Power Systems

Enclosures and expansion units

IBM

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

Contents

Safety notices

Safety notices may be printed throughout this guide:

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

World Trade safety information

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

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

German safety information

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

Laser safety information

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

Laser compliance

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

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

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

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

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

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

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

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

(R001 part 1 of 2):

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

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

(R001 part 2 of 2):

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

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

CAUTION:

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

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

(R002)

(L001)

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

(L002)

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

(L003)
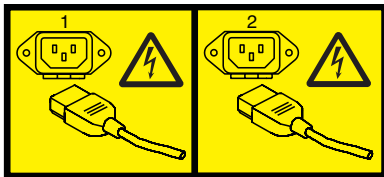
or
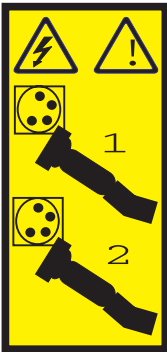
or

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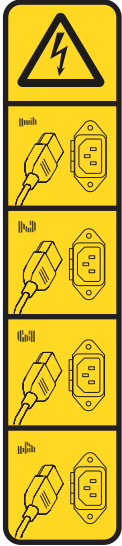
or
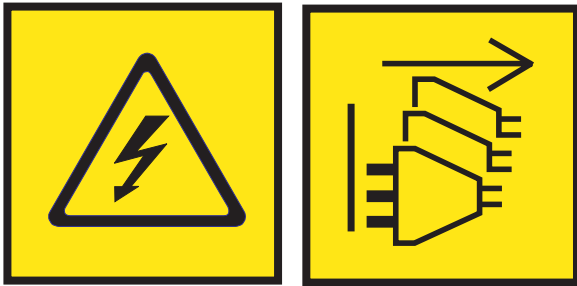
DANGER: Multiple power cords. The product might be equipped with multiple AC power cords or multiple DC power cables. To remove all hazardous voltages, disconnect all power cords and power cables. (L003)

(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.

Enclosures and expansion units

Enclosures and expansion units can be connected to POWER8® processor-based servers.

Use the following table to determine which enclosures and expansion units are supported on your server.

Table 1. Server support for the 5107-084 storage enclosure, 5147-024 storage enclosure, 5147-084 storage enclosure, 5887 disk drive enclosure, EMX0 PCIe Gen3 I/O expansion drawer, ESLL storage enclosure, or ESLS storage enclosure

Server	Enclosure or expansion unit
5148-21L	None
5148-22L	• 5147-024 (Model 024) storage enclosure • 5147-084 (Model 084) storage enclosure
8001-12C	5107-084 (Model 084) storage enclosure
8001-22C	5107-084 (Model 084) storage enclosure
8247-21L[1]	• 5887 disk drive enclosure • EMX0 PCIe Gen3 I/O expansion drawer • ESLL storage enclosure • ESLS storage enclosure
8247-22L[1]	• 5887 disk drive enclosure • EMX0 PCIe Gen3 I/O expansion drawer • ESLL storage enclosure • ESLS storage enclosure
8247-42L[1]	• 5887 disk drive enclosure • EMX0 PCIe Gen3 I/O expansion drawer • ESLL storage enclosure • ESLS storage enclosure
8284-21A	The 8284-21A system must be running the AIX operating system to support the following enclosures: • ESLL storage enclosure • ESLS storage enclosure **Note:** The 8284-21A system does not support the 5147-024 storage enclosure, 5887 disk drive enclosure, or the EMX0 PCIe Gen3 I/O expansion drawer.
8284-22A[1]	• 5887 disk drive enclosure • EMX0 PCIe Gen3 I/O expansion drawer • ESLL storage enclosure • ESLS storage enclosure
8286-41A[1]	• 5887 disk drive enclosure • EMX0 PCIe Gen3 I/O expansion drawer • ESLL storage enclosure • ESLS storage enclosure

Table 1. Server support for the 5107-084 storage enclosure, 5147-024 storage enclosure, 5147-084 storage enclosure, 5887 disk drive enclosure, EMX0 PCIe Gen3 I/O expansion drawer, ESLL storage enclosure, or ESLS storage enclosure (continued)

Server	Enclosure or expansion unit
8286-42A[1]	5887 disk drive enclosure - EMX0 PCIe Gen3 I/O expansion drawer - ESLL storage enclosure - ESLS storage enclosure
8335-GCA	None
8335-GTA	None
8335-GTB	None
8348-21C	None
8408-44E	5887 disk drive enclosure - EMX0 PCIe Gen3 I/O expansion drawer - ESLL storage enclosure - ESLS storage enclosure
8408-E8E	5887 disk drive enclosure - EMX0 PCIe Gen3 I/O expansion drawer - ESLL storage enclosure - ESLS storage enclosure
9080-MHE	5887 disk drive enclosure - EMX0 PCIe Gen3 I/O expansion drawer - ESLL storage enclosure - ESLS storage enclosure
9080-MME	5887 disk drive enclosure - EMX0 PCIe Gen3 I/O expansion drawer - ESLL storage enclosure - ESLS storage enclosure
9119-MHE	5887 disk drive enclosure - EMX0 PCIe Gen3 I/O expansion drawer - ESLL storage enclosure - ESLS storage enclosure
9119-MME	5887 disk drive enclosure - EMX0 PCIe Gen3 I/O expansion drawer - ESLL storage enclosure - ESLS storage enclosure
[1]The SAS port connectors are on the rear bulk head. The external SAS ports are used for expansion to an external SAS drawer.	

5887 disk drive enclosure

This topic provides users and service providers with installation and maintenance information for the 5887 disk drive enclosure (IBM EXP24S SFF Gen2-bay Drawer).

Overview for the 5887 disk drive enclosure

The 5887 disk drive enclosure provides extra disk drives and solid-state drives.

The 5887 disk drive enclosure is connected to system units via a serial-attached SCSI (SAS) port. The SAS disk drive enclosure can hold up to 24 drives. The enclosure can be split logically into one, two, or four independent groups. The SAS disk drive enclosure supports the following operating systems:
- AIX®
- IBM i
- Linux
- VIOS

Installing a disk drive enclosure

Learn about installing your disk drive enclosure.

To learn how to install a disk drive enclosure, refer to Installing the 5887 disk drive enclosure or setting up a preinstalled 5887 disk drive enclosure (http://www.ibm.com/support/knowledgecenter/POWER8/p8ee3/p8ee3_kickoff.htm).

You can also refer to the installation guide that came with the disk drive enclosure.

Removing a disk drive enclosure from a rack

Use this procedure to help you physically remove a disk drive enclosure that is mounted in a rack. Because methods for the attachment of enclosures to a rack vary by model, this procedure provides only conceptual removal steps.

To complete this task, you need the following items:
- A flat-head screwdriver
- A Philips-head screwdriver
- A Torx screwdriver
- Up to three people to physically lift and move the enclosure
- A clear space to place the enclosure and mounting hardware that you are removing

Important: Supplement each step of this procedure with detailed information about the installation of the enclosure, when possible. Before you begin this procedure, check to see whether the following information is available about the enclosure that you are removing:
- The inventory list of parts that are provided with the delivery of your enclosure.
- Installation documentation about your enclosure model provided online or with the delivery of your enclosure.

  Tip: Online installation documentation for your enclosure might not be present in the Power Systems™ hardware level that you are currently searching. You might need to search earlier Power Systems hardware levels to locate installation documentation for the enclosure that you are removing.

To remove an enclosure from the rack, complete the following steps:
1. Power off the enclosure.
2. If a service position exists for your enclosure, place the enclosure in its service position.
3. If the enclosure was installed with shipping or bracing brackets, complete the following steps:
   a. Remove any screws that attach the brackets to the rack.
   b. Remove any screws that attach the brackets to the enclosure.
   c. Carefully lift the brackets from the enclosure and remove them from the rack.

CAUTION:
Shipping and bracing brackets can be heavier than expected. Use more than one person to lift and move the brackets.

4. Disconnect the enclosure from all devices and power as follows:

   a. At the rear of the enclosure, disconnect power cords, any I/O bus cables that connect the enclosure to adapters, and other cables that might be present.

   b. At the front of the enclosure, disconnect any UPIC cables and other cables that might be present.

5. Note the location of all screws that provide for the attachment of the enclosure, the mounting hardware, and the rack to each other. If the bezel covers screws on the left and right ends of the front enclosure panel, remove those bezels.

6. Identify which screws secure the enclosure in position, which screws are weight-bearing screws, and which screws serve more purposes. To remove the enclosure safely, you must understand the functions of all screws that are used to install the enclosure. Evaluate the screws in the following order:

   a. Make a note of which screws are securing screws. You can identify a securing screw as any screw that fastens the enclosure chassis to any other fixture, such as the rack or a rail. Even if a screw attaches the chassis to another fixture that bears weight, it remains a securing screw and not a weight-bearing screw. If a screw secures only a mounting hardware item to the rack, it is not a securing screw. Check both the front and rear of the enclosure for securing screws. During the enclosure installation task, screws to secure the enclosure were the last screws to be installed. Therefore, they are the first screws that you are directed to remove later in this task to enable the detachment of the enclosure.

      Note: The enclosure might be installed in a shell that is, in turn, installed to a rack or rails. If so, then any screw that fastens the enclosure to the shell is a securing screw. Also, any screw that fastens the shell to the rack or rails is a securing screw.

      Exception: If the enclosure is installed on slide-out rails, the securing screws that attach the enclosure to the rails might also be weight-bearing screws. These models were installed in a two-step process that used rail-mounting guides. In the first step, the guides were temporarily attached to the sides of the enclosure. In the second step, the guides were removed after the enclosure was lifted onto the rails and securing screws were installed. For the purposes of this procedure, identify these screws as the weight-bearing screws that you are directed to remove later in this task.

   b. Make a note of which screws are enclosure weight-bearing screws. You can identify a weight-bearing screw as any screw that fastens a rail to the rack, unless the screw is already identified as a securing screw. The type of rail, such as a stationary rail or a slide-out rail, is not a factor in identifying weight-bearing screws. During the enclosure installation task, screws to attach weight-bearing mounting hardware to the rack were installed before the enclosure was lifted onto the rails and secured. Therefore, you will be directed to remove them later in this task only after the enclosure is safely removed.

   c. Make a note of any remaining screws that are used in the installation of the enclosure. These screws serve other purposes and are the last screws that you are directed to remove later in this task.

7. If the enclosure is installed on slide-out rails and you identified the securing screws as weight-bearing screws in step 6a, review the following options for the removal of the enclosure. Then, complete the option that is best for your situation:

   a. If you have the original rail-mounting guides and screws that were used during the installation of the enclosure, complete the following steps:

      1) Attach the rail-mounting guides to the sides of the enclosure by using the screws that are provided for the original installation.

      2) Remove the screws that you identified in the Exception note of step 6a as weight-bearing screws.

3) Using three people, lift the enclosure from the rails and place it carefully in the space that you cleared. If the enclosure cannot be lifted because it is still attached to the rails, return to step 6 on page 4 to identify more screws that might need to be removed.

4) Continue with step 12.

b. If you do not have the original rail-mounting guides and screws that were used during the installation of the enclosure, complete the following steps:

1) Position three people at the front and sides of the enclosure to bear its weight and hold it steady during the removal of weight-bearing screws.

2) Remove the screws that you identified in the Exception note of step 6a on page 4 as weight-bearing screws in the slide-out rails. Order the removal of screws so that the last two screws to be removed are ones that are installed at diagonal points on opposite rails.

3) Using the same three people who are holding the enclosure, lift the enclosure from the rails and place it carefully in the space that you cleared. If the enclosure cannot be lifted because it is still attached to the rails, return to step 6 on page 4 to identify more screws that might need to be removed.

4) Continue with step 12.

8. If the enclosure is installed in a shell, complete the following steps:

a. If a cable retention bracket is present, remove the thumb screw that attaches the bracket to the shell, and remove the bracket.

b. Remove any securing screws that fasten the enclosure to the shell.

c. Slide the enclosure into a position where it can be removed. Using one or two people to handle the enclosure safely, slide the enclosure out from the shell.

d. If more enclosures must be removed from the shell, repeat steps 8a through 8c to remove the enclosures.

e. Remove all remaining securing screws that fasten the shell to the rack or rails.

f. Lift the shell out from the rack and place it carefully in the space that you cleared.

g. Continue with step 12.

9. Remove all screws that you identified in step 6a on page 4 as securing screws. When this step is complete, the enclosure is no longer secured to the rack or to any mounting hardware.

CAUTION:
Be careful in this step to remove only the screws that prevent the enclosure from being detached from the rack or mounting hardware. If you believe that a particular screw might be weight-bearing, do not remove it.

10. Perform a test lift of the enclosure with three people to determine how many people are required to handle the enclosure safely.

CAUTION:
The heaviest of enclosures require three people for safe lifting. Using fewer people than are required to lift an enclosure can result in injury.

11. Slide the enclosure into a position where it can be removed. Lift the enclosure out from the rack and place it carefully in the space that you cleared. If the enclosure is still attached, return to step 6 on page 4 to identify more screws that might need to be removed.

Note: Depending on the method of attachment, you might be required to open latches to fully detach the enclosure from the rack and mounting hardware.

12. If you are required to remove the rails, you can remove them safely now. The procedure to remove rails includes some of the following common steps at one or both ends of the rail:

a. Fold down any hinge brackets that are located where the rail attaches to the rack.

b. Remove all screws that you identified in step 6b on page 4 as weight-bearing screws that attach the rail to the rack.

c. Push any spring-loaded seating pins in the ends of the rails back through their rack holes.

d. Open latches or loosen fasteners on the rail to detach the rail.

e. Perform any additional action that is required to retract and remove the rail.

13. Remove any remaining screws that you identified in step 6c on page 4, and remove any remaining mounting hardware from the rack.

14. Store all mounting hardware, brackets, bezels, and the shell for future use.

EMX0 PCIe Gen3 I/O expansion drawer

This topic provides users and service providers with installation and maintenance information for the EMX0 PCIe Gen3 I/O expansion drawer (EMX0 PCIe3 expansion drawer).

Overview of the EMX0 PCIe Gen3 I/O expansion drawer

The EMX0 PCIe Gen3 I/O expansion drawer (EMX0 PCIe3 expansion drawer) is a 482.6 mm (19 in), 4U PCIe Gen3 I/O drawer. Each EMX0 PCIe3 expansion drawer provides up to 12 PCIe Gen3 adapter slots.

The EMX0 PCIe3 expansion drawer is connected to a system via one or more expansion drawer cable pairs. Each pair provides a single x16 PCIe Gen3 link between the system and the EMX0 PCIe3 expansion drawer. The number of extra PCIe slots that are provided and the number of expansion drawer cable pairs needed depends on the I/O module configuration of the EMX0 PCIe3 expansion drawer.

If you have an 8408-44E system with system firmware FW860.10 or later installed, or a 9080-MHE, 9080-MME, 9119-MHE, or 9119-MME system with system firmware FW840.xx or later installed, you can connect the EMX0 PCIe3 expansion drawer to the system with the system power turned on. For instructions, see Connecting an EMX0 PCIe3 expansion drawer to your system with the system power turned on(http://www.ibm.com/support/knowledgecenter/POWER8/p8egp/ p8egp_connect_to_server_poweron.htm).

Ensure that you have a PCIe3 cable adapter installed in the host system before you install the EMX0 PCIe3 expansion drawer. For all systems except the 8408-44E system that has an installation of system firmware FW860.10 or later installed, or the 9080-MHE, 9080-MME, 9119-MHE, or 9119-MME system that has an installation of system firmware FW840.xx or later installed, you must power off the system to install the PCIe3 cable adapter.

To install another PCIe3 cable adapter to accommodate an EMX0 PCIe3 expansion drawer, see the following topics:

- If you must power off the system to install a PCIe adapter in your system, see PCIe adapters (http://www.ibm.com/support/knowledgecenter/POWER8/p8hak/pciadapters.htm).
- If you can install a PCIe adapter when the system power is turned on, see Installing a part by using the HMC (http://www.ibm.com/support/knowledgecenter/POWER8/p8haj/hmcinstall.htm).
- For PCIe adapter placement rules and slot priorities for your system or expansion drawer, see PCIe adapter placement rules and slot priorities (http://www.ibm.com/support/knowledgecenter/ POWER8/p8hak/p8hak_pciadapters_slot_all_mtms.htm).

Note: To remove or relocate an EMX0 PCIe3 expansion drawer, the system power must be turned off for all configurations.

Installing an EMX0 PCIe Gen3 I/O expansion drawer

Learn about installing your EMX0 PCIe Gen3 I/O expansion drawer (EMX0 PCIe3 expansion drawer).

Note: If you have a 9080-MHE, 9080-MME, 9119-MHE, or 9119-MME system and it is being installed at the same time as your EMX0 PCIe3 expansion drawer, then the service provider completes the installation of the EMX0 PCIe3 expansion drawer. If you already have the 9080-MHE, 9080-MME, 9119-MHE, or 9119-MME system installed, and you have since ordered an EMX0 PCIe3 expansion

drawer, the installation and setup 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.

To learn how to install the EMX0 PCIe Gen3 I/O expansion drawer, refer to Installing an EMX0 PCIe Gen3 I/O expansion drawer (http://www.ibm.com/support/knowledgecenter/POWER8/p8egp/p8egp_kickoff.htm).

You can also refer to the installation guide that came with the EMX0 PCIe3 expansion drawer.

Removing an EMX0 PCIe Gen3 I/O expansion drawer from an existing configuration with the system power turned off

Learn how to remove an EMX0 PCIe Gen3 I/O expansion drawer (EMX0 PCIe3 expansion drawer) from an existing configuration with the system power turned off.

Removing or relocating an EMX0 PCIe3 expansion drawer must be done with the system powered off for all POWER8 configurations.

To remove an EMX0 PCIe3 expansion drawer from the system configuration with the system powered off, complete the following steps:
1. "Preparing to remove an EMX0 PCIe3 expansion drawer"
2. "Removing an EMX0 PCIe3 expansion drawer from a rack" on page 8
3. "Completing the removal of an EMX0 PCIe3 expansion drawer from an existing configuration" on page 9

Preparing to remove an EMX0 PCIe3 expansion drawer

Learn how to prepare the system to remove an EMX0 PCIe3 expansion drawer from an existing configuration.

To prepare the system to remove an EMX0 PCIe3 expansion drawer, complete the following steps:
1. Record the time that you start this procedure. The time is referenced later during error log analysis.
2. Optional: Identify the EMX0 PCIe3 expansion drawer that you want to remove. For instructions, see Enabling enclosure or server indicators with the ASMI.
3. If the system is powered on, power it off.
4. Choose one of the following options:
   - If the system is not in manufacturing default configuration (MDC), continue with step 5.
   - If the system is in MDC, continue with step 6.
5. If the system is not in MDC, you can remove the I/O resources from logical partitions before you remove the EMX0 PCIe3 expansion drawer, or you can remove the EMX0 PCIe3 expansion drawer and then be prompted by the Hardware Management Console (HMC) to remove the I/O resources from the logical partitions.

   If you remove the I/O resources before you remove the EMX0 PCIe3 expansion drawer, find the profiles that include resources in the EMX0 PCIe3 expansion drawer that is being removed, select the profiles to edit, remove the resources in the EMX0 PCIe3 expansion drawer, and click **Save**.

   Note: If you do not remove the I/O resources before you remove the EMX0 PCIe3 expansion drawer, when a profile is activated or edited that includes resources in the EMX0 PCIe3 expansion drawer that was removed, the HMC displays a message about missing resources. Then, you can choose the option to automatically remove the missing I/O resources from the profile by using the HMC.
6. Remove ac power from the EMX0 PCIe3 expansion drawer that will be removed by disconnecting the ac cables from the power supplies on the EMX0 PCIe3 expansion drawer.
7. Remove the expansion drawer cables from the EMX0 PCIe3 expansion drawer and the system.

8. Optional: Remove the PCIe3 cable adapter from the system. For instructions, see PCIe adapters. Select the appropriate model and follow the removal instructions.

Removing an EMX0 PCIe3 expansion drawer from a rack

Learn how to physically remove an EMX0 PCIe3 expansion drawer that is mounted in a rack.

To complete this task, you need the following items:
- #1 and #2 Phillips screwdrivers
- Flat-head screwdriver
- Three people to physically lift and move the EMX0 PCIe3 expansion drawer
- A clear space to place the EMX0 PCIe3 expansion drawer and mounting hardware that you are removing

Important: This procedure provides the conceptual removal steps. Supplement each step of this procedure with detailed information about the installation of the EMX0 PCIe3 expansion drawer, when possible. Before you begin this procedure, check to see whether the following information is available about the EMX0 PCIe3 expansion drawer that you are removing:
- The inventory list of parts that are provided with the delivery of your EMX0 PCIe3 expansion drawer.
- Installation documentation about your EMX0 PCIe3 expansion drawer provided online or with the delivery of your EMX0 PCIe3 expansion drawer.

To remove the EMX0 PCIe3 expansion drawer from the rack, complete the following steps:
1. Ensure you have completed the steps in "Preparing to remove an EMX0 PCIe3 expansion drawer" on page 7.
2. Disconnect the EMX0 PCIe3 expansion drawer from all devices and power supplies. At the rear of the EMX0 PCIe3 expansion drawer, disconnect power cords, expansion drawer cables, cables attached to the I/O adapters in the EMX0 PCIe3 expansion drawer, and the cable management bracket, if installed.
3. Note the location of all screws that provide for the attachment of the EMX0 PCIe3 expansion drawer, the mounting hardware, and the rack to each other. If the cover is blocking screws on the left and right ends of the front EMX0 PCIe3 expansion drawer panel, remove those covers.
4. Identify which screws secure the EMX0 PCIe3 expansion drawer in position, which screws are weight-bearing screws, and which screws serve more purposes. To remove the EMX0 PCIe3 expansion drawer safely, you must understand the functions of all screws that are used to install the EMX0 PCIe3 expansion drawer. Evaluate the screws in the following order:
   a. Make a note of which screws are securing screws. You can identify a securing screw as any screw that fastens the EMX0 PCIe3 expansion drawer chassis to any other fixture, such as the rack or a rail. Even if a screw attaches the chassis to another fixture that bears weight, it remains a securing screw and not a weight-bearing screw. If a screw secures only a mounting hardware item to the rack, it is not a securing screw. Check both the front and rear of the EMX0 PCIe3 expansion drawer for securing screws. During the EMX0 PCIe3 expansion drawer installation task, screws to secure the EMX0 PCIe3 expansion drawer were the last screws to be installed. Therefore, they are the first screws that you are directed to remove later in this task to enable the detachment of the EMX0 PCIe3 expansion drawer.
   b. Make a note of which screws are weight-bearing screws. You can identify a weight-bearing screw as any screw that fastens a rail to the rack, unless the screw is already identified as a securing screw. The type of rail, such as a stationary rail or a slide-out rail, is not a factor in identifying weight-bearing screws. During the EMX0 PCIe3 expansion drawer installation task, screws to attach weight-bearing mounting hardware to the rack were installed before the EMX0 PCIe3 expansion drawer was lifted onto the rails and secured. Therefore, you will be directed to remove them later in this task only after the EMX0 PCIe3 expansion drawer is safely removed.

c. Make a note of any remaining screws that are used in the installation of the EMX0 PCIe3 expansion drawer. These screws serve other purposes and are the last screws that you are directed to remove later in this task.

5. Remove all screws that you identified in step 4a on page 8 as securing screws. When this step is complete, the EMX0 PCIe3 expansion drawer is no longer secured to the rack or to any mounting hardware.

   CAUTION:

   Be careful in this step to remove only the screws that prevent the drawer from being detached from the rack or mounting hardware. If you believe that a particular screw might be a weight-bearing screw, do not remove it.

6. Perform a test lift of the EMX0 PCIe3 expansion drawer with three people to determine how many people are required to handle the EMX0 PCIe3 expansion drawer safely.

   CAUTION:

   The heaviest of drawers require three people for safe lifting. Using fewer people than are required to lift a drawer can result in injury.

7. Slide the EMX0 PCIe3 expansion drawer into a position where it can be removed. Lift the EMX0 PCIe3 expansion drawer out from the rack and place it carefully in the space that you cleared. If the EMX0 PCIe3 expansion drawer is still attached, return to step 4 on page 8 to identify more screws that might need to be removed.

   Note: Depending on the method of attachment, you might be required to open latches to fully detach the EMX0 PCIe3 expansion drawer from the rack and mounting hardware.

8. If you need to remove the rails, you can remove them safely now. The procedure to remove rails includes some of the following common steps at one or both ends of the rail:

   a. Fold down any hinge brackets that are located where the rail attaches to the rack.

   b. Remove all screws that you identified in step 4b on page 8 as weight-bearing screws that attach the rail to the rack.

   c. Push any spring-loaded seating pins in the ends of the rails back through the rack holes.

   d. Open latches or loosen fasteners on the rail to detach the rail.

   e. Perform any additional action that is needed to retract and remove the rail.

9. Remove any remaining screws that you identified in step 4c, and remove any remaining mounting hardware from the rack.

10. Store all mounting hardware, brackets, covers, and the shell for future use.

Completing the removal of an EMX0 PCIe3 expansion drawer from an existing configuration

Learn about the steps to complete the removal of an EMX0 PCIe3 expansion drawer from an existing configuration.

Removing or relocating an EMX0 PCIe3 expansion drawer must be done with the system powered off for all POWER®8 configurations.

To complete the removal process of the EMX0 PCIe3 expansion drawer from the system configuration and start the partitions, complete the following steps:

1. Power on the system but do not start the logical partitions.

2. Check for new serviceable events that are created after starting the system. Choose one of the following options:

   • If the system is managed by an HMC, choose one of the navigation options depending on the interface type of the HMC:

     a. If you are using an HMC Classic or HMC Enhanced interface, complete the following steps:

        1) In the HMC navigation area, select **Service Management**.

    2) Select **Manage Serviceable Events**.

    3) Specify event criteria that includes events that were generated during this procedure.

    4) Perform problem analysis on any open serviceable events that are generated during this procedure.

    5) Continue with step 3.

  b. If you are using an HMC Enhanced + Tech Preview (Pre-GA) or HMC Enhanced+ interface, complete the following steps:

    1) In the navigation area, click the **Serviceability** icon, and then select **Serviceable Events Manager**.

    2) Specify event criteria that includes events that were generated during this procedure.

    3) Perform problem analysis on any open serviceable events that are generated during this procedure.

    4) Continue with step 3.

- If the system is not managed by an HMC, use the Advanced System Management Interface (ASMI) to check and handle new serviceable events by completing the following steps:

  a. In the ASMI navigation area, expand **System Service Aids**.

  b. Click **Error/Event Logs**.

  c. In the Serviceable/Customer attention events table, look for events that were generated during this procedure.

  d. Perform problem analysis on any open serviceable events that are generated during this procedure.

3. Start the logical partitions.

Common procedures for the EMX0 PCIe Gen3 I/O expansion drawer

This section contains all the common procedures related to managing the EMX0 PCIe Gen3 I/O expansion drawer (EMX0 PCIe3 expansion drawer).

Powering on an EMX0 PCIe3 expansion drawer

Learn how to power on an EMX0 PCIe3 expansion drawer.

Before you begin, read this entire procedure. If there are procedural steps that cannot be completed now, the procedure must be delayed until a later time.

Attention: If the server is not managed by a Hardware Management Console (HMC), the EMX0 PCIe3 expansion drawer cannot be powered on with the server powered on. To power on the EMX0 PCIe3 expansion drawer without an HMC, power off the server and then power on the server. The EMX0 PCIe3 expansion drawer will power on automatically when the server powers on.

Attention: Do *not* use this procedure to power on the system unit. To power on a system, see Starting the system or logical partition.

To power on the EMX0 PCIe3 expansion drawer, complete the following steps:

1. Is your system managed by an HMC?
   - **Yes**: Continue with step 2.
   - **No**: To power on the EMX0 PCIe3 expansion drawer without an HMC, you must power on the server. When the server powers on, the EMX0 PCIe3 expansion drawer will power on automatically. For instructions, see Starting the system or logical partition.
2. If the ac power cords were disconnected when the EMX0 PCIe3 expansion drawer was powered off and you have not reconnected them, reconnect them now. If they are already connected, continue with the next step.

3. To use the Power On/Off Unit utility from the HMC, choose one of the following navigation options depending on the interface type of the HMC:

   • If you are using an HMC Classic or HMC Enhanced interface, complete the following steps:

      a. In the navigation area, click **Systems management** > **Servers**.

      b. To enable the tasks for that server, select the required server name.

      c. From the **Tasks** menu, click **Serviceability** > **Hardware** > **Power On/Off Unit**.

      d. In the Power On/Off Unit window, expand the managed system and click the appropriate unit.

      e. Click **Power On**.

   • If you are using an HMC Enhanced + Tech Preview (Pre-GA) or HMC Enhanced+ interface, complete the following steps:

      a. In the navigation area, click the **Resources** icon , and then select **All Systems**.

      b. To view the actions for that server, select the server name of the required server.

      c. In the navigation area, select **Serviceability** > **Serviceability**.

      d. In the **Hardware Operations** section of the Serviceability window, select **Power On/Off Unit**.

      e. In the Power On/Off Unit window, expand the managed system and select the appropriate unit.

      f. Click **Power On**.

4. Wait 3 minutes for the I/O resources in the EMX0 PCIe3 expansion drawer to become fully operational.

5. Reconfigure any I/O resources that were unconfigured when the EMX0 PCIe3 expansion drawer was powered off. Then, go to the next step.

6. Return to the procedure that sent you here.

Powering off an EMX0 PCIe3 expansion drawer

Learn how to power off an EMX0 PCIe3 expansion drawer.

Before you begin, read this entire procedure. If there are procedural steps that cannot be completed now, the procedure must be delayed until a later time.

Attention: If the server is not managed by a Hardware Management Console (HMC), the EMX0 PCIe3 expansion drawer cannot be powered off with the server powered on. To power off the EMX0 PCIe3 expansion drawer without an HMC, power off the server. The EMX0 PCIe3 expansion drawer will power off automatically when the server powers off.

Attention: Do *not* use this procedure to power off the system unit. To stop the system, see Stopping the system or logical partition.

To power off the EMX0 PCIe3 expansion drawer, complete the following steps:

1. If you have not already done so, record the EMX0 PCIe3 expansion drawer location code and machine type-model-serial numbers (MTMs).

2. Is the server managed by an HMC?

   No: The EMX0 PCIe3 expansion drawer must be powered off by powering off the server. For instructions, see Stopping the system or logical partition. Then, return to the procedure that sent you here.

   Yes: The EMX0 PCIe3 expansion drawer can be powered off with the server powered on. Continue with the next step.

3. Verify that the EMX0 PCIe3 expansion drawer being powered off is the correct one. You can activate the identify indicator on the EMX0 PCIe3 expansion drawer. To activate the identify indicator on the EMX0 PCIe3 expansion drawer, complete the following steps for your particular interface:

- For information about activating or deactivating the identify LED by using the ASMI, see Identifying a part by using the ASMI.
- Choose one of the following navigation options depending on the interface type of the HMC:
  - If you are using an HMC Classic or HMC Enhanced interface, complete the following steps:
    a. In the navigation area, select **Systems management** > **Servers**.
    b. To enable the tasks for that server, select the server name.
    c. From the **Tasks** menu, click **Operations** > **LED Status** > **Identify LED**.
    d. Select the wanted EMX0 PCIe3 expansion drawer and click **Activate LED**. Otherwise, click **Deactivate LED** to turn off the LED.
  - If you are using an HMC Enhanced + Tech Preview (Pre-GA) or HMC Enhanced+ interface, complete the following steps:
    a. In the navigation area, click the **Resources** icon , and then click **All Systems**.
    b. To view the actions for that server, select the server name.
    c. In the navigation area, click **System Actions** > **Attention LED** > **Identify Attention LED**.
    d. Select the wanted EMX0 PCIe3 expansion drawer and click **Activate LED**. Click **Deactivate LED** to turn off the LED.

  Are you powering off the correct EMX0 PCIe3 expansion drawer?

  No: Determine the correct EMX0 PCIe3 expansion drawer. Then, complete this procedure again.

  Yes: Continue with the next step.
4. To power off an EMX0 PCIe3 expansion drawer with the server power turned on, choose one of the following navigation options depending on the interface type of the HMC:
   - If you are using an HMC Classic or HMC Enhanced interface, complete the following steps:
     a. In the navigation area, click **Systems management** > **Servers**.
     b. To enable the tasks for that server, select the server name.
     c. From the **Tasks** menu, click **Serviceability** > **Hardware** > **Power On/Off Unit**.
     d. In the Power On/Off Unit window, expand the managed system and select the appropriate unit.
     e. Click **Power Off**.
   - If you are using an HMC Enhanced + Tech Preview (Pre-GA) or HMC Enhanced+ interface, complete the following steps:
     a. In the navigation area, click the **Resources** icon , and then click **All Systems**.
     b. To view the actions for that server, select the server name.
     c. In the navigation area, click **Serviceability** > **Serviceability**.
     d. In the **Hardware Operations** section of the Serviceability window, click **Power On/Off Unit**.
     e. In the Power On/Off Unit window, expand the managed system and select the appropriate unit.
     f. Click **Power Off**.

   Notes:
   - Wait for the EMX0 PCIe3 expansion drawer to power off. This action might take up to 15 minutes depending on the configuration.
   - When the utility displays notification that the power off is complete, ensure that the EMX0 PCIe3 expansion drawer is powered off by verifying that the power LED/indicator on the EMX0 PCIe3 expansion drawer control panel is off or flashing.

- If the EMX0 PCIe3 expansion drawer does not power off after more than 15 minutes, the system might be hung. If this action occurs, contact your service provider for assistance.

5. Were you directed here to power off the EMX0 PCIe3 expansion drawer to set the configuration ID, feature code, or serial number of the EMX0 PCIe3 expansion drawer?

   No: Continue with the next step.

   Yes: Return to the procedure that sent you here.

6. Does the procedure that sent you here instruct you to remove the ac power from the EMX0 PCIe3 expansion drawer?

   No: Return to the procedure that sent you here.

   Yes: Continue with the next step.

7. Disconnect the ac power cords from the EMX0 PCIe3 expansion drawer.

Verifying the PCIe hardware topology with an HMC

Learn how to verify that there are no failed or degraded PCIe links by using a Hardware Management Console (HMC).

To use an HMC to verify that there are no failed or degraded PCIe links, complete the following steps with the system powered on:

1. Verify that no serviceable events include B7006A*xx* reference codes (where *x* is any character 0 - 9 or A - F) by completing the following steps:

   a. If you are using an HMC Classic or HMC Enhanced interface, complete the following steps:

      1) In the navigation area of the HMC, select **Service Management**.

      2) In the content area, select **Manage Serviceable Events**.

      3) Continue with step 1c.

   b. If you are using the HMC Enhanced + Tech Preview (Pre-GA) or HMC Enhanced+ interface, complete the following steps:

      1) In the navigation area of the HMC, click **Serviceability**, and then select **Serviceable Events Manager**.

      2) Continue with step 1c.

   c. In the Manage Serviceable Events window, perform the following steps:

      1) Click **Open** for the **Serviceable event status** field.

      2) Select the machine type, model, and serial number (MTMS) of the server you are working with for the **Reporting MTMS** field.

      3) Click **ALL** for all other fields, and click **OK**.

   d. Scan for any serviceable events that include B7006A*xx* reference codes, and choose one of the following options:

      - If no serviceable events include B7006A*xx* reference codes, close the Manage Serviceable Events window.

      - If any serviceable events include B7006A*xx* reference codes, there might be problems with the PCIe hardware topology. Perform problem analysis on the serviceable events to correct the problems before continuing. If you need assistance, contact your service provider.

2. Verify the status of the PCIe links by completing the following steps:

   a. If you are using an HMC Classic or HMC Enhanced interface, complete the following steps:

      1) From the navigation bar, expand **Systems Management**.

      2) Click **Servers**.

      3) Select the server you are working with.

      4) From the Tasks area, expand **Hardware Information**.

      5) Click **PCIe Hardware Topology**.

      6) Continue with step 2c on page 14.

b. If you are using the HMC Enhanced + Tech Preview (Pre-GA) or HMC Enhanced+ interface, complete the following steps:

   1) In the navigation area, click **Resources**, and then select **All Systems**.

   2) Select the server that you want to work with and click **Actions** > **View System Partitions**.

   3) In the menu pod, expand **Serviceability** and then click **PCI Configuration**.

   4) Continue with step 2c.

c. Scan the PCIe Hardware Topology data to identify rows that have a link status of `Failed` or `Degraded`.

d. If you identified links in step 2c that have a link status of `Failed` or `Degraded`, the links must be repaired before you continue. To repair the links, repeat step 1 on page 13. If you already performed step 1 on page 13 or need assistance, contact your next level of support.

Verifying the PCIe hardware topology without an HMC

Learn how to verify that there are no failed or degraded PCIe links by using the AIX, Virtual I/O Server (VIOS), IBM i, or Linux operating system.

To verify that there are no failed or degraded PCIe links by using the AIX, Virtual I/O Server (VIOS), IBM i, or Linux operating system, complete the following steps with the system powered on:

1. Choose the operating system that best applies to your configuration.

   Important: Multiple options might apply to your configuration. Choose only the first option that applies.

   • If your system has a partition running the VIOS operating system, continue with step 2.

   • If your system has a partition running the AIX operating system, continue with step 3.

   • If your system has a partition running the IBM i operating system, continue with step 4 on page 15.

   • If your system has a partition running the Linux operating system, continue with step 5 on page 15.

2. Use the VIOS error log to verify that there are no B7006Axx errors (where x is any character 0 - 9 or A - F) by completing the following steps.

   a. Log in to the operating system with admin or service level authority. If you need assistance, contact the system administrator.

   b. At the VIOS command prompt, type `diagmenu -d sysplanar0 -E xx` and press Enter, where xx is any number 1 - 60 that specifies the most recent number of days for which results are returned. The suggested range is 30 days.

   c. Highlight the **Problem Determination** option in the DIAGNOSTIC MODE SELECTION display. Press Enter.

   d. Search the results that are displayed to identify problems with B7006Axx reference codes. You might need to scroll down in the display to see all of the results.

      Note: If the Problem Determination results contain serviceable events that have already been reported, a PREVIOUS DIAGNOSTICS RESULTS display is shown. Respond to the **Do you want to review these previously reported errors?** prompt by highlighting the YES response, and then press Enter.

   e. Based on the results of your search, choose one of the following options:

      • If there are no problems that have B7006Axx reference codes, press Enter to return to the command line.

      • If there are problems that have B7006Axx reference codes, there might be problems with the PCIe hardware topology. Perform problem analysis to correct the problems before continuing. If you need assistance, contact your service provider.

   f. Go to step 6 on page 16.

3. Use the AIX error log to verify that there are no B7006Axx errors (where x is any character 0 - 9 or A - F) by completing the following steps.

a. Log in to the operating system with admin or service level authority. If you need assistance, contact the system administrator.

b. At the AIX command prompt, type `diag -d sysplanar0 -E xx` and press Enter, where xx is any number 1 - 60 that specifies the number of days. This command returns results for the most recent number of days specified. The suggested range is 30 days.

c. Highlight the **Problem Determination** option in the DIAGNOSTIC MODE SELECTION display. Press Enter.

d. Search the results that are displayed to identify problems with B7006A*xx* reference codes. You might need to scroll down in the display to see all of the results.

   Note: If the Problem Determination results contain serviceable events that have already been reported, a PREVIOUS DIAGNOSTICS RESULTS display is shown. Respond to the **Do you want to review these previously reported errors?** prompt by highlighting the YES response, and then press Enter.

e. Based on the results of your search, choose one of the following options:
   - If there are no problems that have B7006A*xx* reference codes, press Enter to return to the command line.
   - If there are problems that have B7006A*xx* reference codes, there might be problems with the PCIe hardware topology. Perform problem analysis to correct the problems before continuing. If you need assistance, contact your service provider.

f. Go to step 6 on page 16.

4. Use the IBM i service action event log to verify that there are no B7006A*xx* errors (where *x* is any character 0 - 9 or A - F) by completing the following steps:

   a. Log in to the operating system with admin or service level authority. If you need assistance, contact the system administrator.

   b. At the IBM i command prompt, type `strsst` and press Enter.

   c. Type your service tools user ID and service tools password on the System Service Tools (SST) Sign On display. Press Enter.

   d. Click **Start a service tool** and press Enter.

   e. Click **Hardware service manager** and press Enter.

   f. Click **Work with service action log** and press Enter.

   g. On the **Select Timeframe** display, change the **From: Date and Time** to the desired date and time range. The suggested range is 30 days.

   h. Search for serviceable events with B7006A*xx* reference codes, and choose one of the following options:
      - If there are no serviceable events that have B7006A*xx* reference codes, press F3 (Exit) to return to the Hardware Service Manager display.
      - If there are serviceable events that have B7006A*xx* reference codes, there might be problems with the PCIe hardware topology. Perform problem analysis to correct the problems before continuing. If you need assistance, contact your service provider.

   i. Go to step 6 on page 16.

5. Use the Linux error log to verify that there are no B7006A*xx* errors (where *x* is any character 0 - 9 or A - F) by completing the following steps.

   a. Log in as the root user. If you need assistance, contact the system administrator.

   b. At the Linux command prompt, type `servicelog --query='refcode like "B7006A%" AND serviceable=1 AND closed=0'` and press Enter.

   c. Search the results that are displayed for problems that have B7006A*xx* reference codes and for statuses that are open. If there are problems that have B7006A*xx* reference codes, there might be problems with the PCIe hardware topology. Perform problem analysis to correct the problems before continuing. If you need assistance, contact your service provider.

> **Note:** You might need to scroll down in the display to see all of the results.

d. Go to step 6.

6. Check for failed or degraded PCIe links by completing the following steps:

   a. Access the Advanced System Management Interface (ASMI) by using an authority level of administrator or authorized service provider. For details about using the ASMI, see Managing the Advanced System Management Interface (https://www.ibm.com/support/knowledgecenter/ POWER8/p8hby/p8hby_kickoff.htm).

   b. In the ASMI navigation area, expand **System Configuration**.

   c. Click **PCIe Hardware Topology**.

   d. Scan the PCIe Hardware Topology data to identify rows that have a link status of `Failed` or `Degraded`.

   e. If you identified links in step 6d that have a link status of `Failed` or `Degraded`, the links must be repaired before you continue. To repair the links, repeat step 1 on page 14. If you already completed step 1 on page 14 or need assistance, contact your next level of support.

Model 024, ESLL, and ESLS storage enclosures

This topic provides users and service providers with installation and maintenance information for an IBM Elastic Storage Server Storage Expansion (024) (5147-024 storage enclosure), IBM EXP12SX SAS Storage Enclosure (ESLL storage enclosure), and IBM EXP24SX SAS Storage Enclosure (ESLS storage enclosure).

Overview for the 5147-024, ESLL, and ESLS storage enclosures

The ESLL storage enclosure can hold up to 12 large form factor (LFF) drives. The 5147-024 and ESLS storage enclosures can hold up to 24 small form factor (SFF) drives.

Notes:
- The ESLL storage enclosure provides extra disk drive slots.
- The ESLS storage enclosure provides extra disk drive or solid-state drive (SSD) slots.
- The 5147-024 storage enclosure provides extra SSD slots.

The 5147-024, ESLL, and ESLS storage enclosures are connected to system units via a serial-attached SCSI (SAS) port.

The enclosures can be split logically into one, two, or four independent groups. The SAS storage enclosures support the following operating systems:
- AIX (The 5147-024 storage enclosure is not supported.)
- IBM i (The 5147-024 and ESLL storage enclosures are not supported.)
- Linux
- VIOS (The 5147-024 storage enclosure is not supported.)

Installing the 5147-024, ESLL, or ESLS storage enclosure

Learn how to install the 5147-024 storage enclosure, ESLL storage enclosure, and ESLS storage enclosure.

To learn how to install the 5147-024, ESLL, or ESLS storage enclosure, refer to Installing an 5147-024, ESLL, or ESLS storage enclosure (http://www.ibm.com/support/knowledgecenter/POWER8/p8eiu/ p8eiu_kickoff.htm).

You can also refer to the installation guide that came with the 5147-024, ESLL, or ESLS storage enclosure.

Removing the 5147-024, ESLL, or ESLS storage enclosure from a rack

Use this procedure to help you physically remove the 5147-024, ESLL, or ESLS storage enclosure that is mounted in a rack.

To complete this task, you need the following items:

- A Phillips-head screwdriver or an 8 mm socket wrench
- Two people to physically lift and move the enclosure
- A clear space to place the enclosure and mounting hardware that you are removing

Important: Supplement each step of this procedure with detailed information about the installation of the enclosure, when possible. Before you begin this procedure, check to see whether the following information is available about the enclosure that you are removing:

- The inventory list of parts that are provided with the delivery of your enclosure.
- Installation documentation about your enclosure model provided online or with the delivery of your enclosure.

To remove an enclosure from the rack, complete the following steps:

1. Power off the enclosure.
2. At the rear of the enclosure, note the locations, label, and disconnect the serial-attached SCSI (SAS) cables from the enclosure services manager (ESM).
3. At the front of the rack, remove the left side cover **(A)** and the right side cover **(B)** to show the mounting brackets. Pinch the release to rotate the cover up and off from the chassis flange as shown in Figure 1.
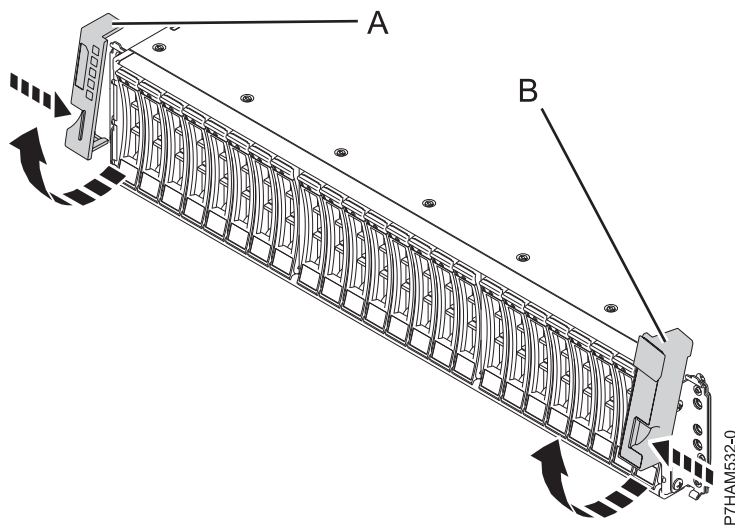

Figure 1. Removing the side covers

4. Remove the M5 screws from the top holes on the mounting brackets.
5. Perform a test lift of the enclosure with two people to determine how many people are required to handle the enclosure safely.

   Attention: Two people are required to safely lift the enclosure. Using fewer than two people to lift the enclosure can result in injury.
6. Slide the enclosure into a position where it can be removed. Lift the enclosure out from the rack and place it carefully in the space that you cleared.
7. If you are required to remove the rails, you can remove them safely now.

   a. At the rear of the rack, remove the M5 screw that attaches the rail to the rack.

      b. Open the hinge bracket on each end of the rail.

      c. At the front of the rack, grasp the support rail and push it inwards and lift it out of the rack.

      d. Repeat steps 7a on page 17 - 7c for the other support rail.

8. Store all mounting hardware, brackets, and covers for future use.

Reference information for enclosures and expansion units

Use this information to assist you as you manage your enclosures and expansion units.

Identifying the enclosure or server that contains the part

Learn how to determine which server or enclosure has the part you want to replace.

Enabling enclosure or server indicators with the ASMI

Find out how to enable enclosure or server indicators by using the Advanced System Management Interface (ASMI).

To perform this operation, you must have one of the following authority levels:

- Administrator
- Authorized service provider

To enable the enclosure or server indicator states, complete the following steps:

1. On the ASMI Welcome pane, specify your user ID and password, and click **Log In**.
2. In the navigation area, expand **System Configuration** > **Service Indicators** > **Enclosure Indicators**. A list of enclosures is displayed.
3. Select the enclosure and click **Continue**. A list of location codes is displayed. Alternatively, you can click **Indicators by Location Code** and type the location code in the **Location code** field.
4. In the **Identify indicator status** field, select **Identify**.
5. To save the changes made to the state of an indicator, click **Save settings**.

Control panel LEDs

Use this information as a guide to the control panel LEDs and buttons.

Use Figure 2 on page 20 with the control panel LED descriptions to understand the system status that is indicated by the control panel.
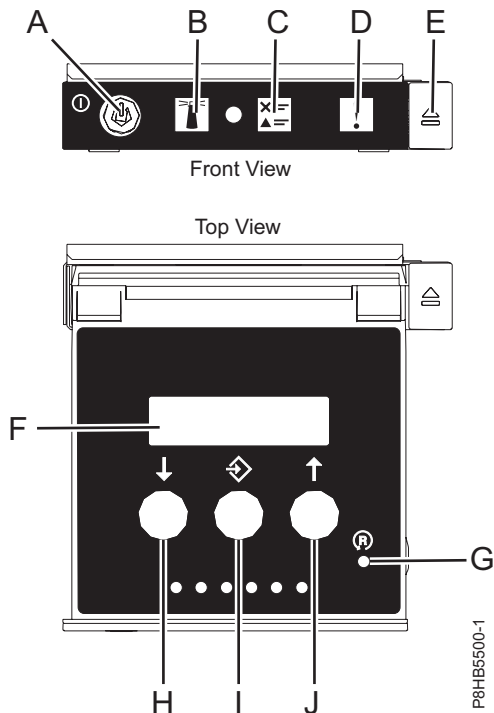
Figure 2. Control panel LEDs

Control panel LEDs and descriptions:

- **A**: Power-on button
    - A constant light indicates full system power to the unit.
    - A flashing light indicates standby power to the unit.
    - There is approximately a 30-second transition period from the time the power-on button is pressed to when the power LED goes from flashing to solid. During the transition period, the LED might flash faster.
- **B**: Enclosure identify light
    - A constant light indicates the identify state, which is used to identify a part.
    - No light indicates that the system is operating normally.
- **C**: Check log light
    - No light indicates that the system is operating normally.
    - Light on indicates that the system requires attention.
- **D**: Enclosure fault light
    - A constant light indicates a fault in the system unit.
    - No light indicates that the system is operating normally.
- **E**: Eject button
- **F**: Function/Data display
- **G**: Pinhole reset button
- **H**: Decrement button
- **I**: Enter button
- **J**: Increment button

Activating an identify LED for an enclosure or server by using the HMC

Learn how to activate an identify LED for an enclosure or server by using the Hardware Management Console (HMC).

The system provides several LEDs that help identify various components in the system, such as enclosures or field-replaceable units (FRUs). For this reason, they are called *identify LEDs*.

If you want to add a part to a specific enclosure or server, you need to know the machine type, model, and serial number (MTMS) of the enclosure or server. To determine whether you have the correct MTMS for the enclosure or server that needs the new part, you can activate the LED for an enclosure or server and verify that the MTMS corresponds to the enclosure or server that requires the new part.

1. Choose one of the following navigation options depending on the interface type of the HMC:
   - If you are using an HMC Classic or HMC Enhanced interface, complete the following steps:
     a. In the navigation area, click **Systems Management** > **Servers**.
     b. In the content pane, select the server.
     c. Click **Tasks** > **Operations** > **LED Status** > **Identify LED**. The Identify LED, Select Enclosure window is displayed.
   - If you are using an HMC Enhanced + Tech Preview (Pre-GA) or HMC Enhanced+ interface, complete the following steps:

     a. In the navigation area, click the **Resources** icon , and then click **All Systems**.
     b. Click the server name for which you want to activate the identify LED.
     c. Click **System Actions** > **Attention LED** > **Identify Attention LED**. The Identify Attention LED, Select Enclosure window is displayed.
2. To activate an identify LED for an enclosure or server, select an enclosure or server and then click **Activate LED**. The associated LED is turned on.

Starting the system or logical partition

Learn how to start a system or logical partition after performing a service action or system upgrade.

Starting a system that is not managed by an HMC

You can use the power button or the Advanced System Management Interface (ASMI) to start a system that is not managed by a Hardware Management Console (HMC).

Starting a system or logical partition by using the HMC

You can use the Hardware Management Console (HMC) to start the system or logical partition after the required cables are installed and the power cables are connected to a power source.

Stopping a system or logical partition

Learn how to stop a system or logical partition as a part of a system upgrade or service action.

Attention: Using either the power-on button on the control panel or entering commands at the Hardware Management Console (HMC) to stop the system can cause unpredictable results in the data files. Also, the next time you start the system, it might take longer if all applications are not ended before stopping the system.

To stop the system or logical partition, select the appropriate procedure.

Stopping a system that is not managed by an HMC

You might need to stop the system to complete another task. If your system is not managed by the Hardware Management Console (HMC), use these instructions to stop the system by using the power button or the Advanced System Management Interface (ASMI).

Before you stop the system, follow these steps:
1. Ensure that all jobs are completed and end all applications.
2. If a Virtual I/O Server (VIOS) logical partition is running, ensure that all clients are shut down or that the clients have access to their devices by using an alternative method.

Stopping a system by using the HMC

You can use the Hardware Management Console (HMC) to stop the system or logical partition.

By default, the managed system is set to power off automatically when you shut down the last running logical partition on the managed system. If you set the managed system properties on the HMC so that the managed system does not power off automatically, you must use this procedure to power off your managed system.

Attention: Ensure that you shut down the running logical partitions on the managed system before you power off the managed system. Powering off the managed system without shutting down the logical partitions first causes the logical partitions to shut down abnormally and can cause data loss. If you use a Virtual I/O Server (VIOS) logical partition, ensure that all clients are shut down or that the clients have access to their devices by using an alternative method.

To power off a managed system, you must be a member of one of the following roles:
- Super administrator
- Service representative
- Operator
- Product engineer

   Note: If you are a product engineer, verify that the customer has shut down all active partitions and has powered off the managed system. Continue with the procedure only after the status of the server changes to **Power Off**.

Connector locations

Learn about connector locations for servers and enclosures and expansion units.

Enclosure and expansion unit connectors

Learn about connector locations for enclosures and expansion units.

Connector locations for the 5887 disk drive enclosure

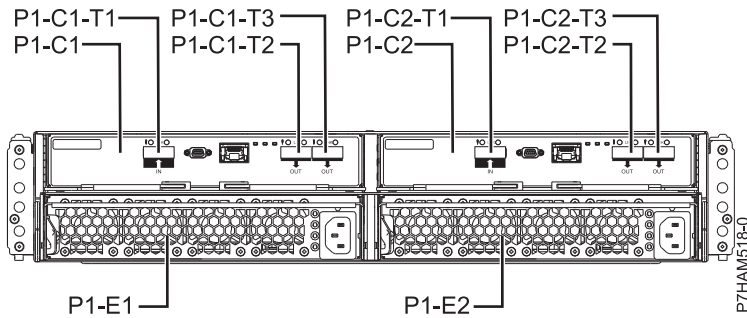Learn about connector locations for the 5887 disk drive enclosure.

Figure 3. Connector locations for the 5887 disk drive enclosure

Connector locations for the EMX0 PCIe3 expansion drawer

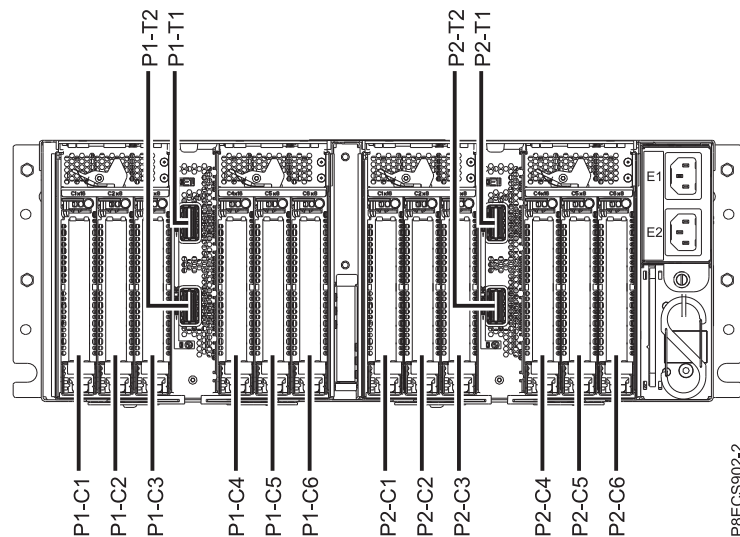Learn about connector locations for the EMX0 PCIe3 expansion drawer.

Figure 4. EMX0 PCIe3 expansion drawer showing the PCIe3 6-slot fanout module

For more information about the EMX0 PCIe3 expansion drawer locations, see PCIe Gen3 I/O expansion drawer locations (http://www.ibm.com/support/knowledgecenter/POWER8/p8ecs/p8ecs_emx0_loccodes.htm).

Connector locations for the 5147-024, ESLL, and ESLS storage enclosures

Learn about connector locations for the 5147-024, ESLL, and ESLS storage enclosures.

Note: The T1 connectors are not used.

P1-C1-T3
P1-C1-T2
P1-C1-T1
P1-C1

P1-C2-T3
P1-C2-T2
P1-C2-T1
P1-C2

T1 T2 T3

T1 T2 T3

P8EIU520-1

P1-E1

P1-E2
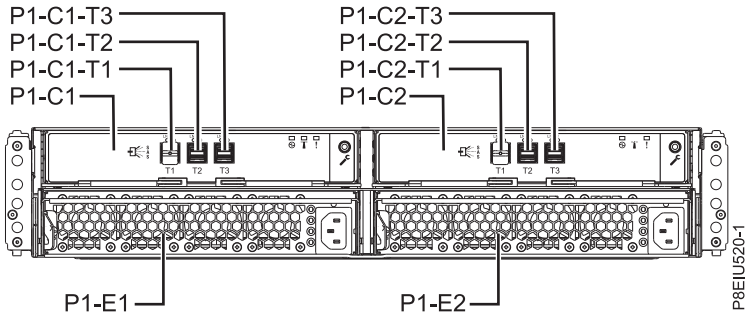
Figure 5. Connector locations for the 5147-024, ESLL, and ESLS storage enclosures

Connector locations for POWER8 servers

Learn about connector locations for POWER8 servers.

Connector locations for the 5148-22L, 8247-21L, 8247-22L, 8284-21A, and 8284-22A systems

Learn about connector locations for the 5148-22L, 8247-21L, 8247-22L, 8284-21A, and 8284-22A systems.

The expanded function 5148-22L, 8247-21L, 8247-22L, 8284-21A, and 8284-22A servers provide cable connector locations via a SAS port for disk drive enclosures.

Serial Port
(P1-C1-T1)

USB 3.0 Port 1
(P1-T1)

SAS Port 1
(P1-C14-T1)

USB 3.0 Port 2
(P1-T2)

USB 2.0 Port 1
(P1-C1-T2)
HMC Port 1
(P1-T3)

USB 2.0 Port 2
(P1-C1-T3)
HMC Port 2
(P1-T4)

SAS Port 2
(P1-C15-T1)

P8HAM516-0
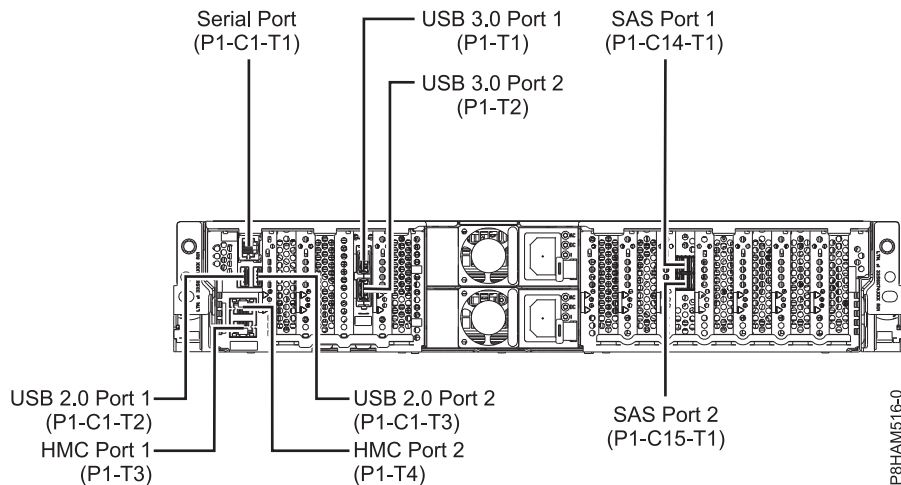
Figure 6. Connector locations for the expanded function 5148-22L, 8247-21L, 8247-22L, 8284-21A, and 8284-22A systems

Connector locations for the 8286-41A system

Learn about connector locations for the 8286-41A rack-mounted and stand-alone models.

The 8286-41A server provides cable connector locations via a SAS port for disk drive enclosures.
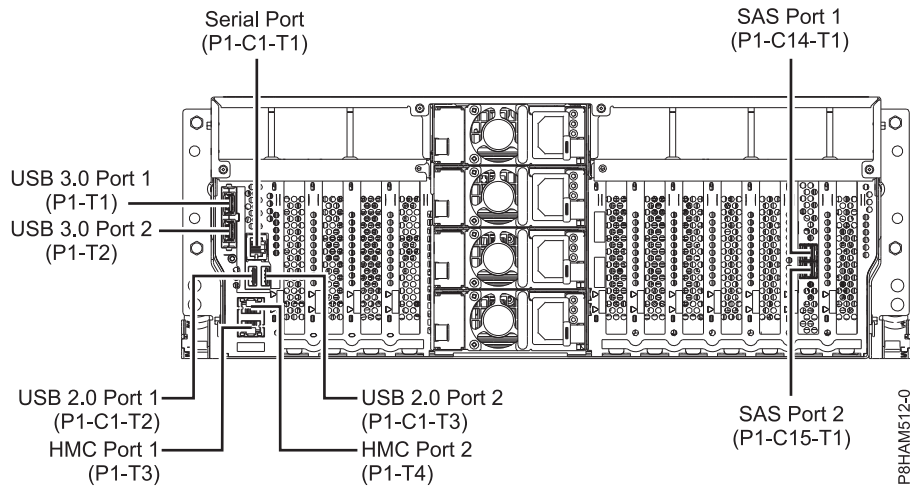
Figure 7. Connector locations for the rack-mounted 8286-41A (expanded function) system
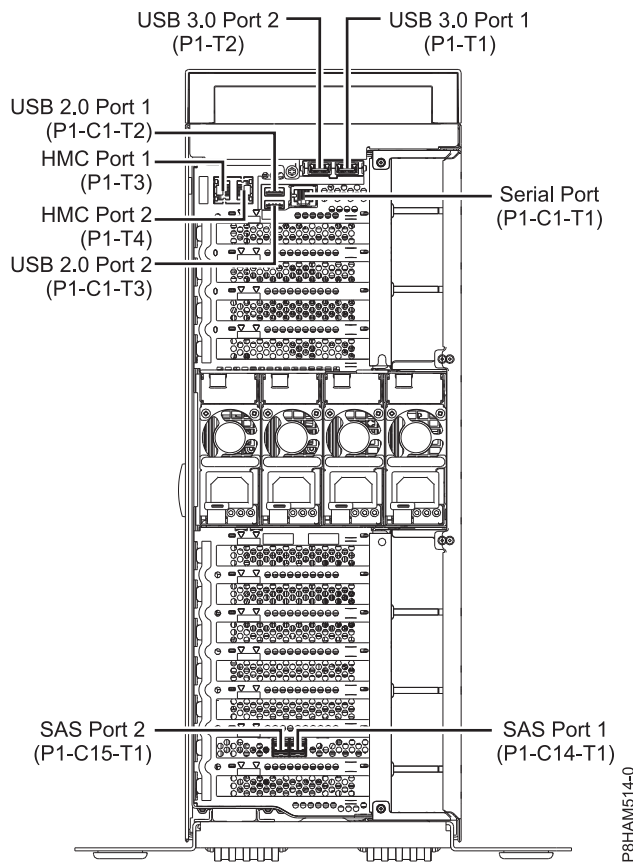

Figure 8. Connector locations for the stand-alone 8286-41A (expanded function) system

Connector locations for the 8247-42L and 8286-42A systems

Learn about connector locations for the 8247-42L and 8286-42A rack-mounted models.

The 8247-42L and 8286-42A (expanded function) servers provide cable connector locations via a SAS port for disk drive enclosures.
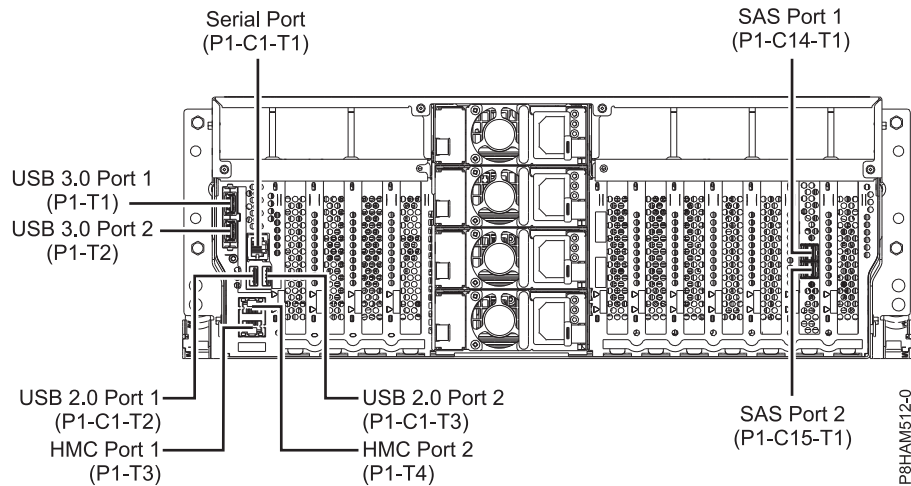
Serial Port
(P1-C1-T1)

SAS Port 1
(P1-C14-T1)

USB 3.0 Port 1
(P1-T1)

USB 3.0 Port 2
(P1-T2)

USB 2.0 Port 1
(P1-C1-T2)

HMC Port 1
(P1-T3)

USB 2.0 Port 2
(P1-C1-T3)

HMC Port 2
(P1-T4)

SAS Port 2
(P1-C15-T1)

P8HAM512-0

Figure 9. Connector locations for the 8247-42L and 8286-42A (expanded function) systems

Connector locations for the 8408-44E and 8408-E8E systems

Learn about connector locations for the 8408-44E and 8408-E8E systems.

The 8408-44E and 8408-E8E systems provide cable connector locations via a SAS port (P1-C5-T3) for disk drive enclosures and cable ports (P1-C5-T1 and P1-C5-T2) for the EMX0 PCIe3 expansion drawer.

P1-T2 P1-T1 P1-C1 P1-C2 P1-C3 P1-C4 P1-C5 P1-C6 P1-C7 P1-C8 P1-C9 P1-C10 P1-C11 P1-C12

E1   E2   E3   E4

P1-C5-T1   P1-C5-T2
P1-C5-T3
P1-C5-T4   P1-C5-T5

P8ECS952-2
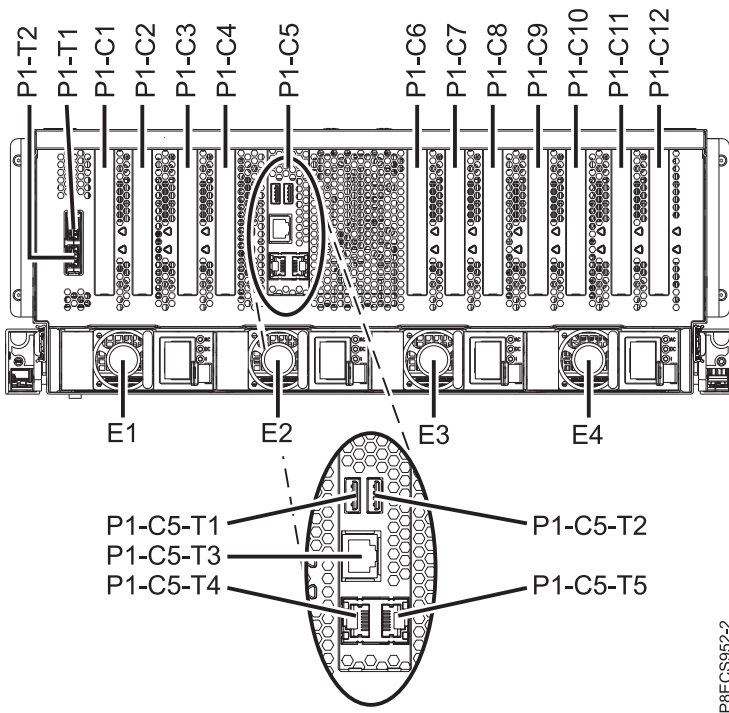
Figure 10. Connector locations for the 8408-44E and 8408-E8E systems

Connector locations for the 9080-MHE, 9080-MME, 9119-MHE, and 9119-MME systems

Learn about connector locations for the 9080-MHE, 9080-MME, 9119-MHE, and 9119-MME systems.

The 9080-MHE, 9080-MME, 9119-MHE, and 9119-MME servers provide cable connector locations for the EMX0 PCIe Gen3 I/O expansion drawer.
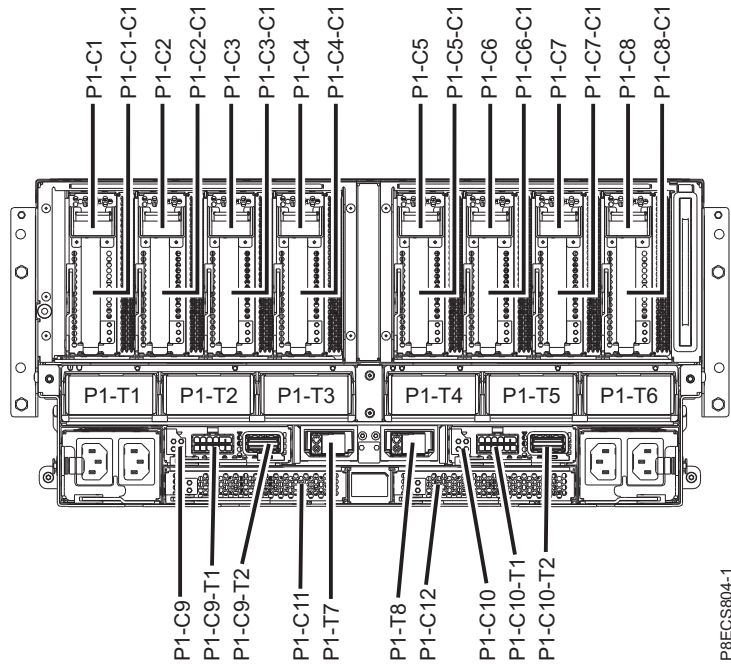

Figure 11. Connector locations for the 9080-MHE, 9080-MME, 9119-MHE, and 9119-MME systems

Connector locations for POWER7 servers

Learn about connector locations for POWER7® servers.

Model 8202-E4B connector locations

Learn about connector locations on rack-mounted and stand-alone models.
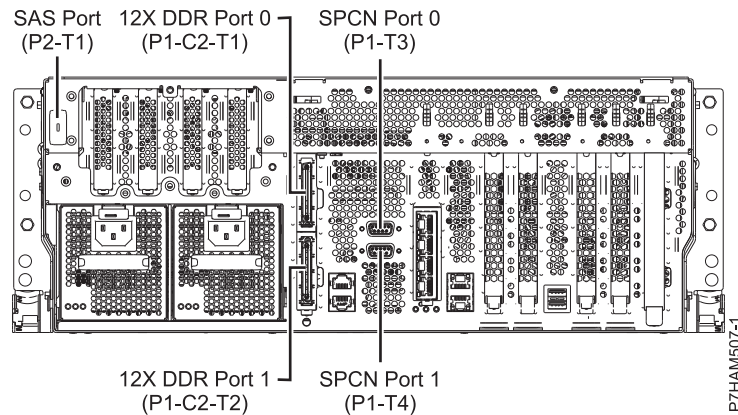
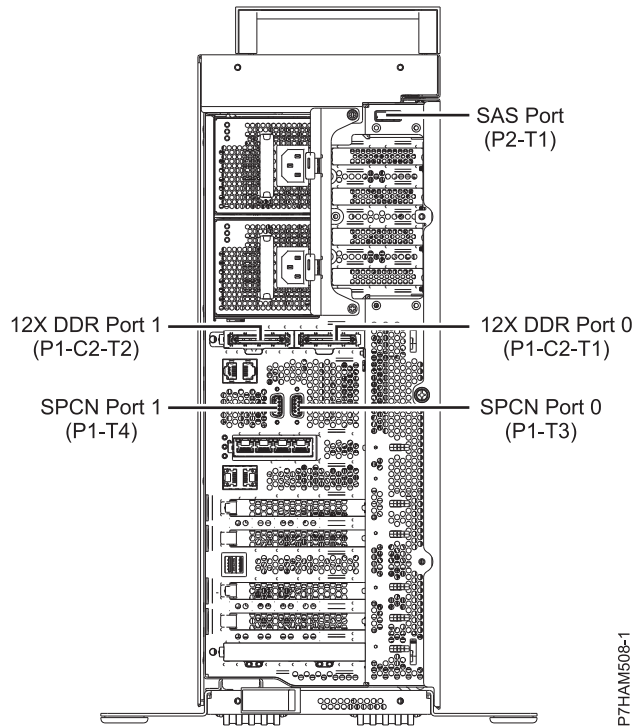*Figure 12. Model 8202-E4B connector locations on a rack-mounted model*

Figure 13. Model 8202-E4B connector locations on a stand-alone model

Model 8202-E4C connector locations

Learn about connector locations on rack-mounted models.

The 8202-E4C server provides cable connector locations for the following enclosures:

- Support for expansion units, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain two 12X double data rate (DDR) cable ports. However, the C1 slot cannot provide both 12X DDR and PCIe cable ports.
  - The server contains a serial-attached SCSI (SAS) port.
- Support for disk drive enclosures, as shown in the following figure, is as follows:
  - The server contains a SAS port.
- Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain two PCIe cable ports. However, the C1 slot cannot provide both PCIe and 12X DDR cable ports.
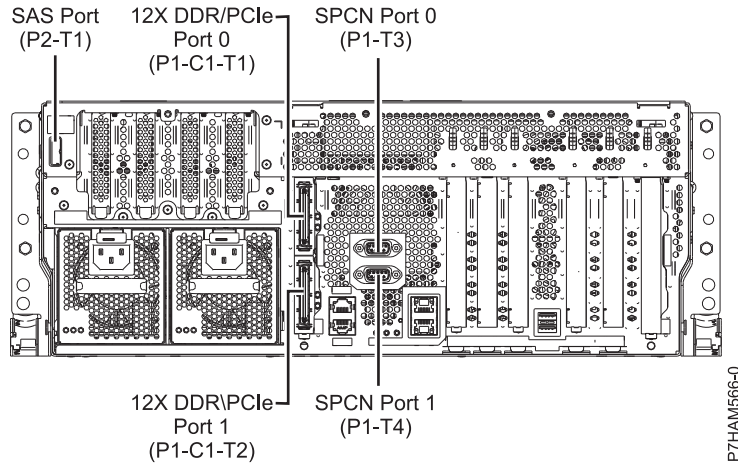 - The server contains a SAS port.

Figure 14. Model 8202-E4C connections for expansion units, disk drive enclosures, and PCIe storage enclosures

Model 8202-E4D connector locations

Learn about connector locations on rack-mounted models.

The 8202-E4D server provides cable connector locations for the following enclosures:

- Support for expansion units, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain two 12X double data rate (DDR) cable ports. However, the C1 slot cannot provide both 12X DDR and PCIe cable ports.
  - The server contains a serial-attached SCSI (SAS) port.
- Support for disk drive enclosures, as shown in the following figure, is as follows:
  - The server contains a SAS port.
- Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain two PCIe cable ports. However, the C1 slot cannot provide both PCIe and 12X DDR cable ports.
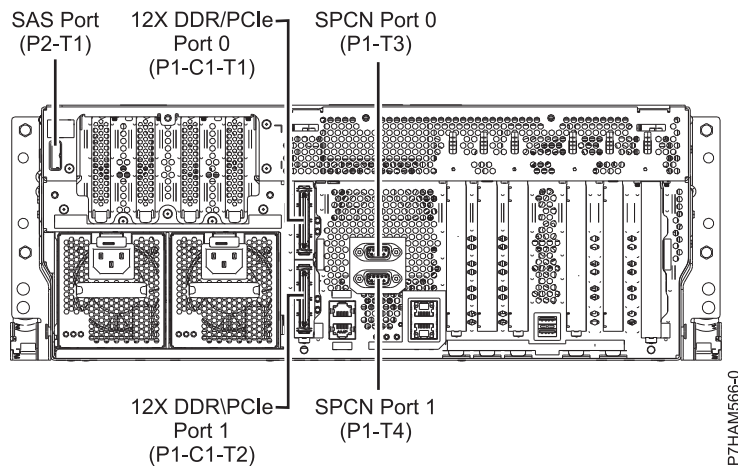 - The server contains a SAS port.

Figure 15. Model 8202-E4D connections for expansion units, disk drive enclosures, and PCIe storage enclosures

Model 8205-E6B connector locations

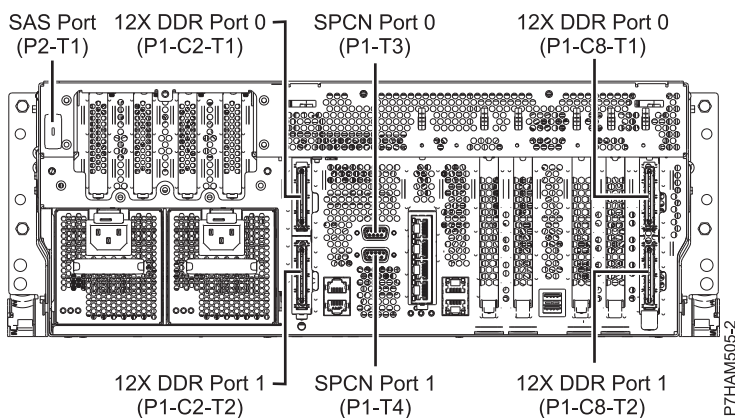Learn about connector locations on rack-mounted and stand-alone models.

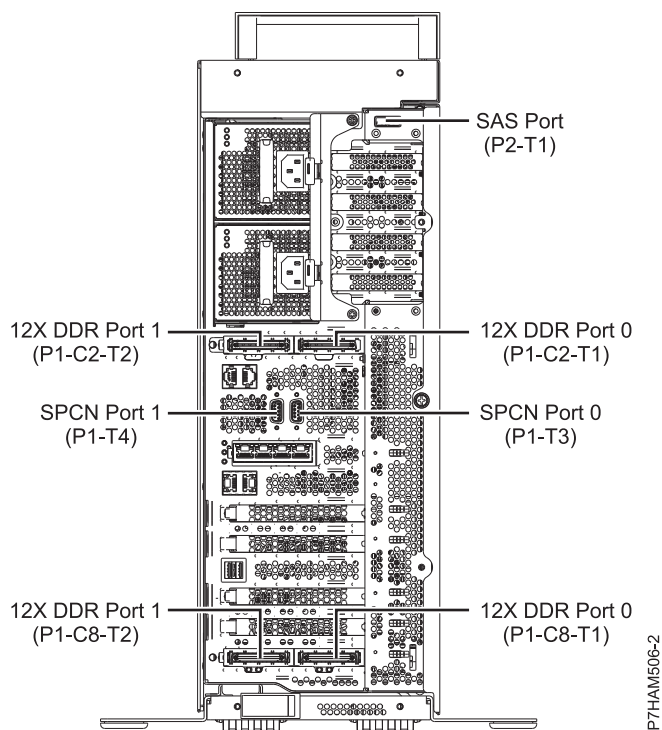*Figure 16. Model 8205-E6B connector locations on a rack-mounted model*

Figure 17. Model 8205-E6B connector locations on a stand-alone model

Model 8205-E6C connector locations

Learn about connector locations on rack-mounted models.

The 8205-E6C server provides cable connector locations for the following enclosures:
- Support for expansion units, as shown in the following figure, is as follows:
  – The card installed in the C1 slot can contain two 12X double data rate (DDR) cable ports. However, the C1 slot cannot provide both 12X DDR and PCIe cable ports.

- The card installed in the C8 slot can contain two 12X DDR cable ports. However, the C8 slot cannot provide both 12X DDR and PCIe cable ports.
  - The port card type installed in the C1 slot can differ from the port card type installed in the C8 slot.
  - The server contains a serial-attached SCSI (SAS) port.
- Support for disk drive enclosures, as shown in the following figure, is as follows:
  - The server contains a SAS port.
- Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain two PCIe cable ports. However, the C1 slot cannot provide both PCIe and 12X DDR cable ports.
  - The card installed in the C8 slot can contain two PCIe cable ports. However, the C8 slot cannot provide both PCIe and 12X DDR cable ports.
  - The port card type installed in the C1 slot can differ from the port card type installed in the C8 slot.
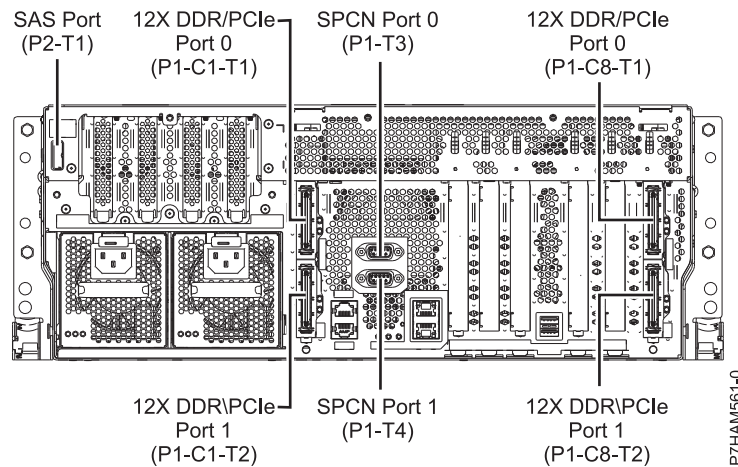 - The server contains a SAS port.

Figure 18. Model 8205-E6C connections for expansion units, disk drive enclosures, and PCIe storage enclosures

Model 8205-E6D connector locations

Learn about connector locations on rack-mounted models.

The 8205-E6D server provides cable connector locations for the following enclosures:
- Support for expansion units, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain two 12X double data rate (DDR) cable ports. However, the C1 slot cannot provide both 12X DDR and PCIe cable ports.
  - The card installed in the C8 slot can contain two 12X DDR cable ports. However, the C8 slot cannot provide both 12X DDR and PCIe cable ports.
  - The port card type installed in the C1 slot can differ from the port card type installed in the C8 slot.
  - The server contains a serial-attached SCSI (SAS) port.
- Support for disk drive enclosures, as shown in the following figure, is as follows:
  - The server contains a SAS port.
- Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain two PCIe cable ports. However, the C1 slot cannot provide both PCIe and 12X DDR cable ports.
  - The card installed in the C8 slot can contain two PCIe cable ports. However, the C8 slot cannot provide both PCIe and 12X DDR cable ports.
  - The port card type installed in the C1 slot can differ from the port card type installed in the C8 slot.
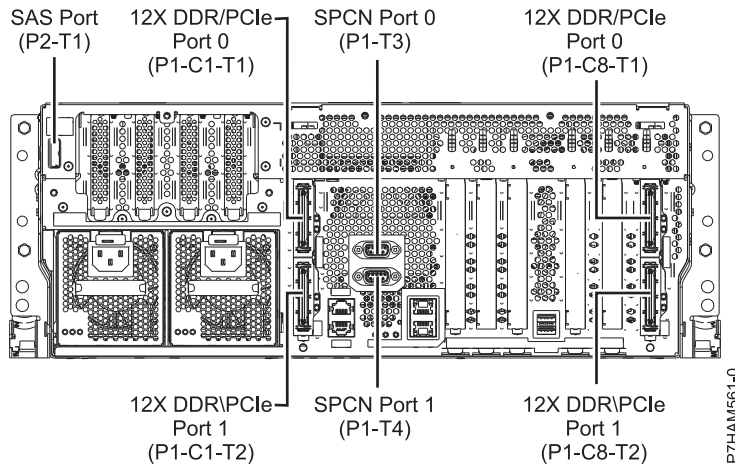
– The server contains a SAS port.

Figure 19. Model 8205-E6D connections for expansion units, disk drive enclosures, and PCIe storage enclosures

Model 8231-E1C connector locations

Learn about connector locations.

The 8231-E1C server provides cable connector locations for the following enclosures:
* Support for disk drive enclosures, as shown in the following figure, is as follows:
  – The server contains a serial-attached SCSI (SAS) port.
* Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  – The card installed in the C1 slot can contain one PCIe cable port.
  – The server contains a SAS port.

Figure 20. Model 8231-E1C connections for disk drive enclosures and PCIe storage enclosures

Model 8231-E1D or 8268-E1D connector locations

Learn about connector locations.

The 8231-E1D or 8268-E1D servers provides cable connector locations for the following enclosures:
* Support for disk drive enclosures, as shown in the following figure, is as follows:
  – The server contains a serial-attached SCSI (SAS) port.
* Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  – The card installed in the C1 slot can contain one PCIe cable port.
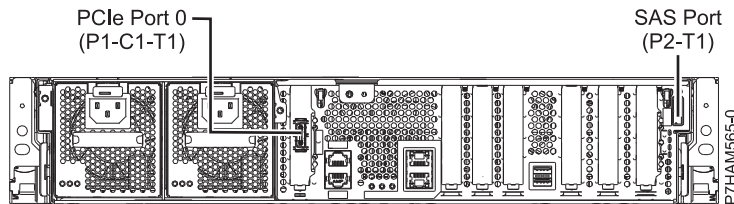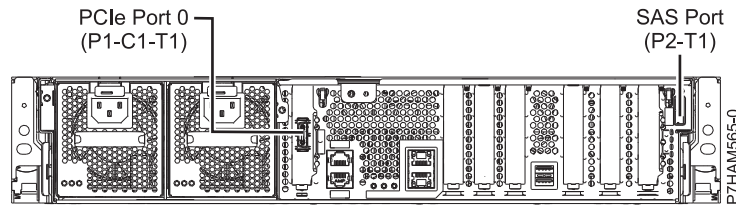 – The server contains a SAS port.

Figure 21. Model 8231-E1D or 8268-E1D connections for disk drive enclosures and PCIe storage enclosures

Model 8231-E2B connector locations

Learn about connector locations on rack-mounted models.

The 8231-E2B server provides cable connector locations for the following enclosures:
- Support for disk drive enclosures, as shown in the following figure, is as follows:
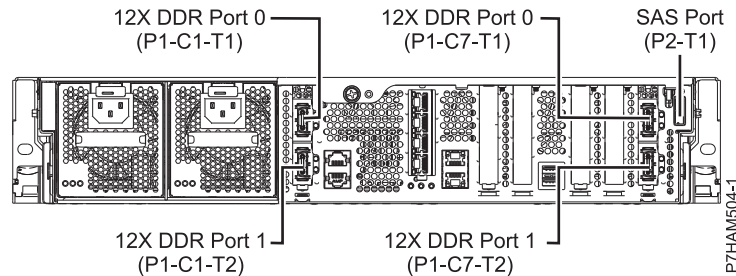 - The server contains a SAS port.

Figure 22. Model 8231-E2B connections for disk drive enclosures

- The 8231-E2B server provides no support for expansion units. The 12X DDR cable ports are for high speed system-to-system interconnection only.

Model 8231-E2C connector locations

Learn about connector locations.

The 8231-E2C server provides cable connector locations for the following enclosures:
- Support for expansion units, as shown in the following figure, is as follows:
  - The C1 slot must contain the system power control network (SPCN) card, and the C8 slot must contain the card with two 12X double data rate (DDR) cable ports.

    Note: Installing the 12X DDR cable ports at this location causes both the C8 and C6 slot space to be occupied.
  - The server cannot support both 12X DDR cable ports and PCIe cable ports at the same time.
  - The server contains a serial-attached SCSI (SAS) port.
- Support for disk drive enclosures, as shown in the following figure, is as follows:
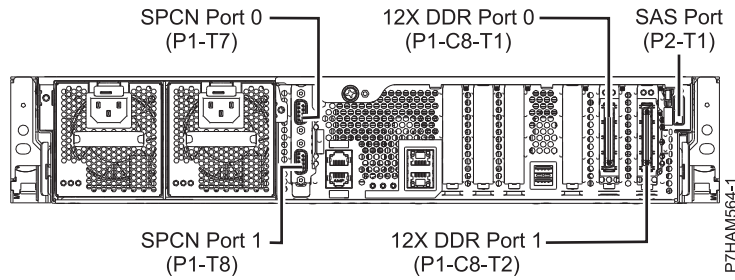 - The server contains a SAS port.

SPCN Port 0
(P1-T7)
12X DDR Port 0
(P1-C8-T1)
SAS Port
(P2-T1)

SPCN Port 1
(P1-T8)
12X DDR Port 1
(P1-C8-T2)

P7HAM564-1

Figure 23. Model 8231-E2C connections for expansion units and disk drive enclosures

- Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  - The card installed in the C1 slot can contain one PCIe cable port, and the card installed in the C8 slot can contain one PCIe cable port.
  - The server cannot support both PCIe cable ports and 12X DDR cable ports at the same time.
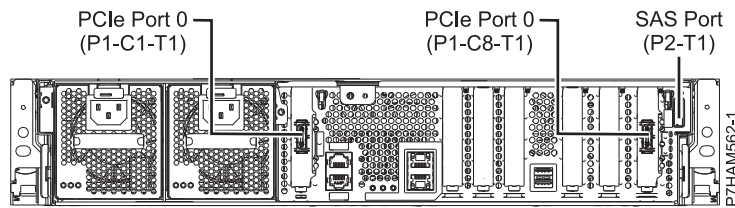 - The server contains a SAS port.

PCIe Port 0
(P1-C1-T1)
PCIe Port 0
(P1-C8-T1)
SAS Port
(P2-T1)

P7HAM562-1

Figure 24. Model 8231-E2C connections for PCIe storage enclosures

Model 8231-E2D connector locations

Learn about connector locations.

The 8231-E2D server provides cable connector locations for the following enclosures:

- Support for expansion units, as shown in the following figure, is as follows:
  - The C1 slot must contain the system power control network (SPCN) card, and the C8 slot must contain the card with two 12X double data rate (DDR) cable ports.

    Note: Installing the 12X DDR cable ports at this location causes both the C8 and C6 slot space to be occupied.
  - The server cannot support both 12X DDR cable ports and PCIe cable ports at the same time.
  - The server contains a serial-attached SCSI (SAS) port.
- Support for disk drive enclosures, as shown in the following figure, is as follows:
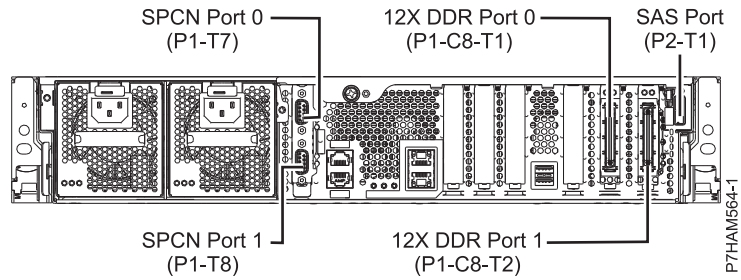 - The server contains a SAS port.

Figure 25. Model 8231-E2D connections for expansion units and disk drive enclosures

- Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  – The card installed in the C1 slot can contain one PCIe cable port, and the card installed in the C8 slot can contain one PCIe cable port.
  – The server cannot support both PCIe cable ports and 12X DDR cable ports at the same time.
  – The server contains a SAS port.
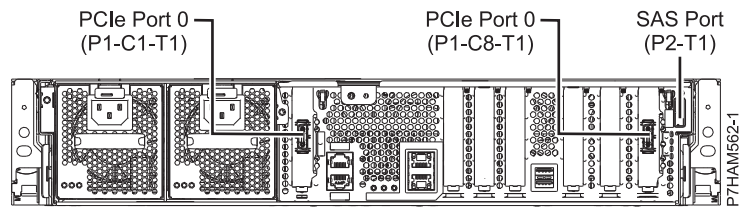
Figure 26. Model 8231-E2D connections for PCIe storage enclosures

Model 8233-E8B connector locations

Learn about connector locations on rack-mounted models.
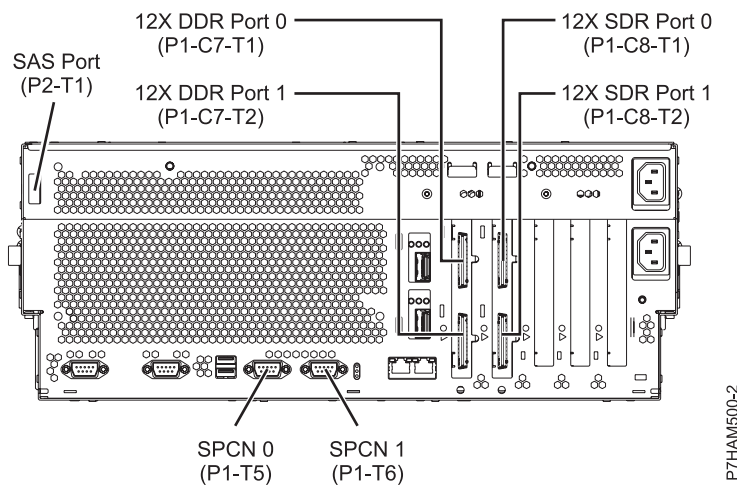
Figure 27. Model 8233-E8B connector locations on a rack-mounted model

Model 8246-L1S connector locations

Learn about connector locations.

Figure 28. Model 8246-L1S connector locations

Model 8246-L1T connector locations

Learn about connector locations.

Figure 29. Model 8246-L1T connector locations
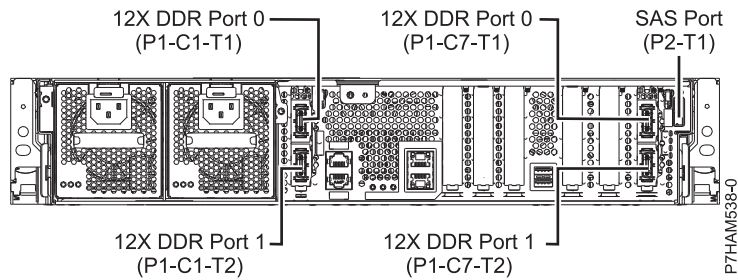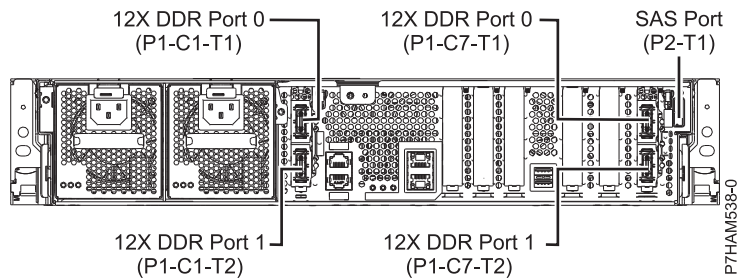
Model 8246-L2S connector locations
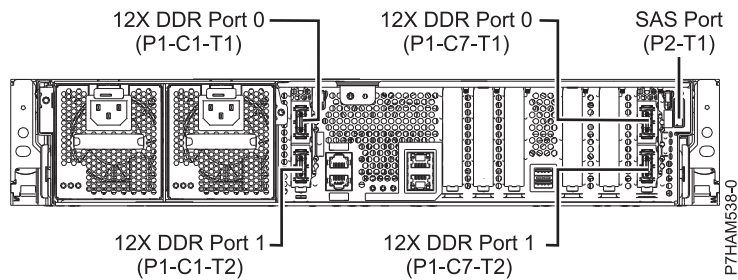
Learn about connector locations.

Figure 30. Model 8246-L2S connector locations

Model 8246-L2T connector locations

Learn about connector locations.

12X DDR Port 0 (P1-C1-T1) 12X DDR Port 0 (P1-C7-T1) SAS Port (P2-T1)

12X DDR Port 1 (P1-C1-T2) 12X DDR Port 1 (P1-C7-T2)

P7HAM538-0
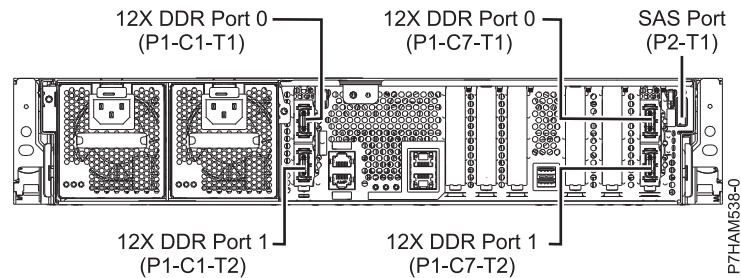
Figure 31. Model 8246-L2T connector locations

Model 8248-L4T, 8408-E8D, or 9109-RMD connector locations

Learn about connector locations.

The 8248-L4T, 8408-E8D, and 9109-RMD servers provide cable connector locations for the following enclosures:

* Support for expansion units, as shown in the following figure, is as follows:
  – The card installed in the C2 slot can contain two 12X double data rate (DDR) cable ports. However, the C2 slot cannot provide both 12X DDR and PCIe cable ports.
  – The card installed in the C3 slot can contain two 12X DDR cable ports. However, the C3 slot cannot provide both 12X DDR and PCIe cable ports.
* Support for disk drive enclosures, as shown in the following figure, is as follows:
  – The server contains a SAS port.
* Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  – The card installed in the C2 slot can contain two PCIe cable ports. However, the C2 slot cannot provide both PCIe and 12X DDR cable ports.
  – The card installed in the C3 slot can contain two PCIe cable ports. However, the C3 slot cannot provide both PCIe and 12X DDR cable ports.

Figure 32. Model 8248-L4T, 8408-E8D, or 9109-RMD connector locations for expansion units, disk drive enclosures, and PCIe storage enclosures

Model 9117-MMB or 9179-MHB connector locations

Learn about connector locations.
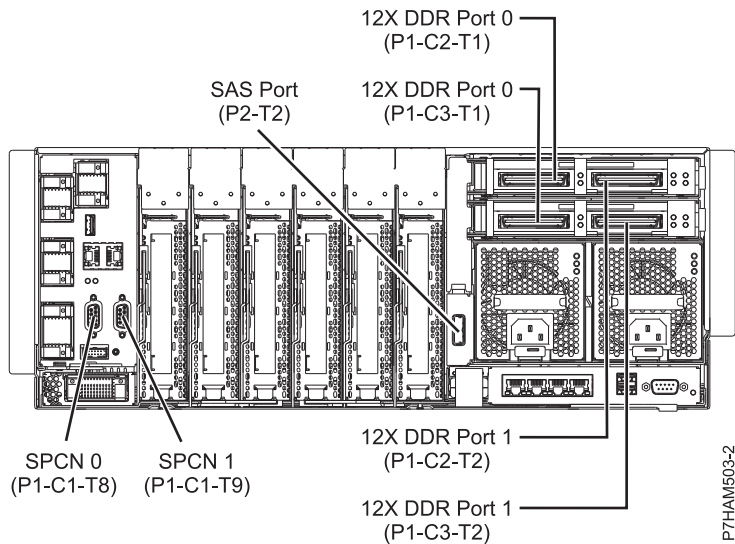
Figure 33. Model 9117-MMB or 9179-MHB connector locations

Model 9117-MMC or 9179-MHC connector locations

Learn about connector locations.
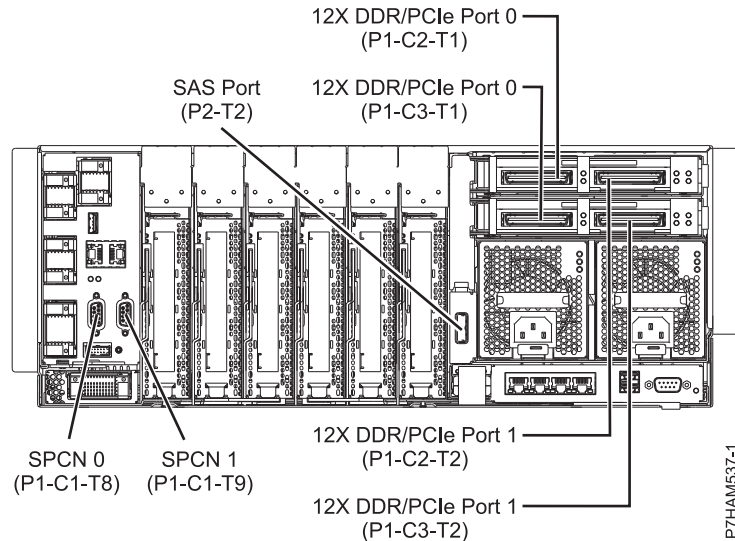
Figure 34. Model 9117-MMC or 9179-MHC connector locations

Model 9117-MMD or 9179-MHD connector locations

Learn about connector locations.

The 9117-MMD and 9179-MHD servers provide cable connector locations for the following enclosures:
* Support for expansion units, as shown in the following figure, is as follows:
  – The card installed in the C2 slot can contain two 12X double data rate (DDR) cable ports. However, the C2 slot cannot provide both 12X DDR and PCIe cable ports.
  – The card installed in the C3 slot can contain two 12X DDR cable ports. However, the C3 slot cannot provide both 12X DDR and PCIe cable ports.
* Support for disk drive enclosures, as shown in the following figure, is as follows:
  – The server contains a SAS port.
* Support for PCIe storage enclosures, as shown in the following figure, is as follows:
  – The card installed in the C2 slot can contain two PCIe cable ports. However, the C2 slot cannot provide both PCIe and 12X DDR cable ports.
  – The card installed in the C3 slot can contain two PCIe cable ports. However, the C3 slot cannot provide both PCIe and 12X DDR cable ports.
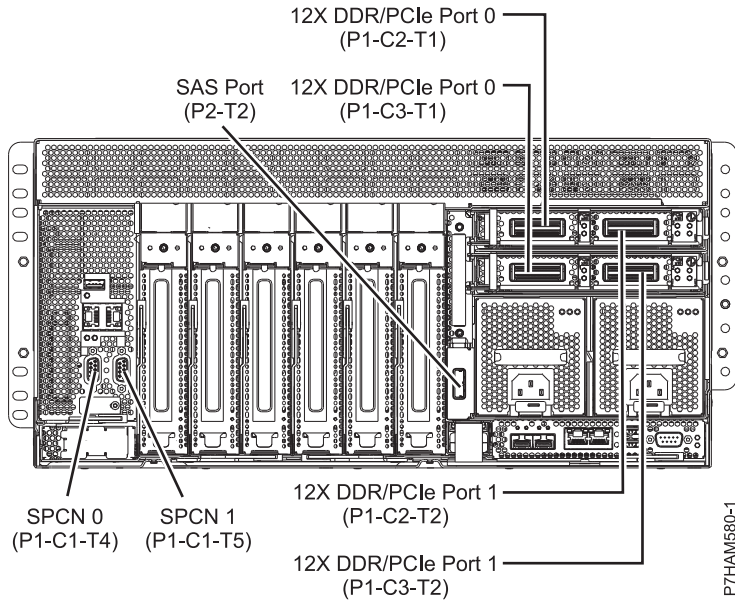
Figure 35. Model 9117-MMD or 9179-MHD connector locations for expansion units, disk drive enclosures, and PCIe storage enclosures

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IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any referenc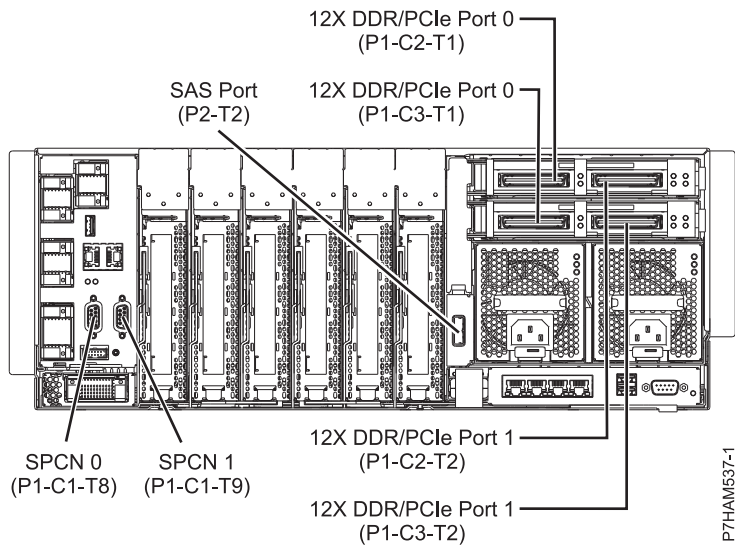e to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

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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.

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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)
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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.

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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

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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

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声　　明

此为 A 级产品,在生活环境中、
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居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

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IBM Taiwan Contact Information:

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台灣國際商業機器股份有限公司
台北市松仁路7號3樓
電話：0800-016-888

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

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

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.

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Federal Communications Commission (FCC) Statement

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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.

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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.

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Germany Compliance Statement

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

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