

# IBM Power System H924 server provides a superior on-premises infrastructure for a hybrid multicloud IT platform, delivering high security and reliability, industry-leading PCIe Gen4 I/O, and a built-in cloud-optimized hypervisor

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## At a glance

The IBM<sup>(R)</sup> Power<sup>(R)</sup> System H924 (9223-42S) server, the latest addition to the SAP HANA platform, easily integrates into your organization's cloud and cognitive strategy and delivers industry-leading price and performance for your mission-critical workloads.

- Gain faster insights from your data with up to 4 TB of in-memory database capabilities for SAP HANA, IBM Db2<sup>(R)</sup>, Oracle, and a variety of open-source databases.
- Deliver superior price and performance for your mission-critical applications with room to scale in IBM AIX<sup>(R)</sup>, IBM i, and Linux<sup>(R)</sup> environments.
- Prevent security threats with advanced security features combined with unmatched reliability and resiliency.
- Harness the integrated virtualization capabilities of the server to rapidly deploy, optimize, and recover workloads.
- Migrate from previous IBM Power Systems servers with Live Partition Mobility (LPM) capabilities. Every new Power H924 server comes with a temporary IBM PowerVM<sup>(R)</sup> license for your old server to support a seamless move to IBM POWER9<sup>TM</sup> technology-based servers.
- Use this cloud-enabled server to build an agile, containerized cloud on a server platform that is optimized for data and cognitive services.
- Twice as much bandwidth for a seamless integration between on-premises and public clouds with a new back-end PCIe Gen4 switch.
- More NVMe adapters with ten PCIe Gen4 slots in the back plus four PCIe Gen4-capable U.2 front-accessible drives.
- Up to 89.6 TB of NVMe Enterprise Class Storage capacity.
- New cost-effective 800 GB data center PCIe Gen3 NVMe device supported for AIX, IBM VIOS, or Linux environments.

## Overview

Power Systems has always been focused on reliability and performance. The Power H924 server is primed with a POWER9 processor, displaying a technology designed from the ground up for data-intensive workloads, such as operational databases, advanced analytics, and business applications. The system is built with

innovations that deliver the highest security and reliability standards for future-driven enterprises.

When it comes to virtualization technology, Power Systems is unmatched. With a built-in IBM PowerVM hypervisor, clients have been relying on IBM for years to provide consumability and agility in IT data centers. Today, leveraging IBM's unique, comprehensive approach to the cloud, from on-premises IT to public cloud provider, we are taking one step forward.

The new Power H924 (9223-42S) server, powered by PCIe Gen4 switches, delivers a seamless and lightspeed throughput I/O between multiple on-premises and public cloud applications.

The Power H924 (9223-42S) server provides:

### **Superior on-premises infrastructure for hybrid cloud**

- Twice as fast back-end I/O enables seamless maximum speed and throughput between on-premises and multiple public cloud infrastructures with high availability (HA).
- Largest memory bandwidth and memory storage in the market combined with up to 14 (four U.2 NVMe plus up to ten PCIe add-in cards) NVMe adapters allows a huge virtual machine (VM), container, and bare metal consolidation, saving data center space and networking costs.
- Supports multiple OS instances without processing overhead in the server.
- PowerVM hypervisor is built in at no extra charge, so every POWER9 workload is virtualized, mobile, and cloud ready.
- IBM VM Recovery Manager, built on PowerVM, provides easy, low-cost solutions for HA and disaster recovery (DR) operations.
- IBM PowerHA<sup>(R)</sup> for AIX and IBM i are the low-cost, highly automated solutions to deliver HA features to your mission-critical applications.

### **Increased performance and flexibility for your key workloads**

- Upgrade AIX and IBM i installations to speed up your journey to a hybrid multicloud environment
- Optimize performance and license costs with Oracle applications through Shared Utility Capacity
- New Red Hat<sup>(R)</sup> Enterprise Linux and Red Hat OpenShift<sup>(R)</sup> deployments
- Increased performance and reduced footprint to run IBM Cloud<sup>(R)</sup> Paks
- High performance for IBM Spectrum<sup>(R)</sup> Scale offerings
- SAP HANA environments with external storage or multiple nodes

### **Key features**

The Power H924 server is a robust 2-socket system that meets today's growth and tomorrow's processing needs. It ships with up to 24 powerful cores and I/O configuration flexibility in a 19-inch rackmount, 4U (EIA units) form factor. The server supports:

- One or two processor sockets populated with the following POWER9 processor modules:
  - 8-core typical 3.8 to 4.0 GHz (max)
  - 10-core typical 3.5 to 3.9 GHz (max)
  - 11-core typical 3.45 to 3.9 GHz (max)
  - 12-core typical 3.4 to 3.9 GHz (max)
  - Power Management mode is set to Max Performance by default in the system. This mode can dynamically optimize the processor frequency at any given time based on CPU utilization and operating environmental conditions. For a description of this feature and other power management options available for

this server, see the [IBM EnergyScale for POWER9 Processor-Based Systems](#) website.

- Up to 4.0 TB of system memory distributed across 32 DDR4 DIMM slots. Supports different memory DIMM sizes, such as 16 GB, 32 GB, 64 GB, and 128 GB, running at different speeds of 2133, 2400, and 2666 Mbps.
- Multiple I/O options:
  - Three x16 Gen4 full-height, half-length slots (CAPI)
  - One x8 Gen4 full-height, half-length slots (with x16 connectors) (CAPI)
  - One x8 Gen4 full-height, half-length slots (with x16 connectors)
  - Two x16 Gen4 full-height, half-length slots
  - Four x8 Gen4 full-height, half-length slots (One of these slots is used for the required base LAN adapter.)
- Storage feature and backplane options:
  - Storage backplane with six SFF-3 bays and two front PCIe Gen4 capable NVMe U.2 drive slots
  - Storage backplane with two or four front PCIe Gen4 capable NVMe U.2 drive slots
  - Twelve or eighteen 2.5-in. SFF-3 (Gen3 carrier) disk bays
  - Base 12 SFF-3 bays/RDX bay
  - RAID 0, 5, 6, 10, 5T2, 6T2, and 10T2 support
  - One RDX bay (only available with x12 disk bays, not available with x18 disk bays)
  - Split feature to 6+6 SFF bays: Add a second SAS controller
  - Expanded function 18 SFF-3 bays/dual IOA with write cache and optional external SAS port
  - Expanded function 12 SFF-3 bays/RDX bay and optional external SAS port
  - Expansion capabilities for the EXP12SX/EXP24SX SFF Gen2-bay drawer
  - Hot-plug PCIe Gen4 capable U.2 slots
- Integrated technologies and features:
  - Service processor
  - EnergyScale
  - Hot-plug and redundant cooling
  - One front and two rear USB 3.0 ports
  - Two HMC ports
  - One system port with RJ45 connector
- 2+2 redundant hot-plug AC power supplies in each enclosure
- PowerVM integrated virtualization with minimum processing overhead

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## Key requirements

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Linux is required as the primary operating system with a minimum of 75% of total cores activated.

IBM AIX and IBM i can be chosen as secondary operating systems, with a maximum of 25% of total cores activated across both.

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## Planned availability date

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November 20, 2020

Availability of programs with an encryption algorithm in France is subject to French government approval.

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## Description

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The POWER9 scale-out family is the first set of servers that comes completely cloud enabled out of the box with integrated PowerVM Enterprise capabilities. These servers have a native hypervisor included at no additional license cost. Additionally, on-chip analytics and algorithms combined with a sophisticated PCIe Gen4 I/O architecture help clients run their workloads at an optimized processor frequency for performance and throughput. In combination with the DDR4 memory footprint of 4 TB, IBM provides a system that is unmatched by the competition in terms of memory scaling as well as the core-to-memory ratio needed for data-centric and in-memory workloads. LPM capabilities help you migrate from previous Power Systems. Every new Power H924 server also has the option of a temporary PowerVM license for your old server to support a seamless move of workloads to POWER9. The Power H924 server has built-in security that can help you to be ready for current and future security threats.

### Summary of standard features for the Power H924 server:

- POWER9 processor modules:
  - 8-core typical 3.8 to 4.0 GHz (max) POWER9 processor (#EP7J)
  - 10-core typical 3.5 to 3.9 GHz (max) POWER9 processor (#EP7K)
  - 11-core typical 3.45 to 3.9 GHz (max) POWER9 processor (#EP7M)
  - 12-core typical 3.4 to 3.9 GHz (max) POWER9 processor (#EP7L)
- High-performance Mbps DDR4 error-correcting code (ECC) memory
  - 16 GB (#EM6J), 32 GB (#EM6K), 64 GB (#EM7B), or 128 GB (#EM7C) memory features - different sizes and configurations run at different frequencies of 2133, 2400, and 2666 Mbps
  - Up to 4 TB of DDR4 memory with two Power Systems processors
  - Up to 2 TB of DDR4 memory with one Power Systems processor
- Storage backplane feature:
  - Storage backplane with six SFF-3 bays and two PCIe Gen4 capable NVMe U.2.
  - Storage backplane with two or four PCIe Gen4 capable NVMe U.2 drive slots.
  - Base 12 SFF-3 bays/RDX bay.
  - Optionally, split the above SFF-3 bays and add a second integrated SAS controller without cache.
  - Expanded function 18 SFF-3 bays/dual IOA with write cache and optional external SAS port.
  - Expanded function 12 SFF-3 bays/RDX bay/dual IOA with write cache and optional external SAS port.
  - Optionally, attach an EXP12SX/EXP24SX SAS HDD/SSD expansion drawer to the dual IOA.
- PCIe slots with single processor:
  - One x16 Gen4 full-height, half-length slots (CAPI)
  - One x8 Gen4 full-height, half-length slots (with x16 connectors) (CAPI)
  - Two x16 Gen4 full-height, half-length slots
  - Four x8 Gen4 full-height, half-length slots (One of these slots is used for the required base LAN adapter.)
- PCIe slots with two processors:
  - Three x16 Gen4 full-height, half-length slots (CAPI)
  - One x8 Gen4 full-height, half-length slots (with x16 connectors) (CAPI)
  - One x8 Gen4 full-height, half-length slots (with x16 connectors)

- Two x16 Gen4 full-height, half-length slots
- Four x8 Gen4 full-height, half-length slots (One of these slots is used for the required base LAN adapter.)
- Integrated:
  - Service processor
  - EnergyScale technology
  - Hot-swap and redundant cooling
  - One front USB 3.0 ports
  - Two rear USB 3.0 ports
  - Two HMC 1 GbE RJ45 ports
  - One system port with RJ45 connector
  - Four hot-plug, redundant power supplies
  - 19-inch rack-mounting hardware (4U)

## **PowerVM**

PowerVM, which delivers industrial-strength virtualization for AIX and Linux environments on POWER<sup>®</sup> processor-based systems, provides a virtualization-oriented performance monitor, and performance statistics are available through the HMC. These performance statistics can be used to understand the workload characteristics and to prepare for capacity planning.

## **Power H924 software tier for IBM i**

The IBM i software tier is P20. The IBM i QPRCFEAT number is the same numeric value as the processor feature code.

IBM i cannot be the primary partition.

## **Processor modules**

A maximum of two processors of the same type is allowed. The following defines the allowed quantities of processor activation entitlements:

- One 8-core, typical 3.8 to 4.0 GHz (max) processor (#EP7J) requires that eight processor activation codes be ordered. A maximum of eight processor activations (#EP7P) is allowed.
- Two 8-core, typical 3.8 to 4.0 GHz (max) processors (#EP7J) require that sixteen processor activation codes be ordered. A maximum of 16 processor activations (#EP7P) is allowed.
- One 10-core, typical 3.5 to 3.9 GHz (max) processor (#EP7K) requires that ten processor activation codes be ordered. A maximum of 10 processor activation code features (#EP7Q) is allowed.
- Two 10-core, typical 3.5 to 3.9 GHz (max) processors (#EP7K) require that twenty processor activation codes be ordered. A maximum of 20 processor activation code features (#EP7Q) is allowed.
- One 11-core, typical 3.45 to 3.9 GHz (max) processor (#EP7M) requires that eleven processor activation codes be ordered. A maximum of 11 processor activation code features (#EP7S) is allowed.
- Two 11-core, typical 3.45 to 3.9 GHz (max) processors (#EP7M) require that twenty-two processor activation codes be ordered. A maximum of 22 processor activation code features (#EP7S) is allowed.
- One 12-core, typical 3.4 to 3.9 GHz (max) processor (#EP7L) requires that twelve processor activation codes be ordered. A maximum of 12 processor activation code features (#EP7R) is allowed.
- Two 12-core, typical 3.4 to 3.9 GHz (max) processors (#EP7L) require that twenty-four processor activation codes be ordered. A maximum of 24 processor activation code features (#EP7R) is allowed.

## System memory

- A minimum 32 GB of memory is required on the Power H924 system.
- Memory upgrades require memory pairs. Base memory is two 16 GB DDR4 memory modules (#EM62).

Plans for future memory upgrades should be taken into account when deciding which memory feature size to use at the time of initial system order.

| Feature description | Feature number | Minimum DIMM quantity | Maximum DIMM quantity |
|---------------------|----------------|-----------------------|-----------------------|
| 16 GB DDR4 Memory   | EM6J           | 0                     | 32                    |
| 32 GB DDR4 Memory   | EM6K           | 0                     | 32                    |
| 64 GB DDR4 Memory   | EM7B           | 0                     | 32                    |
| 128 GB DDR4 Memory  | EM7C           | 0                     | 32                    |

**Note:** Different sizes and configurations run at different frequencies of 2133, 2400, and 2666 Mbps.

## Power supply

- Four power supplies supporting a rack: 2+2 1400 Watt 200 - 240 Volt (#EB2M)

## Redundant fans

Redundant fans are standard.

## Power cords

Four power cords are required. The Power H924 server supports power cord 4.3 m (14 ft), Drawer to Wall/IBM PDU (250V/10A) in the base shipment group. See the feature listing for other options.

## PCIe slots

The Power H924 server has up to 14 (four U.2 NVMe plus up to ten PCIe add-in cards) PCIe hot-plug slots, providing excellent configuration, flexibility, and expandability. For more information about PCIe slots, see the rack-integrated system with I/O expansion drawer section below.

With two POWER9 processor single-chip modules (SCM), eleven PCIe slots are available:

- Three are x16 Gen4 full-height, half-length slots (CAPI)
- One is x8 Gen4 full-height, half-length slots (with x16 connectors) (CAPI)
- One is x8 Gen4 full-height, half-length slots (with x16 connectors)
- Two are x16 Gen4 full-height, half-length slots
- Four are x8 Gen4 full-height, half-length slots (One of these slots is used for the required base LAN adapter.)

With one POWER9 processor SCM, eight PCIe slots are available:

- One is x16 Gen4 full-height, half-length slot (CAPI)
- One is x8 Gen4 full-height, half-length slot (with x16 connector) (CAPI)
- Two are x16 Gen4 full-height, half-length slots
- Four are x8 Gen4 full-height, half-length slots (One of these slots is used for the required base LAN adapter.)

The x16 slots can provide up to twice the bandwidth of x8 slots because they offer twice as many PCIe lanes. PCIe Gen4 slots can support up to twice the bandwidth of

a PCIe Gen3 slot, and PCIe Gen3 slots can support up to twice the bandwidth of a PCIe Gen2 slot, assuming an equivalent number of PCIe lanes.

At least one PCIe Ethernet adapter is required on the server by IBM to ensure proper manufacture, test, and support of the server. One of the x8 PCIe slots is used for this required adapter.

These servers are smarter about energy efficiency when cooling the PCIe adapter environment. They sense which IBM PCIe adapters are installed in their PCIe slots and, if an adapter requires higher levels of cooling, they automatically speed up fans to increase airflow across the PCIe adapters. Note that faster fans increase the sound level of the server. Higher wattage PCIe adapters include the PCIe3 SAS adapters and SSD/flash PCIe adapters (#EJ10, #EJ14, and #EJ0J).

### **NVMe drive slots, SAS bays, and storage backplane options**

- Storage backplane with 6 SFF-3 bays and 2 PCIe Gen4 capable NVMe U.2 (#EJ1S)
- Storage backplane with 2 PCIe Gen4 capable NVMe U.2 drive slots (#EJ1T)
- Storage backplane with 4 PCIe Gen4 capable NVMe U.2 drive slots (#EJ1U)
- Base storage backplane 12 SFF-3 bays/RDX bay (#EJ1C)
- Feature EJ1E (6 +6 SFF-3 bays split backplane for #EJ1C)
- Expanded function storage backplane 18 SFF-3 bays/dual IOA with write cache and optional external SAS port (#EJ1D)
- Expanded function storage backplane 12 SFF-3 bays/RDX bay/dual IOA with write cache and optional external SAS port (#EJ1M)

The backplane options provide SFF-3 SAS bays in the system unit. These 2.5-inch or small form factor (SFF) SAS bays can contain SAS drives (HDD or SSD) mounted on a Gen3 tray or carrier. Thus, the drives are designated SFF-3. SFF-1 or SFF-2 drives do not fit in an SFF-3 bay. All SFF-3 bays support concurrent maintenance or hot-plug capability.

These backplane options use leading-edge, integrated SAS RAID controller technology designed and patented by IBM. A custom-designed PowerPC<sup>(R)</sup>-based ASIC chip is the basis of these SAS RAID controllers and provides RAID 5 and RAID 6 performance levels, especially for SSD. Internally, SAS ports are implemented and provide plenty of bandwidth. The integrated SAS controllers are placed in dedicated slots and do not reduce the number of available PCIe slots.

The feature EJ1C base storage backplane option provides twelve SFF-3 bays and one SAS controller with zero write cache.

By optionally adding the feature EJ1E split backplane, a second integrated SAS controller with no write cache is provided, and the twelve SFF-3 bays are logically divided into two sets of six bays. Each SAS controller independently runs one of the six-bay sets of drives.

This backplane option supports HDDs or SSDs or a mixture of HDDs and SSDs in the SFF-3 bays. Mixing HDDs and SSDs applies even within a single set of six bays of the split backplane option. Note that if mixing HDDs and SSDs, they must be in separate arrays.

This backplane option can offer different drive protection options: RAID 0, RAID 5, RAID 6, or RAID 10. RAID 5 requires a minimum of three drives of the same capacity. RAID 6 requires a minimum of four drives of the same capacity. RAID 10 requires a minimum of two drives. Hot spare capability is supported with RAID 5, or RAID 6, or RAID 10.

Note that RAID 5 and RAID 6 result in more drive write activity than mirroring or than unprotected drives.

This backplane option is supported by AIX, Linux, VIOS, and IBM i. It is highly recommended but not required that the drives be protected. With IBM i, all drives are required to be protected by either RAID or mirroring.

If the client needs a change after the server is installed, the backplane option can be changed. For example, the feature EJ1E split backplane feature can be added to an existing feature EJ1C backplane.

Unlike the hot-plug PCIe slots and SAS bays, concurrent maintenance is not available for the integrated SAS controllers. Scheduled downtime is required if a service action is required for these integrated resources.

In addition to supporting HDDs and SSDs in the SFF-3 SAS bays, the expanded function storage backplanes (#EJ1D and #EJ1M) support the optional attachment of an EXP12SX/EXP24SX drawer in mode 1. For these expanded function backplanes, all bays are accessed by both of the integrated SAS controllers. The bays support concurrent maintenance (hot plug).

### **Cable management arm**

A folding arm is attached to the server's rails at the rear of the server. The server's power cords and the cables from the PCIe adapters or integrated ports run through the arm and into the rack. The arm enables the server to be pulled forward on its rails for service access to PCIe slots, memory, processors, and so on without disconnecting the cables from the server. Approximately 1 meter (3 feet) of cord or cable length is needed for the arm.

### **Integrated I/O ports**

In addition to the integrated SAS controllers and SAS ports associated with the storage backplane, there are two HMC ports, one system port, and three USB ports. The two HMC ports are RJ45 supporting 1 Gb Ethernet connections.

The one system port is RJ45 and is supported by AIX and Linux for attaching serial devices, such as an asynchronous device like a console. If the device does not have an RJ45 connection, a converter cable, such as feature 3930, can provide a 9-pin D-shell connection. Note that serial devices can have very individual characteristics (different pin outs), and feature 3930 may not be appropriate for all possible devices. In this case, the user should acquire an OEM converter cable appropriate for their device.

Three USB-3 ports are available for general client use; one is located in front and two in the rear. Additionally, there are two USB-2 ports in the service processor located in the rear of the system. These ports are for limited client use. A converter cable ECCF provides a USB-to-9-pin D-Shell connection for this function.

### **Rack-integrated system with I/O expansion drawer**

Regardless of the rack-integrated system to which the PCIe Gen3 I/O expansion drawer is attached, if the expansion drawer is ordered as factory integrated, the PDUs in the rack will be placed horizontally by default to enhance cable management.

Expansion drawers complicate the access to vertical PDUs if located at the same height. IBM recommends accommodating PDUs horizontally on racks containing one or more PCIe Gen3 I/O expansion drawers.

After the rack with expansion drawers is delivered to the client, the client can rearrange the PDUs from horizontal to vertical. However, the configurator will continue to consider the PDUs as being placed horizontally for the matter of calculating the free space still available in the rack.

Vertical PDUs can be used only if CSR ( #0469) is on the order. When specifying CSR, the client will provide the locations where the PCIe Gen3 I/O expansion



drawers must be placed, avoiding locating those adjacent to vertical PDU locations, EIA 6 through 16 and 21 through 31.

The I/O expansion drawer can be migrated from a POWER8<sup>®</sup> to a POWER9 processor-based system. Only I/O cards supported on POWER9 in the I/O expansion drawer are allowed. Clients migrating the I/O expansion drawer configuration might have one or two PCIe3 6-slot fanout modules (#EMXF or #EMXG) installed in the rear of the I/O expansion drawer.

For a 4U server configuration with one processor module, up to one I/O expansion drawer and one fanout module (#EMXF or #EMXG) connected to one optical cable adapter (#EJ08) are supported (the right PCIe module bay must be populated by a filler module).

For a 4U server configuration with one processor module, up to one I/O expansion drawer and one fanout module (#EMXH) connected to one optical cable adapter (#EJ20) are supported (the right PCIe module bay must be populated by a filler module).

#### **Limitations:**

- Mixing of prior PCIe3 fanout modules (#EMXF or #EMXG) with PCIe3 fanout module (#EMXH) in the same I/O expansion drawer is not allowed.
- Mixing of I/O expansion drawer with prior PCIe3 fanout modules (#EMXF or #EMXG) and I/O expansion drawer with PCIe3 fanout module (#EMXH) in same configuration is allowed.
- PCIe3 optical cable adapters (#EJ20) requires the use of optical cables (#ECCX or ECCY) or copper cable (#ECCS).

#### **RDX docking station**

The RDX docking station EUA4 accommodates RDX removable disk cartridges of any capacity. The disk is in a protective rugged cartridge enclosure that plugs into the docking station. The docking station holds one removable rugged disk drive or cartridge at a time. The rugged removable disk cartridge and docking station performs saves, restores, and backups similar to a tape drive. This docking station can be an excellent entry capacity and performance option.

#### **EXP24SX SAS storage enclosure (#ESLS)**

The EXP24SX is a storage expansion enclosure with twenty-four 2.5-inch SFF SAS bays. It supports up to 24 hot-plug HDDs or SSDs in only 2 EIA of space in a 19-inch rack. The EXP24SX SFF bays use SFF Gen2 (SFF-2) carriers or trays.

The EXP24SX drawer feature ESLS is supported on the Power S914, Power S922, and Power H924 servers by AIX, IBM i, Linux, and VIOS.

With AIX, Linux, and VIOS, the EXP24SX can be ordered with four sets of 6 bays (mode 4), two sets of 12 bays (mode 2), or one set of 24 bays (mode 1). With IBM i, only one set of twenty-four bays (mode 1) is supported. It is possible to change the mode setting in the field using software commands along with a specifically documented procedure. The predecessor EXP24S did not support this mode change in the field.

**Important:** When changing modes, a skilled, technically qualified person should follow the special documented procedures. Improperly changing modes can potentially destroy existing RAID sets, prevent access to existing data, or allow other partitions to access another partition's existing data. Hire an expert to assist if you are not familiar with this type of reconfiguration work.

Four mini-SAS HD ports on the EXP24SX are attached to PCIe Gen3 SAS adapters or attached to an integrated SAS controller in a POWER9 scale-out server, such as the Power H922 or Power H924. The following PCIe3 SAS adapters support the EXP24SX:

- PCIe3 RAID SAS Adapter Quad-port 6 Gb x8 (#EJ0J)

- PCIe3 12 GB Cache RAID Plus SAS Adapter Quad-port 6 Gb x8 (#EJ14)

Earlier-generation PCIe2 or PCIe1 SAS adapters are not supported with the EXP24SX.

The attachment between the EXP24SX and the PCIe3 SAS adapters or integrated SAS controllers is through SAS YO12 or X12 cables. X12 and YO12 cables are designed to support up to 12 Gb SAS. The PCIe Gen3 SAS adapters support up to 6 Gb throughput. The EXP24SX has been designed to support up to 12 Gb throughput if future SAS adapters support that capability. All ends of the YO12 and X12 cables have mini-SAS HD narrow connectors. Cable options are:

- X12 cable: 3 meter copper (#ECDJ)
- YO12 cables: 1.5 meter copper (#ECDT), 3 meter copper (#ECDU)
- 3M 100 GbE Optical Cable QSFP28 (AOC) (#EB5R)
- 5M 100 GbE Optical Cable QSFP28 (AOC) (#EB5S)
- 10M 100 GbE Optical Cable QSFP28 (AOC) (#EB5T)
- 15M 100 GbE Optical Cable QSFP28 (AOC) (#EB5U)
- 20M 100 GbE Optical Cable QSFP28 (AOC) (#EB5V)
- 30M 100 GbE Optical Cable QSFP28 (AOC) (#EB5W)
- 50M 100 GbE Optical Cable QSFP28 (AOC) (#EB5X)
- 100M 100 GbE Optical Cable QSFP28 (AOC) (#EB5Y)

An AA12 cable interconnecting a pair of PCIe3 12 GB cache adapters (two #EJ14) is not attached to the EXP24SX. These higher-bandwidth cables could support 12 Gb throughput if future adapters support that capability. Copper feature ECE0 is 0.6 meters long, feature ECE3 is 3 meters long, and optical AA12 feature ECE4 is 4.5 meters long.

One no-charge specify code is used with each EXP24SX I/O drawer (#ESLS) to communicate to IBM configurator tools and IBM Manufacturing which mode setting, adapter, and SAS cable are needed. With this specify code, no hardware is shipped. The physical adapters, controllers, and cables must be ordered with their own chargeable feature numbers. There are more technically supported configurations than are represented by these specify codes. IBM Manufacturing and IBM configurator tools such as e-config only understand and support EXP24SX configurations represented by these specify codes.

| Specify code | Mode   | Adapter/<br>Controller             | Cable to<br>drawer | Environment              |
|--------------|--------|------------------------------------|--------------------|--------------------------|
| #EJW0        | Mode 1 | CEC SAS<br>Ports                   | 2 YO12<br>cables   | AIX/IBM i/<br>Linux/VIOS |
| #EJW1        | Mode 1 | One<br>(unpaired)<br>#EJ0J/#EJ0M   | 1 YO12 cable       | AIX/IBM i/<br>Linux/VIOS |
| #EJW2        | Mode 1 | Two (one<br>pair) #EJ0J/<br>#EJ0M  | 2 YO12<br>cables   | AIX/IBM i/<br>Linux/VIOS |
| #EJW3        | Mode 2 | Two<br>(unpaired)<br>#EJ0J/#EJ0M   | 2 X12 cables       | AIX/Linux/<br>VIOS       |
| #EJW4        | Mode 2 | Four (two<br>pair) #EJ0J/<br>#EJ0M | 2 X12 cables       | AIX/Linux/<br>VIOS       |
| #EJW5        | Mode 4 | Four<br>(unpaired)<br>#EJ0J/#EJ0M  | 2 X12 cables       | AIX/Linux/<br>VIOS       |
| #EJW6        | Mode 2 | One<br>(unpaired)<br>#EJ0J/#EJ0M   | 2 YO12<br>cables   | AIX/Linux/<br>VIOS       |
| #EJW7        | Mode 2 | Two<br>(unpaired)<br>#EJ0J/#EJ0M   | 2 YO12<br>cables   | AIX/Linux/<br>VIOS       |

| Specify code | Mode   | Adapter/<br>Controller | Cable to<br>drawer | Environment              |
|--------------|--------|------------------------|--------------------|--------------------------|
| #EJWF        | Mode 1 | Two (one pair) #EJ14   | 2 Y012 cables      | AIX/IBM i/<br>Linux/VIOS |
| #EJWG        | Mode 2 | Two (one pair) #EJ14   | 2 X12 cables       | AIX/Linux/<br>VIOS       |
| #EJWJ        | Mode 2 | Four (two pair) #EJ14  | 2 X12 cables       | AIX/Linux/<br>VIOS       |
| #EJWU        | Mode 1 | Controller<br>EJ1G     | 1 Y012<br>cables   | Linux/AIX                |

All of the above EXP24SX specify codes assume a full set of adapters and cables able to run all the SAS bays configured. The following specify codes communicate to IBM Manufacturing a lower-cost partial configuration is to be configured where the ordered adapters and cables can run only a portion of the SAS bays. The future MES addition of adapters and cables can enable the remaining SAS bays for growth. The following specify codes are used:

| Specify              | Mode   | Adapter/<br>Controller       | Cable to<br>drawer | Environment        |
|----------------------|--------|------------------------------|--------------------|--------------------|
| #EJWA (1/2 of #EJW7) | Mode 2 | One (unpaired) #EJ0J/#EJ0M   | 1 Y012 cables      | AIX/Linux/<br>VIOS |
| #EJWB (1/2 of #EJW4) | Mode 2 | Two (one pair) #EJ0J/#EJ0M   | 1 X12 cable        | AIX/Linux/<br>VIOS |
| #EJWC (1/4 of #EJW5) | Mode 4 | One (unpaired) #EJ0J/#EJ0M   | 1 X12 cable        | AIX/Linux/<br>VIOS |
| #EJWD (1/2 of #EJW5) | Mode 4 | Two (unpaired) #EJ0J/#EJ0M   | 1 X12 cables       | AIX/Linux/<br>VIOS |
| #EJWE (3/4 of #EJW5) | Mode 4 | Three (unpaired) #EJ0J/#EJ0M | 2 X12 cables       | AIX/Linux/<br>VIOS |
| #EJWH (1/2 of #EJWJ) | Mode 2 | Two (one pair) #EJ14         | 1 X12 cables       | AIX/Linux/<br>VIOS |

An EXP24SX drawer in mode 4 can be attached to two or four SAS controllers and provide a great deal of configuration flexibility. For example, if using unpaired feature EJ0J adapters, these EJ0J adapters could be in the same server in the same partition, same server in different partitions, or even different servers.

An EXP24SX drawer in mode 2 has similar flexibility. If the I/O drawer is in mode 2, then half of its SAS bays can be controlled by one pair of PCIe3 SAS adapters, such as a 12 GB write cache adapter pair (#EJ14), and the other half can be controlled by a different PCIe3 SAS 12 GB write cache adapter pair or by zero-write-cache PCIe3 SAS adapters.

Note that for simplicity, IBM configurator tools such as e-config assume that the SAS bays of an individual I/O drawer are controlled by one type of SAS adapter. As a client, you have more flexibility than e-config understands.

A maximum of twenty-four 2.5-inch SSDs or 2.5-inch HDDs are supported in the EXP24SX 24 SAS bays. There can be no mixing of HDDs and SSDs in the same mode 1 drawer. HDDs and SSDs can be mixed in a mode 2 or mode 4 drawer, but they cannot be mixed within a logical split of the drawer. For example, in a mode 2 drawer with two sets of 12 bays, one set could hold SSDs and one set could hold HDDs, but you cannot mix SSDs and HDDs in the same set of 12 bays.

The indicator feature EHS2 helps IBM Manufacturing understand where SSDs are placed in a mode 2 or a mode 4 EXP24SX drawer. On one mode 2 drawer, use a quantity of one feature EHS2 to have SSDs placed in just half the bays, and use two EHS2 features to have SSDs placed in any of the bays. Similarly, on one mode 4 drawer, use a quantity of one, two, three, or four EHS2 features to indicate how many bays can have SSDs. With multiple EXP24SX orders, IBM Manufacturing will

have to guess which quantity of feature ESH2 is associated with each EXP24SX. Consider using CSP (#0456) to reduce guessing.

Two-and-a-half-inch small form factor (SFF) SAS HDDs and SSDs are supported in the EXP24SX. All drives are mounted on Gen2 carriers/trays and thus named SFF-2 drives.

The EXP24SX drawer has many high-reliability design points:

- SAS drive bays that support hot swap
- Redundant and hot-plug-capable power and fan assemblies
- Dual line cords
- Redundant and hot-plug enclosure service modules (ESMs)
- Redundant data paths to all drives
- LED indicators on drives, bays, ESMs, and power supplies that support problem identification
- Through the SAS adapters or controllers, drives that can be protected with RAID and mirroring and hot-spare capability

Order two ESLL features for AC power supplies. The enclosure is shipped with adjustable depth rails and can accommodate 19-inch rack depths from 59.5 - 75 cm (23.4 - 29.5 in.). Slot filler panels are provided for empty bays when initially shipped from IBM.

### **EXP12SX SAS storage enclosure (#ESLL)**

The EXP12SX is a storage expansion enclosure with twelve 3.5-inch LFF SAS bays. It supports up to 12 hot-plug HDDs in only 2 EIA of space in a 19-inch rack. The EXP12SX SFF bays use LFF Gen1 (LFF-1) carriers or trays. The 4k byte sector drives (#4096 or #4224) are supported. SSDs are not supported.

The EXP12SX drawer feature ESLL is supported on the Power S914, Power S922, and Power H924 servers by AIX, Linux, and VIOS.

With AIX, Linux, and VIOS, the EXP12SX enclosure can be ordered with four sets of 3 bays (mode 4), two sets of 6 bays (mode 2), or one set of 12 bays (mode 1). The mode setting can be changed in the field using software commands along with a specifically documented procedure.

**Important:** When changing modes, it is very important that you follow the documented procedures. Improperly changing modes can potentially destroy existing RAID sets, prevent access to existing data, or allow other partitions to access another partition's existing data. Hire an expert to assist if you are not familiar with this type of reconfiguration work.

Four mini-SAS HD ports on the EXP12SX are attached to PCIe Gen3 SAS adapters or attached to an integrated SAS controller in a POWER9 scale-out server such as the Power S914, Power S922, or Power H924 server. The following PCIe3 SAS adapters support the EXP12SX:

- PCIe3 RAID SAS Adapter Quad-port 6 Gb x8 (#EJ0J)
- PCIe3 12 GB Cache RAID Plus SAS Adapter Quad-port 6 Gb x8 (#EJ14)

Earlier-generation PCIe2 or PCIe1 SAS adapters are not supported with the EXP12SX drawer.

The EXP12SX drawer and the PCIe3 SAS adapters or integrated SAS controllers are attached through SAS YO12 or X12 cables. X12 and YO12 cables are designed to support up to 12 Gb. The PCIe Gen3 SAS adapters support up to 6 Gb throughput. The EXP12SX has been designed to support up to 12 Gb throughput if future SAS adapters support that capability. All ends of the YO12 and X12 cables have mini-SAS HD narrow connectors. Cable options are:

- X12 cable: 3 meter copper (#ECDJ)

- YO12 cables: 1.5 meter copper (#ECDT), 3 meter copper (#ECDU)
- 3M 100 GbE Optical Cable QSFP28 (AOC) (#EB5R)
- 5M 100 GbE Optical Cable QSFP28 (AOC) (#EB5S)
- 10M 100 GbE Optical Cable QSFP28 (AOC) (#EB5T)
- 15M 100 GbE Optical Cable QSFP28 (AOC) (#EB5U)
- 20M 100 GbE Optical Cable QSFP28 (AOC) (#EB5V)
- 30M 100 GbE Optical Cable QSFP28 (AOC) (#EB5W)
- 50M 100 GbE Optical Cable QSFP28 (AOC) (#EB5X)
- 100M 100 GbE Optical Cable QSFP28 (AOC) (#EB5Y)

An AA12 cable interconnecting a pair of PCIe3 12 GB cache adapters (two #EJ14) is not attached to the EXP12SX drawer. These higher-bandwidth cables could support 12 Gb throughput if future adapters support that capability. Copper feature ECE0 is 0.6 meters long, feature ECE3 is 3 meters long, and optical AA12 feature ECE4 is 4.5 meters long.

One no-charge specify code is used with each EXP12SX I/O drawer (#ESLL) to communicate to IBM configurator tools and IBM Manufacturing which mode setting, adapter, and SAS cable are needed. With this specify code, no hardware is shipped. The physical adapters, controllers, and cables must be ordered with their own chargeable feature numbers. There are more technically supported configurations than are represented by these specify codes. IBM Manufacturing and IBM configurator tools such as e-config only understand and support EXP12SX configurations represented by these specify codes.

| <b>Specify</b> | <b>Mode</b> | <b>Adapter/<br/>Controller</b>     | <b>Cable to<br/>drawer</b> | <b>Environment</b> |
|----------------|-------------|------------------------------------|----------------------------|--------------------|
| #EJV0          | Mode 1      | CEC SAS<br>Ports                   | 2 YO12<br>cables           | AIX/Linux/<br>VIOS |
| #EJV1          | Mode 1      | One<br>(unpaired)<br>#EJ0J/#EJ0M   | 1 YO12 cable               | AIX/Linux/<br>VIOS |
| #EJV2          | Mode 1      | Two<br>(unpaired)<br>#EJ0J/#EJ0M   | 2 YO12<br>cables           | AIX/Linux/<br>VIOS |
| #EJV3          | Mode 2      | Two (one<br>pair) #EJ0J/<br>#EJ0M  | 2 X12 cables               | AIX/Linux/<br>VIOS |
| #EJV4          | Mode 2      | Four (two<br>pair) #EJ0J/<br>#EJ0M | 2 X12 cables               | AIX/Linux/<br>VIOS |
| #EJV5          | Mode 4      | Four<br>(unpaired)<br>#EJ0J/#EJ0M  | 2 X12 cables               | AIX/Linux/<br>VIOS |
| #EJV6          | Mode 2      | One<br>(unpaired)<br>#EJ0J/#EJ0M   | 2 YO12<br>cables           | AIX/Linux/<br>VIOS |
| #EJV7          | Mode 2      | Two<br>(unpaired)<br>#EJ0J/#EJ0M   | 2 YO12<br>cables           | AIX/Linux/<br>VIOS |
| #EJV8          | Mode 1      | Two #EJ14<br>(one pair)            | 2 YO12<br>cables           | AIX/Linux/<br>VIOS |
| #EJV9          | Mode 2      | Two #EJ14<br>(one pair)            | 2 X12 cables               | AIX/Linux/<br>VIOS |
| #EJVJ          | Mode 2      | Four #EJ14<br>(two pair)           | 2 X12 cable                | AIX/Linux/<br>VIOS |
| #EJVU          | Mode 1      | Controller<br>#EJ1G/<br>#EL67      | 1 YO12<br>cables           | Linux              |

All of the above EXP12SX specify codes assume a full set of adapters and cables able to run all the SAS bays configured. The following specify codes communicate to IBM Manufacturing a lower cost, partial configuration is to be configured where the

ordered adapters and cables can run only a portion of the SAS bays. The future MES addition of adapters and cables can enable the remaining SAS bays for growth. The following specify codes are used:

| Specify              | Mode   | Adapter/<br>Controller          | Cable to<br>drawer | Environment        |
|----------------------|--------|---------------------------------|--------------------|--------------------|
| #EJVA (1/2 of #EJV7) | Mode 2 | One (unpaired)<br>#EJOJ/#EJOM   | 1 YO12 cables      | AIX/Linux/<br>VIOS |
| #EJVB (1/2 of #EJV4) | Mode 2 | One pair<br>#EJOJ/#EJOM         | 1 X12 cable        | AIX/Linux/<br>VIOS |
| #EJVC (1/4 of #EJV5) | Mode 4 | One (unpaired)<br>#EJOJ/#EJOM   | 1 X12 cable        | AIX/Linux/<br>VIOS |
| #EJVD (2/4 of #EJV5) | Mode 4 | Two (unpaired)<br>#EJOJ/#EJOM   | 1 X12 cables       | AIX/Linux/<br>VIOS |
| #EJVE (3/4 of #EJV5) | Mode 4 | Three (unpaired)<br>#EJOJ/#EJOM | 2 X12 cables       | AIX/Linux/<br>VIOS |

An EXP12SX drawer in mode 4 can be attached to two or four SAS controllers and provide a great deal of configuration flexibility. For example, if using unpaired feature EJOJ adapters, these EJOJ adapters could be in the same server in the same partition, same server in different partitions, or even different servers.

An EXP12SX drawer in mode 2 has similar flexibility. If the I/O drawer is in mode 2, then half of its SAS bays can be controlled by one pair of PCIe3 SAS adapters, such as a 12 GB write cache adapter pair (#EJ14), and the other half can be controlled by a different PCIe3 SAS 12 GB write cache adapter pair or by zero-write-cache PCIe3 SAS adapters.

Note that for simplicity, IBM configurator tools such as e-config assume that the SAS bays of an individual I/O drawer are controlled by one type of SAS adapter. As a client, you have more flexibility than e-config understands.

The 3.5-inch large form factor (LFF) SAS HDDs are supported in the EXP24SX. All drives are mounted on Gen1 carriers/trays and thus named LFF-1 drives. Only 4k byte sector drives are supported in the EXP24SX drawer. The 5xx byte sector drives are not announced or planned. Drives are 7,200 rpm and sometimes referred to as *nearline*. These drives provide excellent cost per gigabyte. Note that formatting or rebuilding arrays on large disk drives can take hours. If higher performance is required, consider higher rpm disks or SSDs in the EXP24SX drawer.

The EXP12SX drawer has many high-reliability design points:

- SAS bays that support hot swap
- Redundant and hot-plug power and fan assemblies
- Dual line cords
- Redundant and hot-plug ESMs
- Redundant data paths to all drives
- LED indicators on drives, bays, ESMs, and power supplies that support problem identification
- Through the SAS adapters or controllers, drives that can be protected with RAID and mirroring and hot-spare capability

Order two ESLA features for AC power supplies. The enclosure is shipped with adjustable depth rails and can accommodate 19-inch rack depths from 59.5 - 75 cm (23.4 - 29.5 in.). Slot filler panels are provided for empty bays when initially shipped from IBM.

EXP24SX and EXP12SX enclosures can be mixed on the same server. EXP24SX and EXP12SX enclosures can be mixed on the same PCIe3 adapter.

### PCIe Gen3 I/O drawer cabling option

A copper cabling option (#ECCS) is available for the scale-out servers. The cable option offers a much lower-cost connection between the server and the PCIe Gen3 I/O drawer fanout modules. The currently available Active Optical Cable (AOC) offers much longer length cables, providing rack placement flexibility. Plus, AOC cables are much thinner and have tighter bend radius and thus are much easier to cable in the rack.

The 3M Copper CXP Cable Pair (#ECCS) has the same performance and same reliability, availability, and serviceability (RAS) characteristics as the AOC cables. One copper cable length of 3 meters is offered. Note that the cable management arm of the scale-out servers requires about 1 meter of cable.

Like the AOC cable pair, the copper pair is cabled in the same manner. One cable attaches to the top CXP port in the PCIe adapter in the x16 PCIe slot in the server system unit and then attaches to the top CXP port in the fanout module in the I/O drawer. Its cable pair attaches to the bottom CXP port of the same PCIe adapter and to the bottom CXP port of the same fanout module. Note that the PCIe adapter providing the CXP ports on the server was named a PCIe3 "Optical" Cable Adapter. In hindsight, this naming was unfortunate as the adapter's CXP ports are not unique to optical. But at the time, optical cables were the only connection option planned.

Copper and AOC cabling can be mixed on the same server. However, they cannot be mixed on the same PCIe Gen3 I/O drawer or mixed on the same fanout module.

Copper cables have the same operating system software prerequisites as AOC cables.

### High-function (switched and monitored) power distribution units (PDUs)

The high-function PDUs provide switching, better monitoring, and 50% more C19 receptacles than previous Power Systems PDUs. Depending on country wiring standards, either two or four full-price features are orderable.

|        | 208 V 3-phase delta | 200 V - 240 V 1-phase or 3-phase wye |
|--------|---------------------|--------------------------------------|
| 12xC13 | #EPTQ               | #EPTN                                |
| 9xC19  | #EPTL               | #EPTJ                                |

These PDUs can be mounted vertically in rack-side pockets or they can be mounted horizontally. If mounted horizontally, they each use 1 EIA (1U) of rack space. See feature EPTH for horizontal mounting hardware, which is used when IBM Manufacturing doesn't automatically factory-install the PDU. Two RJ45 ports on the front of the PDU enable the client to monitor each receptacle's electrical power usage and to remotely switch any receptacle on or off. These PDUs do provide the same low price as the low-function 12xC13 PDU feature (#7188).

**Recommendation:** The PDU is shipped with a generic PDU password. IBM strongly urges clients to change it upon installation.

### High-function (switched and monitored) PDUs plus

#### Hardware

- IEC 62368-1 and IEC 60950 safety standard
- A new product safety approval
- No China 5000 m altitude or tropical restrictions
- Detachable inlet for 3-phase delta-wired PDU with 30A, 50A, and 60A wall plugs
- IBM Technology and Qualification approved components, such as anti-sulfur resistors (ASRs)
- Ethernet 10/100/1000 Mb/s

#### Software

- IPv4 and IPv6 support

- SSH command line
- Ability to change passwords over a network

| PDU description | 208 V 3-phase delta | 200 V - 240 V 1-phase or 3-phase wye |
|-----------------|---------------------|--------------------------------------|
| <b>12xC13</b>   | #ECJQ/#ECJP         | #ECJN/#ECJM                          |
| <b>9xC19</b>    | #ECJL/#ECJK         | #ECJJ/#ECJG                          |

These PDUs can be mounted vertically in rack-side pockets or they can be mounted horizontally. If mounted horizontally, they each use one EIA (1U) of rack space. See feature EPTH for horizontal mounting hardware, which is used when IBM Manufacturing doesn't automatically factory-install the PDU. Two RJ45 ports on the front of the PDU enable the client to monitor each receptacle's electrical power usage and to remotely switch any receptacle on or off.

**Recommendation:** The PDU is shipped with a generic PDU password. IBM strongly urges clients to change it upon installation.

Existing and new high-function (switched and monitored) PDUs have the same physical dimensions. New high-function (switched and monitored) PDUs can be supported in the same racks as existing PDUs. Mixing of PDUs in a rack on new orders is not allowed.

Also, all factory-integrated orders must have the same PDU line cord.

The PDU features ECJQ/ECJP and ECJL/ECJK with the Amphenol inlet connector require new PDU line cords:

- #ECJ5 - 4.3 m (14-Ft) PDU to Wall 3PH/24A 200-240V Delta-wired Power Cord
- #ECJ7 - 4.3 m (14-Ft) PDU to Wall 3PH/48A 200-240V Delta-wired Power Cord

No pigtail (like feature ELC0) is available because an Amphenol male inline connector is unavailable.

The PDU features ECJJ/ECJG and ECJN/ECJM with the UTG624-7SKIT4/5 inlet connector use the existing PDU line cord features 6653, 6667, 6489, 6654, 6655, 6656, 6657, 6658, 6491, or 6492.

### **High-function 12xC13 PDU plus 3-phase delta (#ECJQ/#ECJP)**

This is an intelligent, switched 200 - 240 volt 3-phase delta AC PDU plus with twelve C13 receptacles on the front of the PDU. The PDU is mounted on the rear of the rack, making the twelve C13 receptacles easily accessible. Each receptacle has a 20 amp circuit breaker. Three-phase delta-wired connectors have four pins and use three line conductors and a protective earth. The input is 200 - 240 volt line-to-line, and the output is 200 - 240 volt line-to-line for 3-phase delta PDUs.

The PDU can be mounted vertically in rack-side pockets, or it can be mounted horizontally. If mounted horizontally, it uses one EIA (1U) of rack space. See feature EPTH for horizontal mounting hardware.

Device power cords with a C20 plug connect to C19 PDU receptacles and are ordered separately. One wall line cord is also ordered separately and attaches to the Amphenol inlet connector. Supported line cords include features ECJ5 and ECJ7.

Two RJ45 ports on the front of the PDU enable clients to monitor the electrical power usage of each receptacle and to remotely switch any receptacle on or off.

**Recommendation:** The PDU is shipped with a generic PDU password. IBM strongly urges clients to change it upon installation.

Features ECJP and ECJQ are identical PDUs. Up to one lower-priced feature ECJP can be ordered with a new 7014-T42/T00 rack in place of a no-charge feature 9188 PDU.

For comparison, this is most like the earlier-generation feature EPTP PDU.



**Limitation:** Some configurations of the Elastic Storage Server (ESS) are delivered with an Intelligent PDU. At this time, the intelligent management capabilities of this PDU are not configured or used by the ESS system. If the ESS customer would like to use this capability, it is the customer's responsibility to configure this PDU. In any case, the Ethernet port on the Intelligent PDU must not be connected to the ESS Management switch.

### **High-function 9xC19 PDU plus 3-phase delta (#ECJL/#ECJK)**

This is an intelligent, switched 200 - 240 volt 3-phase delta AC PDU plus with nine C19 receptacles on the front of the PDU. The PDU is mounted on the rear of the rack, making the nine C19 receptacles easily accessible. Each receptacle has a 20 amp circuit breaker. Three-phase delta-wired connectors have four pins and use three line conductors and a protective earth. The input is 200 - 240 volt line-to-line and the output is 200 - 240 volt line-to-line for 3-phase delta PDUs.

The PDU can be mounted vertically in rack-side pockets, or it can be mounted horizontally. If mounted horizontally, it uses one EIA (1U) of rack space. See feature EPTH for horizontal mounting hardware.

Device power cords with a C20 plug connect to C19 PDU receptacles and are ordered separately. One wall line cord is also ordered separately and attaches to the Amphenol inlet connector. Supported line cords include features ECJ5 and ECJ7.

Two RJ45 ports on the front of the PDU enable clients to monitor the electrical power usage of each receptacle and to remotely switch any receptacle on or off.

**Recommendation:** The PDU is shipped with a generic PDU password. IBM strongly urges clients to change it upon installation.

There are also three C13 receptacles on the rear of the PDU positioned toward the middle of the rack. These are not easily accessed, and therefore IBM does not generally recommend their use.

Features ECJK and ECJL are identical PDUs. Up to one lower-priced feature ECJK can be ordered with a new 7014-T42/T00 rack in place of a no-charge feature 9188 PDU.

For comparison, this is most like the earlier-generation feature EPTL PDU.

**Limitation:** Some configurations of the ESS are delivered with an Intelligent PDU. At this time, the intelligent management capabilities of this PDU are not configured or used by the ESS system. If the ESS customer would like to use this capability, it is the customer's responsibility to configure this PDU. In any case, the Ethernet port on the Intelligent PDU must not be connected to the ESS Management switch.

### **High-function 9xC19 single-phase or 3-phase wye PDU plus (#ECJJ/#ECJG)**

This is an intelligent, switched 200 - 240 volt single-phase or 380 - 415/220 - 240 volt 3-phase wye AC PDU plus with nine C19 receptacles on the front of the PDU. The PDU is mounted on the rear of the rack, making the nine C19 receptacles easily accessible. Each receptacle has a 20 amp circuit breaker. Depending on country wiring standards, the PDU is single-phase or 3-phase wye. Three-phase wye-wired connectors have five pins and use three line conductors, a neutral, and a protective earth. The input is 380 - 415 volt line-to-line, and the output is 220 - 240 volt line-to-neutral for 3-phase wye PDUs.

The PDU can be mounted vertically in rack-side pockets, or it can be mounted horizontally. If mounted horizontally, it uses one EIA (1U) of rack space. See feature EPTH for horizontal mounting hardware.

Device power cords with a C20 plug connect to C19 PDU receptacles and are ordered separately. One country-specific wall line cord is also ordered separately and attaches to a UTG524-7 connector on the front of the PDU. Supported line cords include features 6489, 6491, 6492, 6653, 6654, 6655, 6656, 6657, 6658, and 6667.

Two RJ45 ports on the front of the PDU enable clients to monitor the electrical power usage of each receptacle and to remotely switch any receptacle on or off.

**Recommendation:** The PDU is shipped with a generic PDU password. IBM strongly urges clients to change it upon installation.

There are also three C13 receptacles on the rear of the PDU positioned toward the middle of the rack. These are not easily accessed, and therefore IBM does not generally recommend their use.

Features ECJG and ECJJ are identical PDUs. Up to one lower-priced feature ECJG can be ordered with a new 7014-T42/T00 rack in place of a no-charge feature 9188 PDU.

For comparison, this is most like the earlier-generation feature EPTJ PDU.

**Limitation:** Some configurations of the ESS are delivered with an Intelligent PDU. At this time, the intelligent management capabilities of this PDU are not configured or used by the ESS system. If the ESS customer would like to use this capability, it is the customer's responsibility to configure this PDU. In any case, the Ethernet port on the Intelligent PDU must not be connected to the ESS Management switch.

### **High-function 12x C13 single-phase or 3-phase wye PDU plus (#ECJN/ #ECJM)**

This is an intelligent, switched 200 - 240 volt single-phase or 380 - 415/220 - 240 volt 3-phase wye AC PDU plus with twelve C13 receptacles on the front of the PDU. The PDU is mounted on the rear of the rack making the twelve C13 receptacles easily accessible. Each receptacle has a 20 amp circuit breaker. Depending on country wiring standards the PDU is single-phase or 3-phase wye. Three-phase wye-wired connectors have five pins and use three line conductors, a neutral, and a protective earth. The input is 380 - 415 volt line-to-line, and the output is 220 - 240 volt line-to-neutral for 3-phase wye PDUs.

See 3-phase #ECJP/#ECJQ for countries that do not use wye wiring.

The PDU can be mounted vertically in rack-side pockets, or it can be mounted horizontally. If mounted horizontally, it uses one EIA (1U) of rack space. See feature EPTH for horizontal mounting hardware.

Device power cords with a C14 plug connect to C13 PDU receptacles and are ordered separately. One country-specific wall line cord is also ordered separately and attaches to a UTG524-7 connector on the front of the PDU. Supported line cords include features 6489, 6491, 6492, 6653, 6654, 6655, 6656, 6657, 6658, and 6667.

Two RJ45 ports on the front of the PDU enable clients to monitor the electrical power usage of each receptacle and to remotely switch any receptacle on or off.

**Recommendation:** The PDU is shipped with a generic PDU password. IBM strongly urges clients to change it upon installation.

Features ECJM and ECJN are identical PDUs. Up to one lower-priced feature ECJM can be ordered with a new 7014-T42/T00 rack in place of a no-charge feature 9188 PDU.

For comparison, this is most like the earlier-generation feature EPTN PDU.

**Limitation:** Some configurations of the ESS are delivered with an Intelligent PDU. At this time, the intelligent management capabilities of this PDU are not configured or used by the ESS system. If the ESS customer would like to use this capability, it is the customer's responsibility to configure this PDU. In any case, the Ethernet port on the Intelligent PDU must not be connected to the ESS Management switch.

### **Reliability, Availability, and Serviceability**

#### **Reliability, fault tolerance, and data correction**

The reliability of systems starts with components, devices, and subsystems that are designed to be highly reliable. During the design and development process, subsystems go through rigorous verification and integration testing processes. During system manufacturing, systems go through a thorough testing process to help ensure the highest level of product quality.

### **Memory subsystem RAS**

The memory has error detection and correction circuitry designed such that the failure of any one specific memory module within an ECC word by itself can be corrected absent any other fault.

### **Mutual surveillance**

The service processor monitors the operation of the firmware during the boot process and also monitors the hypervisor for termination. The hypervisor monitors the service processor and reports a service reference code when it detects surveillance loss. In the PowerVM environment, it will perform a reset/reload if it detects the loss of the service processor.

### **Environmental monitoring functions**

The Power Systems family does ambient and over temperature monitoring and reporting.

### **POWER9 processor functions**

As in POWER8, the POWER9 processor has the ability to do processor instruction retry for some transient errors.

### **Cache availability**

The L2 and L3 caches in the POWER9 processor in the memory buffer chip are protected with double-bit detect, single-bit correct error detection code (ECC). In addition, a threshold of correctable errors detected on cache lines can result in the data in the cache lines being purged and the cache lines removed from further operation without requiring a reboot in the PowerVM environment.

Modified data would be handled through Special Uncorrectable Error handling. L1 data and instruction caches also have a retry capability for intermittent errors and a cache set delete mechanism for handling solid failures.

### **Special Uncorrectable Error handling**

Special Uncorrectable Error (SUE) handling prevents an uncorrectable error in memory or cache from immediately causing the system to terminate. Rather, the system tags the data and determines whether it will ever be used again. If the error is irrelevant, it will not force a check stop. If the data is used, termination may be limited to the program/kernel or hypervisor owning the data; or the I/O adapters controlled by an I/O hub controller would freeze if data were transferred to an I/O device.

### **PCI extended error handling**

PCI extended error handling (EEH)-enabled adapters respond to a special data packet generated from the affected PCI slot hardware by calling system firmware, which will examine the affected bus, allow the device driver to reset it, and continue without a system reboot. For Linux, EEH support extends to the majority of frequently used devices, although some third-party PCI devices may not provide native EEH support.

### **Uncorrectable error recovery**

When the auto-restart option is enabled, the system can automatically restart following an unrecoverable software error, hardware failure, or environmentally induced (AC power) failure.

## Serviceability

The purpose of serviceability is to efficiently repair the system while attempting to minimize or eliminate impact to system operation. Serviceability includes system installation, MES (system upgrades/downgrades), and system maintenance/repair. Depending upon the system and warranty contract, service may be performed by the client, an IBM representative, or an authorized warranty service provider.

The serviceability features delivered in this system help provide a highly efficient service environment by incorporating the following attributes:

### Service environment

In the PowerVM environment, the HMC is a dedicated server that provides functions for configuring and managing servers for either partitioned or full-system partition using a GUI or command-line interface (CLI) or REST API. An HMC attached to the system allows support personnel (with client authorization) to remotely, or locally to the physical HMC that is in proximity of the server being serviced, log in to review error logs and perform remote maintenance if required.

The POWER9 processor-based platforms support several service environments:

- Attachment to one or more HMCs or vHMCs is a supported option by the system with PowerVM. This is the default configuration for servers supporting logical partitions with dedicated or virtual I/O. In this case, all servers have at least one logical partition.
- For non-HMC systems.
  - Full-system partition with PowerVM: A single partition owns all the server resources and only one operating system may be installed. The primary service interface is through the operating system and the service processor.

### Service interface

Support personnel can use the service interface to communicate with the service support applications in a server using an operator console, a graphical user interface on the management console or service processor, or an operating system terminal. The service interface helps to deliver a clear, concise view of available service applications, helping the support team to manage system resources and service information in an efficient and effective way. Applications available through the service interface are carefully configured and placed to give service providers access to important service functions.

Different service interfaces are used, depending on the state of the system, hypervisor, and operating environment. The primary service interfaces are:

- LEDs
- Operator Panel
- Service Processor menu
- Operating system service menu
- Service Focal Point on the HMC or vHMC with PowerVM

In the light path LED implementation, the system can clearly identify components for replacement by using specific component-level LEDs, and can also guide the servicer directly to the component by signaling (turning on solid) the amber system fault LED, enclosure fault LED, and component FRU fault LED. The servicer can also use the identify function to blink the FRU-level LED. When this function is activated, a roll-up to the blue enclosure locate and system locate LEDs will occur. These enclosure LEDs will turn on solid and can be used to follow the light path from the system to the enclosure and down to the specific FRU in the PowerVM environment.

## **First Failure Data Capture and error data analysis**

First Failure Data Capture (FFDC) is a technique that helps ensure that when a fault is detected in a system, the root cause of the fault will be captured without the need to re-create the problem or run any sort of extending tracing or diagnostics program. For the vast majority of faults, a good FFDC design means that the root cause can also be detected automatically without service intervention.

FFDC information, error data analysis, and fault isolation are necessary to implement the advanced serviceability techniques that enable efficient service of the systems and to help determine the failing items.

In the rare absence of FFDC and Error Data Analysis, diagnostics are required to re-create the failure and determine the failing items.

## **Diagnostics**

General diagnostic objectives are to detect and identify problems so they can be resolved quickly. Elements of IBM's diagnostics strategy include:

- Provide a common error code format equivalent to a system reference code with PowerVM, system reference number, checkpoint, or firmware error code.
- Provide fault detection and problem isolation procedures. Support remote connection ability to be used by the IBM Remote Support Center or IBM Designated Service.
- Provide interactive intelligence within the diagnostics with detailed online failure information while connected to IBM's back-end system.

## **Automatic diagnostics**

Because of the FFDC technology designed into IBM servers, it is not necessary to perform re-create diagnostics for failures or require user intervention. Solid and intermittent errors are designed to be correctly detected and isolated at the time the failure occurs. Runtime and boot-time diagnostics fall into this category.

## **Stand-alone diagnostics with PowerVM**

As the name implies, stand-alone or user-initiated diagnostics requires user intervention. The user must perform manual steps, including:

- Booting from the diagnostics CD, DVD, USB, or network
- Interactively selecting steps from a list of choices

## **Concurrent maintenance**

The determination of whether a firmware release can be updated concurrently is identified in the readme information file that is released with the firmware. An HMC is required for the concurrent firmware update with PowerVM. In addition, concurrent maintenance of PCIe adapters is supported with PowerVM. Concurrent maintenance of the Operator Panel is supported through ASMI. Additional concurrent maintenance includes power supplies, fans, and HDD/SSD drives.

## **Service labels**

Service providers use these labels to assist them in performing maintenance actions. Service labels are found in various formats and positions and are intended to transmit readily available information to the service during the repair process. Following are some of these service labels and their purpose:

- Location diagrams: Location diagrams are located on the system hardware, relating information regarding the placement of hardware components. Location diagrams may include location codes, drawings of physical locations, concurrent maintenance status, or other data pertinent to a repair. Location diagrams are

especially useful when multiple components such as DIMMs, CPUs, processor books, fans, adapter cards, LEDs, and power supplies are installed.

- Remove/replace procedures: Service labels that contain remove/replace procedures are often found on a cover of the system or in other spots accessible to the servicer. These labels provide systematic procedures, including diagrams detailing how to remove or replace certain serviceable hardware components.
- Arrows: Numbered arrows are used to indicate the order of operation and the serviceability direction of components. Some serviceable parts such as latches, levers, and touch points need to be pulled or pushed in a certain direction and in a certain order for the mechanical mechanisms to engage or disengage. Arrows generally improve the ease of serviceability.

## **QR labels**

QR labels are placed on the system to provide access to key service functions through a mobile device. Once the QR label is scanned, it will go to a landing page specific to that server which contains many of the service functions of interest while physically located at the server. These include things such as installation and repair instructions, service diagrams, reference code look up, and so on.

## **Packaging for service**

The following service enhancements are included in the physical packaging of the systems to facilitate service:

- Color coding (touch points): Blue-colored touch points delineate touchpoints on service components where the component can be safely handled for service actions such as removal or installation.
- Tool-less design: Selected IBM systems support tool-less or simple tool designs. These designs require no tools or simple tools such as flathead screw drivers to service the hardware components.
- Positive retention: Positive retention mechanisms help to assure proper connections between hardware components such as cables to connectors, and between two cards that attach to each other. Without positive retention, hardware components run the risk of becoming loose during shipping or installation, preventing a good electrical connection. Positive retention mechanisms like latches, levers, thumb-screws, pop Nylatches (U-clips), and cables are included to help prevent loose connections and aid in installing (seating) parts correctly. These positive retention items do not require tools.

## **Error handling and reporting**

In the event of system hardware or environmentally induced failure, the system runtime error capture capability systematically analyzes the hardware error signature to determine the cause of failure. The analysis result will be stored in system NVRAM. When the system can be successfully restarted either manually or automatically, or if the system continues to operate, the error will be reported to the operating system. Hardware and software failures are recorded in the system log. When an HMC is attached in the PowerVM environment, an ELA routine analyzes the error, forwards the event to the Service Focal Point (SFP) application running on the HMC, and notifies the system administrator that it has isolated a likely cause of the system problem. The service processor event log also records unrecoverable checkstop conditions, forwards them to the SFP application, and notifies the system administrator.

The system has the ability to call home through the operating system to report platform-recoverable errors and errors associated with PCI adapters/devices.

In the HMC-managed environment, a call home service request will be initiated from the HMC and the pertinent failure data with service parts information and part locations will be sent to an IBM service organization. Customer contact information and specific system-related data such as the machine type, model, and serial number, along with error log data related to the failure, are sent to IBM Service.

## Live Partition Mobility

With Live Partition Mobility, users can migrate an AIX or IBM i partition running on one POWER partition system to another POWER system without disrupting services. The migration transfers the entire system environment, including processor state, memory, attached virtual devices, and connected users. It provides continuous operating system and application availability during planned partition outages for repair of hardware and firmware faults.

## Service processor

The service processor provides the capability to diagnose, check the status of, and sense the operational conditions of a system. It runs on its own power boundary and does not require resources from a system processor to be operational to perform its tasks.

Under PowerVM, the service processor supports surveillance of the connection to the HMC and to the system firmware (hypervisor). It also provides several remote power control options, environmental monitoring, reset, restart, remote maintenance, and diagnostic functions, including console mirroring. The service processors menus (ASMI) can be accessed concurrently with system operation, allowing nondisruptive abilities to change system default parameters.

## Call home

*Call home* refers to an automatic or manual call from a client location to the IBM support structure with error log data, server status, or other service-related information. Call home invokes the service organization in order for the appropriate service action to begin. Call home can be done through HMC or most non-HMC-managed systems through Electronic Service Agent running on top of the operating system. While configuring call home is optional, clients are encouraged to implement this feature in order to obtain service enhancements such as reduced problem determination and faster and potentially more accurate transmittal of error information. In general, using the call home feature can result in increased system availability. The Electronic Service Agent application can be configured for automated call home. See the next section for specific details on this application.

## IBM Electronic Services

Electronic Service Agent and the IBM Electronic Services web portal comprise the IBM Electronic Services solution, which is dedicated to providing fast, exceptional support to IBM clients. IBM Electronic Service Agent is a no-charge tool that proactively monitors and reports hardware events such as system errors, performance issues, and inventory. Electronic Service Agent can help focus on the client's company business initiatives, save time, and spend less effort managing day-to-day IT maintenance issues.

System configuration and inventory information collected by Electronic Service Agent also can be viewed on the secure Electronic Services web portal and used to improve problem determination and resolution between the client and the IBM support team. As part of an increased focus to provide even better service to IBM clients, Electronic Service Agent tool configuration and activation comes standard with the system. In support of this effort, a new HMC External Connectivity security whitepaper has been published, which describes data exchanges between the HMC and the IBM Service Delivery Center (SDC) and the methods and protocols for this exchange. To read the whitepaper and prepare for Electronic Service Agent installation, see the "Security" section at the [IBM Electronic Service Agent](#) website.

Select your country. Click "IBM Electronic Service Agent Connectivity Guide."

## Benefits: increased uptime

Electronic Service Agent is designed to enhance the warranty and maintenance service by potentially providing faster hardware error reporting and uploading system information to IBM Support. This can optimize the time monitoring the symptoms, diagnosing the error, and manually calling IBM Support to open a

problem record. And 24x7 monitoring and reporting means no more dependency on human intervention or off-hours client personnel when errors are encountered in the middle of the night.

**Security:** The Electronic Service Agent tool is designed to help secure the monitoring, reporting, and storing of the data at IBM. The Electronic Service Agent tool is designed to help securely transmit either through the internet (HTTPS or VPN) or modem to provide clients a single point of exit from their site. Communication is one way. Activating Electronic Service Agent does not enable IBM to call into a client's system.

For additional information, see the [IBM Electronic Service Agent](#) website.

### More accurate reporting

Because system information and error logs are automatically uploaded to the IBM Support Center in conjunction with the service request, clients are not required to find and send system information, decreasing the risk of misreported or misdiagnosed errors. Once inside IBM, problem error data is run through a data knowledge management system, and knowledge articles are appended to the problem record.

### Customized support

By using the IBMid entered during activation, clients can view system and support information in the "My Systems" and "Premium Search" sections of the Electronic Services website.

The Electronic Services web portal is a single internet entry point that replaces the multiple entry points traditionally used to access IBM internet services and support. This web portal enables you to gain easier access to IBM resources for assistance in resolving technical problems. The newly improved My Systems and Premium Search functions make it even easier for Electronic Service Agent-enabled clients to track system inventory and find pertinent fixes.

My Systems provides valuable reports of installed hardware and software using information collected from the systems by IBM Electronic Service Agent. Reports are available for any system associated with the client's IBMid. Premium Search combines the function of search and the value of Electronic Service Agent information, providing advanced search of the technical support knowledgebase. Using Premium Search and the Service Agent information that has been collected from the system, clients are able to see search results that apply specifically to their systems.

For more information on how to utilize the power of IBM Electronic Services, see the following website or contact an [IBM Systems Services Representative](#).

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## Product number

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The following are newly announced features on the specific models of the IBM Power Systems 9223 machine type:

| Description   | Machine type | Model number | Feature number |
|---|--------------|--------------|----------------|
| IBM Power System H924                                     | 9223         | 42S          |                |
| Enterprise 6.4 TB SSD PCIe4 NVMe U.2 module for AIX/Linux | 9223         | 42S          | EC5V           |
| Enterprise 6.4 TB SSD PCIe4 NVMe U.2 module for IBM i     | 9223         | 42S          | EC5W           |
| Mainstream 800 GB SSD PCIe3 NVMe U.2 module for AIX/Linux | 9223         | 42S          | EC5X           |
| PCIe2 2-Port USB 3.0 Adapter                              | 9223         | 42S          | EC6K           |
| PCIe4 1.6TB NVMe Flash Adapter x8 for AIX/Linux           | 9223         | 42S          | EC7B           |
| PCIe4 3.2TB NVMe Flash Adapter x8 for AIX/Linux           | 9223         | 42S          | EC7D           |
| PCIe4 6.4TB NVMe Flash Adapter x8 for AIX/Linux           | 9223         | 42S          | EC7F           |



|   |      |     |      |
|---|------|-----|------|
| PCIe4 1.6TB NVMe Flash Adapter x8 for IBM i                                       | 9223 | 42S | EC7K |
| PCIe4 3.2TB NVMe Flash Adapter x8 for IBM i                                       | 9223 | 42S | EC7M |
| PCIe4 6.4TB NVMe Flash Adapter x8 for IBM i                                       | 9223 | 42S | EC7P |
| NVMe U.2 Passthru adapter Gen4 capable  | 9223 | 42S | EJ1Q |
| Storage backplane 6 SFF-3 Bays and 2 front PCIe Gen4 capable NVMe U.2 drive slots | 9223 | 42S | EJ1S |
| Storage backplane with two front PCIe Gen4 capable NVMe U.2 drive slots           | 9223 | 42S | EJ1T |
| Storage backplane with four front PCIe Gen4 capable NVMe U.2 drive slots          | 9223 | 42S | EJ1U |
| Front IBM Bezel for 6 SAS + 4 NVMe Bays BackPlane                                 | 9223 | 42S | EJUK |
| Front OEM Bezel for 6 SAS + 4 NVMe-Bays BackPlane                                 | 9223 | 42S | EJUL |
| 64 GB DDR4 Memory Dimm  | 9223 | 42S | EM7B |
| 128 GB DDR4 Memory Dimm   | 9223 | 42S | EM7C |
| PCIe3 16Gb 2-port Fibre Channel Adapter   | 9223 | 42S | EN2A |
| 8-core Typical 3.8 to 4.0 GHz (max) POWER9 Processor                              | 9223 | 42S | EP7J |
| 10-core Typical 3.5 to 3.9 GHz (max) POWER9 Processor                             | 9223 | 42S | EP7K |
| 12-core Typical 3.4 to 3.9 GHz (max) POWER9 Processor                             | 9223 | 42S | EP7L |
| 11-core Typical 3.45 to 3.9 GHz (max) POWER9 Processor                            | 9223 | 42S | EP7M |
| One Processor Core Activation for EP7J  | 9223 | 42S | EP7P |
| One Processor Core Activation for EP7K  | 9223 | 42S | EP7Q |
| One Processor Core Activation for EP7L  | 9223 | 42S | EP7R |
| One Processor Core Activation for EP7M  | 9223 | 42S | EP7S |
| Enterprise 1.6 TB SSD PCIe4 NVMe U.2 module for AIX/Linux                         | 9223 | 42S | ES1E |
| Enterprise 1.6 TB SSD PCIe4 NVMe U.2 module for IBM i                             | 9223 | 42S | ES1F |
| Enterprise 3.2 TB SSD PCIe4 NVMe U.2 module for AIX/Linux                         | 9223 | 42S | ES1G |
| Enterprise 3.2 TB SSD PCIe4 NVMe U.2 module for IBM i                             | 9223 | 42S | ES1H |
| 931GB Mainstream SAS 4k SFF-2 SSD for AIX/Linux                                   | 9223 | 42S | ESJJ |
| 931GB Mainstream SAS 4k SFF-2 SSD for IBM i                                       | 9223 | 42S | ESJK |
| 1.86TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux                                  | 9223 | 42S | ESJL |
| 1.86TB Mainstream SAS 4k SFF-2 SSD for IBM i                                      | 9223 | 42S | ESJM |
| 3.72TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux                                  | 9223 | 42S | ESJN |
| 3.72TB Mainstream SAS 4k SFF-2 SSD for IBM i                                      | 9223 | 42S | ESJP |
| 7.44TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux                                  | 9223 | 42S | ESJQ |
| 7.44TB Mainstream SAS 4k SFF-2 SSD for IBM i                                      | 9223 | 42S | ESJR |
| 931GB Mainstream SAS 4k SFF-3 SSD for AIX/Linux                                   | 9223 | 42S | ESJS |
| 931GB Mainstream SAS 4k SFF-3 SSD for IBM i                                       | 9223 | 42S | ESJT |
| 1.86TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux                                  | 9223 | 42S | ESJU |
| 1.86TB Mainstream SAS 4k SFF-3 SSD for IBM i                                      | 9223 | 42S | ESJV |
| 3.72TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux                                  | 9223 | 42S | ESJW |
| 3.72TB Mainstream SAS 4k SFF-3 SSD for IBM i                                      | 9223 | 42S | ESJX |
| 7.44TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux                                  | 9223 | 42S | ESJY |
| 7.44TB Mainstream SAS 4k SFF-3 SSD for IBM i                                      | 9223 | 42S | ESJZ |

The following are features already announced for the IBM Power Systems 9223 machine type:

| Description                                | Machine type | Model number | Feature number |
|--|--------------|--------------|----------------|
| EMEA Bulk MES Indicator                    | 9223         | 42S          | 0004           |
| One CSC Billing Unit                       | 9223         | 42S          | 0010           |
| Ten CSC Billing Units                      | 9223         | 42S          | 0011           |
| Mirrored System Disk Level, Specify Code   | 9223         | 42S          | 0040           |
| Device Parity Protection-All, Specify Code | 9223         | 42S          | 0041           |
| Mirrored System Bus Level, Specify Code    | 9223         | 42S          | 0043           |
| Device Parity RAID-6 All, Specify Code     | 9223         | 42S          | 0047           |
| Special Manufacturing Operations Indicator | 9223         | 42S          | 0098           |
| RISC-to-RISC Data Migration                | 9223         | 42S          | 0205           |

|  |      |     |      |
|--|------|-----|------|
| AIX Partition Specify                                | 9223 | 42S | 0265 |
| Linux Partition Specify                              | 9223 | 42S | 0266 |
| IBM i Operating System Partition Specify             | 9223 | 42S | 0267 |
| Specify Custom Data Protection                       | 9223 | 42S | 0296 |
| Mirrored Level System Specify Code                   | 9223 | 42S | 0308 |
| RAID Hot Spare Specify                               | 9223 | 42S | 0347 |
| V.24/EIA232 6.1m (20-Ft) PCI Cable                   | 9223 | 42S | 0348 |
| V.35 6.1m (20-Ft) PCI Cable                          | 9223 | 42S | 0353 |
| X.21 6.1m (20-Ft) PCI Cable                          | 9223 | 42S | 0359 |
| V.24/EIA232 20-Ft. PCI Cable with M3                 | 9223 | 42S | 0368 |
| Customer Specified Placement                         | 9223 | 42S | 0456 |
| 19 inch, 1.8 meter high rack                         | 9223 | 42S | 0551 |
| 19 inch, 2.0 meter high rack                         | 9223 | 42S | 0553 |
| Rack Filler Panel Kit                                | 9223 | 42S | 0599 |
| Load Source Not in CEC                               | 9223 | 42S | 0719 |
| EXP24S SFF Gen2 Load Source Specify (#5887 or #EL1S) | 9223 | 42S | 0728 |
| SAN Load Source Specify                              | 9223 | 42S | 0837 |
| Modem Cable - Austria                                | 9223 | 42S | 1010 |
| Modem Cable - Belgium                                | 9223 | 42S | 1011 |
| Modem Cable - Africa                                 | 9223 | 42S | 1012 |
| Modem Cable - Italy                                  | 9223 | 42S | 1014 |
| Modem Cable - France                                 | 9223 | 42S | 1015 |
| Modem Cable - Germany                                | 9223 | 42S | 1016 |
| Modem Cable - UK                                     | 9223 | 42S | 1017 |
| Modem Cable - Iceland/Sweden                         | 9223 | 42S | 1018 |
| Modem Cable - Fin/Nor                                | 9223 | 42S | 1021 |
| Modem Cable - Netherlands                            | 9223 | 42S | 1022 |
| Modem Cable - Swiss                                  | 9223 | 42S | 1023 |
| Modem Cable - Denmark                                | 9223 | 42S | 1024 |
| Modem Cable - US/Canada and General Use              | 9223 | 42S | 1025 |
| USB 500 GB Removable Disk Drive                      | 9223 | 42S | 1107 |
| Custom Service Specify, Rochester Minn, USA          | 9223 | 42S | 1140 |
| Quantity 150 of #1962                                | 9223 | 42S | 1817 |
| Quantity 150 of #1964                                | 9223 | 42S | 1818 |
| Quantity 150 of #1948                                | 9223 | 42S | 1927 |
| Quantity 150 of #1953                                | 9223 | 42S | 1929 |
| 283GB 15k RPM SAS SFF-2 Disk Drive (IBM i)           | 9223 | 42S | 1948 |
| 300GB 15k RPM SAS SFF-2 Disk Drive (AIX/Linux)       | 9223 | 42S | 1953 |
| 571GB 10k RPM SAS SFF-2 Disk Drive (IBM i)           | 9223 | 42S | 1962 |
| 600GB 10k RPM SAS SFF-2 Disk Drive (AIX/Linux)       | 9223 | 42S | 1964 |
| Primary OS - Linux                                   | 9223 | 42S | 2147 |
| Factory Deconfiguration of 1-core                    | 9223 | 42S | 2319 |
| 2M LC-SC 50 Micron Fiber Converter Cable             | 9223 | 42S | 2456 |

|  |      |     |      |
|--|------|-----|------|
| 2M LC-SC 62.5 Micron Fiber Converter Cable                   | 9223 | 42S | 2459 |
| PCIe 2-Line WAN w/Modem                                      | 9223 | 42S | 2893 |
| 3M Asynchronous Terminal/Printer Cable EIA-232               | 9223 | 42S | 2934 |
| Asynchronous Cable EIA-232/V.24 3M                           | 9223 | 42S | 2936 |
| Serial-to-Serial Port Cable for Drawer/Drawer-               |      |     |      |
| 3.7M   | 9223 | 42S | 3124 |
| Serial-to-Serial Port Cable for Rack/Rack- 8M                | 9223 | 42S | 3125 |
| Widescreen LCD Monitor                                       | 9223 | 42S | 3632 |
| 0.3M Serial Port Converter Cable, 9-Pin to 25-Pin            | 9223 | 42S | 3925 |
| Serial Port Null Modem Cable, 9-pin to 9-pin,                |      |     |      |
| 3.7M   | 9223 | 42S | 3927 |
| Serial Port Null Modem Cable, 9-pin to 9-pin, 10M            | 9223 | 42S | 3928 |
| System Serial Port Converter Cable                           | 9223 | 42S | 3930 |
| 1.8 M (6-ft) Extender Cable for Displays (15-pin             |      |     |      |
| D-shell to 15-pin D-shell)                                   | 9223 | 42S | 4242 |
| Extender Cable - USB Keyboards, 1.8M                         | 9223 | 42S | 4256 |
| VGA to DVI Connection Converter                              | 9223 | 42S | 4276 |
| Rack Integration Services                                    | 9223 | 42S | 4649 |
| One and only one rack indicator feature is required on       |      |     |      |
| all orders (#4650 to #4666).                                 |      |     |      |
| Rack Indicator- Not Factory Integrated                       | 9223 | 42S | 4650 |
| Rack Indicator, Rack #1                                      | 9223 | 42S | 4651 |
| Rack Indicator, Rack #2                                      | 9223 | 42S | 4652 |
| Rack Indicator, Rack #3                                      | 9223 | 42S | 4653 |
| Rack Indicator, Rack #4                                      | 9223 | 42S | 4654 |
| Rack Indicator, Rack #5                                      | 9223 | 42S | 4655 |
| Rack Indicator, Rack #6                                      | 9223 | 42S | 4656 |
| Rack Indicator, Rack #7                                      | 9223 | 42S | 4657 |
| Rack Indicator, Rack #8                                      | 9223 | 42S | 4658 |
| Rack Indicator, Rack #9                                      | 9223 | 42S | 4659 |
| Rack Indicator, Rack #10                                     | 9223 | 42S | 4660 |
| Rack Indicator, Rack #11                                     | 9223 | 42S | 4661 |
| Rack Indicator, Rack #12                                     | 9223 | 42S | 4662 |
| Rack Indicator, Rack #13                                     | 9223 | 42S | 4663 |
| Rack Indicator, Rack #14                                     | 9223 | 42S | 4664 |
| Rack Indicator, Rack #15                                     | 9223 | 42S | 4665 |
| Rack Indicator, Rack #16                                     | 9223 | 42S | 4666 |
| Power Active Memory Expansion Enablement                     | 9223 | 42S | 4794 |
| One Processor of 5250 Enterprise Enablement                  | 9223 | 42S | 4970 |
| Full 5250 Enterprise Enablement                              | 9223 | 42S | 4974 |
| Software Preload Required                                    | 9223 | 42S | 5000 |
| PowerVM Enterprise Edition                                   | 9223 | 42S | 5228 |
| Sys Console On HMC   | 9223 | 42S | 5550 |
| System Console-Ethernet LAN adapter                          | 9223 | 42S | 5557 |
| PCIe2 8Gb 4-port Fibre Channel Adapter                       | 9223 | 42S | 5729 |
| 8 Gigabit PCI Express <sup>(R)</sup> Dual Port Fibre Channel |      |     |      |
| Adapter  | 9223 | 42S | 5735 |
| POWER <sup>(R)</sup> GXT145 PCI Express Graphics Accelerator | 9223 | 42S | 5748 |
| 4 Port Async EIA-232 PCIe Adapter                            | 9223 | 42S | 5785 |
| EXP24S SFF Gen2-bay Drawer                                   | 9223 | 42S | 5887 |
| PCIe2 4-port 1GbE Adapter                                    | 9223 | 42S | 5899 |
| Opt Front Door for 1.8m Rack                                 | 9223 | 42S | 6068 |
| Opt Front Door for 2.0m Rack                                 | 9223 | 42S | 6069 |
| 1.8m Rack Acoustic Doors                                     | 9223 | 42S | 6248 |
| 2.0m Rack Acoustic Doors                                     | 9223 | 42S | 6249 |
| 1.8m Rack Trim Kit   | 9223 | 42S | 6263 |
| 2.0m Rack Trim Kit   | 9223 | 42S | 6272 |
| Power Cord 4.3m (14-ft), Drawer to IBM PDU (250V/            |      |     |      |
| 10A)   | 9223 | 42S | 6458 |
| Power Cord 4.3m (14-ft), Drawer To OEM PDU                   |      |     |      |
| (125V, 15A)  | 9223 | 42S | 6460 |
| Power Cord 4.3m (14-ft), Drawer to wall/OEM PDU              |      |     |      |
| (250V/15A) U. S.   | 9223 | 42S | 6469 |
| Power Cord 1.8m (6-ft), Drawer to wall (125V/15A)            | 9223 | 42S | 6470 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU               |      |     |      |
| (250V/10A)   | 9223 | 42S | 6471 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU               |      |     |      |
| (250V/16A)   | 9223 | 42S | 6472 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU               |      |     |      |
| (250V/10A)   | 9223 | 42S | 6473 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU,              |      |     |      |
| (250V/13A)   | 9223 | 42S | 6474 |

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| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU, (250V/16A)              | 9223 | 42S | 6475 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU, (250V/10A)              | 9223 | 42S | 6476 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU, (250V/16A)              | 9223 | 42S | 6477 |
| Power Cord 2.7 M(9-foot), To wall/OEM PDU, (250V, 16A)                  | 9223 | 42S | 6478 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU, (125V/15A or 250V/10A ) | 9223 | 42S | 6488 |
| 4.3m (14-Ft) 3PH/32A 380-415V Power Cord                                | 9223 | 42S | 6489 |
| 4.3m (14-Ft) 1PH/63A 200-240V Power Cord                                | 9223 | 42S | 6491 |
| 4.3m (14-Ft) 1PH/48A 200-240V Power Cord                                | 9223 | 42S | 6492 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU, (250V/10A)              | 9223 | 42S | 6493 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU, (250V/10A)              | 9223 | 42S | 6494 |
| Power Cord 2.7M (9-foot), To wall/OEM PDU, (250V, 10A)                  | 9223 | 42S | 6496 |
| Power Cable - Drawer to IBM PDU, 200-240V/10A                           | 9223 | 42S | 6577 |
| Optional Rack Security Kit  | 9223 | 42S | 6580 |
| Power Cord 2.7M (9-foot), To wall/OEM PDU, (125V, 15A)                  | 9223 | 42S | 6651 |
| 4.3m (14-Ft) 3PH/16A 380-415V Power Cord                                | 9223 | 42S | 6653 |
| 4.3m (14-Ft) 1PH/24A Power Cord   | 9223 | 42S | 6654 |
| 4.3m (14-Ft) 1PH/24A WR Power Cord                                      | 9223 | 42S | 6655 |
| 4.3m (14-Ft) 1PH/32A Power Cord   | 9223 | 42S | 6656 |
| 4.3m (14-Ft) 1PH/32A Power Cord   | 9223 | 42S | 6657 |
| 4.3m (14-Ft) 1PH/24A Power Cord-Korea                                   | 9223 | 42S | 6658 |
| Power Cord 2.7M (9-foot), To wall/OEM PDU, (250V, 15A)                  | 9223 | 42S | 6659 |
| Power Cord 4.3m (14-ft), Drawer to wall/OEM PDU (125V/15A)              | 9223 | 42S | 6660 |
| Power Cord 2.8m (9.2-ft), Drawer to IBM PDU, (250V/10A)                 | 9223 | 42S | 6665 |
| 4.3m (14-Ft) 3PH/32A 380-415V Power Cord-Australia                      | 9223 | 42S | 6667 |
| Power Cord 4.3M (14-foot), Drawer to OEM PDU, (250V, 15A)               | 9223 | 42S | 6669 |
| Power Cord 2.7M (9-foot), Drawer to IBM PDU, 250V/10A                   | 9223 | 42S | 6671 |
| Power Cord 2M (6.5-foot), Drawer to IBM PDU, 250V/10A                   | 9223 | 42S | 6672 |
| Power Cord 2.7m (9-ft), Drawer to wall/OEM PDU, (250V/10A)              | 9223 | 42S | 6680 |
| Intelligent PDU+, 1 EIA Unit, Universal UTG0247 Connector               | 9223 | 42S | 7109 |
| Environmental Monitoring Probe  | 9223 | 42S | 7118 |
| Power Distribution Unit   | 9223 | 42S | 7188 |
| Power Distribution Unit (US) - 1 EIA Unit, Universal, Fixed Power Cord  | 9223 | 42S | 7196 |
| Ethernet Cable, 15m, Hardware Management Console to System Unit         | 9223 | 42S | 7802 |
| Linux Software Preinstall   | 9223 | 42S | 8143 |
| Linux Software Preinstall (Business Partners)                           | 9223 | 42S | 8144 |
| USB Mouse   | 9223 | 42S | 8845 |
| Order Routing Indicator- System Plant                                   | 9223 | 42S | 9169 |
| Language Group Specify - US English                                     | 9223 | 42S | 9300 |
| Specify mode-1 & CEC SAS port for EXP24 #5887/EL1S                      | 9223 | 42S | 9387 |
| New AIX License Core Counter  | 9223 | 42S | 9440 |
| New IBM i License Core Counter  | 9223 | 42S | 9441 |
| New Red Hat License Core Counter  | 9223 | 42S | 9442 |
| New SUSE License Core Counter   | 9223 | 42S | 9443 |
| Other AIX License Core Counter  | 9223 | 42S | 9444 |
| Other Linux License Core Counter  | 9223 | 42S | 9445 |
| 3rd Party Linux License Core Counter                                    | 9223 | 42S | 9446 |
| VIOS Core Counter   | 9223 | 42S | 9447 |
| Other License Core Counter  | 9223 | 42S | 9449 |
| Ubuntu Linux License Core Counter                                       | 9223 | 42S | 9450 |
| Month Indicator   | 9223 | 42S | 9461 |
| Day Indicator   | 9223 | 42S | 9462 |
| Hour Indicator  | 9223 | 42S | 9463 |
| Minute Indicator  | 9223 | 42S | 9464 |

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| Qty Indicator  | 9223 | 42S | 9465 |
| Countable Member Indicator                             | 9223 | 42S | 9466 |
| Language Group Specify - Dutch                         | 9223 | 42S | 9700 |
| Language Group Specify - French                        | 9223 | 42S | 9703 |
| Language Group Specify - German                        | 9223 | 42S | 9704 |
| Language Group Specify - Polish                        | 9223 | 42S | 9705 |
| Language Group Specify - Norwegian                     | 9223 | 42S | 9706 |
| Language Group Specify - Portuguese                    | 9223 | 42S | 9707 |
| Language Group Specify - Spanish                       | 9223 | 42S | 9708 |
| Language Group Specify - Italian                       | 9223 | 42S | 9711 |
| Language Group Specify - Canadian French               | 9223 | 42S | 9712 |
| Language Group Specify - Japanese                      | 9223 | 42S | 9714 |
| Language Group Specify - Traditional Chinese (Taiwan)  | 9223 | 42S | 9715 |
| Language Group Specify - Korean                        | 9223 | 42S | 9716 |
| Language Group Specify - Turkish                       | 9223 | 42S | 9718 |
| Language Group Specify - Hungarian                     | 9223 | 42S | 9719 |
| Language Group Specify - Slovakian                     | 9223 | 42S | 9720 |
| Language Group Specify - Russian                       | 9223 | 42S | 9721 |
| Language Group Specify - Simplified Chinese (PRC)      | 9223 | 42S | 9722 |
| Language Group Specify - Czech                         | 9223 | 42S | 9724 |
| Language Group Specify - Romanian                      | 9223 | 42S | 9725 |
| Language Group Specify - Croatian                      | 9223 | 42S | 9726 |
| Language Group Specify - Slovenian                     | 9223 | 42S | 9727 |
| Language Group Specify - Brazilian Portuguese          | 9223 | 42S | 9728 |
| Language Group Specify - Thai                          | 9223 | 42S | 9729 |
| QSFP+ 40GbE Base-SR Transceiver                        | 9223 | 42S | EB27 |
| 1m (3.3-ft), IBM Passive QSFP+ to QSFP+ Cable (DAC)    | 9223 | 42S | EB2B |
| 3m (9.8-ft), IBM Passive QSFP+ to QSFP+ Cable (DAC)    | 9223 | 42S | EB2H |
| 10m (30.3-ft), IBM Passive QSFP+ MTP Optical Cable     | 9223 | 42S | EB2J |
| 30m (90.3-ft), IBM Passive QSFP+ MTP Optical Cable     | 9223 | 42S | EB2K |
| AC Power Supply - 1400W for Server (200-240 VAC)       | 9223 | 42S | EB2M |
| Lift tool based on GenieLift GL-8 (standard)           | 9223 | 42S | EB3Z |
| 10GbE Optical Transceiver SFP+ SR                      | 9223 | 42S | EB46 |
| 25GbE Optical Transceiver SFP28                        | 9223 | 42S | EB47 |
| 0.5m SFP28/25GbE copper Cable                          | 9223 | 42S | EB4J |
| 1.0m SFP28/25GbE copper Cable                          | 9223 | 42S | EB4K |
| 1.5m SFP28/25GbE copper Cable                          | 9223 | 42S | EB4L |
| 2.0m SFP28/25GbE copper Cable                          | 9223 | 42S | EB4M |
| 2.0m QSFP28/100GbE copper split Cable to SFP28 4x25GbE | 9223 | 42S | EB4P |
| Service wedge shelf tool kit for EB3Z                  | 9223 | 42S | EB4Z |
| 0.5m EDR IB Copper Cable QSFP28                        | 9223 | 42S | EB50 |
| 1.0m EDR IB Copper Cable QSFP28                        | 9223 | 42S | EB51 |
| 2.0M EDR IB Copper Cable QSFP28                        | 9223 | 42S | EB52 |
| 1.5M EDR IB Copper Cable QSFP28                        | 9223 | 42S | EB54 |
| 100GbE Optical Transceiver QSFP28                      | 9223 | 42S | EB59 |
| 3M EDR IB Optical Cable QSFP28                         | 9223 | 42S | EB5A |
| 5M EDR IB Optical cable QSFP28                         | 9223 | 42S | EB5B |
| 10M EDR IB Optical Cable QSFP28                        | 9223 | 42S | EB5C |
| 15M EDR IB optical Cable QSFP28                        | 9223 | 42S | EB5D |
| 20M EDR IB optical Cable QSFP28                        | 9223 | 42S | EB5E |
| 30M EDR IB Optical Cable QSFP28                        | 9223 | 42S | EB5F |
| 50M EDR IB optical Cable QSFP28                        | 9223 | 42S | EB5G |
| 100M EDR IB Optical Cable QSFP28                       | 9223 | 42S | EB5H |
| 0.5m 100GbE copper Cable QSFP28                        | 9223 | 42S | EB5J |
| 1.0M 100GbE Copper Cable QSFP28                        | 9223 | 42S | EB5K |
| 1.5M 100GbE Copper Cable QSFP28                        | 9223 | 42S | EB5L |
| 2.0M 100GbE Copper Cable QSFP28                        | 9223 | 42S | EB5M |
| 25M EDR IB Optical Cable QSFP28                        | 9223 | 42S | EB5N |
| 3M 100GbE optical Cable QSFP28 (AOC)                   | 9223 | 42S | EB5R |
| 5M 100GbE optical Cable QSFP28 (AOC)                   | 9223 | 42S | EB5S |
| 10M 100GbE Optical Cable QSFP28 (AOC)                  | 9223 | 42S | EB5T |
| 15M 100GbE optical Cable QSFP28 (AOC)                  | 9223 | 42S | EB5U |
| 20M 100GbE optical Cable QSFP28 (AOC)                  | 9223 | 42S | EB5V |
| 30M 100GbE optical Cable QSFP28 (AOC)                  | 9223 | 42S | EB5W |
| 50M 100GbE optical Cable QSFP28 (AOC)                  | 9223 | 42S | EB5X |
| 100M 100GbE optical cable QSFP28 (AOC)                 | 9223 | 42S | EB5Y |
| IBM i 7.2 Indicator                                    | 9223 | 42S | EB72 |
| IBM i 7.3 Indicator                                    | 9223 | 42S | EB73 |

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| IBM i 7.4 Indicator  | 9223 | 42S | EB74 |
| Slim Rear Acoustic Door  | 9223 | 42S | EC07 |
| Slim Front Acoustic Door   | 9223 | 42S | EC08 |
| PCIe3 2-Port 10Gb NIC&ROCE SR/Cu Adapter                         | 9223 | 42S | EC2S |
| PCIe3 2-Port 25/10Gb NIC&ROCE SR/Cu Adapter                      | 9223 | 42S | EC2U |
| PCIe3 2-port 10GbE NIC&ROCE SFP+ Copper Adapter                  | 9223 | 42S | EC38 |
| PCIe3 2-Port 40GbE NIC RoCE QSFP+ Adapter                        | 9223 | 42S | EC3B |
| PCIe3 2-port 100Gb EDR IB Adapter x16                            | 9223 | 42S | EC3F |
| PCIe3 2-port 100GbE (NIC&RoCE) QSFP28 Adapter x16                | 9223 | 42S | EC3M |
| PCIe3 1-port 100Gb EDR IB Adapter x16                            | 9223 | 42S | EC3U |
| PCIe2 4-Port USB 3.0 Adapter                                     | 9223 | 42S | EC46 |
| PCIe3 x8 1.6 TB NVMe Flash Adapter for AIX/Linux                 | 9223 | 42S | EC5B |
| PCIe3 x8 3.2 TB NVMe Flash Adapter for AIX/Linux                 | 9223 | 42S | EC5D |
| PCIe3 x8 6.4 TB NVMe Flash Adapter for AIX/Linux                 | 9223 | 42S | EC5F |
| PCIe4 1-port 100Gb EDR IB CAPI adapter                           | 9223 | 42S | EC63 |
| PCIe4 2-port 100Gb EDR IB CAPI adapter                           | 9223 | 42S | EC65 |
| PCIe4 2-port 100Gb ROCE EN adapter                               | 9223 | 42S | EC66 |
| PCIe3 x8 1.6 TB NVMe Flash Adapter for IBM i                     | 9223 | 42S | EC6V |
| PCIe3 x8 3.2 TB NVMe Flash Adapter for IBM i                     | 9223 | 42S | EC6X |
| PCIe3 x8 6.4 TB NVMe Flash Adapter for IBM i                     | 9223 | 42S | EC6Z |
| SAS X Cable 3m - HD Narrow 6Gb 2-Adapters to Enclosure           | 9223 | 42S | ECBJ |
| SAS X Cable 6m - HD Narrow 6Gb 2-Adapters to Enclosure           | 9223 | 42S | ECBK |
| SAS X Cable 10m - HD Narrow 6Gb 2-Adapters to Enclosure          | 9223 | 42S | ECBL |
| SAS X Cable 15m - HD Narrow 3Gb 2-Adapters to Enclosure          | 9223 | 42S | ECBM |
| 5m (16.4-ft), IBM Passive QSFP+ to QSFP+ Cable (DAC)             | 9223 | 42S | ECBN |
| SAS YO Cable 1.5m - HD Narrow 6Gb Adapter to Enclosure           | 9223 | 42S | ECBT |
| SAS YO Cable 3m - HD Narrow 6Gb Adapter to Enclosure             | 9223 | 42S | ECBU |
| SAS YO Cable 6m - HD Narrow 6Gb Adapter to Enclosure             | 9223 | 42S | ECBV |
| SAS YO Cable 10m - HD Narrow 6Gb Adapter to Enclosure            | 9223 | 42S | ECBW |
| SAS YO Cable 15m - HD Narrow 3Gb Adapter to Enclosure            | 9223 | 42S | ECBX |
| SAS AE1 Cable 4m - HD Narrow 6Gb Adapter to Enclosure            | 9223 | 42S | ECBY |
| SAS YE1 Cable 3m - HD Narrow 6Gb Adapter to Enclosure            | 9223 | 42S | ECBZ |
| 3M Optical Cable Pair for PCIe3 Expansion Drawer                 | 9223 | 42S | ECC7 |
| 10M Optical Cable Pair for PCIe3 Expansion Drawer                | 9223 | 42S | ECC8 |
| System Port Converter Cable for UPS                              | 9223 | 42S | ECCF |
| 3M Copper CXP Cable Pair for PCIe3 Expansion Drawer              | 9223 | 42S | ECCS |
| 3M Active Optical Cable Pair for PCIe3 Expansion Drawer          | 9223 | 42S | ECCX |
| 10M Active Optical Cable Pair for PCIe3 Expansion Drawer         | 9223 | 42S | ECCY |
| 3.0M SAS X12 Cable (Two Adapter to Enclosure)                    | 9223 | 42S | ECDJ |
| 4.5M SAS X12 Active Optical Cable (Two Adapter to Enclosure)     | 9223 | 42S | ECDK |
| 10M SAS X12 Active Optical Cable (Two Adapter to Enclosure)      | 9223 | 42S | ECDL |
| 1.5M SAS Y012 Cable (Adapter to Enclosure)                       | 9223 | 42S | ECDT |
| 3.0M SAS Y012 Cable (Adapter to Enclosure)                       | 9223 | 42S | ECDU |
| 4.5M SAS Y012 Active Optical Cable (Adapter to Enclosure)        | 9223 | 42S | ECDV |
| 10M SAS Y012 Active Optical Cable (Adapter to Enclosure)         | 9223 | 42S | ECDW |
| 0.6M SAS AA12 Cable (Adapter to Adapter)                         | 9223 | 42S | ECE0 |
| 3.0M SAS AA12 Cable  | 9223 | 42S | ECE3 |
| 4.5M SAS AA12 Active Optical Cable (Adapter to Adapter)          | 9223 | 42S | ECE4 |
| 4.3m (14-Ft) PDU to wall 3PH/24A 200-240V Delta-wired Power Cord | 9223 | 42S | ECJ5 |
| 4.3m (14-Ft) PDU to wall 3PH/48A 200-240V Delta-wired Power Cord | 9223 | 42S | ECJ7 |
| High Function 9xC19 Single-Phase or Three-Phase wye PDU plus     | 9223 | 42S | ECJJ |

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| High Function 9xC19 PDU plus 3-Phase Delta   | 9223 | 42S | ECJL |
| High Function 12xC13 Single-Phase or Three-Phase Wye PDU plus                                | 9223 | 42S | ECJN |
| High Function 12xC13 PDU plus 3-Phase Delta  | 9223 | 42S | ECJQ |
| Cloud Private Solution   | 9223 | 42S | ECP0 |
| 2.0 Meter Slim Rack  | 9223 | 42S | ECR0 |
| Rack Front Door High-End appearance  | 9223 | 42S | ECRF |
| Rack Rear Door Black   | 9223 | 42S | ECRG |
| Rack Side Cover  | 9223 | 42S | ECRJ |
| Rack Rear Extension 5-In   | 9223 | 42S | ECRK |
| Rack Front Door for Rack (Black/Flat)  | 9223 | 42S | ECRM |
| Custom Service Specify, Montpellier, France  | 9223 | 42S | ECSF |
| Custom Service Specify, Mexico   | 9223 | 42S | ECSM |
| Custom Service Specify, Poughkeepsie, USA  | 9223 | 42S | ECSP |
| Integrated Solution Packing  | 9223 | 42S | ECSS |
| Optical Wrap Plug  | 9223 | 42S | ECW0 |
| Boot Drive / Load Source in EXP12SX Specify (in #ESLL or #ELLL)                              | 9223 | 42S | EHR1 |
| Boot Drive / Load Source in EXP24SX Specify (in #ESLS or #ELLS)                              | 9223 | 42S | EHR2 |
| SSD Placement Indicator - #ESLS/#ELLS  | 9223 | 42S | EHS2 |
| PCIe3 Optical Cable Adapter for PCIe3 Expansion Drawer                                       | 9223 | 42S | EJ08 |
| PCIe3 RAID SAS Adapter Quad-port 6Gb x8  | 9223 | 42S | EJ0J |
| PCIe3 12GB Cache RAID SAS Adapter Quad-port 6Gb x8   | 9223 | 42S | EJ0L |
| SAS Ports/Cabling for Dual IOA BackPlane   | 9223 | 42S | EJ0W |
| PCIe3 SAS Tape/DVD Adapter Quad-port 6Gb x8  | 9223 | 42S | EJ10 |
| PCIe3 12GB Cache RAID PLUS SAS Adapter Quad-port 6Gb x8                                      | 9223 | 42S | EJ14 |
| Base Storage Backplane 12 SFF-3 Bays/RDX Bay   | 9223 | 42S | EJ1C |
| Expanded Function Storage Backplane 18 SFF-3 Bays/Dual IOA with Write Cache/Opt Ext SAS port | 9223 | 42S | EJ1D |
| Split #EJ1C to 6+6 SFF-3 Bays: Add 2nd SAS Controller  | 9223 | 42S | EJ1E |
| Expanded Function Storage Backplane 12 SFF-3 Bays/RDX Bay/Opt Ext SAS port                   | 9223 | 42S | EJ1M |
| PCIe1 SAS Tape/DVD Dual-port 3Gb x8 Adapter  | 9223 | 42S | EJ1P |
| PCIe x16 to CXP Optical or CU converter Adapter for PCIe3 Expansion Drawer                   | 9223 | 42S | EJ20 |
| PCIe3 Crypto Coprocessor no BSC 4767   | 9223 | 42S | EJ32 |
| PCIe3 Crypto Coprocessor BSC-Gen3 4767   | 9223 | 42S | EJ33 |
| Specify Mode-1 & (1)EJ0J/EJ0M/EL3B for EXP24S (#5887/EL1S)                                   | 9223 | 42S | EJR1 |
| Specify Mode-1 & (2)EJ0J/EJ0M/EL3B for EXP24S (#5887/EL1S)                                   | 9223 | 42S | EJR2 |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B & (2) X for EXP24S (#5887/EL1S)                           | 9223 | 42S | EJR3 |
| Specify Mode-2 & (4)EJ0J/EJ0M/EL3B for EXP24S (#5887/EL1S)                                   | 9223 | 42S | EJR4 |
| Specify Mode-4 & (4)EJ0J/EJ0M/EL3B for EXP24S (#5887/EL1S)                                   | 9223 | 42S | EJR5 |
| Specify Mode-2 & (1)EJ0J/EJ0M/EL3B & (2) YO for EXP24S (#5887/EL1S)                          | 9223 | 42S | EJR6 |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B & (2) YO for EXP24S (#5887/EL1S)                          | 9223 | 42S | EJR7 |
| Specify Mode-2 & (1)EJ0J/EJ0M/EL3B & (1) YO for EXP24S (#5887/EL1S)                          | 9223 | 42S | EJRA |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B & (1) X for EXP24S (#5887/EL1S)                           | 9223 | 42S | EJRB |
| Specify Mode-4 & (1)EJ0J/EJ0M/EL3B for EXP24S (#5887/EL1S)                                   | 9223 | 42S | EJRC |
| Specify Mode-4 & (2)EJ0J/EJ0M/EL3B for EXP24S (#5887/EL1S)                                   | 9223 | 42S | EJRD |
| Specify Mode-4 & (3)EJ0J/EJ0M/EL3B for EXP24S (#5888/EL1S)                                   | 9223 | 42S | EJRE |
| Specify Mode-1 & (2)EJ14 for EXP24S (#5887/EL1S)   | 9223 | 42S | EJRF |
| Specify Mode-2 & (2)EJ14 & (2) X for EXP24S (#5887/EL1S)                                     | 9223 | 42S | EJRG |
| Specify Mode-2 & (2)EJ14 & (1) X for EXP24S (#5887/EL1S)                                     | 9223 | 42S | EJRH |
| Specify Mode-2 & (4)EJ14 for EXP24S (#5887/EL1S)   | 9223 | 42S | EJRJ |
| Non-paired Indicator EJ14 PCIe SAS RAID+ Adapter   | 9223 | 42S | EJRL |
| Specify Mode-1 & (2)EJ0L for EXP24S (#5887/EL1S)   | 9223 | 42S | EJRP |

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| Specify mode-2 & (4) EJ0L for EXP24S #5887/EL1S                          | 9223 | 42S | EJRR |
| Specify Mode-2 & (2)EJ0L & (2) X for EXP24S (#5887/EL1S)                 | 9223 | 42S | EJRS |
| Specify Mode-2 & (2)EJ0L & (1) X for EXP24S (#5887/EL1S)                 | 9223 | 42S | EJRT |
| Non-paired Indicator EJ0L PCIe SAS RAID Adapter                          | 9223 | 42S | EJRU |
| Front IBM Bezel for 12-Bay BackPlane                                     | 9223 | 42S | EJU3 |
| Front OEM Bezel for 12-Bay BackPlane                                     | 9223 | 42S | EJU4 |
| Front IBM Bezel for 18-Bay BackPlane                                     | 9223 | 42S | EJUG |
| Front OEM Bezel for 18-Bay BackPlane                                     | 9223 | 42S | EJUH |
| Specify Mode-1 & CEC SAS Ports & (2)Y012 for EXP12SX #ESLL/ELLL          | 9223 | 42S | EJV0 |
| Specify Mode-1 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)Y012 for EXP12SX #ESLL/ELLL | 9223 | 42S | EJV1 |
| Specify Mode-1 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)Y012 for EXP12SX #ESLL/ELLL | 9223 | 42S | EJV2 |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP12SX #ESLL/ELLL  | 9223 | 42S | EJV3 |
| Specify Mode-2 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP12SX #ESLL/ELLL  | 9223 | 42S | EJV4 |
| Specify Mode-4 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP12SX #ESLL/ELLL  | 9223 | 42S | EJV5 |
| Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 & (2)Y012 for EXP12SX #ESLL/ELLL | 9223 | 42S | EJV6 |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)Y012 for EXP12SX #ESLL/ELLL | 9223 | 42S | EJV7 |
| Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)Y012 for EXP12SX #ESLL/ELLL | 9223 | 42S | EJVA |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12 for EXP12SX #ESLL/ELLL  | 9223 | 42S | EJVB |
| Specify Mode-4 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)X12 for EXP12SX #ESLL/ELLL  | 9223 | 42S | EJVC |
| Specify Mode-4 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12 for EXP12SX #ESLL/ELLL  | 9223 | 42S | EJVD |
| Specify Mode-4 & (3)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP12SX #ESLL/ELLL  | 9223 | 42S | EJVE |
| Specify Mode-1 & (2)EJ14 & (2)Y012 for EXP12SX #ESLL/ELLL                | 9223 | 42S | EJVF |
| Specify Mode-1 & (2)EJ0L & (2)Y012 for EXP12SX #ESLL/ELLL                | 9223 | 42S | EJVP |
| Specify Mode-1 & CEC SAS Ports & (2)Y012 for EXP24SX #ESLS/ELLS          | 9223 | 42S | EJW0 |
| Specify Mode-1 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)Y012 for EXP24SX #ESLS/ELLS | 9223 | 42S | EJW1 |
| Specify Mode-1 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)Y012 for EXP24SX #ESLS/ELLS | 9223 | 42S | EJW2 |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP24SX #ESLS/ELLS  | 9223 | 42S | EJW3 |
| Specify Mode-2 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP24SX #ESLS/ELLS  | 9223 | 42S | EJW4 |
| Specify Mode-4 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP24SX #ESLS/ELLS  | 9223 | 42S | EJW5 |
| Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 & (2)Y012 for EXP24SX #ESLS/ELLS | 9223 | 42S | EJW6 |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)Y012 for EXP24SX #ESLS/ELLS | 9223 | 42S | EJW7 |
| Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)Y012 for EXP24SX #ESLS/ELLS | 9223 | 42S | EJWA |
| Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12 for EXP24SX #ESLS/ELLS  | 9223 | 42S | EJWB |
| Specify Mode-4 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)X12 for EXP24SX #ESLS/ELLS  | 9223 | 42S | EJWC |
| Specify Mode-4 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12 for EXP24SX #ESLS/ELLS  | 9223 | 42S | EJWD |
| Specify Mode-4 & (3)EJ0J/EJ0M/EL3B/EL59 & (2)X12 for EXP24SX #ESLS/ELLS  | 9223 | 42S | EJWE |
| Specify Mode-1 & (2)EJ14 & (2)Y012 for EXP24SX #ESLS/ELLS                | 9223 | 42S | EJWF |
| Specify Mode-2 & (2)EJ14 & (2)X12 for EXP24SX #ESLS/ELLS                 | 9223 | 42S | EJWG |
| Specify Mode-2 & (2)EJ14 & (1)X12 for EXP24SX #ESLS/ELLS                 | 9223 | 42S | EJWH |
| Specify Mode-2 & (4)EJ14 & (2)X12 for EXP24SX #ESLS/ELLS                 | 9223 | 42S | EJWJ |



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| Specify Mode-1 & (2)EJ0L & (2)Y012 for EXP24SX<br>#ESLS/ELLS                          | 9223 | 42S | EJWP |
| Specify Mode-2 & (4)EJ0L & (2)X12 for EXP24SX<br>#ESLS/ELLS                           | 9223 | 42S | EJWR |
| Specify Mode-2 & (2)EJ0L & (2)X12 for EXP24SX<br>#ESLS/ELLS                           | 9223 | 42S | EJWS |
| Specify Mode-2 & (2)EJ0L& (1)X12 for EXP24SX<br>#ESLS/ELLS                            | 9223 | 42S | EJWT |
| PDU Access Cord 0.38m   | 9223 | 42S | ELC0 |
| Power Cable - Drawer to IBM PDU (250V/10A)  | 9223 | 42S | ELC5 |
| 16 GB DDR4 Memory   | 9223 | 42S | EM6J |
| 32 GB DDR4 Memory   | 9223 | 42S | EM6K |
| PCIe Gen3 I/O Expansion Drawer  | 9223 | 42S | EMX0 |
| AC Power Supply Conduit for PCIe3 Expansion<br>Drawer                                 | 9223 | 42S | EMXA |
| PCIe3 6-Slot Fanout Module for PCIe3 Expansion<br>Drawer                              | 9223 | 42S | EMXF |
| PCIe3 6-Slot Fanout Module for PCIe3 Expansion<br>Drawer                              | 9223 | 42S | EMXG |
| PCIe3 6-Slot Fanout Module for PCIe3 Expansion<br>Drawer                              | 9223 | 42S | EMXH |
| 1m (3.3-ft), 10Gb E'Net Cable SFP+ Act Twinax<br>Copper                               | 9223 | 42S | EN01 |
| 3m (9.8-ft), 10Gb E'Net Cable SFP+ Act Twinax<br>Copper                               | 9223 | 42S | EN02 |
| 5m (16.4-ft), 10Gb E'Net Cable SFP+ Act Twinax<br>Copper                              | 9223 | 42S | EN03 |
| PCIe3 16Gb 2-port Fibre Channel Adapter   | 9223 | 42S | EN0A |
| PCIe2 8Gb 2-Port Fibre Channel Adapter  | 9223 | 42S | EN0G |
| PCIe3 4-port (10Gb FCoE & 1GbE) SR&RJ45   | 9223 | 42S | EN0H |
| PCIe3 4-port (10Gb FCoE & 1GbE) SFP+Copper&RJ45                                       | 9223 | 42S | EN0K |
| PCIe2 4-Port (10Gb+1GbE) SR+RJ45 Adapter  | 9223 | 42S | EN0S |
| PCIe2 4-port (10Gb+1GbE) Copper SFP+RJ45 Adapter                                      | 9223 | 42S | EN0U |
| PCIe2 2-port 10/1GbE BaseT RJ45 Adapter   | 9223 | 42S | EN0W |
| PCIe2 8Gb 4-port Fibre Channel Adapter<br>Not withdrawn in Japan until August 7, 2018 | 9223 | 42S | EN12 |
| PCIe 1-port Bisync Adapter  | 9223 | 42S | EN13 |
| PCIe3 4-port 10GbE SR Adapter   | 9223 | 42S | EN15 |
| PCIe3 32Gb 2-port Fibre Channel Adapter   | 9223 | 42S | EN1A |
| PCIe3 16Gb 4-port Fibre Channel Adapter   | 9223 | 42S | EN1C |
| Horizontal PDU Mounting Hardware  | 9223 | 42S | EPTH |
| High Function 9xC19 PDU: Switched, Monitoring   | 9223 | 42S | EPTJ |
| High Function 9xC19 PDU 3-Phase: Switched,<br>Monitoring                              | 9223 | 42S | EPTL |
| High Function 12xC13 PDU: Switched, Monitoring  | 9223 | 42S | EPTN |
| High Function 12xC13 PDU 3-Phase: Switched,<br>Monitoring                             | 9223 | 42S | EPTQ |
| Quantity 150 of #ES0Q 387GB SFF-2 4k SSD (AIX/<br>Linux)                              | 9223 | 42S | EQ0Q |
| Quantity 150 of #ES0R 387GB SFF-2 4k SSD (IBM i)                                      | 9223 | 42S | EQ0R |
| Quantity 150 of #ES0S 775GB SFF-2 4k SSD (AIX/<br>Linux)                              | 9223 | 42S | EQ0S |
| Quantity 150 of #ES0T 775GB SFF-2 4k SSD (IBM i)                                      | 9223 | 42S | EQ0T |
| Quantity 150 of #ES62 3.86-4.0 TB 7200 rpm 4k<br>LFF-1 Disk                           | 9223 | 42S | EQ62 |
| Quantity 150 of #ES64 7.72-8.0 TB 7200 rpm 4k<br>LFF-1 Disk                           | 9223 | 42S | EQ64 |
| Quantity 150 of #ES78 387GB SFF-2 SSD 5xx   | 9223 | 42S | EQ78 |
| Quantity 150 of #ES79 387GB SFF-2 SSD 5xx   | 9223 | 42S | EQ79 |
| Quantity 150 of #ES7E 775GB SFF-2 SSD 5xx   | 9223 | 42S | EQ7E |
| Quantity 150 of #ES7F 775GB SFF-2 SSD 5xx   | 9223 | 42S | EQ7F |
| Quantity 150 of #ES80 1.9TB SFF-2 SSD 4k  | 9223 | 42S | EQ80 |
| Quantity 150 of ES81 1.9TB SFF-2 SSD 4k   | 9223 | 42S | EQ81 |
| Quantity 150 of #ES85 387GB SFF-2 SSD 4k  | 9223 | 42S | EQ85 |
| Quantity 150 of #ES86 387GB SFF-2 SSD 4k  | 9223 | 42S | EQ86 |
| Quantity 150 of #ES8C 775GB SFF-2 SSD 4k  | 9223 | 42S | EQ8C |
| Quantity 150 of #ES8D 775GB SFF-2 SSD 4k  | 9223 | 42S | EQ8D |
| Quantity 150 of #ES8F 1.55TB SFF-2 SSD 4k   | 9223 | 42S | EQ8F |
| Quantity 150 of #ES8G 1.55TB SFF-2 SSD 4k   | 9223 | 42S | EQ8G |
| Quantity 150 of #ES8Y 931GB SFF-2 SSD 4k  | 9223 | 42S | EQ8Y |
| Quantity 150 of ES8Z 931GB SFF-2 SSD 4k   | 9223 | 42S | EQ8Z |
| Quantity 150 of ES96 1.86TB SFF-2 SSD 4k  | 9223 | 42S | EQ96 |
| Quantity 150 of ES97 1.86TB SFF-2 SSD 4k  | 9223 | 42S | EQ97 |

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| Quantity 150 of #ESD2 (1.1TB 10k SFF-2)                           | 9223 | 42S | EQD2 |
| Quantity 150 of #ESD3 (1.2TB 10k SFF-2)                           | 9223 | 42S | EQD3 |
| Quantity 150 of #ESDN (571GB 15K RPM SAS SFF-2 for IBM i)         | 9223 | 42S | EQDN |
| Quantity 150 of #ESDP (600GB 15K RPM SAS SFF-2 for AIX/LINUX)     | 9223 | 42S | EQDP |
| Quantity 150 of #ESE7 3.72TB SFF-2 SSD 4k                         | 9223 | 42S | EQE7 |
| Quantity 150 of #ESE8 3.72TB SFF-2 SSD 4k                         | 9223 | 42S | EQE8 |
| Quantity 150 of #ESEU (571GB 10k SFF-2)                           | 9223 | 42S | EQEU |
| Quantity 150 of #ESEV (600GB 10k SFF-2)                           | 9223 | 42S | EQEV |
| Quantity 150 of #ESEY (283 GB SFF-2)                              | 9223 | 42S | EQEY |
| Quantity 150 of #ESEZ (300GB SFF-2)                               | 9223 | 42S | EQEZ |
| Quantity 150 of #ESF2 (1.1TB 10k SFF-2)                           | 9223 | 42S | EQF2 |
| Quantity 150 of #ESF3 (1.2TB 10k SFF-2)                           | 9223 | 42S | EQF3 |
| Quantity 150 of #ESFN (571GB SFF-2)                               | 9223 | 42S | EQFN |
| Quantity 150 of #ESFP (600GB SFF-2)                               | 9223 | 42S | EQFP |
| Quantity 150 of #ESFS (1.7TB 10k SFF-2)                           | 9223 | 42S | EQFS |
| Quantity 150 of #ESFT (1.8TB 10k SFF-2)                           | 9223 | 42S | EQFT |
| Quantity 150 of #ESG5 (387GB SAS 5xx)                             | 9223 | 42S | EQG5 |
| Quantity 150 of #ESG6 (387GB SAS 5xx)                             | 9223 | 42S | EQG6 |
| Quantity 150 of #ESGB (387GB SAS 4k)                              | 9223 | 42S | EQGB |
| Quantity 150 of #ESGC (387GB SAS 4k)                              | 9223 | 42S | EQGC |
| Quantity 150 of #ESGF (775GB SAS 5xx)                             | 9223 | 42S | EQGF |
| Quantity 150 of #ESGG (775GB SAS 5xx)                             | 9223 | 42S | EQGG |
| Quantity 150 of #ESGK (775GB SAS 4k)                              | 9223 | 42S | EQGK |
| Quantity 150 of #ESGL (775GB SAS 4k)                              | 9223 | 42S | EQGL |
| Quantity 150 of #ESGP (1.55TB SAS 4k)                             | 9223 | 42S | EQGP |
| Quantity 150 of #ESGQ (1.55TB SAS 4k)                             | 9223 | 42S | EQGQ |
| Quantity 150 of ES94 387GB SAS 4k                                 | 9223 | 42S | ER94 |
| Quantity 150 of ES95 387GB SAS 4k                                 | 9223 | 42S | ER95 |
| RFID Tags for Servers, Compute Nodes, Chassis, Racks, and HMCs    | 9223 | 42S | ERF1 |
| Rear rack extension   | 9223 | 42S | ERG0 |
| Quantity 150 of ESGV 387GB SSD 4k                                 | 9223 | 42S | ERGV |
| Quantity 150 of ESGZ 775GB SSD 4k                                 | 9223 | 42S | ERGZ |
| Quantity 150 of #ESHJ 931 GB SSD 4k SFF-2                         | 9223 | 42S | ERHJ |
| Quantity 150 of #ESHK 931 GB SSD 4k SFF-2                         | 9223 | 42S | ERHK |
| Quantity 150 of #ESHL 1.86 TB SSD 4k SFF-2                        | 9223 | 42S | ERHL |
| Quantity 150 of #ESHM 1.86 TB SSD 4k SFF-2                        | 9223 | 42S | ERHM |
| Quantity 150 of #ESHN 7.45 TB SSD 4k SFF-2                        | 9223 | 42S | ERHN |
| Quantity 150 of ESJ0 931GB SAS 4k                                 | 9223 | 42S | ERJ0 |
| Quantity 150 of ESJ1 931GB SAS 4k                                 | 9223 | 42S | ERJ1 |
| Quantity 150 of ESJ2 1.86TB SAS 4k                                | 9223 | 42S | ERJ2 |
| Quantity 150 of ESJ3 1.86TB SAS 4k                                | 9223 | 42S | ERJ3 |
| Quantity 150 of ESJ4 3.72TB SAS 4k                                | 9223 | 42S | ERJ4 |
| Quantity 150 of ESJ5 3.72TB SAS 4k                                | 9223 | 42S | ERJ5 |
| Quantity 150 of ESJ6 7.45TB SAS 4k                                | 9223 | 42S | ERJ6 |
| Quantity 150 of ESJ7 7.45TB SAS 4k                                | 9223 | 42S | ERJ7 |
| Quantity 150 of #ESM8 3.72 TB SSD 4k SFF-2                        | 9223 | 42S | ERM8 |
| Quantity 150 of #ESM9 3.72 TB SSD 4k SFF-2                        | 9223 | 42S | ERM9 |
| Quantity 150 of ESNA 775GB SSD 4k                                 | 9223 | 42S | ERNA |
| Quantity 150 of ESNB 775GB SSD 4k                                 | 9223 | 42S | ERNB |
| Quantity 150 of ESNE 1.55TB SSD 4k                                | 9223 | 42S | ERNE |
| Quantity 150 of ESNF 1.55TB SSD 4k                                | 9223 | 42S | ERNF |
| 387GB SFF-2 4k SSD for AIX/Linux                                  | 9223 | 42S | ES0Q |
| 387GB SFF-2 4k SSD for IBM i                                      | 9223 | 42S | ES0R |
| 775GB SFF-2 4k SSD for AIX/Linux                                  | 9223 | 42S | ES0S |
| 775GB SFF-2 4k SSD for IBM i                                      | 9223 | 42S | ES0T |
| 3.86-4.0 TB 7200 RPM 4K SAS LFF-1 Nearline Disk Drive (AIX/Linux) | 9223 | 42S | ES62 |
| 7.72-8.0 TB 7200 RPM 4K SAS LFF-1 Nearline Disk Drive (AIX/Linux) | 9223 | 42S | ES64 |
| 387GB SFF-2 SSD 5xx eMLC4 for AIX/Linux                           | 9223 | 42S | ES78 |
| 387GB SFF-2 SSD 5xx eMLC4 for IBM i                               | 9223 | 42S | ES79 |
| 775GB SFF-2 SSD 5xx eMLC4 for AIX/Linux                           | 9223 | 42S | ES7E |
| 775GB SFF-2 SSD 5xx eMLC4 for IBM i                               | 9223 | 42S | ES7F |
| 387GB SFF-3 SSD 5xx eMLC4 for AIX/Linux                           | 9223 | 42S | ES7K |
| 387GB SFF-3 SSD 5xx eMLC4 for IBM i                               | 9223 | 42S | ES7L |
| 775GB SFF-3 SSD 5xx eMLC4 for AIX/Linux                           | 9223 | 42S | ES7P |
| 775GB SFF-3 SSD 5xx eMLC4 for IBM i                               | 9223 | 42S | ES7Q |
| 1.9TB Read Intensive SAS 4k SFF-2 SSD for AIX/Linux               | 9223 | 42S | ES80 |
| 1.9TB Read Intensive SAS 4k SFF-2 SSD for IBM i                   | 9223 | 42S | ES81 |
| 931GB Mainstream SAS 4k SFF-3 SSD for AIX/Linux                   | 9223 | 42S | ES83 |

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| 931GB Mainstream SAS 4k SFF-3 SSD for IBM i                | 9223 | 42S | ES84 |
| 387GB SFF-2 SSD 4k eMLC4 for AIX/Linux                     | 9223 | 42S | ES85 |
| 387GB SFF-2 SSD 4k eMLC4 for IBM i                         | 9223 | 42S | ES86 |
| 775GB SFF-2 SSD 4k eMLC4 for AIX/Linux                     | 9223 | 42S | ES8C |
| 775GB SFF-2 SSD 4k eMLC4 for IBM i                         | 9223 | 42S | ES8D |
| 1.55TB SFF-2 SSD 4k eMLC4 for AIX/Linux                    | 9223 | 42S | ES8F |
| 1.55TB SFF-2 SSD 4k eMLC4 for IBM i                        | 9223 | 42S | ES8G |
| 1.9TB Read Intensive SAS 4k SFF-3 SSD for AIX/Linux        | 9223 | 42S | ES8J |
| 1.9TB Read Intensive SAS 4k SFF-3 SSD for IBM i            | 9223 | 42S | ES8K |
| 387GB SFF-3 SSD 4k eMLC4 for AIX/Linux                     | 9223 | 42S | ES8N |
| 387GB SFF-3 SSD 4k eMLC4 for IBM i                         | 9223 | 42S | ES8P |
| 775GB SFF-3 SSD 4k eMLC4 for AIX/Linux                     | 9223 | 42S | ES8Q |
| 775GB SFF-3 SSD 4k eMLC4 for IBM i                         | 9223 | 42S | ES8R |
| 1.55TB SFF-3 SSD 4k eMLC4 for AIX/Linux                    | 9223 | 42S | ES8V |
| 1.55TB SFF-3 SSD 4k eMLC4 for IBM i                        | 9223 | 42S | ES8W |
| 931GB Mainstream SAS 4k SFF-2 SSD for AIX/Linux            | 9223 | 42S | ES8Y |
| 931GB Mainstream SAS 4k SFF-2 SSD for IBM i                | 9223 | 42S | ES8Z |
| 387GB Enterprise SAS 4k SFF-3 SSD for AIX/Linux            | 9223 | 42S | ES90 |
| 387GB Enterprise SAS 4k SFF-3 SSD for IBM i                | 9223 | 42S | ES91 |
| 1.86TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux           | 9223 | 42S | ES92 |
| 1.86TB Mainstream SAS 4k SFF-3 SSD for IBM i               | 9223 | 42S | ES93 |
| 387GB Enterprise SAS 4k SFF-2 SSD for AIX/Linux            | 9223 | 42S | ES94 |
| 387GB Enterprise SAS 4k SFF-2 SSD for IBM i                | 9223 | 42S | ES95 |
| 1.86TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux           | 9223 | 42S | ES96 |
| 1.86TB Mainstream SAS 4k SFF-2 SSD for IBM i               | 9223 | 42S | ES97 |
| 387GB Enterprise SAS 5xx SFF-3 SSD for AIX/Linux           | 9223 | 42S | ESB0 |
| 387GB Enterprise SAS 5xx SFF-2 SSD for AIX/Linux           | 9223 | 42S | ESB2 |
| 775GB Enterprise SAS 5xx SFF-3 SSD for AIX/Linux           | 9223 | 42S | ESB4 |
| 775GB Enterprise SAS 5xx SFF-2 SSD for AIX/Linux           | 9223 | 42S | ESB6 |
| 387GB Enterprise SAS 4k SFF-3 SSD for AIX/Linux            | 9223 | 42S | ESB8 |
| 387GB Enterprise SAS 4k SFF-3 SSD for IBM i                | 9223 | 42S | ESB9 |
| 387GB Enterprise SAS 4k SFF-2 SSD for AIX/Linux            | 9223 | 42S | ESBA |
| 387GB Enterprise SAS 4k SFF-2 SSD for IBM i                | 9223 | 42S | ESBB |
| 775GB Enterprise SAS 4k SFF-3 SSD for AIX/Linux            | 9223 | 42S | ESBE |
| 775GB Enterprise SAS 4k SFF-3 SSD for IBM i                | 9223 | 42S | ESBF |
| 775GB Enterprise SAS 4k SFF-2 SSD for AIX/Linux            | 9223 | 42S | ESBG |
| 775GB Enterprise SAS 4k SFF-2 SSD for IBM i                | 9223 | 42S | ESBH |
| 1.55TB Enterprise SAS 4k SFF-3 SSD for AIX/Linux           | 9223 | 42S | ESBJ |
| 1.55TB Enterprise SAS 4k SFF-3 SSD for IBM i               | 9223 | 42S | ESBK |
| 1.55TB Enterprise SAS 4k SFF-2 SSD for AIX/Linux           | 9223 | 42S | ESBL |
| 1.55TB Enterprise SAS 4k SFF-2 SSD for IBM i               | 9223 | 42S | ESBM |
| S&H - No Charge  | 9223 | 42S | ESC0 |
| S&H-b  | 9223 | 42S | ESC6 |
| 1.1TB 10K RPM SAS SFF-2 Disk Drive (IBMi)                  | 9223 | 42S | ESD2 |
| 1.2TB 10K RPM SAS SFF-2 Disk Drive (AIX/Linux)             | 9223 | 42S | ESD3 |
| 571GB 10K RPM SAS SFF-3 Disk Drive (IBM i)                 | 9223 | 42S | ESD4 |
| 600GB 10K RPM SAS SFF-3 Disk Drive (AIX/Linux)             | 9223 | 42S | ESD5 |
| 283GB 15K RPM SAS SFF-3 Disk Drive (IBM i)                 | 9223 | 42S | ESDA |
| 300GB 15K RPM SAS SFF-3 Disk Drive (AIX/Linux)             | 9223 | 42S | ESDB |
| 571GB 15K RPM SAS SFF-2 Disk Drive - 528 Block (IBM i)     | 9223 | 42S | ESDN |
| 600GB 15K RPM SAS SFF-2 Disk Drive - 5xx Block (AIX/Linux) | 9223 | 42S | ESDP |
| 3.72TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux           | 9223 | 42S | ESE1 |
| 3.72TB Mainstream SAS 4k SFF-3 SSD for IBM i               | 9223 | 42S | ESE2 |
| 3.72TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux           | 9223 | 42S | ESE7 |
| 3.72TB Mainstream SAS 4k SFF-2 SSD for IBM i               | 9223 | 42S | ESE8 |
| 571GB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4224         | 9223 | 42S | ESEU |
| 600GB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4096         | 9223 | 42S | ESEV |
| 283GB 15K RPM SAS SFF-2 4K Block - 4224 Disk Drive         | 9223 | 42S | ESEY |
| 300GB 15K RPM SAS SFF-2 4K Block - 4096 Disk Drive         | 9223 | 42S | ESEZ |
| 1.1TB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4224         | 9223 | 42S | ESF2 |
| 1.2TB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4096         | 9223 | 42S | ESF3 |
| 571GB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4224         | 9223 | 42S | ESF4 |
| 600GB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4096         | 9223 | 42S | ESF5 |

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| 1.1TB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4224 | 9223 | 42S | ESF8 |
| 1.2TB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4096 | 9223 | 42S | ESF9 |
| 283GB 15K RPM SAS SFF-3 4K Block - 4224 Disk Drive | 9223 | 42S | ESFA |
| 300GB 15K RPM SAS SFF-3 4K Block - 4096 Disk Drive | 9223 | 42S | ESFB |
| 571GB 15K RPM SAS SFF-3 4K Block - 4224 Disk Drive | 9223 | 42S | ESFE |
| 600GB 15K RPM SAS SFF-3 4K Block - 4096 Disk Drive | 9223 | 42S | ESFF |
| 571GB 15K RPM SAS SFF-2 4K Block - 4224 Disk Drive | 9223 | 42S | ESFN |
| 600GB 15K RPM SAS SFF-2 4K Block - 4096 Disk Drive | 9223 | 42S | ESFP |
| 1.7TB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4224 | 9223 | 42S | ESFS |
| 1.8TB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4096 | 9223 | 42S | ESFT |
| 1.7TB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4224 | 9223 | 42S | ESFU |
| 1.8TB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4096 | 9223 | 42S | ESFV |
| 387GB Enterprise SAS 5xx SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESG5 |
| 387GB Enterprise SAS 5xx SFF-2 SSD for IBM i       | 9223 | 42S | ESG6 |
| 387GB Enterprise SAS 5xx SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESG9 |
| 387GB Enterprise SAS 5xx SFF-3 SSD for IBM i       | 9223 | 42S | ESGA |
| 387GB Enterprise SAS 4k SFF-2 SSD for AIX/Linux    | 9223 | 42S | ESGB |
| 387GB Enterprise SAS 4k SFF-2 SSD for IBM i        | 9223 | 42S | ESGC |
| 387GB Enterprise SAS 4k SFF-3 SSD for AIX/Linux    | 9223 | 42S | ESGD |
| 387GB Enterprise SAS 4k SFF-3 SSD for IBM i        | 9223 | 42S | ESGE |
| 775GB Enterprise SAS 5xx SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESGF |
| 775GB Enterprise SAS 5xx SFF-2 SSD for IBM i       | 9223 | 42S | ESGG |
| 775GB Enterprise SAS 5xx SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESGH |
| 775GB Enterprise SAS 5xx SFF-3 SSD for IBM i       | 9223 | 42S | ESGJ |
| 775GB Enterprise SAS 4k SFF-2 SSD for AIX/Linux    | 9223 | 42S | ESGK |
| 775GB Enterprise SAS 4k SFF-2 SSD for IBM i        | 9223 | 42S | ESGL |
| 775GB Enterprise SAS 4k SFF-3 SSD for AIX/Linux    | 9223 | 42S | ESGM |
| 775GB Enterprise SAS 4k SFF-3 SSD for IBM i        | 9223 | 42S | ESGN |
| 1.55TB Enterprise SAS 4k SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESGP |
| 1.55TB Enterprise SAS 4k SFF-2 SSD for IBM i       | 9223 | 42S | ESGQ |
| 1.55TB Enterprise SAS 4k SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESGR |
| 1.55TB Enterprise SAS 4k SFF-3 SSD for IBM i       | 9223 | 42S | ESGS |
| 387GB Enterprise SAS 5xx SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESGT |
| 387GB Enterprise SAS 5xx SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESGV |
| 775GB Enterprise SAS 5xx SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESGX |
| 775GB Enterprise SAS 5xx SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESGZ |
| SAP HANA Identifier for 9223-42H/42S               | 9223 | 42S | ESH2 |
| 931 GB Mainstream SAS 4k SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESHJ |
| 931 GB Mainstream SAS 4k SFF-2 SSD for IBM i       | 9223 | 42S | ESHK |
| 1.86 TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux  | 9223 | 42S | ESHL |
| 1.86 TB Mainstream SAS 4k SFF-2 SSD for IBM i      | 9223 | 42S | ESHM |
| 7.45 TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux  | 9223 | 42S | ESHN |
| 931 GB Mainstream SAS 4k SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESHS |
| 931 GB Mainstream SAS 4k SFF-3 SSD for IBM i       | 9223 | 42S | ESHT |
| 1.86 TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux  | 9223 | 42S | ESHU |
| 1.86 TB Mainstream SAS 4k SFF-3 SSD for IBM i      | 9223 | 42S | ESHV |
| 7.45 TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux  | 9223 | 42S | ESHW |
| 931GB Mainstream SAS 4k SFF-2 SSD for AIX/Linux    | 9223 | 42S | ESJ0 |
| 931GB Mainstream SAS 4k SFF-2 SSD for IBM i        | 9223 | 42S | ESJ1 |
| 1.86TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESJ2 |
| 1.86TB Mainstream SAS 4k SFF-2 SSD for IBM i       | 9223 | 42S | ESJ3 |
| 3.72TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESJ4 |
| 3.72TB Mainstream SAS 4k SFF-2 SSD for IBM i       | 9223 | 42S | ESJ5 |
| 7.45TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux   | 9223 | 42S | ESJ6 |
| 7.45TB Mainstream SAS 4k SFF-2 SSD for IBM i       | 9223 | 42S | ESJ7 |
| 931GB Mainstream SAS 4k SFF-3 SSD for AIX/Linux    | 9223 | 42S | ESJ8 |
| 931GB Mainstream SAS 4k SFF-3 SSD for IBM i        | 9223 | 42S | ESJ9 |
| 1.86TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESJA |
| 1.86TB Mainstream SAS 4k SFF-3 SSD for IBM i       | 9223 | 42S | ESJB |
| 3.72TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESJC |
| 3.72TB Mainstream SAS 4k SFF-3 SSD for IBM i       | 9223 | 42S | ESJD |
| 7.45TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux   | 9223 | 42S | ESJE |

|  |      |     |      |
|--|------|-----|------|
| 7.45TB Mainstream SAS 4k SFF-3 SSD for IBM i                   | 9223 | 42S | ESJF |
| Specify AC Power Supply for EXP12SX/EXP24SX                    |      |     |      |
| Storage Enclosure  | 9223 | 42S | ESLA |
| EXP12SX SAS Storage Enclosure                                  | 9223 | 42S | ESLL |
| EXP24SX SAS Storage Enclosure                                  | 9223 | 42S | ESLS |
| 3.72 TB Mainstream SAS 4k SFF-2 SSD for AIX/Linux              | 9223 | 42S | ESM8 |
| 3.72 TB Mainstream SAS 4k SFF-2 SSD for IBM i                  | 9223 | 42S | ESM9 |
| 3.72 TB Mainstream SAS 4k SFF-3 SSD for AIX/Linux              | 9223 | 42S | ESMQ |
| 3.72 TB Mainstream SAS 4k SFF-3 SSD for IBM i                  | 9223 | 42S | ESMR |
| 775GB Enterprise SAS 4k SFF-2 SSD for AIX/Linux                | 9223 | 42S | ESNA |
| 775GB Enterprise SAS 4k SFF-2 SSD for IBM i                    | 9223 | 42S | ESNB |
| 775GB Enterprise SAS 4k SFF-3 SSD for AIX/Linux                | 9223 | 42S | ESNC |
| 775GB Enterprise SAS 4k SFF-3 SSD for IBM i                    | 9223 | 42S | ESND |
| 1.55TB Enterprise SAS 4k SFF-2 SSD for AIX/Linux               | 9223 | 42S | ESNE |
| 1.55TB Enterprise SAS 4k SFF-2 SSD for IBM i                   | 9223 | 42S | ESNF |
| 1.55TB Enterprise SAS 4k SFF-3 SSD for AIX/Linux               | 9223 | 42S | ESNG |
| 1.55TB Enterprise SAS 4k SFF-3 SSD for IBM i                   | 9223 | 42S | ESNH |
| 283GB 15K RPM SAS SFF-3 4k Block Cached Disk Drive (IBM i)     | 9223 | 42S | ESNJ |
| 300GB 15K RPM SAS SFF-3 4k Block Cached Disk Drive (AIX/Linux) | 9223 | 42S | ESNK |
| 283GB 15K RPM SAS SFF-2 4k Block Cached Disk Drive (IBM i)     | 9223 | 42S | ESNL |
| 300GB 15K RPM SAS SFF-2 4k Block Cached Disk Drive (AIX/Linux) | 9223 | 42S | ESNM |
| 571GB 15K RPM SAS SFF-3 4k Block Cached Disk Drive (IBM i)     | 9223 | 42S | ESNN |
| 600GB 15K RPM SAS SFF-3 4k Block Cached Disk Drive (AIX/Linux) | 9223 | 42S | ESNP |
| 571GB 15K RPM SAS SFF-2 4k Block Cached Disk Drive (IBM i)     | 9223 | 42S | ESNQ |
| 600GB 15K RPM SAS SFF-2 4k Block Cached Disk Drive (AIX/Linux) | 9223 | 42S | ESNR |
| Quantity 150 of #ESNL (283GB 15k SFF-2)                        | 9223 | 42S | ESPL |
| Quantity 150 of #ESNM (300GB 15k SFF-2)                        | 9223 | 42S | ESPM |
| Quantity 150 of #ESNQ (571GB 15k SFF-2)                        | 9223 | 42S | ESPQ |
| Quantity 150 of #ESNR (600GB 15k SFF-2)                        | 9223 | 42S | ESPR |
| Quantity 150 of ESB2 387GB SAS 4k                              | 9223 | 42S | ESQ2 |
| Quantity 150 of ESB6 775GB SAS 4k                              | 9223 | 42S | ESQ6 |
| Quantity 150 of ESBA 387GB SAS 4k                              | 9223 | 42S | ESQA |
| Quantity 150 of ESBB 387GB SAS 4k                              | 9223 | 42S | ESQB |
| Quantity 150 of ESBG 775GB SAS 4k                              | 9223 | 42S | ESQG |
| Quantity 150 of ESBH 775GB SAS 4k                              | 9223 | 42S | ESQH |
| Quantity 150 of ESBL 1.55TB SAS 4k                             | 9223 | 42S | ESQL |
| Quantity 150 of ESBM 1.55TB SAS 4k                             | 9223 | 42S | ESQM |
| RDX USB Internal Docking Station for Removable Disk Cartridge  | 9223 | 42S | EU00 |
| 1TB Removable Disk Drive Cartridge                             | 9223 | 42S | EU01 |
| Not available in US, EMEA, and Japan                           |      |     |      |
| RDX USB External Docking Station for Removable Disk Cartridge  | 9223 | 42S | EU04 |
| RDX 320 GB Removable Disk Drive                                | 9223 | 42S | EU08 |
| Operator Panel LCD Display                                     | 9223 | 42S | EU0B |
| 1.5TB Removable Disk Drive Cartridge                           | 9223 | 42S | EU15 |
| Cable Ties & Labels  | 9223 | 42S | EU19 |
| Order Placed Indicator   | 9223 | 42S | EU29 |
| 2TB Removable Disk Drive Cartridge (RDX)                       | 9223 | 42S | EU2T |
| RDX USB External Docking Station                               | 9223 | 42S | EUA4 |
| Standalone USB DVD drive w/cable                               | 9223 | 42S | EUA5 |
| Core Use HW Feature  | 9223 | 42S | EUC6 |
| Core Use HW Feature 10X  | 9223 | 42S | EUC7 |
| BP Post-Sale Services: 1 Day                                   | 9223 | 42S | SVBP |
| IBM Systems Lab Services Post-Sale Services: 1 Day             | 9223 | 42S | SVCS |
| Other IBM Post-Sale Services: 1 Day                            | 9223 | 42S | SVNN |

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## Publications

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### Publications:

Power Systems hardware documentation provides clients with the following topical information:

- Licenses, notices, safety, and warranty information
- Planning for the system
- Installing and configuring the system
- Troubleshooting, service, and support
- Installing, configuring, and managing consoles, terminals, and interfaces
- Installing operating systems
- Creating a virtual computing environment
- Enclosures and expansion units
- Glossary

You can access the product documentation at [IBM Knowledge Center](#).

Product documentation is also available on DVD (SK5T-7087).

The following information is shipped with the Power H924 server:

- Power Hardware Information DVD SK5T-7087
- Installing the 9223-42S
- Important Notices
- Warranty Information
- License Agreement for Machine Code

Hardware documentation such as installation instructions, user's information, and service information is available to download or view at the [IBM Support](#) website.

You can access IBM i documentation at the [IBM i](#) website.

You can access AIX documentation at the [AIX](#) website.

You can access documentation about Linux on IBM systems at the [Linux information for IBM systems](#) website.

The IBM Systems Information Center provides you with a single information center where you can access product documentation for IBM systems hardware, operating systems, and server software. Through a consistent framework, you can efficiently find information and personalize your access. See the IBM Systems Information Center at [IBM Knowledge Center](#).

To access the IBM Publications Center Portal, go to the [IBM Publications Center](#) website.

The Publications Center is a worldwide central repository for IBM product publications and marketing material with a catalog of 70,000 items. Extensive search facilities are provided. A large number of publications are available online in various file formats, which can currently be downloaded.

### **National language support**

Not applicable

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## **Services**

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### **IBM Systems Lab Services**

IBM Systems Lab Services offers infrastructure services to help you build the foundation for on-premise IT or hybrid cloud with SAP HANA. From servers, storage systems and software, Lab Services helps you deploy the building blocks of your next-generation IT infrastructure for SAP HANA. Our IBM Lab Services consultants

perform SAP HANA infrastructure and migration services for clients on site, offering deep technical expertise, trusted tools and successful methodologies. Our services are designed to help clients solve business challenges, gain new skills and apply best practices as they deploy, migrate or upgrade their SAP HANA systems. Our implementation services include advising clients on planning data center, infrastructure, storage, networking and database requirements, implementing PowerVM, Linux on Power (SUSE or Red Hat) and an SAP HANA instance/s using a Tailored Datacenter Integration (TDI) methodology before performing verification tests of file system performance and of the SAP HANA landscape required for SAP environment certification. Our SAP HANA migration services will help you understand the practical aspects of planning and executing a migration from any database or an existing SAP HANA on x86 deployment to SAP HANA on Power. A workshop with an experienced IBM Lab Services consultant will help you plan the migration, selecting the appropriate SAP migration tools and methodologies. For details on available SAP HANA services, clients should contact their IBM representative, go to the [IBM Systems Lab Services](#) website or contact us at [ibmsls@us.ibm.com](mailto:ibmsls@us.ibm.com)<sup>(R)</sup>.

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## Global Technology Services

IBM services include business consulting, outsourcing, hosting services, applications, and other technology management.

These services help you learn about, plan, install, manage, or optimize your IT infrastructure to be an on-demand business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

For details on available services, contact your IBM representative or go to the [IBM Global Technology Services](#) website.

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or go to the [Resiliency Services](#) website.

Details on education offerings related to specific products can be found on the [IBM Skills Gateway](#) website.

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## Technical information

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### Specified operating environment

#### *Physical specifications*

- Width: 482 mm (18.97 in.)
- Depth: 769.6 mm (30.3 in.)
- Height: 173.3 mm (6.8 in.)
- Weight: 39.9 kg (88 lb)

To assure installability and serviceability in non-IBM industry-standard racks, review the installation planning information for any product-specific installation requirements.

#### *Operating environment*

- Temperature: (nonoperating) 5 to 45 degrees C (41 to 113 F); recommended temperature (operating) 18 to 27 degrees C (64 to 80 F); allowable operating temperature 5 to 40 degrees C (41 to 104 F)
- Relative humidity: 8% - 85% (allowable operating humidity range); recommended 5.5 degrees C (42 F) dew point to 60% RH and 15 degrees C (59 F) dew point
- Maximum dew point: 24 degrees C (75 F)(allowable operating)
- Operating voltage: 1400 W PSU: 200 - 240 V AC

- Operating frequency: 47/63 Hz
- Maximum power consumption: 2750 watts (maximum)
- Power factor: 0.98
- Thermal output: 9,386 Btu/hour (maximum)
- Power-source loading
  - 2.835 kVa (maximum configuration)
  - Maximum altitude: 3,050 m (10,000 ft)

**Note:** The maximum measured value is the worst case power consumption expected from a fully populated server under an intensive workload. The maximum measured value also accounts for component tolerance and non-ideal operating conditions. Power consumption and heat load vary greatly by server configuration and utilization. The [IBM Systems Energy Estimator](#) should be used to obtain a heat output estimate based on a specific configuration.

### **Noise levels and declared A-weighted sound power level**

- Rack-mount system: 6.4 bels operating; 5.2 bels idling

See the **Installation Planning Guide** in [IBM Knowledge Center](#) for additional detail.

For example, the actual sound power noise level is impacted by multiple factors, including:

- Enablement of Maximum Performance mode increases fan speed, which increases power noise levels
- Usage of Maximum Performance mode further increases fan speed, which further increases power noise levels
- Using higher wattage PCIe adapters increases fan speed, which increases power noise levels.
- Placing multiple servers in a rack increases the total power noise level.
- Placing servers in racks with acoustic doors reduces the power noise levels.

### **EMC conformance classification**

This equipment is subject to FCC rules and shall comply with the appropriate FCC rules before final delivery to the buyer or centers of distribution.

- US: FCC Class A
- Europe: CISPR 22 Class A
- Japan: VCCI-A
- Korea: Korean Requirement Class A
- China: People's Republic of China commodity inspection law Class A

### **Homologation -- Telecom environmental testing (Safety and EMC):**

Homologation approval for specific countries has been initiated with the IBM Homologation and Type Approval (HT&A) organization in LaGaude, France. This Power Systems model and applicable features meet the environmental testing requirements of the country telecom and have been designed and tested in compliance with the Full Quality Assurance Approval (FQAA) process as delivered by the British Approval Board for Telecom (BABT), the UK Telecom regulatory authority.

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



## Product safety/Country testing/Certification

- UL 60950-1:2007 Underwriters Laboratory, Safety Information
- CSA C22.2 No. 60950-1-07, Canadian Standards Association
- EN60950 European Norm
- IEC 60950, Edition 1, International Electrotechnical Commission, Safety Information
- Nordic deviations to IEC 60950-1 1st Edition

## General requirements:

The product is in compliance with IBM Corporate Bulletin C-B 0-2594-000 Statement of Conformity of IBM Product to External Standard (Suppliers Declaration).

## Hardware requirements

### Power H924 system configuration

The minimum Power H924 initial order must include a processor module, two 16 GB DIMMs, four power supplies and line cords, an operating system indicator, a cover set indicator, and a Language Group Specify. Also, it must include one of these storage options and one of these network options:

Storage options:

- For boot from NVMe: One NVMe drive slot and one NVMe drive or one PCIe NVMe add in adapter.
- For boot from direct attach storage SFF-3 / SFF-2 HDD or SSD: One storage backplane and one SFF-3 / SFF-2 HDD or SSD.
- For boot from SAN: Internal HDD or SSD and RAID card are *not* required if feature 0837 (Boot from SAN) is selected. A Fibre Channel adapter must be ordered if feature 0837 is selected.

Network options:

- One PCIe2 4-port 1 Gb Ethernet adapter
- One of the supported 10 Gb Ethernet adapters

Linux is the primary operating system. The minimum defined initial order configuration is as follows:

| Feature number | Description  | Quantity | Notes                      |
|----------------|--|----------|----------------------------|
| EU0B           | Operator Panel LCD Display                             | 1        | Optional with AIX or Linux |
| Processors     |  |          |                            |
| EP7J           | 8-core typical 3.8 to 4.0 GHz (max) POWER9 Processor   | 1        |                            |
| or             |  |          |                            |
| EP7K           | 10-core typical 3.5 to 3.9 GHz (max) POWER9 Processor  | 1        |                            |
| or             |  |          |                            |
| EP7M           | 11-core Typical 3.45 to 3.9 Ghz (max) POWER9 Processor | 1        |                            |
| or             |  |          |                            |
| EP7L           | 12-core Typical 3.4 to 3.9 Ghz (max) POWER9 Processor  | 1        |                            |

| Feature number                | Description  | Quantity | Notes  |
|-------------------------------|--|----------|--|
| Processor activations         |  |          |  |
| EP7P                          | One Processor Core Activation for #EP7J  | 8        |  |
| or                            |  |          |  |
| EP7Q                          | One Processor Core Activation for #EP7K  | 10       |  |
| or                            |  |          |  |
| EP7S                          | One Processor Core Activation for #EP7M  | 11       |  |
| or                            |  |          |  |
| EP7R                          | One Processor Core Activation for #EP7L  | 12       |  |
| Memory DIMMs                  |  |          |  |
| EM6J                          | 16 GB DDR4 Memory  | 2        |  |
| or                            |  |          |  |
| EM6K                          | 32 GB DDR4 Memory  | 2        |  |
| or                            |  |          |  |
| EM7B                          | 64 GB DDR4 Memory  | 2        |  |
| or                            |  |          |  |
| EM7C                          | 128 GB DDR4 Memory   | 2        |  |
| Storage Backplane             |  |          |  |
| EJ1S                          | Storage Backplane with 6 SFF-3 Bays and 2 PCIe Gen4 capable NVMe U.2 drive slots | 1        | See Note 2 and Note 4  |
| or                            |  |          |  |
| EJ1T                          | Storage Backplane with 2 PCIe Gen4 capable NVMe U.2 drive slots                  | 1        | Optional EJ1Q as MES to allow 4 NVMe U.2 drives. See Note 2 and Note 4 |
| or                            |  |          |  |
| EJ1U                          | Storage Backplane with 4 PCIe Gen4 capable NVMe U.2 drive slots                  | 1        | See Note 2 and Note 4  |
| Disk Drive                    |  |          |  |
| ESDB                          | 300 GB 15K RPM SAS SFF-3 Disk Drive (AIX/Linux)                                  | 1        |  |
| LAN Adapter                   |  |          |  |
| 5899                          | PCIe2 LP 4-port 1GbE Adapter   | 1        | See Note 3   |
| Power Supplies/<br>Power cord |  |          |  |
| EB2M                          | AC Power Supply - 1400 W for Server (200 - 240 V AC)                             | 4        | EB2M - (default)   |
| 6458                          | Power Cord 4.3 m (14 ft), Drawer   | 4        | 6458 - (default)   |

| Feature number              | Description  | Quantity | Notes  |
|-----------------------------|--|----------|--|
|                             | to IBM PDU<br>(250V/10A)                                   |          |  |
| 9300/97xx                   | Language Group<br>Specify                                  | 1        | 9300 - (default)   |
| Front Bezel                 |  |          | Default Front Bezel<br>is #EJU3 when no<br>DASD Backplane is<br>ordered. |
| EJUK                        | Front IBM Bezel for<br>6 SAS + 4 NVMe<br>Bays BackPlane    | 1        |  |
| or                          |  |          |  |
| EJUL                        | Front OEM Bezel<br>for 6 SAS +<br>4 NVMe-Bays<br>BackPlane | 1        |  |
| Primary operating<br>system |  |          |  |
| 2147                        | Primary Operating<br>System Indicator -<br>Linux           | 1        |  |

1. The racking approach for the initial order must be either a 7014-T00, 7014-T42, 7965-S42, or 7953-94Y. If an additional rack is required for I/O expansion drawers as an MES to an existing system, either a feature 0551, 0553, or ER05 rack must be ordered.
2. Must order, at a minimum, one #ES1E/#ES1G/#EC5V/#EC5X (NVMe U.2 drive) with backplane #EJ1S, #EJ1T, or #EJ1U. Maximum of two #ES1E/#ES1G/#EC5V/#EC5X per one #EJ1S/#EJ1T. Maximum of four #ES1E/#ES1G/#EC5V/#EC5X per one #EJ1U. Mixing of #ES1E, #ES1G, #EC5V, or #EC5X is allowed on a backplane.
3. One PCIe2 4-port 1 GbE Adapter (#5899) is defaulted. Options for servers with AIX and Linux as the primary operating system are one of a 10 Gb Ethernet adapter, either feature EC2S, EC2U, EN0H, EN0K, EN0S, EN0U, EN0W, or EN15.
4. Storage backplane features #EJ1C/#EJ1D/#EJ1E/#EJ1M are also available (selected Front Bezel are required).

### Hardware Management Console (HMC) machine code

An HMC is required to manage the Power H924 server implementing partitioning. Multiple POWER7<sup>(R)</sup>, POWER8<sup>(R)</sup>, and POWER9 processor-based servers can be supported by a single HMC.

Planned HMC hardware and software support:

- X86 based - 7042-CR7, 7042-CR8, 7042-CR9
  - vHMC x86
- POWER8 based Open Power: 7063-CR1
  - vHMC PowerVM based LPAR

If you are attaching an HMC to a new server or adding function to an existing server that requires a firmware update, the HMC machine code may need to be updated because HMC code must always be equal to or higher than the managed server's firmware. Access to firmware and machine code updates is conditioned on entitlement and license validation in accordance with IBM policy and practice. IBM may verify entitlement through customer number, serial number, electronic restrictions, or any other means or methods employed by IBM at its discretion.

To determine the HMC machine code level required for the firmware level on any server, go to the following web page to access the Fix Level Recommendation Tool (FLRT) on or after the planned availability date for this product. FLRT will identify the correct HMC machine code for the selected system firmware level; see the website [Fix Level Recommendation Tool](#).

If a single HMC is attached to multiple servers, the HMC machine code level must be updated to be at or higher than the server with the most recent firmware level. All prior levels of server firmware are supported with the latest HMC machine code level.

The HMC code latest level contains the following:

- Support for managing Power S922, Power H924, and Power S914 systems.
- Support for the new HMC model 7063-CR1.
- Support for PowerVM functions such as the new HMC GUI interface for VIOS management.
- GUI for HMC's Performance and Capacity Monitoring function.
- An HMC command to initiate a remote restart operation. This removes the requirement of VMControl for the PowerVM Remote Restart function.
- For PowerVM GUI functions, VIOS is recommended.

For clients installing systems higher than the EIA 29 position (location of the rail that supports the rack-mounted server) in any IBM or non-IBM rack, acquire approved tools outlined in the server specifications section at [IBM Knowledge Center](#).

In situations where IBM service is required and the recommended tools are not available, there could be delays in repair actions.

### **Software requirements**

Linux as the Primary Operating System:

Linux is required as the primary operating system with a minimum of 75% of total cores activated.

If installing the Linux operating systems LPAR in production SAP implementations:

- SUSE Linux Enterprise Server for SAP with SUSE Linux Enterprise Server 15 Service Pack 1, or later
- Red Hat Enterprise Linux for SAP with Red Hat Enterprise Linux 8 for Power LE version 8.1, or later
- SUSE Linux Enterprise Server for SAP with SUSE Linux Enterprise Server 12, Service Pack 5, or later

If installing the Linux operating system LPAR in nonproduction SAP implementations:

- Red Hat Enterprise Linux 8 for Power LE, version 8.1, or later
- SUSE Linux Enterprise Server 15 Service Pack 1, or later
- SUSE Linux Enterprise Server 12 Service Pack 5, or later

AIX and IBM i as the Secondary Operating Systems:

IBM AIX and IBM i can be chosen as secondary operating systems, with a maximum of 25% of total cores activated across both.

If installing the AIX operating system LPAR with any I/O configuration (one of these):

- AIX Version 7.2 with the 7200-05 Technology Level, or later
- AIX Version 7.2 with the 7200-04 Technology Level and Service Pack 7200-04-02-2028, or later
- AIX Version 7.1 with the 7100-05 Technology Level and Service Pack 7100-05-06-2028, or later
- AIX Version 7.2 with the 7200-03 Technology Level and Service Pack 7 (Planned Availability February 19, 2021)

If installing the AIX operating system Virtual I/O only LPAR (one of these):

- AIX Version 7.2 with the 7200-05 Technology Level, or later
- AIX Version 7.2 with the 7200-04 Technology Level, or later
- AIX Version 7.2 with the 7200-03 Technology Level, or later
- AIX Version 7.1 with the 7100-05 Technology Level and Service Pack 7100-05-02-1832, or later

If installing VIOS:

- VIOS 3.1.2.10, or later
- VIOS 3.1.1.25, or later

If installing IBM i, the IBM i operating system levels supported are:

- IBM i 7.4 TR3, or later
- IBM i 7.3 TR9, or later
- IBM i 7.2 with 7.2 Licensed Machine Code - RS 720-Q, or later

For the latest prerequisites, visit the [Power Systems Prerequisites](#) tool.

### **Limitations**

- Integrated system port is not supported under AIX or Linux when the HMC ports are connected to an HMC. Either the HMC ports or the integrated system ports can be used, but not both. The FSP2 USB 2.0 port is used for communication to a UPS.
- The integrated system port is supported for modem and TTY terminal connections by AIX or Linux. Any other application using serial ports requires a serial port adapter to be installed in a PCI slot. The integrated system port does not support HACMP configurations.

### **Planning information**

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#### **Cable orders**

No cables required.

### **Security, auditability, and control**

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This product uses the security and auditability features of host hardware and application software.

The client is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

### **IBM Systems Lab Services**

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IBM Systems Lab Services offers infrastructure services to help you build the foundation for on-premise IT or hybrid cloud with SAP HANA. From servers, storage systems and software, Lab Services helps you deploy the building blocks of your next-generation IT infrastructure for SAP HANA. Our IBM Lab Services consultants perform SAP HANA infrastructure and migration services for clients on site, offering deep technical expertise, trusted tools and successful methodologies. Our services are designed to help clients solve business challenges, gain new skills and apply best practices as they deploy, migrate or upgrade their SAP HANA systems. Our implementation services include advising clients on planning data center, infrastructure, storage, networking and database requirements, implementing PowerVM, Linux on Power (SUSE or Red Hat) and an SAP HANA instance/s using a Tailored Datacenter Integration (TDI) methodology before performing verification tests of file system performance and of the SAP HANA landscape required for SAP environment certification. Our SAP HANA migration services will help you understand the practical aspects of planning and executing a migration from any database or an

existing SAP HANA on x86 deployment to SAP HANA on Power. A workshop with an experienced IBM Lab Services consultant will help you plan the migration, selecting the appropriate SAP migration tools and methodologies. For details on available SAP HANA services, clients should contact their IBM representative, go to the [IBM Systems Lab Services](#) website or contact us at [ibmsls@us.ibm.com](mailto:ibmsls@us.ibm.com).

## Global Technology Services

Contact your IBM representative for the list of selected services available in your country, either as standard or customized offerings, for the efficient installation, implementation, and/or integration of this product.

## Terms and conditions

### Volume orders

Contact your IBM representative.

### Products - terms and conditions

#### Warranty period

| Warranty and additional coverage options:                                  | Coverage summary <sup>(1)</sup> :   |
|--|---|
| Warranty Period:   | 3 years   |
| Service Level:   | IBM CRU & On-Site, 9x5 Next Business Day                                  |
| <b>Service Upgrade Options :</b>   |   |
| Warranty Service Upgrade   | IBM On-Site Repair, 9x5 Same Day <sup>(2)</sup> and 24x7 Same Day options |
| Maintenance Services (Post-Warranty):                                      | IBM On-Site Repair, Next Business Day and Same Day options                |
| IBM Hardware Maintenance Services - committed maintenance <sup>(3)</sup> : | Y   |

<sup>(1)</sup> See complete coverage details below.

<sup>(2)</sup> Offered in US and EMEA only.

<sup>(3)</sup> Not offered in the US.

To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM.

An IBM part or feature installed during the initial installation of an IBM machine is subject to the full warranty period specified by IBM. An IBM part or feature that replaces a previously installed part or feature assumes the remainder of the warranty period for the replaced part or feature. An IBM part or feature added to a machine without replacing a previously installed part or feature is subject to a full warranty. Unless specified otherwise, the warranty period, type of warranty service, and service level of a part or feature are the same as those for the machine in which it is installed.

Any IBM Mainstream devices (previously called *read intensive device*) identified in this document have a maximum number of write cycles. IBM Mainstream device failures will be replaced during standard warranty and maintenance period for devices that have not reached the maximum number of write cycles. Devices that reach this limit may fail to operate according to specifications and must be replaced at the client's expense. Individual service life may vary and can be monitored using an operating system command.

The IBM warranty covers feature number EB4Z. For warranty terms associated with feature number EB3Z and the Lift tool based on GenieLift GL-8, see the separate warranty terms provided by Genie found in the Genie Operator's Manual at the [Genie website](#).

For clients installing systems higher than the EIA 29 position (location of the rail that supports the rack-mounted server) in any IBM or non-IBM rack, acquire approved tools outlined in the server specifications section at [IBM Knowledge Center](#). In situations where IBM service is required and the recommended tools are not available, there could be delays in repair actions.

### **Warranty service**

If required, IBM provides repair or exchange service depending on the types of warranty service specified for the machine. IBM will attempt to resolve your problem over the telephone, or electronically through an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts. If applicable to your product, parts considered Customer Replaceable Units (CRUs) will be provided as part of the machine's standard warranty service.

Service levels are response-time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country-specific and location-specific information.

### **CRU Service**

IBM provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM upon your request. CRUs are designated as being either a Tier 1 (mandatory) or a Tier 2 (optional) CRU.

#### **Tier 1 (mandatory) CRU**

Installation of Tier 1 CRUs, as specified in this announcement, is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.

The following parts have been designated as Tier 1 CRUs:

- DASD SFF Drive
- DASD SSD Drive
- RDX Drive
- Enclosure
- Power Cable
- NVMe U.2
- SAS Card
- Op Panel -- Base
- Op Panel -- LCD
- Memory DIMM
- All PCI Adapters
- FAN
- Upper Fan cable
- TPM Card
- Power Supplies
- Service Processor Card/FSP

- TOD Battery
- Air Baffle
- Bezel
- SAS Cable
- Front Heatsink
- Service Cover
- DASD Backplane Power Cable
- DASD Backplane Signal Cable

### ***Tier 2 (optional) CRU***

You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge.

Based upon availability, CRUs will be shipped for next-business-day (NBD) delivery. IBM specifies, in the materials shipped with a replacement CRU, whether a defective CRU must be returned to IBM. When return is required, return instructions and a container are shipped with the replacement CRU. You may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

### ***CRU and On-site Service***

At IBM's discretion, you will receive specified CRU service, or IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well-lit, and suitable for the purpose.

Service level is:

- 9 hours per day, Monday through Friday, excluding holidays, next-business-day response. Calls must be received by 3:00 PM local time in order to qualify for next-business-day response.

### ***Warranty service***

IBM is now shipping machines with selected non-IBM parts that contain an IBM field replaceable unit (FRU) part number label. These parts are to be serviced during the IBM machine warranty period. IBM is covering the service on these selected non-IBM parts as an accommodation to their customers, and normal warranty service procedures for the IBM machine apply.

### ***International Warranty Service***

International Warranty Service allows you to relocate any machine that is eligible for International Warranty Service and receive continued warranty service in any country where the IBM machine is serviced. If you move your machine to a different country, you are required to report the machine information to your Business Partner or IBM representative.

The warranty service type and the service level provided in the servicing country may be different from that provided in the country in which the machine was purchased. Warranty service will be provided with the prevailing warranty service type and service level available for the eligible machine type in the servicing country, and the warranty period observed will be that of the country in which the machine was purchased.

The following types of information can be found on the [International Warranty Service](#) website

- Machine warranty entitlement and eligibility
- Directory of contacts by country with technical support contact information
- Announcement Letters



### **Warranty service upgrades**

During the warranty period, warranty service upgrades provide an enhanced level of On-site Service for an additional charge. Service levels are response-time objectives and are not guaranteed. See the Warranty services section for additional details.

IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts.

### **Maintenance service options**

#### **CRU and On-site Service**

At IBM's discretion, you will receive CRU service or IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well-lit, and suitable for the purpose. The following on-site response-time objectives are available as warranty service upgrades for your machine. Available offerings are:

- IBM On-Site Repair, Same-Day On-Site Response Target, Monday-Friday 08:00-17:00 (excluding public holidays), Last Call Registration: 12:00
- IBM On-Site Repair, Same-Day On-Site Response Target, Monday-Sunday 00:00-24:00, 365 days a year

Customer Replaceable Units (CRUs) may be provided as part of the machine's standard warranty CRU Service except that you may install a CRU yourself or request IBM installation, at no additional charge, under the CRU and On-site Service level specified above. For additional information on the CRU Service, see the warranty information.

#### **Maintenance services**

If required, IBM provides repair or exchange service depending on the types of maintenance service specified for the machine. IBM will attempt to resolve your problem over the telephone or electronically, through an IBM website. Certain machines contain remote support capabilities for direct problem reporting, remote problem determination, and resolution with IBM. You must follow the problem determination and resolution procedures that IBM specifies. Following problem determination, if IBM determines on-site service is required, scheduling of service will depend upon the time of your call, machine technology and redundancy, and availability of parts. Service levels are response-time objectives and are not guaranteed. The specified level of maintenance service may not be available in all worldwide locations. Additional charges may apply outside IBM's normal service area. Contact your local IBM representative or your reseller for country-specific and location-specific information.

The following service selections are available as maintenance options, at additional cost, for your machine type.

- IBM On-Site Repair, Next-Business-Day Response Target, Monday-Friday. Calls must be received by 3:00 PM local time in order to qualify for next-business-day response.
- IBM On-Site Repair, Same-Day On-Site Response Target, Monday-Friday 08:00-17:00 (excluding public holidays), Last Call Registration: 12:00.
- IBM On-Site Repair, Same-Day On-Site Response Target, Monday-Sunday 00:00-24:00, 365 days a year.

### **IBM Hardware Maintenance Services -- committed maintenance<sup>(1)</sup>**

Organizations can lose as much as USD100 million per year to downtime related to information and communications technology. IBM Hardware Maintenance Services -- committed maintenance can deliver different types of hardware service for IBM equipment from the moment you call for support worldwide (based on the countries in which IBM has a presence) and around the clock. Through clear response targets and standardized service-delivery metrics, we can help you optimize your IT infrastructure and can help reduce the threat of hardware-related outages.

For more information, visit: [IBM Hardware Maintenance Services - committed maintenance Data Sheet \(D\) - USEN](#)

<sup>(1)</sup> Currently not available in the US

### ***On-site Service***

IBM will repair the failing machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM machine. The area must be clean, well-lit, and suitable for the purpose.

### ***Customer Replaceable Unit (CRU) Service***

If your problem can be resolved with a CRU (for example, keyboard, mouse, speaker, memory, or hard disk drive), and depending upon the maintenance service offerings in your geography, IBM will ship the replacement CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM upon your request.

CRUs will be shipped based upon availability. IBM specifies, in the materials shipped with a replacement CRU, whether a defective CRU must be returned to IBM. When return is required, 1) return instructions and a container are shipped with the replacement CRU, and 2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

CRUs are designated as being either a Tier 1 (mandatory) or a Tier 2 (optional) CRU.

Tier 1 (mandatory) CRUs: Installation of Tier 1 CRUs, as specified in this announcement, is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.

For machines with On-site Same-day Response Service, IBM will replace a Tier 1 CRU part at your request, at no additional charge.

The following parts have been designated as Tier 1 CRUs:

- DASD SFF Drive
- DASD SSD Drive
- RDX Drive
- Enclosure
- Power Cable
- NVMe U.2
- SAS Card
- Op Panel -- Base
- Op Panel -- LCD
- Memory DIMM
- All PCI Adapters
- FAN
- Upper Fan cable
- TPM Card
- Power Supplies
- Service Processor Card/FSP

- TOD Battery
- Air Baffle
- Bezel
- SAS Cable Front
- Heatsink
- Service Cover
- DASD Backplane Power Cable
- DASD Backplane Signal Cable

Tier 2 (optional) CRUs: You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge.

Feature codes or models for which there is a maintenance charge:

9223-42S

### ***Additional reference for Europe***

The following European documents can be found on the [IBM Maintenance and Technical Support Services](#) website.

- European Announcement Letter ZS03-0150 for IBM Customer Agreement (ICA)
- European Announcement Letter ZS04-0135 for Enterprise Agreement Contract
- European Announcement Letter ZS98-0118 for ServiceSuite Contract

### ***Non-IBM parts service***

Under certain conditions, IBM provides services for selected non-IBM parts at no additional charge for machines that are covered under warranty service upgrades or maintenance services.

This service includes hardware problem determination (PD) on the non-IBM parts (for example, adapter cards, PCMCIA cards, disk drives, memory) installed within IBM machines and provides the labor to replace the failing parts at no additional charge.

If IBM has a Technical Service Agreement with the manufacturer of the failing part, or if the failing part is an accommodations part (a part with an IBM FRU label), IBM may also source and replace the failing part at no additional charge. For all other non-IBM parts, customers are responsible for sourcing the parts. Installation labor is provided at no additional charge, if the machine is covered under a warranty service upgrade or a maintenance service.

### ***Usage plan machine***

No

### ***IBM hourly service rate classification***

Three

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.

### ***Maintenance service offerings***

This machine is eligible under terms and conditions of IBM ServiceElite, the IBM Enterprise Service Agreement (ESA), or the IBM Maintenance Agreement. Consult your IBM representative for details.

### ***General terms and conditions***

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**Field-installable features**

Yes

**Model conversions**

No

**Machine installation**

Client setup. Clients are responsible for installation according to the instructions IBM provides with the machine.

**Graduated program license charges apply**

Yes

The applicable processor group is: Small.

**Licensed Machine Code**

IBM Machine Code is licensed for use by a client on the IBM machine for which it was provided by IBM under the terms and conditions of the IBM License Agreement for Machine Code, to enable the machine to function in accordance with its specifications, and only for the capacity authorized by IBM and acquired by the client. You can obtain the agreement by contacting your IBM representative. It can also be found on the [License Agreement for Machine Code and Licensed Internal Code](#)

Machine using LMC Type Model 9223-42S

Access to Machine Code updates is conditioned on entitlement and license validation in accordance with IBM policy and practice. IBM may verify entitlement through client number, serial number, electronic restrictions, or any other means or methods employed by IBM in its discretion.

If the machine does not function as warranted and your problem can be resolved through your application of downloadable Machine Code, you are responsible for downloading and installing these designated Machine Code changes as IBM specifies. If you would prefer, you may request IBM to install downloadable Machine Code changes; however, you may be charged for that service.

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**Prices**

For all local charges, contact your IBM representative.

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## **Announcement countries**

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All European, Middle Eastern, and African countries, except Islamic Republic of Iran, Sudan, and Syrian Arab Republic.

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