SAS subsystem

IBM

Contents

SAS subsystem for the 9040-MR9 or 9225-50H

Review the Serial-attached SCSI (SAS) subsystem features, configurations, and limitations for the IBM®
Power® System E950 (9040-MR9) or IBM Power System H950 (9225-50H) 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.

Serial-attached SCSI (SAS) is an evolution of the parallel Small Computer System Interface (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. If there is more than
one physical link in the port, the port is a wide 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 a
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 the expander devices
are 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

Learn about the features and locations of the SAS subsystem parts in the 9040-MR9 or 9225-50H system.

Use this information in conjunction with your specific system and operating system documentation.

Feature locations for the SAS subsystem parts in the base function storage configuration

Figure 1 on page 2 and Table 1 on page 2 provide information about the supported SAS features and the
part locations in 9040-MR9 or 9225-50H systems with the base function storage configuration.
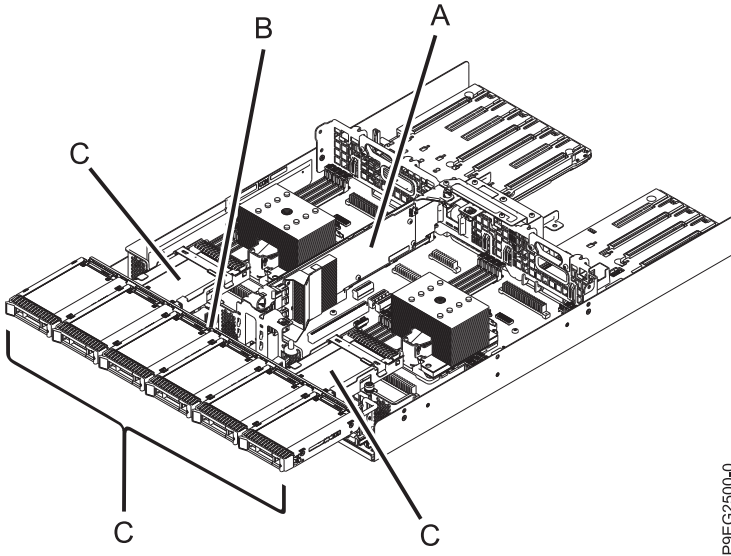
Figure 1. SAS subsystem parts in the base function storage configuration in the 9040-MR9 or 9225-50H system

Table 1. SAS subsystem parts in 9040-MR9 or 9225-50H systems with the base function storage configuration

Diagram location	Part name	Feature code (FC)	Customer card identification numbers (CCINs)	Physical location codes
A	PCIe3 x8 SAS RAID internal adapter 6 Gb	EJ1F	57D7	P1-C49
B, C	Base function disk drive backplane with 8 SFF bays	EJ1F	2D36	P2-D1 through P2-D8

Feature locations for the SAS subsystem parts in systems with base function storage configuration with the split-disk feature

Figure 2 on page 3 and Table 2 on page 3 provide information about the supported SAS features and the part locations in 9040-MR9 or 9225-50H systems with the base function storage configuration with the split-disk feature.
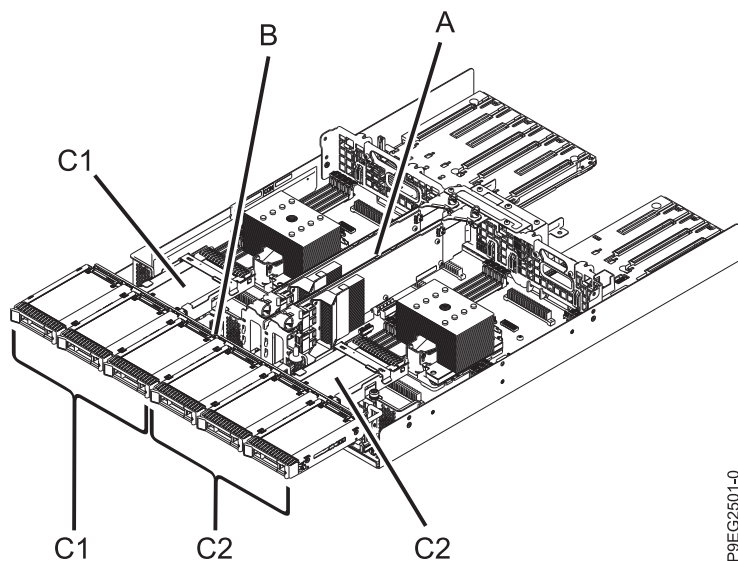
Figure 2. SAS subsystem parts in the base function storage configuration with the split-disk feature in 9040-MR9 or 9225-50H system

Table 2. SAS subsystem parts in 9040-MR9 or 9225-50H systems with the base function storage configuration with split-disk feature

Diagram location	Part name	Feature code (FC)	Customer card identification numbers (CCINs)	Physical location codes
A	PCIe3 x8 SAS RAID internal adapter 6 Gb (quantity 2)	EJ1H	57D7	P1-C49, P1-C50
B, C1, C2	Base function disk drive backplane with 8 SFF bays that are split into two groups of 4 disk bays (**C1** and **C2**)	EJ1H	2D36	P2-D1 through P2-D8

Feature details

SAS RAID adapters

The SAS RAID adapters have the following features:

- PCI Express (PCIe3) system interface
- Physical link (phy) speed of 6 Gbps SAS
- Optimized for SAS disk configurations that use dual paths through dual expanders for redundancy and reliability
- Adapter managed path redundancy and path switching for multiported SAS devices
- Embedded PowerPC processor, hardware XOR DMA Engine, and hardware Finite Field Multiplier (FFM) DMA Engine (for Redundant Array of Independent Disks (RAID))
- Support for RAID 0, 5, 6, and 10 disk arrays
- Additional features when the PCIe3 x8 cache SAS RAID internal adapter 6 Gb card is installed:
  - Adapters support nonvolatile write cache
  - Support for RAID 5T2, 6T2, and 10T2 tiered disk arrays (depending on the Operating System support)
  - Adapters configured in dual storage IOA or high availability (HA) RAID mode for best reliability and availability
- RAID disk arrays supported as a boot device
- Advanced RAID features:
  - Hot spares for RAID 5, 6, 10, 5T2, 6T2, and 10T2 disk arrays

- – Background parity checking
- – Background data scrubbing
- – Disks formatted to 528 or 4224 bytes per sector, providing cyclical redundancy checking (CRC) and logically bad block checking (T10 Data Integrity Fields)
- – Optimized hardware for RAID 5 and 6 sequential write workloads
- – Optimized skip read/write disk support for transaction workloads

Related information:

 Serial-attached SCSI cable planning

 SAS RAID controllers for AIX

 SAS RAID controllers for IBM i

 SAS RAID controllers for Linux

SAS subsystem storage configurations

Several SAS subsystem storage configurations are supported on the 9040-MR9 or 9225-50H systems.

The configuration you use depends on the combination of SAS features that you have installed on your system. The following tables provide an overview of the features and related configurations for the different systems.

Table 3. SAS subsystem storage configuration for the 9040-MR9 or 9225-50H system

SAS subsystem configuration	Supported SAS RAID adapter	External SAS components	SAS port cables	SAS cables	Limitations
Base function storage configuration	PCIe3 x8 SAS RAID internal adapter 6 Gb (CCIN 57D7)	None	None	Internal 8x mini SAS HD cables	
Base function storage configuration with the split-disk feature	Two PCIe3 x8 SAS RAID internal adapters 6 Gb (CCIN 57D7)	None	None	Two internal 8x mini SAS HD cables	

Related concepts:

SAS subsystem service considerations
There are several considerations to review before servicing features within the SAS subsystem for the 9008-22L, 9009-22A, 9009-41A, 9009-42A, 9223-22H, or 9223-42H system.

Related information:

 Serial-attached SCSI cable planning

SAS subsystem base function storage configuration for the 9040-MR9 or 9225-50H

This configuration uses the base function disk drive backplane.

The base function storage configuration for 9040-MR9 or 9225-50H systems includes:
- One PCIe3 x8 SAS RAID internal adapter 6 Gb, with RAID 0,10,5,6
- One base function disk drive backplane that supports 8x SFF (2.5") bays
- Two 8x mini SAS HD cables

The base function storage configuration for 9040-MR9 or 9225-50H systems includes:
- One PCIe3 x8 SAS RAID internal adapter 6 Gb, with RAID 0,10,5,6
- One base function disk drive backplane that supports 12x SFF (2.5") bays

- Two 8x mini SAS HD cables

On the base function disk drive backplane, the disks are directly attached to the SAS adapter, and uses Virtual SCSI Enclosure Services (VSES) for controlling the light-emitting diode (LED) and system power. The RDX drive utilizes one of the USB3.0 ports from the embedded USB3.0 controller.

SAS subsystem base function storage configuration with the split-disk feature for the 9040-MR9 or 9225-50H

This configuration uses the base function disk drive backplane with the split-disk feature.

The base function storage configuration with split-disk feature for 9040-MR9 or 9225-50H systems includes:
- Two PCIe3 x8 SAS RAID internal adapters 6 Gb, with RAID 0,10,5,6
- One base function disk drive backplane that supports 8x SFF (2.5") bays, with disks split as 4+4.
- Two 8x mini SAS HD cables

The base function storage configuration with split-disk feature for 9009-41A, 9009-42A, and 9223-42H systems includes:
- Two PCIe3 x8 SAS RAID internal adapters 6 Gb, with RAID 0,10,5,6
- One RDX bay
- One base function disk drive backplane that supports 12x SFF (2.5") bays, with disks split as 6+6.
- Two 8x mini SAS HD cables

On the base function disk drive backplane, the disks are directly attached to the SAS adapter, and uses Virtual SCSI Enclosure Services (VSES) for controlling the light-emitting diode (LED) and system power. The RDX drive utilizes one of the USB3.0 ports from the embedded USB3.0 controller.

SAS subsystem service considerations

There are several considerations to review before servicing features within the SAS subsystem for the 9040-MR9 or 9225-50H system.

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

Problem determination and recovery

Review information about using problem determination and recovery procedures for the 9040-MR9 or 9225-50H system.

Attention: To maintain system availability and to prevent possible data loss, contact your next level of support for any service that is related to the SAS storage subsystem on the 9040-MR9 or 9225-50H system.