Power Systems

SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

IBM

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SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

IBM

This edition applies to IBM Power Systems servers that contain the POWER7 processor and to all associated models.

Contents

Safety notices

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

World Trade safety information

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

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

German safety information

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

Laser safety information

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

Laser compliance

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

DANGER

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

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:
- 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.
- 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.
- 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.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- 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. Remove the power cords from the outlets.
   3. Remove the signal cables from the connectors.
   4. 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. Attach the power cords to the outlets.
   5. Turn on the devices.

   (D005)

DANGER

Observe the following precautions when working on or around your IT rack system:

- Heavy equipment–personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.

- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet 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.

CAUTION

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

(R001)

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 no empty U-levels between devices installed in the rack cabinet below the 32U level.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 mm (30 x 80 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:
  - Lower the four leveling pads.
  - Install stabilizer brackets on the rack cabinet.
  - If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.
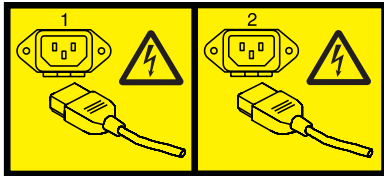
(R002)

(L001)

(L002)
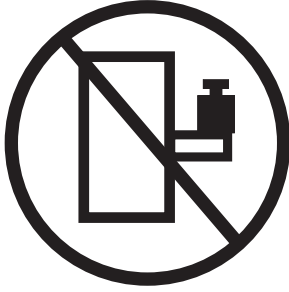
(L003)

or

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. (C027)

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

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

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

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

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

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.

SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

Review the SAS subsystem features, configurations, and limitations for the IBM Power® 720 Express (8202-E4C or 8202-E4D) and the IBM Power 740 Express (8205-E6C or 8205-E6D) system.

What's new in SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

Read about new or significantly changed information in SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D since the previous update of this topic collection.

March 2013

The following updates are made to the content:

- Added information for the IBM Power 720 Express (8202-E4D) and the IBM Power 740 Express (8205-E6D) servers.

SAS architecture

Serial-attached SCSI (SAS) architecture describes a serial device interconnection and transportation protocol that defines the rules for information exchange between devices.

SAS is an evolution of the parallel SCSI device interface into a serial point-to-point interface. SAS physical links are a set of four wires used as two differential signal pairs. One differential signal transmits in one direction, while the other differential signal transmits in the opposite direction. Data can be transmitted in both directions simultaneously. Physical links are contained in SAS ports, which contain one or more physical links. A port is a wide port if there are more than one physical link in the port. If there is only one physical link in the port, it is a narrow port. A port is identified by a unique SAS worldwide name (also called SAS address).

A *SAS adapter* contains one or more SAS ports. A *path* is a logical point-to-point link between a SAS initiator port in the adapter and a SAS target port in the I/O device (for example, a disk). A *connection* is a temporary association between an adapter and an I/O device through a path. A connection enables communication to a device. The adapter can communicate to the I/O device over this connection by using either the SCSI command set or the Advanced Technology Attachment (ATA) and Advanced technology Attachment Packet Interface (ATAPI) command set depending on the device type.

A *SAS expander* enables connections between an adapter port and multiple I/O device ports by routing connections between the expander ports. Only a single connection through an expander can exist at any given time. Using expanders creates more nodes in the path from the adapter to the I/O device. If an I/O device supports multiple ports, more than one path to the device can exist when there are expander devices included in the path.

A *SAS fabric* refers to the summation of all paths between all SAS adapter ports and all I/O device ports in the SAS subsystem including cables, enclosures, and expanders.

SAS subsystem overview for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

Review the SAS subsystem features and locations for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

Use this information with your specific system unit and operating system documentation. General information is intended for all users of this product. Service information is intended for a service representative that is specifically trained on the system unit and subsystem being serviced.

Note: All SAS subsystem features for 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D systems share the same integrated base system board (custom card identification numbers (CCIN) 2B2C or 2B4A for the two-socket model and 2B2D or 2B4B for the one-socket model). The physical location code for the base system board is U*n*-P1.

Feature locations

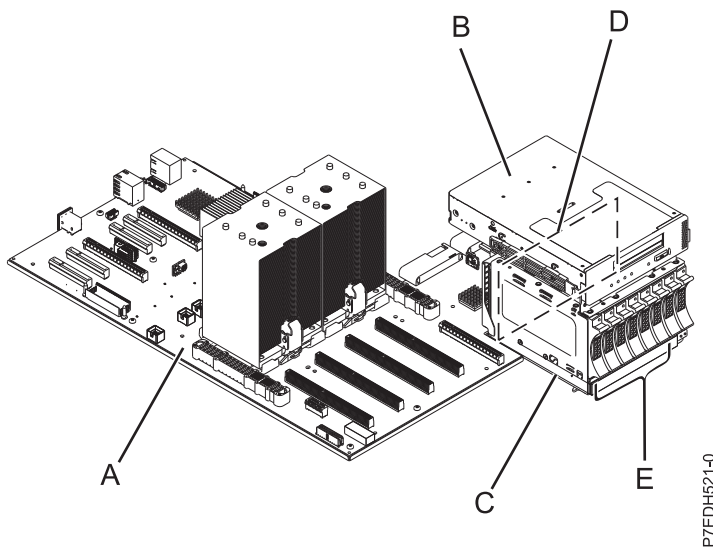Use Figure 1 and Table 1 to review the features and locations of the SAS base subsystem.

Figure 1. SAS base subsystem overview

Table 1. SAS base subsystem (feature code 5618) components

Diagram location	Part name	CCINs	Physical location codes
A	Base backplane[1]	2B2C, 2B2D, 2B4A, or 2B4B	U*n*-P1
B	Tape drive (optional)[1]	NA	U*n*-P1-D1 (SAS connector) or U*n*-P1-D2 (USB connector) **Note:** The tape drive bay is the same for both.
C	DVD drive[1]	NA	U*n*-P2-D9
D	Disk drive backplane	2BD5	U*n*-P2
E	Disk drives (6 SFF drive disk bays, 2 closed "filler" bays)	NA	U*n*-P2-D1 - U*n*-P2-D6
[1] Feature is part of the SAS subsystem but separate from feature code 5618.			

Use Figure 2 on page 3 and Table 2 on page 3 to review the features and locations of the SAS subsystem with a two-way split drive backplane.
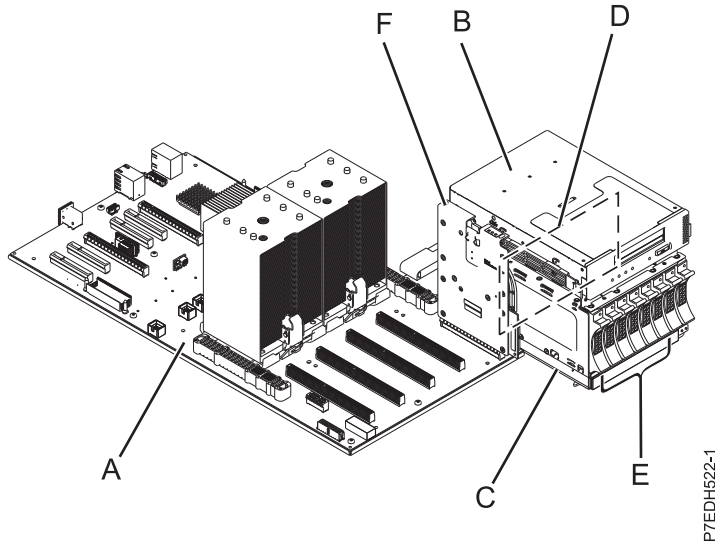
Figure 2. SAS two-way split drive backplane overview

Table 2. SAS base subsystem with two-way split drive backplane components (feature code EJ02)

Diagram location	Part name	CCINs	Physical location codes
A	Base backplane[1]	2B2C, 2B2D, 2B4A, or 2B4B	U*n*-P1
B	Tape drive (optional)[1]	NA	U*n*-P1-D1 (SAS connector) or U*n*-P1-D2 (USB connector) **Note:** The tape drive bay is the same for both.
C	DVD drive[1]	NA	U*n*-P2-D9
D	Disk drive backplane	2BD5	U*n*-P2
E	Disk drives (JBOD, RAID-0, or RAID-10)	NA	U*n*-P2-D1 - U*n*-P2-D6 (U*n*-P2-D7 and U*n*-P2-D8 are closed bays, also called filler bays)
F	RAID-10 storage controller	2B4F (feature code EJ02)	U*n*-P1-C19
[1] Feature is part of the SAS subsystem but separate from feature code EJ02.			

Use Figure 3 on page 4 and Table 3 on page 4 to review the features and locations of the SAS subsystem with dual-RAID components.
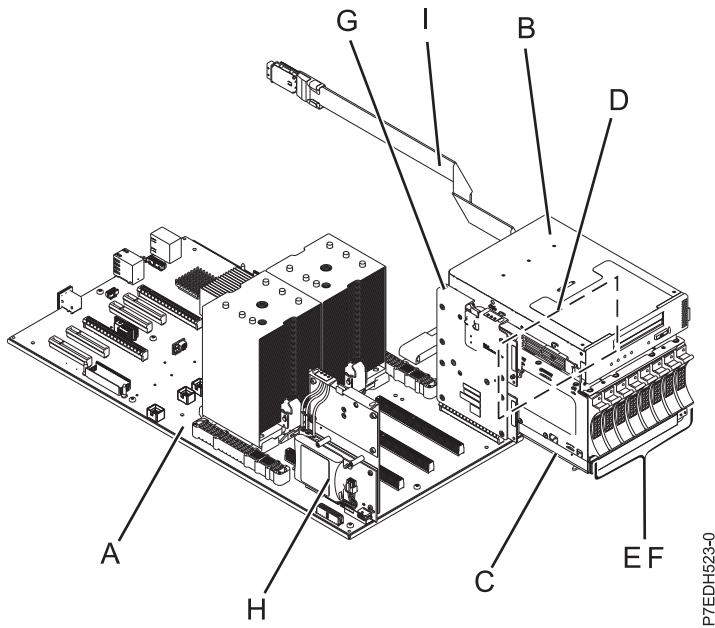
Figure 3. SAS dual-RAID subsystem overview

Table 3. SAS dual-RAID subsystem components (feature code EJ01)

Diagram location	Part name	CCINs	Physical location codes
A	Base backplane[1]	2B2C, 2B2D, 2B4A, or 2B4B	U*n*-P1
B	Tape drive (optional)[1]	NA	U*n*-P1-D1 (SAS connector) or U*n*-P1-D2 (USB connector) **Note:** The tape drive bay is the same for both.
C	DVD drive[1]	NA	U*n*-P2-D9
D	8-disk-drive dual storage IOA backplane with removable media	2BD6	U*n*-P2
E, F	8 SFF disk drives	NA	U*n*-P2-D1 - U*n*-P2-D8
G	RAID/Cache storage controller	2B4C	U*n*-P1-C19
H	Cache battery card	2BCF	U*n*-P1-C14
I	SAS I/O attachment cable		U*n*-P2-T1
(not pictured)	Optional external SAS cables for storage on integrated RAID[1] • 1.5 m: FC 3686 • 3.0 m: FC 3687		
[1] Feature is part of the SAS subsystem but separate from feature code EJ01.			

Feature details

SAS RAID adapters

The SAS RAID adapters have the following features:

- A host PCI-x at 66 MHz.

- Physical link (phy) speed of 3 Gbps SAS supporting transfer rates of 300 MB per second
- Optimized for SAS disk configurations that use dual paths through dual expanders for redundancy and reliability
- Adapter managed path redundancy and path switching for multiport SAS devices
- Embedded PowerPC® RISC Processor, hardware XOR DMA Engine, and hardware Finite Field Multiplier (FFM) DMA Engine (for Redundant Array of Independent Disks (RAID) 6)
- Support for RAID 0 and 10 disk arrays
- RAID disk arrays supported as a boot device
- Advanced RAID features:
  - Hot spares for RAID 10 disk arrays
  - Background parity checking
  - Background data scrubbing
  - Disks that are formatted to 528 bytes per sector, providing cyclical redundancy checking (CRC) and logically bad block checking
  - Optimized skip read/write disk support for transaction workloads

Related concepts:

"SAS storage configurations"
Several SAS subsystem configurations are supported on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

Related information:

➡ Serial attached SCSI cable planning

➡ System parts

SAS storage configurations

Several SAS subsystem configurations are supported on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

The configuration that you use depends on the combination of SAS features that you have installed on your system. The following table provides an overview of the features and related configurations.

Note: All SAS subsystem configurations for 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D systems share the same integrated base system board (custom card identification numbers (CCIN) 2B2C or 2B4A for the two-socket model and 2B2D or 2B4B for the one-socket model). The physical location code for the base system board is U*n*-P1.

Table 4. SAS subsystem configurations for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system

SAS subsystem configuration	RAID cache enablement card	External SAS components	SAS port cables	SAS cables	Limitations
SAS base subsystem (FC 5618)	No	None	None	Not applicable	• Either solid-state drives (SSDs) or hard disk drives (HDDs) can be used, but the two can never be mixed in the same RAID array. • IBM i is not supported.

Table 4. SAS subsystem configurations for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system (continued)

SAS subsystem configuration	RAID cache enablement card	External SAS components	SAS port cables	SAS cables	Limitations
SAS base subsystem with two-way split drive backplane (FC EJ02)	No	None	None	Not applicable	• IBM i is not supported. • Connecting to an external disk enclosure is not supported. • Each set of three drives can be HDDs or SSDs.
SAS dual-RAID subsystem configuration using internal disk drives and external disk enclosure (FC EJ01)	Yes **Note:** The internal dual RAID input/output adapters (IOAs) report as CCIN 57CB and CCIN 2B4C.	External SAS port	SAS cable assembly for connecting to an external SAS drive enclosure	• YI cable (FC 3686) - System to SAS disk enclosure, single adapter/dual path 1.5 meter • YI cable (FC 3687) - System to SAS disk enclosure, single adapter/dual path 3 meter	Both SSDs and HDDs can be used in the internal disk enclosure, but can never be mixed in the same RAID array. SSDs and HDDs cannot be mixed in the external disk enclosure. If an external SAS drawer is attached, only HDDs are supported.

Related concepts:

"SAS subsystem service considerations for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D" on page 13
Review several considerations before servicing features within the SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

"Service considerations for the cache battery pack" on page 14
To prevent data loss, follow the procedures before replacing the cache battery pack on the cache RAID cards.

Related information:

➡ Serial attached SCSI cable planning

SAS subsystem base configuration for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

This configuration uses the base backplane.

The following rules apply to this configuration:
• This feature is not available with the IBM i operating system.
• The base backplane uses six drives and cannot function in dual-storage I/O-adapter (IOA) mode or in high-availability (HA) RAID mode.
• There is a single path to drives.
• Internal adapter slots must be empty (slots Un-P1-C14 and Un-P1-C19).
• Non-volatile RAM (NVRAM) provided by embedded Obsidian module, so drives include JBOD, RAID 0, and 10 formats.

- Solid-state drives (SSDs) and hard disk drives (HDDs) can be mixed in any combination within the internal disk enclosure.

Example: Base backplane

This example shows a base backplane configuration on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D systems.
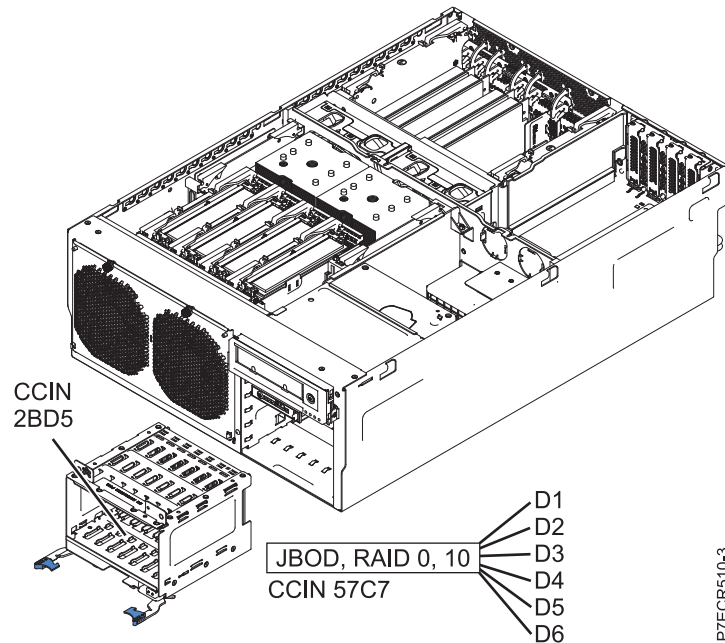

Figure 4. Disk bays controlled by base backplane

The following table lists the details of the base backplane configuration on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D systems.

Table 5. Configuration details

Embedded SAS	Configuration details
Storage controller (on base system board)	• The base backplane is located at Un-P1. • The controller reports as CCIN 57C7. • Six JBOD drives (Un-P2-D1 - Un-P2-D6, two closed filler bays) are included on base disk drive backplane. • Embedded module supports JBOD, RAID 0, and RAID 10. • There is a single path to each drive. • RAID-0 storage is supported.

SAS base subsystem with two-way split drive backplane for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

This configuration uses a two-way split backplane.

The following rules apply to this configuration:

- Each SAS adapter can control only three of the disk drives and cannot function in dual-storage I/O adapter (IOA) mode or in high availability (HA) RAID mode. One SAS adapter (RAID 10 storage controller) connects to D1, D2, and D3. The other SAS adapter (Base storage controller) connects to D4, D5, and D6.
- The SAS adapters can be assigned to separate partitions for boot devices.
- This configuration supports disks without RAID (referred to as JBOD) or RAID drives (RAID 0 and RAID 10). However, RAID drives are limited to three drives and to no write cache.
- RAID 10 with two drives is limited. A RAID 10 array with two drives is equivalent to RAID 1 (mirrored drives). A RAID 10 array with one or three drives is not allowed.
- Solid-state drives (SSDs) and hard disk drives (HDDs) can be used.
- SSDs and HDDs can both be present in a split backplane if each side of the split backplane has only SSDs or HDDs. The supported configurations are as follows:
  - SSD on D1 - D3, and HDD on D4 - D6
  - HDD on D1 - D3, and SSD on D4 - D6
  - SSD on D1 - D6
  - HDD on D1 - D6

Example: Two-way split drive backplane

Figure 5 shows a two-way split drive backplane configuration on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D systems. The pluggable SAS adapter controls three disk drives and the base backplane storage controller controls three drives in addition to DVD and optional tape storage.
Table 6 on page 9 lists the details of the two-way split drive backplane configuration on the 8202-E4C,
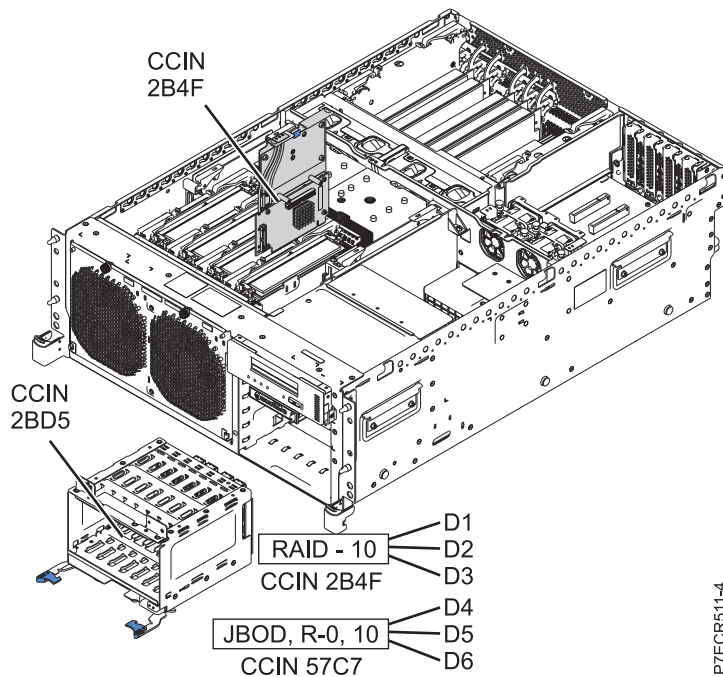

Figure 5. Embedded SAS adapter in a two-way split drive backplane

8202-E4D, 8205-E6C, or 8205-E6D systems.

Table 6. Configuration details

Embedded SAS	Configuration details
RAID 10 storage controller	• Features are located at U*n*-P1-C19. • The configuration controls D1, D2, and D3. • A single path goes to each drive. • JBOD, RAID 0, and RAID 10 are supported. • Physical connections to the SAS cable are disabled. If the external SAS port is installed, it is not functional. • The SAS adapter reports as custom card identification number (CCIN) 2B4F. It does not contain a write cache.
Base storage controller (base backplane)	• Features are located at U*n*-P1. • The configuration controls D4, D5, and D6. • A single path goes to each drive. • JBOD, RAID 0, and RAID 10 are supported. • Physical connections to the SAS cable are disabled. If the external SAS port is installed, it is not functional. • The controller reports as CCIN 57C7. It does not contain a write cache.

SAS dual-RAID subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

The dual-RAID subsystem configuration can be used with both internal and external disk drives or with only internal disk drives.

SAS dual-RAID subsystem with internal drives for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D
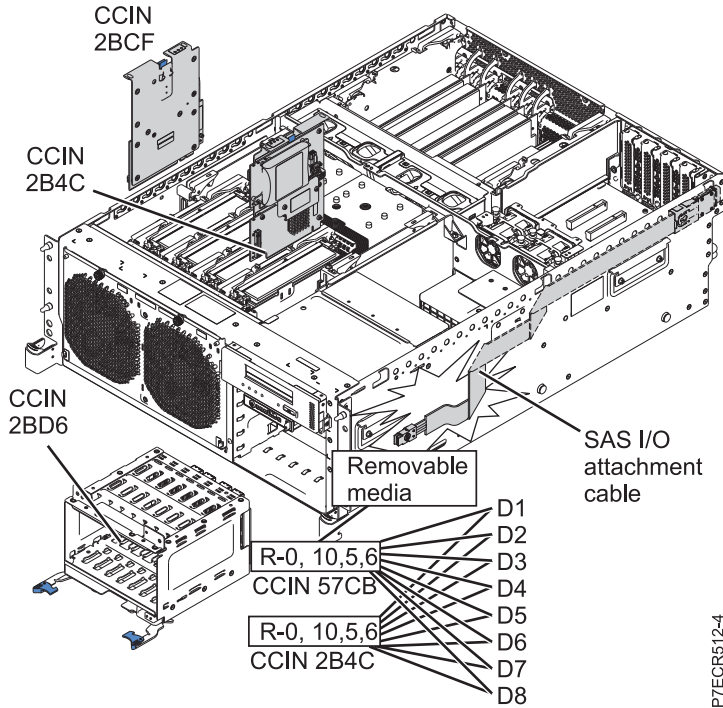
This configuration uses dual-storage I/O adapter (IOA) mode or high availability (HA) RAID mode with internal disk drives.

This configuration increases availability by using dual-storage IOA or high availability (HA) to connect multiple adapters to a common set of internal disk drives. It also increases the performance of RAID arrays. The following rules apply to this configuration:

• This configuration uses dual cache RAID adapters.
• Using the RAID adapters with port expanders, the two adapters connect to each other and to all eight disk drives.
• The disk drives are required to be in RAID arrays (JBOD is not supported).
• Separate SAS cables are not required to connect the two SAS RAID adapters to each other. The connection is contained within the backplane.
• RAID 0, 5, 6, and 10 support up to eight drives.
• Solid-state drives (SSDs) and hard disk drives (HDDs) can be used but can never be mixed in the same RAID array. An SSD-only RAID set and an HDD-only RAID set are supported.
• The SAS I/O attachment cable is supported for an optional connection to external storage. For more information, see related concepts.

Example: SAS dual-RAID subsystem with internal drives

Figure 6 on page 10 provides an overview of the dual-storage I/O adapter (IOA) configuration by using internal disk drives on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

CCIN
2BCF

CCIN
2B4C

CCIN
2BD6

Removable
media

SAS I/O
attachment
cable

R-0, 10,5,6
CCIN 57CB

R-0, 10,5,6
CCIN 2B4C

D1
D2
D3
D4
D5
D6
D7
D8

P7ECR512-4

Figure 6. Disk bays controlled by both SAS adapters when using a SAS dual-RAID subsystem with internal drives

Table 7 lists the configuration details.

Table 7. Configuration details

Embedded SAS	Configuration details
Embedded storage controller (U*n*-P1-T9) Cache battery card (U*n*-P1-C14) (CCIN 2BCF) RAID and cache storage controller (U*n*-P1-C19, U*n*-P1-C19-E1) (CCIN 2B4C)	• The RAID and cache enablement battery card (CCIN 2BCF) along with the base embedded storage controller creates one RAID adapter with 175 MB cache and reports as CCIN 57CB. • The RAID controller card with the cache battery card attached (CCIN 2B4C) creates the second RAID adapter with a 175 MB cache. • The SAS adapters connect to all eight disk drives.

Related concepts:

"SAS dual-RAID subsystem with external drives for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D" on page 11
This configuration increases availability by using dual-storage I/O adapter (IOA) mode or high availability (HA) RAID mode to connect multiple adapters to a common set of internal and external disk drives.

"SAS subsystem service considerations for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D" on page 13
Review several considerations before servicing features within the SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

"Service considerations for the cache battery pack" on page 14
To prevent data loss, follow the procedures before replacing the cache battery pack on the cache RAID cards.

SAS dual-RAID subsystem with external drives for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

This configuration increases availability by using dual-storage I/O adapter (IOA) mode or high availability (HA) RAID mode to connect multiple adapters to a common set of internal and external disk drives.

The following rules apply to this configuration:

- This configuration uses dual cache RAID adapters.
- Using the RAID adapters with port expanders, the two adapters connect to each other and to all eight disk drives.
- The disk drives are required to be in RAID arrays (JBOD is not supported).
- Separate SAS cables are not required to connect the two SAS RAID adapters to each other. The connection is contained within the backplane.
- RAID 0, 5, 6, and 10 support up to eight internal drives and the externally attached drives.
- Solid-state drives (SSDs) and hard disk drives (HDDs) can be used, but can never be mixed in the same RAID array. An SSD-only RAID set and an HDD-only RAID set are supported. SSDs are not supported in the externally attached disk drawer.
- The external SAS port is used for expansion to external SAS disk drawers.
- The external SAS port cannot connect to a SAS disk drawer that is populated with SSDs.
- The external SAS port cannot connect to a SAS drawer at all (even if it is populated with HDDs) if any SSDs are used in the internal RAID configuration.

Example: SAS dual-RAID subsystem with external drives

This example provides an overview of the SAS dual-RAID subsystem configuration by using external disk drives on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D systems.
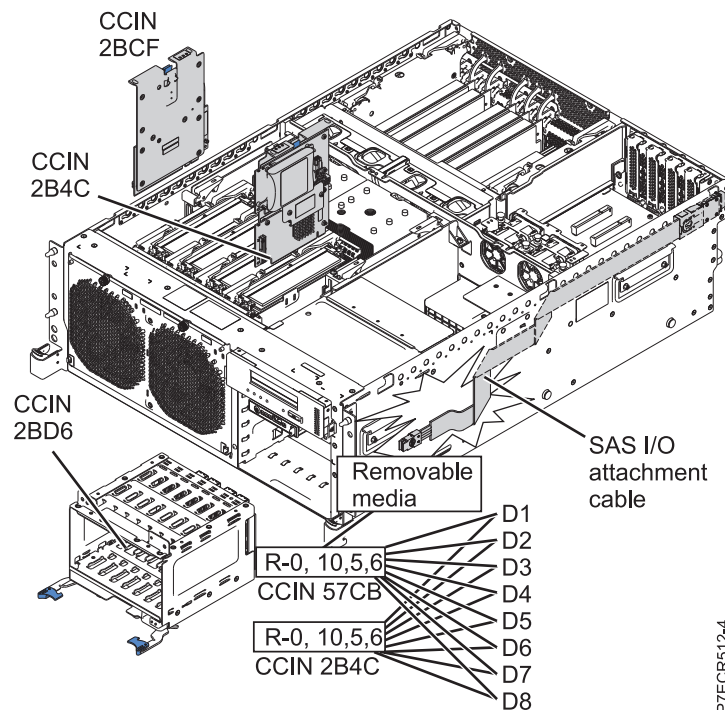

Figure 7. Disk bays controlled by both SAS adapters when using a SAS dual-RAID subsystem with internal and external drives
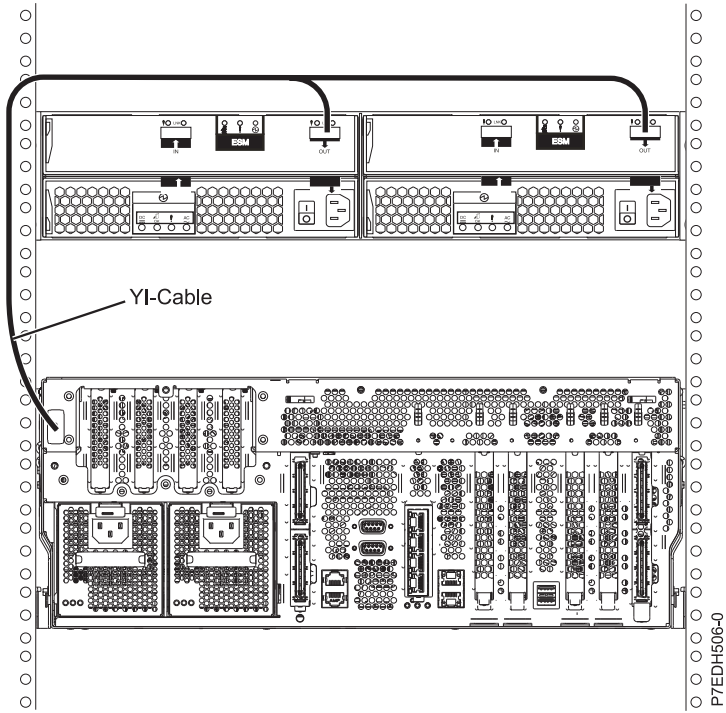
Figure 8. Physical connection to attach a 5886 disk drive enclosure
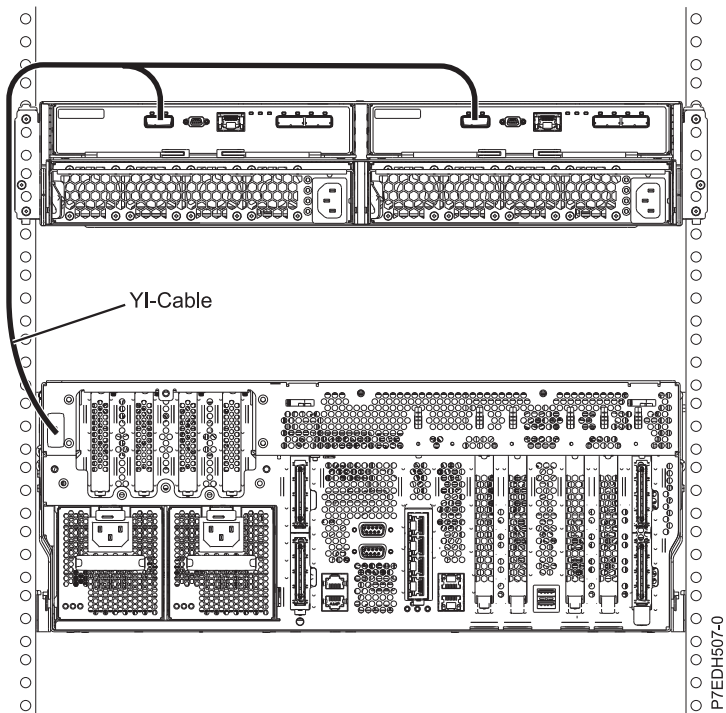

Figure 9. Physical connection to attach a 5887 disk drive enclosure

The following table lists the configuration details.

Table 8. Configuration details

Embedded SAS	Configuration details
Embedded storage controller (U*n*-P1-T9) Cache battery card (U*n*-P1-C14) RAID and cache storage controller (U*n*-P1-C19, U*n*-P1-C19-E1) (CCIN 2B4C) Eight-bay disk drive backplane (U*n*-P2)	• The RAID and cache enablement battery card (CCIN 2BCF) and the base embedded storage controller create one RAID adapter with a 175 MB cache and reports as CCIN 57CB. • The RAID controller card with a cache battery card attached (CCIN 2B4C) create the second RAID adapter with a 175 MB cache. • The SAS adapters connect to all eight disk drives and any drives that are attached by the external cable. • Physical connections to the SAS cable are enabled so that you can attach to another SAS port expander in an external disk enclosure by using a YI cable.

Related concepts:

"SAS subsystem service considerations for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D"
Review several considerations before servicing features within the SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

"Service considerations for the cache battery pack" on page 14
To prevent data loss, follow the procedures before replacing the cache battery pack on the cache RAID cards.

SAS subsystem service considerations for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D

Review several considerations before servicing features within the SAS subsystem for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

Attention: Do not attempt to remove any parts related to the SAS subsystem if the cache data present LED on the card in either P1-C19 or P1-C14 is flashing. To see this LED, you must shut down the system and remove the service cover. The LED shows a no-touch icon (a hand with a slash through it), and indicates that data might be in the cache on the adapter. To prevent data loss, first make sure that the system is shut down correctly. If either cache data present LED is flashing, see one of the following topics before removing any SAS subsystem parts. You can safely replace the cache battery pack when `Yes` is displayed next to `Battery pack can be safely replaced` on the Battery Information panel (for Linux and IBM i systems) or COMMAND STATUS panel (for AIX® systems).

Before servicing any features, review the I/O configurations for each logical partition on your system. It is important to understand the differences between the various configurations and the resulting service considerations. In addition, consider possible impacts to the following areas:
• Logical partitions and their I/O adapter assignments
• RAID array configurations
• Physical disk locations
• Path to your boot device

Related information:

↪ Displaying rechargeable battery information

↪ Displaying rechargeable battery information

↪ Displaying rechargeable battery information

↪ Logical partitioning

↪ SAS RAID controllers for IBM i

→ SAS RAID controllers for Linux

→ SAS RAID controllers for AIX

Service considerations for the cache battery pack

To prevent data loss, follow the procedures before replacing the cache battery pack on the cache RAID cards.

Note: Concurrent maintenance of adapter battery is not supported. Even with failed or missing batteries, the card associated with the battery must first be removed. For more information, see Removing and replacing SAS RAID adapters and batteries.

Attention: To maintain system availability and prevent possible data loss, you must understand that these features have implications on the SAS configuration and data accessibility of the system.

Attention: Do not attempt to remove any parts related to the SAS subsystem if the cache data present LED on the card in either P1-C19 or P1-C14 is flashing. To see this LED, you must shut down the system and remove the service cover. The LED shows a no-touch icon (a hand with a slash through it), and indicates that data might be in the cache on the adapter. To prevent data loss, first make sure the system is shut down correctly. If either cache data present LED is flashing, see one of the following topics before removing any SAS subsystem parts. You can safely replace the cache battery pack when `Yes` is displayed next to `Battery pack can be safely replaced` on the Battery Information panel (for the Linux and IBM i systems) or the COMMAND STATUS panel (for AIX systems).

The following figure shows the location of the cache data present LED in the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D SAS subsystem.
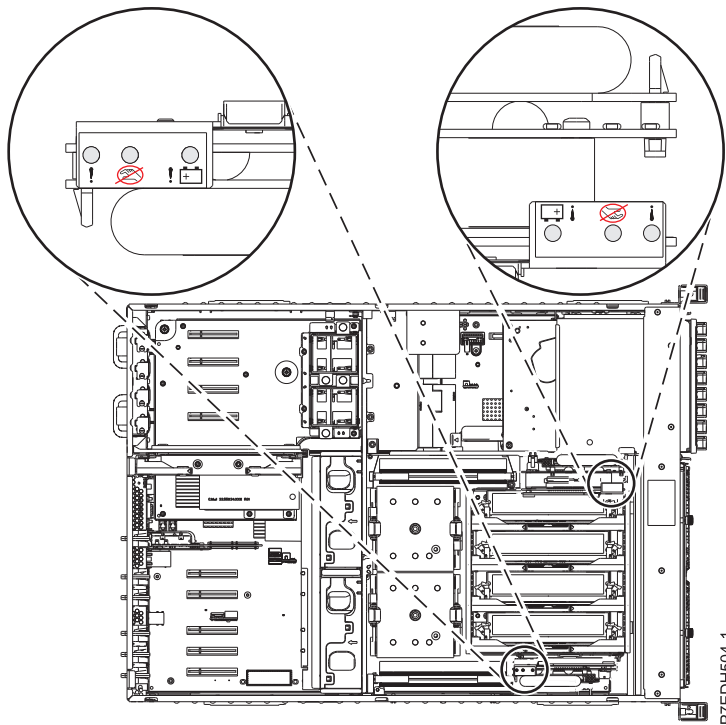
Figure 10. Cache data present LED

The following table describes the states of the cache data present LED and what to consider before attempting a service action.

Table 9. LED indications and actions

Cache battery card (Un-P1-C14)	RAID/Cache storage controller (Un-P1-C19)	Indication	Action
Off	Off	Cache is not active.	Service actions can proceed.
Off	Flashing	Cache is active on C19. Cache might have been flushed on C14 if C19 failed.	Attempt to power on and shut down prior to any service action.
Flashing	Off	Cache is active on C14. Cache might have been flushed on C19 if C14 failed.	Attempt to power on and shut down prior to any service action.
Flashing	Flashing	Cache is active on the dual controllers.	Attempt to power on and shut down prior to any service action. If this is unsuccessful in clearing the cache active LEDs, contact support.

Related information:

↪ Displaying rechargeable battery information

↪ Displaying rechargeable battery information

↪ Displaying rechargeable battery information

↪ Removing and Replacing a cache battery pack

↪ Contacting IBM support

Problem determination and recovery

Review the following information about using problem determination and recovery procedures for the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

Attention: To maintain system availability and prevent possible data loss, contact your next level of support for any service related to the SAS storage subsystem on the 8202-E4C, 8202-E4D, 8205-E6C, or 8205-E6D system.

For more details on service, support, service request numbers (SRNs), and feature information for the SAS storage subsystem, see the following information:
- Planning for cables
- Removing and replacing SAS RAID adapters and batteries
- Service request numbers

Related information:

↪ SAS RAID controllers for AIX

↪ SAS RAID controllers for IBM i

↪ SAS RAID controllers for Linux

↪ Serial-attached SCSI cable planning

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

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

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European Community contact:
IBM Deutschland GmbH
Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Tele: +49 7032 15 2941
email: lugi@de.ibm.com

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

Electromagnetic Interference (EMI) Statement - Korea

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Tel: 914-499-1900

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IBM-Allee 1, 71139 Ehningen, Germany
Tel: +49 7032 15 2941
email: lugi@de.ibm.com

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- 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
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- Consult an IBM-authorized dealer or service representative for help.

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European Community contact:
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New Orchard Road
Armonk, New York 10504
Tel: 914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:
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Technical Regulations, Abteilung M372
IBM-Allee 1, 71139 Ehningen, Germany
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