port

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

AlphaData ADM-PCIE-9V3 CAPI2.0 FPGA (Xilinx VU3P) Dev Kit PCIe4 x8 (FC EKAT)

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

Overview

The AlphaData ADM-PCIE-9V3 CAPI2.0 FPGA (Xilinx VU3P) Dev Kit PCIe4 x8is 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. The adapter features two independent channels of DDR3 memory capable of 1600 mega transfers per second (MT/s), SATA connections, and high-speed I/O through dual quad small form-factor pluggable (QSFP) ports. It supports up to 40G Ethernet or 4x10G Ethernet links and offers voltage, temperature, current control and monitoring.
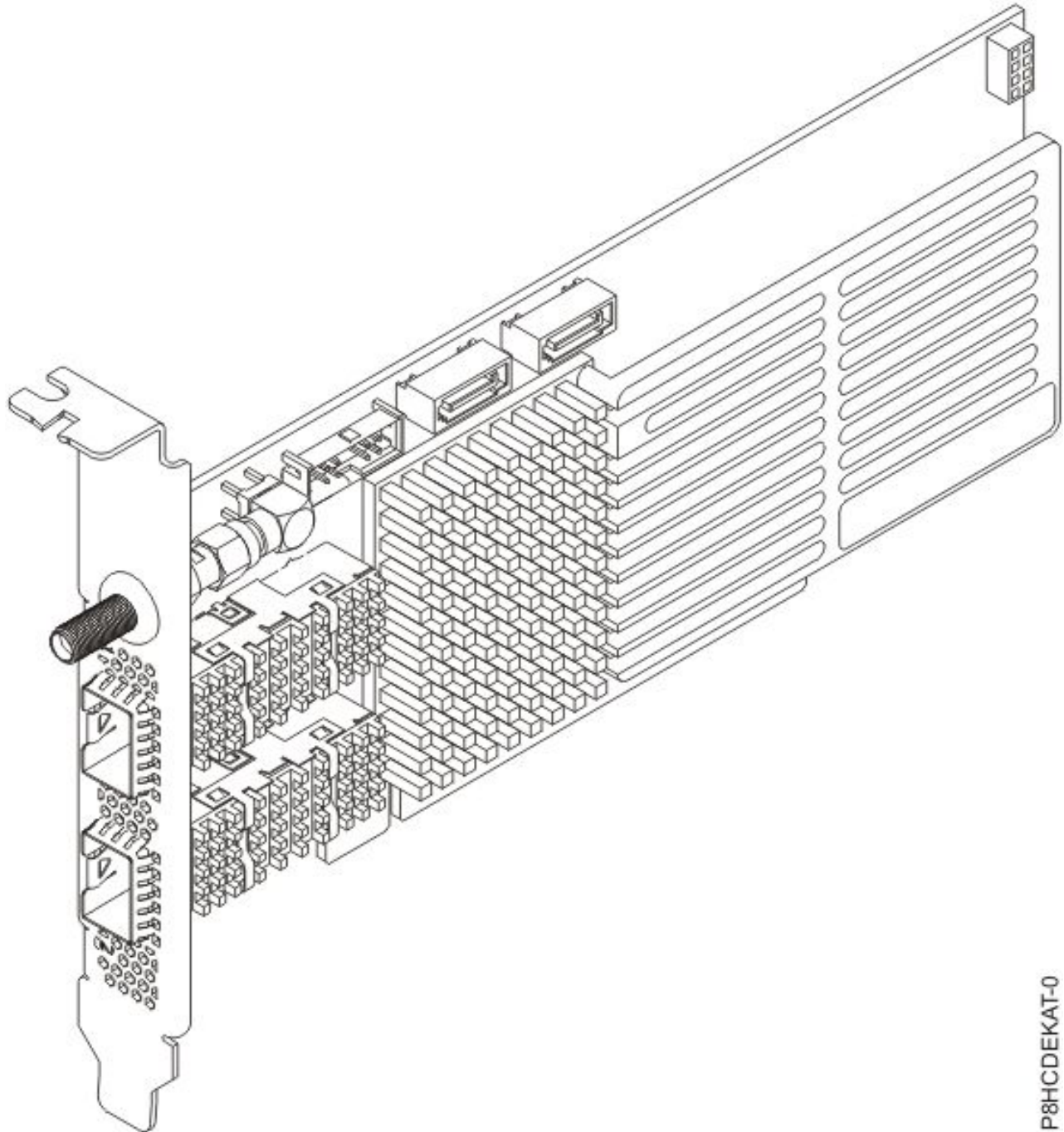
Figure 37. AlphaData ADM-PCIE-9V3 CAPI2.0 FPGA (Xilinx VU3P) Dev Kit PCIe4 x8

Specifications

Item   Description
Adapter FRU number
    ADM-PCIE-KU3 (Designed to comply with RoHS requirement)
I/O bus architecture
    PCIe3 x8
Slot requirement
    For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement
    rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/

p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems
- 9006-12C and 9006-22C

Voltage

12 V

Form factor

Short, low-profile

Attributes provided

Dual QSFP cages for high-speed optical communication including 10 and 40 Gigabit Ethernet

Dual SATA Interfaces

1 GB of BPI x16 configuration flash

References

Please note that the Alpha-data CAPI Adapter: ADM-PCIe KU3 (FC EKAT) is hardware only. The adapter development toolkit and services are available on the Alpha-Data® website. For more information, consult the following references:
- IBM® CAPI information:
  - POWER8® Coherent Accelerator Processor Interface (CAPI) (http://www.ibm.biz/powercapi)
- Alpha-Data® CAPI PCIe adapter information:
  - Coherent Accelerator Processor Interface (CAPI) for POWER8® (http://www.alpha-data.com/dcp/ capi.php)
  - ADM-PCIE-KU3 Summary and Features (http://www.alpha-data.com/dcp/ products.php?product=adm-pcie-ku3)

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:
- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/ lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Mellanox MCX4121A-ACAT ConnectX-4 Lx EN 25 GbE Dual-port SFP28 PCIe3.0 x8 LP Adapter (FC EKAU)

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

Overview

The Mellanox MCX4121A-ACAT ConnectX-4 Lx EN 25 GbE Dual-port SFP28 PCIe3.0 x8 LP 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. The adapter provides a combination of 1, 10, 25, 40, and 50 GbE bandwidth, sub-microsecond latency and a 75 million packets per second message rate. It includes native hardware support for remote direct memory access (RDMA) over converged Ethernet (RoCE), Ethernet stateless offload engines, overlay networks, and GPU Direct® Technology.

Figure 38. Mellanox MCX4121A-ACAT ConnectX-4 Lx EN 25 GbE Dual-port SFP28 PCIe3.0 x8 LP Adapter

Specifications

Item   Description

Adapter FRU number

> AOC-MCX4121A-ACAT-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

> PCIe3 x8

Slot requirement

> For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported systems

> POWER8 and POWER9 processor-based systems
> * 9006-12C and 9006-22C

Voltage

>   3.3V, 12 V

Form factor

>   Short, with full-height tailstock

Attributes provided

>   Low latency RDMA over converged Ethernet
>
>   Connectivity to up-to 4 independent hosts
>
>   Hardware-based I/O virtualization

Transceivers and cables

>   Mellanox LinkX 10 Gb/s, 25 Gb/s, 40 Gb/s, 50 Gb/s and 100 Gb/s Direct Attach Copper cables
>   (DACs), Copper Splitter cables, Active Optical Cables (AOCs) and Transceivers. For information
>   regarding Mellanox LinkX cables and Transceivers, see LinkX™ InfiniBand Direct Attach Copper
>   Cables.(http://www.mellanox.com/products/interconnect/infiniband-copper-cables.php)

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 that you determine whether any prerequisites must be met for this feature and attaching
devices. To check for operating system and partition requirements, see one of the following links:

*   The latest version of enabling libraries and utilities may be downloaded from Fix Central.
    (http://www.ibm.com/support/fixcentral/)
*   IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
*   IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/
    ssic/interoperability.wss)
*   The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/
    lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC
readme (https://ibm.biz/BdrgTZ).

Mellanox MCX414A-BCAT ConnectX-3 Pro EN Dual-port 40/56 GbE PCIe3.0 x8 LP Adapter (FC EKAW)

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

Overview

The Mellanox MCX414A-BCAT ConnectX-3 Pro EN Dual-port 40/56 GbE PCIe3.0 x8 LP 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. The adapter provides a combination of 1, 10, 25, 40, and 50 GbE bandwidth, sub-microsecond
latency and a 75 million packets per second message rate. It includes native hardware support for RDMA
over Converged Ethernet, Ethernet stateless offload engines, Overlay Networks, and GPUDirect®
Technology.

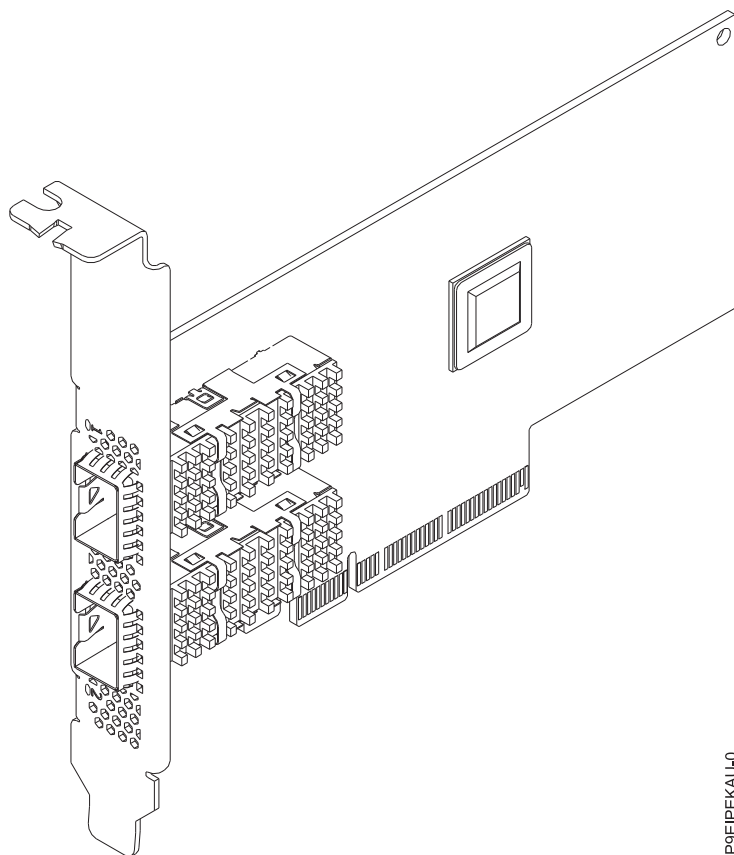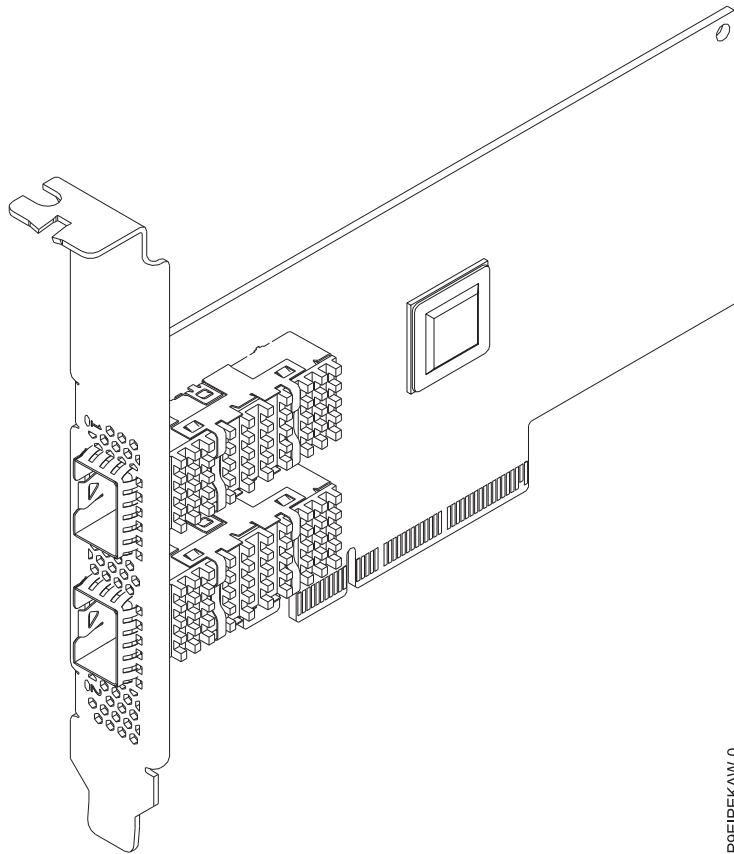*Figure 39. Mellanox MCX414A-BCAT ConnectX-3 Pro EN Dual-port 40/56 GbE PCIe3.0 x8 LP Adapter*

Specifications

Item   Description

Adapter FRU number

MCX414A-BCAT-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x16

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems

• 9006-12C and 9006-22C

Voltage

3.3V, 12 V

Form factor

Short, with full-height tailstock

Attributes provided

Single and dual-port options available

Low latency RDMA over Converged Ethernet

Connectivity to up to 4 independent hosts (specific OPNs)

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Mellanox MCX556A-EDAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe4.0 x16 LP (FC EKAY)

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

Overview

The Mellanox MCX556A-EDAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe4.0 x16 LP Adapter is a PCI Express (PCIe) generation 4 (Gen3) x16 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. The adapter delivers high bandwidth, low latency, and high computation efficiency for high performance, data intensive and scalable compute and storage platforms.
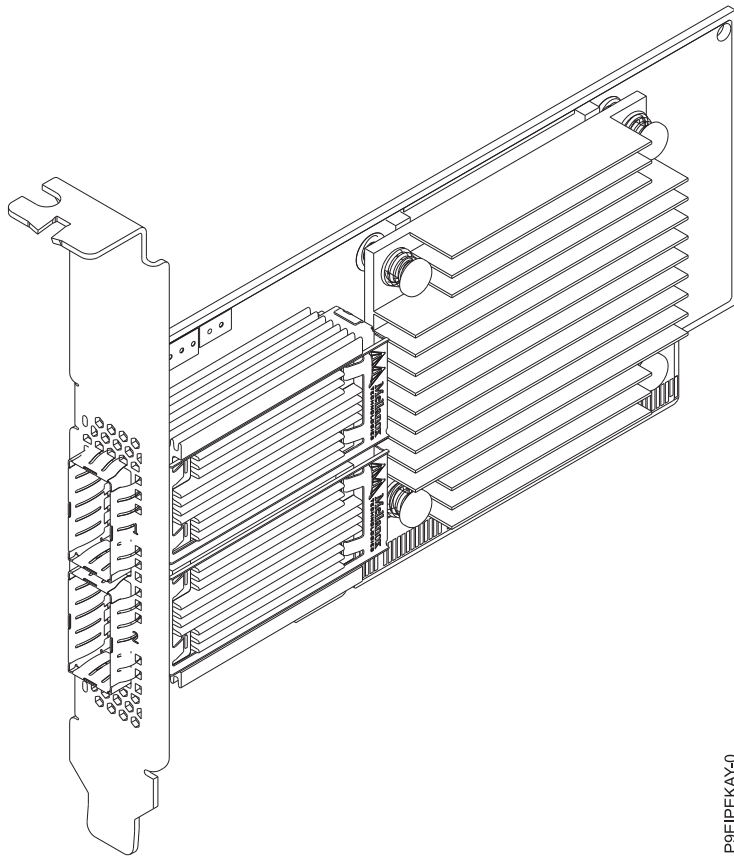
Figure 40. Mellanox MCX556A-EDAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Dual-port QSFP28 PCIe4.0 x16 LP Adapter

Specifications

Item   Description

Adapter FRU number

MCX556A-EDAT (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe4 x16

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems

• 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

Tag matching and rendezvous Offloads

Up to 100 Gb/s connectivity per port

Industry-leading throughput, low latency, low CPU utilization and high message rate

RoCE for Overlay Networks

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables Adapter (FC EKAZ)

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

Overview

The NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables Adapter is a PCI Express (PCIe) generation 3 (Gen3) x16 adapter. The adapter has a double-wide, full-height form-factor and takes up two x16 PCIe slots in the system. The NVIDIA Tesla P100 16GB PCIe3.0 x16 dual-slot FHFL can deliver up to 18.7 teraflops (TFLOPS) of half-precision and is capable of 720 GB/s of memory bandwidth. The accelerator is ideal for high-performance-computing (HPC) and hyperscale workloads.

Figure 41. NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables Adapter

Specifications

Item   Description

Adapter FRU number

AOC-KIT-NVTP100-IB001 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x16

Slot requirement

For details about slot priorities 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.

Supported Systems

POWER8 and POWER9 processor-based systems
- 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Double-wide, full-height

Attributes

Pascal Architecture

NVLink

Kepler GPU Architecture

Page Migration Engine

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Mellanox MCX555A-ECAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Single-port QSFP28 PCIe3.0 x16 LP Adapter (FC EKFD)

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

Overview

The Mellanox MCX555A-ECAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Single-port QSFP28 PCIe3.0 x16 LP 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. The adapter offers a xx
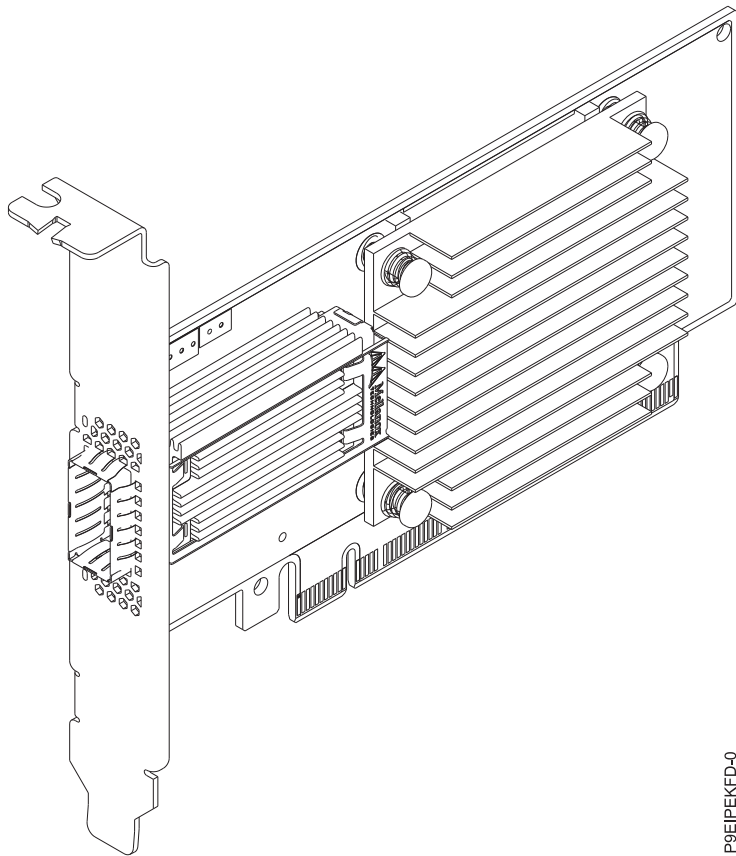
Figure 42. Mellanox MCX555A-ECAT ConnectX-5 VPI EDR IB 100 Gb/s and 100 GbE Single-port QSFP28 PCIe3.0 x16 LP Adapter

Specifications

Item   Description

Adapter FRU number

      xx (Designed to comply with RoHS requirement)

I/O bus architecture

      PCIe3 x8

Slot requirement

      For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

      POWER8 and POWER9 processor-based systems

      • 9006-12C and 9006-22C

Voltage

      3.3 V, 12 V

Form factor

      Short, low-profile

Attributes provided

      xx

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

QEmulax 32 GB x8 Fiber Channel Adapter (FC EKFE)

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

Overview

The Emulax 32 GB x8 Fiber Channel 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. The adapter delivers enhanced performance with up to 2.6 million IOPS (650 K per port) and up to 24,000 MB/s of aggregate throughput, and providing unsurpassed reliability and resiliency. It provides advanced storage networking features, capable of supporting the most demanding virtualized and private cloud environments, while fully leveraging the capabilities of high-performance Gen-6 FC, all-flash arrays (AFAs), and demanding enterprise applications.
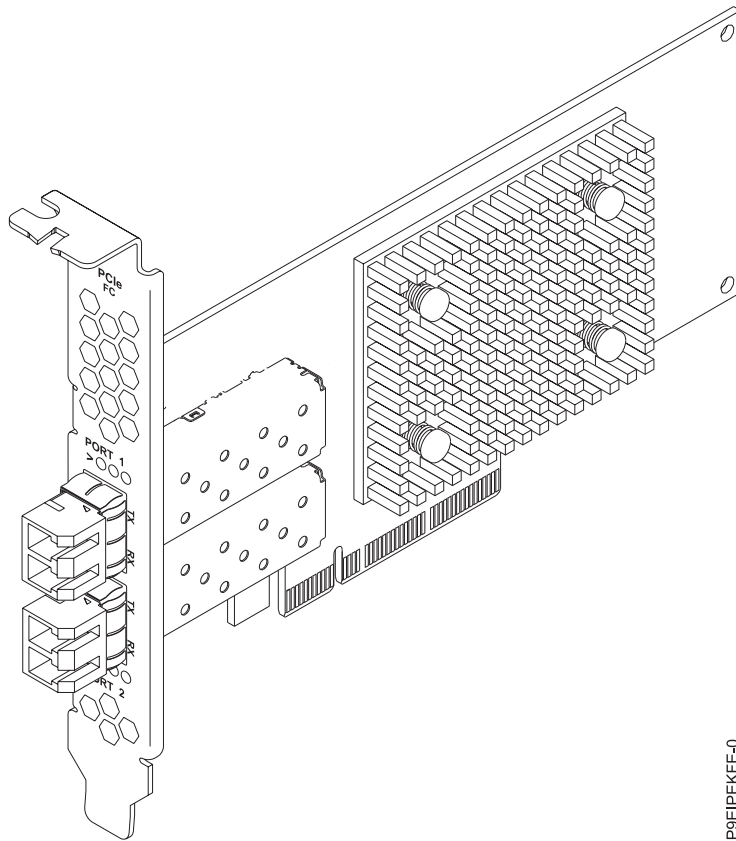
Figure 43. Emulax 32 GB x8 Fiber Channel Adapter

Specifications

Item   Description
Adapter FRU number
>   xx (Designed to comply with RoHS requirement)

I/O bus architecture
>   PCIe3 x8

Slot requirement
>   For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement
>   rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/
>   p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C.
>   (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/
>   p9eip22c_pcie_slot_details.dita)

Supported Systems
>   POWER8 and POWER9 processor-based systems
>   • 9006-12C and 9006-22C

Voltage
>   3.3 V, 12 V

Form factor
>   Short, low-profile

Attributes provided
>   Up to 2.6 million IOPS fuel high performance in AFAs and high-density virtualized environments
>
>   Full hardware offloads deliver industry-leading native FC performance with extremely low CPU
>   usage
>
>   Improvements in total cost of ownership (TCO) with QLogic StorFusion technology

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Broadcom 5719 QP 1G (1G/100M/10M) Network Interface Card PCIe x4 LP (FC EKFF)

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

Overview

The Broadcom 5719 QP 1G (1G/100M/10M) Network Interface Card PCIe x4 LP Adapter is a PCI Express (PCIe) x4 adapter. The adapter can be used in either an x4, x8 or x16 PCIe slot in the system. This adapter provides 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.
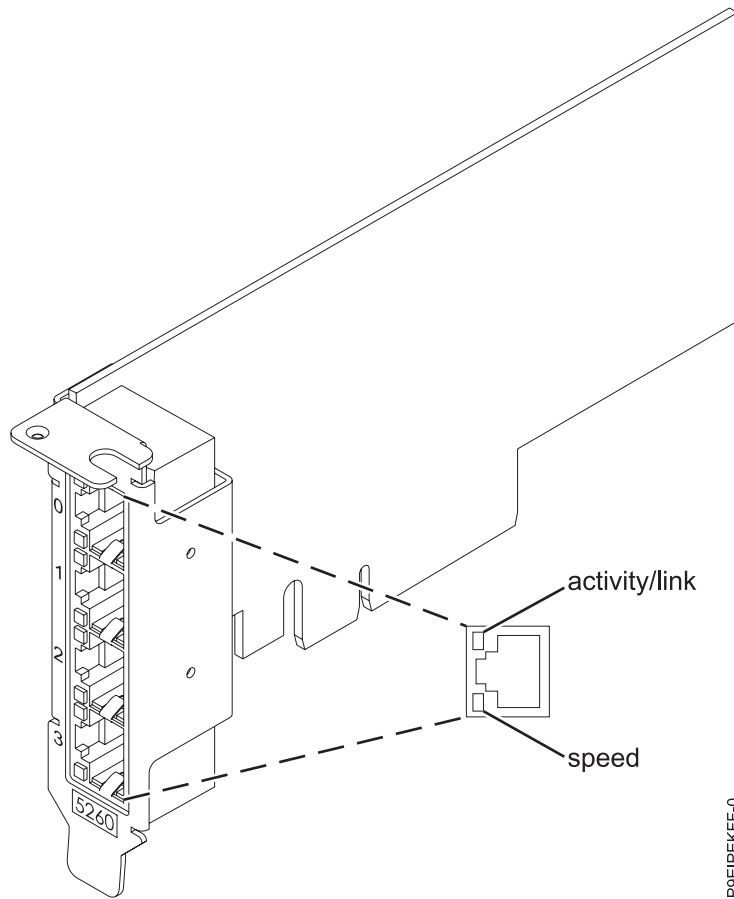
Figure 44. Broadcom 5719 QP 1G (1G/100M/10M) Network Interface Card PCIe x4 LP

Specifications

Item   Description

Adapter FRU number

xx (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe x4

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems

- 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

4-Port machine access code (MAC)

High performance IPV4/IPV6 checksum offload

Supports large send and large receive

Multiple queues

VIOS

Transceivers and cables

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

Supported cable length is more than 100 M

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Intel XL710 Ethernet Converged Network Adapter Quad-port 10G/1G SFP+ PCIe3.0 x8 LP (FC EKFH)

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

Overview

The Intel XL710 Ethernet Converged Network Adapter Quad-port 10G/1G SFP+ PCIe3.0 x8 LP is a PCI Express (PCIe) x8 adapter. The adapter can be used in either an x4, x8 or x16 PCIe slot in the system. The adapter expands virtualization beyond the server level to the network level and combines with hardware optimizations and offloads. It provides unmatched features for virtualization, flexibility for LAN and SAN networks, and reliable performance.

Figure 45. Intel XL710 Ethernet Converged Network Adapter Quad-port 10G/1G SFP+ PCIe3.0 x8 LP

Specifications

Item   Description

Adapter FRU number

AOC-STG-I4S (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe x8

Slot requirement

> For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems

> POWER8 and POWER9 processor-based systems
> - 9006-12C and 9006-22C

Voltage

> 3.3 V, 12 V

Form factor

> Short, low-profile

Attributes provided

> Quad SFP+ Connectors
>
> Small Packet Performance
>
> Network Virtualization Offloads including VXLAN and NVGRE
>
> Unified networking providing a single with support

Transceivers and cables

> Supported cable length is more than 100 M

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

FlashGT + with embedded M.2 NVMe Nallatech Adapter with Xilinx KU15P FPGA (FC EKFK)

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

Overview

The FlashGT + with embedded M.2 NVMe Nallatech Adapter with Xilinx KU15P FPGA 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. The adapter offers a xx

Figure 46. FlashGT + with embedded M.2 NVMe Nallatech Adapter with Xilinx KU15P FPGA

Specifications

Item   Description

Adapter FRU number

   xx (Designed to comply with RoHS requirement)

I/O bus architecture

   PCIe3 x8

Slot requirement

   For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems

   POWER8 and POWER9 processor-based systems
   • 9006-12C and 9006-22C

Voltage

   3.3 V, 12 V

Form factor

   Short, low-profile

Attributes provided

   xx

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

• The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)

- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

FlashGT+ HBA to connect 2.5" NVMe Nallatech Adapter with Xilinx KU15P FPGA PCIe4.0 x8 Dual-slot LP (FC EKFL)

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

Overview

The FlashGT+ HBA to connect 2.5" NVMe Nallatech Adapter with Xilinx KU15P FPGA PCIe4.0 x8 Dual-slot LP is a PCI Express (PCIe) generation 4 (Gen4) x8 adapter. The adapter can be used in either a x8 or x16 PCIe slot in the system. The adapter offers a xx

Figure 47. FlashGT+ HBA to connect 2.5" NVMe Nallatech Adapter with Xilinx KU15P FPGA PCIe4.0 x8 Dual-slot LP

Specifications

Item   Description

Adapter FRU number

xx (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems
- 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

xx

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

FlashGT+ HBA to Connect 2.5" NVMe, Nallatech Adapter with Xilinx KU15P FPGA (FC EKFN)

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

Overview

The FlashGT+ HBA to Connect 2.5" NVMe, Nallatech Adapter with Xilinx KU15P FPGA 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. The adapter offers a xx
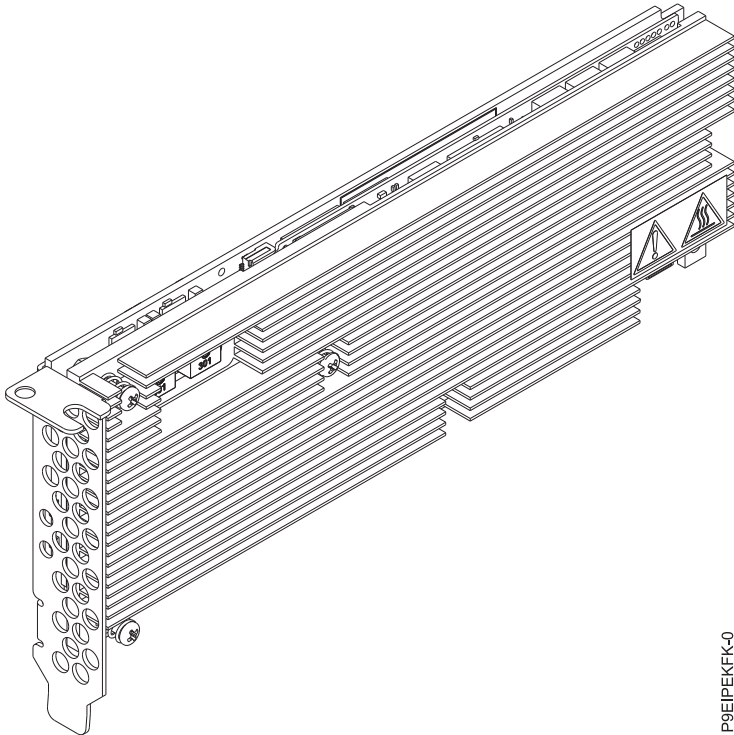

Figure 48. FlashGT+ HBA to Connect 2.5" NVMe, Nallatech Adapter with Xilinx KU15P FPGA

Specifications

Item   Description

Adapter FRU number
 xx (Designed to comply with RoHS requirement)

I/O bus architecture
 PCIe3 x8

Slot requirement
 For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Supported Systems
 POWER8 and POWER9 processor-based systems
 - 9006-12C and 9006-22C

Voltage
 3.3 V, 12 V

Form factor

    Short, low-profile

Attributes provided

    xx

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Intel XL710/X557 10GBase-T Converged Network Adapter Quad-port (10G/1G/100M speeds) PCIe3.0 x8 LP (FC EKFP)

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

Overview

TheIntel XL710/X557 10GBase-T Converged Network Adapter Quad-port (10G/1G/100M speeds) PCIe3.0 x8 LP is a PCI Express (PCIe) generation 3 (Gen3) x8 adapter. The adapter can be used in either an x8 or x16 PCIe slot in the system. The adapter enables rapid network provisioning in an agile data center.

Figure 49. Intel XL710/X557 10GBase-T Converged Network Adapter Quad-port (10G/1G/100M speeds) PCIe3.0 x8 LP

Specifications

Item   Description

Adapter FRU number

    AOC-STG-I4T (Designed to comply with RoHS requirement)

I/O bus architecture

    PCIe x8

Slot requirement

    For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/

p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems
* 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

Network Virtualization Offloads

Small Packet Performance

NC-SI for Remote Management

Transceivers and cables

Supported cable length is more than 100 M

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

* The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)

* IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)

* IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)

* The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Broadcom (LSI) 9305-16E SAS3 HBA PCIe3.0 x8 LP (FC EKGC)

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

Overview

The Broadcom (LSI) 9305-16E SAS3 HBA PCIe3.0 x8 LP 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. The adapter is designed for large-scale, data-intensive applications and is ideal for tiered storage or multiple external storage enclosures.
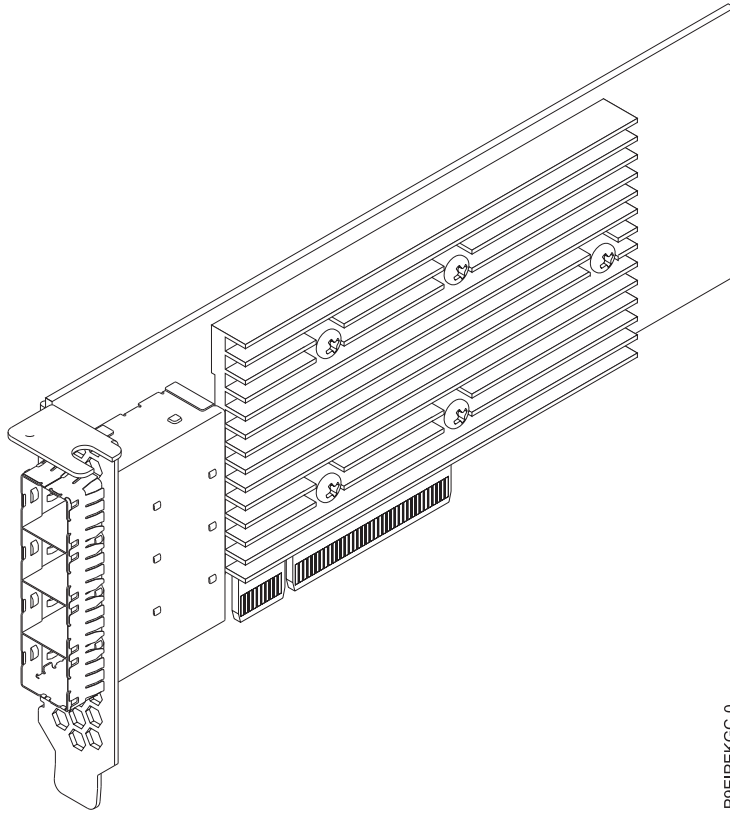
Figure 50. Broadcom (LSI) 9305-16E SAS3 HBA PCIe3.0 x8 LP

Specifications

Item   Description

Adapter FRU number

AOC-SAS3-9305-16E (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems
- 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

Performance of over 1.5 million input-output operations per second (IOPS)

Connects up to 1024 SAS and SATA devices with 16 external 12 Gb/s SAS ports

Provides maximum connectivity and performance for external JBOD and external RAID enclosures

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

PCIe 800 GB Add-In-card NVMe (FC EKN1)

Learn about the specifications and operating system requirements for feature code (FC) EKN1 adapters.

Overview

The PCIe 800 GB Add-In-card NVMe is a PCI Express (PCIe) generation 3 (Gen3) x4 adapter. The SFF 2.5-inch adapter can be used in either a x8 or x16 PCIe slot in the system. It offers flash-aware RAID, end-to-end data-path protection, advanced ECC, secure erase, and power fail protection.

Figure 51. PCIe 800 GB Add-In-card NVMe

Specifications

Item   Description

Adapter FRU number
>   00E4944 (Designed to comply with RoHS requirement)

I/O bus architecture
>   PCIe3 x4

Slot requirement
>   For details about the maximum number of adapters that are supported, 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.

Supported Systems
>   POWER8 and POWER9 processor-based systems
>   - 9006-12C and 9006-22C

Voltage
>   3.3V, 12 V

Form factor
>   SFF 2.5-inch

Maximum number
For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/p9eip22c_pcie_slot_details.dita)

Attributes provided
Supports standard NVMe drivers

UEFI boot support

Advanced power management

Up to 310,000 mixed sustained random IOPS

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

PCIe3 1.6 TB NVMe Flash Adapter (FC EKN2)
Learn about the specifications and operating system requirements for feature code (FC) EKN2 adapters.

Overview

See FC EKN3 for an adapter with more capacity.

The PCIe3 1.6 TB NVMe Flash Adapter is a PCI Express (PCIe) generation 3 (Gen3) x4 adapter. The adapter can be used in either a x8 or x16 PCIe (Gen3) slot in the system and uses Non-Volatile Memory Express (NVMe). NVMe is a high performance software interface that can read/write flash memory. Compared to a SAS or SATA SSD, the NVMe Flash adapter provides more read/write input/output operations per second (IOPS) and larger throughput (GB/sec). The NVMe Flash Adapter is read intensive and is not designed for high write intensive workloads. At about 8,760 to 17,000 TB of writes to the adapter, it will be at its maximum projected write capability. The nature of the workload has a great impact on the maximum write capacity. If a high percentage of more sequentially oriented writes is used instead of random writes, the maximum write capacity will be closer to the larger value in the range. In the case of a high percentage of random writes, the maximum will be closer to the smaller value in the range. Writes past the adapter's maximum write capacity will continue to work for some period of time, but much more slowly. A Predictive Failure Analysis message will indicate that it is time to replace the adapter if enabled by the system administrator. After the warranty period, if the maximum write capability is achieved, the adapter's replacement is not covered under IBM maintenance. This adapter has protection against single Flash channel failures. To prevent the entire adapter from failing, software RAID

should be used. For high value applications where the content in the adapter must be protected, additional NVMe Flash adapters with OS mirroring or software Redundant Array of Independent Disks (RAID) are recommended. This adapter is not supported in the PCIe Gen3 I/O drawer.

Important: Before removing a NVMe Flash adapter, ensure that all data on the adapter or the array that contains the adapter is backed up. Restore the data after the adapter is replaced.

Figure 52. PCIe3 1.6 TB NVMe Flash Adapter

Important: The micro USB connector visible through the adapter tailstock has no function and cannot be used. Do not insert a cable of any kind into this port.

Specifications

Item   Description

Adapter FRU number
> HDS-AVM-HUSPR3216AHP301 (Designed to comply with RoHS requirement)

I/O bus architecture
> PCIe3 x4

Slot requirement
> One PCIe x8 or x16 slot per adapter

Supported Systems
> POWER8 and POWER9 processor-based systems
> • 9006-12C and 9006-22C

Voltage
> 3.3 V, 12 V

Form factor
> Short, low-profile

Attributes provided
> 1.6 TB of low latency flash memory
>
> Non-Volatile write buffer
>
> Hot plug capable

Transceivers and cables
> Attach any necessary cables to the add-on card.

NVMe Flash adapter maximum write capability

Determine whether the NVMe Flash adapter maximum write capability is depleted by completing the following steps:

1. Type the following command at the Linux command line and press Enter: `nvme smart-log /dev/nvmeX`, where nvmeX is the resource name of the NVMe Flash adapter.

2. If the critical_warning field is 1 (bit 0 is set) and the percentage_used field is 90% or greater, replace the NVMe Flash adapter.

Note: The replacement of depleted NVMe Flash adapters is covered during the system warranty period. After the warranty period has expired, the cost that is incurred for the replacement of depleted NVMe Flash adapters is not covered under maintenance contracts, and is the responsibility of the customer.

Service tools for Linux on Power servers

To obtain the utility to update firmware, format storage, and complete other service tasks, complete the following steps:

1. Go to Service and productivity tools and follow the instructions to download service tools.

2. Install the NVMe management command line interface (CLI).
   - For Red Hat Enterprise Linux (RHEL), type `yum install nvme-cli`.
   - For SUSE Linux Enterprise Server (SLES), type `zypper install nvme-cli`.

3. For more information about using the NVMe CLI, see the README file.

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)

- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

PCIe3 3.2 TB NVMe Flash Adapter (FC EKN3)

Learn about the specifications and operating system requirements for feature code (FC) EKN3 adapters.

Overview

See FC EKN2 for an adapter with less capacity.

The PCIe3 3.2 TB NVMe Flash Adapter is a PCI Express (PCIe) generation 3 (Gen3) x4 adapter. The adapter can be used in either a x8 or x16 PCIe3 slot in the system and uses Non-Volatile Memory Express (NVMe). NVMe is a high performance software interface that can read/write flash memory. Compared to a SAS or SATA SSD, the NVMe Flash adapter provides more read/write input/output operations per second (IOPS) and larger throughput (GB/sec). The NVMe Flash Adapter is read intensive and is not designed for high write intensive workloads. At about 17,000 to 35,000 TB of writes to the adapter, it will be at its maximum projected write capability. The nature of the workload has a great impact on the maximum write capacity. If a high percentage of more sequentially oriented writes is used instead of random writes, the maximum write capacity will be closer to the larger value in the range. In the case of a high percentage of random writes, the maximum will be closer to the smaller value in the range. Writes past the adapter's maximum write capacity will continue to work for some period of time, but much more slowly. A Predictive Failure Analysis message will indicate that it is time to replace the adapter if enabled by the system administrator. After the warranty period, if the maximum write capability is achieved, the adapter's replacement is not covered under IBM maintenance. This adapter has protection against single Flash channel failures. To prevent the entire adapter from failing, software RAID should be used. For high value applications where the content in the adapter must be protected, additional NVMe Flash adapters with OS mirroring or software Redundant Array of Independent Disks (RAID) are recommended. This adapter is not supported in the PCIe Gen3 I/O drawer.

Important: Before removing a NVMe Flash adapter, ensure that all data on the adapter or the array that contains the adapter is backed up. Restore the data after the adapter is replaced.
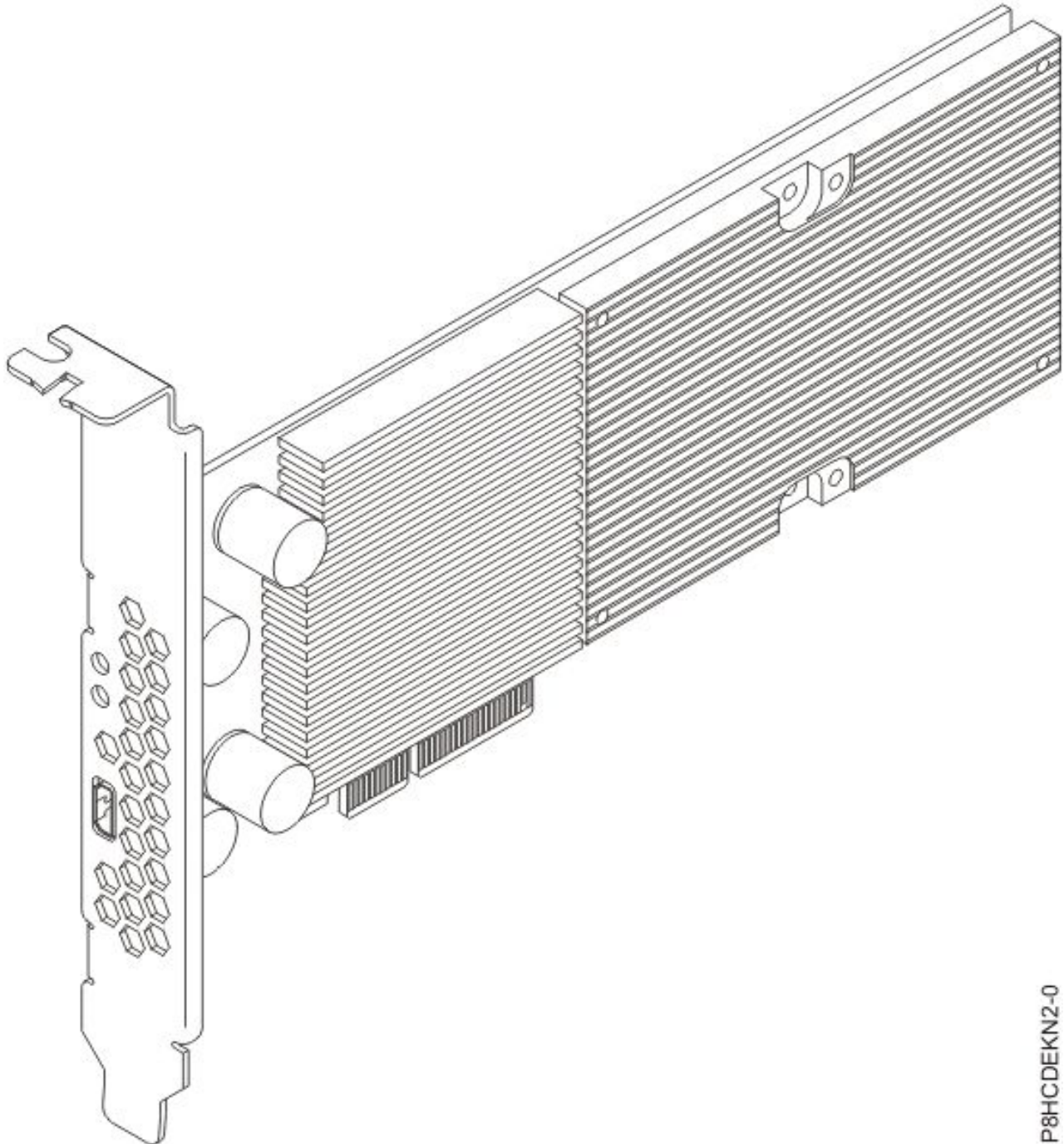

Figure 53. PCIe3 3.2 TB NVMe Flash Adapter

Important: The micro USB connector visible through the adapter tailstock has no function and cannot be used. Do not insert a cable of any kind into this port.

Specifications

Item   Description

Adapter FRU number
HDS-AVM-HUSPR3232AHP301 (Designed to comply with RoHS requirement)

I/O bus architecture
PCIe3 x4

Slot requirement
For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems
POWER8 and POWER9 processor-based systems
- 9006-12C and 9006-22C

Voltage
3.3 V, 12 V

Form factor
Short, low-profile

Attributes provided
3.2 TB of low latency flash memory

Non-Volatile Write Buffer

Hot Plug Capable

NVMe Flash adapter maximum write capability

Determine whether the NVMe Flash adapter maximum write capability is depleted by completing the following steps:

1. Type the following command at the Linux command line and press Enter: `nvme smart-log /dev/nvmeX`, where nvmeX is the resource name of the NVMe Flash adapter

2. If the critical_warning field is 1 (bit 0 is set) and the percentage_used field is 90% or greater, replace the NVMe Flash adapter.

Note: The replacement of depleted NVMe Flash adapters is covered during the system warranty period. After the warranty period has expired, the cost that is incurred for the replacement of depleted NVMe Flash adapters is not covered under maintenance contracts, and is the responsibility of the customer.

Service tools for Linux on Power servers

To obtain the utility to update firmware, format storage, and complete other service tasks, complete the following steps:

1. Go to Service and productivity tools and follow the instructions to download service tools.

2. Install the NVMe management command line interface (CLI).
   - For Red Hat Enterprise Linux (RHEL), type `yum install nvme-cli`.
   - For SUSE Linux Enterprise Server (SLES), type `zypper install nvme-cli`.

3. For more information about using the NVMe CLI, see the README file.

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Samsung PM1725a NVMe 1.6 TB 5DWPD PCIe3.0 x8 LP Adapter (FC EKSQ)

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

Overview

The Samsung PM1725a NVMe 1.6 TB 5DWPD PCIe3.0 x8 LP 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. The adapter utilizes Samsung V-NAND flash memory, which features a unique design that stacks 48 layers on top of another. It also employs cost-effective TLC (triple-level cell) flash memory, which delivers higher reliability than MLC (multi-level cell) planar NAND flash memory SSDs.

Figure 54. Samsung PM1725a NVMe 1.6 TB 5DWPD PCIe3.0 x8 LP Adapter

Specifications

Item   Description

Adapter FRU number

HDS-AVT-MZPLL1T6HEHP003 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems

• 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

Samsung 3rd-generation TLC V-NAND technology

Five drive writes per day (DWPD)

Delivers a wide bandwidth of up to 6,400/3,000 MB/s sequential R/W speeds respectively

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Samsung PM1725a NVMe 3.2 TB 5DWPD PCIe3.0 x8 LP Adapter (FC EKSR)

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

Overview

The Samsung PM1725a NVMe 3.2 TB 5DWPD PCIe3.0 x8 LP 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. The adapter utilizes Samsung V-NAND flash memory, which features a unique design that stacks 48 layers on top of another. It also employs cost-effective TLC (triple-level cell) flash memory, which delivers higher reliability than MLC (multi-level cell) planar NAND flash memory SSDs.
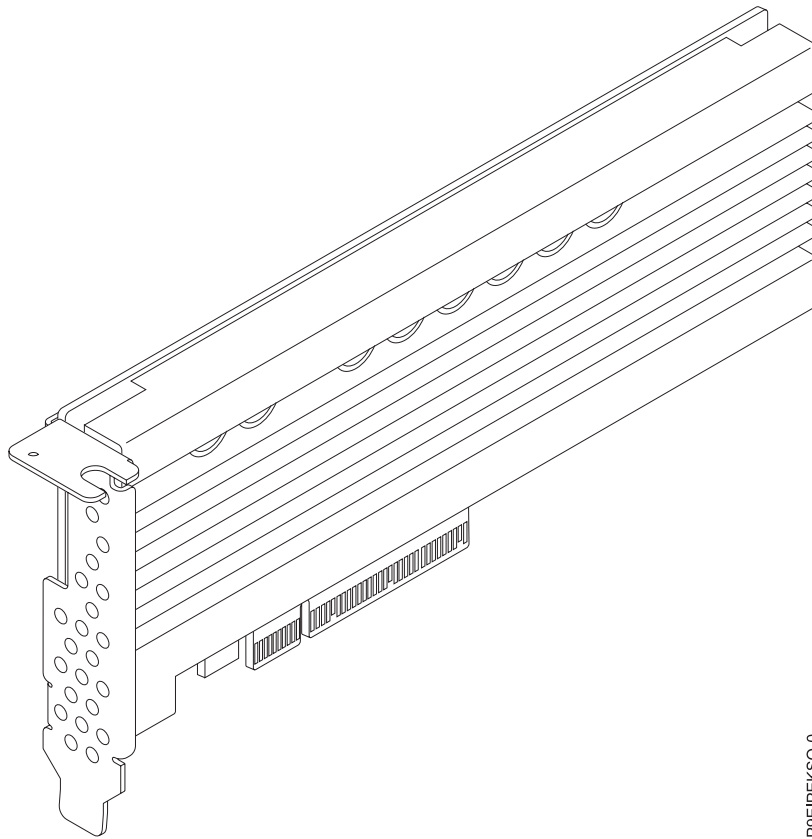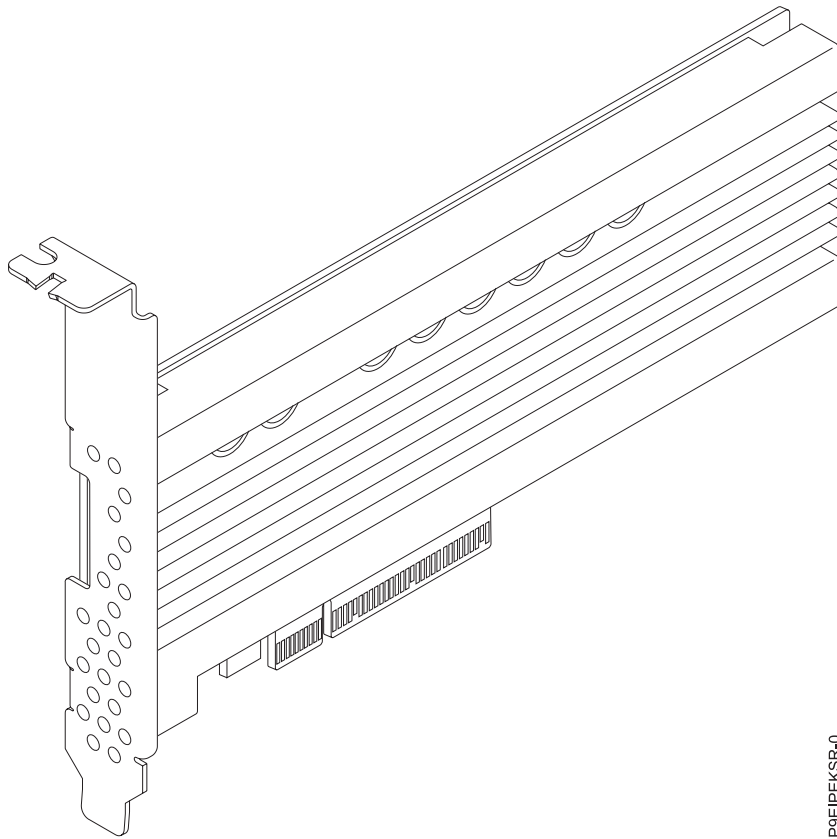
Figure 55. Samsung PM1725a NVMe 3.2 TB 5DWPD PCIe3.0 x8 LP Adapter

Specifications

Item   Description

Adapter FRU number

HDS-AVT-MZPLL3T2HMLS003 (Designed to comply with RoHS requirement)

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities, maximums, and placement rules, see the PCIe adapter placement rules for the 9006-12C(http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip12c_pcie_slot_details.dita) or PCIe adapter placement rules for the 9006-22C. (http://www.ibm.com/support/knowledgecenter/POWER9/p9eip/ p9eip22c_pcie_slot_details.dita)

Supported Systems

POWER8 and POWER9 processor-based systems

• 9006-12C and 9006-22C

Voltage

3.3 V, 12 V

Form factor

Short, low-profile

Attributes provided

Samsung 3rd-generation TLC V-NAND technology

Five drive writes per day (DWPD)

Delivers a wide bandwidth of up to 6,400/3,000 MB/s sequential R/W speeds respectively

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 that you determine whether any prerequisites must be met for this feature and attaching devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables Adapter (FC EKAZ)

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

Overview

The NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables Adapter is a PCI Express (PCIe) generation 3 (Gen3) x16 adapter. The adapter has a double-wide, full-height form-factor and takes up two x16 PCIe slots in the system. The NVIDIA Tesla P100 16GB PCIe3.0 x16 dual-slot FHFL can deliver up to 18.7 teraflops (TFLOPS) of half-precision and is capable of 720 GB/s of memory bandwidth. The accelerator is ideal for high-performance-computing (HPC) and hyperscale workloads.

Figure 56. NVIDIA Tesla P100 16GB PCIe3.0 x16 Dual-slot FHFL with cables Adapter

Specifications

Item   Description
Adapter FRU number
    AOC-KIT-NVTP100-IB001 (Designed to comply with RoHS requirement)
I/O bus architecture
    PCIe3 x16
Slot requirement
    For details about slot priorities 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.
Supported Systems
    POWER8 and POWER9 processor-based systems
    • 9006-12C and 9006-22C
Voltage
    3.3 V, 12 V
Form factor
    Double-wide, full-height
Attributes
    Pascal Architecture

    NVLink

    Kepler GPU Architecture

    Page Migration Engine

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 that you determine whether any prerequisites must be met for this feature and attaching
devices. To check for operating system and partition requirements, see one of the following links:

- The latest version of enabling libraries and utilities may be downloaded from Fix Central. (http://www.ibm.com/support/fixcentral/)
- IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf)
- IBM SSIC (System Storage Interoperation Center) (http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss)
- The latest version of the device driver or 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 support details, see the Linux Alert website. (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html)

Important: For a list of known Linux OS issues that may affect this adapter, see the IBM Power LC readme (https://ibm.biz/BdrgTZ).

Installing a PCIe adapter in the 9006-12C system

Complete the steps in this procedure to install a PCIe adapter in the IBM Power System LC921 (9006-12C) system.

Before you begin

Power off the system and place it in the service position. For instructions, see "Preparing the 9006-12C system to remove and replace internal parts" on page 106.

About this task

See "PCIe adapter placement rules and slot priorities for the 9006-12C system" on page 23 for information and capabilities of the PCIe slots.

Attention: For safety and airflow purposes, if you remove parts from the system, you must ensure that:
- PCIe tail-stock fillers are present
- System processor airflow baffles are 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. An adapter can share a PCIe riser card with other adapters. Label and remove any cables and plugs that extend out of the adapters. See Figure 57 on page 97.
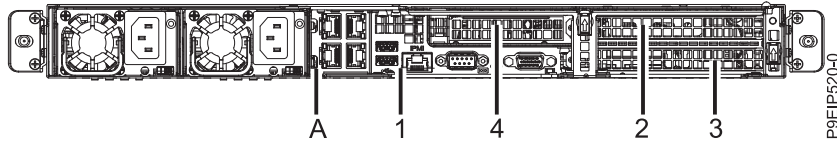
Figure 57. 9006-12C PCIe adapter positions

Position	Step
1 (UIO Slot1)	3
2 (WIO Slot1), 3 (WIO Slot2), 4 (WIO-R Slot)	4

3. If you are working with a PCIe adapter in position 1, do the following:
   a. Remove the standard tailstock from the adapter.
   b. If you are inserting a storage drive adapter, connect the signal cables to the adapter before inserting the adapter. See "Drive installation details for the 9006-12C system" on page 7 for cabling information.
   c. If needed, install a support bracket for the PCIe adapter to the system backplane. Also install a special support tailstock to the PCIe adapter.
   d. Insert the adapter into the PCIe riser.
   e. If you installed the support bracket for the PCIe adapter, fasten the special support tailstock to that bracket.

4. If the PCIe adapter to install is in positions 2, 3, or 4, you must remove the PCIe cage and riser.
   a. If the riser contains a GPU, remove the power cable **(A)** from the system backplane as shown in Figure 58. Using your thumb, press the release latch on the connector to remove the cable.
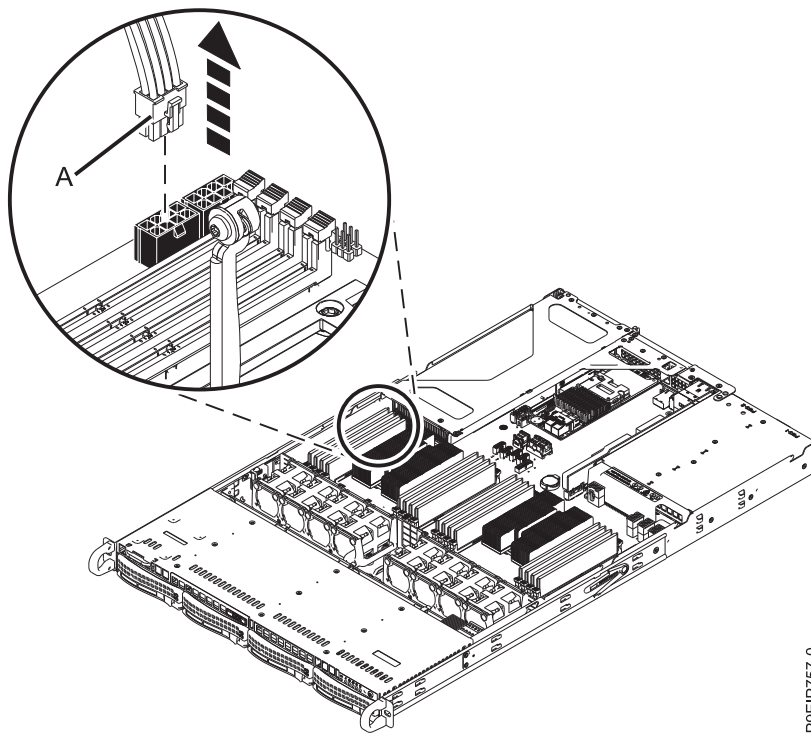
Figure 58. Unplugging the GPU power cable

   b. Remove the PCIe riser as shown in Figure 59 on page 98.

1) Retract the retaining pins **(A)** so that the arrows on the tabs point to the system.
2) Lift the PCIe riser from the system.
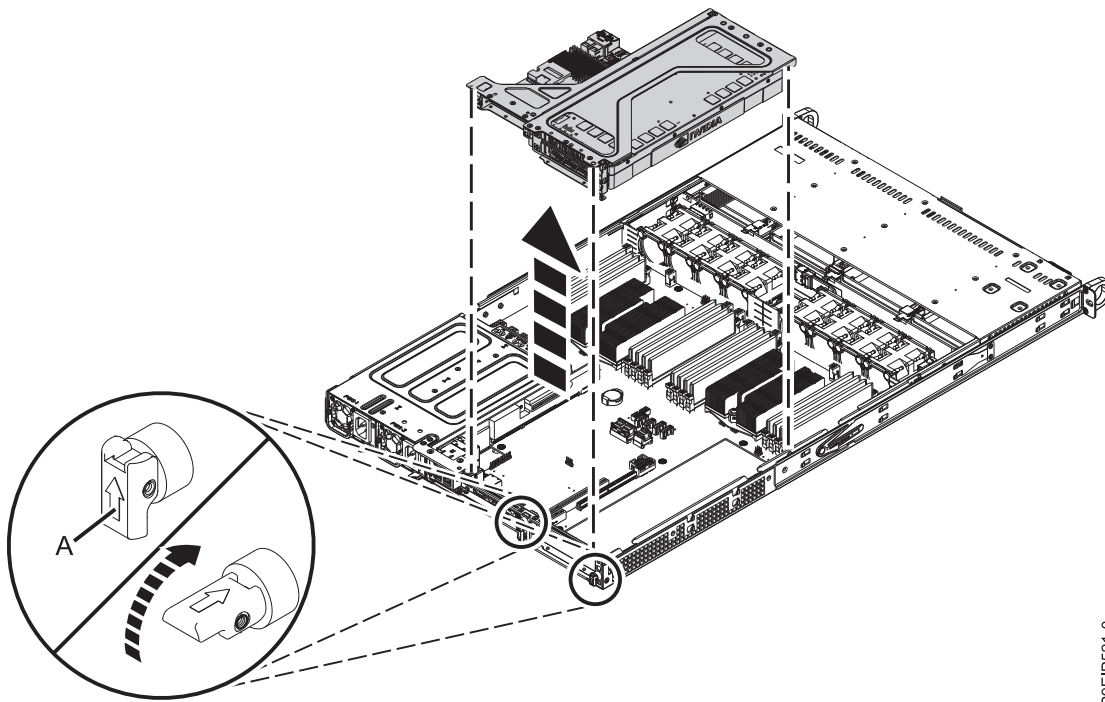
Figure 59. Removing the PCIe riser

c. Place the PCIe riser on an ESD surface.
d. Remove the screw and the tail-stock filler for that position.
e. If you are inserting a storage drive adapter, connect the signal cables to the adapter before inserting the adapter. See "Drive installation details for the 9006-12C system" on page 7 for cabling information.

   NVMe drives are only supported on host operating systems. NVMe drives are not supported by guest operating systems. On systems with RHEL 7.3 or later, or Ubuntu 16.04 or later, NVMe drives can be used as bootable drives. Port 1 of the internal NVMe host bus adapter must be plugged into NVMe port 1 on the disk drive backplane.
f. Insert the adapter **(A)** into the riser **(B)** as shown in Figure 60 on page 99, aligning it properly and inserting it fully into the slot. Secure the adapter tail-stock with 1 or 2 screws as needed.
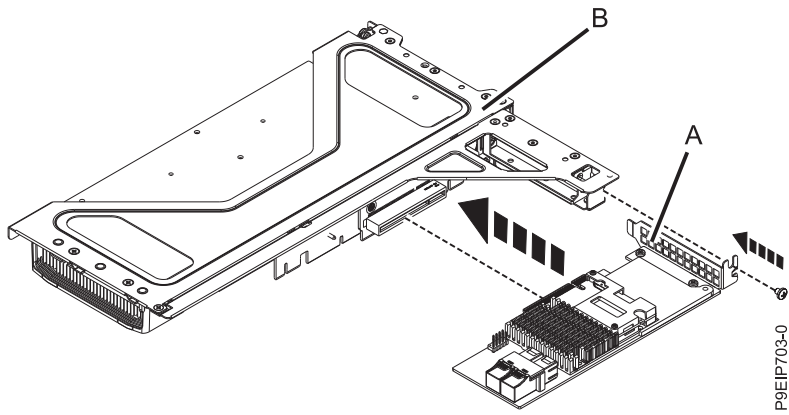
Figure 60. Inserting an adapter into position 4 of the riser
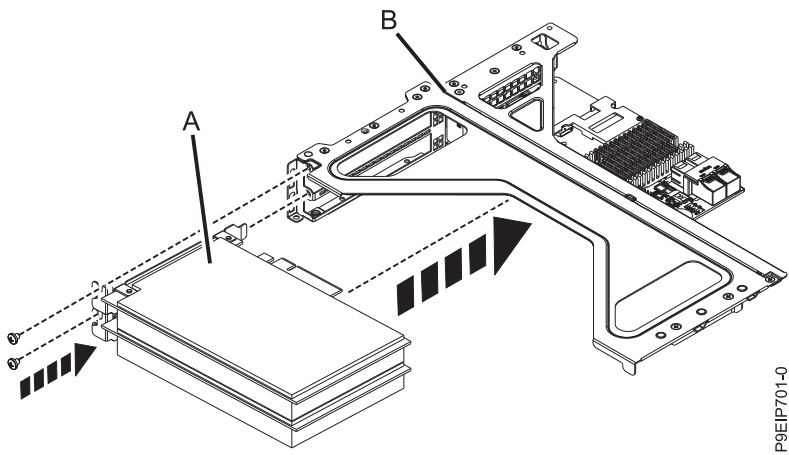
Figure 61. Inserting an adapter into position 2 or 3 of the riser

g. Place the PCIe adapter riser and the cards it contains into the system backplane as shown in Figure 62 on page 100.

1) Ensure that the PCIe holder release pins **(B)** are retracted, so the arrows point into the system.

2) Use the alignment pins **(A)** and slots to help you properly insert the riser cards and replace the cover

3) Reset the retaining pins to secure the PCIe cage.
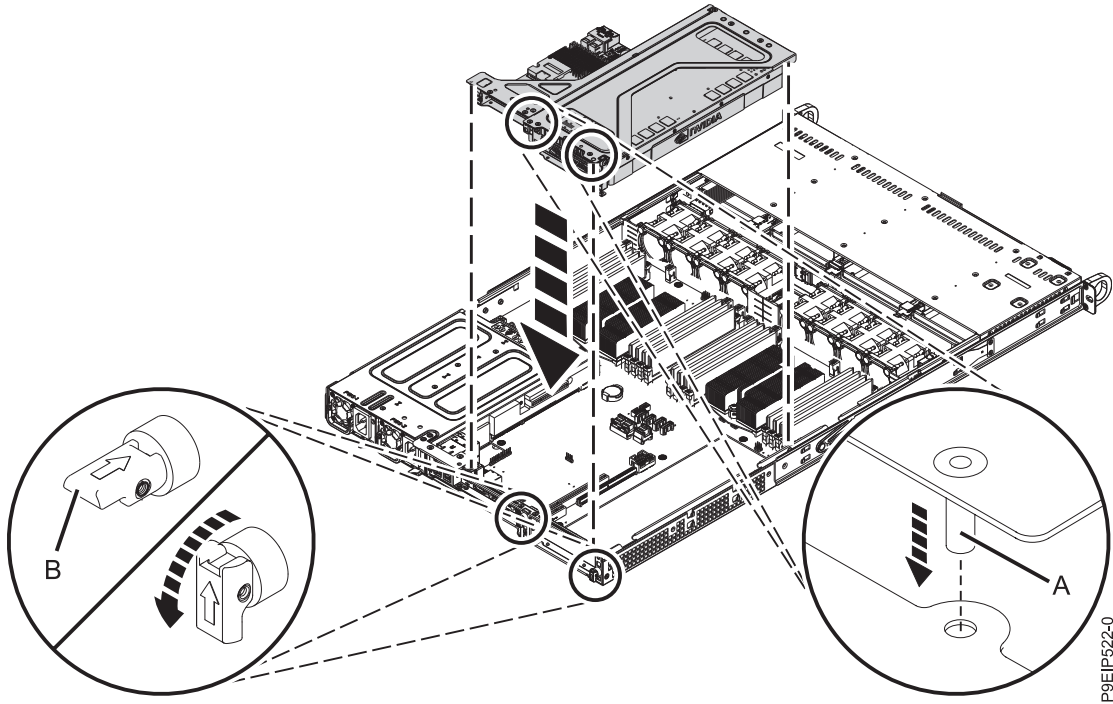
Figure 62. Replacing the PCIe riser

   h. If the riser contains a GPU, replace the power cable **(A)** into the system backplane.
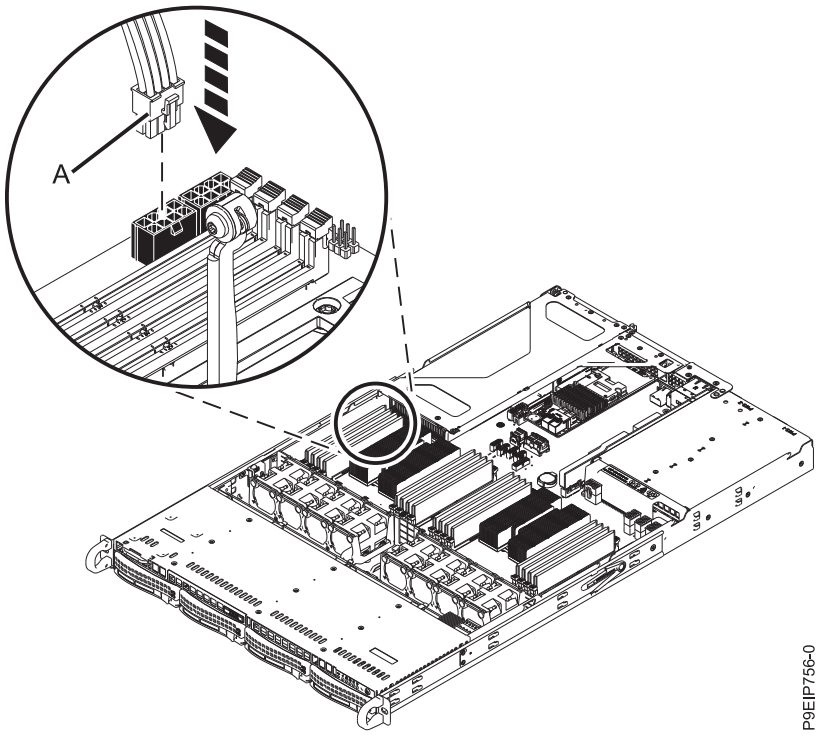
Figure 63. Plugging the GPU power cable

What to do next

Prepare the system for operation. For instructions, see "Preparing the 9006-12C system for operation after you remove and replace internal parts" on page 108.

Common procedures for servicing or installing features in the 9006-12C

Learn about the common procedures related to installing, removing, and replacing features in the IBM Power System LC921 (9006-12C) system.

Before you begin

Observe these precautions when you are installing, removing, or replacing features and parts.

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.
* Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements.
* Do not continue with the inspection if any unsafe conditions are present.
* Before you open the device covers, unless instructed otherwise in the installation and configuration procedures: Disconnect the attached AC power cords, turn off the applicable circuit breakers located in the rack power distribution panel (PDP), and disconnect any telecommunications systems, networks, and modems.

DANGER:

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

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

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

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

(R001 part 1 of 2):

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

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

(R001 part 2 of 2):

CAUTION:

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

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

Procedure

1. If you are installing a new feature, ensure that you have the software that is required 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 or terra-cotta 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, or open or close a latch. Terra-cotta might also indicate that the part can be removed and replaced with the system or logical partition powered 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, use the following website to locate your service and support telephone numbers:

   `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. For thermal performance, ensure that the top cover is on when the system is running.

Identifying the system that contains the part to replace

Learn how to determine which system has the part you want to replace.

LEDs on the 9006-12C system

Use this information as a guide to the LEDs on the IBM Power System LC921 (9006-12C) system.

The LEDs indicate various system status. If the part does not have a problem indicator LED, you can use a troubleshooting program such as **impitool** to identify the issue.

The front LEDs are shown in Figure 64.
- The green LED **(6)** indicates the power status.
- The identify LED **(2)** can indicate the following states:
  - Solid blue indicates that the local UID button was pressed.
  - Flashing blue indicates that a remote UID command was run.
  - Solid red indicates that the system is overheated.
  - Flashing red at 1 Hz indicates that a fan failed.
  - Flashing red at 0.25 Hz indicates that a power supply failed.
- The amber LED **(5)** flashes when there is SATA drive activity, for SATA drives directly attached to the system backplane.
- The network activity LEDs **(3)** and **(4)** flash when there is network activity on the feature EKA6 four port network card.
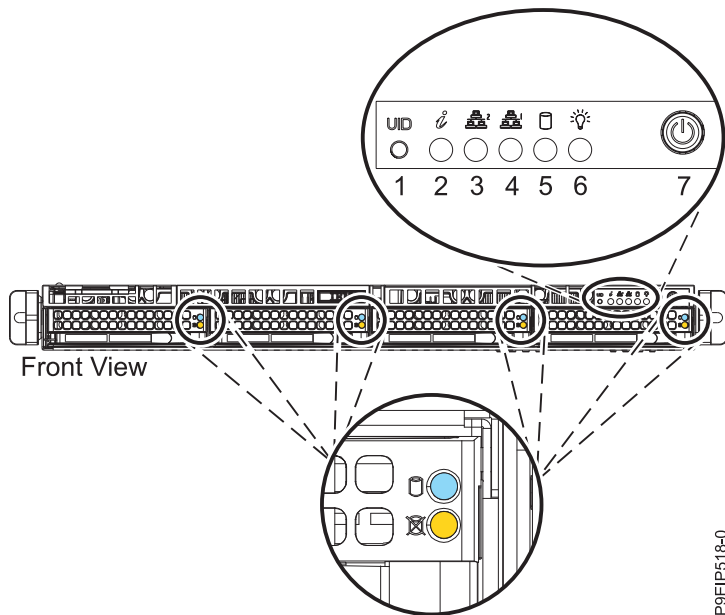
Figure 64. LEDs on the front of the system

LEDs are also located on the rear of the system; see Figure 65 on page 105.

The identify LED is at **(2)**. Turn it on by using a system identify command or by pressing the UID button.
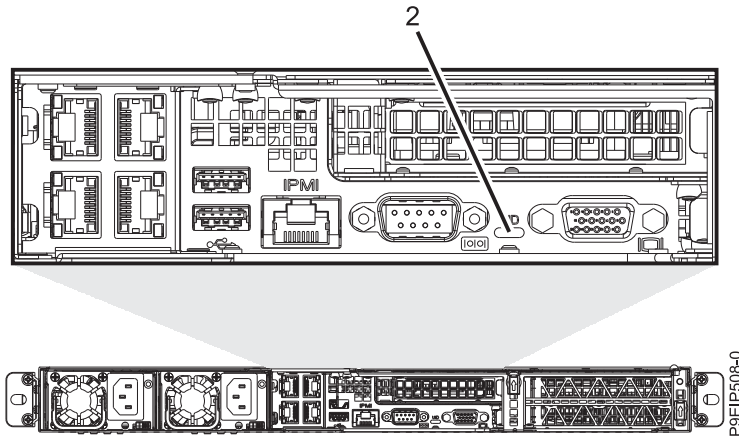
Figure 65. LEDs on the rear of the system

Drive LEDs can indicate the following states:

- Blue activity LED can indicate the following states:
  - When there is no activity, the LED is off for SATA drives; on for SAS drives.
  - Flashing blue indicates activity
- Red status LED can indicate the following states. The status LED does not work when SATA drives are directly attached to the system backplane.
  - Steady red indicates that the drive failed
  - Flashing red at 4 Hz identifies the drive
  - Flashing red at 1 Hz indicates that the drive is rebuilding

Power supply LEDs can indicate the following states:

- Steady green indicates that power is on
- Steady amber indicates that power is off, or a power fault occurred
- Flashing amber indicates that the power supply is overheating

Identifying the 9006-12C or 9006-22C that needs servicing

Use the Intelligent Platform Management Interface (IPMI) program to turn on the blue identify LED to help you find the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) system that needs servicing.

Procedure

Use the **ipmitool** command to activate the blue system identify LED.
For in-band networks, enter the following chassis identify command:

```
ipmitool -I <interface> chassis identify <interval>
```

interface
  The interface that you are using to connect to the system. For example, usb.

interval
  The time to turn on the identify LED in seconds. The default value is 15. This means that the LED is on for 15 seconds and then turns off for 15 seconds. A value of zero (0) turns off the LED. A value of force turns on the LED and leaves it on until turned off.

To run the command remotely over the LAN, enter the following chassis identify command:

```
ipmitool -I lanplus -H <hostname> -U <username> -P <password> chassis identify <interval>
```

Preparing the 9006-12C system to remove and replace internal parts

Learn how to prepare the IBM Power System LC921 (9006-12C) system to remove and replace internal parts.

Procedure

1. Complete the prerequisite tasks. For instructions, see "Before you begin" on page 101.
2. Identify the part and the system that you will be working on. For instructions, see "Identifying the system that contains the part to replace" on page 104.
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 9006-12C or 9006-22C system" on page 110.
5. Disconnect the power source from the system by unplugging the system. For instructions, see "Disconnecting the power cords from an 9006-12C or 9006-22C system" on page 120.

   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)
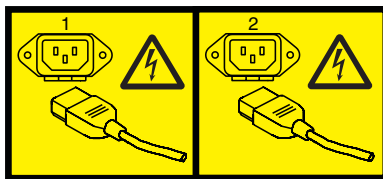
   or
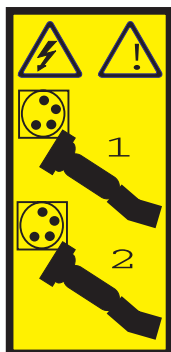
   or

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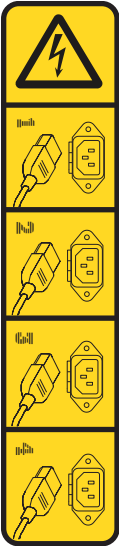
or
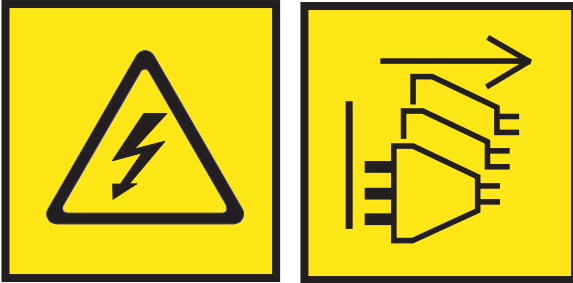
DANGER: Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)

(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. Place the system into the service position. For instructions, see "Placing an 9006-12C system into the service position" on page 117.

   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)

    or

   CAUTION: Pinch hazard. (L012)

7. Remove the service access cover. For instructions, see "Removing the service access cover from an 9006-12C system" on page 115.

Preparing the 9006-12C system for operation after you remove and replace internal parts

Learn how to prepare the IBM Power System LC921 (9006-12C) system for operation after you remove and replace internal parts.

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 an 9006-12C system" on page 116.

3. Place the system into the operating position. For instructions, see "Placing an 9006-12C system into the operating position" on page 118.

   (L012)

    or

   CAUTION: Pinch hazard. (L012)

4. Reconnect the power cords to the system. For instructions, see "Connecting the power cords to an 9006-12C or 9006-22C system" on page 120.

5. Start the system. For instructions, see "Connecting the power cords to an 9006-12C or 9006-22C system" on page 120.

6. If you installed or replaced a PCIe adapter, update the adapter firmware. See http://www.ibm.com/support/knowledgecenter/HW4P4/p8ei8/p8ei8_update_other_adapter.htm(www.ibm.com/support/knowledgecenter/HW4P4/p8ei8/p8ei8_update_other_adapter.htm).

7. Verify the installed part. For instructions, see Verifying a repair (www.ibm.com/support/knowledgecenter/POWER8//p8ei3/p8ei3_verifyrepair.htm).

Starting and stopping the 9006-12C or 9006-22C

Learn how to start and stop the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) system to perform a service action or system upgrade.

Starting the 9006-12C or 9006-22C system

You can use the power button to start the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) systems.

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 and the IPMI tool to power on the system.

Procedure

1. Before you press the power button, ensure that the power supplies are connected to the system unit and that the power cables are connected to a power source.
2. Press the power button **(7)** shown in Figure 66 or Figure 67 on page 110. You may have to press the switch for 0.5 to 3 seconds.
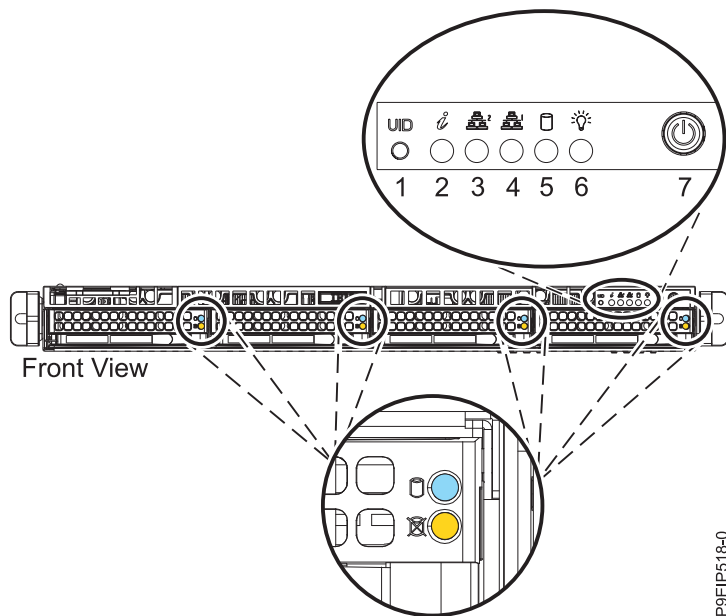
Figure 66. Power switch for 9006-12C
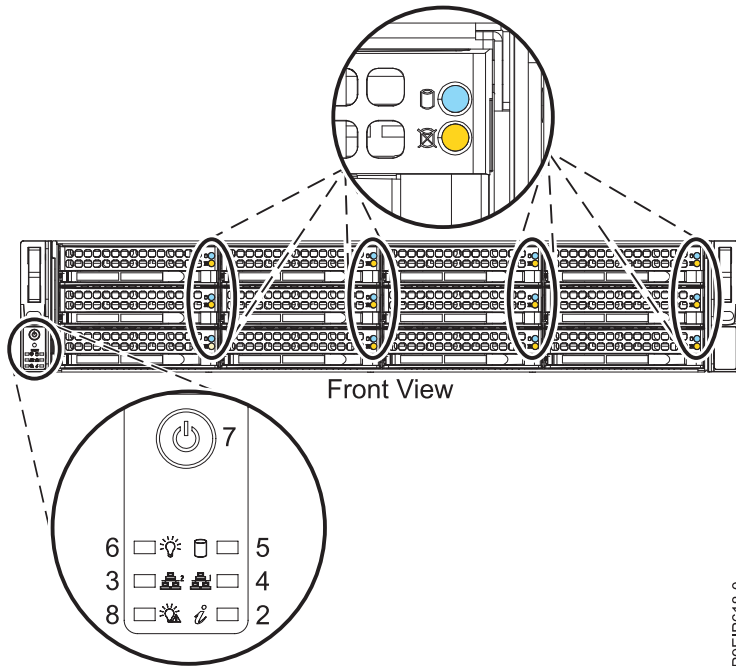
Figure 67. Power switch for 9006-22C

What to do next

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

Stopping the 9006-12C or 9006-22C system

Learn how to stop the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) systems to complete another task.

Procedure

You can use the Linux **shutdown** command to stop and power down the system.
For example, the following command will shut down the system in 10 minutes and send the message "Repairs coming" to the users.

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

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

Drive commands for 9006-12C or 9006-22C

Learn about the storage drive commands for the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) systems.

arcconf commands

Learn about the **arcconf** commands. They are for SATA drives and drive on modules (DOMs) that are directly connected to the system backplane without using a PCIe adapter.

To list the logical drives and device configurations. For additional information about the **arcconf** tool, refer to http://i.adaptec.com/power

```
arcconf getconfig 1
```

Note the Channel and Device numbers of the desired drive. In this example, the channel number is 0 and the device number is 11.

```
Reported Channel,Device(T:L) : 0,11(11:0)
```

Take the drive off line. Run the following **arcconf setstate** command that uses the Channel and Device numbers from the **arcconf getconfig** command: This command also activates the Fault LED on the drive.

```
arcconf setstate 1 device 0 11 ddd
```

StorCLI commands

Learn about the StorCLI commands. They are for feature code EKAA using a PCIe adapter.

If the command is not installed, download the utility from http://avagotech.com. You can find the download by searching that site for storcli. Get their latest "MegaRAID Storcli" download. To install, follow their documentation. Unzip the file; then for:

RHEL

1. Navigate to the linux-ppc folder then to the Little Endian folder.
2. Install the package by running this command, where x.xx-x equals the version of the utility. :
   ```
   rpm -ivh <StorCLI-x.xx-x.noarch.rpm>
   ```

Ubuntu:

1. Navigate to the Ubuntu folder.
2. Install the debian file by using this command:
   ```
   dpkg -i storcli_x.xx-x._all.deb
   ```

To upgrade the StorCLI RPM, run:

```
rpm -Uvh <StorCLI-x.xx-x.noarch.rpm>
```

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 prepare a drive for use:

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

sas3ircu commands

Learn about the sas3ircu command. This command is for feature code EKAB using a PCIe adapter.

If the `sas3ircu` command is not installed, download the utility from ftp://ftp.supermicro.com/driver/ P8DTU/. You can find the download by searching that site for `sas3ircu`; currently: **LSI MegaRAID and HBA (AOC-Utility)** > **SMC-Broadcom (Supermicro 12Gbs SAS HBA - AOC-S3008L-L8i)** > **AOC-S3008L-L8i** > **Tools**.

To install:

1. Download the `sas3ircu` command.
2. Copy the `sas3ircu` command file to the `/usr/local/bin` directory.
3. To enable the command to be executed, as root, run the command:

   `chmod +x sas3ircu`

General SAS3IRCU command syntax:

`sas3ircu <controller_#> <command> <parameters>`

To list the controllers:

`sas3ircu list`

To show the controller status:

`sas3ircu <controller_#> status`

To turn the drive light on:

`sas3ircu <controller_#> locate <Enclosure:Bay> ON`

And off:

`sas3ircu <controller_#> locate <Enclosure:Bay> OFF`

To view additional help for the command:

`sas3ircu help`

NVMe commands

Learn about the NVMe commands. These commands are for NVMe drives together with feature code EKAE using an NVMe PCIe adapter.

If the `nvme` command is not installed, download the utility from https://github.com/linux-nvme/nvme-cli. Follow the installation instructions found 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"`

Sensor readings GUI display

The sensor readings GUI display is a way to quickly determine the general health status of the server without having to look at the detailed system event log (SEL) information.

To view the sensor readings GUI display, log in to the BMC web interface. Click **Server Health** > **Sensor Readings**.

Some occurrences of errors in the system might not appear in the sensor readings GUI. After you view the sensor readings GUI display, use the SEL logs to view any active SEL events that indicate a service action event.

Sensor readings display operation

Most sensors are initially gray, then change status and color during the boot process when the FRU is initialized and either determined to be good (green) or faulty (red). No sensor display is available until you can get to the sensor display selection on the BMC, which means that the system attains a certain power level or that the BMC finishes initializing. The indicator color of the sensor is determined based on the sensor status at time of invocation of the display. The sensor display maintains the sensor status indicator color until the display is refreshed, which updates the sensor value with the latest status. Changes to SEL events changes color of sensor indicator when you refresh or restart the display. Sensor status display also starts over with a reboot or a power cycle.

Sensor status indicator descriptions

Gray indicator:
- FRU not plugged
- Sensor not initialized
- Sensor function is not initialized

Red (faulty) indicator:
- Critical threshold exceeded (an event requires a service action)
- Service action required for hard fail
- Partial function failure that reached a "service action required" state
- A deconfigured resource requires a service action

Green (good) indicator:
- FRU or sensor is plugged in and fully operational
- Recoverable event is below the critical "service action required" threshold
- FRU or sensor returned to "normal" operating range (for threshold sensors)

Removing and replacing a power supply in the 9006-12C or 9006-22C

Learn how to remove and replace power supplies in the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) systems.

Removing a power supply from the 9006-12C or 9006-22C

Learn how to remove power supplies in the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) systems.

About this task

If a single power supply failed, it 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. Label and remove the power cord from the power supply to remove. For instructions, see "Disconnecting the power cords from an 9006-12C or 9006-22C system" on page 120.

3. Remove the power supply from the system.

   a. To unseat the power supply from its position in the system, push the locking-tab to the left as shown in Figure 68.

   b. Grasp the power supply handle with one hand, and pull the power supply 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.
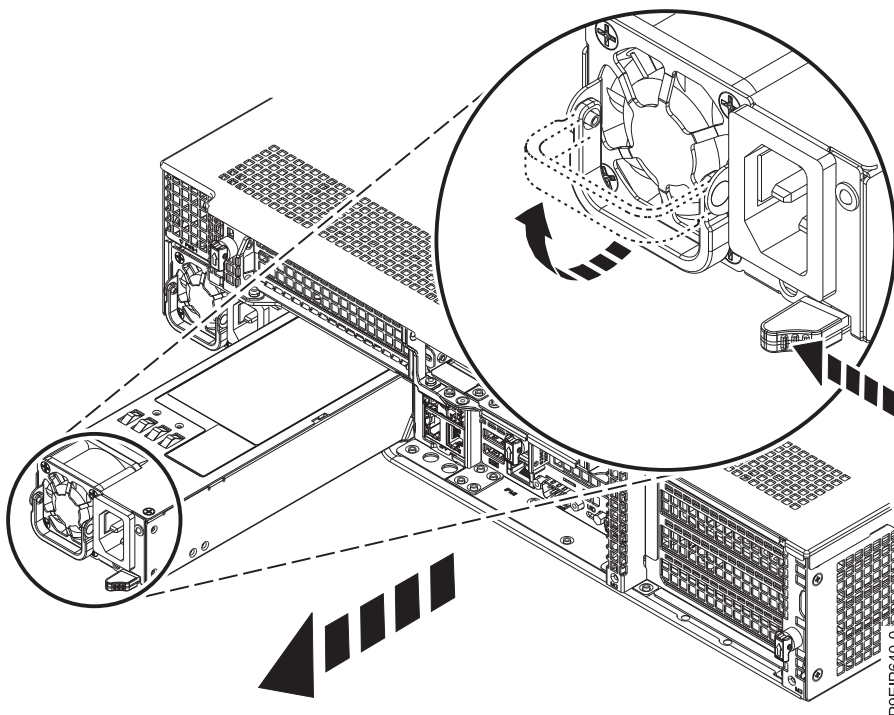
Figure 68. Removing a power supply from the system

Replacing a power supply in the 9006-12C or 9006-22C

Learn how to replace power supplies in the IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) systems.

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. Align the power supply with the bay as shown in Figure 69. The fan is on the left; the plug is on the right. Slide the power supply into the system until the latch locks in place.
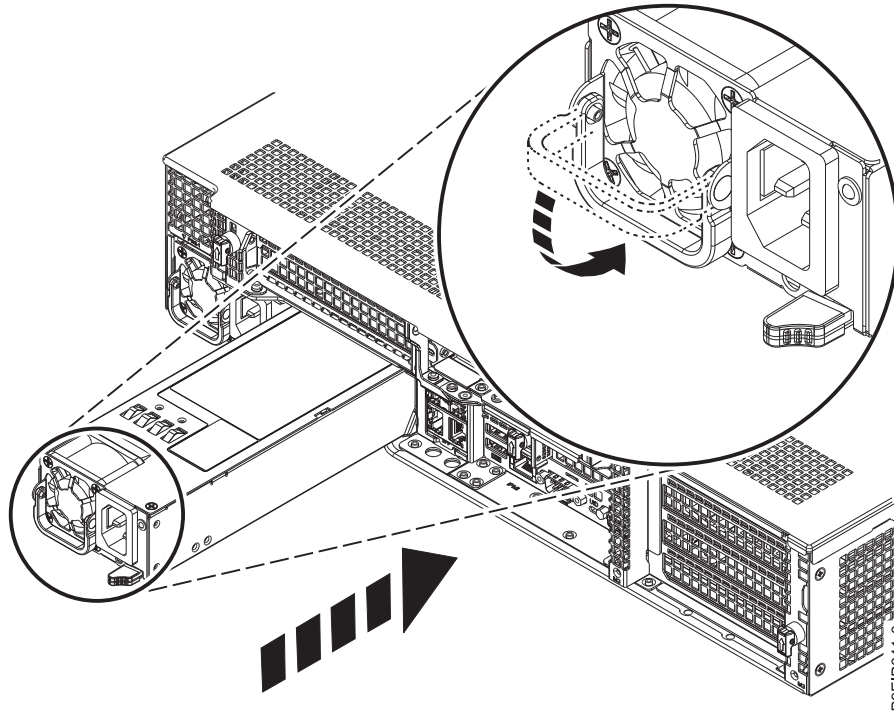
Figure 69. Replacing a power supply in the system

3. Reconnect the power cord. For instructions, see "Connecting the power cords to an 9006-12C or 9006-22C system" on page 120.

Removing and replacing covers on an 9006-12C system

Learn how to remove and replace the covers for an IBM Power System LC921 (9006-12C) system so that you can access the hardware parts or service the system.

Removing the service access cover from an 9006-12C system

Learn how to remove the service access cover from an IBM Power System LC921 (9006-12C) 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.

Procedure

1. Ensure that you removed both power cords from the system. For instructions, see "Disconnecting the power cords from an 9006-12C or 9006-22C system" on page 120.

   (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. Remove the two cover screws **(1)**, from the rear of the cover.

3. Press both buttons on the top cover **(2)** to release the latches as shown in Figure 70, and push the cover back about 0.5 in (1 cm) until it stops. If the buttons do not easily press down, partially remove the drives directly under the buttons.
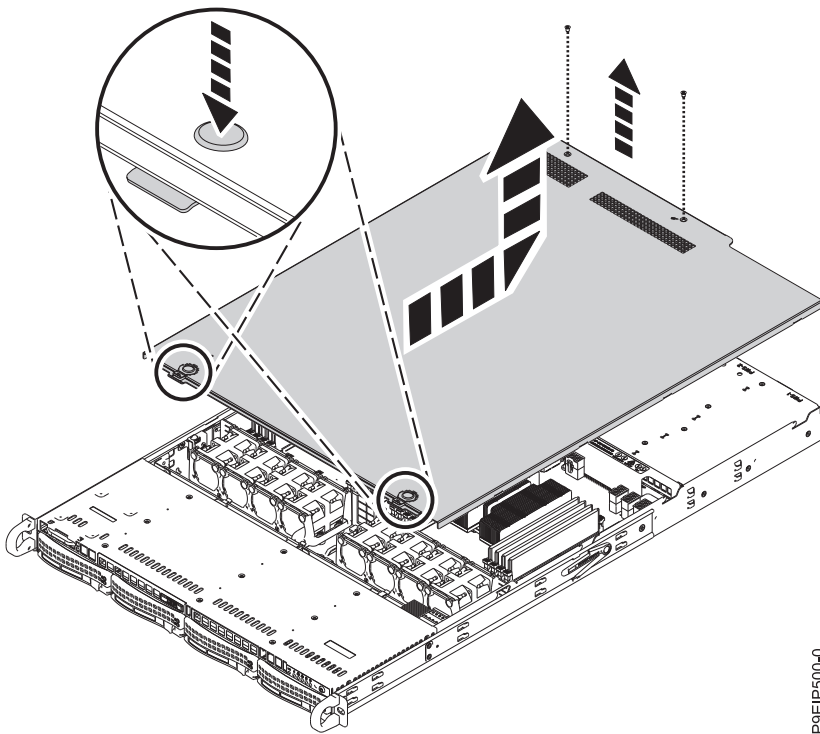
Figure 70. Releasing and opening the cover

4. Lift up the front of the cover up and remove it from the system.

Installing the service access cover on an 9006-12C system

Learn how to install the service access cover on a rack-mounted IBM Power System LC921 (9006-12C) 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.

Procedure

1. Place the rear of the cover on the system. Pivot to front of the cover down until it rests on the system.
2. Slide the cover forwards until it latches into place as shown in Figure 71.
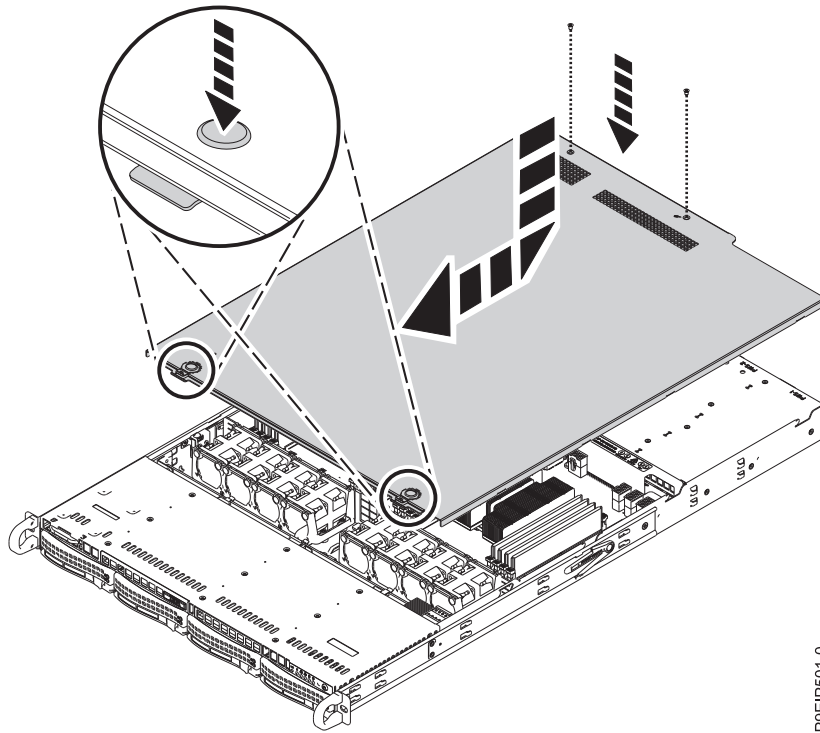
Figure 71. Replacing and securing the cover

3. Replace the two cover screws **(2)** at the rear of the cover.

Service and operating positions for 9006-12C

Learn how to place an IBM Power System LC921 (9006-12C) system into the service or operating position.

Placing an 9006-12C system into the service position

Learn how to place an IBM Power System LC921 (9006-12C) system into the service position.

Before you begin

The systems must be removed from the rails for servicing.

CAUTION:

The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

Notes:

- When you slide a system out of a rack, ensure that all stability plates are firmly installed to prevent the rack from toppling. Slide only one system out at a time.
- When the rails are fully extended, the rail safety latches lock into place. This action prevents the system from being pulled out too far.

Procedure

1. Label and remove all cables from the rear of the system.
2. Remove the front screws that secure the system to the rack from both sides of the system as shown in Figure 72.
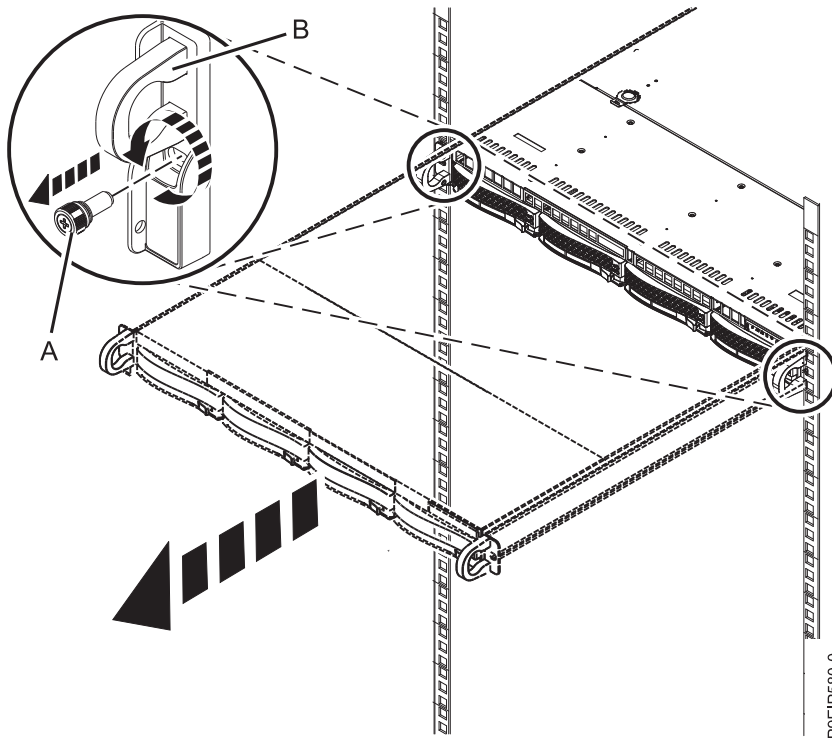
Figure 72. Removing the front screws and removing the system from the rack

3. Pull the system unit out of the rack.

   CAUTION:
   - **The chassis rails only extend about half of the distance of the chassis. Once the safety latches are released, the chassis only slides forward a few inches before disengaging from the rails. Be prepared to support the full weight of the chassis as you remove it from the slide rails.**
   - **The chassis contains most of the weight in the back side of the unit. When you remove the system, take care to be ready to support the weight by grasping the chassis closer to the back of the unit.**

4. Using two people, release the rail safety latches and remove the system from the rails. The safety latches work in opposite directions; the latch on one side moves up while the latch on the other side moves down.
5. Carefully set the system on a table with an appropriate ESD surface.

Placing an 9006-12C system into the operating position

Learn how to place an IBM Power System LC921 (9006-12C) system into the operating position.
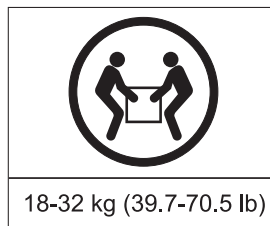
About this task

CAUTION:
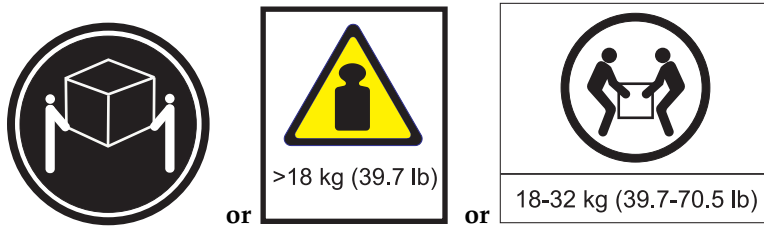
The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

Procedure

1. Using two people, one on each side of the system, lift the system from the table.
2. Align the system rails on each side of the system with the rack rails.
3. Push the system into the rack until you hear each rail click into place.
4. Before releasing your hold on the system, ensure that the rails are engaged by sliding the system forward into service lock position. Check that the rails are properly seated. If the rails are not fully engaged, the system could drop.
5. Release the rail safety latches **(A)** by lifting them upward, as shown in Figure 73, then push the system fully into the rack. The safety latches work in opposite directions; the latch on one side moves up while the latch on the other side moves down.
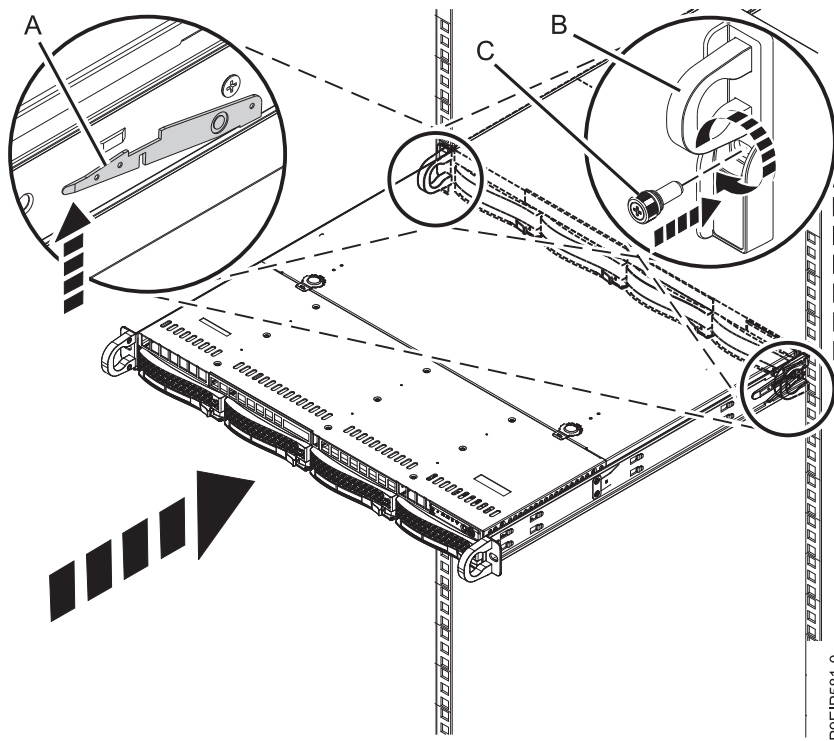
Figure 73. Placing the system into the operating position

6. Fasten the two front screws **(C)** to secure the system to the rack.
7. Using your labels, reconnect the cables at the rear of the system unit.
8. If you removed the storage drives, using your labels, replace the drives in their proper locations.

9. If you removed the power supplies, replace them. For instructions, see "Replacing a power supply in the 9006-12C or 9006-22C" on page 115.

Power cords

Learn how to disconnect and connect the power cords on IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) systems.

Disconnecting the power cords from an 9006-12C or 9006-22C system

Learn how to disconnect the power cords from an IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) system.

Before you begin

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 power sources to the system are disconnected.

Procedure

1. Identify the system unit that you are servicing in the rack.
2. Label and disconnect the power cords from the system unit as shown in Figure 74.
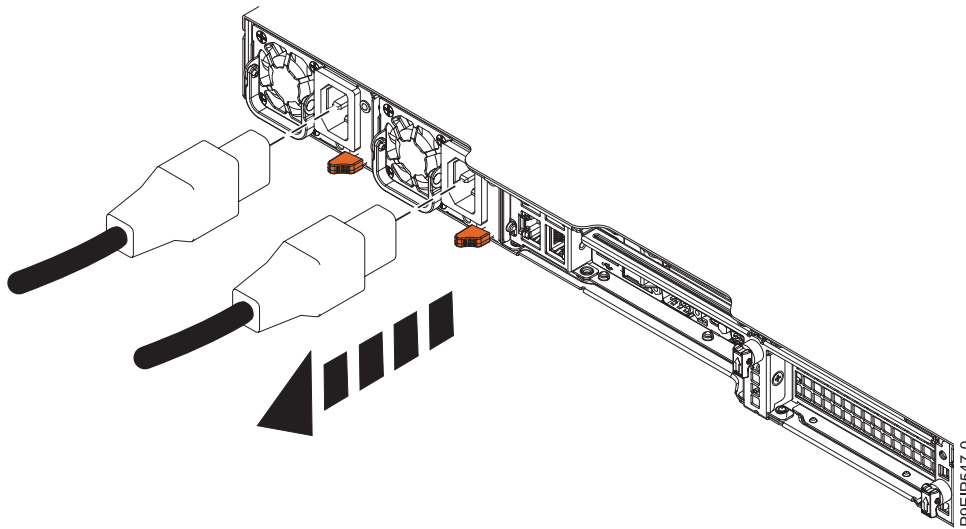
Figure 74. Removing the power cords from the system

Connecting the power cords to an 9006-12C or 9006-22C system

Learn how to connect the power cords to an IBM Power System LC921 (9006-12C) or IBM Power System LC922 (9006-22C) system.

Procedure

Using your labels, reconnect the power cords to the system unit as shown in Figure 75 on page 121.
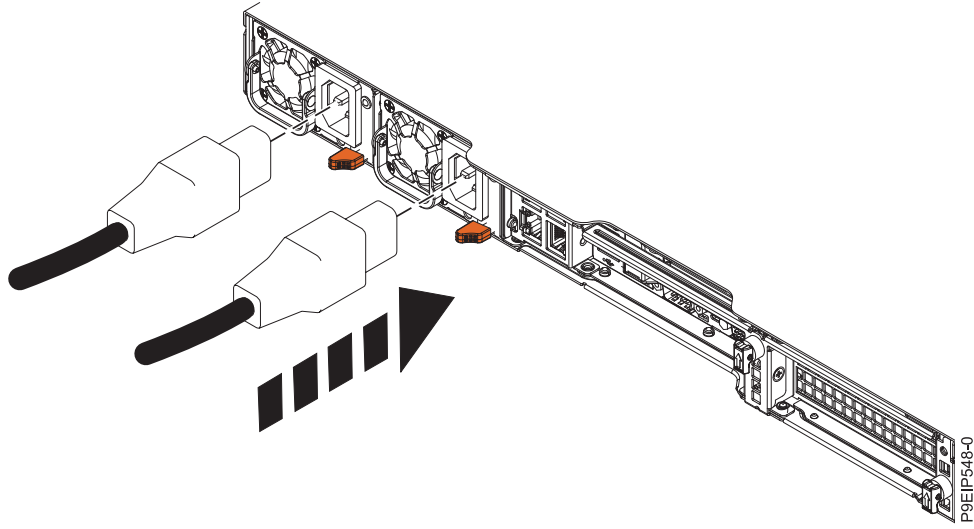
Figure 75. Connecting the power cords to the system

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Homologation statement

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

Accessibility features for IBM Power Systems servers

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

Overview

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

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

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

Keyboard navigation

This product uses standard navigation keys.

Interface information

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

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

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

Vendor software

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

Related accessibility information

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

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

For more information about the commitment that IBM has to accessibility, see IBM Accessibility (www.ibm.com/able).

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Electronic emission notices

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

Class A Notices

The following Class A statements apply to the IBM servers that contain the POWER9 processor and its features unless designated as electromagnetic compatibility (EMC) Class B in the feature information.

Federal Communications Commission (FCC) Statement

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

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

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

Industry Canada Compliance Statement

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

European Community Compliance Statement

This product is in conformity with the protection requirements of EU Council Directive 2014/30/EU on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

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

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

VCCI Statement - Japan

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

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

Japan Electronics and Information Technology Industries Association Statement

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

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

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

高調波電流規格　JIS C 61000-3-2 適合品

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

高調波電流規格 JIS C 61000-3-2 準用品

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・回路分類 ：6（単相、ＰＦＣ回路付）
・換算係数 ：0

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

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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
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・回路分類 ：5（3相、ＰＦＣ回路付）
・換算係数 ：0

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

声　明

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

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

Electromagnetic Interference (EMI) Statement - Taiwan

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居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

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

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

IBM Taiwan Contact Information:

台灣IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

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Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

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

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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

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Tel: +49 (0) 800 225 5426
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Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 / EN 55032 Klasse A.

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Class B Notices

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

Federal Communications Commission (FCC) Statement

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

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

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

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

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

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

Industry Canada Compliance Statement

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

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

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

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・換算係数　：0

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New Orchard Road
Armonk, New York 10504
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