Power Systems

Installing the System and Ordered Parts for the IBM Power System S812LC (8348-21C)

IBM

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IBM

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

Contents

Safety notices

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

World Trade safety information

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

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

German safety information

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

Laser safety information

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

Laser compliance

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

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

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

- For racks with AC power, connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- For racks with a DC power distribution panel (PDP), connect the customer's DC power source to the PDP. Ensure that the proper polarity is used when attaching the DC power and DC power return wiring.
- Connect any equipment that will be attached to this product to properly wired outlets.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Do not attempt to switch on power to the machine until all possible unsafe conditions are corrected.
- Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements.
- Do not continue with the inspection if any unsafe conditions are present.
- Before you open the device covers, unless instructed otherwise in the installation and configuration procedures: Disconnect the attached AC power cords, turn off the applicable circuit breakers located in the rack power distribution panel (PDP), and disconnect any telecommunications systems, networks, and modems.

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

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

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

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

(R001 part 1 of 2):

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

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

(R001 part 2 of 2):

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

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

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

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

(R002)

(L001)

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

(L002)

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

(L003)
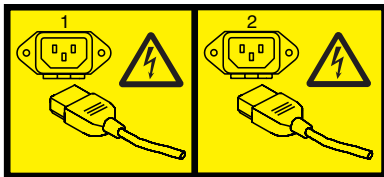
or
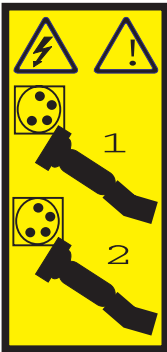
or

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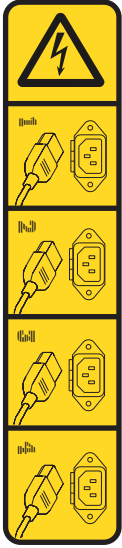
or
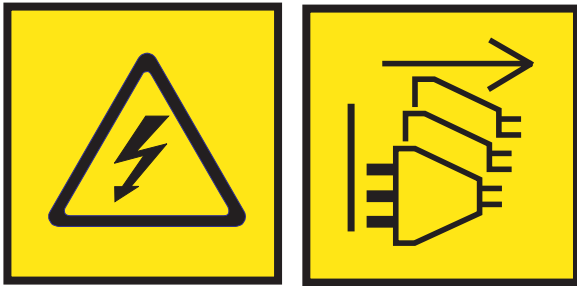
DANGER: Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)

(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 POWER8 processor-based systems and system features

Use this information to install and configure POWER8® 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.

Before you install a feature, ensure that the software that is required to support the feature is installed on the system. For information about software prerequisites, see the IBM Prerequisite website (http://www-912.ibm.com/e_dir/eServerPrereq.nsf). If the required software is not installed, go to the Fix Central website (http://www.ibm.com/support/fixcentral/) to download it, and then install it before you continue.

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

Installing the IBM Power System S812LC (8348-21C) system

Learn how to install, cable, and set up your system.

Prerequisites for installing the rack-mounted 8348-21C 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 install the server:
- The latest version of this document is maintained online, see Installing the IBM Power System 8348-21C (http://www.ibm.com/support/knowledgecenter/POWER8/p8eic/p8eic_installsys_kickoff.htm).
- To plan your server installation, see Planning for the system (http://www.ibm.com/support/knowledgecenter/POWER8/p8had/p8had_8xx_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

Note: If you do not have a rack that is installed, install the rack. For instructions, see Racks and rack features (http://www.ibm.com/support/knowledgecenter/POWER8/p8hbf/p8hbf_8xx_kickoff.htm).

Completing inventory for your 8348-21C 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 8348-21C 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/POWER8/p8hbf/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.

   Note: The server is two EIA units high. An EIA unit is 44.55 mm (1.75 in.) in height. The rack contains three mounting holes for each EIA unit of height. This system unit, therefore, is 89 mm (3.5 in.) high and covers six mounting holes in the rack.

2 EIAs

P8EHM501-0
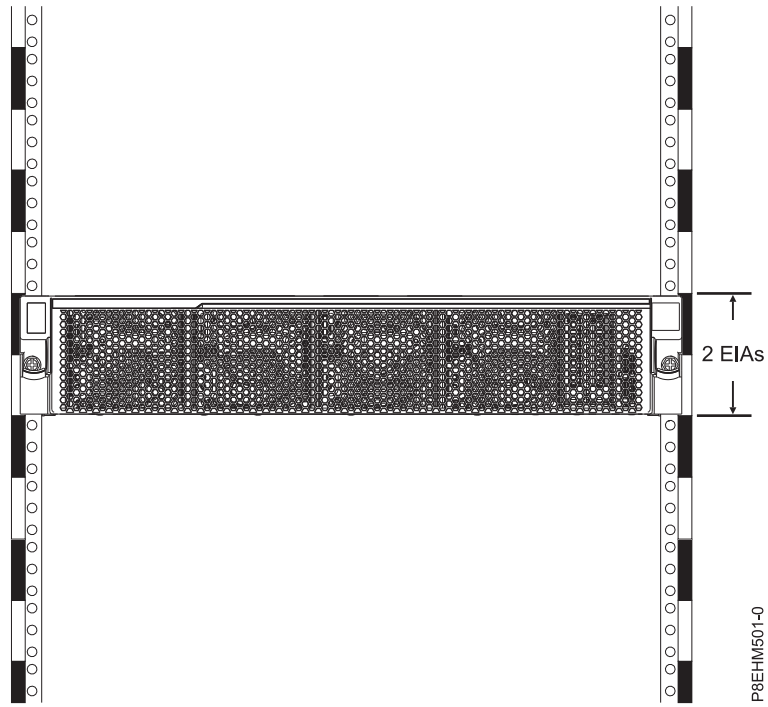
3. If necessary, remove the filler panels to allow access to the inside of the rack enclosure where you plan to place the unit, as shown in Figure 1 on page 4.
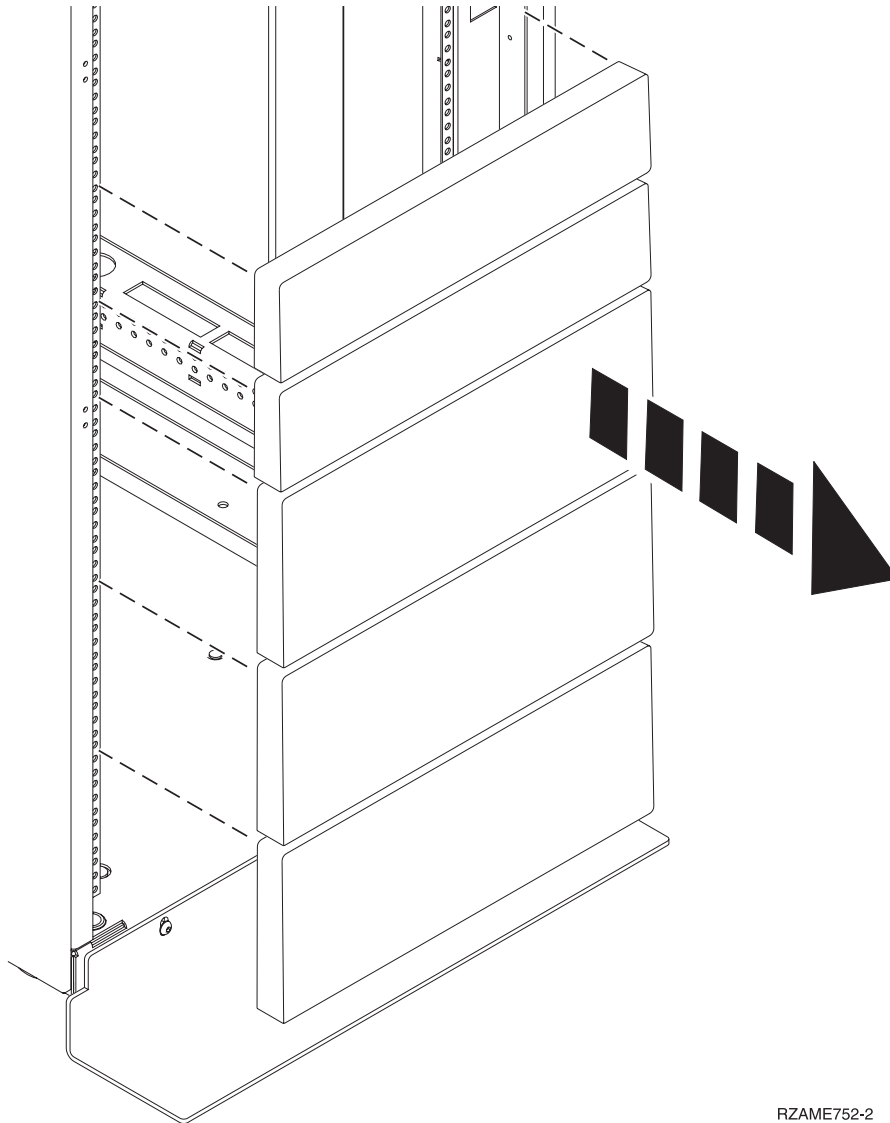
RZAME752-2

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.

Installing the 8348-21C system by using slide rails

If you ordered the system with the slide rail option, read this section to install the system into the rack by using slide rails.

Attaching slide rails to the system and rack

Attach slide rails to the system and then to the rack.

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.

The slide rails arrive fully assembled. To install the slide rails into the rack, you must disassemble the slide rails into four pieces.

Procedure

1. Remove the lower DASD backplane screw on either side so that you can service the backplane at a later date without removing the system from the rack.
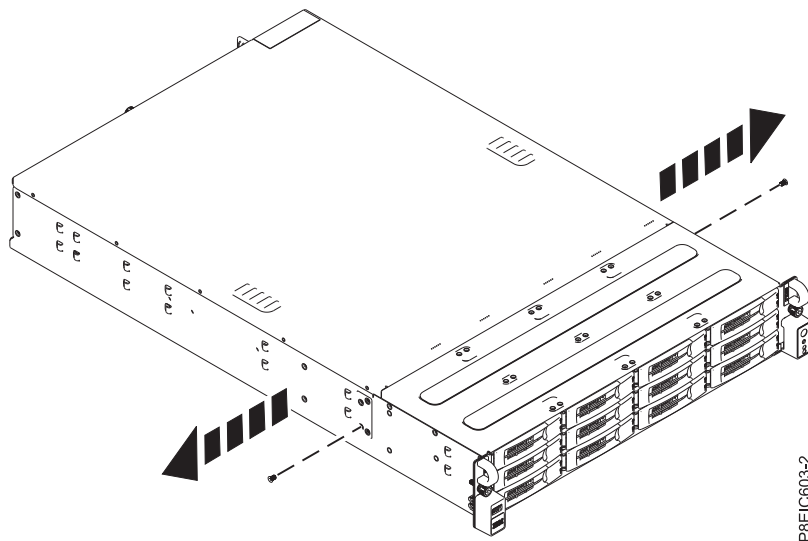
Figure 2. Removing the DASD backplane screws

2. Attach the system chassis slide rails to each side of the system chassis. At the rear of the system chassis, align the tabs on the system chassis **(B)** with the slots on the slide rail **(A)**. Push the chassis slide rail forward so that the slam latch clicks into place.

   Note: The system rails are marked with an **L**, to designate the left system rail, and an **R**, to designate the right system rail from the front of the system.
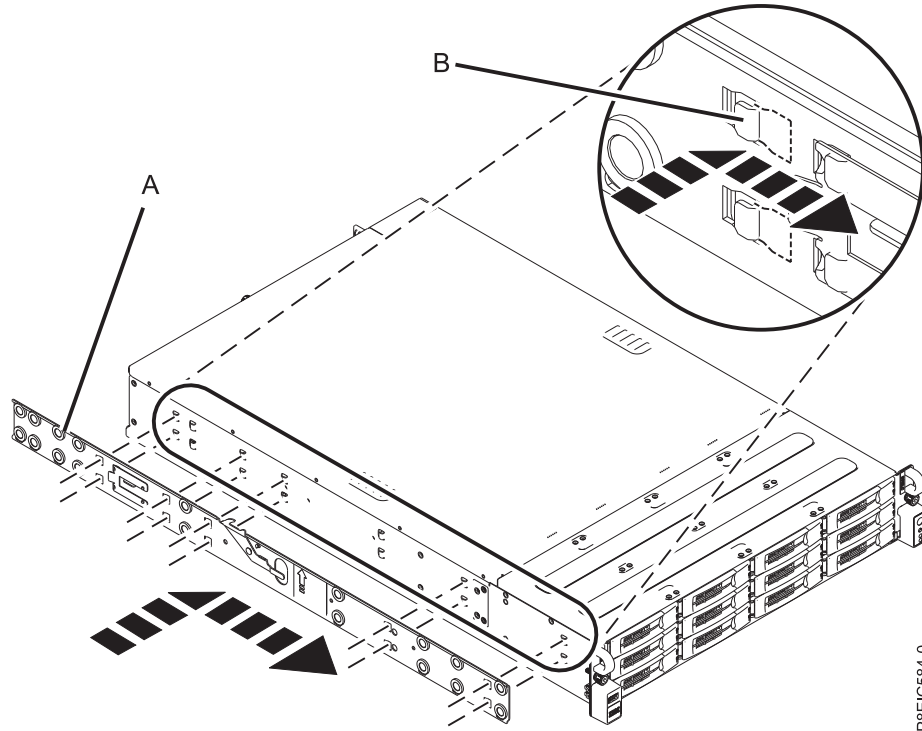
Figure 3. Attaching the left system chassis slide rail to the system chassis

3. Install the retention screw on each system chassis slide rail to further attach the slide rail to the system chassis.
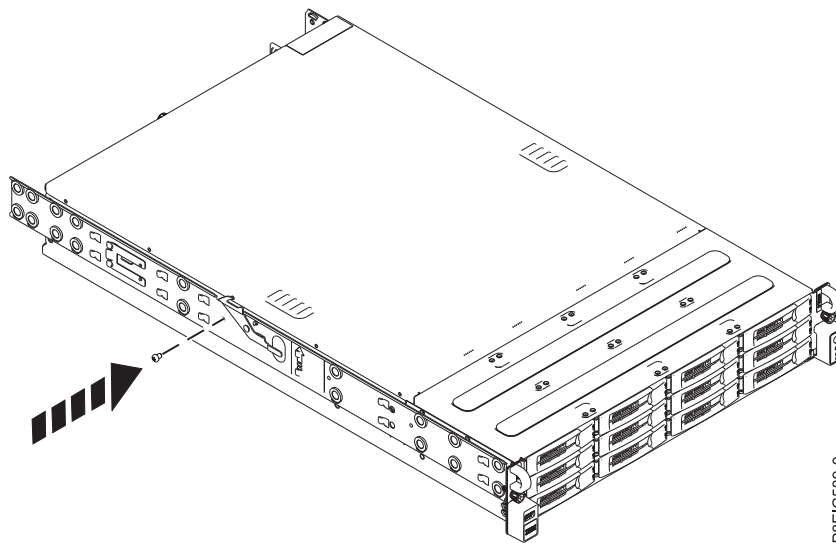
Figure 4. Attaching the left system chassis rail retention screw to the system chassis

4. Next, install the rack slide rails into the rack. Each rack slide rail is marked with either an **R** (right) or an **L** (left), when you look from the front. Select the right slide rail, bring it to the front of the rack, and locate the selected EIA unit.

5. From the front of the rack, insert the pins on the front of the slide rail **(1)** into the holes on the front of the rack that you previously marked **(2)**. Pull the rail forward so that the rail spring clip **(3)** latches

to the rail flanges and clicks into place.
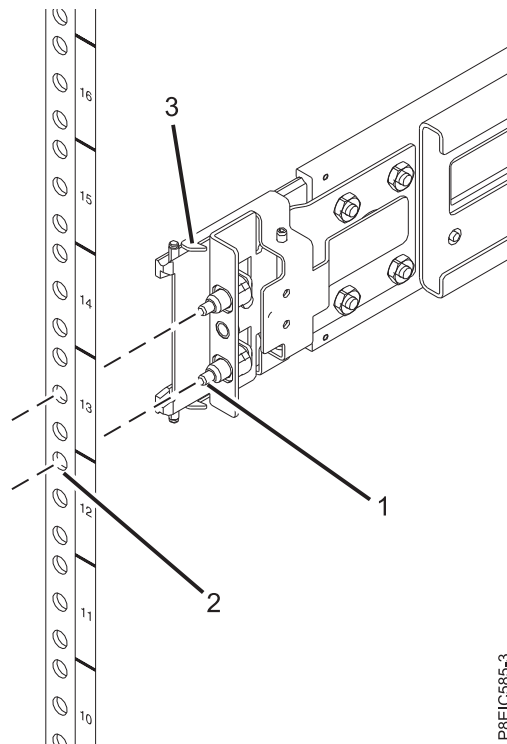
Figure 5. Installing the slide rail from the front of the rack

6. Repeat steps **3** and **4** for the left rail.
7. Move to the rear of the rack. Pull the slide rail toward you to insert the two pins **(1)** into the rack holes **(2)**. Pull the rail until the rail spring clip **(3)** clicks into place. Install the screw **(4)** to secure the slide rail to the rack.
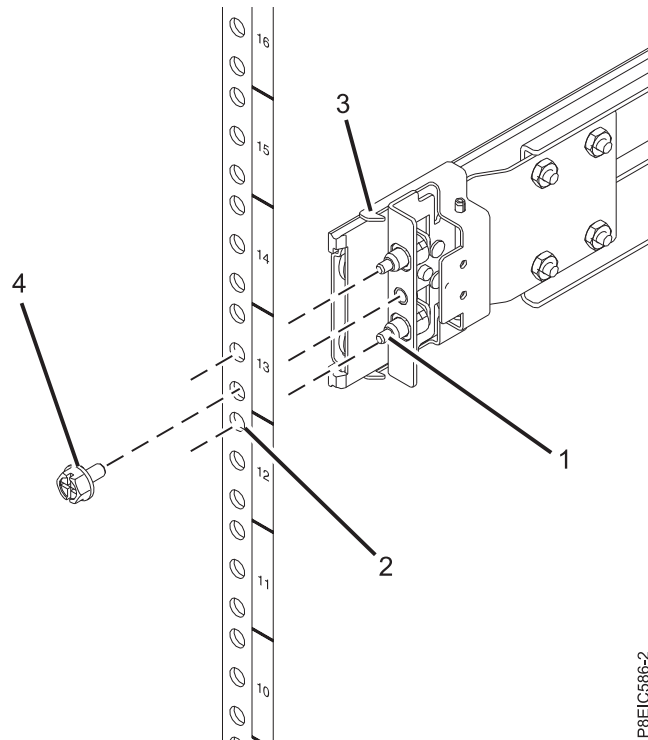
Figure 6. Installing the slide rail at the rear of the rack

Installing the system into the rack by using the slide rails

Learn how to install the system into the rack by using the slide rails.

About this task

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

Procedure

1. Fully extend the slide rails until the rails click into the service position **(A)**.
2. Using two people, lift the system and align the lower roller pins on the chassis rails with the grooves in the rack slide rails on both sides.
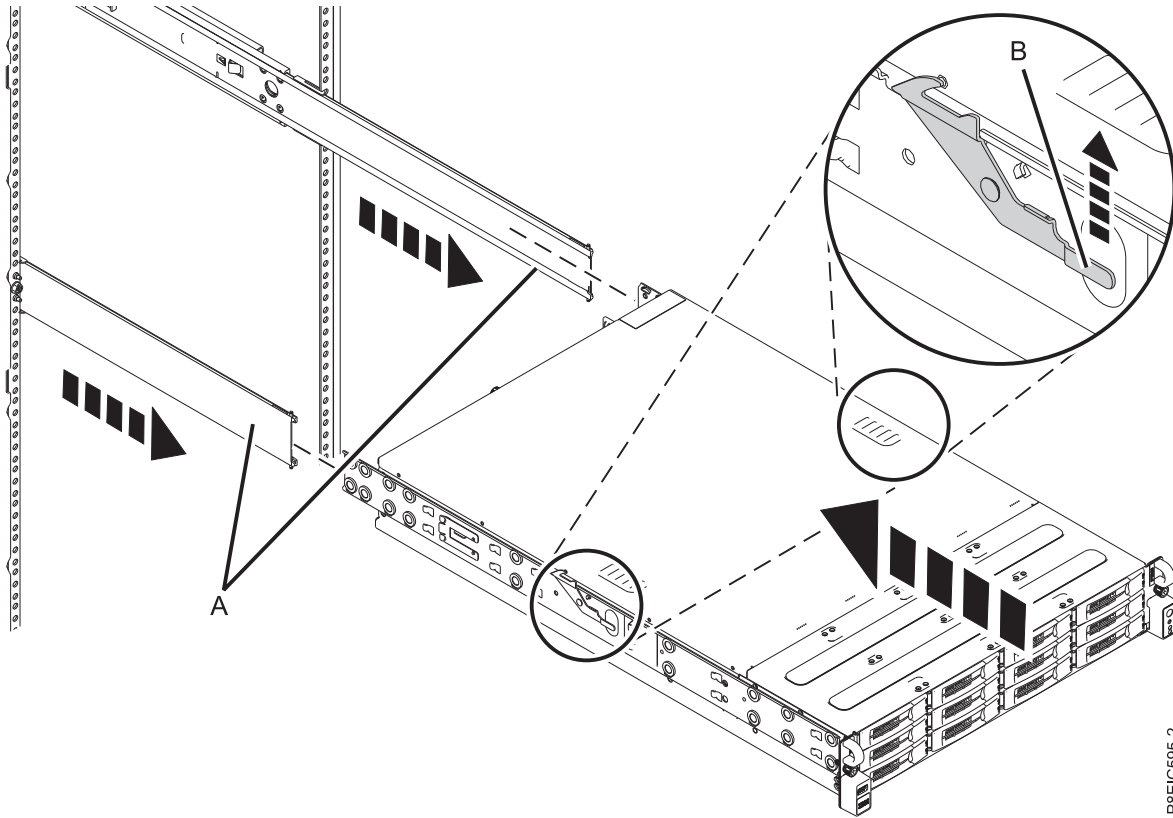
Figure 7. Aligning the lower roller pins on the chassis rails with the grooves in the rack slide rails

3. Simultaneously lift the latches on either side of the rack **(B)** that are marked with a green arrow.
4. Push the system into the rack.
5. Tighten the thumbscrews on either side of the system to secure the system to the rack.

Connecting and routing power cables

Learn how to connect and route power cables in the IBM Power System S812LC (8348-21C) system.

About this task

Note: The IPMI Ethernet port transmits 10 and 100 megabits per second.

Procedure

1. To connect the power cables, complete the following steps:
    a. Plug the power cords into the power supplies.
    b. Attach all cables to the rear of the server.
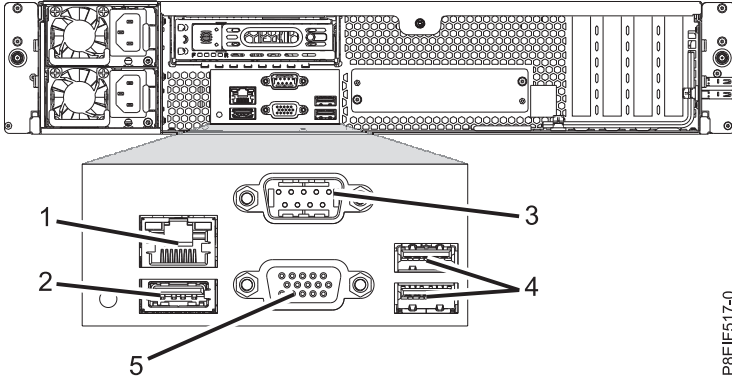
Figure 8. Rear view of the system with ports displayed

 Table 1. Input and output ports

Identifier	Description
1	Ethernet
2	USB 1.1 Baseboard management controller (BMC) - not enabled
3	Serial Intelligent Platform Management Interface (IPMI)
4	USB 3.0 used for keyboard and mouse
5	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.

    c. Plug the system power cords and the power cords for any other attached devices into the alternating current (ac) power source.

2. Continue with "Completing the server setup."

Completing the server setup

Learn how to complete the server setup.

Procedure

1. Connect your server to a VGA terminal and keyboard or a console. 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.

2. Go to Getting fixes (http://www.ibm.com/support/knowledgecenter/POWER8/p8ei8/ p8ei8_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 a disk drive in the 8348-21C

Learn how to install a disk drive in the IBM Power® System S812LC (8348-21C) system.

About this task

The drive might be a hard disk drive (HDD) or a solid-state drive (SSD).

Installing a front drive in the 8348-21C

Learn how to install a front drive in the IBM Power System S812LC (8348-21C) system.

About this task

You can install front disks with the system is powered on and running.

Procedure

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

   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.

2. Unlock the drive tray handle by pushing the handle release **(A)** in the direction shown. The handle **(B)** snaps out towards you. If the handle does not snap out all the way, the drive tray does not slide out of the system, as shown in Figure 9 on page 12.

Figure 9. Removing a front drive tray

3. Support the bottom of the drive tray as you slide it out of the system. Do not hold the drive tray by the handle.
4. If you are installing more than one drive, remove additional drive trays.
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 10 on page 13. Fasten the drive to the sides of the tray with four screws (2 on each side).
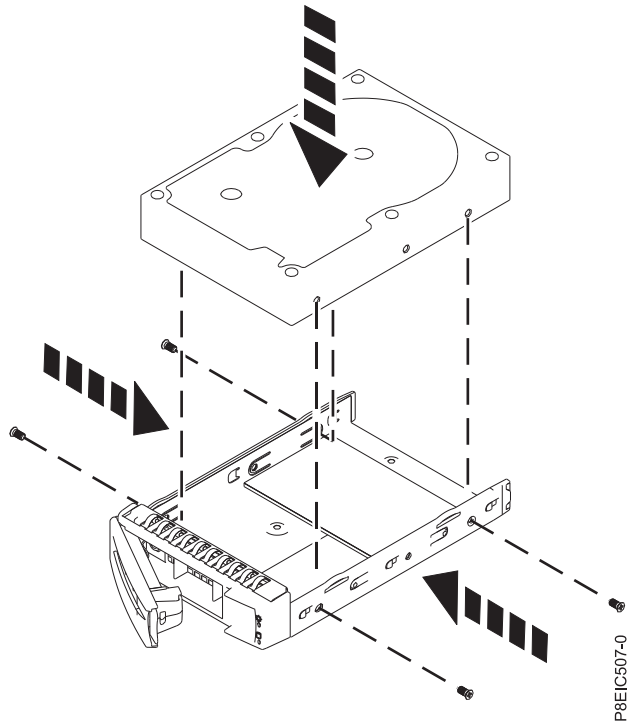
Figure 10. Mounting the 3.5 inch drive in the tray

- A 2.5 inch drive must be positioned at the rear of the tray. While you hold both the drive and the tray, turn the tray over. Fasten the drive to the bottom of the tray with four screws, as shown in Figure 11.
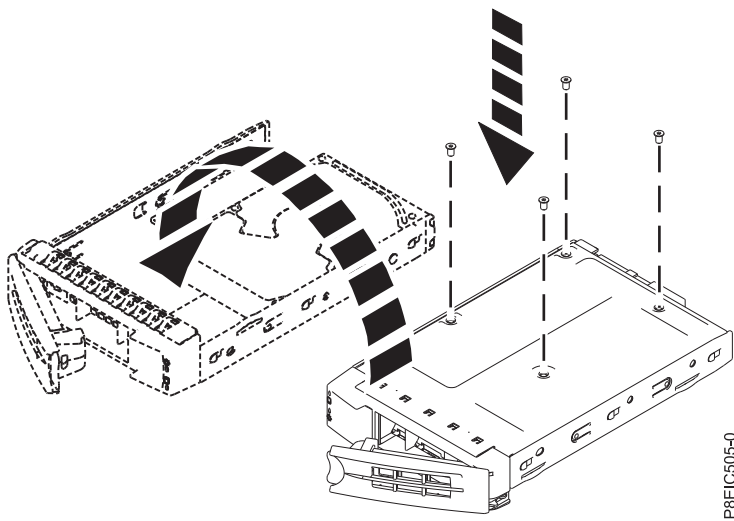
Figure 11. Mounting the 2.5 inch drive in the tray

6. Hold the drive tray by the bottom as you position the drive tray. Slide the drive try all the way into the system. Push the drive tray in until the drive tray handle **(A)** starts to close, then push the handle in until it locks, as shown in Figure 12 on page 14.

Figure 12. Locking the drive tray handle

7. Lock the drive tray handle **(A)** by pushing the handle in until it clicks into place.
8. Configure the installed or replaced drive for your environment.
   a. After you insert a new drive, you must 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 may 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/adding_storage-device-or-path.html)
   b. Load or restore data from your backup media. If a drive failed, refer to Recovering from a Disk Drive Failure (www.adaptec.com/en-us/support/infocenter/release-2015-1/index.jsp?topic=/RAID_IUG.xml/Topics/Recovering_from_a_Disk_Drive_Failure.html).

Installing a rear drive in the 8348-21C

Learn how to install a rear drive in the IBM Power System S812LC (8348-21C) system.

Procedure

1. Shut down the system for this procedure. For instructions, see "Stopping the 8348-21C system" on page 71.
2. Attach the electrostatic discharge (ESD) wrist strap.

   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.

3. Unlock the rear drive tray handle by pushing in the handle release **(A)**. The handle then snaps out towards you. Pull the handle out all the way; if the handle is not fully open, the drive tray does not slide out of the system, as shown in Figure 13.
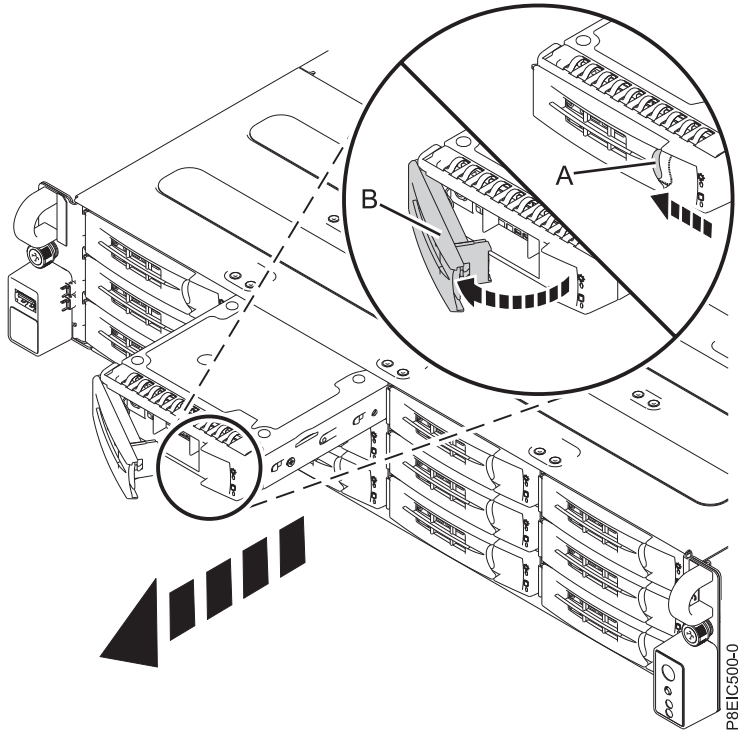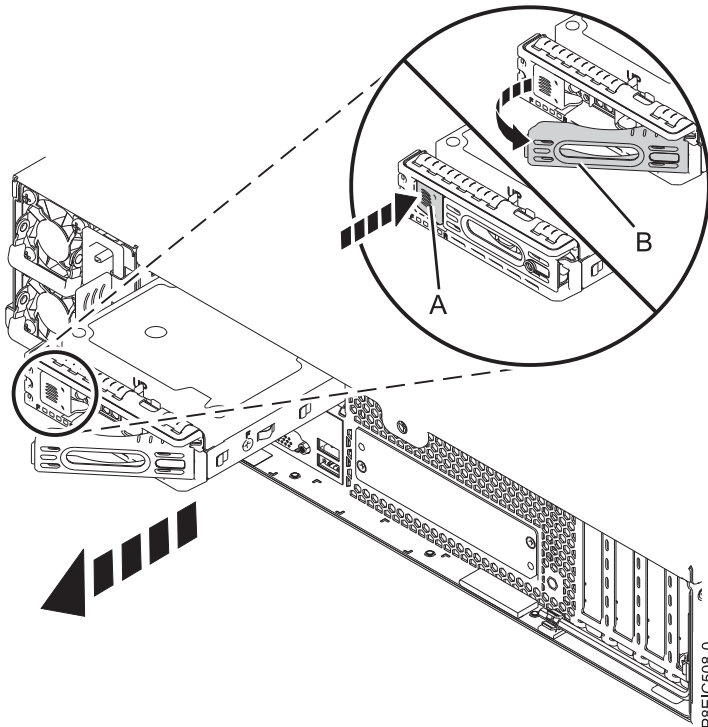

Figure 13. Removing a rear drive

4. Support the bottom of the drive tray as you slide it out of the system. Do not hold the drive tray by the handle.
5. Install a drive into the tray.

   • For a 3.5 inch drive:

   a. Place the drive in the tray, then slide the drive into the socket, as shown in Figure 14 on page 16.
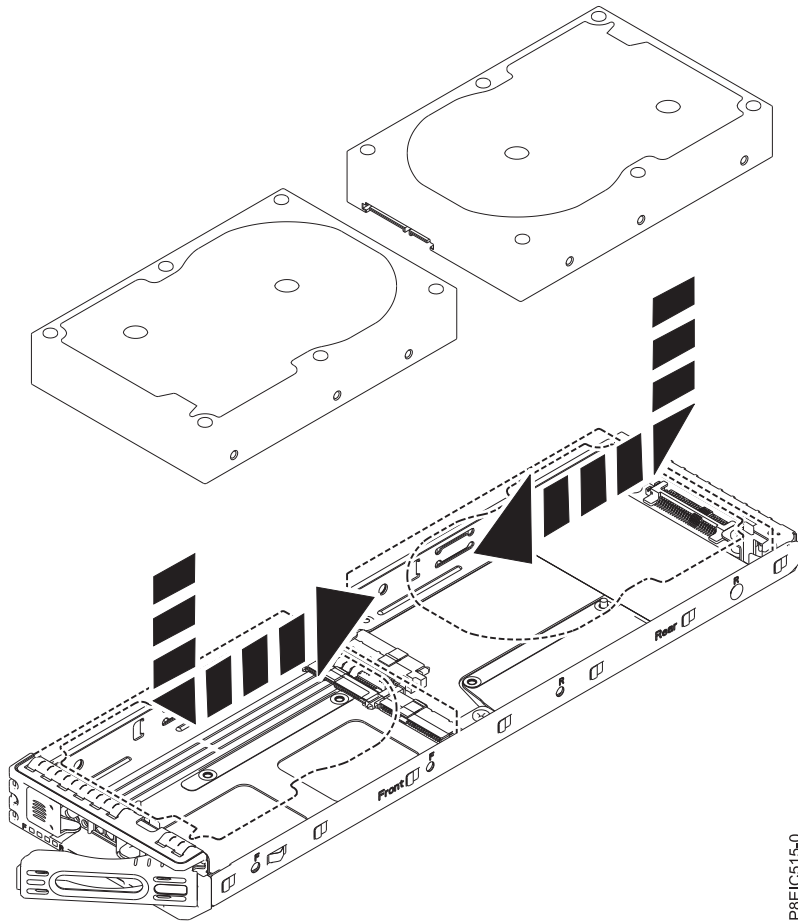
Figure 14. Installing the 3.5 inch drive into the tray

    b. Fasten the drive to the sides of the tray by using four screws (2 on each side), as shown in Figure 15 on page 17.
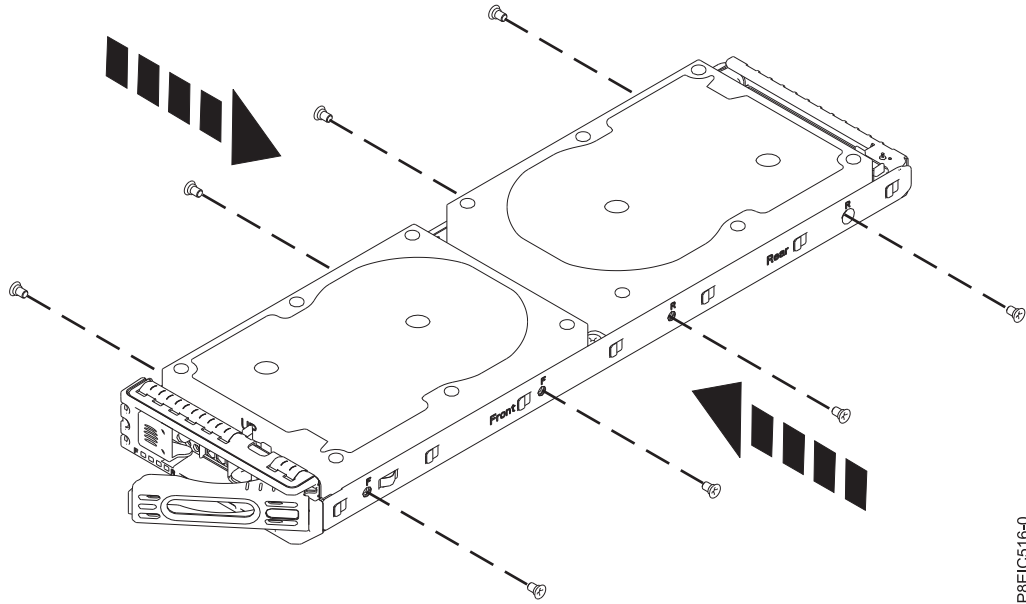
Figure 15. Fastening the 3.5 inch drive to the tray

- For a 2.5 inch drive:
  a. Place the drive in the tray, then slide the drive into the socket, as shown in Figure 16.
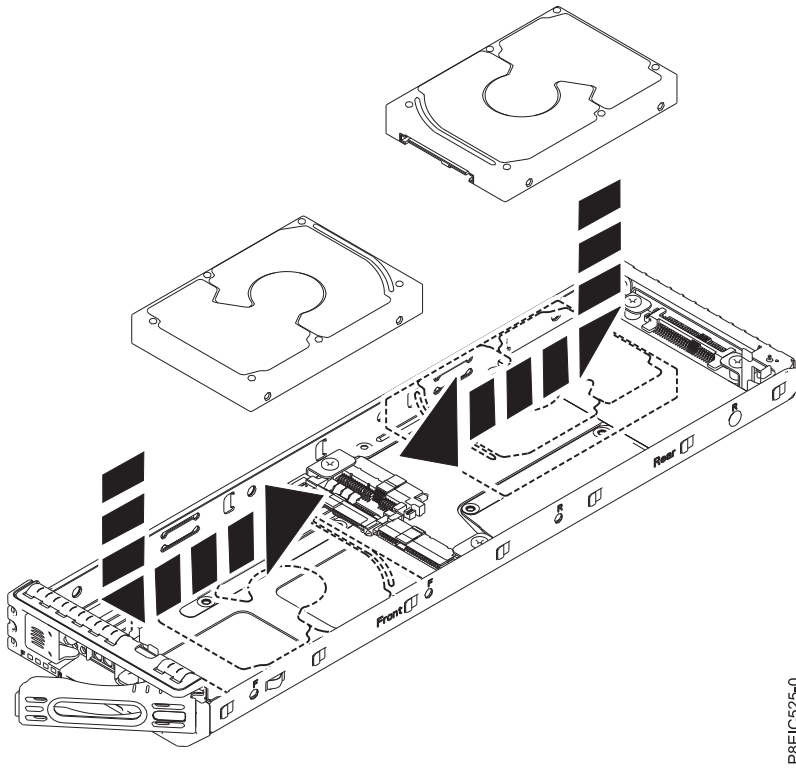
Figure 16. Installing the 2.5 inch drive into the tray

  b. While you hold both the drive and the tray, turn the tray over such that the drive is facing down.

c. Fasten the drive to the bottom of the tray by using four screws, as shown in Figure 17.
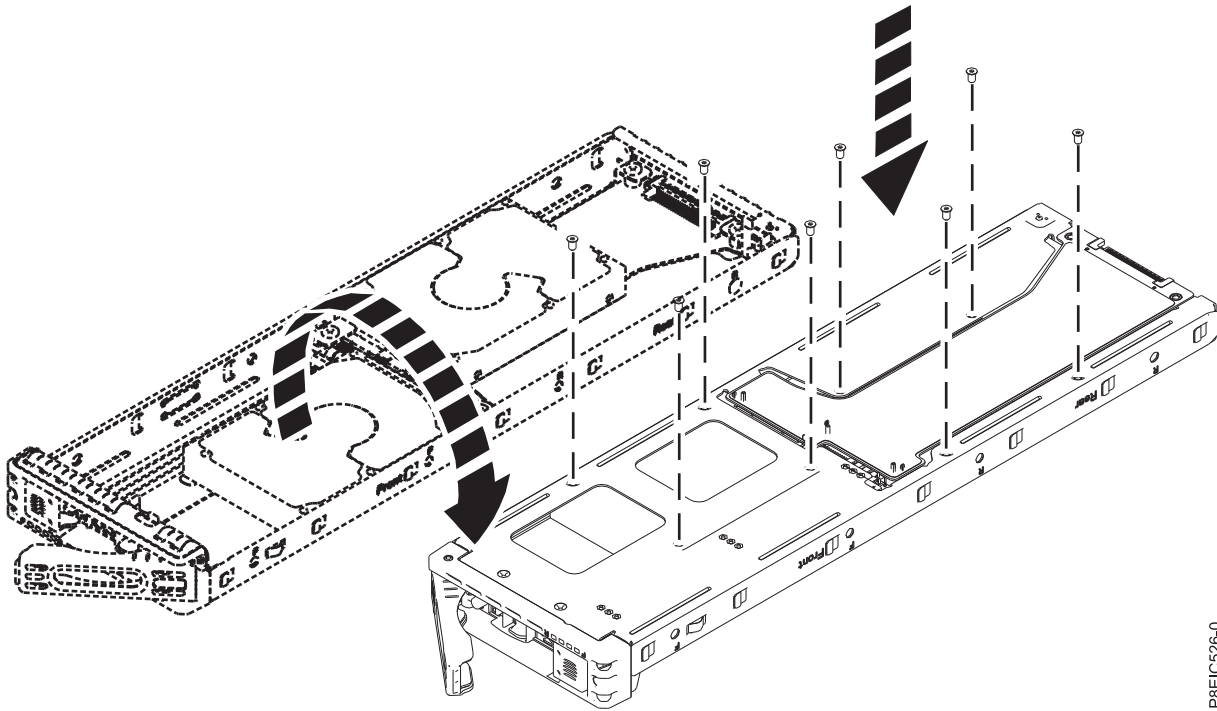
Figure 17. Screw locations for the 2.5 inch drive

d. Turn the tray over so that the drive is facing up.

6. Hold the drive tray by the bottom as you position the drive. Slide the drive tray all the way into the system. Push the drive tray in until the handle starts to close, then push the handle in until it locks. as shown in Figure 18 on page 19.
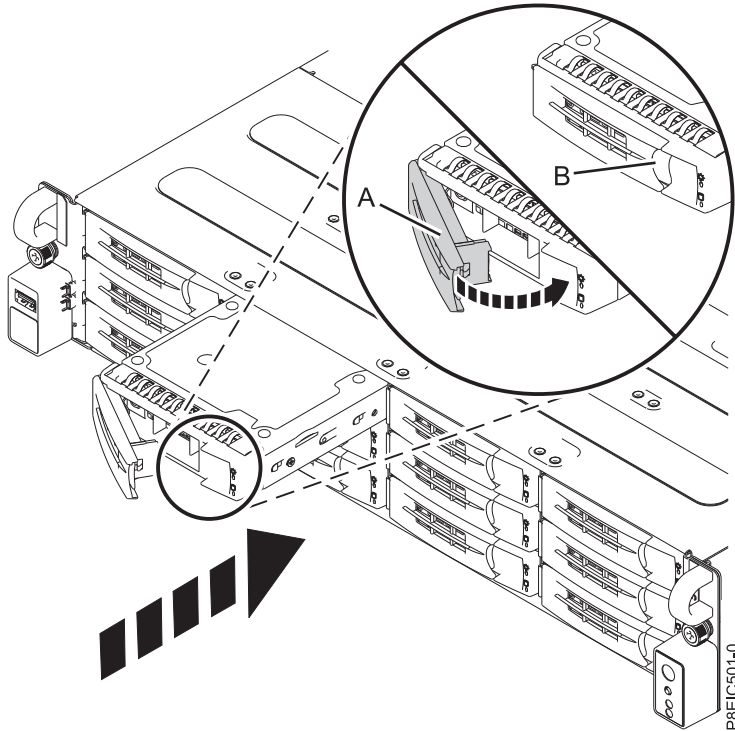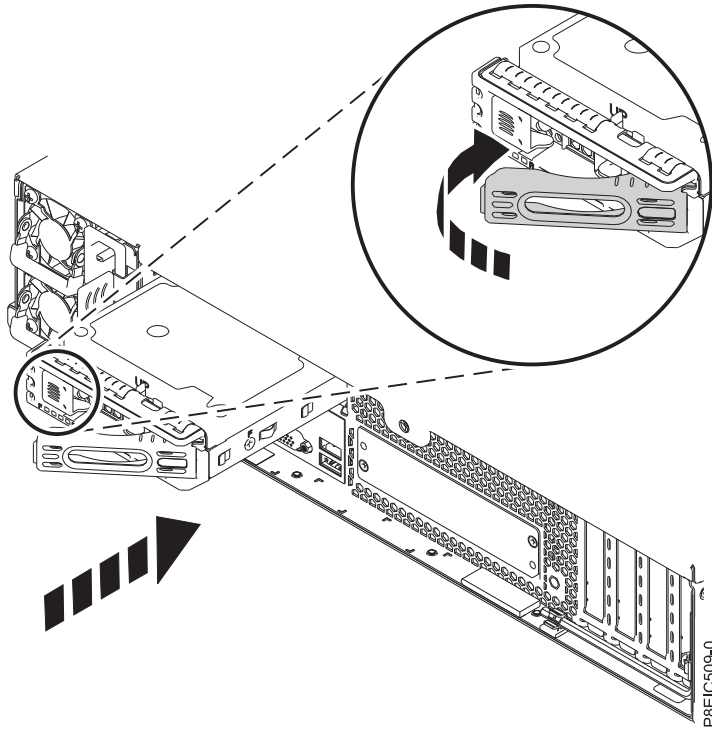
Figure 18. Locking the rear drive tray handle

7. Start the system. For instructions, see "Starting the 8348-21C system" on page 71.
8. Configure the installed or replaced drive for your environment.
   a. After you insert a new drive, you must 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 may 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/adding_storage-device-or-path.html)
   b. Load or restore data from your backup media. If a drive failed, refer to Recovering from a Disk Drive Failure (www.adaptec.com/en-us/support/infocenter/release-2015-1/index.jsp?topic=/RAID_IUG.xml/Topics/Recovering_from_a_Disk_Drive_Failure.html).

Installing memory in the 8348-21C

Learn how to install memory in the IBM Power System S812LC (8348-21C) system.

Placement rules for memory in the 8348-21C system

Learn about the configurations and rules that apply to adding memory to the IBM Power System S812LC (8348-21C) system.

Table 2 lists the supported memory DIMM feature codes and Table 3 shows the allowable memory capacity points for the 8348-21C system. Mixing of memory feature codes is not allowed.

Table 2. Memory DIMM feature codes

Supported feature codes (FC)	Size
EM5A	4 GB IS DIMMS, 1333 MHZ, 4 GBIT DDR3 DRAM
EM5C	16 GB IS DIMMS, 1333 MHZ, 16 GBIT DDR3 DRAM
EM5D	32 GB IS DIMMS, 1333 MHZ, 32 GBIT DDR3 DRAM
EM5E	8 GB IS DIMMS, 1066 MHZ, 8 GBIT DDR3 DRAM

Table 3. 8348-21C memory configuration as a function of the number of DIMMs. You read this table by selecting the individual DIMM size row in the leftmost column, then move to the right and select the columns for the memory capacity. The value that is listed is the quantity of the memory feature code that can be ordered, which corresponds to the DIMM size in the leftmost column.

	32 GB	64 GB	128 GB	256 GB	512 GB	1024 GB
DIMM Size	DIMMs	DIMMs	DIMMs	DIMMs	DIMMs	DIMMs
4 GB	8^1	16	32			
8 GB			16^1	32		
16 GB				16^1	32	
32 GB					16^1	32
Notes:						
1. Default configurations for the listed memory capacity						

Use Table 4 and Figure 19 on page 21 to determine the memory placement. The memory needs to be plugged in a sequence: Slots with blue connectors are plugged first. Slots with ivory connectors are plugged second. Slots with black connectors are plugged last.

Table 4. Memory plugging sequence

Slot latch color	Slot number	Sequence
Blue	22, 24, 30, 32, 38, 40, 46, 48	Fill these DIMM slots first
Ivory	26, 28, 34, 36, 42, 44, 50, 52	Fill these DIMM slots second
Black	23, 25, 27, 29, 31, 33, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53	Fill these DIMM slots last
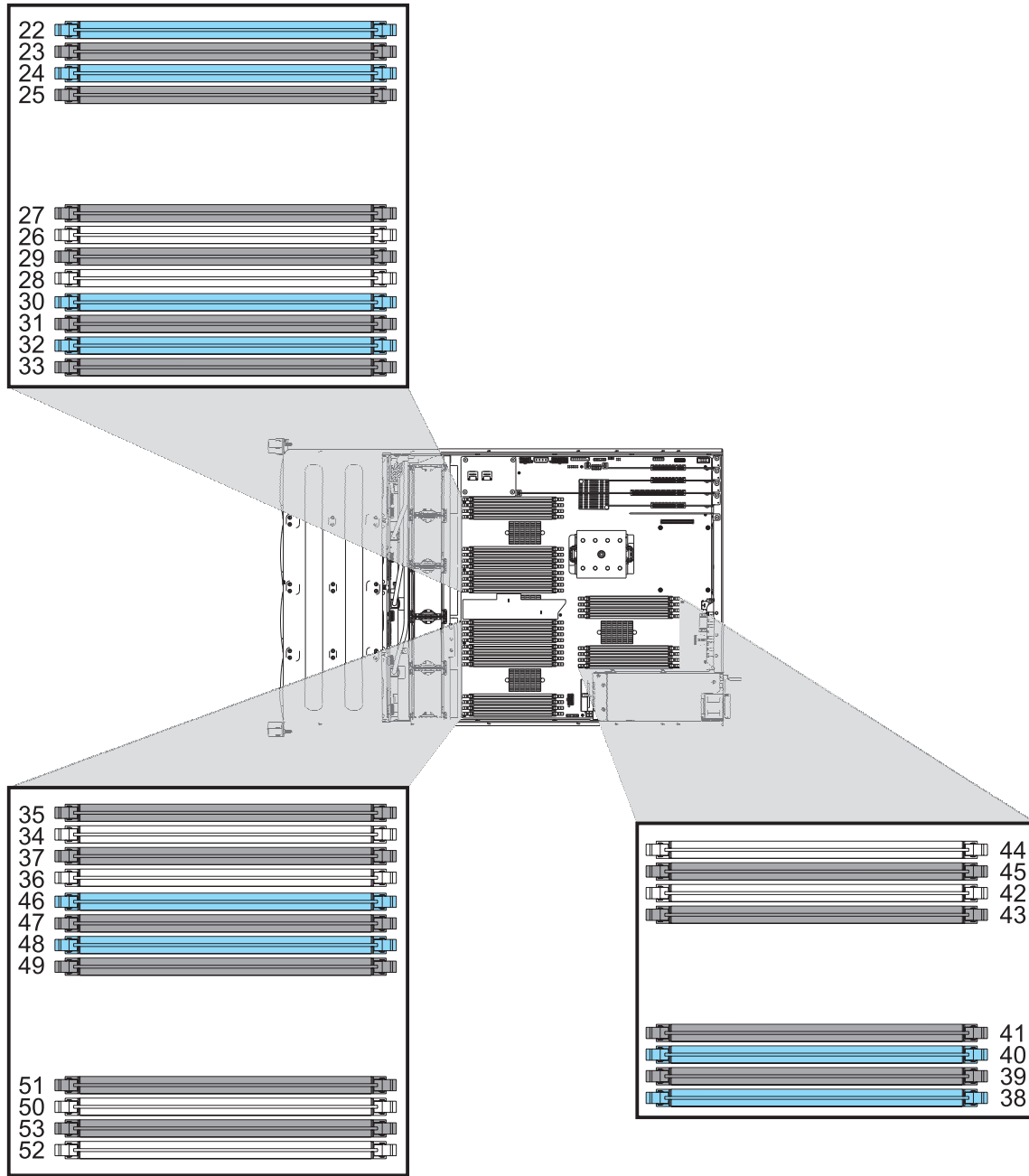
Figure 19. 8348-21C memory slot locations

Installing memory in the 8348-21C

Learn how to install memory in the IBM Power System S812LC (8348-21C) system.

Procedure

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

   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.

2. Determine the slot in which you want to install the memory. See "Placement rules for memory in the 8348-21C system" on page 20 to understand the plugging rules and ensure that the memory are plugged in the correct sequence.

3. Push the locking tabs away from the socket, in the direction that is shown in Figure 20.
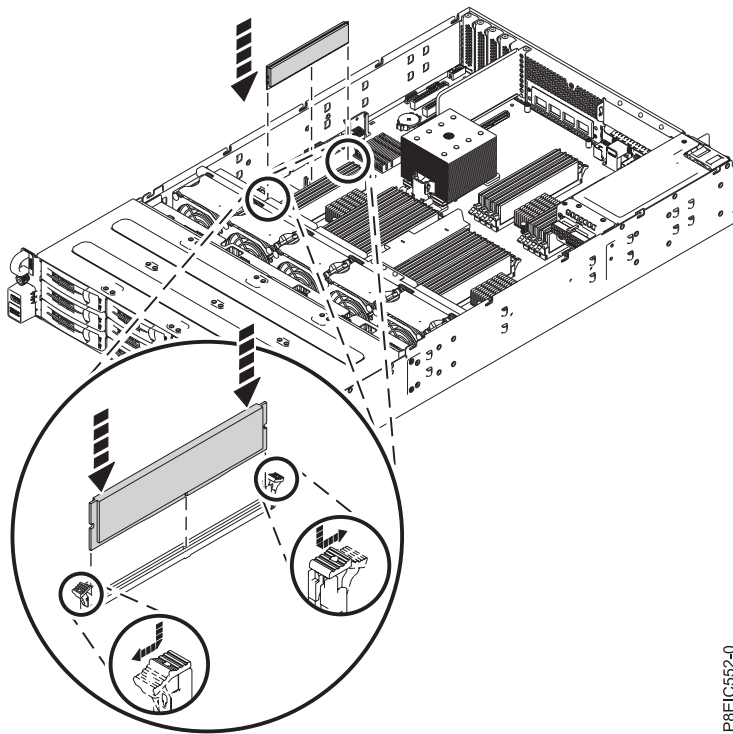
Figure 20. Opening the DIMM locking tabs and inserting memory

4. Install 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.

5. Repeat steps 3 and 4 for any additional memory to be installed.

Installing a PCIe adapter in the 8348-21C

Learn how to install a PCIe adapter in the IBM Power System S812LC (8348-21C) system.

The 8348-21C system has four open PCIe slots on the system board.

You can install half-height, half-length and half-height, full-length PCIe adapters in the system board.

If you need to change the tailstock of the PCIe adapter from one size to another, so that the adapter fits properly in the socket, see Removing and replacing the tailstock on a PCIe adapter.

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

Table 5. Electromagnetic compatibility (EMC) Class B features

Feature	Description
EL3Z	PCIe2 LP 2-port 10 GbE BaseT RJ45 Adapter

PCIe adapter placement rules and slot priorities for the 8348-21C

Find information about the placement rules and slot priorities for the Peripheral Component Interconnect (PCI) Express (PCIe) adapters that are supported for the 8348-21C system.

PCIe slot descriptions for the 8348-21C

The 8348-21C system provides PCIe generation 3 slots. Figure 21 shows the rear view of the system with the PCIe adapter slots. Table 6 lists the PCIe adapter slot locations and details for the 8348-21C system.
- The half-height, half-length or short (low-profile) adapters can be installed in slots 1, 2, and 4.
- The half-height, full-length adapters can be installed only in slot 3.
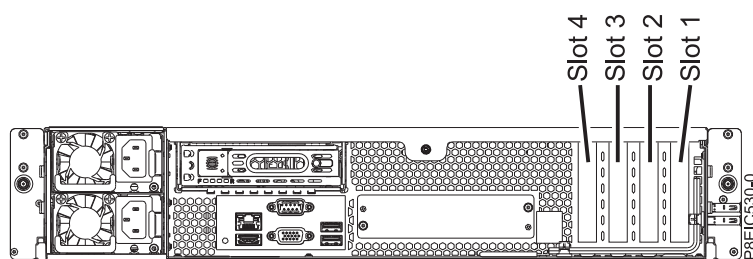
Figure 21. Rear view of an 8348-21C system with PCIe slots indicated

Table 6. PCIe slot locations and descriptions for the 8348-21C system

Slot	Description	PCI host bridge (PHB)	Adapter size	Coherent Accelerator Processor Interface (CAPI)
1[1]	PCIe3 x8	Processor Module 1, S2P17	Half-height, half-length	No
2[1]	PCIe3 x8	Processor Module 1, S2P16	Half-height, half-length	No
3	PCIe3 x16	Processor Module 1, PHB0	Half-height, full-length	Yes
4[1]	PCIe3 x8	Processor Module 2, PHB2	Half-height, half-length	Yes

Table 6. PCIe slot locations and descriptions for the 8348-21C system (continued)

Slot	Description	PCI host bridge (PHB)	Adapter size	Coherent Accelerator Processor Interface (CAPI)
[1]Slots 1, 2, and 4 are x8 slots. The adapter priority for these slots is for the high-performance adapters followed by any other adapter.				

PCIe adapter placement rules

Use this information to select slots for installing PCIe adapters in the 8348-21C system. Table 7 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 7. PCIe adapter slot priorities and maximum adapters supported in the systems

Feature code	Description	8348-21C	
		Slot priorities	Maximum number of adapters supported
5260	PCIe2 LP 4-port 1 GbE Adapter (FC 5260; CCIN 576F); Adapter FRU number: 74Y4064 • PCIe1 or PCIe2 x4 • Short, low-profile • High bandwidth • Four-port 1 Gb Ethernet OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	4, 3, 2, 1	4
EC3A	PCIe3 LP 2-Port 40 GbE NIC RoCE QSFP+ Adapter (FC EC3A; CCIN 57BD); Adapter FRU number: 00FW105 • PCIe3 x8 • Short, low-profile • Extra-high bandwidth, low latency 40 Gb Ethernet • Supports NIC and RoCE services OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	4, 3, 2, 1	4
EC3E	PCIe3 LP 2-port 100 Gb EDR IB Adapter x16 (FC EC3E, CCIN 2CEA); Adapter FRU number: 00WT075 • PCIe3, x16 • Short, low-profile • OS support: Linux operating system	3	1
EC3S	PCIe3 SAS/SATA RAID adapter with 16 internal native ports, 12 Gbs, low-profile, short form factor (FC EC3S); Adapter FRU number: 00WV555 • PCIe3 x8 • Supported RAID levels: 0, 1, 1E, 5, 6, 10, 50, 60 and Hybrid RAID 1 and 10 • Cache memory = 1024 MB OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	4[1]	1[1]
EC3T	PCIe3 LP 1-port 100 Gb EDR IB Adapter x16 (FC EC3T; CCIN 2CEB); Adapter FRU number: 00WT013 • PCIe generation 3, x16 • Short, low-profile • OS support: Linux operating system	3	1

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

Feature code	Description	8348-21C	
		Slot priorities	Maximum number of adapters supported
EC3Y	PCIe3 x8, LP adapter, SAS/SATA/RAID controller (FC EC3Y); Adapter FRU number: 00WV553 • PCIe3 x8 • Short, low-profile • Supported RAID levels: 0, 1, 1E, 10, and Hybrid RAID 1 and 10 • Volatile cache memory = 256 MB OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	4	1
EJ1B	CAPI Compression Accelerator Adapter (FC EJ1A and EJ1B; CCIN 2CF0); Adapter FRU number: 00WT173 • PCIe3 x8 • Short, with full-height tailstock (FC EJ1A) • Short, low-profile (FC EJ1B) • Up to 2 GB/sec compression and decompression throughput • CPU offload and CAPI interface with negligible software load • OS support: Linux operating systems	3, 4	1
EL2N	PCIe 8 Gb Dual-port Fibre Channel Adapter (FC EL2N; CCIN 577D); Adapter FRU number: 10N9824 • PCIe x8 • Short, low-profile OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	4, 3, 2, 1	4
EL3Z	PCIe2 LP 2-port 10 GbE BaseT RJ45 Adapter (FC EL3Z; CCIN 2CC4); Adapter FRU number: 00E2714; Full-height tailstock part number: 00E2862; Low-profile tailstock part number: 00E2721 • PCIe2 x8 • Short, low-profile • Two 10 Gb RJ45 ports • Local area network (LAN) adapter OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	4, 3, 2, 1	4
EL43	PCIe3 LP 16 Gb 2-port Fibre Channel Adapter (FC EL43; CCIN 577F); Adapter FRU number: 00E3496 • PCIe3 x8 • Short, low-profile • Extra-high bandwidth • OS support: Red Hat Enterprise Linux, SUSE Linux Enterprise Server, Linux Ubuntu operating system, and PowerKVM	3, 2, 1, 4	3
EN0T	PCIe2 LP 4-port (10 Gb + 1 GbE) SR+RJ45 Adapter (FC EN0T; CCIN 2CC3); Adapter FRU number: 00E2715; Low-profile tailstock (PN): 00E2720 • PCIe2 x8 • Short, low-profile • Two 10 Gb SR optical ports and two 1 Gb RJ45 ports • NIC network convergence adapter • Local area network (LAN) adapter OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	4, 3, 2	3[2]

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

Feature code	Description	8348-21C	
		Slot priorities	Maximum number of adapters supported
EN0V	PCIe2 LP 4-port (10 Gb + 1 GbE) Copper SFP+RJ45 Adapter (FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715; low-profile tailstock: 00E2720 • PCIe2 x8 • Short, low-profile • Two 10 Gb copper twinax small form-factor pluggable (SFP+) ports • Two 1 Gb RJ45 ports • Ethernet network interface controller (NIC) function • OS support: AIX®, IBM i only with VIOS, Linux, and PowerKVM operating systems • VIOS supported OS support: Red Hat Linux, Ubuntu, and PowerKVM operating systems	3, 2, 4	4
[1]PCIe tailstock bracket to mount supercap pack for this adapter utilizes PCIe slot 1. [2]Physical interference in slot 1 reduces maximum to 3.			

PCIe adapter information by feature type for the 8348-21C

Find information about the Peripheral Component Interconnect Express (PCIe) adapters that are supported for the 8348-21C system that contains the POWER8 processor.

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

Important:

• This document does not replace the latest sales and marketing publications and tools that document supported features.
• If you are installing a new feature, ensure that you have the software required to support the new feature and determine whether you must install any existing program temporary fix (PTF) prerequisites. To do this, use the IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf).

Table 8. PCIe adapters supported in the 8348-21C system

Feature code	Description
5260	PCIe2 LP 4-port 1 GbE Adapter (FC 5260; CCIN 576F); Adapter FRU number: 74Y4064
EC3A	PCIe3 LP 2-Port 40 GbE NIC RoCE QSFP+ Adapter (FC EC3A; CCIN 57BD); Adapter FRU number: 00FW105
EC3E	PCIe3 2-port 100 Gb EDR IB Adapter x16 (FC EC3E and EC3F; CCIN 2CEA); Adapter FRU number: 00WT075
EC3S	PCIe3 SAS/SATA RAID adapter with 16 internal native ports, 12 Gbs (FC EC3S); Adapter FRU number: 00WV555
EC3T	PCIe3 LP 1-port 100 Gb EDR InfiniBand Adapter x16 (FC EC3T; CCIN 2CEB) Adapter FRU number: 00WT013
EJ1B	CAPI Compression Accelerator Adapter (FC EJ1A and EJ1B; CCIN 2CF0); Adapter FRU number: 00WT173
EC3Y	PCIe Gen3 x8 LP SAS/SATA/RAID controller (FC EC3Y); Adapter FRU number: 00WV553

Table 8. PCIe adapters supported in the 8348-21C system (continued)

Feature code	Description
EL2N	PCIe 8 Gb Dual-port Fibre Channel Adapter (FC EL2N; CCIN 577D); Adapter FRU number: 10N9824
EL3Z	PCIe2 LP 2-port 10 GbE BaseT RJ45 Adapter (FC EL3Z; CCIN 2CC4); Adapter FRU number: 00E2714; Full-height tailstock part number: 00E2862; Low-profile tailstock part number: 00E2721
EL43	PCIe3 LP 16 Gb 2-port Fibre Channel Adapter (FC EL43; CCIN 577F); Adapter FRU number: 00E3496
EN0T	PCIe2 LP 4-port (10 Gb + 1 GbE) SR+RJ45 Adapter (FC EN0T; CCIN 2CC3); Adapter FRU number: 00E2715; Low-profile tailstock (PN): 00E2720
EN0V	PCIe2 LP 4-port (10 Gb + 1 GbE) Copper SFP+RJ45 Adapter (FC EN0V; CCIN 2CC3); Adapter FRU number: 00E2715; low-profile tailstock: 00E2720

PCIe2 LP 4-port 1GbE Adapter (FC 5260; CCIN 576F)

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

Overview

FC 5260 and FC 5899 are both the same adapter with different feature codes. FC 5260 is a low-profile adapter and the FC 5899 is a full-height adapter.

The PCIe2 LP 4-port 1GbE Adapter is a short, low-profile, generation-2 PCIe adapter. 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.

Each of the Ethernet ports can be connected by using:
- CAT5e (or later) UTP cables for 1000 Mbps network attachment
- CAT5 or CAT3 UTP cables for 100 Mbps or 10 Mbps network attachment

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

The adapter provides the following features:
- Supports interrupt moderation to deliver increased performance while significantly reducing processor utilization
- Supports dual port operation in almost any PCIe slot, except x1
- Supports auto-negotiation, full-duplex only
- Supports integrated media-access control (MAC) and physical layer (PHY)
- Supports Fast EtherChannel (FEC) with the existing software
- Supports gigabit EtherChannel (GEC) with the existing software
- Supports IEEE 802.3ad (Link Aggregation control protocol)
- Supports IEEE 802.1Q VLANs
- Supports IEEE 802.3 z, ab, u, x flow control support
- Supports IEEE 802.1p
- Supports IEEE 802.3ab for TX

- Supports TCP checksum offload transmission control protocol (TCP), user datagram protocol (UDP), Internet Protocol (IP) for IPv4 and IPv6
- Supports TCP segmentation or large send offload
- Supports EEPROM-SPI and single EEPROM
- Supports interrupt levels INTA and MSI
- Hardware certifications FCC B, UL, CE, VCCI, BSMI, CTICK, MIC
- Network Controller (MAC) Intel 82571EB
- Compliant with European Union Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment

Specifications

Item   Description
Adapter FRU number
> 74Y4064 (Designed to comply with RoHS requirement)

Wrap plug
> 10N7405

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

I/O bus architecture
> PCIe2.0 x4

Slot requirement
> One PCIe x4 (low-profile) slot.

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

Voltage
> 3.3 V

Form factor
> short, low-profile

Maximum number
> 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/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Connector information
> - Two RJ-45 ports
> - Two LED adapter status indicators per port, for link activity and speed

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

The following figure shows the adapter.
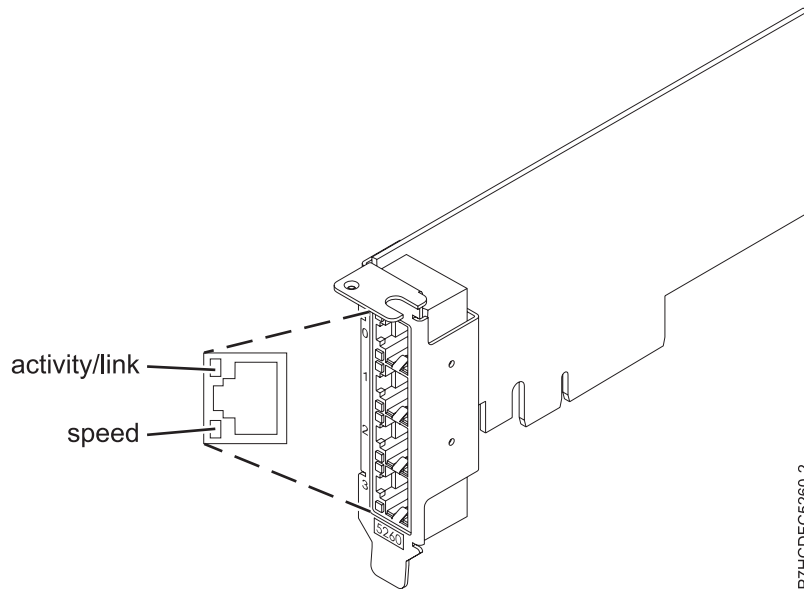
Figure 22. Adapter

Adapter LED states

The LEDs on the adapter provide information about the operation status of the adapter. The LEDs are visible through the mounting bracket. Figure 22 shows the location of the LEDs. Table 9 describes the different LED states and what those states indicate.

Table 9. Adapter LEDs and descriptions

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

For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Operating system or partition requirements

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

- AIX
  - AIX 7.1, Technology Level 3, Service Pack 2, or later
  - AIX 6.1, Technology Level 8, Service Pack 3, or later
  - AIX Version 5.3, Technology Level 12, or later
- Linux
  - Red Hat Enterprise Linux Version 7, or later, with current maintenance updates available from Red Hat.

- – Red Hat Enterprise Linux Version 6.4, or later, with current maintenance updates available from Red Hat.
- – SUSE Linux Enterprise Server Version 12, or later
- – SUSE Linux Enterprise Server 11, Service Pack 2, or later, with current maintenance updates available from SUSE.
- – Ubuntu Server 14.04.3, or later
- – For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
- – 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).
- • IBM i
  - – IBM i Version 7.2 or later
  - – IBM i Version 7.1, or later
- • VIOS
  - – VIOS support requires VIOS 2.2.1.4, or later.
- • PowerKVM
  - – IBM PowerKVM 2.1.1, or later

PCIe3 LP 2-Port 40 GbE NIC RoCE QSFP+ Adapter (FC EC3A; CCIN 57BD)

Learn about the specifications and operating system requirements for the feature code (FC) EC3A adapter.

Overview

The PCIe3 LP 2-Port 40 GbE NIC RoCE QSFP+ Adapter is a low-profile, PCIe generation-3 (PCIe3), dual port, 40-Gigabit Ethernet (GbE) adapter with a PCIe 3.0 host bus interface. The adapter acts as a network interface controller (NIC) and uses the IBTA RDMA over Converged Ethernet (RoCE) protocols to provide efficient Remote Direct Memory Access (RDMA) services. The adapter delivers high-bandwidth and low-latency 40 GbE connectivity, reducing the load on the processor and efficiently using the memory access. This action off-loads the processor from networking tasks which improves the performance and scalability of the processor.

The adapter is optimized for enterprise data centers, high-performance computing, transaction databases, cloud computing, virtualization, storage, and other embedded environments. The adapter improves network performance by increasing available bandwidth to the processor and by providing enhanced performance. The adapter provides dedicated adapter resources and protection for virtual machines (VM). The link aggregation and failover features of the adapter are ideal for critical network applications that require redundancy and high availability.

The two 40 Gb quad (4-channel) small form-factor pluggable (QSFP+) transceiver ports are used for connectivity with other servers or switches in the network. Each QSFP+ port provides Ethernet connectivity with a nominal data rate of 40 gigabits per second (Gbps).

The adapter does not include transceivers. Use copper cables with QSFP+ 40G BASE-SR transceivers for short distances. See "Cables" on page 32 for more information about the cables.

For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

The adapter provides the following features:
- • Data center bridging support (IEEE standard version CEE)
- • T11.3 FC-BB-5 FCoE

- TCP/IP stateless offload in hardware
- Traffic steering across multiple cores
- Intelligent interrupt coalescence
- Advanced Quality of Service (QoS)
- RoHS-R6 compliant
- RDMA over Ethernet using uDAPL

The adapter provides Ethernet NIC support with the following features:
- 64-bit kernel environments
- multi-processor safe
- AIX Common Data Link Interface (CDLI) compliant
- Concurrent operation of NIC and RoCE device drivers while sharing the same physical port
- Standard frames (1518 bytes + 4 bytes for VLAN tag)
- Jumbo frames (9018 bytes + 4 bytes for VLAN tag)
- IPV4 or IPV6 transmit/receive TCP checksum offload
- IPV4 transmit TCP segmentation offload (commonly known as large send)
- IPV4 receive TCP segmentation aggregation (commonly known as large receive)
- Enhanced Error Handling (EEH) from PCI bus errors

Figure 23 shows the adapter.
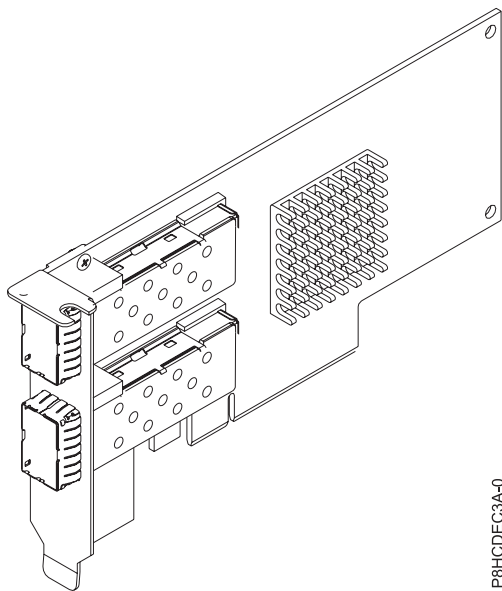
Figure 23. FC EC3A adapter

Specifications

Item   Description
Adapter FRU number
  00FW105 (Designed to comply with RoHS requirement)
I/O bus architecture
  PCIe3 x8
Slot requirement
  For details about slot priorities and placement rules, see PCIe adapter placement rules and slot

priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/ p8eab_mtm_pciplacement.htm) and select the system you are working on.

Cables
    See "Cables" for details.

Voltage
    3.3 V

Form factor
    Short

Maximum number
    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/POWER8/ p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Cables

This adapter feature requires the use of compatible QSFP+, 40 Gbps, copper, twinaxial, active, Ethernet cables for cabling over short distances. See Figure 24 for different views of the QSFP+ copper cable. For distances over 5 meters, use two optical QSFP+ SR transceivers (FC EB27) that attach to optical cables FC EB2J or FC EB2K. See Table 10 for details about the feature codes.

Do not mix copper and optical cables on the same adapter.

These cables are compliant with industry standard specifications SFF-8431 Rev 4.1 and SFF-8472 Rev 10.4, and all applicable IBM requirements.

Note: These cables are EMC Class A compliant.

P7ECF505-0
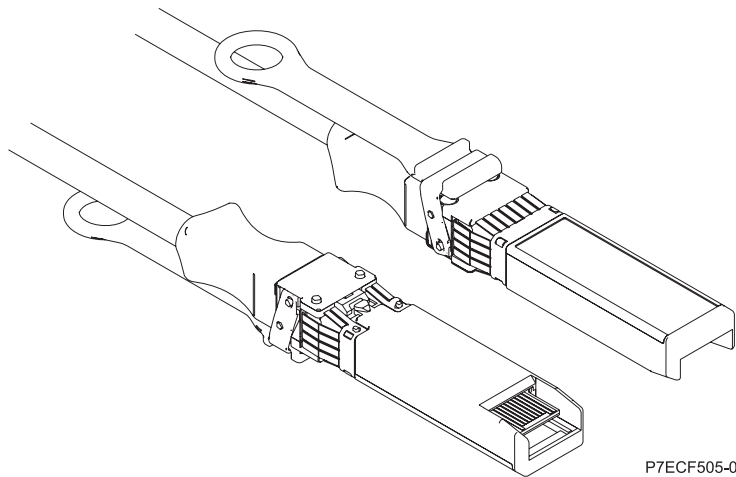
Figure 24. Top and bottom view of the cable

Table 10. Feature code and part number for varying lengths of the cable

Cable length	Feature code	CCIN	Part number
Copper cables			
1 m (3.28 ft)	EB2B		49Y7934
3 m (9.84 ft)	EB2H		49Y7935
5 m (16.4 ft)	ECBN		00D5809
Optical cables			

Table 10. Feature code and part number for varying lengths of the cable (continued)

Cable length	Feature code	CCIN	Part number
10 m (32.8 ft)	EB2J		41V2458
30 m (98.4 ft)	EB2K		45D6369
QSFP+ 40G BASE-SR transceiver	EB27		49Y7928

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 the prerequisites, see IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf).

The adapter is supported on the following versions of the operating systems, depending on the system you are using:
* AIX
  – AIX 7.1, or later
  – AIX Version 6.1, or later
* Linux
  – Red Hat Enterprise Linux Version 7, or later, with current maintenance updates available from Red Hat.
  – Red Hat Enterprise Linux Version 6.5, or later, with current maintenance updates available from Red Hat.
  – SUSE Linux Enterprise Server Version 12, or later
  – SUSE Linux Enterprise Server 11, Service Pack 3, or later, with current maintenance updates available from SUSE.
  – Ubuntu Server 14.04.3, or later
  – For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
  – 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).
* Supported on Firmware level 8.1
* PowerKVM
  – IBM PowerKVM 2.1.1, or later

PCIe3 low profile 12 Gb SAS/SATA RAID adapter with 1 GB protected write cache (FC EC3S - PMC 81605Z)

Learn about the specifications and operating system requirements for the feature code (FC EC3S - PMC 81605Z) adapter.

Overview

The PCIe Gen3 SAS/SATA RAID Adapter is a low-profile, PCIe generation-3 (PCIe3) x8 adapter with a 1 GB protected write cache. The adapter has four internal connections each of which has four x1 ports, allowing it to support up to 16 drives. The adapter supports RAID (0, 1, 1E, 5, 6, 10, 50, 60), Hybrid RAID (1, 10), and the hot plug of its attached drives. The adapter's super capacitors provide protection of the write cache in case of power loss.

Note: The adapter can connect to the 12 internal (front) disk bays on the 8348-21C. SATA devices are supported at up to 6 Gb/s per port.

The adapter provides the following RAID features:
* Flexible Configuration: HBA Mode and Auto Volume Mode for automatic deployment
* Optimized Disk Utilization (multiple arrays per disk)
* Supports up to 256 SAS or SATA devices that use SAS expanders
* Support for native 4 K sector SAS and SATA devices in addition to 512-byte sector devices
* Hybrid RAID 1 and 10
* Quick initialization
* Online Capacity Expansion
* Copyback Hot Spare
* Dynamic caching algorithm
* Native Command Queuing (NCQ)
* Background initialization
* Hot-plug drive support
* RAID Level Migration
* Hot spares - global, dedicated, and pooled
* Automatic and manual rebuild of hot spares
* SES and SAF-TE enclosure management
* Configurable stripe size
* S.M.A.R.T. support
* Multiple arrays per disk drive
* Dynamic sector repair
* Staggered drive spin-up
* Bootable array support
* Support for tape devices, autoloaders
* MSI-X support for all device driver for all supported operating systems
* Secure boot support for the uEFI host BIOS
* USB image available to boot maxView Storage Manager
* GUI from any USB device for enhanced GUI-based setup and offline maintenance
* Offline maintenance

Utilities

The adapter can use the following management utilities:
* Adaptec maxView Storage Manager

  IBM highly recommends that you use the maxView Storage Manager utility to configure and manage the storage that is controlled by a PMC adapter or adapters. Once the maxView Storage Manager utility is installed and running, it can be configured to automatically monitor and report issues such as disk failures. If you do not install the maxView Storage Manager utility, you need to use manual tools such as the ARCCONF command line utility. ARCCONF does not offer the automatic monitoring and reporting of issues such as disk failures.

  The maxView Storage Manager includes the following options:
  – Web-based GUI Management utility
  – Remote configuration, monitoring, and notification
  – Remote firmware updates including adapter and FW updates

- SMI-S Support
- SMTPARCCONF

Important:
- It is recommended that you install the maxView Storage Manager utility if you are using the Red Hat Enterprise Linux or IBM PowerKVM operating systems.
- The maxView Storage Manager utility is not currently supported on Ubuntu.
- To download the maxView Storage Manager utility, see the PMC Adaptec (http://i.adaptec.com/power) website.
- Arcconf:
  - Command Line Interface
  - SMI-S support for VMware
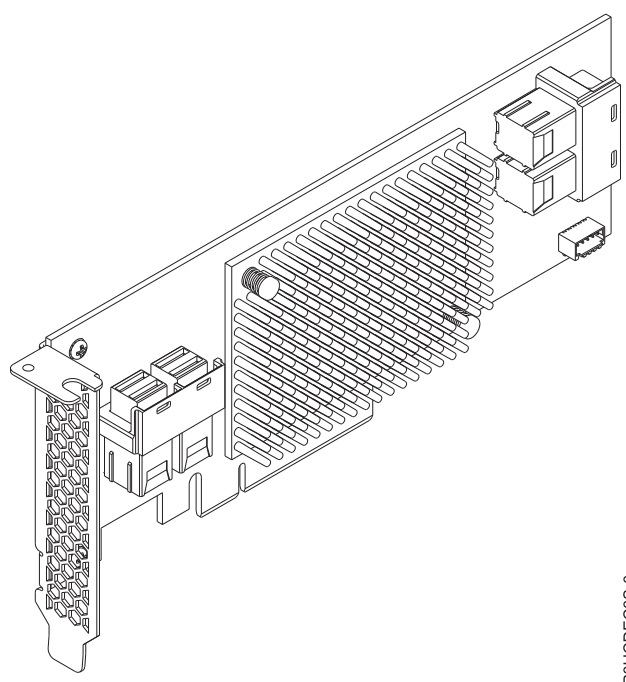
Figure 25. FC EC3S adapter (PMC 81605Z)

Specifications

Item   Description
Adapter FRU number
      00WV554 (Designed to comply with RoHS requirement)
I/O bus architecture
      PCIe3 x8
Slot requirement
      For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.
Cables
      Internal mini-SAS cables are included with the system and can be connected to the adapter SAS HD connectors as needed.
Voltage
      3.3 V

Form factor

> Short

Maximum number

> 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/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

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 the prerequisites, see IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf).

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

- Bare Metal Systems (FC EC16):
  - Linux:
    - Ubuntu Server 14.04.3 or later with AACRAID device driver v1.2.1-41059
    - Ubuntu Server 16.04, or later
    - Red Hat Enterprise Linux 7.2, little endian, for Power, or later with AACRAID device driver v1.2.1-41059
    - For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
- PowerKVM 3.1 Systems (FC EC40):
  - Virtualized resources served to guest partitions
  - PCI pass-through direct to guests not supported

PCIe3 low profile 6 Gb SAS/SATA RAID adapter (FC EC3Y - PMC 71605E)

Learn about the specifications and operating system requirements for the feature code (FC EC3Y - PMC 71605E) adapter.

Overview

The PCIe Gen3 SAS/SATA RAID Adapter is a low-profile, PCIe generation-3 (PCIe3) x8 adapter with a 256 MB volatile write cache. The adapter has four internal connections each of which has four x1 ports, allowing it to support up to 16 drives. The adapter supports RAID (0, 1, 1E, 10) and the hot plug of its attached drives.

Note: Cache content is lost if a problem such as a power failure occurs.

The adapter provides the following RAID features:

- Optimized Disk Utilization
- Hybrid RAID levels: 0, 1, 1E, 10
- HBA Mode and Simple Volume Mode for automatic deployment
- Supports up to 256 SAS or SATA devices that use SAS expanders
- Support for native 4 K sector SAS and SATA devices in addition to 512-byte sector devices
- Hybrid RAID 1 and 10
- Quick initialization
- Online Capacity Expansion
- Copyback Hot Spare

- Dynamic caching algorithm
- Native Command Queuing (NCQ)
- Background initialization
- Hot-plug drive support
- RAID Level Migration
- Hot spares - global, dedicated, and pooled
- Automatic and manual rebuild of hot spares
- SES and SAF-TE enclosure management
- Configurable stripe size
- S.M.A.R.T. support
- Multiple arrays per disk drive
- Dynamic sector repair
- Staggered drive spin-up
- Bootable array support
- Support for tape devices and autoloaders

Utilities

The adapter can use the following management utilities:

- Adaptec maxView Storage Manager

  IBM highly recommends that you use the maxView Storage Manager utility to configure and manage the storage that is controlled by a PMC adapter or adapters. Once the maxView Storage Manager utility is installed and running, it can be configured to automatically monitor and report issues such as disk failures. If you do not install the maxView Storage Manager utility, you need to use manual tools such as the ARCCONF command line utility. ARCCONF does not offer the automatic monitoring and reporting of issues such as disk failures.

  The maxView Storage Manager includes the following options:
  - Web-based GUI Management utility
  - Remote configuration, monitoring, and notification
  - Remote firmware updates including adapter and device FW updates
  - SMI-S Support
  - SMTPARCCONF

  Important:
  - It is recommended that you install the maxView Storage Manager utility if you are using the Red Hat Enterprise Linux or IBM PowerKVM operating systems.
  - The maxView Storage Manager utility is not currently supported on Ubuntu.
  - To download the maxView Storage Manager utility, see the PMC Adaptec (http://i.adaptec.com/power) website.
- Arcconf:
  - Command Line Interface
  - SMI-S support for VMware
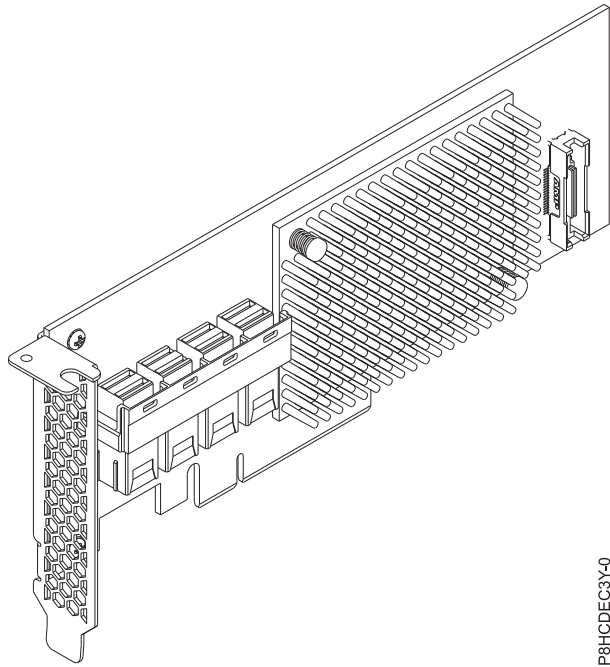
Figure 26. FC EC3Y adapter (PMC 71605E)

Specifications

Item   Description

Adapter FRU number

> 00WV552 (Designed to comply with RoHS requirement.)

I/O bus architecture

> PCIe3 x8

Slot requirement

> For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Cables

> Internal mini-SAS cables are included with the system and can be connected to the adapter SAS HD connectors as needed.

Voltage

> 3.3 V

Form factor

> Short

Maximum number

> 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/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

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 the prerequisites, see IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf).

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

- Bare Metal Systems (FC EC16):
  - Linux:
    - Ubuntu Server 14.04.3 or later with AACRAID device driver v1.2.1-41059
    - Ubuntu Server 16.04, or later
    - Red Hat Enterprise Linux 7.2, little endian, for Power, or later with AACRAID device driver v1.2.1-41059
    - For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
- PowerKVM 3.1 Systems (FC EC40):
  - Virtualized resources served to guest partitions
  - PCI pass-through direct to guests not supported

CAPI Compression Accelerator Adapter (FC EJ1A and EJ1B; CCIN 2CF0)

Learn about the specifications and operating system requirements for feature code (FC) EJ1A and EJ1B adapters.

Overview

FC EJ1A and EJ1B are both the same adapter with different feature codes. FC EJ1A is a full-height adapter and FC EJ1B is a low-profile adapter. See "PCIe3 FPGA Compression Accelerator Adapter (FC EJ12; CCIN 59AB)" on page 41 and "PCIe3 FPGA Compression Accelerator Adapter (FC EJ13; CCIN 59AB)" on page 44 for additional compression accelerator adapters.

The PCIe3 CAPI Compression Accelerator Adapter is a PCI Express (PCIe) generation 3 (Gen3) x8 adapter. The adapter can be used in either a x8 or x16 PCIe3 slot in the system. The CAPI Compression Accelerator Adapter implements the well-defined, open standard DEFLATE compressed data format. This data format is widely accepted through zlib, gzip, Java, and other applications. Within the gzip and zip file formats, the adapter is the standard for compressed data exchange. The adapter's high compression bandwidth reduces the latency for a single compression job significantly. Its aggregate throughput allows the adapter to keep pace with common I/O traffic and offers reduced data for storage and network traffic. Additionally, the adapter has no impact on most I/O traffic and in some cases will have a positive effect. The adapter also enables good standard compression in cases where software overhead prevents it. To achieve the best performance gain, strive for data block sizes larger than 64 KB, or combine smaller blocks before sending them to hardware. The accelerated zlib library has a selectable buffering feature built-in as well. For a graphic of the full-height adapter, see Figure 27 on page 40

Important: Graphics processing units (GPUs) and Coherent Accelerator Processor Interface (CAPI) adapters cannot be replaced with the power on.

The following are examples of typical applications that can benefit from compression acceleration:
- Store or transmit large amounts of data that average over 100 MB/s
- Applications that need a high average throughput of data compressed
- Handling high peak throughput of data when software compression is limited
- When low latency for individual compression streams is required and it is more difficult to run in parallel on many CPUs
- When the standard DEFLATE compression format is required for interchange as used in gzip, zlib, zip, or JAR (Software compression methods such as LZ4 or LZS with lower compression ratios and high bandwidth on CPUs are not an option in that case)
- Compression or a mix of compression and decompression is the main bottleneck (Decompression alone can sometimes still be done in software with many cores in parallel)

Note: The adapter supports full speed decompression for all compliant compressed input regardless of whether it was compressed by hardware or software.

For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.
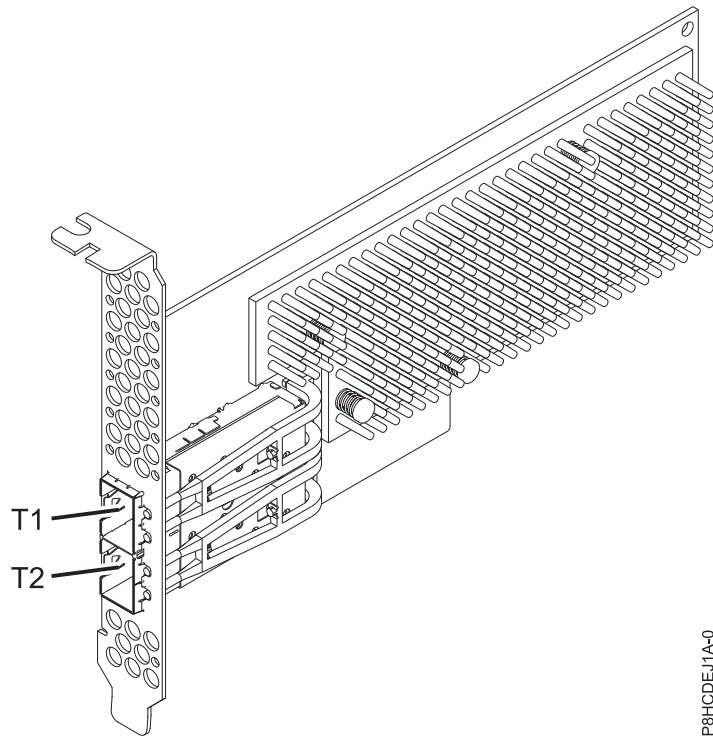
Figure 27. CAPI Compression Accelerator Adapter (Full-height)

Specifications

Item   Description
Adapter FRU number
    00WT173 (Designed to comply with RoHS requirement)
I/O bus architecture
    PCIe3 x8
Slot requirement
    One PCIe x8 or x16 CAPI enabled slot per adapter
Supported Systems
    POWER8® processor-based server
    • 8247-21L, 8247-22L, and 8247-42L
    • 8335-GCA and 8335-GTA
    • 8348-21C
Voltage
    12 V
Form factor
    Short, with full-height tailstock (FC EJ1A)

    Short, low-profile (FC EJ1B)
Maximum number
    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/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.
**Attributes provided**
    High throughput compression that saves storage and I/O bandwidth with little or no overhead

CPU offload and CAPI interface with negligible software load frees up CPU cores for higher value computation or licensed software

Lower power consumption by offloading the CPU intensive compression to an FPGA

Widely used zlib and gzip standard format for data interchange

Up to 2 GB/s compression and decompression throughput

4-30x speed up achievable

Compression ratio near software zlib and gzip

Multiple uses including genomics, data center, cloud, and backup solutions

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 the prerequisites, see IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf).

The adapter is supported on the following versions of the operating systems:
* Linux
  – Red Hat Enterprise Linux 7.2 LE, or later
  – Ubuntu 14.04.5, or later
  – For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
  – For additional information regarding firmware level and additional software installations, see Fix Central.
    - See the specific firmware level for 8335-GCA and GTA at Fix Central (8335-GCA and GTA).
    - See the specific firmware level for 8348-21C at Fix Central (8348-21C).
  – To use the CAPI Compression Accelerator Adapter, the following software packages must be downloaded at the IBM Service and Productivity Tools website(http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html):
    - genwqe-zlib: Hardware accelerated zlib
    - genwqe-tools: Tools to analyze adapter functionality plus hardware accelerated genwqe_gzip and genwqe_gunzip
  – For details on how the adapter can be used to accelerate your application, please refer to the CAPI Compression Accelerator Adapter user's guide published on IBM developerWorks (http://www.ibm.com/developerworks/).

PCIe3 FPGA Compression Accelerator Adapter (FC EJ12; CCIN 59AB)
Learn about the specifications and operating system requirements for the feature code (FC) EJ12 adapter.

Overview

FC EJ12 and EJ13 are both the same adapter with different feature codes. FC EJ12 is a full-height adapter and FC EJ13 is a low-profile adapter. See "CAPI Compression Accelerator Adapter (FC EJ1A and EJ1B; CCIN 2CF0)" on page 39 for compression accelerator adapters with greater compression acceleration and CPU load reduction.

The PCIe3 FPGA Compression Adapter is a PCI Express (PCIe) generation 3 (Gen3), x8 adapter. The adapter can be used in either a x8 or x16 PCIe Gen3 slot in the system. The PCIe3 FPGA Compression Accelerator Adapter implements the well-defined, open standard DEFLATE compressed data format. This data format is widely accepted through zlib, gzip, Java and other applications. Within the gzip and zip

file formats, the adapter is the standard for compressed data exchange. The adapter's high compression bandwidth reduces the latency for a single compression job significantly. Its aggregate throughput allows the adapter to keep pace with common I/O traffic and offers reduced data for storage and network traffic. Additionally, the adapter has no impact on most I/O traffic and in some cases will have a positive effect. The adapter also enables good standard compression in cases where software overhead prevents it.

The following are examples of typical applications that can benefit from compression acceleration:

- Store or transmit large amounts of data that average over 100 MB/s
- Expensive storage with high storage bandwidth, where the accelerator's compression ratio, compared to fast software compression, yields significant savings
- Applications that need a high average throughput of data compressed
- Handling high peak throughput of data when software compression is limited
- When low latency for individual compression streams is required and it is more difficult to run in parallel on many CPUs
- When the standard DEFLATE compression format is required for interchange as used in gzip, zlib, zip, or JAR (Software compression methods such as LZ4 or LZS with lower compression ratios and high bandwidth on CPUs are not an option in that case)
- Compression or a mix of compression and decompression is the main bottleneck.

  Note: Decompression alone can sometimes still be done in software with many cores in parallel. The adapter supports full speed decompression for all compliant compressed input regardless of whether it was compressed by hardware or software.
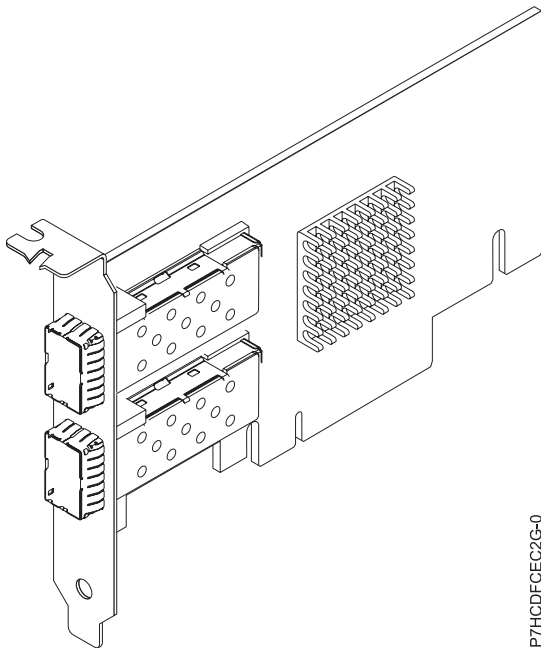

Figure 28. PCIe3 FPGA Compression Accelerator Adapter

Specifications

Item   Description
Adapter FRU number
    000NK006 (Designed to comply with RoHS requirement)
I/O bus architecture
    PCIe3 x8

Slot requirement
>One PCIe x8 or x16 slot

Voltage
>3.3 V, 12 V

Form factor
>Full-height (FC EJ12) and short, low-profile (FC EJ13)

Maximum number
>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/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Attributes provided
>High throughput compression that saves storage and I/O bandwidth with little or no overhead
>
>CPU offload and PCIe interface with negligible software load frees up CPU cores for higher value computation or licensed software
>
>Lower power consumption by offloading the CPU intensive compression to an FPGA
>
>Widely used zlib and gzip standard format for data interchange
>
>Up to 1.8 GB/s compression and decompression throughput
>
>3-25x speed up achievable
>
>Compression ratio near software zlib and gzip
>
>Multiple uses including genomics, data center, cloud, and backup solutions

Operating system or partition requirements

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

- AIX
  - AIX 7.1, Technology Level 3, Service Pack 2, or later
  - AIX 6.1, Technology Level 9, or later
- Linux
  - Red Hat Enterprise Linux 7.2, and later include the GenWQE Linux drive
  - Red Hat Enterprise Linux 7.1, or later

    Important: See Generic Work Queue Engine (GenWQE) introduction for instructions about installing the driver.
  - Red Hat Enterprise Linux 7, or later
  - For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
  - For additional information regarding firmware level and additional software installations, see Fix Central.
  - To use the PCIe3 FPGA Compression Accelerator Adapter, the following software packages must be downloaded at the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html):
    - genwqe-zlib: Hardware accelerated zlib
    - genwqe-tools: Tools to analyze adapter functionality plus hardware accelerated genwqe_gzip and genwqe_gunzip
  - For details on how the adapter can be used to accelerate your application, please refer to the Generic Work Queue Engine (GenWQE) Application Programming Guide published on IBM developerWorks (http://www.ibm.com/developerworks/).

PCIe3 FPGA Compression Accelerator Adapter (FC EJ13; CCIN 59AB)

Learn about the specifications and operating system requirements for the feature code (FC) EJ13 adapter.

Overview

FC EJ12 and EJ13 are both the same adapter with different feature codes. FC EJ12 is a full-height adapter and FC EJ13 is a low-profile adapter. See "CAPI Compression Accelerator Adapter (FC EJ1A and EJ1B; CCIN 2CF0)" on page 39 for compression accelerator adapters with greater compression acceleration and CPU load reduction.

The PCIe3 FPGA Compression Adapter is a PCI Express (PCIe) generation 3 (Gen3), x8 adapter. The adapter can be used in either a x8 or x16 PCIe Gen3 slot in the system. The PCIe3 FPGA Compression Accelerator Adapter implements the well-defined, open standard DEFLATE compressed data format. This data format is widely accepted through zlib, gzip, Java and other applications. Within the gzip and zip file formats, the adapter is the standard for compressed data exchange. The adapter's high compression bandwidth reduces the latency for a single compression job significantly. Its aggregate throughput allows the adapter to keep pace with common I/O traffic and offers reduced data for storage and network traffic. Additionally, the adapter has no impact on most I/O traffic and in some cases will have a positive effect. The adapter also enables good standard compression in cases where software overhead prevents it.

The following are examples of typical applications that can benefit from compression acceleration:
- Store or transmit large amounts of data that average over 100 MB/s
- Expensive storage with high storage bandwidth, where the accelerator's compression ratio, compared to fast software compression, yields significant savings
- Applications that need a high average throughput of data compressed
- Handling high peak throughput of data when software compression is limited
- When low latency for individual compression streams is required and it is more difficult to run in parallel on many CPUs
- When the standard DEFLATE compression format is required for interchange as used in gzip, zlib, zip, or JAR (Software compression methods such as LZ4 or LZS with lower compression ratios and high bandwidth on CPUs are not an option in that case)
- Compression or a mix of compression and decompression is the main bottleneck.

  Note: Decompression alone can sometimes still be done in software with many cores in parallel. The adapter supports full speed decompression for all compliant compressed input regardless of whether it was compressed by hardware or software.

Figure 29. PCIe3 FPGA Compression Accelerator Adapter

Specifications

Item   **Description**

Adapter FRU number

    000NK006 (Designed to comply with RoHS requirement)

I/O bus architecture

    PCIe3 x8

Slot requirement

    One PCIe x8 or x16 slot (Low-profile)

Voltage

    3.3 V, 12 V

Form factor

    Full-height (FC EJ12) and short, low-profile (FC EJ13)

Maximum number

    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/POWER8/ p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Attributes provided

    High throughput compression that saves storage and I/O bandwidth with little or no overhead

    CPU offload and PCIe interface with negligible software load frees up CPU cores for higher value computation or licensed software

    Lower power consumption by offloading the CPU intensive compression to an FPGA

    Widely used zlib and gzip standard format for data interchange

    Up to 1.8 GB/s compression and decompression throughput

    3-25x speed up achievable

    Compression ratio near software zlib and gzip

    Multiple uses including genomics, data center, cloud, and backup solutions

Operating system or partition requirements

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

- AIX
  - AIX 7.1, Technology Level 3, Service Pack 2, or later
  - AIX 6.1, Technology Level 9, or later
- Linux
  - Red Hat Enterprise Linux 7.2, and later include the GenWQE Linux drive
  - Red Hat Enterprise Linux 7.1, or later

    Important: See Generic Work Queue Engine (GenWQE) introduction (https://www.ibm.com/support/knowledgecenter/linuxonibm/liabt/liabtkickoff.htm) on how to install the driver.

  - Red Hat Enterprise Linux 7, or later
  - For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
  - For additional information regarding firmware level and additional software installations, see Fix Central (http://www.ibm.com/support/fixcentral/).
  - To use the PCIe3 FPGA Compression Accelerator Adapter, the following software packages must be downloaded at the IBM Service and Productivity Tools website (http://www14.software.ibm.com/webapp/set2/sas/f/lopdiags/home.html):
    - genwqe-zlib: Hardware accelerated zlib
    - genwqe-tools: Tools to analyze adapter functionality plus hardware accelerated genwqe_gzip and genwqe_gunzip
  - For details on how the adapter can be used to accelerate your application, please refer to the Generic Work Queue Engine (GenWQE) Application Programming Guide published on IBM developerWorks (http://www.ibm.com/developerworks/).

PCIe LP 8 Gb 2-Port Fibre Channel Adapter (FC EL2N; CCIN 577D)

Learn about the specifications and operating system requirements for the feature code (FC) EL2N adapter.

Overview

The FC EL2N is a low-profile adapter. The PCIe LP 8 Gb 2-Port Fibre Channel Adapter is a high-performance adapter based on the Emulex LPe12002 PCIe Host Bus Adapter (HBA). Each port provides single initiator capability over a fiber link. The ports have LC type connectors that use shortwave laser optics. The adapter connects to Fibre Channel switches and operates at link speeds of 2, 4, and 8 Gbps. The adapter automatically negotiates with the switch to the highest speed that the switch is capable of. LEDs on each port provide information about the status and link speed of the port.

N_Port ID Virtualization (NPIV) capability is supported through Virtual I/O Server (VIOS).

Figure 30 on page 47 shows the adapter:
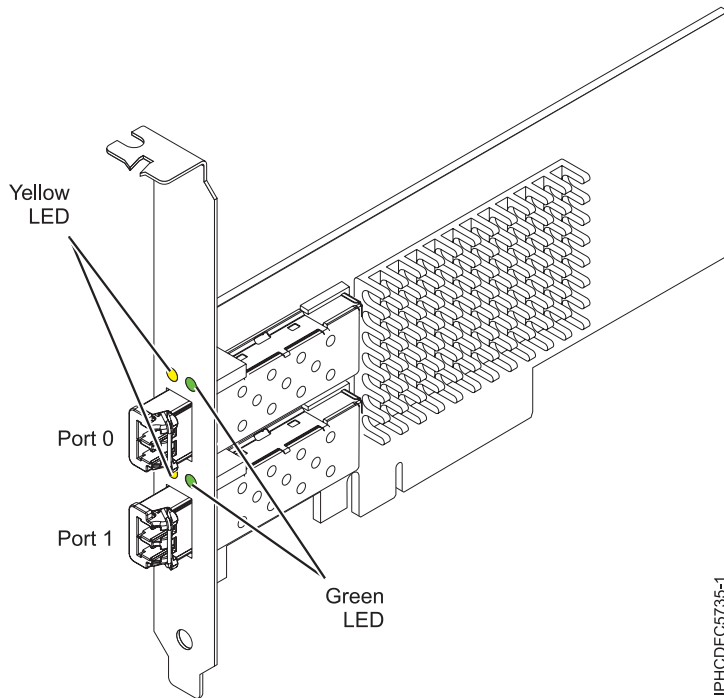
Figure 30. EL2N adapter

Adapter specifications

Item   Description

FRU number

10N9824 (Designed to comply with RoHS requirement)

Wrap plug FRU number

12R9314

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

I/O bus architecture

PCI Express (PCIe) Base and Card Electromechanical (CEM) 2.0 x8 PCIe bus interface

Slot requirement

For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/ p8eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage

3.3 V

Form factor

Short, low-profile

FC compatibility

2, 4, 8 Gigabit

Cables

Cables are the responsibility of the customer.

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

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

Because core sizes are different, OM1 cables can only be connected to other OM1 cables. For best results, OM2 cables should not be connected to OM3 cables. However, if an OM2 cable is

connected to an OM3 cable, the characteristics of the OM2 cable apply to the entire length of the cables. The following table shows the supported distances for the different fiber optic cable types at different link speeds.

Table 11. Supported distances for multimode fiber optic cables

Header	Cable Type and Distance		
Rate	OM1	OM2	OM3
2.125 Gbps	0.5 meters to 150 meters (1.64 feet to 492.12 feet)	0.5 meters to 300 meters (1.64 feet to 984.25 feet)	0.5 meters to 500 meters (1.64 feet to 1640.41 feet)
4.25 Gbps	0.5 meters to 70 meters (1.64 feet to 229.65 feet)	0.5 meters to 150 meters (1.64 feet to 492.12 feet)	0.5 meters to 380 meters (1.64 feet to 1246.71 feet)
8.5 Gbps	0.5 meters to 21 meters (1.64 feet to 68.89 feet)	0.5 meters to 50 meters (1.64 feet to 164.04 feet)	0.5 meters to 150 meters (1.64 feet to 492.12 feet)

Maximum number

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/POWER8/ p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

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 the prerequisites, see IBM Prerequisite website (www-912.ibm.com/e_dir/ eServerPrereq.nsf).

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

*   Linux
    *   Red Hat Enterprise Linux Version 7, or later, with current maintenance updates available from Red Hat.
    *   Red Hat Enterprise Linux Version 6, or later
    *   Red Hat Enterprise Linux Version 5.6, or later
    *   SUSE Linux Enterprise Server Version 12, or later
    *   SUSE Linux Enterprise Server 11, Service Pack 1, or later, with current maintenance updates available from SUSE.
    *   Ubuntu Server 14.04.3, or later
    *   For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/ lopdiags/info/LinuxAlerts.html).
*   PowerKVM
    *   IBM PowerKVM 2.1 SP1, or later

Adapter LED

Green and yellow LEDs can be seen through openings in the mounting bracket of the adapter. Green indicates firmware operation and yellow signifies port activity. Table 12 summarizes the link rate conditions. There is a 1-second pause when the LED is off between each group of fast flashes (2, 3, or 4). Observe the LED sequence for several seconds to be sure that you have correctly identified the state.

Table 12. Normal LED states

Green LED	Yellow LED	State
Slow flash	Off	Normal, link inactive or not started

Table 12. Normal LED states (continued)

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

Power-on self test (POST) conditions and results are summarized in Table 13. These states can be used to identify abnormal states or problems. Follow the action to be taken for each condition.

Table 13. POST conditions and results

Green LED	Yellow LED	State	Action to be taken
Off	Off	Wake-up failure (dead board)	Perform AIX, IBM i, or Linux operating system diagnostics procedure.
Off	On	POST failure (dead board)	Perform AIX, IBM i, or Linux operating system diagnostics procedure.
Off	Slow flash	Wake-up failure monitor	Perform AIX, IBM i, or Linux operating system diagnostics procedure.
Off	Fast flash	POST failure	Perform AIX, IBM i, or Linux operating system diagnostics procedure.
Off	Flashing	POST processing in progress	None
On	Off	Failure while functioning	Perform AIX, IBM i, or Linux operating system diagnostics procedure.
On	On	Failure while functioning	Perform AIX, IBM i, or Linux operating system diagnostics procedure.
Slow flash	Slow flash	Offline for download	None
Slow flash	Fast flash	Restricted offline mode, waiting for restart	None
Slow flash	Flashing	Restricted offline mode, test active	None
Fast flash	Off	Debug monitor in restricted mode	None
Fast flash	On	Not defined	None
Fast flash	Slow flash	Debug monitor in test fixture mode	None
Fast flash	Fast flash	Debug monitor in remote debug mode	None
Fast flash	Flashing	Not defined	None

Replacing Fibre Channel adapters by using hot swap

When hot swapping Fibre Channel adapters, be aware that device-related software for the storage devices might have extra devices (for example, the disk array router (dar) device that is associated with the fiber array storage technology (FAStT) or DS4800) that need to be removed. See the specific storage device documentation for information about how to remove these additional devices.

The new adapter has a unique worldwide port name (WWPN). Check the zoning and logical unit number (LUN) assignments to ensure that the new adapter functions as expected.

PCIe2 LP 2-port 10 GbE BaseT RJ45 Adapter (FC EL3Z; CCIN 2CC4)

Learn about the specifications and operating system requirements for the feature code (FC) EL3Z adapter.

Overview

The PCIe2 LP 2-port 10 GbE BaseT RJ45 Adapter is a PCI Express (PCIe) generation 2, x8, short form-factor, low-profile adapter. The adapter provides two 10 Gb RJ45 ports. This adapter provides a PCIe 2.0 host bus interface. The adapter supports the Ethernet network interface controller (NIC) function. The adapter is a high-performance adapter that consolidates traffic for networking. The link aggregation and failover features of the adapter make it suitable for critical network applications that require redundancy and high availability. Figure 31 on page 51 shows the FC EL3Z adapter.

The ports default to auto negotiate the highest speed either at 10 Gb (10G BaseT), 1Gb (1000 BaseT), or 100 Mb (100 BaseT) full duplex. Each RJ45 port can be configured independent of the other port. Each RJ45 port is connected with a 4-pair, CAT-6A cable, and is supported for distances of up to 100 meters.

The adapter provides the following features:
- The adapter is a PCIe2 NIC network convergence adapter.
- The 10 Gb RJ45 ports can function in the NIC mode.
- The adapter can be used as the host local area network (LAN) adapter.
- The adapter supports interrupt moderation to deliver increased performance while significantly reducing processor utilization
- The adapter supports dual port operation in any PCIe3 or PCIe2 slot.
- The adapter supports auto-negotiation, full-duplex only.
- The adapter supports multiple media-access control (MAC) per interface.
- The adapter supports integrated media-access control (MAC) and physical layer (PHY).
- The adapter supports the following standards for the different ports and functions:
  - IEEE 802.3ae in the 10 GbE ports
  - 802.3ab in the 1 GbE ports
  - Ether II and IEEE 802.3 for encapsulated frames
  - 802.1p for setting up priority levels in tagged VLAN frames
  - 802.1Q for VLAN tagging
  - 802.3x for flow control
  - 802.3ad for load-balancing and failover
  - IEEE 802.3ad and 802.3 for link aggregation
- The adapter provides message signal interrupts (MSI), MSI-X, and support of legacy pin interrupts.
- The adapter supports jumbo frames up to 9.6 KB.
- The adapter supports gigabit EtherChannel (GEC) with the existing software.
- The adapter supports TCP checksum offload transmission control protocol (TCP), user datagram protocol (UDP), TCP segmentation Offload (TSO) for IPv4 and IPv6.
- Supports TCP segmentation or large send offload
- Supports EEPROM-SPI and single EEPROM
- Compliant with European Union Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
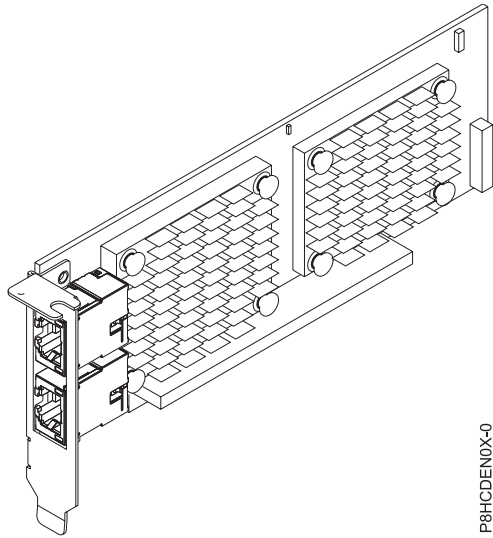
Figure 31. FC EL3Z adapter

Specifications

Item   Description

Adapter FRU number

00E2714 (Designed to comply with RoHS requirement)

Regular-height tailstock part number: 00E2862

Low-profile tailstock part number: 00E2721

Wrap plug FRU number

10N7405 (RJ45 wrap plug)

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

I/O bus architecture

PCIe2 x8

Slot requirement

For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/ p8eab_mtm_pciplacement.htm) and select the system you are working on.

Cables

CAT-6A cable

Voltage

3.3 V

Form factor

Short, low-profile

Maximum number

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/POWER8/ p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

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 the prerequisites, see IBM Prerequisite website (www-912.ibm.com/e_dir/ eServerPrereq.nsf).

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

- Linux
  - Red Hat Enterprise Linux Version 7, or later, with current maintenance updates available from Red Hat.
  - Red Hat Enterprise Linux Version 6.5, or later, with current maintenance updates available from Red Hat.
  - SUSE Linux Enterprise Server 11, Service Pack 3, or later, with current maintenance updates available from SUSE.
  - For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
- PowerKVM
  - IBM PowerKVM 2.1.1, or later

This adapter requires the following driver in the Linux operating system:

- `bnx2x driver`
- 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).

PCIe3 LP 4-Port (10Gb+1GbE) SR+RJ45 Adapter (FC EN0T; CCIN 2CC3)

Learn about the specifications and operating system requirements for the feature code (FC) EN0T adapter.

Overview

The PCIe3 LP 4-Port (10Gb+1GbE) SR+RJ45 Adapter is a PCI Express (PCIe) generation 2 (Gen2) x8, short form-factor, low-profile adapter. The adapter provides two 10 Gb SR optical ports and two 1 Gb RJ45 ports. This adapter provides a PCIe 2.0 host bus interface. The adapter supports the Ethernet network interface controller (NIC) function. The adapter is a high-performance adapter that consolidates traffic for networking. The link aggregation and failover features of the adapter make it suitable for critical network applications that require redundancy and high availability.

The four-port adapter provides two 10 Gb small form-factor pluggable (SFP+) optical SR transceiver ports and two 1 Gb RJ45 Ethernet ports. The two 10 Gb SR ports have little connector (LC) duplex-type connectors. The optical transceiver uses shortwave laser optics and is attached with MMF-850nm fiber cabling with LC connectors. See "Cables" on page 54 for more information about the optical cables. Each 10 Gb port provides Ethernet connectivity with a nominal data rate of 10 Gbps (gigabits per second). Figure 32 on page 53 shows the FC EN0T adapter.

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

The adapter provides the following features:

- The adapter is a PCIe3 NIC network convergence adapter.
- The 10 Gb SR ports can function in the NIC mode.
- The adapter can be used as the host local area network (LAN) adapter.
- The adapter supports interrupt moderation to deliver increased performance while significantly reducing processor utilization
- The adapter supports dual port operation in any PCIe3 or PCIe2 slot.
- The adapter supports auto-negotiation, full-duplex only.

- The adapter supports multiple media-access control (MAC) per interface.
- The adapter supports integrated media-access control (MAC) and physical layer (PHY).
- The adapter supports the following standards for the different ports and functions:
  - IEEE 802.3ae in the 10 GbE ports
  - 802.3ab in the 1 GbE ports
  - Ether II and IEEE 802.3 for encapsulated frames
  - 802.1p for setting up priority levels in tagged VLAN frames
  - 802.1Q for VLAN tagging
  - 802.3x for flow control
  - 802.3ad for load-balancing and failover
  - IEEE 802.3ad and 802.3 for link aggregation
- The adapter provides message signal interrupts (MSI), MSI-X, and support of legacy pin interrupts.
- The adapter supports jumbo frames up to 9.6 KB.
- The adapter supports gigabit EtherChannel (GEC) with the existing software.
- The adapter supports TCP checksum offload transmission control protocol (TCP), user datagram protocol (UDP), TCP segmentation Offload (TSO) for IPv4 and IPv6.
- Supports TCP segmentation or large send offload
- Supports EEPROM-SPI and single EEPROM
- Compliant with European Union Directive 2002/95/EC on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment
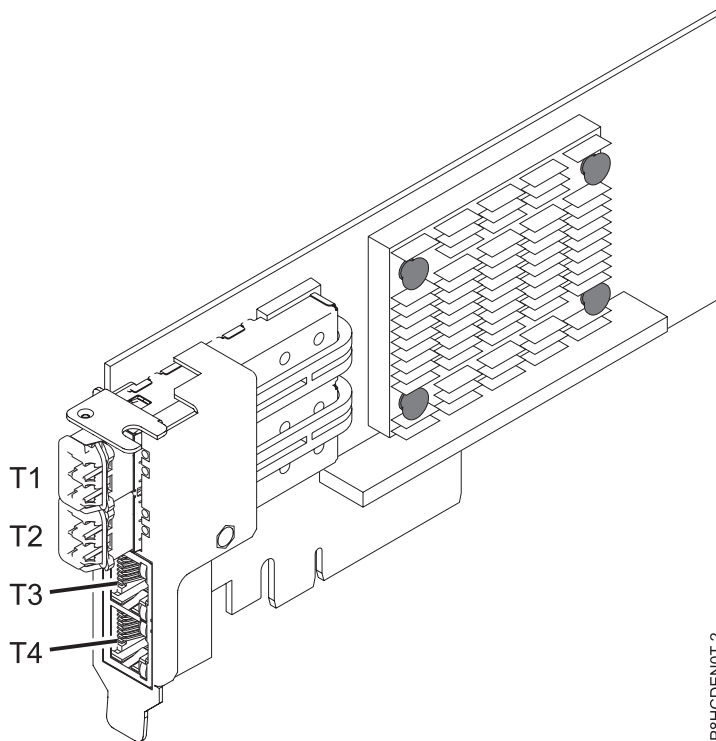

Figure 32. FC EN0T adapter

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

Specifications

Item   **Description**

Adapter FRU number

00E2715 (Designed to comply with RoHS requirement)

Low-profile tailstock part number: 00E2720

Wrap plug FRU number

12R9314 (SFP+ SR wrap plug)

10N7405 (1 Gb UTP wrap plug)

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

I/O bus architecture

PCIe3 x8

Slot requirement

For details about slot priorities and placement rules, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Voltage

3.3 V

Form factor

Short, low-profile

Maximum number

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/POWER8/p8eab/p8eab_mtm_pciplacement.htm) and select the system you are working on.

Cables

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

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

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

Table 14. Supported distances for multimode fiber optic cables

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

Operating system or partition requirements

If you are installing a new feature, ensure that you have the software that is required to support the new feature and that you determine whether any prerequisites must be met for this feature and attaching devices. To check for the prerequisites, see IBM Prerequisite website (www-912.ibm.com/e_dir/eServerPrereq.nsf).

The adapter is supported on the following versions of the operating systems, depending on the system you are using:

- AIX
  - AIX 7.1with the 7100-03 Technology Level and Service Pack 3, or later
  - AIX 6.1, Technology Level 9, Service Pack 2, or later
- Linux
  - Red Hat Enterprise Linux Version 6.5, or later, with current maintenance updates available from Red Hat.
  - Red Hat Enterprise Linux Version 7, or later, with current maintenance updates available from Red Hat.
  - SUSE Linux Enterprise Server Version 12, or later
  - SUSE Linux Enterprise Server 11, Service Pack 3, or later, with current maintenance updates available from SUSE.
  - Ubuntu Server 14.04.3, or later
  - For support details, see the Linux Alert website (www14.software.ibm.com/webapp/set2/sas/f/lopdiags/info/LinuxAlerts.html).
- IBM i
  - IBM i is supported only with VIOS

This adapter requires the following drivers:

- AIX: `devices.pciex.e4148a1614109304` for SFP+ optical ports and `devices.pciex.e4148a1614109404` for RJ45 ports
- Linux: bnx2x driver
- 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).

Installing PCIe adapters in the 8348-21C

Learn how to install Peripheral Component Interconnect (PCI) Express (PCIe) adapters in the IBM Power System S812LC (8348-21C).

Before you begin

Power off the system and place it in the service position. For instructions, see "Preparing the system to remove and replace internal parts in the 8348-21C" on page 67.

About this task

See "PCIe adapter placement rules and slot priorities for the 8348-21C" 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 tailstock fillers are present.

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap attached. If not, attach it now.
2. Pick the correct slot for the PCIe adapter. See Figure 33 on page 56.
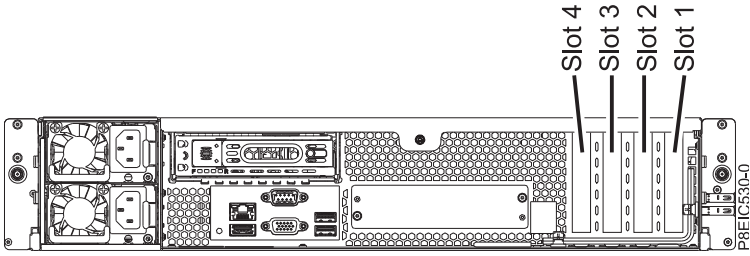
Figure 33. 8348-21C PCIe adapter slots

3. Remove the retaining screw **(A)** and remove the PCIe slot cover **(B)**. See Figure 34. Keep the retaining screw.

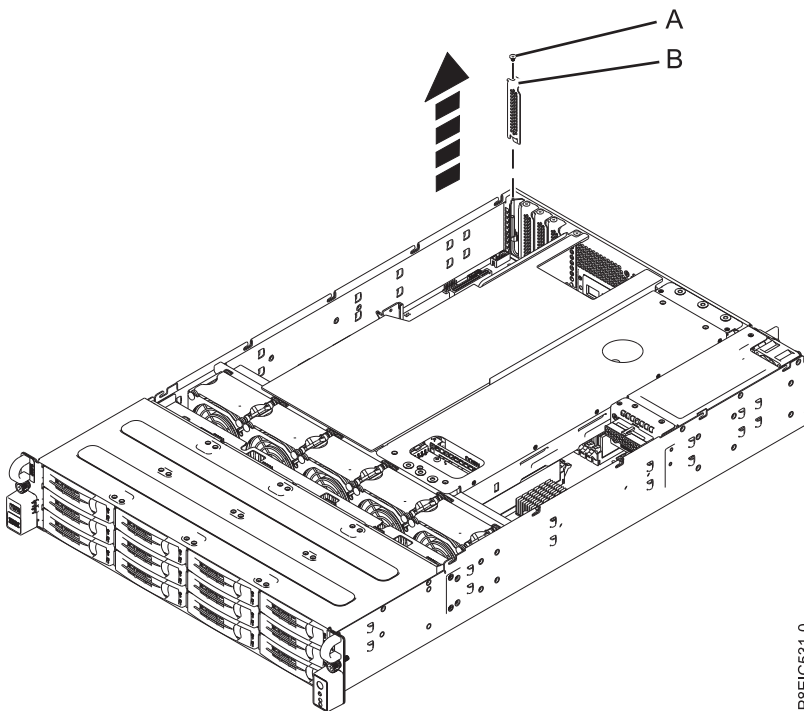*Figure 34. Removing the PCIe slot cover*

4. If you are installing a PCIe3 low profile 6 Gb SAS/SATA RAID adapter (FC EC3Y - PMC 71605E – see http://www.ibm.com/support/knowledgecenter/HW4P4/p8eic/fcec3y.htm), complete this step. Otherwise, skip this step and go to step 5 on page 58.

   a. Connect the signal cables for the disk drive to the RAID adapter before installing the adapter. See Figure 35 on page 57.
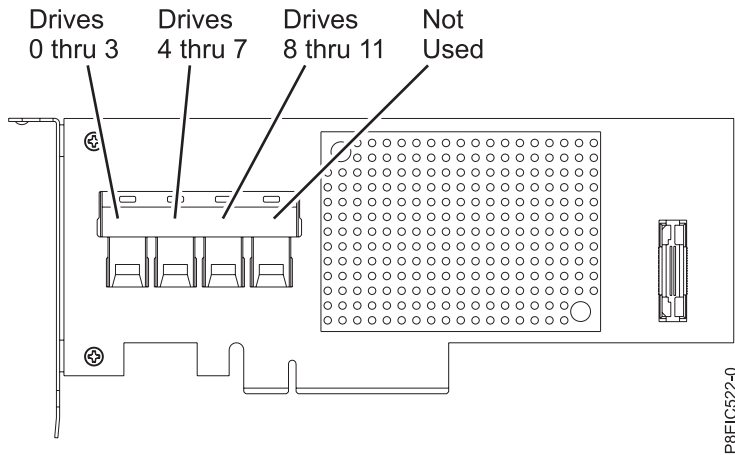
Figure 35. Cabling the PCIe3 low profile 6 Gb SAS/SATA RAID adapter (FC EC3Y - PMC 71605E)

b. Insert the RAID adapter **(A)** into the adapter slot of the system backplane PCIe, aligning the adapter properly and inserting it fully into the slot.

c. Insert the retaining screw **(B)** and tighten it to secure the RAID adapter in the system, as shown in Figure 36.
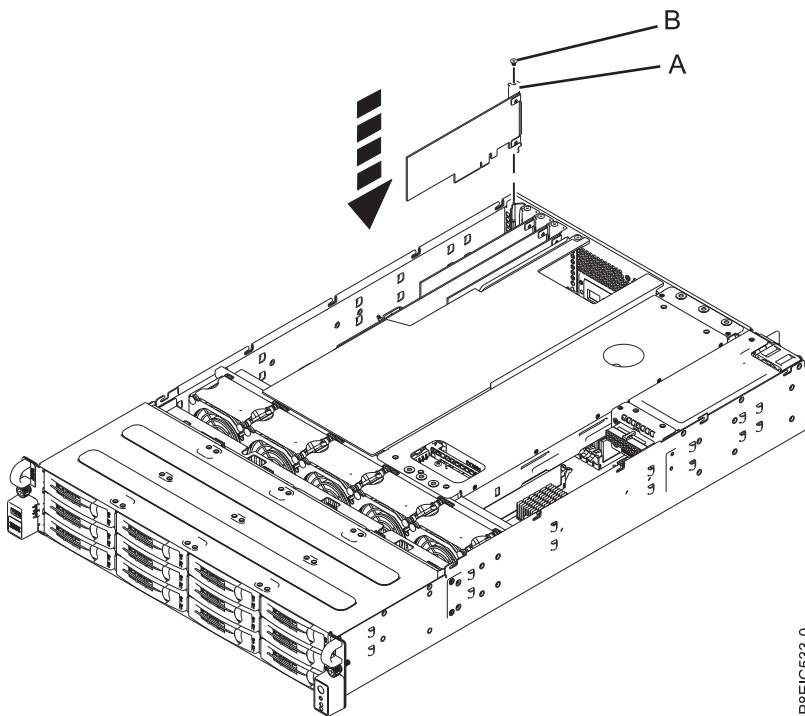

Figure 36. Installing the PCIe3 low profile 6 Gb SAS/SATA RAID adapter (FC EC3Y - PMC 71605E) (A) and screw (B) in the system

d. Remove any existing cable ties as they can prevent proper cable layout and interfere with the top cover.

e. Do not damage the adapters or cables.

Notes:

• Do not tie the cables together.

- Route the disk drive signal cables along the top of the PCIe adapters to keep the cables from damaging the adapters.
- Do not route the cables between the adapters.
- Spread the cables to ensure that the service access cover can be closed without pinching the cables. See Figure 37.
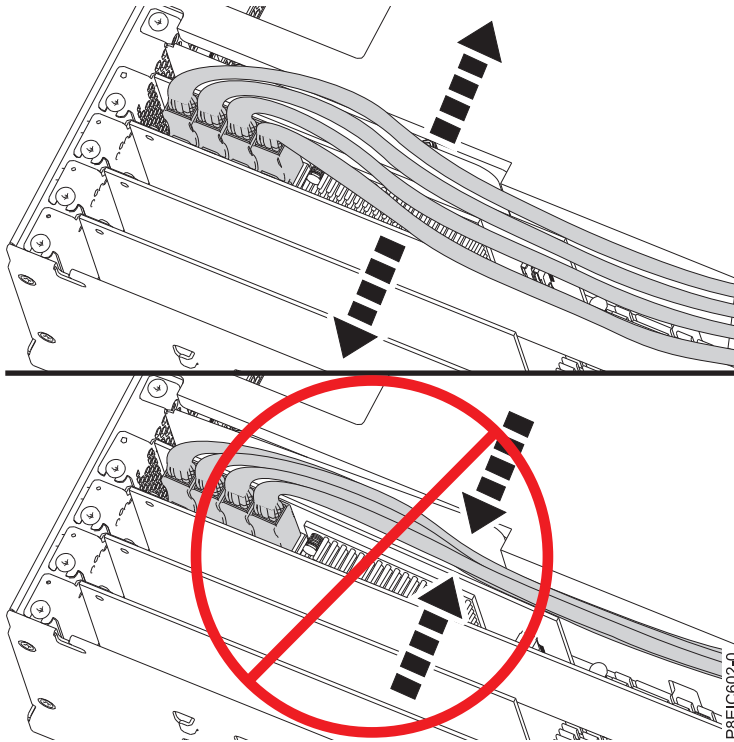

Figure 37. Routing the disk drive signal cables

      f. Go to step 10 on page 62.

5. If you are installing a PCIe3 low profile 12 Gb SAS/SATA RAID adapter with 1 GB protected write cache (FC EC3S - PMC 81605Z – see http://www.ibm.com/support/knowledgecenter/HW4P4/p8eic/fcec3s.htm), complete this step. Otherwise, skip this step and go to step 6 on page 61.

Note: The supercapacitor module card is shipped together with the PCIe Gen3 SAS/SATA RAID adapter (FC EC3S) as a single FRU and therefore the module card must also be replaced when the SAS RAID adapter is replaced.

    a. Insert the replacement supercapacitor module card **(A)** into the PCIe adapter slot of the system backplane, aligning the module properly and inserting it fully into the slot.

    b. Insert the retaining screw **(B)** and tighten it to secure the supercapacitor module card in the system, as shown in Figure 38 on page 59.

Figure 38. Replacing the supercapacitor module card (A) and screw (B)

    c. Connect the disk drive signal cables to the PCIe Gen3 SAS/SATA RAID adapter (FC EC3S) before installing the adapter. See Figure 39.

Figure 39. Cabling the PCIe Gen3 SAS/SATA RAID adapter (FC EC3S)

    d. Insert the replacement RAID adapter **(A)** into the PCIe adapter slot of the system backplane, aligning the adapter properly and inserting it fully into the slot.

    e. Insert the retaining screw **(B)** and tighten it to secure the PCIe adapter in the system, as shown in Figure 40 on page 60.
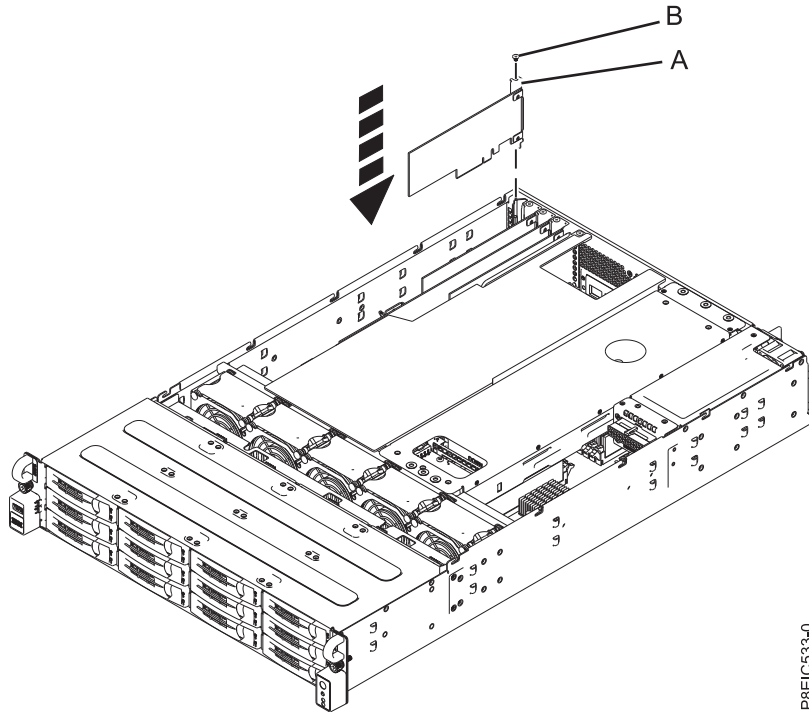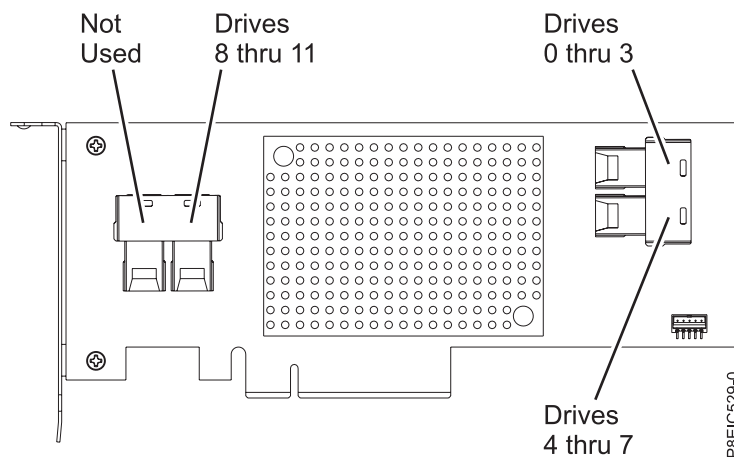
Figure 40. Installing the PCIe Gen3 SAS/SATA RAID adapter (FC EC3S) (A) and screw (B)

    f. Route the disk drive signal cables along the top of the PCIe adapters to keep the cables from damaging the adapters. Do not route the cables between the adapters. Spread the cables to ensure that the service access cover can be closed without pinching the cables. See Figure 41 on page 61 for an example of how to route the cables along the top of the PCIe adapters. Your cable connections may differ from Figure 41 on page 61, but how the cable is routed along the top of the PCIe adapters will not differ.

Figure 41. Routing the disk drive signal cable

     g. Go to step 10 on page 62.

6. If needed, label and remove any plugs that extend out of the PCIe adapter.
7. Insert the PCIe adapter **(A)** into the PCIe slot in the system backplane, aligning it properly and inserting it fully into the slot.
8. Insert the retaining screw **(B)** and tighten it to secure the PCIe adapter in the system, as shown in Figure 42 on page 62.
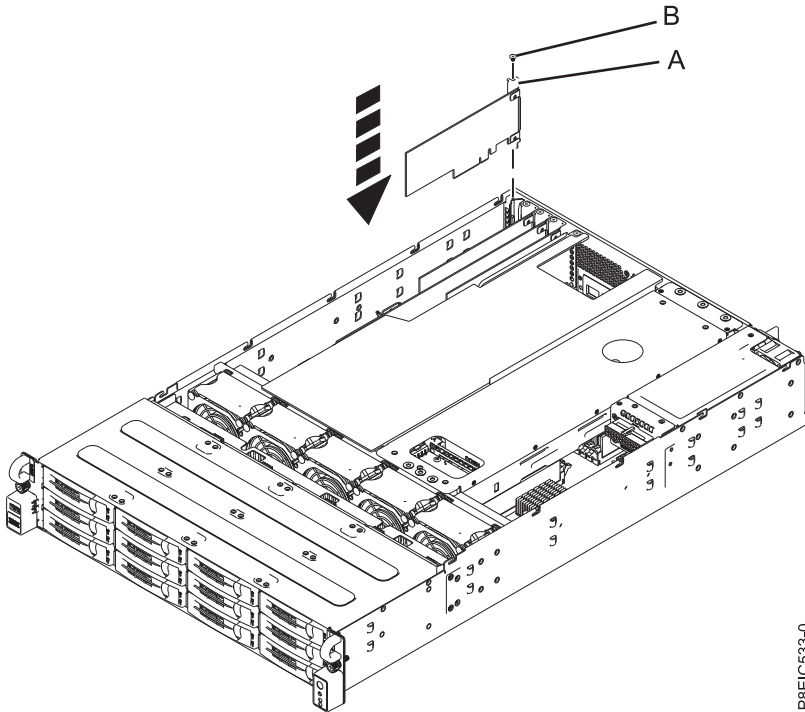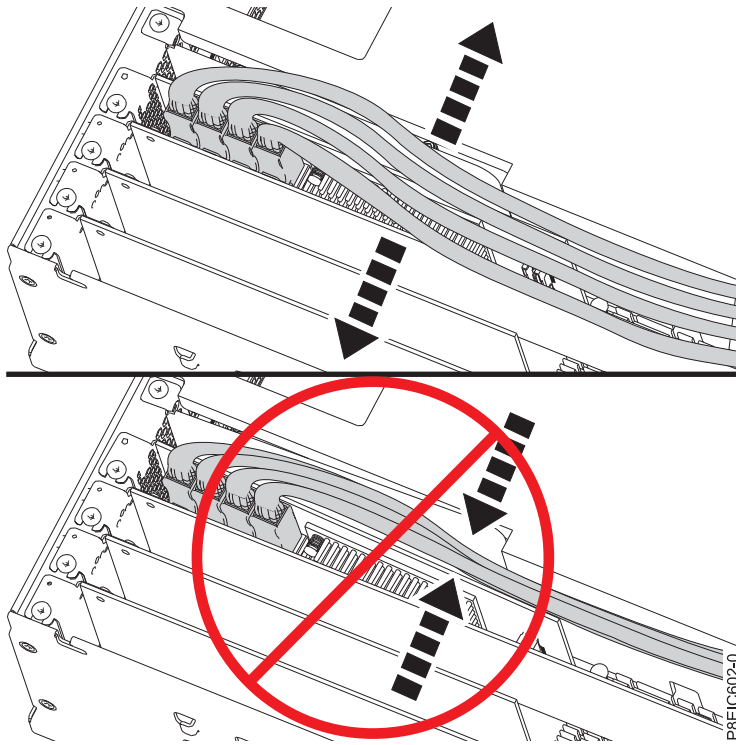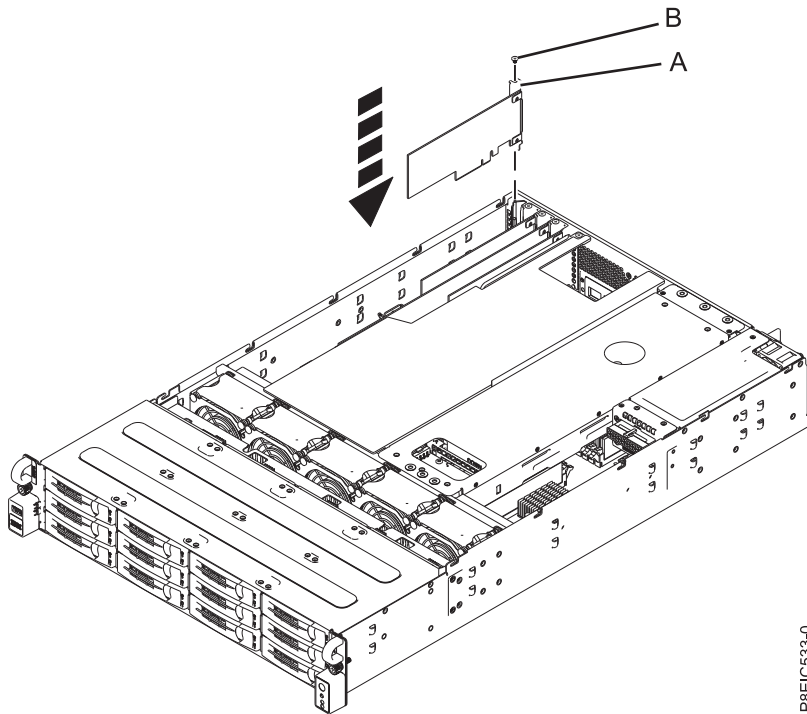
Figure 42. Installing the PCIe adapter (A) and screw (B)

9. Using your labels, replace any plugs that you removed from the PCIe adapter. Insert the cables into the PCIe adapter.

10. The procedure is complete.

What to do next

Prepare the system for operation. For instructions, see "Preparing the system for operation after removing and replacing internal parts for the 8348-21C" on page 69.

Common procedures for servicing or installing features in the 8348-21C

This section contains all the common procedures related to installing, removing, and replacing features in the IBM Power System S812LC (8348-21C) 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 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 required to support the new feature. See IBM Prerequisite.
2. If you are performing an installation or replacement procedure 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, open or close a latch, and so on. Terra-cotta might also indicate that the part can be removed and replaced with the system or logical partition power 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:
   - 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. Ensure that the top cover is on when running for thermal performance.
9. If you are installing new hardware in a logical partition, you need to understand and plan for the implications of partitioning your system. For information, see Logical Partitioning.

LEDs on the 8348-21C system

Use this information as a guide to the LEDs on the IBM Power System S812LC (8348-21C) 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.

These LEDs are located at the front (as shown in Figure 43 on page 66).
- The green LED and power button **(A)** indicates the power status.
  - A constant light indicates full system power to the unit.
  - A flashing light indicates standby power to the unit.
- The blue LED **(B)** is used to identify the system that requires service.
- The amber LED **(C)** indicates a problem in the system. After a part is repaired, the amber LED takes a minute to turn off.
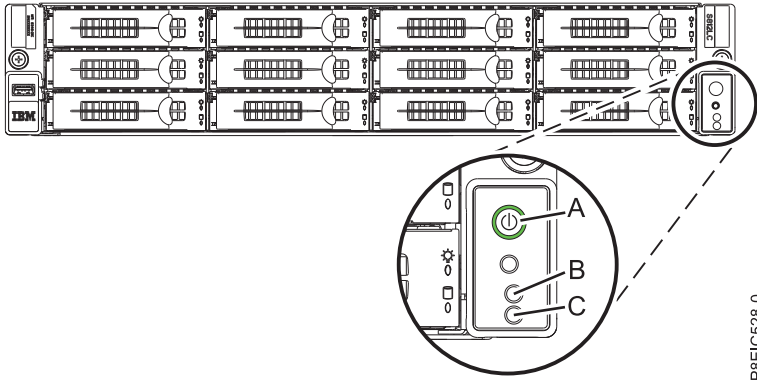
Figure 43. LEDs on the front of the 8348-21C system

LEDs are also located on the rear of the system; see Figure 44. The identify LED is at **(A)**.
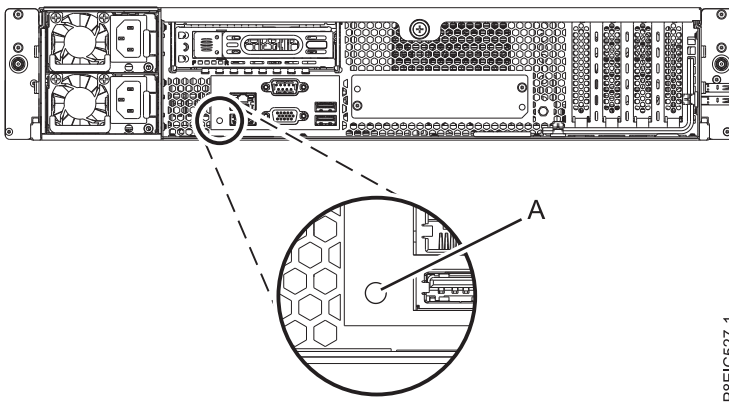

Figure 44. LEDs on the rear of the 8348-21C system

LEDs are located on the following parts:
- At the front of the system:
  - Disk drives:
    - Steady green LED indicates that the drive is present but has no activity
    - Blinking green LED indicates activity
    - Steady amber LED indicates a problem
    - 1 Hz blinking amber LED indicates identifier
    - 4 Hz blinking amber LED indicates that drive is rebuilding
- At the rear of the system:
  - LAN connectors
  - Power supplies: green LED indicates that power is on and functioning properly; amber LED indicates a problem with the power supply
  - PCIe adapters

Identifying the 8348-21C system that needs servicing

Use the blue identify LEDs on the front and rear panels to help you find the system that needs servicing.

Procedure
- You can press the identify LED button on the front panel to turn the blue identify LEDs on the front and rear panels on or off.

- You can use the **ipmitool** command to activate the blue identify LEDs.

  For in-band networks, run the following chassis identify command:

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

  Where:

  interface
  > The interface you are using to connect to the system. For example: usb.m

  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 it turns off. 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, run the following chassis identify command:

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

Preparing the system to remove and replace internal parts in the 8348-21C

Learn how to prepare the IBM Power System S812LC (8348-21C) system to remove and replace internal parts.

About this task

The front disks can be removed and replaced when the system is running and the system power is on.

Procedure

1. Complete the prerequisite tasks. For instructions, see "Before you begin" on page 62.
2. Identify the system that you need to work on. For instructions, see "Identifying the 8348-21C system that needs servicing" on page 66.
3. If applicable, open the rack front door.
4. Attach the electrostatic discharge (ESD) wrist strap.

   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.
5. Stop the system. For instructions, see "Stopping the 8348-21C system" on page 71.
6. If applicable, open the rack door at the rear of the system.
7. Disconnect the power source from the system by unplugging the system. For instructions, see "Disconnecting the power cords from an 8348-21C system" on page 74.

   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.
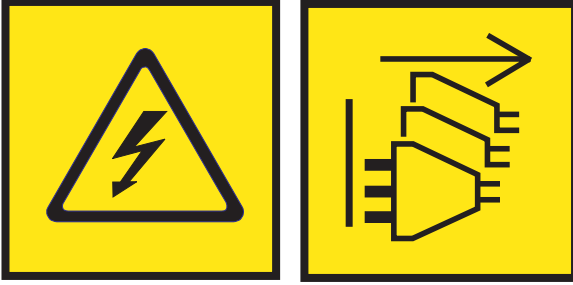
   (L003)
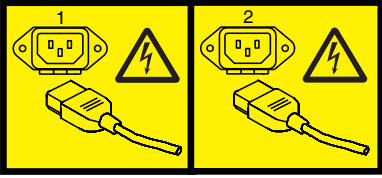
or
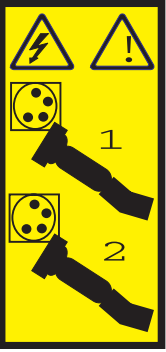
or

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)

8. Place the system into the service position. For instructions, see "Placing an 8348-21C system into the service position" on page 76.

   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
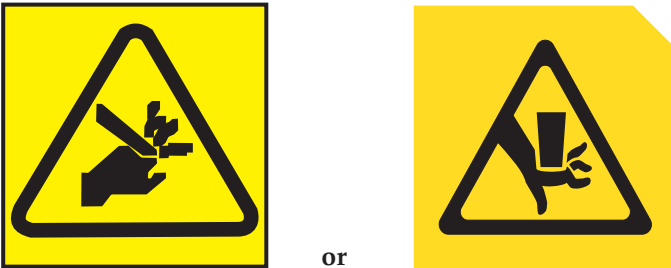
   CAUTION: Pinch hazard. (L012)

9. Remove the service access cover. For instructions, see "Removing the service access cover from an 8348-21C system" on page 78.

Preparing the system for operation after removing and replacing internal parts for the 8348-21C

Learn how to prepare the IBM Power System S812LC (8348-21C) system for operation after removing and replacing internal parts.

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap attached. If not, attach it now.

2. Replace the service access cover. For instructions, see "Installing the service access cover on an 8348-21C system" on page 79.

3. Place the system into the operating position. For instructions, see "Placing an 8348-21C system into the operating position" on page 77.

   (L012)

or

CAUTION: Pinch hazard. (L012)

4. Reconnect the power cords to the system. For instructions, see "Connecting the power cords to an 8348-21C system" on page 75.

5. If applicable, close the rack door at the rear of the system.

6. Start the system. For instructions, see "Starting the 8348-21C system" on page 71.

7. If applicable, close the rack front door.

8. Did you install or replace one of the following PCIe3 adapters?
   - PCIe3 low profile 6 Gb SAS/SATA RAID adapter (FC EC3Y)
   - PCIe3 low profile 12 Gb SAS/SATA RAID adapter with 1 GB protected write cache (FC EC3S)

Option	Description
Yes	Continue with the next step.
No	Go to step 14 on page 71.

9. Is your operating system stored on a front drive?

Option	Description
Yes	Continue with the next step.
No	Go to step 12 on page 71.

10. From another system that is running, go to the PMC Adaptec downloads website (http://i.adaptec.com/power) and copy the following two files to a portable USB device:
    - **Arcconf-1.0*n*-21*nnn*.pb-plugin**
    - Latest firmware
      - If you have a Series 7 adapter copy (EC3Y - PMC 71605E) **as716E01.ufi**.
      - If you have a Series 8 adapter copy (EC3S - PMC 81605Z) **AS816Z01.ufi**.

11. From the system where the adapter was replaced, plug the portable USB device into the front USB port and complete the following steps:
    a. From the Petitboot menu select **Exit to shell**.
    b. Locate the USB device in the subdirectory /var/petitboot/mnt/dev/sd*nn*.
    c. Type the following command to load the arcconf tool:
       - `pb-plugin install /var/petitboot/mnt/dev/sdnn/Arcconf-1.0n-21nnn.pb-plugin` where sd*nn* is the portable USB device, and `Arcconf-1.0n-21nnn.pb-plugin` is the arcconf file that you copied in step 10.
    d. Copy the firmware file for your adapter that was copied in step 10 to the **/var** directory by entering the following command:
       - `cp /var/petitboot/mnt/dev/<sdnn>/<latest firmware>.ufi /var`
    e. Download the latest firmware to your adapter by entering the following command:
       - `arcconf romupdate 1 /var/<latest firmware>.ufi`

f. Reboot the system.

g. Go to step 13.

12. Update the adapter firmware. See Getting firmware fixes for vendor I/O adapters by using the vendor website.

13. Set the **BACKPLANEMODE BIOS** parameter by entering the following command:

- `arcconf setbiosparams 1 backplanemode 1`

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

Starting the 8348-21C system

You can use the power button to start the IBM Power System S812LC (8348-21C) 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. Open the front rack door, if necessary.

2. Before you press the power button, ensure that the power supplies are connected to the system unit and verify the following items:

- All system power cables are connected to a power source.
- The power-on LED, as shown in Figure 45, is flashing. A flashing light indicates standby power to the unit.

3. Press the power button **(A)** shown in Figure 45. The power-on light stops flashing and remains on, indicating that the system power is turned on. The system cooling fans operate at a high speed, and after approximately 30 seconds, return to operating speed.
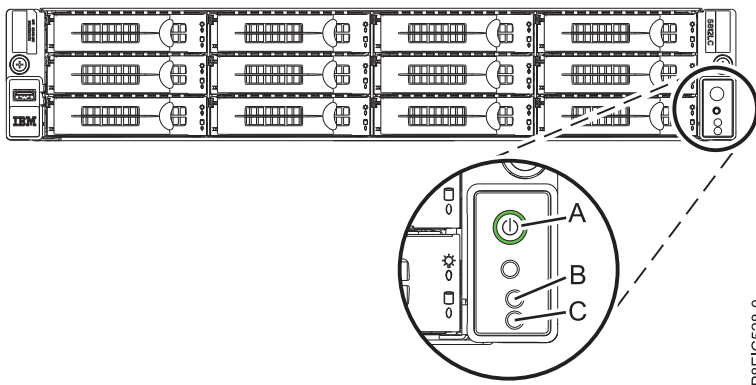

Figure 45. Power button

What to do next

If pressing the power button does not start the system, then contact your next level of support or your service provider.

Stopping the 8348-21C system

Learn how to stop the IBM Power System S812LC (8348-21C) system to complete another task.

Procedure

You can use the Linux **shutdown** command to stop and power down the system.
From a Linux command prompt, run the following command to shut down the system in 10 minutes and send the message "System shutdown in 10 minutes; repairs coming." to the users.

```
shutdown -P +10 "System shutdown in 10 minutes; repairs coming."
```

The -P setting instructs the system to shut down and then power off.

Event sensor status GUI display

The event sensor status 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 event sensor status GUI display, log in to the BMC web interface. The sensors and values appear on the first page (the dashboard).

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

Event sensor status 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 with a few exceptions, indicated in Table 15 on page 73.

Event 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 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)

Sensor state values during boot process

The key stages of operation.

Initial power on to BMC ready state

In this stage, some indicator values might not reflect the status of the physical sensor. In some instances, the state is not available because the sensor is not initialized; in this case, the sensor color is gray. In other cases (typically associated with Host Boot sensors), the value of the sensor shows the state when the system was operational. These sensors update to indicate the current status if the display is refreshed when the system reaches the Petitboot stage of operation. Table 15 shows the affected indicators.

BMC ready to PetitBoot or Host operation state

When the system reaches the Petitboot menu stage, and you refresh the display, all of the indicators reflect their operational state.

Table 15. Sensors and values during the stages of system operation

Sensor Name	Value at BMC Ready	Value at Petitboot or Later
Mem Buf Temp x (x = 0 - 7)	Not Available	Current
CPUx Temp (x = 0 - 1)	Not Available	Current
CPU Core Temp x (x = 0 - 23)	Not Available	Current
DIMMx Temp (x = 0 – 31)	Not Available	Current
GPU Temp x (x = 1 – 4)	Not Available	Current
CPU Diode x (x = 1 – 2)	Current	Current
Ambient Temp	Current	Current
CPU VDD Volt	Not Available	Current
CPU VDD Current	Not Available	Current
Fan x (x = 0 – 5)	Not Available	Current
Mem Buf Func x (X = 0 – 7)	From Previous IPL	Current
DIMM Func x (x = 0 – 31)	From Previous IPL	Current
GPU Func x (x = 1 – 4)	Not Available	Current
CPU Core Func x (x = 0 – 23)	From Previous IPL	Current
CPU Func x (X = 0 – 1)	From Previous IPL	Current
Checkstop	Current	Current
Quick Power Drop	Current	Current
OCC x Active (x = 1 – 2)	Current	Current
PSU Fault x (x = 1 – 2)	Current	Current
All Pgood	Current	Current
FW Boot Progress	From Previous IPL	Current
Host Status	Current	Current
Watchdog	From Previous IPL	Current
System Event	From Previous IPL	Current
OS Boot	From Previous IPL	Current
PCI	From Previous IPL	Current
Mem ProcX Pwr (x = 0 – 3)	From Previous IPL	Current
Procx Power (x = 0 – 1)	From Previous IPL	Current
PCIE Procx Pwr (x = 0 – 1)	From Previous IPL	Current
Fan Power A (Fan Power)	From Previous IPL	Current
Mem Cache Power	From Previous IPL	Current

Table 15. Sensors and values during the stages of system operation (continued)

Sensor Name	Value at BMC Ready	Value at Petitboot or Later
12V Sense	From Previous IPL	Current
GPU Sense (GPU Power)	From Previous IPL	Current
IO (A-B) Power	From Previous IPL	Current
Storage Power (A-B)	From Previous IPL	Current
Motherboard Flt	From Previous IPL	Current
Ref Clock Fault	From Previous IPL	Current
PCI Clock Fault	From Previous IPL	Current
TOD Clock Fault	From Previous IPL	Current
APSS Fault	From Previous IPL	Current
BMC Golden Side	Current	Current
BIOS Golden Side	Current	Current
Boot Count	Current	Current
Activate Pwr Lt	From Previous IPL	Current
PS Derating Fac	Current	Current
NxtPwr Redundant	Current	Current
CurPwr Redundant	Current	Current
System Power	Not Applicable	Current if applicable
Freq Limit OT x (x = 1 - 2)	Not Applicable	Current if applicable
Freq Limit Pwr x (x = 1 - 2)	Not Applicable	Current if applicable
CPU x VDD Temp (x = 1 - 2)	Not Applicable	Current if applicable

Disconnecting the power cords from an 8348-21C system

Learn how to disconnect the power cords from an IBM Power System S812LC (8348-21C) system.

Procedure

1. Open the rear rack door on the system unit that you are servicing.
2. Identify the system unit that you are servicing in the rack.
3. Disconnect the power cords from the power supply handle.
4. Label and disconnect the power cords from the system unit. See figure Figure 46 on page 75.

Note: This system is equipped with two power supplies. If the removing and replacing procedures require the system power to be turned off, ensure that all the power sources to the system have been completely disconnected.
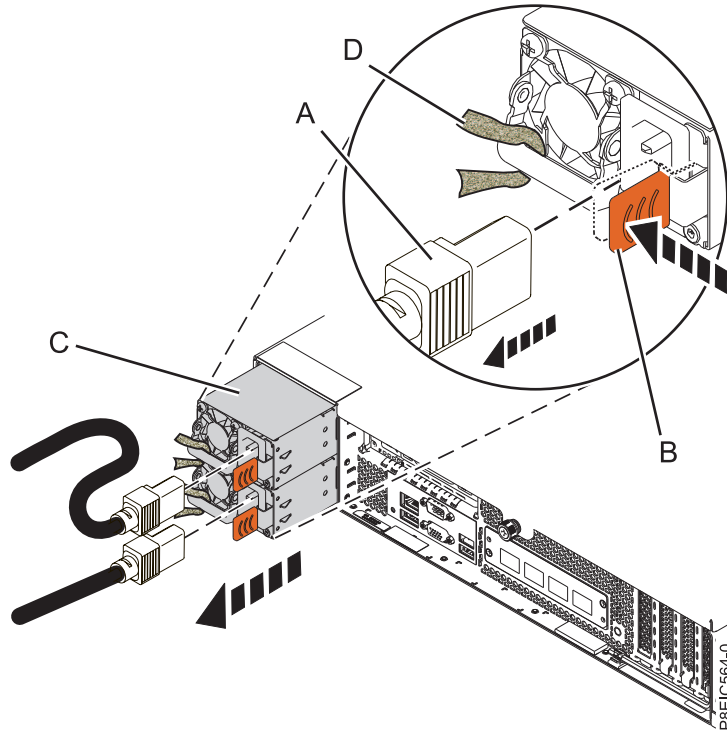
Figure 46. Removing the power cords from the system

Connecting the power cords to an 8348-21C system

Learn how to connect the power cords to an IBM Power System S812LC (8348-21C) system.

Procedure

1. Open the rear rack door on the system unit that you are servicing.
2. Using your labels, reconnect the power cords to the system unit. See figure Figure 47 on page 76.
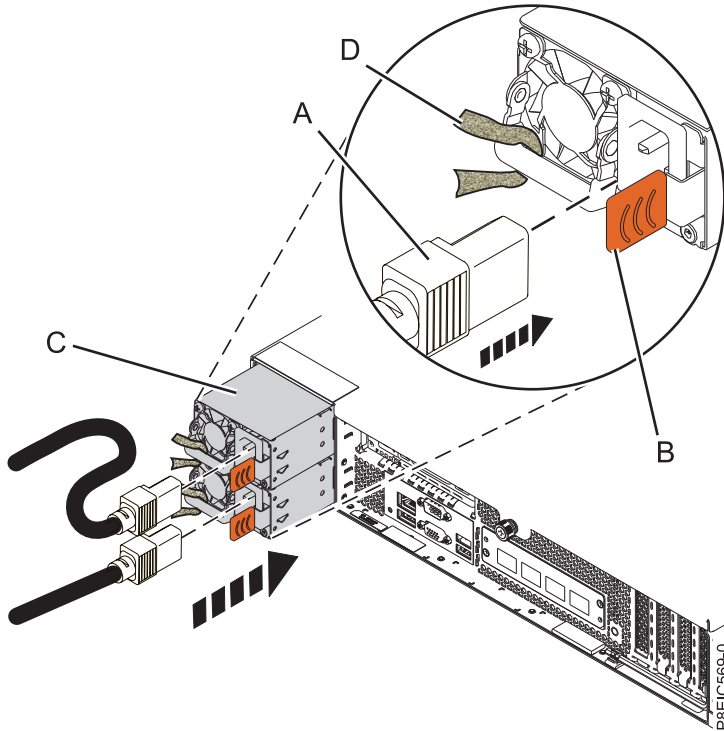
Figure 47. Connecting the power cords to the system

3. Loop and attach the power cords to the power supply handle.
4. Close the rack door at the rear of the system.

Placing an 8348-21C system into the service position

Learn how to place an IBM Power System S812LC (8348-21C) system into the service position.

Before you begin

Notes:
- When you place the system into the service position, ensure that all stability plates are firmly installed to prevent the rack from toppling. Ensure that only one system unit is in the service position at a time.
- Ensure that the cables at the rear of the system unit do not catch or bind as you pull the system unit forward in the rack.
- When the rails are fully extended, the rail safety latches lock into place. This action prevents the system from being pulled out too far.

Procedure

1. Remove the front screws that secure the system to the rack from both sides of the system.
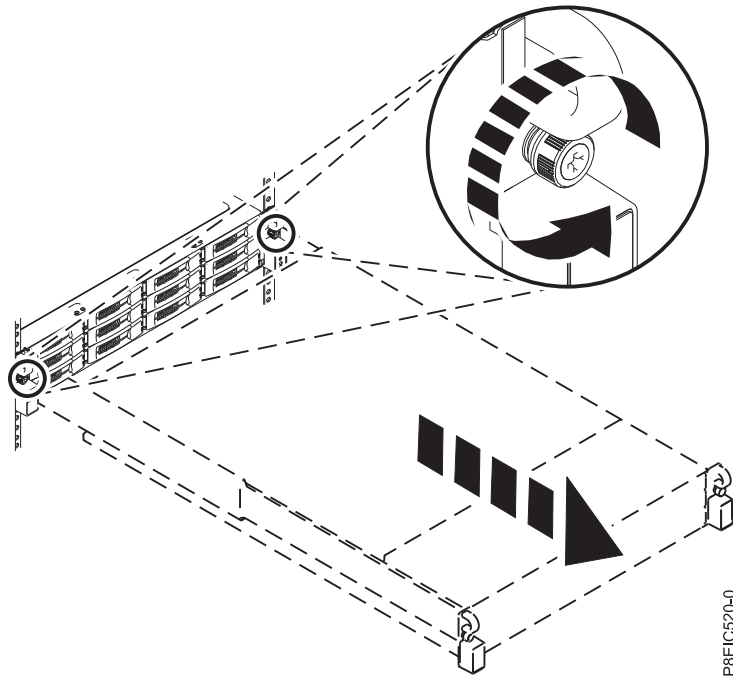
Figure 48. Removing the front screws and removing the system from the rack

2. Pull the system unit out of the rack.
3. If you are working on the front USB and cable, you must remove the system from the rails. You must also remove the left rail holder to access the mounting screws on the side of the system.
4. If you are working on the power switch and cable, you must remove the system from the rails. You must also remove the right rail holder to access the mounting screws on the side of the system.
5. If you are working on the disk drive backplane, and did not remove the lower side screws during installation, you must remove the system from the rails. You must also remove both rail holders to access the lower mounting screws on the side of the system.

   If you did remove the lower side screws during installation, you can service the system while it remains in the rails.
6. If you are working on the system backplane, the recommendation is to remove the system from the rails.
7. If you need to remove the system from the rails, use a lift tool or seek the help of a second person. If a second person is not available, you can also make the system lighter by doing the following steps:

   a. Remove the power supplies. For instructions, see "Removing a power supply from the 8348-21C" on page 83.
   b. Label and remove the front drives, keeping track of their locations. For instructions, see "Removing a front drive in the 8348-21C" on page 85.

Placing an 8348-21C system into the operating position

Learn how to place an IBM Power System S812LC (8348-21C) system into the operating position.

Before you begin

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

Procedure

1. If you removed the rail holders from the side of the system, reattach the rail holders. Replace the screws that secure the rail holders to the system.
2. If you removed the system from the rails, reattach the system to the rails. Depending on the weight of the system, you need two people to lift the system, carry it, and replace it in the rack.
3. If you removed the power supplies, replace them. For instructions, see "Replacing a power supply in the 8348-21C" on page 84.
4. If you removed the front drives, replace them in their proper locations. For instructions, see "Replacing a front drive in the 8348-21C" on page 88.
5. Release the rail safety latches **(A)** by lifting them upward, as shown in Figure 49, then push the system fully into the rack.
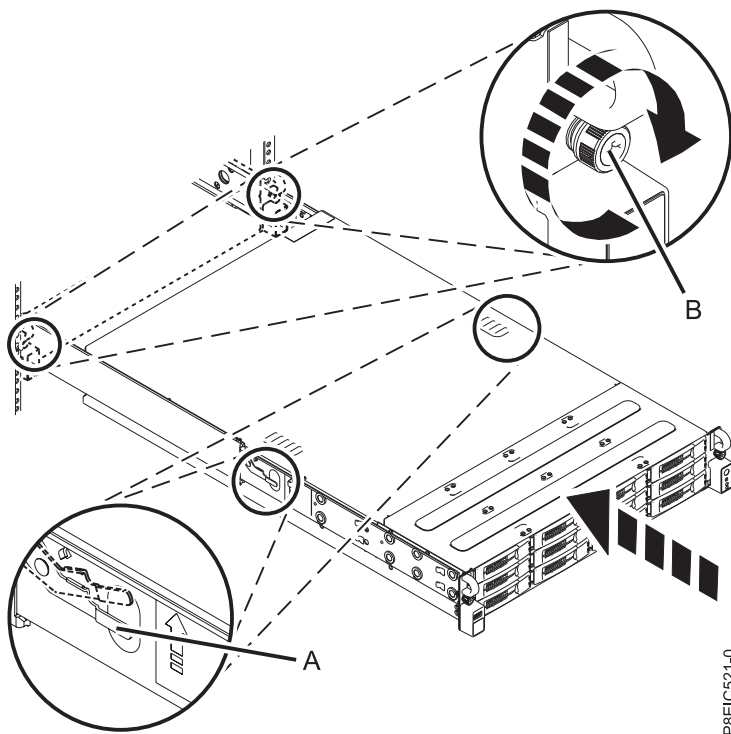

Figure 49. Placing the system into the operating position

6. Fasten the two front screws **(B)** to secure the system to the rack.

Removing the service access cover from an 8348-21C system

Learn how to remove the service access cover from an IBM Power System S812LC (8348-21C) system.

Before you begin

Ensure that the power plugs are removed from the power supplies.

Procedure

1. At the rear of the system, loosen the cover screw **(A)** that fastens the cover to the chassis. See Figure 50 on page 79.
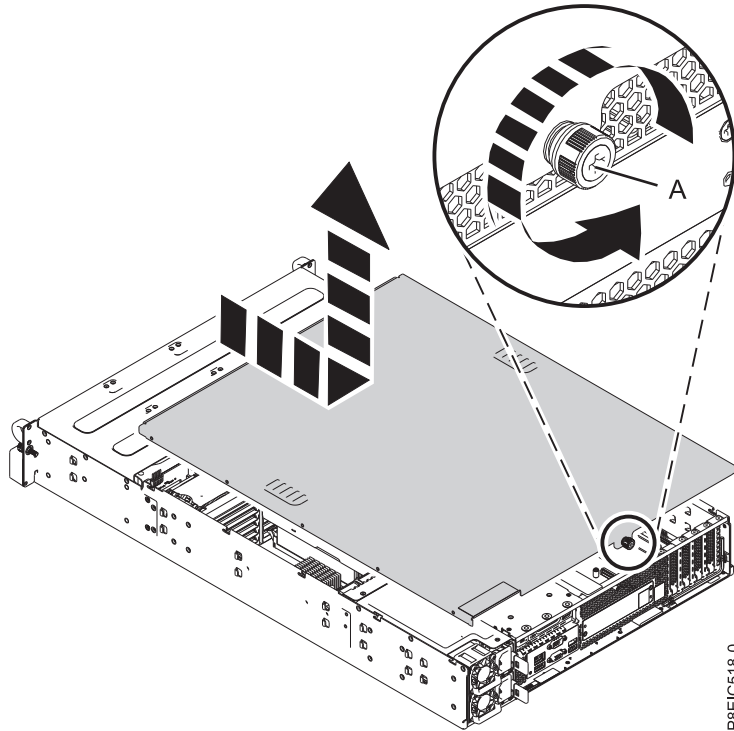
Figure 50. Removing the service cover

2. Slide the cover toward the rear of the system unit. When the front of the service access cover clears the upper frame ledge, lift the cover up and off the system unit.

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

Installing the service access cover on an 8348-21C system

Learn how to install the service access cover on a rack-mounted IBM Power System S812LC (8348-21C) 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 cover on the system unit such that the alignment pins on the cover are aligned to the slots on the chassis. Slide the cover forward. See Figure 51 on page 80.
2. Fasten the cover with the cover screw **(A)**. See Figure 51 on page 80.
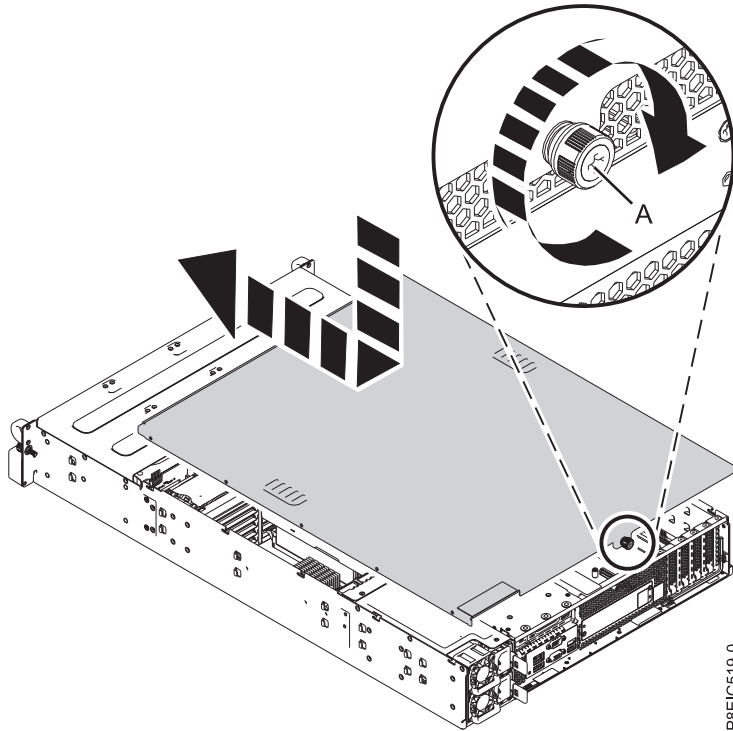
Figure 51. Replacing the service cover

Removing the processor baffle from an 8348-21C system

Learn how to remove the processor baffle from an IBM Power System S812LC (8348-21C) system.

Procedure

Remove the processor baffle as shown in Figure 52 on page 81.
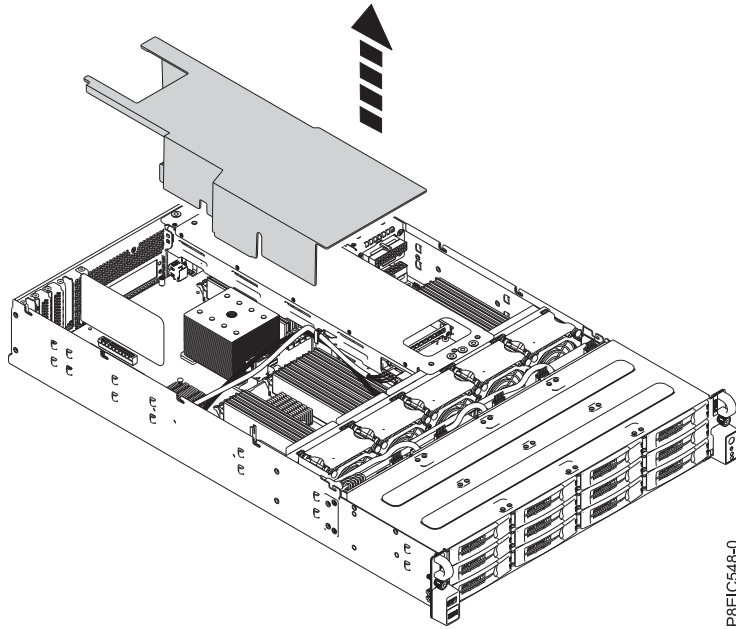
Figure 52. Removing processor baffle

Replacing the processor baffle in an 8348-21C system

Learn how to replace the processor baffle in an IBM Power System S812LC (8348-21C) system.

Procedure

1. Route the drive signal cable and drive power cable through the cable slot **(A)** in the baffle, as shown in Figure 53 on page 82.
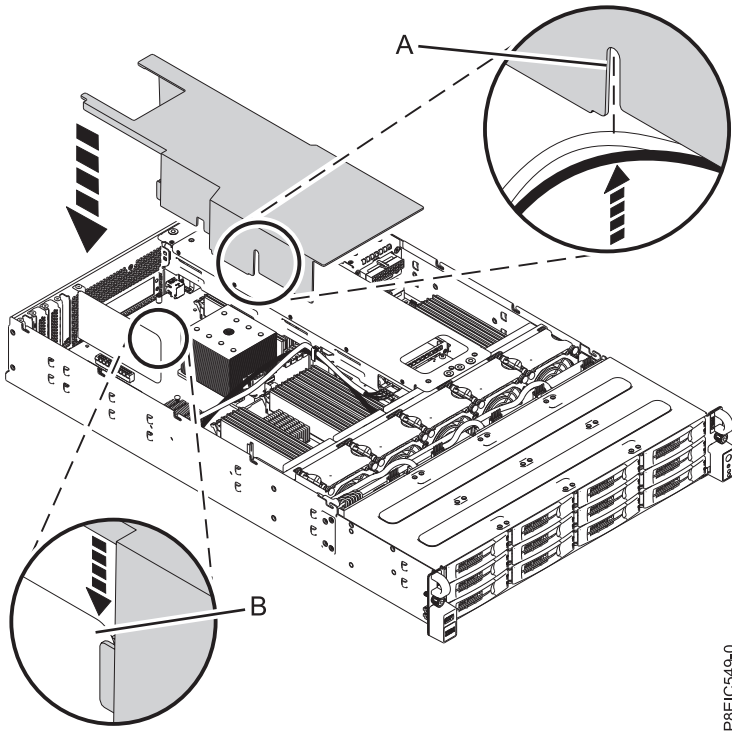
Figure 53. Replacing the processor baffle. Route the drive signal cable and drive power cable through **(A)**; align the air divider at **(B)**.

2. Align the air divider **(B)** into the air divider slot in the baffle, as shown in Figure 53.
3. Carefully press the baffle fully into the system.

Additional procedures

Removing a power supply from the 8348-21C

Learn how to remove a power supply in the IBM Power System S812LC (8348-21C) system.

Before you begin

Power off the system and place it in the service position. For instructions, see "Preparing the system to remove and replace internal parts in the 8348-21C" on page 67.

Procedure

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

   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.

2. Label and disconnect the power cord from the failed power supply. For instructions, see "Disconnecting the power cords from an 8348-21C system" on page 74.

3. Remove the power supply from the system.

   a. To unseat the power supply from its position in the system, push the locking-tab **(B)** in the direction shown. See Figure 54 on page 84.

   b. Grasp the power supply handle with one hand, and pull the power supply **(C)** out of the system about 5 cm (2 in).

   c. Place your other hand underneath the power supply, pull the power supply completely out of the system, and place it on an ESD mat.
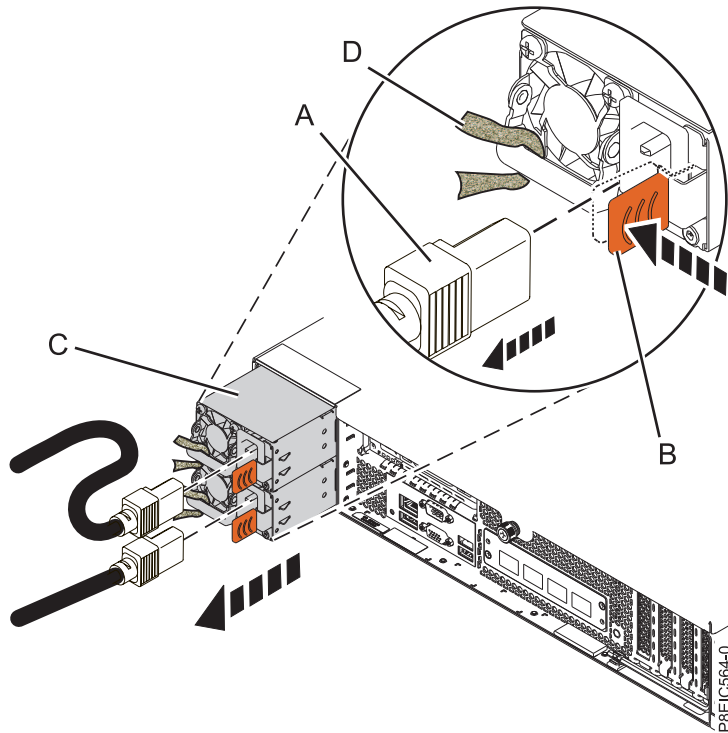
Figure 54. Removing a power supply from the system

Replacing a power supply in the 8348-21C

Learn how to replace the power supply in the IBM Power System S812LC (8348-21C) system.

Procedure

1. Align the power supply **(C)** with the bay and slide the power supply into the system until the latch **(B)** locks in place. See Figure 55 on page 85.
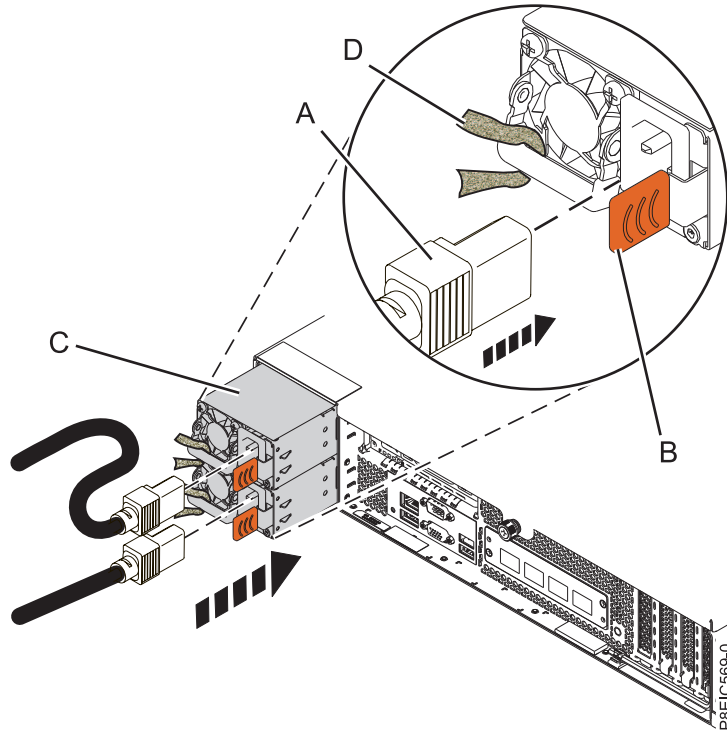
Figure 55. Replacing a power supply in the system

2. Connect and fasten the power cord to the power supply.

   a. Connect the power cord to the power supply, as shown in Figure 55.

   b. Use the hook-and-loop fastener and tie the power cord to the power supply handle.

      Attention: This system is equipped with two power supplies. Before you continue with this procedure, connect all power cords to the power supplies and strap them.

   c. Loop the power cables. For instructions, see "Connecting the power cords to an 8348-21C system" on page 75.

What to do next

See "Preparing the system for operation after removing and replacing internal parts for the 8348-21C" on page 69.

Removing a front drive in the 8348-21C

Learn how to remove a front drive in the IBM Power System S812LC (8348-21C) system. The front disks can be removed and replaced when the system is running and the system power is on.

Procedure

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

   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.

2. If the device is part of a fault tolerant logical drive, the OS will continue to access the logical drive. Continue to step 3.

   If the device falls into any of the following categories, make sure that the OS is not actively using the device before continuing to step 3.

   - A raw disk
   - A member of a simple volume
   - A member of a raid 0 logical drive

3. Identify device and prepare it for removal.

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

      ```
      arcconf getconfig 1
      ```

   b. 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)
      ```

   c. Take the drive off line. Run the following **arcconf setstate** command, using the Channel and Device numbers from the **arcconf getconfig** command: This will also activate the Fault LED on the drive.

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

   d. You can now physically remove the drive from the system.

4. Unlock the drive tray handle by pushing the handle release **(A)** in the direction shown. The handle **(B)** snaps out towards you. If the handle does not snap out all the way, the drive tray does not slide out of the system, as shown in Figure 56 on page 87.
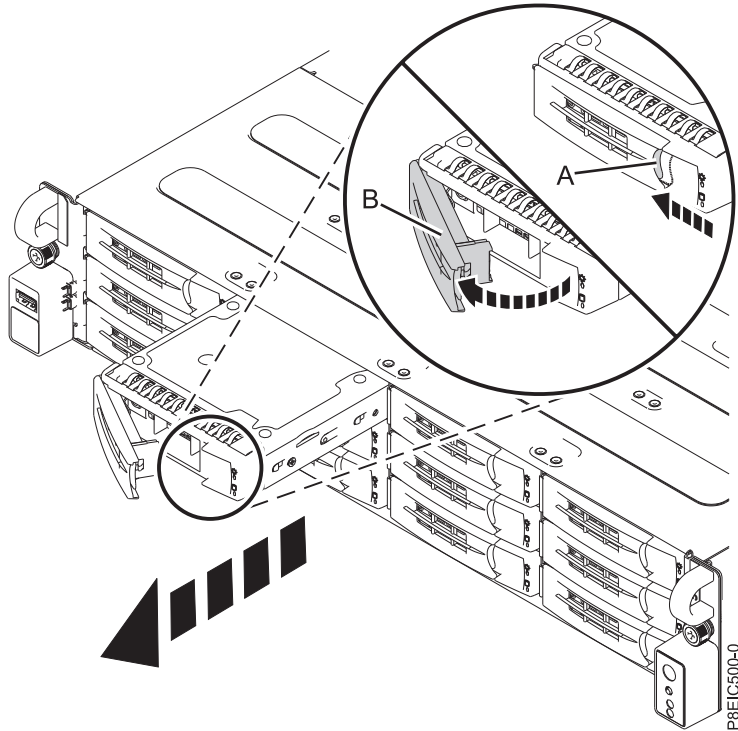
Figure 56. Removing a front drive tray

5. Support the bottom of the drive tray as you slide it out of the system. Do not hold the drive tray by the handle.

6. If you are removing more than one drive, repeat the steps 3 on page 86 to 5 in this procedure until all drives are removed.

7. Remove a drive from the tray.

   • For a 3.5 inch drive, unfasten the drive from the sides of the tray by removing four screws (2 on each side), as shown in Figure 57 on page 88.
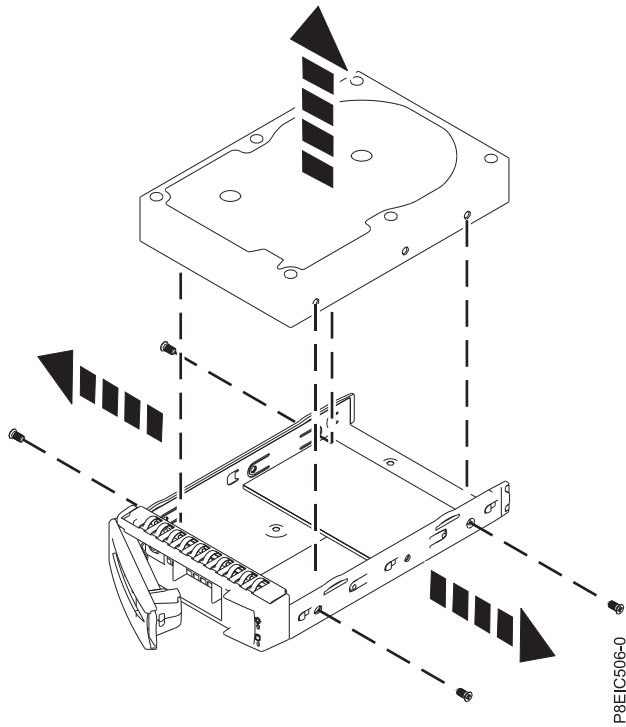
Figure 57. Removing the 3.5 inch drive from the tray

- For a 2.5 inch drive, turn the tray over. Unfasten the drive from the bottom of the tray by removing four screws, as shown in Figure 58.
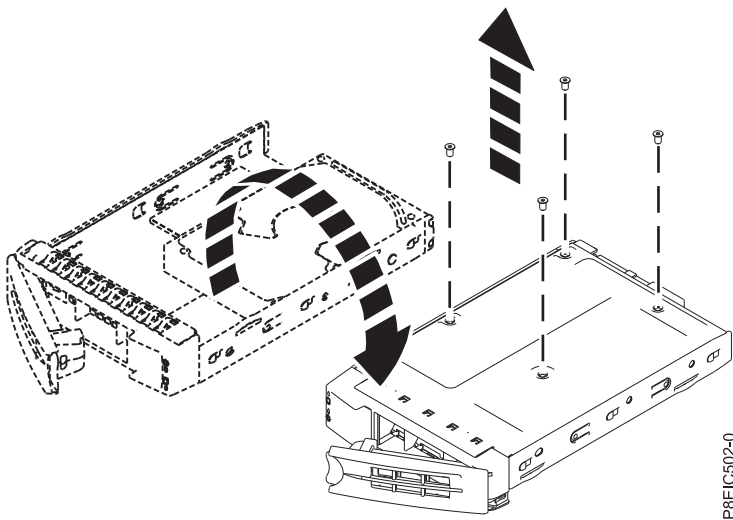
Figure 58. Removing the 2.5 inch drive from the tray

Replacing a front drive in the 8348-21C

Learn how to remove a front drive in the IBM Power System S812LC (8348-21C) system.

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap attached. If not, attach it now.

2. 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 59. Fasten the drive to the sides of the tray with four screws (2 on each side).

Figure 59. Mounting the 3.5 inch drive in the tray

   - A 2.5 inch drive must be positioned at the rear of the tray. While you hold both the drive and the tray, turn the tray over. Fasten the drive to the bottom of the tray with four screws, as shown in Figure 60.

Figure 60. Mounting the 2.5 inch drive in the tray
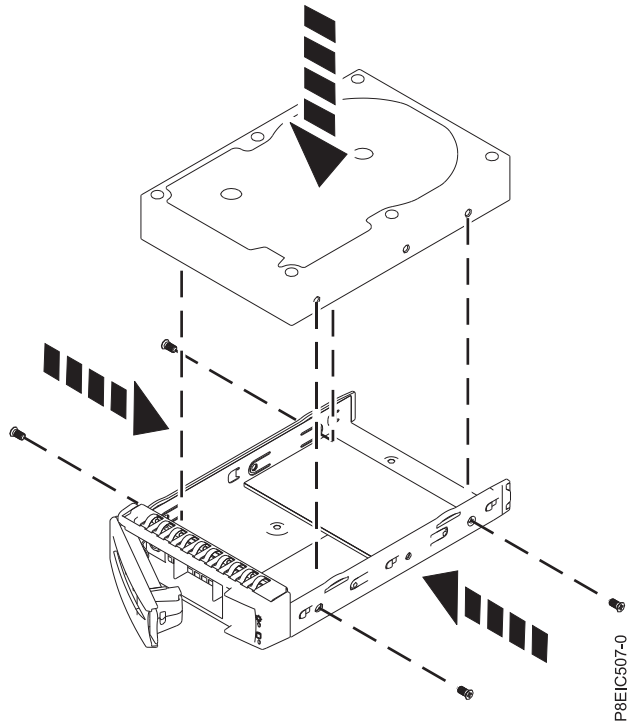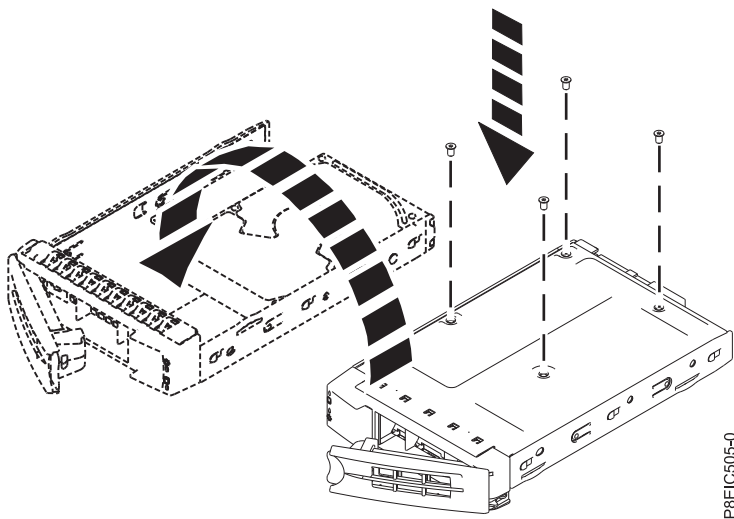
3. Hold the drive tray by the bottom as you position the drive tray. Slide the drive try all the way into the system. Push the drive tray in until the drive tray handle **(A)** starts to close, then push the handle in until it locks, as shown in Figure 61.
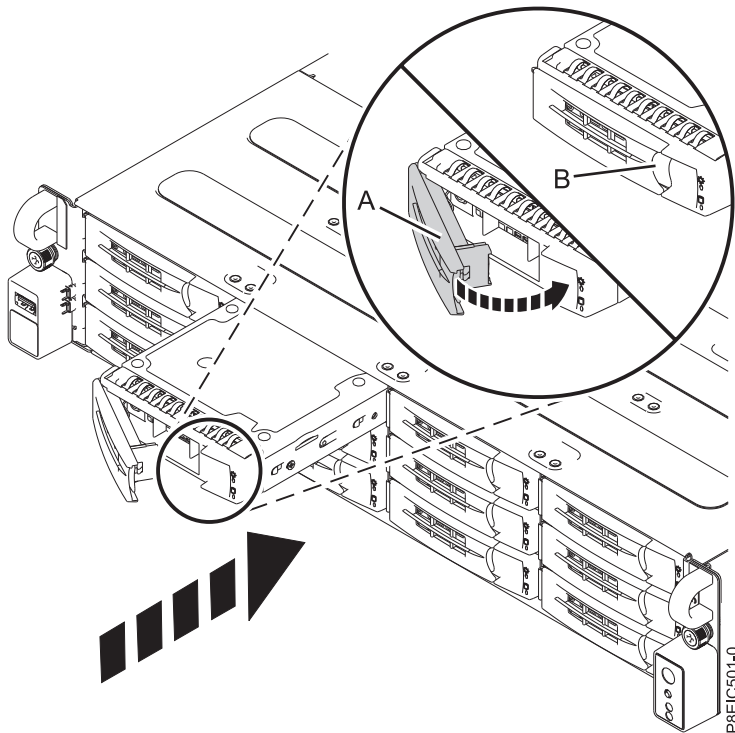

Figure 61. Locking the drive tray handle

4. Lock the drive tray handle **(A)** by pushing the handle in until it clicks into place.
5. Configure the installed or replaced drive for your environment.
   a. After you insert a new drive, you must 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 may 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/adding_storage-device-or-path.html)
   b. Load or restore data from your backup media. If a drive failed, refer to Recovering from a Disk Drive Failure (www.adaptec.com/en-us/support/infocenter/release-2015-1/index.jsp?topic=/RAID_IUG.xml/Topics/Recovering_from_a_Disk_Drive_Failure.html).

Getting firmware fixes for vendor I/O adapters by using the vendor website

Learn how to get vendor I/O adapter firmware fixes by using the vendor website.

About this task

To get fixes for the vendor I/O adapter firmware, complete the following steps:

Procedure

1. Go to the vendor website listed for your I/O adapter in Table 16.
2. Follow the on-screen instructions to download and install the I/O adapter firmware fixes to your system.

Table 16. Vendor websites

Name	Website
Broadcom	Broadcom website (http://www.broadcom.com/support/)
Emulex	Emulex website (http://www.emulex.com/products/ethernet-networking-storage-connectivity/ethernet-networking-adapters/ibm-branded/selection-guide/)
Marvell	Marvell website (http://www.marvell.com/storage/system-solutions/sata-controllers/)
Mellanox	Mellanox website (http://www.mellanox.com/page/oem_firmware_download)
NVIDIA	NVIDIA website (http://www.nvidia.com)
PMC-Sierra	PMC-Sierra website (http://i.adaptec.com/power)
QLogic	QLogic website (http://driverdownloads.qlogic.com/QLogicDriverDownloads_UI/IBM_Search.aspx)

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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 POWER8 processor and its features unless designated as electromagnetic compatibility (EMC) Class B in the feature information.

Federal Communications Commission (FCC) Statement

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

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

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

Industry Canada Compliance Statement

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

European Community Compliance Statement

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

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

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

VCCI Statement - Japan

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

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

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

Japan Electronics and Information Technology Industries Association Statement

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

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

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

高調波電流規格　JIS C 61000-3-2 適合品

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

高調波電流規格　JIS C 61000-3-2 準用品

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

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

高調波電流規格　JIS C 61000-3-2 準用品

本装置は、「高圧又は特別高圧で受電する需要家の高調波抑制対策ガイドライン」対象機器（高調波発生機器）です。
・回路分類 ： 5（3相、ＰＦＣ回路付）
・換算係数 ： 0

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

警告使用者：
這是甲類的資訊產品，在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

Electromagnetic Interference (EMI) Statement - Korea

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

Germany Compliance Statement

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

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

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

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

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

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

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

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

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
International Business Machines Corp.
New Orchard Road

Armonk, New York 10504
Tel: 914-499-1900

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

Generelle Informationen:

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

Electromagnetic Interference (EMI) Statement - Russia

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

Class B Notices

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

Federal Communications Commission (FCC) Statement

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

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

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

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

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

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

Industry Canada Compliance Statement

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

European Community Compliance Statement

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

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

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取扱説明書に従って正しい取り扱いをして下さい。　　　　ＶＣＣＩ－Ｂ

Japan Electronics and Information Technology Industries Association Statement

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

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

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

高調波電流規格　JIS C 61000-3-2 適合品

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

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

IBM Taiwan Contact Information

Germany Compliance Statement

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

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

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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.

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

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

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

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

Generelle Informationen:

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

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