Power Systems

System backplane for the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S

Note

Before using this information and the product it supports, read the information in "Safety notices" on page v, "Notices" on page 125, the *IBM Systems Safety Notices* manual, G229-9054, and the *IBM Environmental Notices and User Guide*, Z125–5823.

This edition applies to IBM® Power Systems servers that contain the POWER9™ processor and to all associated models.

© Copyright International Business Machines Corporation 2018, 2020.
US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

Safety notices ..... **v**

System backplane **1**
Removing and replacing the system backplane 1
Preparing the system 1
Removing the system backplane 12
Replacing the system backplane 67
Preparing the system for operation 115

Notices **125**
Accessibility features for IBM Power Systems servers 126
Privacy policy considerations 127
Trademarks 127
Electronic emission notices 127
Class A Notices 127
Class B Notices 131
Terms and conditions 133

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.

© Copyright IBM Corp. 2018, 2020

- 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 if provided, unless the earthquake option is to be installed..
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.

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

- Stability hazard:
  - The rack may tip over causing serious personal injury.
  - Before extending the rack to the installation position, read the installation instructions.
  - Do not put any load on the slide-rail mounted equipment mounted in the installation position.
  - Do not leave the slide-rail mounted equipment in the installation position.
- Each rack cabinet might have more than one power cord.
  - For AC powered racks, be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
  - For racks with a DC power distribution panel (PDP), turn off the circuit breaker that controls the power to the system unit(s), or disconnect the customer’s DC power source, when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (R001 part 1 of 2)

(R001 part 2 of 2):

CAUTION:

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

- *(For fixed drawers.)* This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack. (R001 part 2 of 2)

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

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must observe the following precautions:
  - Remove all devices in the 32U position and above.
  - Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
  - Ensure that there are little-to-no empty U-levels between devices installed in the rack cabinet below the 32U level, unless the received configuration specifically allowed it.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- If the rack cabinet you are relocating was supplied with removable outriggers they must be reinstalled before the cabinet is relocated.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 2083 mm (30 x 82 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:
  - Lower the four leveling pads.
  - Install stabilizer brackets on the rack cabinet or in an earthquake environment bolt the rack to the floor.
  - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.

(R002)

(L001)

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

(L002)

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

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

(L002)

(L003)

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 may not injure the eye, this procedure is potentially dangerous. Therefore, verifying the continuity of optical fibers by shining light into one end and looking at the other end is not recommended. To verify continuity of a fiber optic cable, use an optical light source and power meter. (C027)

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

CAUTION: Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following information:

- Laser radiation when open.
- Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam. (C030)

(C030)

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

Do Not:

- Throw or immerse into water
- Heat to more than 100 degrees C (212 degrees F)
- Repair or disassemble

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

CAUTION: Regarding IBM provided VENDOR LIFT TOOL:

- Operation of LIFT TOOL by authorized personnel only.

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

Freewheeling will cause uneven cable wrapping around winch drum, damage cable, and may cause serious injury.

- This TOOL must be maintained correctly for IBM Service personnel to use it. IBM shall inspect condition and verify maintenance history before operation. Personnel reserve the right not to use TOOL if inadequate. (C048)

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

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

The equipment is suitable for installation in the following:

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

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

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

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

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

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

Removing and replacing the system backplane in the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S

Find information about removing and replacing the system backplane in the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S.

Removing and replacing the system backplane in the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S

Find information about removing and replacing the system backplane in the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S.

If your system is managed by the Hardware Management Console (HMC), use the HMC to repair a part in the system. For instructions, see Repairing a part by using the HMC (www.ibm.com/support/knowledgecenter/POWER9/p9haj/p9haj_hmc_repair.htm).

If you do not have an HMC, use the following procedures to remove and replace the system backplane.

Note: Only an authorized service representative must remove or replace this part.

Preparing the system to remove and replace the system backplane

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

About this task

Before you begin this procedure, ensure that you have authority to log in as an authorized service provider. The authority levels are described in ASMI authority levels.

Procedure

1. Identify the part and the system that you are working on. For instructions, see Identifying a part (www.ibm.com/support/knowledgecenter/POWER9/p9haj/sal.htm).

   Use the blue identify LED on the enclosure to locate the system. Ensure that the serial number of the system matches the serial number to be serviced.
2. Stop the system. For instructions, see Stopping a system (www.ibm.com/support/knowledgecenter/POWER9/p9haj/crustopsys.htm).
3. Access the Advanced System Management Interface (ASMI).

   For instructions, see Accessing the ASMI without an HMC (www.ibm.com/support/knowledgecenter/POWER9/p9hby/connect_asmi.htm).
4. On the ASMI welcome panel, locate **Service Processor: Primary (Location: UXXXX.YYY.ZZZZZZZ)** where *XXXX.YYY* represents the **Feature Code/Sequence Number** and *ZZZZZZZ* represents the **Enclosure serial number**. Record the values for **XXXX.YYY** and **ZZZZZZZ**.
5. Check and record the System Enclosure Type and Feature Code. The enclosure serial number is a seven-digit number that is printed on a bar-coded label on the system unit.
6. Attach the electrostatic discharge (ESD) wrist strap.

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

   Attention:

© Copyright IBM Corp. 2018, 2020

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

7. Open the cable management arm by completing the following steps:
   a) Release the mounting bracket from the cable management arm assembly by pressing the indentation **(A)** on the inner cable management arm tab.

      The cable management arm releases from the outer mounting bracket in the direction shown.

Figure 1. Releasing the cable management arm

   b) Swing the cable management arm away from the system.

      In the image, the inner cable management arm tab is shown on the left side as you are facing the system from the rear. However, the cable management arm can also be installed so that the inner cable management arm tab is on the right side of the system.

CAUTION: To avoid causing damage to the arm, open the cable management arm just long enough to complete these repairs.

8. Label and disconnect the power cords from the system unit.

   See Figure 2 on page 3.

   Notes:

   - This system might be equipped with two or more power supplies. If the removing and replacing procedures require the system power to be turned off, ensure that all the power sources to the system are disconnected.
   - The power cord **(B)** is fastened to the system with hook-and-loop fastener **(A)**. If you are placing the system in a service position after you disconnect the power cords, ensure that you unstrap the fastener.

Figure 2. Removing the power cords

(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)

9. Unseat each of the power supplies by pushing on the locking-tab and pulling the power supply out enough so that the connector is disengaged.
10. Label, disconnect, and set aside all remaining rear cables that connect to the system.
11. Close the cable management arm by completing the following steps:
    a) Swing the cable management arm towards the server.
    b) Insert the inner cable management arm tab **(A)** into the outer mounting bracket **(B)** until it clicks into place as shown. The inner mounting bracket **(C)** is not used on the left side.

Figure 3. Closing the cable management arm

12. Disconnect the cable management arm from the system by pressing the inner cable management arm tab **(A)** while lightly squeezing the inner and outer cable management arms together. Then, secure the inner cable management arm to the outer cable management arm with a hook and loop fastener. You should secure the inner and outer arms at the narrowest spot **(G)** between the basket and the side of the arm that you just disconnected. See Figure 4 on page 7.

Figure 4. Cable management arm parts

13. Hold the indentations **(A)** on the front cover and pull it away from the system. See Figure 5 on page 8.

Figure 5. Removing the front cover

14. Open the side latches **(A)** and pull the latches to slide the system unit fully into the service position, until the slides click and hold the system unit securely. Ensure that the screws inside the latches are not secured to the rack.

    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.

Figure 6. Releasing the side latches

15. Release the service access cover latch by pushing the release latch **(A)** in the direction shown.
16. Slide the cover **(B)** off the system unit. When the front of the service access cover clears the upper frame ledge, lift the cover up and off the system unit.

Attention: Operating the system without the service access cover on for more than 10 minutes when the system power is turned on might damage the system components.

Figure 7. Removing the service access cover

17. To activate the identify LED for the faulty part, press and hold push-button **(A)** on the trusted platform module card as shown in the following figure.

    Verify that the LED **(B)** is lit, which indicates that sufficient power exists for the identify LED. If the LED **(B)** is not lit, use the location code to find the physical location by using the service label.

Figure 8. Activating the identify LED

18. Look for the amber LED of the system backplane. See Figure 9 on page 12.

Figure 9. Service indicator LEDs

Removing the system backplane from the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S

Follow these steps to remove the system backplane from a server to replace a failing part or as part of another service procedure.

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap on and that the ESD clip is plugged into a ground jack or connected to an unpainted metal surface. If not, do so now.
2. Lift each air baffle **(A)** straight up.

   See Figure 10 on page 13.

   Place air baffles upside down on a clean area. When you turn an air baffle over, hold the detachable drive cover to prevent it from coming loose.

Figure 10. Removing the air baffle

3. Remove the PCIe adapters:
   a) Label and disconnect all external cables that are attached to the adapters.
   b) Record the slot number and location of each adapter being removed. See the following figure.

Figure 11. PCIe adapter slot locations in the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S system

c) Set the adapter latch **(A)** in the target slot to the open position by rotating the latch **(A)** in the direction that is shown in the following figure.

(L007)

CAUTION: A hot surface nearby. (L007)

d) Carefully grasp the adapter **(B)** by its top edge or tailstock, and remove the adapter from the slot as shown in the following figure.

Attention: A pin on the tailstock of the adapter resembles a removable screw. Do not remove this pin. It is required for correct alignment and seating.

Figure 12. Removing an adapter from the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S system

e) Place the adapter on an approved ESD surface.

f) Repeat steps "3.a" on page 13 through "3.e" on page 15 for all of the PCIe adapters.

4. Remove the rear USB cable:

a) While pressing the latch release on the connector, unplug the rear USB cable **(A)** from the system backplane as shown in the following figure. The connector on the system backplane that has the USB port symbol with an arrow that points to the rear of the system.

Figure 13. Removing the rear USB cable

b) At the rear of the system, open the adapter latch **(B)** and lift the USB cable housing **(C)** as shown in the following figure.

Figure 14. Removing the rear USB cable

c) Lift the rear USB cable out of the system.

d) Place the rear USB cable on an appropriate ESD surface.

5. Disconnect the front USB cable from the system backplane:

a) Pressing the latch release on the connector, disconnect the front USB cable from the system backplane as shown in the following figure. The USB connector on the system backplane has the USB port symbol with an arrow pointing to the front of the system.

b) Unfasten the cable from the hook and loop fasteners that secure the cable to the right side of the chassis.

c) Route the cable over the side of the system and out of the way to provide clearance for removing the backplane. See the following figure.

Figure 15. Disconnecting the front USB cable and routing it over the side of the system

6. Remove the vital product data (VPD) card:
   a) Grasp the VPD card by the plastic housing as shown in the following figure.
   b) Pull the VPD card out of its slot in location P1-C13 on the system backplane. See the following figure.

Figure 16. Removing the VPD card

c) Place the VPD card on an appropriate ESD surface.

7. Remove the service processor card:

a) At the rear of the system, unlatch the PCI adapter retainer **(A)** for the service processor card. See **(A)** in the following figure.

b) Pull the service processor card straight up from the slot by holding the card bracket **(B)** and the tailstock.

c) Place the service processor card on an appropriate ESD surface.

Figure 17. Removing the service processor card from slot P1-C1

8. Remove PCIe adapter dividers:
   a) Place your finger on the top edge of the PCIe adapter divider **(A)** to hold the divider steady as shown in the following figure.

      Figure 18. Preparing to remove the PCIe adapter divider

b) Press down on the retaining latch at the back edge of the divider **(B)** as shown in the previous figure.

c) Slide the divider away from the system chassis and towards the inside of the system. When the tab on the divider **(C)** clears the groove in the system backplane, lift the divider to remove it from the system. See the following figure.

Figure 19. Sliding the PCIe divider out of the system

d) Place the adapter divider in a clean area.

e) Repeat steps "8.a" on page 20 through "8.d" on page 22 for all of the PCIe adapter dividers.

9. Remove the RAID adapter or adapters, if present. Otherwise, continue with the next step.

a) Locate the RAID adapter you want to remove.

Note: If only one RAID adapter is present, remove the plastic air dividers between slots P1-C49 and P1-C50.

b) If a rear SAS cable is attached to the SAS RAID adapter, label and disconnect the rear SAS cable from the SAS RAID adapter by pressing the connector latch and unplugging the cable. See the following figure.

Figure 20. Disconnecting the rear SAS cable from the SAS RAID internal adapter

c) If a rear SAS cable is attached to the SAS RAID adapter, unlatch the PCI adapter retainer **(A)** for the corresponding PCI adapter slot at the rear of the system. Then, lift and remove the rear SAS cable adapter **(B)**. See the following figure.

   Ensure that the rear SAS cable does not catch on any components while you are lifting the rear SAS adapter out of the slot.

Figure 21. Removing the rear SAS cable adapter

d) Place the rear SAS cable and connector on an appropriate ESD surface.

e) Identify and label the front SAS cable or cables that are connected to the adapter you want to remove. Pay attention to the locations of the connectors where the cable or cables attach to the disk drive backplane and the SAS RAID internal adapter.

   Note: Depending on which SAS RAID adapter is installed in your system, one or two front SAS cables are connected to the SAS RAID adapter.

f) Press the connector latch **(A)** and unplug the front SAS cable or cables from the disk drive backplane. Leave the other end of the cable or cables plugged in to the SAS RAID internal adapter. See the following figure.

Figure 22. Unplugging the front SAS cables

g) Twist the screws **(A)** counterclockwise to release the SAS RAID adapter. Lift both the SAS RAID adapter and the front SAS cable (or cables) out of the slot. Ensure that the front SAS cable does not catch on any components while you are lifting the SAS RAID adapter out of the slot.

See the following figure.

Figure 23. Removing the SAS RAID adapter

h) Place the SAS RAID adapter on an appropriate ESD surface.

i) If a second SAS RAID internal adapter is present, repeat steps "9.a" on page 22 through "9.h" on page 26.

10. Remove the NVMe M.2 carrier cards, if present. Otherwise, continue with the next step.

    a) Twist the screws **(A)** counterclockwise to release the NVMe M.2 carrier card.

    b) Lift the NVMe M.2 carrier card out of the slot as shown in the following figure.

Figure 24. Removing the NVMe M.2 carrier card

c) Place the NVMe M.2 carrier card on an appropriate ESD surface.

d) If a second NVMe M.2 carrier card is present, repeat steps “10.a” on page 26 through “10.c” on page 27.

11. Remove the NVMe U.2 pass-thru cards, if present. Otherwise, continue with the next step.

    a) Label the NVMe cables and how they connect between the NVMe drive backplane and the NVMe U.2 pass-thru cards. Record how the plugs and jacks are connected. Disconnect the NVMe cables from the NVMe drive backplane by pressing the cable latch and unplugging the cable as shown in the following figure.

Figure 25. Disconnecting the NVMe cables from the NVMe drive backplane

b) Twist the screws **(A)** counterclockwise to release the NVMe U.2 pass-thru card. Lift both the NVMe U.2 pass-thru card and the NVMe cable out of the slot as shown in the following figure.

Figure 26. Removing the NVMe U.2 pass-thru card

c) Place the NVMe U.2 pass-thru card on an appropriate ESD surface.

d) If a second NVMe U.2 pass-thru card is present, repeat steps "11.a" on page 27 through "11.c" on page 29.

12. Remove the non-volatile dual in-line memory modules (NVDIMMs), if present. Otherwise, continue with the next step.

    a) Record the slot location of the NVDIMM you want to remove. Then, review and record the locations where the backup power module (BPM) cable connects to the NVDIMM and to the BPM.

    b) To unlock the NVDIMM from its connector, simultaneously push both of the locking tabs away from the module in the direction that is shown in Figure 27 on page 30.

    The lever action of the tabs pushes the NVDIMM out of the connector. If you find it hard to open the tabs with your fingers, you may use the tips of ball point pens, or the eraser ends of pencils. The levers must be opened simultaneously, so that the NVDIMM lifts straight up.

Figure 27. Removing a NVDIMM

c) Hold the NVDIMM by the edges and pull it out of the system.

d) Press latch **(A)** and disconnect the BPM cable from its connector on the NVDIMM. See the following figure.

Figure 28. Disconnecting a BPM cable from the NVDIMM

e) Place the NVDIMM on an appropriate ESD surface.

f) Repeat steps “12.a” on page 29 through “12.e” on page 31 for any additional NVDIMMs.

13. Remove the backup power modules and backup power module cables, if present. Otherwise, continue with the next step.

    Note: The BPM (BPM) is mounted in a standard drive carrier. The BPM is handled as a drive in this procedure.

    a) If your system has more than one BPM, record the location of both BPMs and decide which BPM you want to remove first.

    b) Provide slack in the BPM cable by pulling the BPM cable forward about 5 cm (2 in) in the direction shown in Figure 29 on page 32.

Figure 29. Pulling the BPM cable forward.

c) Disconnect the drive backplane power cable. See the following figure.

Figure 30. Disconnecting the drive backplane power cable.

d) Open the BPM holder lever **(A)**. See the following figure.

Figure 31. Opening the BPM holder lever

e) Unlock the BPM handle **(B)** by pressing the handle release latch **(A)** in the direction that is shown, and pulling out the handle toward you. See the following figure.

Figure 32. Unlocking the BPM handle

f) Using the BPM handle, pull the BPM about 2.5 cm (1 in.) from the disk drive backplane. See the following figure.

Figure 33. Sliding the BPM forward

g) Refer to Figure 34 on page 36. Rotate the BPM on its longer axis to expose the cable connectors at the bottom of the BPM.

Figure 34. Rotating the BPM

h) Label BPM cables. Press the release latch **(A)** on both BPM cables and disconnect both cables from the BPM. See the following figure.

Figure 35. Disconnecting the BPM cables

i) Remove the BPM. See the following figure.

Figure 36. Removing the BPM

j) Place the BPM on an appropriate ESD surface.

k) Carefully remove the BPM cable from the cutout **(A)** in the opening below the BPM tray and through the cutout **(B)** in the bulkhead. See the following figure.

Figure 37. Removing the BPM cable from the sheetmetal cutouts

l) Place the BPM cable on an appropriate ESD surface.

m) Repeat steps “13.k” on page 38 through “13.l” on page 39 for the other BPM cable that is connected to the BPM you just removed.

n) If you have a second BPM, repeat steps “13.b” on page 31 through “13.l” on page 39 for the other BPM and BPM cables.

14. Remove the internal drives, if present. Otherwise, continue with the next step.

a) Record the location of both of the internal drives.

b) Open the drive holder lever **(A)**.

Figure 38. Opening the drive holder lever

c) Unlock the drive handle **(B)** by pressing the handle release latch **(A)** in the direction that is shown, and pulling out the handle toward you.

Figure 39. Unlatching the drive handle

d) Using the drive handle, pull the drive about 1 in (2.5 cm) from the disk drive backplane.

e) Lift the drive from the system.

Figure 40. Lifting the drive

f) Place the drive on an appropriate ESD surface.

g) Close the drive holder lever.

h) Repeat steps “14.b” on page 39 through “14.g” on page 42 to remove the other internal drive.

Note: The internal slots do not have fillers.

15. Remove the drive trays **(A)**, if present, as shown in the following figure.

Figure 41. Removing the drive trays

a) Using a flat screwdriver, loosen the two screws **(A)** at the front of the drive tray.

b) Using your fingers, loosen the two screws **(B)** at the middle of the drive tray. If needed, you can use a Phillips screwdriver to loosen the screws.

c) Lift the drive tray out of the system.

d) Place the drive tray on an approriate ESD surface.

e) Repeat steps “15.a” on page 43 through “15.d” on page 43 for the other drive tray.

16. Remove the front drives enough to prevent them from interfering with the removal of the drive backplane:

    a) Unplug but do not remove the front drives from their slots. Unlock the drive handle **(B)** by pressing the handle release latch **(A)** in the direction that is shown, and pulling out the handle toward you. If the handle is not all the way out, the drive cannot slide out of the system.

Figure 42. Unlocking and removing the drive

b) Using the drive lever, pull the drive about 2.5 cm (1 in) from the system. Pull the drive out far enough to prevent it from interfering with the removal of the disk drive backplane.

c) Repeat “16.a” on page 43 through “16.b” on page 44 for the other front drives.

17. Remove the disk drive backplane:
    - If you have a base function disk drive backplane, continue with step “18” on page 44.
    - If you have a NVMe drive backplane, continue with step “19” on page 46.
18. Remove the base function disk drive backplane:

    a) Label and disconnect the signal cable **(A)** and the power cable **(B)** from the disk drive backplane and system backplane as shown in the following figure.

    Note: If your system has a BPM, you disconnected the power cable from the rear of the disk drive backplane in a previous step. For this step, you need to disconnect the power cable from the system backplane only.

    Unlatch the clips that secure the connectors to the disk drive backplane and to the system backplane.

Figure 43. Disconnecting the signal and power cables

b) Place the cables on an appropriate ESD surface.

c) Carefully unscrew the three captive thumbscrews **(A)** of the disk drive backplane **(B)** as shown in the following figure until fully loose.

   If needed, use a Phillips screwdriver to loosen the screws.

Figure 44. Loosening the disk drive backplane screws

d) Pull the disk drive backplane **(B)** away from the chassis using the thumbscrews, then lift up the disk drive backplane from the chassis.

e) Place the disk drive backplane on an appropriate ESD surface.

19. Remove the NVMe drive backplane:

a) Label and disconnect the signal cable **(A)** and the power cable **(B)** from the NVMe drive backplane as shown in the following figure.

Note: If your system has a BPM, you disconnected the power cable from the rear of the disk drive backplane in a previous step. For this step, you need to disconnect the power cable from the system backplane only.

Unlatch the clips that secure the connectors to the NVMe drive backplane and the system backplane.

Figure 45. Disconnecting the signal cable and power cable

b) Ensure that all cables are carefully positioned out of the way, such that the NVMe drive backplane can be easily lifted and removed.

c) Unscrew the three captive thumbscrews **(A)** of the NVMe drive backplane **(B)** as shown in the following figure until fully loose.

   If needed, use a Phillips screwdriver to loosen the screws.

Figure 46. Loosening the NVMe drive backplane screws

d) Pull the NVMe drive backplane **(B)** away from the chassis that uses the thumbscrews, then lift the NVMe drive backplane from the chassis. See the previous figure.

20. Remove the fans enough to prevent them from interfering with the removal of the backplane:
    a) Put your thumb against the front of the latch, **(A)** as shown in the following figure, and put your index finger against the rear of the latch.
    b) Push against the latch with your thumb and pull out with your index finger. This action releases the latch.
    c) Rotate the handle in the direction shown in the following figure to unlock the fan from its slot.
    d) After the fan unlatches, unplug but do not remove fan from its slot. Pull the fan out far enough to prevent it from interfering with the removal of the sytem backplane. See the following figure.
    e) Repeat “20.a” on page 48 through “20.d” on page 48 for the other fans.

Figure 47. Removing a fan from the system

21. Disconnect the control panel cable from the system backplane:
    a) Unplug the control panel cable from the system backplane as shown in the following figure.
    As you face the chassis, the connector is in the left front corner. You can pull the cable from the system backplane by using the cable cover near the plug.

Figure 48. Disconnecting the control panel cable from the system backplane

b) Route the cable over the side of the system and out of the way to provide clearance for removing the backplane. See the following figure.

22. Disconnect the control panel display cable from the system backplane:

a) Unplug the control panel display cable from the system backplane as shown in the following figure.

Figure 49. Disconnecting the control panel display cable from the system backplane

b) Route the cable over the side of the system and out of the way to provide clearance for removing the backplane. See the following figure.

23. Remove the heat sink from the system processor module:

a) Loosen the heat sink actuation screw by turning the supplied hex key counterclockwise **(A)**. Loosen the screw until it moves freely. See the following figure.

Figure 50. Removing the heat sink

b) Grip the heat sink **(B)** on opposing sides and remove the heat sink by lifting it upward. Set the heat sink aside with the module side facing upward.

Note: If you plan to remove dust or debris from the heat sink, this operation must be performed in another room that is greater than 7.6 m (24.9 ft) away from the work area.

c) Place the heat sink on an appropriate ESD surface.

d) If your system has a second system processor, repeat steps "23.a" on page 51 through "23.c" on page 52 to remove the other heat sink.

24. Remove the thermal interface material (TIM) from the system processor module or modules:

a) If the system uses the gray-colored TIM: Using the tweezers, remove the gray-colored TIM from the top of the processor and place it in a clean, dry area as shown in Figure 51 on page 53.

The system can use two types of TIMs. One TIM is silver-colored with trimmed corners and typically adheres to the heat sink. The other TIM is dark gray with square corners and will lightly adhere. The gray-colored TIM needs to be removed before the processor is removed.

Note: The gray-colored TIM can be removed using tweezers and reused, but it is best left on the heat sink during servicing. Be careful not to damage the gray-colored TIM as it is very light and porous.

Figure 51. Removing the TIM from the system processor module

b) If your system has a second system processor module, repeat step "24.a" on page 52 to remove the other TIM.

25. Remove the system processor module or modules:
    a) Open the packaging of the system processor module tray. Remove the tray cover and set it aside. Place the system processor module tray on a solid surface.
    b) Using the supplied removal tool, align the tool over the system processor module on the system backplane as shown in the second figure.
    c) Ensure that the removal tool **(A)** is in the open position as shown in the following figure. The middle pin **(B)** must be pushed down and blue tabs **(C)** must be turned inward.

Figure 52. Ensuring the removal tool is in the open position

d) Lower the tool over the system processor module by ensuring the two guide pins **(A)** are inserted into the alignment holes **(B)** on each side of the tool. Ensure that the chamfered edge on the tool aligns with the chamfered edge of the processor **(C)**.

Figure 53. Lowering the removal tool onto the system processor module

e) With the removal tool sitting on top of the system processor module, push down on the pin **(A)** slightly so that the blue tabs **(B)** snap outward and the jaws engage with the system processor module as shown in the following figure. Make sure that both of the tool jaws are locked onto the system processor module by pushing down on the tool.

Important: Do not press the blue release tabs until directed to do so later.

Figure 54. Locking the system processor module into the tool

f) Hold the outside of the tool and use it to lift the system processor module from the socket. Lift the tool upward slowly to ensure that the jaws are fully engaged with the system processor module. Ensure that the system processor module does not disengage and fall back into the socket of the system processor module. If the system processor module falls back into the socket of system processor module, the pins may be damaged. Place the system processor module on the system processor module tray as shown in the following figure.

Figure 55. Placing the tool on the system processor module tray

g) To release the system processor module, push the pin downward. Hold the pin down while pushing the blue tabs inward. Ensure that the pin catches on the openings in the blue tabs, and that the blue tabs are locked in a fixed position. See the following figure.

Note: To prevent the system processor module from falling, pull up on the round lever before you place the tool on the system processor module tray.

Figure 56. Releasing the system processor module from the tool

h) Place the cover on the system processor module tray.

i) If your system has a second system processor module, repeat steps “25.a” on page 53 through “25.h” on page 58 to remove the other system processor module.

26. Place the socket dust covers in the system processor module sockets on the system backplane:

a) Lower the socket dust cover over the sockets on the system backplane and ensure that the holes **(B)** on the socket dust cover align with the two guide pins **(A)** on the system backplane. Push straight down until the latches **(D)** on the socket dust cover engage with the latches **(C)** on the backplane. See the following figure.

Figure 57. Placing the dust covers on the system processor module sockets on the system backplane

b) If your system has a second system processor, repeat step "26.a" on page 58 to install the other socket dust cover.

27. Remove the system backplane:

a) Using a Phillips screwdriver, unscrew and remove the four black screws **(A)** that mount the backplane to the chassis. See the following figure.

Notes:

- You might find it helpful to use a magnetic screwdriver.
- Do not remove the silver Torx screws.

Figure 58. System backplane screw locations

b) Using a Phillips screwdriver, unscrew and remove the two screws **(B)** that attach the backplane to the power supply cage. See the following figure.

c) Using a Phillips screwdriver, unscrew and remove the six screws **(C)** that attach the backplane to the sides of the system chassis. See the following figure.

d) After removing the screws, place your fingers in positions **(A)** and **(B)** and slide the system backplane slightly toward the front of the system as shown in the following figure.

Note: Slide the system backplane carefully. There is just enough space for the power connectors to clear the flange on the power supply cage **(C)**.

Figure 59. Preparing the system backplane for removal

e) Grasp the system backplane by positions **(A)** and **(B)** on the front and middle metal bulkheads and lift up until the pins disengage from the bottom of the chassis. As you lift the backplane, be careful not to hit the backplane on the tabs **(C)** on the power supply cage. See the following figure.

Figure 60. Grasping the system backplane and disengaging the pins

f) Tilt the system backplane so that the front end is high and the back end is low as you continue to lift the system backplane out of the chassis. When the system backplane catches on the tabs **(A)**

on the power supply cage, slide the system backplane forward until it clear the tabs. Then, lift the system backplane completely out of the chassis. See the following figure.

Figure 61. Lifting the system backplane out of the chassis

g) Place the system backplane on an appropriate ESD surface.

28. Set the new system backplane on the ESD surface next to the system backplane you just removed.
29. Transfer the memory modules and fillers to the new system backplane:
    a) Unlock a memory module or filler from its connector by simultaneously pushing both of the locking tabs away from the module in the direction that is shown in the following figure.

    The lever action of the tabs pushes the memory module or filler out of the connector. If you find it difficult to open the tabs with your fingers, you may use the tips of ball point pens or the eraser ends of pencils to open the tabs. The levers must be opened simultaneously, so that the memory module lifts straight up.

Figure 62. Removing a memory module

b) Hold the memory module or filler by the edges and pull it out of the system. Note the location from which you are removing the memory module.

c) Identify the corresponding location on the new system backplane and ensure that the locking tabs are open. See the following figure.

Figure 63. Replacing a memory module

d) Press the memory module or filler straight down, firmly into the slot, until the locking tabs lock into place. See the previous figure.

e) Repeat “29.a” on page 62 through “29.d” on page 64 for the remaining memory modules and fillers.

30. Install the vital product data card on the new system backplane:

a) Align the VPD card in its slot in location P1-C13 on the new system backplane as shown in the following figure.

Figure 64. Replacing the VPD card

b) Push the VPD card into place until it is fully seated in the new system backplane.

31. Transfer the trusted platform module card to the new system backplane:
    a) Grasp the TPM card by the plastic housing as shown in the following figure.
    b) Pull the TPM card out of its slot in location P1-C14 on the system backplane.

Figure 65. Removing the TPM card

c) Insert the TPM card into its slot in location P1-C14 on the new system backplane as shown in the following figure.

Figure 66. Replacing the TPM card

d) Push the TPM card into place until it is fully seated in the new system backplane.

Replacing the system backplane in the 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S

Follow these steps to replace the system backplane.

About this task

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap on and that the ESD clip is plugged into a ground jack or connected to an unpainted metal surface. If not, do so now.
2. Install the replacement system backplane:
   a) Grasp the replacement system backplane by positions **(A)** and **(B)** on the front and middle metal bulkheads and begin lowering the backplane into the chassis. As you lower the backplane, be careful not to hit the tabs **(C)** on the power supply cage. See the following figure.

Figure 67. Grasping the system backplane and lowering it into the chassis

b) Tilt the backplane so that the front end is high and the back end is low as you continue to lower the backplane into the chassis. When the backplane catches on the tabs **(A)** on the power supply cage, lower the front end enough so that it clears the tabs. See the following figure.

Figure 68. Tilting and lowering the system backplane into the chassis

c) Continue lowering the backplane into the chassis until the pins engage.

d) Place your fingers in positions **(A)** and **(B)** and slide the system backplane slightly toward the rear of the system as shown in the following figure

Note: Slide the system backplane carefully. There is just enough space for the power connectors to clear the flange on the power supply cage **(C)**.

Figure 69. Sliding the backplane towards the rear of the system

e) Using a Phillips screwdriver, replace and screw in the six screws **(C)** that attach the backplane to the sides of the system chassis. See the following figure.

Notes:

- You might find it helpful to use a magnetic screwdriver.
- Do not remove the silver Torx screws.

Figure 70. System backplane screw locations

f) Using a Phillips screwdriver, replace and screw in the two screws **(B)** that attach the backplane to the power supply cage. See the previous figure.

g) Using a Phillips screwdriver, replace and screw in the four black screws **(A)** that mount the backplane to the chassis. See the previous figure.

3. Remove the socket dust covers from the system processor module sockets on the new system backplane:

   a) Grasp the latches on both sides of the socket dust cover and squeeze them inwards until the latches release from the pins on the system backplane. See the following figure.

   b) Lift the socket dust cover straight up as shown in the following figure. Set the dust cover aside.

Figure 71. Removing the socket dust covers

   c) If your system has a second system processor, repeat steps "3.a" on page 71 through "3.b" on page 71 to remove the other socket dust cover.

4. Place the original system backplane on the packaging for the replacement system backplane FRU and place it near the system with the replacement system backplane.

5. Install the system processor modules from the original system backplane in the new system backplane:

   a) If dust or debris is present on the system processor socket on the new system backplane, use the supplied air pump to clean the socket before you install the new system processor. Blow small bursts of air from the center toward the sides of the socket, as shown the following figure.

Figure 72. Removing dust and debris from the system processor socket

b) If necessary, take the cover off of the system processor module tray.

c) Hold the sides of the tool with system processor module and carefully lift the tool out of the system processor module tray.

d) Lower the tool and system processor module onto the socket. Align the beveled corner of the tool with the beveled corner on the socket. Align the guide pins **(A)** with the alignment holes **(B)** on each side of the tool. Use care to lower the tool evenly without tilting the tool.

   Note: Do not attempt to slide the tool and the system processor module in any direction while the system processor module is touching the socket. If the tool and the system processor module are not aligned with the guide pins, lift the tool and the system processor module and reposition them.

Figure 73. Installing the system processor module

e) Open the latches that hold the system processor module in the supplied removal tool **(A)** as shown in the following figure. Push down on the ring **(B)** while pressing in on the tabs **(C)**.

Figure 74. Removing the system processor module tool

f) Lift the tool off the system processor module.

g) Repeat “5.a” on page 71 through “5.f” on page 74 for the other system processor module.

6. Replace the thermal interface material (TIM) and heat sinks:

   a) Using the tweezers, move the old processor's TIM from the clean, dry surface and center it onto the new system processor module.

      The TIM has no preferred up side. The TIM can be placed on the processor and centered as shown in the following figure.

Figure 75. Moving the TIM onto the system processor module

b) Place the heat sink on the TIM as shown in the following figure.

Figure 76. Installing the heat sink on the TIM

c) Ensure that the heat sink load arms are engaged as shown by **(A)** in the following figure.

d) Tighten the center load screw clockwise by using the supplied hex key as shown by **(B)** in the following figure until a firm stop is reached. If the heat sink moves noticeably, the load arms are not engaged. Unscrew the center load screw and repeat this step again.

Figure 77. Tightening the center load screw on the heat sink

e) If your system has a second system processor module, repeat steps "6.a" on page 74 through "6.d" on page 76 to replace the other TIM and heat sink.

7. Reconnect the control panel display cable to the system backplane as shown in the following figure.

Figure 78. Connecting the control panel display cable to the system backplane

8. Reconnect the control panel cable to the system backplane as shown in the following figure.

Figure 79. Connecting the control panel cable to the system backplane

9. Replace the fans into their slots:
   a) Using your hand to support the bottom of the fan, slide the fan into the system. See the following figure.
   b) Rotate the fan handle **(A)** in the direction shown, and then press the handle until the latch locks in place. See the following figure.
   c) Repeat “9.a” on page 79 through “9.b” on page 79 for the other fans.

Figure 80. Replacing a fan in the system

10. Replace the disk drive backplane:
    - If you have a base function disk drive backplane, continue with step "11" on page 80.
    - If you have a NVMe drive backplane, continue with step "12" on page 82.
11. Replace the base function disk drive backplane:
    a) The chassis has four alignment pins **(B)** to secure the disk drive backplane **(A)**. Insert the disk drive backplane as shown in the following figure, ensuring that the alignment pins fit through the holes in the disk drive backplane.

Figure 81. Replacing the disk drive backplane

b) Carefully tighten each of the three captive thumbscrews **(C)** to secure the disk drive backplane to the system's chassis, as shown in the previous figure.

c) Using your labels, reconnect the signal cable **(A)** and the power cable **(B)** to the disk drive backplane and system backplane as shown in the following figure.

   Note: If your system has a BPM, do not reconnect the disk drive power cable to the disk drive backplane until directed to do so in a later step. Connect the power cable to the system backplane only.

   Push the connectors in until the latch clicks.

Figure 82. Reconnecting the signal cable and the power cable

12. Replace the NVMe drive backplane:
    a) The chassis has four alignment pins **(B)** to secure the NVMe drive backplane **(A)**. Insert the NVMe drive backplane as shown in the following figure. Ensure that the alignment pins fit through the holes in the NVMe drive backplane.

Figure 83. Replacing the NVMe drive backplane

b) Carefully tighten each of the three captive thumbscrews **(C)** to secure the NVMe drive backplane to the system's chassis, as shown in the previous figure.

c) Using your labels, reconnect the signal cable **(A)** and the power cable **(B)** to the NVMe drive backplane as shown in the following figure.

   Note: If your system has a BPM, do not reconnect the disk drive power cable to the disk drive backplane until directed to do so in a later step. Connect the power cable to the system backplane only.

   Push the connectors in until the latch clicks.

Figure 84. Reconnecting the signal cable and the power cable

13. Replace the front drives:
    a) Support the drive by the top and bottom edge as you slide the drive all the way into the system.
    b) Push the drive bay handle **(A)** in until it locks.

Figure 85. Installing a drive in a system

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

c) Repeat "13.a" on page 84 and "13.b" on page 84 for the other front drives.

14. Replace the internal drive trays, if present:

    a) Lower the drive tray into the system.

    The bottoms of the trays have a hook that slides into a support. Ensure that hook slides under the edge of the support. See the following figure.

Figure 86. Replacing the drive trays

b) Slide the drive tray forward and align the screws with their holes.

c) Tighten the two screws **(A)** at the middle of the drive tray.

d) Tighten the two screws **(B)** at the front of the drive tray.

e) Repeat steps "14.a" on page 85 through "14.d" on page 86 for the second drive tray.

15. Replace the backup power modules and back up power module cables, if present. Otherwise, continue with the next step.

    Note: The BPM is mounted in a standard drive carrier. The BPM is handled as a drive in this procedure.

    a) If your system has more than one backup power module (BPM), refer to your notes for the locations you recorded for each BPM and decide which BPM you want to replace first.

    b) Refer to Figure 87 on page 87. Carefully route the BPM cable through the sheetmetal cutout **(B)** in the bulkhead and up through the sheetmetal cutout **(A)** that is below the BPM tray.

Figure 87. Routing the BPM cable through the sheetmetal cutouts

c) Repeat step "15.b" on page 86 for the other BPM cable.

d) Unlock the BPM handle **(B)** by pressing the handle release latch **(A)** in the direction that is shown, and pulling out the handle toward you. See the following figure.

Figure 88. Unlocking the BPM handle

e) Lower the BPM into the drive tray as shown in the following figure.

Figure 89. Lowering the BPM into the drive tray

f) Refer to Figure 90 on page 90. Rotate the BPM on its longer axis to expose the cable connectors at the bottom of the BPM.

g) Using your cable labels, connect both BPM cables to the BPM as shown in the following image. The cables are routed through the cutout in the BPM. Push the BPM cables in until the connector latches click.

Figure 90. Connecting the BPM cable

h) Rotate the BPM back down into the BPM tray.

i) Slide the BPM forward by using the drive handle.

j) Push BPM handle **(A)** until the BPM handle locks as shown in the following figure.

Figure 91. Locking the BPM handle

k) Close the BPM holder lever **(A)** over the BPM.

Figure 92. Closing the BPM holder lever

l) Reconnect the drive backplane power cable by pushing the cable in until the latch clicks. See the following figure.

Figure 93. Reconnecting the drive backplane power cable

m) Remove excess slack by pulling the BPM cable in the direction shown. See the following figure.

Figure 94. Pulling the BPM to remove cable slack

n) If your system has a second BPM, repeat steps “15.b” on page 86 through “15.m” on page 93 for the other BPM and BPM cable.

16. Using your labels, replace the internal drives into their trays, if present. Otherwise, continue with the next step.

    a) Unlock the drive handle **(B)** by pressing the handle release latch **(A)** in the direction that is shown, and pulling out the handle toward you.

Figure 95. Unlatching the drive handle

b) Lower the drive into the drive tray.

Figure 96. Lowering the drive into the drive tray

c) Slide the drive forward by using the drive handle until it contacts the disk drive backplane.

d) Push drive handle **(A)** until the drive is fully seated and the drive handle locks.

Figure 97. Locking the drive handle

e) Close the drive holder lever **(A)** over the drive.

Figure 98. Closing the drive holder lever

f) Repeat steps “16.a” on page 94 through “16.e” on page 97 for the second internal drive.

17. Replace the non-volatile dual in-line memory modules (NVDIMMs), if present. Otherwise, continue with the next step.

    a) Grasp the NVDIMM along its edges and align it with the slot.

    Attention: NVDIMMs are keyed to prevent an NVDIMM from being installed incorrectly. Note the location of the key tab within the NVDIMM connector before you attempt to install the NVDIMM.

    b) Connect the BPM cable to the NVDIMM. Push the connector in until the connector latch **(A)** clicks. See the following figure.

Figure 99. Connecting the BPM cable to the NVDIMM

c) Ensure that the locking tabs of the NVDIMM connector are open. Slowly press the NVDIMM straight down, firmly into the slot, until the locking tabs lock into place. See the following figure.

Figure 100. Replacing an NVDIMM

Note: It is important the BPM cable is routed correctly to allow for proper installation of the air baffles.

d) Repeat steps “17.a” on page 98 through “17.c” on page 99 for any additional NVDIMMs.

18. Replace the NVMe U.2 pass-thru card, if present. Otherwise, continue with the next step.
    a) Route the NVMe cable into position while you lower the NVMe U.2 pass-thru card into its slot.
    b) Push the NVMe U.2 pass-thru card down to seat the card.
    c) Push in and twist the screws **(A)** clockwise to fully seat the NVMe U.2 pass-thru card.

Figure 101. Seating the NVMe U.2 pass-thru card

d) Connect the NVMe cable to the port on the NVMe drive backplane.

Use the following information to determine in which connector to plug the NVMe cable into the NVMe drive backplane:

If you have one NVMe U.2 pass-thru card, it is installed in slot P1-C49 and a filler is in slot P1-C50.

The NVMe cable connects from port **(J1)** on the NVMe drive backplane to port **(J1)** on the NVMe U.2 pass-thru card. See the following figure.

Figure 102. Connecting the NVMe cable for a system with one NVMe U.2 pass-thru card in P1-C49 and a filler in slot P1-C50

If you have two NVMe U.2 pass-thru cards, one is installed in slot P1-C49 and the other one is installed in slot P1-C50.

One NVMe cable connects from port **(J1)** on the NVMe drive backplane to port **(J1)** on the NVMe U.2 pass-thru card in slot P1-C49. One NVMe cable connects from port **(J2)** on the NVMe drive backplane to port **(J1)** on the NVMe U.2 pass-thru card in slot P1-C50. See the following figure.

Figure 103. Connecting the NVMe cable for a system with two NVMe U.2 pass-thru cards in slot P1-C49 and slot P1-C50

e) Push the connector in until the connector latch clicks. See the following figure.

Figure 104. Connecting the NVMe cable to the NVMe drive backplane

f) If a second NVMe U.2 pass-thru card is present, repeat steps “18.a” on page 100 through “18.d” on page 101.

19. Replace the NVMe carrier card, if present. Otherwise, continue with the next step.
    a) Lower the NVMe M.2 carrier card down into the slot.
    b) Push in and twist the screws **(A)** clockwise to fully seat the NVMe M.2 carrier card. See the following figure.

Figure 105. Seating the NVMe M.2 carrier card

20. Replace the RAID adapters, if present. Otherwise, continue with the next step.
    a) Route the front SAS cables into position while you lower the SAS RAID adapter into its slot. Push the SAS RAID adapter down to seat the adapter. Push in and twist the screws **(A)** clockwise to fully seat the adapter. See the following figure.

Figure 106. Replacing the SAS RAID adapter

b) If a rear SAS cable was attached to the SAS RAID adapter, reconnect the rear SAS cable **(A)** to the SAS RAID adapter rear connector **(B)**, as shown in the following figure.

Figure 107. Reconnecting the rear SAS cable

c) Using your labels, reconnect the front SAS cable (or cables) **(A)** to the connector port on the disk drive backplane. Push the connector in until the connector latch clicks. See the following figure.

Figure 108. Reconnecting the front SAS cables

d) If you removed only one RAID adapter, replace the plastic air dividers between slots P1-C49 and P1-C50. If you removed more than one RAID adapter repeat steps "20.a" on page 105 through "20.c" on page 107.

21. Replace the PCIe adapter divider, if present. Otherwise, continue with the next step.

    a) Carefully grasp the adapter divider by its edge or tailstock and slide the divider towards the system chassis and into its slot. Make sure the tab **(A)** on the divider is fully seated and slides into the groove **(B)** on the system backplane. See the following figure

    Figure 109. Sliding the PCIe divider into the system

b) To lock the divider in its slot, lift up on the retaining latch at the back edge of the divider **(C)** as shown in the following figure.

Figure 110. Locking the retaining latch on the PCIe divider

22. Replace the service processor card:
    a) Align the service processor card **(A)** into PCIe location and slide the card into the slot, as shown in the following figure.
    b) Close the PCI adapter retainer latch **(B)** to secure the card.

Figure 111. Installing the service processor card into slot P1-C1

23. Attach the rear USB cable:
    a) Insert the rear USB cable housing **(A)** into the PCI adapter slot at the rear of the system as shown in the following figure.

Figure 112. Replacing the rear USB cable

b) Press the adapter latch **(B)** down and route the cable behind the PCI adapters and spacers to the plug on the right side of the system.

c) Plug the other end of the rear USB cable **(C)** into the connector on the system backplane.

d) Using your labels, replace any cables that you removed from the USB port.

24. Attach the front USB cable:

a) Plug the USB cable **(A)** into the connector on the system backplane as shown in the following figure. The connector on the system backplane that has the USB port symbol with an arrow that points to the front of the system.

Figure 113. Plugging the front USB cable into the system backplane

b) Reroute the cable along the upper right side of the system and secure it to the hook-and-loop fasteners on the side of the system.

25. Replace the PCIe adapters:

a) Refer to your notes to identify the location where you want to install the PCIe adapter.

b) If the adapter latch **(B)** at the target slot on the system is not already in the open position, pull the latch into the open position by rotating the latch outwards from its clip on the back of the system.

See the following figure for the location of the adapter latch.

(L007)

CAUTION: A hot surface nearby. (L007)

Attention: Before you insert the adapter in the slot, ensure that the adapter has nothing attached to it.

c) Press the adapter firmly into its connector ensuring that it is seated.
   See the following figure.
d) To lock the adapter in its slot, rotate the adapter latch **(B)** in the direction that is shown.

Figure 114. Installing or replacing an adapter in a 5105-22E, 9008-22L, 9009-22A, 9009-22G, 9223-22H, or 9223-22S

e) Using your labels, reconnect all cables and transceivers that are attached to the adapter.
f) Repeat steps "25.a" on page 113 through "25.e" on page 114 for the remaining adapters.

26. Replace each air baffle **(A)** straight down into the chassis.
    See Figure 115 on page 115. When an air baffle is upside-down, hold the detachable drive cover to prevent it from coming loose.

Figure 115. Replacing the air baffle

Preparing the system for operation after removing and replacing the system backplane

Follow these steps to prepare the system for operation after removing and replacing the system backplane.

Procedure

1. Ensure that you have the electrostatic discharge (ESD) wrist strap on and that the ESD clip is plugged into a ground jack or connected to an unpainted metal surface. If not, do so now.
2. Slide the service access cover **(A)** onto the system unit.
3. Close the release latch **(B)** by pushing it in the direction shown.

Figure 116. Installing the service access cover

4. Unlock the blue rail safety latches **(A)** as shown in Figure 117 on page 117 by pushing them inward. Carefully push the system unit until it is 2.5-5 cm (1-2 in.) away from the rack.

   Note: To allow enough room to attach the cable management arm, do not push the system unit all the way into the rack.

Figure 117. Pushing the system into the rack

5. Unlatch the hook and loop fastener that you used to secure the inner cable management arm to the outer cable management arm. The fastener is attached at the narrowest spot **(G)** between the basket and the side of the arm. See Figure 118 on page 118.

Figure 118. Cable management arm parts

6. Reconnect the cable management arm by inserting the inner cable management arm tab **(A)** into the inner mounting bracket **(B)** until it clicks into place. As you insert the tab, ensure the pin on the support arm is positioned between the inner and outer arm.
7. Continue to push the system unit all the way into the rack until both release latches lock the system into the operation position.
8. Gently push the cover **(A)** in until the cover snaps into place.

   The cover has indentations where you can hold it more easily. Use the alignment pin **(B)** to secure the cover to the system as shown in Figure 119 on page 119. Push along the grill area above the fans to secure the cover to the front.

Figure 119. Installing the front cover

9. Open the cable management arm by completing the following steps:

   In the image, the inner cable management arm tab is shown on the left side as you are facing the system from the rear. However, the cable management arm can also be installed so that the inner cable management arm tab is on the right side of the system.

   CAUTION: To avoid causing damage to the arm, open the cable management arm just long enough to complete these repairs.

   a) Release the mounting bracket from the cable management arm assembly by pressing the indentation **(A)** on the inner cable management arm tab.

      The cable management arm releases from the outer mounting bracket in the direction shown.

Figure 120. Releasing the cable management arm

b) Swing the cable management arm away from the system.

10. Slide each of the power supplies into the system until the latch locks each one in place.
11. Using your labels, reconnect the power cords **(A)** to the system unit.

    Fasten the power cords to the system using the hook-and-loop fasteners **(B)** as shown in Figure 121 on page 121.

Figure 121. Connecting the power cords

12. Use your labels to reconnect the remaining rear external cables to the system.
13. Close the cable management arm by completing the following steps:
    a) Swing the cable management arm towards the server.
    b) Insert the inner cable management arm tab **(A)** into the outer mounting bracket **(B)** until it clicks into place as shown. The inner mounting bracket **(C)** is not used on the left side.

Figure 122. Closing the cable management arm

14. When the service processor comes up to the standby state (the power-on LED on the control panel is flashing slowly), continue to the next step.
15. Turn off the identify LED. For instructions, see Deactivating an identify LED (www.ibm.com/support/knowledgecenter/POWER9/p9haj/p9haj_turn_off_identify_led.htm).
16. Start the system. For instructions, see Starting a system (www.ibm.com/support/knowledgecenter/POWER9/p9haj/crustartsys.htm).
17. Access the Advanced System Management Interface (ASMI).

    For instructions, see Accessing the ASMI without an HMC (www.ibm.com/support/knowledgecenter/POWER9/p9hby/connect_asmi.htm).
18. Verify that the **Enclosure serial number** and **Feature Code/Sequence Number** match the values you recorded.

    Note: To complete these steps, your authority level must be Authorized Service Provider (ID: celogin).

    a. On the ASMI Welcome pane, specify your user ID and password, and click **Log in**.
    b. In the navigation area, expand **System Configuration** > **Program Vital Product Data**.
    c. Select **System Enclosures**. In the right pane, the current system enclosures are displayed.
    d. Compare the values listed for the **Feature Code/Sequence Number** and **Enclosure serial number** with your notes.

On the right pane, the **Feature Code/Sequence Number** value includes a dash (-) instead of a decimal as shown on the ASMI welcome panel. For example, the ASMI welcome panel lists the **Feature Code/Sequence Number** value as 78D3.001 while the right pane lists the **Feature Code/Sequence Number** value as 78D3-001.

e. If the **Enclosure serial number** and **Feature Code/Sequence Number** do not match your notes, update the values.

Note: If you update the value for the **Feature Code/Sequence Number**, be sure to include a dash (-) instead of a decimal. For example, if your notes indicate the value for *XXXX.YYY* is *78D3.001*, you should specify *78D3-001* in the **Feature Code/Sequence Number** field.

f. Click **Save settings** to update and save the **Enclosure serial number** and **Feature Code/Sequence Number**.

19. Verify the installed part.

- If you replaced the part because of a service action, verify the installed part. For instructions, see Verifying a repair (www.ibm.com/support/knowledgecenter/POWER9/p9ect/pxect_verifyrepair.htm).
- If you installed the part for any other reason, verify the installed part. For instructions, see Verifying the installed part (www.ibm.com/support/knowledgecenter/POWER9/p9haj/pxhaj_hsmverify.htm).

Notices

This information was developed for products and services offered in the US.

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 reference 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.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive, MD-NC119
Armonk, NY 10504-1785
US

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some jurisdictions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you provide in any way it believes appropriate without incurring any obligation to you.

The performance data and client examples cited are presented for illustrative purposes only. Actual performance results may vary depending on specific configurations and operating conditions.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to actual people or business enterprises is entirely coincidental.

© Copyright IBM Corp. 2018, 2020

If you are viewing this information in softcopy, the photographs and color illustrations may not appear.

The drawings and specifications contained herein shall not be reproduced in whole or in part without the written permission of IBM.

IBM has prepared this information for use with the specific machines indicated. IBM makes no representations that it is suitable for any other purpose.

IBM's computer systems contain mechanisms designed to reduce the possibility of undetected data corruption or loss. This risk, however, cannot be eliminated. Users who experience unplanned outages, system failures, power fluctuations or outages, or component failures must verify the accuracy of operations performed and data saved or transmitted by the system at or near the time of the outage or failure. In addition, users must establish procedures to ensure that there is independent data verification before relying on such data in sensitive or critical operations. Users should periodically check IBM's support websites for updated information and fixes applicable to the system and related software.

Homologation statement

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

Accessibility features for IBM Power Systems servers

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

Overview

The IBM Power Systems servers include the following major accessibility features:

- Keyboard-only operation
- Operations that use a screen reader

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

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

Keyboard navigation

This product uses standard navigation keys.

Interface information

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

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

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

Vendor software

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

Related accessibility information

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

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

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

Privacy policy considerations

IBM Software products, including software as a service solutions, ("Software Offerings") may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user, or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering's use of cookies is set forth below.

This Software Offering does not use cookies or other technologies to collect personally identifiable information.

If the configurations deployed for this Software Offering provide you as the customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, see IBM's Privacy Policy at http://www.ibm.com/privacy and IBM's Online Privacy Statement at http://www.ibm.com/privacy/details/us/en/ in the section entitled "Cookies, Web Beacons and Other Technologies".

Trademarks

IBM, the IBM logo, and ibm.com® are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at Copyright and trademark information.

The registered trademark Linux® is used pursuant to a sublicense from the Linux Foundation, the exclusive licensee of Linus Torvalds, owner of the mark on a worldwide basis.

Electronic emission notices

Class A Notices

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

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

Canada Notice

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

European Community and Morocco Notice

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

This product may cause interference if used in residential areas. Such use must be avoided unless the user takes special measures to reduce electromagnetic emissions to prevent interference to the reception of radio and television broadcasts.

Warning: This equipment is compliant with Class A of CISPR 32. In a residential environment this equipment may cause radio interference.

Germany Notice

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

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

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

EN 55032 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:

"Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

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

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

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

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

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

Generelle Informationen:

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

Japan Electronics and Information Technology Industries Association (JEITA) Notice

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

This statement applies to products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

This statement applies to products greater than 20 A, single phase.

高調波電流規格 JIS C 61000-3-2 準用品

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

This statement applies to products greater than 20 A per phase, three-phase.

高調波電流規格 JIS C 61000-3-2 準用品

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

Japan Voluntary Control Council for Interference (VCCI) Notice

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

Korea Notice

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

People's Republic of China Notice

声　明

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

Russia Notice

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

Taiwan Notice

警告使用者：
此為甲類資訊技術設備，
於居住環境中使用時，可
能會造成射頻擾動，在此
種情況下，使用者會被要
求採取某些適當的對策。

IBM Taiwan Contact Information:

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

United States Federal Communications Commission (FCC) Notice

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

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

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

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

Class B Notices

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

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

Canada Notice

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

European Community and Morocco Notice

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

German Notice

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

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

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

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

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

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

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

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

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:
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 55032 Klasse B

Japan Electronics and Information Technology Industries Association (JEITA) Notice

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

This statement applies to products less than or equal to 20 A per phase.

高調波電流規格 JIS C 61000-3-2 適合品

This statement applies to products greater than 20 A, single phase.

高調波電流規格 JIS C 61000-3-2 準用品

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

This statement applies to products greater than 20 A per phase, three-phase.

高調波電流規格 JIS C 61000-3-2 準用品

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

Japan Voluntary Control Council for Interference (VCCI) Notice

この装置は，クラスＢ情報技術装置です。この装置は，家庭環境で使用することを目的としていますが，この装置がラジオやテレビジョン受信機に近接して使用されると，受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。　　ＶＣＣＩ－Ｂ

Taiwan Notice

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

United States Federal Communications Commission (FCC) Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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

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

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:

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

Terms and conditions

Permissions for the use of these publications are granted subject to the following terms and conditions.

Applicability: These terms and conditions are in addition to any terms of use for the IBM website.

Personal Use: You may reproduce these publications for your personal, noncommercial use provided that all proprietary notices are preserved. You may not distribute, display or make derivative works of these publications, or any portion thereof, without the express consent of IBM.

Commercial Use: You may reproduce, distribute and display these publications solely within your enterprise provided that all proprietary notices are preserved. You may not make derivative works of these publications, or reproduce, distribute or display these publications or any portion thereof outside your enterprise, without the express consent of IBM.

Rights: Except as expressly granted in this permission, no other permissions, licenses or rights are granted, either express or implied, to the publications or any information, data, software or other intellectual property contained therein.

IBM reserves the right to withdraw the permissions granted herein whenever, in its discretion, the use of the publications is detrimental to its interest or, as determined by IBM, the above instructions are not being properly followed.

You may not download, export or re-export this information except in full compliance with all applicable laws and regulations, including all United States export laws and regulations.

IBM MAKES NO GUARANTEE ABOUT THE CONTENT OF THESE PUBLICATIONS. THE PUBLICATIONS ARE PROVIDED "AS-IS" AND WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

IBM®