IBM Power System L922 server offers large memory footprint of up to 4 TB in a dense form factor and helps deliver high security and reliability for Enterprise Linux workloads

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At a glance

The IBM[(R)] Power[(R)] System L922 (9008-22L) server easily integrates into your organization's cloud and cognitive strategy and delivers industry-leading price/performance for your mission-critical workloads.

- Gain insights faster from your data with 4 TB in-memory database capabilities.
- Deliver superior price/performance for your mission-critical applications with room to scale in Linux[(R)] environments.
- Help guard against security threats with the server's features, reliability, and performance.
- Harness the integrated virtualization capabilities of the L922 to enable enterprises to rapidly deploy, optimize, and recover workloads.

The Power L922 server is a powerful 2-socket server that ships with up to 24 fully activated cores and I/O configuration flexibility to meet today's growth and tomorrow's processing needs. The server features:

- The following fully activated IBM POWER9[TM] processor module configurations in a 19-inch rack-mount, 2U (EIA units) form factor:
  - 8-core typical 3.4 to 3.9 GHz (max)
  - 10-core typical 2.9 to 3.8 GHz (max)
  - 12-core typical 2.7 to 3.8 GHz (max)
- Up to 4096 GB of DDR4 memory
- Storage backplane options:
  - Base Storage Backplane 8 SFF-3 Bays.
  - Split feature to 4+4 SFF-3 Bays: Add a second SAS Controller.
  - Expanded Function Storage Backplane 8 SFF-3 Bays/Single IOA with Write Cache.
- Optional PCIe3 NVMe carrier card with two M.2 module slots
- Expansion capabilities for the EXP12SX/EXP24SX SFF Gen2 bay Drawer
- Hot-plug PCIe Gen4 and Gen3 slots
- Integrated:
  - Service processor

- – EnergyScale™ technology
- – Hot-plug and redundant cooling
- – USB 3.0 ports
- – Two HMC ports
- – One system port with RJ45 connector
- Two hot-plug, redundant power supplies
- 19-inch rack-mounting hardware (2U)

Overview

The next generation of Power Systems™ servers with POWER9 technology is built with innovations that can help deliver security and reliability for the data-intensive workloads of today's enterprises. POWER9 technology is designed from the ground up for data-intensive workloads like databases and analytics.

This new server generation has twice the memory footprint of IBM POWER8^(R) servers, making it an ideal platform for in-memory and data-centric applications. Changes in the memory subsystem and the use of industry standard memory DIMMs take POWER9 technology to the next level by superseding a number of existing price/performance offerings. Designed to run commercial, cognitive, and database workloads, POWER9 technology provides a highly competitive server platform. Client references indicate POWER^(R) servers help provide a robust and secure backbone of their IT infrastructure. More companies are using POWER technology in their IT infrastructure down from the shop level to large data center deployments.

The Power L922 server by default has its Power Management mode set to Max Performance. 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 as other power management options available for this server, see the IBM EnergyScale for POWER9 Processor-Based Systems website.

The Power L922 server supports two processor sockets offering 8-core or 16-core typical 3.4 to 3.9 GHz (max), or 10-core or 20-core typical 2.9 to 3.8 GHz (max), or 24-core typical 2.7 to 3.8 GHz (max) POWER9 cores in a 19-inch rack-mount, 2U (EIA units) drawer configuration. All the cores are active.

The server supports a maximum of 32 DDR4 DIMM slots. Memory features supported are 16 GB, 32 GB, 64 GB, and 128 GB, and run at different speeds of 2133, 2400, and 2666 Mbps, offering a maximum system memory of 4096 GB.

- I/O options in the system unit, including:
  - – Three x16 Gen4 low-profile, half-length (Coherent Accelerator Processor Interface (CAPI))
  - – Two x8 Gen4 low-profile, half-length slots (with x16 connectors) (CAPI)
  - – Two x8 Gen3 low-profile, half-length slots (with x16 connectors)
  - – Two x8 Gen3 low-profile, half-length slots (One of these slots is used for the required base LAN adapter.)
  - – Eight 2.5-inch SFF-3 (Gen3 carrier) disk bays
  - – RAID 0, 5, 6, 10, 5T2, 6T2, and 10T2 support
  - – PCIe3 NVMe carrier card with two M.2 module slots
- Two front and two rear USB 3.0 ports
- Service processor
- 1+1 redundant hot-swap AC power supplies in each enclosure
- 19-inch rack-mount 2U configuration
- IBM PowerVM^(R) (IBM PowerVM for IBM PowerLinux™)

- Red Hat Enterprise Linux (RHEL), SUSE Linux Enterprise Server (SUSE), and Ubuntu Server operating system support

Feature exchange

Not applicable.

Key prerequisites

A Linux distribution is required. See the Software requirements section for details.

Planned availability date

March 20, 2018

Description

The POWER9 scale-out family is the first set of entry servers that comes completely cloud enabled out of the box with integrated PowerVM Enterprise capabilities. Additionally, on-chip analytics and algorithms 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 systems that are 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. The Power System L922 server has built-in security that can help you to be ready for current and future security threats.

Power Systems servers running Linux are designed to provide the ideal foundation for private and public cloud infrastructure.

Summary of standard features for Power L922:

- POWER9 processor modules:

  - 8-core, typical 3.4 to 3.9 GHz (max) POWER9 Processor (#ELPV)
  - 10-core, typical 2.9 to 3.8 GHz (max) POWER9 Processor (#ELPW)
  - 12-core, typical 2.7 to 3.8 GHz (max) POWER9 Processor (#ELPX)
- High-performance Mbps DDR4 ECC memory

  - 16 GB (#EM62), 32 GB (#EM63), 64 GB (#EM64), or 128 GB (#EM65) memory features - different sizes/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 feature: eight SFF bays, one integrated SAS controller without cache, and JBOD RAID 0, 5, 6, or 10

  - Optionally, split the above SFF-3 bays and add a second integrated SAS controller without cache.
  - Expanded Function Storage Backplane 8 SFF-3 Bays/Single IOA with Write Cache.
  - Optionally, attach an EXP12SX/EXP24SX SAS HDD/SSD Expansion Drawer to the single IOA.
- Up to two PCIe3 NVMe carrier cards with two M.2 module slots (with up to four mainstream 400 GB SSD NVMe M.2 modules)

- A quantity of one PCIe3 NVMe carrier card can be ordered only with a storage backplane. If a PCIe3 NVMe carrier card is ordered with a storage backplane, then the optional split feature is not supported.
- PCIe slots with single processor:
  - One x16 Gen4 low-profile, half-length (CAPI)
  - One x8 Gen4 low-profile, half-length (with x16 connector) (CAPI)
  - Two x8 Gen3 low-profile, half-length (with x16 connectors)
  - Two x8 Gen3 low-profile, half-length (One of these slots is used for the required base LAN adapter.)
- PCIe slots with two processors:
  - Three x16 Gen4 low-profile, half-length (CAPI)
  - Two x8 Gen4 low-profile, half-length (with x16 connectors) (CAPI)
  - Two x8 Gen3 low-profile, half-length (with x16 connectors)
  - Two x8 Gen3 low-profile, half-length (One of these slots is used for the required base LAN adapter.)
- Integrated:
  - Service processor
  - EnergyScale technology
  - Hot-plug and redundant cooling
  - Two front USB 3.0 ports
  - Two rear USB 3.0 ports
  - Two HMC 1 GbE RJ45 ports
  - One system port with RJ45 connector
  - Two hot-plug, redundant power supplies
  - 19-inch rack-mounting hardware (2U)

PowerVM

PowerVM, which delivers industrial-strength virtualization for IBM AIX$^{(R)}$ and Linux environments on POWER processor-based systems, has been enhanced with 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 L922 system configuration

The minimum Power L922 initial order must include a processor module, two 16 GB DIMMs, two power supplies and line cords, an operating system indicator, a cover set indicator, and a Language Group Specify. Also, it must include one of the storage options and the network options below:

Storage options:

- For boot from NVMe: One NVMe carrier and one NVMe M.2 Module.
- For boot from local SFF-3 HDD/SDD: One storage backplane and one SFF-3 HDD or SDD.
- 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 10Gb 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	
Processors			
ELPV	8-core, typical 3.4 to 3.9 GHz (max) POWER9 Processor	1	
or			
ELPW	10-core, typical 2.9 to 3.8 GHz (max) POWER9 Processor	1	
Processor activations			
ELAV	One Processor Core Activation for #ELPV	8	
or			
ELAW	One Processor Core Activation for #ELPW	10	
Memory DIMMs			
EM62	16 GB DDR4 Memory	2	
or			
EM63	32 GB DDR4 Memory	2	
or			
EM64	64 GB DDR4 Memory	2	
or			
EM65	128 GB DDR4 Memory	2	
Storage Backplane			
EL66	Storage Backplane 8 SFF-3 Bays	1	Optional split card EL68
or			
EC59	PCIe3 NVMe carrier card w/2 M.2 module slots	1	Must order, at a minimum, one of feature ES14
Disk Drive			
ELDB	300 GB 15K RPM SAS SFF-3 Disk Drive (Linux)	1	
LAN Adapter			
EL4M	PCIe2 LP 4-port 1 GbE Adapter	1	
Power supplies/ Power cord			
EL1B	AC Power Supply - 1400 W for Server (200 - 240 V AC)	2	
6458	Power Cord 4.3 m (14 ft), Drawer to IBM PDU (250V/10A)	2	6458 - (default)
9300/97xx	Language Group Specify		9300 - (default)

Feature number	Description	Quantity	Notes
Front Bezel			
EJUC	Front IBM Bezel for 8-Bay BackPlane		
or			
EJU7	Front OEM Bezel for 8-Bay BackPlane		
Operating System			
2147	Primary Operating System Indicator - Linux		

- 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.
- If NVMe carrier card feature EC59 is selected, no disk units are required to be ordered. If neither feature EC59 nor feature 0837 (SAN boot) is ordered, then at least one disk unit is required to be ordered. If no HDD/SSD/SAN boot (0837) is ordered, then feature EC59 (with at least one of #ES14) is the load source.
- Adapter feature EL4M is the default 1 Gb Ethernet adapter. Options of a 10 Gb Ethernet adapter include one of either EC2R, EC2T, EL38, EL3C, EL3Z, EN0T, or EN0V.

Processor modules

A maximum of two processors with eight processor cores (#ELPV), or two processors with ten processor cores (#ELPW), or two processors with twelve cores (#ELPX) is allowed. All processor cores must be activated. The following defines the allowed quantities of processor activation entitlements.

- One 8-core, typical 3.4 to 3.9 GHz (max) processor (#ELPV) requires that eight processor activation codes be ordered. A maximum of eight processor activations (#ELAV) is allowed.
- Two 8-core, typical 3.4 to 3.9 GHz (max) processors (#ELPV) require that sixteen processor activation codes be ordered. A maximum of 16 processor activations (#ELAV) is allowed.
- One 10-core, typical 2.9 to 3.8 GHz (max) processor (#ELPW) requires that ten processor activation codes be ordered. A maximum of 10 processor activation code features (#ELAW) is allowed.
- Two 10-core, typical 2.9 to 3.8 GHz (max) processors (#ELPW) require that twenty processor activation codes be ordered. A maximum of 20 processor activation code features (#ELAW) is allowed.
- Two 12-core, typical 2.7 to 3.8 GHz (max) processors (#ELPX) require that twenty-four processor activation codes be ordered. A maximum of 24 processor activation code features (#ELAX) is allowed.

System memory

- A minimum of 32 GB of memory is required on the Power L922 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	Feature number	Minimum DIMM quantity	Maximum DIMM quantity
16 GB DDR4 Memory	EM62	0	32
32 GB DDR4 Memory	EM63	0	32

Feature	Feature number	Minimum DIMM quantity	Maximum DIMM quantity
64 GB DDR4 Memory	EM64	0	32
128 GB DDR4 Memory	EM65	0	32

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

Power supply

- Two power supplies supporting a rack: 1+1 1400 Watt 200 - 240 Volt (#EL1B)

Redundant fans

Redundant fans are standard.

Power cords

Two power cords are required. A maximum of two feature 6458 cords is allowed on the system unless a valid I/O drawer or tower is attached to the system. The Power L922 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 L922 server has up to nine PCIe hot-plug slots, providing excellent configuration flexibility and expandability. For more information about the PCIe slots, see the **PCIe Gen3 I/O Drawer Cabling Option** section below.

With two POWER9 processor single-chip modules (SCM), nine PCIe slots are available: three are x16 Gen4 low-profile, half-length slots (CAPI), two are x8 Gen4 low-profile, half-length slots (with x16 connectors) (CAPI), two are x8 Gen3 low-profile, half-length slots (with x16 connectors), and two are x8 Gen3 low-profile, half-length slots (one of these slots is used for the required base LAN adapter).

With one POWER9 processor SCM, six PCIe slots are available: one is x16 Gen4 low-profile, half-length slots (CAPI), one is x8 Gen4 low-profile, half-length slots (with x16 connector) (CAPI), two are x8 Gen3 low-profile, half-length slots (with x16 connectors) and two are x8 Gen3 low-profile, 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 for 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 (#EL3B, #EL60, #EJ10, #EJ11, and #EJ14).

SAS bays and storage backplane options

- Storage Backplane 8 SFF-3 Bays (#EL66)
- Feature EL68 (4 + 4 SFF-3 Bays split backplane)
- Expanded Function Storage Backplane 8 SFF-3 Bays/Single IOA with Write Cache (#EL67)

The backplane option provides 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.

This backplane option uses leading-edge, integrated SAS RAID controller technology designed and patented by IBM. A custom-designed PowerPC(R) based ASIC chip is the basis of these SAS RAID controllers and provides industry-leading RAID 5 and RAID 6 performance levels, especially for SSDs. 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 EL66 Storage Backplane option provides eight SFF-3 bays and one SAS controller with zero write cache.

By optionally adding the feature EL68 Split Backplane, a second integrated SAS controller with no write cache is provided, and the eight SSF-3 bays are logically divided into two sets of four bays. Each SAS controller independently runs one of the four-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 four bays of the split backplane option. Note, if you are mixing HDDs and SSDs, they must be in separate arrays (unless using the Easy Tier(R) function).

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.

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 Linux and VIOS. It is highly recommended but not required that the drives be protected.

If the client needs a change after the server is already installed, the backplane option can be changed. For example, the feature EL68 Split Backplane feature can be added to an existing feature EL66 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 Backplane feature EL67 supports the optional attachment of an EXP12SX/EXP24SX drawer. 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/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 four USB ports. The two HMC ports are RJ45 supporting 1 Gb Ethernet connections.

The one system port is RJ45 and is supported by 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 the 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.

Four USB-3 ports are available for general client use, two are 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 defaulted to be placed horizontally 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 is allowed to 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 CSRP (#0469) is on the order. When specifying CSRP, 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.

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/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/performance option.

EXP24SX SAS Storage Enclosure (#ESLS/#ELLS)

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, S922, and S924 servers by AIX, IBM i, Linux, and VIOS. The EXP24SX drawer feature ELLS is supported on the Linux-only Power L922 server.

With AIX/Linux/VIOS, the EXP24SX can be ordered with four sets of six bays (mode 4), two sets of twelve bays (mode 2), or one set of twenty-four 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, it is very important that a skilled, technically qualified person 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 S914, S922, or S924 servers. The following PCIe3 SAS adapters support the EXP24SX:

- PCIe3 RAID SAS Adapter Quad-port 6 Gb x8 (#EJ0J, #EJ0M, #EL3B, or #EL59)
- 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, ECE3 is 3 meters long, and optical AA12 feature ECE4 is 4.5-meter long.

One no-charge specify code is used with each EXP24SX I/O Drawer (#ESLS/#ELLS) 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/ Controller	Cable to Drw	Environment
#EJW0	Mode 1	CEC SAS Ports	2 YO12 cables	AIX/IBM i/ Linux/VIOS
#EJW1	Mode 1	One (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 YO12 cable	AIX/IBM i/ Linux/VIOS
#EJW2	Mode 1	Two (one pair) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 YO12 cables	AIX/IBM i/ Linux/VIOS
#EJW3	Mode 2	Two (unpaired) #EJ0J/ #EJ0M/	2 X12 cables	AIX/Linux/ VIOS

Specify code	Mode	Adapter/ Controller	Cable to Drw	Environment
		#EL3B/ #EL59		
#EJW4	Mode 2	Four (two pair) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 X12 cables	AIX/Linux/ VIOS
#EJW5	Mode 4	Four (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 X12 cables	AIX/Linux/ VIOS
#EJW6	Mode 2	One (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 YO12 cables	AIX/Linux/ VIOS
#EJW7	Mode 2	Two (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 YO12 cables	AIX/Linux/ VIOS
#EJWF	Mode 1	Two (one pair) #EJ14	2 Y012 cables	AIX/IBM i/ Linux/VIOS
#EJWG	Mode 2	Two (one pair) #EJ14	2 X12 cables	AIX/Linux/ VIOS
#EJWJ	Mode 2	Four (two pair) #EJ14	2 X12 cables	AIX/Linux/ VIOS
#EJWU	Mode 1	Controller EJ1G/EL67	1 YO12 cables	Linux

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/ Controller	Cable to Drw	Environment
#EJWA (1/2 of #EJW7)	Mode 2	One (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 YO12 cables	AIX/Linux/ VIOS
#EJWB (1/2 of #EJW4)	Mode 2	Two (one pair) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 X12 cable	AIX/Linux/ VIOS
#EJWC (1/4 of #EJW5)	Mode 4	One (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 X12 cable	AIX/Linux/ VIOS
#EJWD (1/2 of #EJW5)	Mode 4	Two (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 X12 cables	AIX/Linux/ VIOS

Specify	Mode	Adapter/ Controller	Cable to Drw	Environment
#EJWE (3/4 of #EJW5)	Mode 4	Three (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 X12 cables	AIX/Linux/ VIOS
#EJWH (1/2 of #EJWJ)	Mode 2	Two (one pair) #EJ14	1 X12 cables	AIX/Linux/ 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 is 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/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.

EXP12SX SAS Storage Enclosure (#ESLL/#ELLL)

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/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, S922, and S924 servers by AIX, Linux, and VIOS. The EXP24SX drawer feature ELLL is supported on the Linux-only Power L922 server.

With AIX/Linux/VIOS, the EXP12SX enclosure can be ordered with four sets of three bays (mode 4), two sets of six bays (mode 2), or one set of twelve 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, 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, S922, or S924 server. The following PCIe3 SAS adapters support the EXP12SX:

- PCIe3 RAID SAS Adapter Quad-port 6 Gb x8 (#EJ0J or #EJ0M or #EL3B or #EL59)
- 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-meter long, feature ECE3 is 3-meter long, and optical AA12 feature ECE4 is 4.5-meter long.

One no-charge specify code is used with each EXP12SX I/O Drawer (#ELLL/#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.

Specify	Mode	Adapter/ Controller	Cable to Drw	Environment
#EJV0	Mode 1	CEC SAS Ports	2 YO12 cables	AIX/Linux/ VIOS
#EJV1	Mode 1	One (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 YO12 cable	AIX/Linux/ VIOS
#EJV2	Mode 1	Two (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 YO12 cables	AIX/Linux/ VIOS
#EJV3	Mode 2	Two (one pair) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 X12 cables	AIX/Linux/ VIOS
#EJV4	Mode 2	Four (two pair) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 X12 cables	AIX/Linux/ VIOS
#EJV5	Mode 4	Four (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 X12 cables	AIX/Linux/ VIOS
#EJV6	Mode 2	One (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 YO12 cables	AIX/Linux/ VIOS
#EJV7	Mode 2	Two (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 YO12 cables	AIX/Linux/ VIOS
#EJVF	Mode 1	Two #EJ14 (one pair)	2 YO12 cables	AIX/Linux/ VIOS
#EJVG	Mode 2	Two #EJ14 (one pair)	2 X12 cables	AIX/Linux/ VIOS
#EJVJ	Mode 2	Four #EJ14 (two pair)	2 X12 cable	AIX/Linux/ VIOS
#EJVU	Mode 1	Controller EJ1G/EL67	1 YO12 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/ Controller	Cable to Drw	Environment
#EJVA (1/2 of #EJV7)	Mode 2	One (unpaired) #EJ0J/ #EJ0M/	1 YO12 cables	AIX/Linux/ VIOS

Specify	Mode	Adapter/ Controller	Cable to Drw	Environment
		#EL3B/ #EL59		
#EJVB (1/2 of #EJV4)	Mode 2	One pair #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 X12 cable	AIX/Linux/ VIOS
#EJVC (1/4 of #EJV5)	Mode 4	One (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 X12 cable	AIX/Linux/ VIOS
#EJVD (2/4 of #EJV5)	Mode 4	Two (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	1 X12 cables	AIX/Linux/ VIOS
#EJVE (3/4 of #EJV5)	Mode 4	Three (unpaired) #EJ0J/ #EJ0M/ #EL3B/ #EL59	2 X12 cables	AIX/Linux/ 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 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 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 7200 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.

EXP12SX drives for feature ESLL (multi-OS) are the 3.86 TB/4.0 TB 4k 7200 RPM (#ES62) and 7.72 TB/8.0 TB 4k 7200 RPM (#ES64) drives. Drives for feature ELLL (Linux-only) are the 3.86 TB/4.0 TB 4k 7200 RPM (#EL62) and the 7.72 TB/8.0 TB 4k 7200 RPM (#EL64) drives.

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/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 m is offered. Note that the cable management arm of the scale-out servers requires about 1 m 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) PDUs

The high-function PDUs (power distribution units) provide switching, better monitoring, and 50% more C19 receptacles than previous Power System 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
12 x C13	#EPTQ	#EPTN
9 x C19	#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. The PDU is shipped with a generic PDU password, and IBM strongly urges clients to change it upon installation. These PDUs do provide the same low price as the low-function 12xC13 PDU feature (#7188).

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:

- Design for Customer Set Up (CSU), Customer Installed Features (CIF), and Customer Replaceable Units (CRU)
- Error Detection and Fault Isolation (ED/FI)
- First Failure Data Capture (FFDC)
- Lightpath service indicators
- Service labels and service diagrams available on the system and delivered through IBM Knowledge Center
- Step-by-step service procedures documented in IBM Knowledge Center or available through the Hardware Management Console
- Automatic reporting of serviceable events to IBM through the Electronic Service Agent™ Call Home application
- CRU videos planned to be available on the web at general availability
- Mobile access to important customer service functions available by scanning a QR label

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 servicer 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 servicer 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 a Linux 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.

Accessibility by people with disabilities

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be found on the Product accessibility information website.

Section 508 of the US Rehabilitation Act

The Power L922 server (9008-22L) is capable as of March 20, 2018, when used in accordance with IBM's associated documentation, of satisfying the applicable requirements of Section 508 of the Rehabilitation Act, provided that any assistive technology used with the product properly interoperates with it. A US Section 508 Voluntary Product Accessibility Template (VPAT) can be found on the Product accessibility information website.

Product positioning

IBM is leading the cognitive and cloud space. Integrated cloud capabilities in POWER9 go in line with IBM's cloud strategy and enable you to connect current enterprise data with cloud-based AI or analytics offerings like Watson™. IBM gives you best-in-class on-premises cloud deployment possibilities with this announcement in addition to the off-premises portfolio already maintained. And IBM applies that innovation to cognitive infrastructure, helping you on your journey to AI.

IBM aligns cutting-edge innovation with enterprise dependability: IBM has over 105 years of aligning continuous innovation with clients' business needs.

The POWER9 scale-out family delivers a set of entry servers that comes cloud enabled out of the box with integrated PowerVM Enterprise capabilities. Additionally, on-chip analytics and algorithms 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 systems that are 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. The Power L922 server has built-in security that can help you be ready for current and future security threats.

Product number

The following are newly announced features on the specific models of the IBM Power Systems 9008 machine type:

Description	Machine type	Model	Feature number
IBM Power System L922	9008	22L	
One CSC Billing Unit	9008	22L	0010
Ten CSC Billing Units	9008	22L	0011
Linux Partition Specify	9008	22L	0266
V.24/EIA232 6.1m (20-Ft) PCI Cable	9008	22L	0348
V.35 6.1m (20-Ft) PCI Cable	9008	22L	0353
X.21 6.1m (20-Ft) PCI Cable	9008	22L	0359
Customer Specified Placement	9008	22L	0456
19 inch, 1.8 meter high rack	9008	22L	0551
19 inch, 2.0 meter high rack	9008	22L	0553
Rack Filler Panel Kit	9008	22L	0599
Load Source Not in CEC	9008	22L	0719
SAN Load Source Specify	9008	22L	0837
US TAA Compliance Indicator	9008	22L	0983
Product assembled in USA manufacturing plant	9008	22L	0984
USB 500 GB Removable Disk Drive	9008	22L	1107
3m, Blue Cat5e Cable	9008	22L	1111
10m, Blue Cat5e Cable	9008	22L	1112
25m, Blue Cat5e Cable	9008	22L	1113
CAT5E Ethernet Cable, 3M GREEN	9008	22L	1115
CAT5E Ethernet Cable, 10M GREEN	9008	22L	1116
3m, Yellow Cat5e Cable	9008	22L	1118
10m, Yellow Cat5e Cable	9008	22L	1119

Custom Service Specify, Rochester Minn, USA	9008	22L	1140
Primary OS - Linux	9008	22L	2147
Factory Deconfiguration of 1-core	9008	22L	2319
2M LC-SC 50 Micron Fiber Converter Cable	9008	22L	2456
2M LC-SC 62.5 Micron Fiber Converter Cable	9008	22L	2459
3M Asynchronous Terminal/Printer Cable EIA-232	9008	22L	2934
Asynchronous Cable EIA-232/V.24 3M	9008	22L	2936
Serial-to-Serial Port Cable for Drawer/Drawer-3.7M	9008	22L	3124
Serial-to-Serial Port Cable for Rack/Rack- 8M	9008	22L	3125
Widescreen LCD Monitor	9008	22L	3632
0.3M Serial Port Converter Cable, 9-Pin to 25-Pin	9008	22L	3925
Serial Port Null Modem Cable, 9-pin to 9-pin, 3.7M	9008	22L	3927
Serial Port Null Modem Cable, 9-pin to 9-pin, 10M	9008	22L	3928
System Serial Port Converter Cable	9008	22L	3930
1.8 M (6-ft) Extender Cable for Displays (15-pin D-shell to 15-pin D-shell)	9008	22L	4242
Extender Cable - USB Keyboards, 1.8M	9008	22L	4256
VGA to DVI Connection Converter	9008	22L	4276
Rack Integration Services: BP only	9008	22L	4648
Rack Integration Services	9008	22L	4649
Rack Indicator- Not Factory Integrated	9008	22L	4650
Rack Indicator, Rack #1	9008	22L	4651
Rack Indicator, Rack #2	9008	22L	4652
Rack Indicator, Rack #3	9008	22L	4653
Rack Indicator, Rack #4	9008	22L	4654
Rack Indicator, Rack #5	9008	22L	4655
Rack Indicator, Rack #6	9008	22L	4656
Rack Indicator, Rack #7	9008	22L	4657
Rack Indicator, Rack #8	9008	22L	4658
Rack Indicator, Rack #9	9008	22L	4659
Rack Indicator, Rack #10	9008	22L	4660
Rack Indicator, Rack #11	9008	22L	4661
Rack Indicator, Rack #12	9008	22L	4662
Rack Indicator, Rack #13	9008	22L	4663
Rack Indicator, Rack #14	9008	22L	4664
Rack Indicator, Rack #15	9008	22L	4665
Rack Indicator, Rack #16	9008	22L	4666
Software Preload Required	9008	22L	5000
PCIe LP POWER GXT145 Graphics Accelerator	9008	22L	5269
PCIe2 8Gb 4-port Fibre Channel Adapter	9008	22L	5729
4 Port Async EIA-232 PCIe Adapter	9008	22L	5785
PCIe2 4-port 1GbE Adapter	9008	22L	5899
Opt Front Door for 1.8m Rack	9008	22L	6068
Opt Front Door for 2.0m Rack	9008	22L	6069
1.8m Rack Acoustic Doors	9008	22L	6248
2.0m Rack Acoustic Doors	9008	22L	6249
1.8m Rack Trim Kit	9008	22L	6263
2.0m Rack Trim Kit	9008	22L	6272
Power Cord 4.3m (14-ft), Drawer to IBM PDU (250V/10A)	9008	22L	6458
Power Cord 4.3m (14-ft), Drawer To OEM PDU (125V, 15A)	9008	22L	6460
Power Cord 4.3m (14-ft), Drawer to Wall/OEM PDU (250V/15A) U. S.	9008	22L	6469
Power Cord 1.8m (6-ft), Drawer to Wall (125V/15A)	9008	22L	6470
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU (250V/10A)	9008	22L	6471
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU (250V/16A)	9008	22L	6472
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU (250V/10A)	9008	22L	6473
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU, (250V/13A)	9008	22L	6474
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU, (250V/16A)	9008	22L	6475
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU, (250V/10A)	9008	22L	6476
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU, (250V/16A)	9008	22L	6477
Power Cord 2.7 M(9-foot), To Wall/OEM PDU, (250V, 16A)	9008	22L	6478
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU,			

(125V/15A or 250V/10A)	9008	22L	6488
4.3m (14-Ft) 3PH/24A 380-415V Power Cord	9008	22L	6489
4.3m (14-Ft) 1PH/63A 200-240V Power Cord	9008	22L	6491
4.3m (14-Ft) 1PH/48-60A 200-240V Power Cord	9008	22L	6492
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU, (250V/10A)	9008	22L	6493
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU, (250V/10A)	9008	22L	6494
Power Cord 2.7M (9-foot), To Wall/OEM PDU, (250V, 10A)	9008	22L	6496
Power Cable - Drawer to IBM PDU, 200-240V/10A	9008	22L	6577
Optional Rack Security Kit	9008	22L	6580
Power Cord 2.7M (9-foot), To Wall/OEM PDU, (125V, 15A)	9008	22L	6651
4.3m (14-Ft) 3PH/16A 380-415V Power Cord	9008	22L	6653
4.3m (14-Ft) 1PH/24-30A Pwr Cord	9008	22L	6654
4.3m (14-Ft) 1PH/24-30A WR Pwr Cord	9008	22L	6655
4.3m (14-Ft) 1PH/24A Power Cord	9008	22L	6656
4.3m (14-Ft) 1PH/32A Power Cord	9008	22L	6657
4.3m (14-Ft) 1PH/24A Pwr Cd-Korea	9008	22L	6658
Power Cord 2.7M (9-foot), To Wall/OEM PDU, (250V, 15A)	9008	22L	6659
Power Cord 4.3m (14-ft), Drawer to Wall/OEM PDU (125V/15A)	9008	22L	6660
Power Cord 2.8m (9.2-ft), Drawer to IBM PDU, (250V/10A)	9008	22L	6665
4.3m (14-Ft) 3PH/32A 380-415V Power Cord-Australia	9008	22L	6667
Power Cord 4.3M (14-foot), Drawer to OEM PDU, (250V, 15A)	9008	22L	6669
Power Cord 2.7M (9-foot), Drawer to IBM PDU, 250V/10A	9008	22L	6671
Power Cord 2M (6.5-foot), Drawer to IBM PDU, 250V/10A	9008	22L	6672
Power Cord 2.7m (9-ft), Drawer to Wall/OEM PDU, (250V/10A)	9008	22L	6680
Intelligent PDU+, 1 EIA Unit, Universal UTG0247 Connector	9008	22L	7109
Environmental Monitoring Probe	9008	22L	7118
Power Distribution Unit	9008	22L	7188
Power Distribution Unit (US) - 1 EIA Unit, Universal, Fixed Power Cord	9008	22L	7196
Ethernet Cable, 15m, Hardware Management Console to System Unit	9008	22L	7802
Linux Software Preinstall	9008	22L	8143
USB Mouse	9008	22L	8845
Order Routing Indicator- System Plant	9008	22L	9169
Language Group Specify - US English	9008	22L	9300
New Red Hat License Core Counter	9008	22L	9442
New SUSE License Core Counter	9008	22L	9443
Other Linux License Core Counter	9008	22L	9445
3rd Party Linux License Core Counter	9008	22L	9446
VIOS Core Counter	9008	22L	9447
Other License Core Counter	9008	22L	9449
Ubuntu Linux License Core Counter	9008	22L	9450
Month Indicator	9008	22L	9461
Day Indicator	9008	22L	9462
Hour Indicator	9008	22L	9463
Minute Indicator	9008	22L	9464
Qty Indicator	9008	22L	9465
Countable Member Indicator	9008	22L	9466
Language Group Specify - Dutch	9008	22L	9700
Language Group Specify - French	9008	22L	9703
Language Group Specify - German	9008	22L	9704
Language Group Specify - Polish	9008	22L	9705
Language Group Specify - Norwegian	9008	22L	9706
Language Group Specify - Portuguese	9008	22L	9707
Language Group Specify - Spanish	9008	22L	9708
Language Group Specify - Italian	9008	22L	9711
Language Group Specify - Canadian French	9008	22L	9712
Language Group Specify - Japanese	9008	22L	9714
Language Group Specify - Traditional Chinese (Taiwan)	9008	22L	9715
Language Group Specify - Korean	9008	22L	9716

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Language Group Specify - Turkish                     9008  22L    9718
Language Group Specify - Hungarian                   9008  22L    9719
Language Group Specify - Slovakian                   9008  22L    9720
Language Group Specify - Russian                     9008  22L    9721
Language Group Specify - Simplified Chinese (PRC)    9008  22L    9722
Language Group Specify - Czech                       9008  22L    9724
Language Group Specify - Romanian                    9008  22L    9725
Language Group Specify - Croatian                    9008  22L    9726
Language Group Specify - Slovenian                   9008  22L    9727
Language Group Specify - Brazilian Portuguese        9008  22L    9728
Language Group Specify - Thai                        9008  22L    9729


10m (30.3-ft), IBM Passive QSFP+ MTP Optical
Cable                                                9008  22L    EB2J
30m (90.3-ft), IBM Passive QSFP+ MTP Optical
Cable                                                9008  22L    EB2K
Lift tool based on GenieLift GL-8 (standard)         9008  22L    EB3Z
10Gb Optical Transceiver SFP+                        9008  22L    EB46
25Gb Optical Transceiver SFP28                       9008  22L    EB47
0.5m SFP28/25GbE copper Cable                        9008  22L    EB4J
1.0m SFP28/25GbE copper Cable                        9008  22L    EB4K
1.5m SFP28/25GbE copper Cable                        9008  22L    EB4L
2.0m SFP28/25GbE copper Cable                        9008  22L    EB4M
2.0m QSFP28/100GbE copper split Cable to SFP28
4x25GbE                                              9008  22L    EB4P
Service wedge shelf tool kit for EB3Z                9008  22L    EB4Z
0.5m EDR IB Copper Cable QSFP28                      9008  22L    EB50
1.0m EDR IB Copper Cable QSFP28                      9008  22L    EB51
2.0M EDR IB Copper Cable QSFP28                      9008  22L    EB52
1.5M EDR IB Copper Cable QSFP28                      9008  22L    EB54
100Gb Optical Transceiver QSFP28                     9008  22L    EB59
3M EDR IB Optical Cable QSFP28                       9008  22L    EB5A
5M EDR IB Optical Cable QSFP28                       9008  22L    EB5B
10M EDR IB Optical Cable QSFP28                      9008  22L    EB5C
15M EDR IB Optical Cable QSFP28                      9008  22L    EB5D
20M EDR IB Optical Cable QSFP28                      9008  22L    EB5E
30M EDR IB Optical Cable QSFP28                      9008  22L    EB5F
50M EDR IB Optical Cable QSFP28                      9008  22L    EB5G
100M EDR IB Optical Cable QSFP28                     9008  22L    EB5H
0.5M 100GbE Copper Cable QSFP28                      9008  22L    EB5J
1.0M 100GbE Copper Cable QSFP28                      9008  22L    EB5K
1.5M 100GbE Copper Cable QSFP28                      9008  22L    EB5L
2.0M 100GbE Copper Cable QSFP28                      9008  22L    EB5M
25M EDR IB Optical Cable QSFP28                      9008  22L    EB5N
3M 100GbE Optical Cable QSFP28 (AOC)                 9008  22L    EB5R
5M 100GbE Optical Cable QSFP28 (AOC)                 9008  22L    EB5S
10M 100GbE Optical Cable QSFP28 (AOC)                9008  22L    EB5T
15M 100GbE Optical Cable QSFP28 (AOC)                9008  22L    EB5U
20M 100GbE Optical Cable QSFP28 (AOC)                9008  22L    EB5V
30M 100GbE Optical Cable QSFP28 (AOC)                9008  22L    EB5W
50M 100GbE Optical Cable QSFP28 (AOC)                9008  22L    EB5X
100M 100GbE Optical Cable QSFP28 (AOC)               9008  22L    EB5Y
Rack Front Door (Black)                              9008  22L    EC01
Rack Rear Door                                       9008  22L    EC02
Rack Side Cover                                      9008  22L    EC03
Rack Suite Attachment Kit                            9008  22L    EC04
Slim Rear Acoustic Door                              9008  22L    EC07
Slim Front Acoustic Door                             9008  22L    EC08
Rear Door Heat Exchanger for 2.0 Meter Slim Rack     9008  22L    EC15
IBM PowerVM for IBM PowerLinux                       9008  22L    EC22
PCIe3 LP 2-Port 10Gb NIC&ROCE SR/Cu Adapter          9008  22L    EC2R
PCIe3 2-Port 10Gb NIC&ROCE SR/Cu Adapter             9008  22L    EC2S
PCIe3 LP 2-Port 25/10Gb NIC&ROCE SR/Cu Adapter       9008  22L    EC2T
PCIe3 2-Port 25/10Gb NIC&ROCE SR/Cu Adapter          9008  22L    EC2U
PCIe3 LP 2-port 100GbE (NIC& RoCE) QSFP28
Adapter x16                                          9008  22L    EC3L
PCIe3 NVMe carrier card w/2 M.2 module slots         9008  22L    EC59
PCIe4 LP 1-port 100Gb EDR IB CAPI adapter            9008  22L    EC62
PCIe4 LP 2-port 100Gb EDR IB CAPI adapter            9008  22L    EC64
SAS X Cable 3m - HD Narrow 6Gb 2-Adapters to
Enclosure                                            9008  22L    ECBJ
SAS X Cable 6m - HD Narrow 6Gb 2-Adapters to
Enclosure                                            9008  22L    ECBK
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Description			
SAS X Cable 10m - HD Narrow 6Gb 2-Adapters to Enclosure	9008	22L	ECBL
SAS X Cable 15m - HD Narrow 3Gb 2-Adapters to Enclosure	9008	22L	ECBM
SAS YO Cable 1.5m - HD Narrow 6Gb Adapter to Enclosure	9008	22L	ECBT
SAS YO Cable 3m - HD Narrow 6Gb Adapter to Enclosure	9008	22L	ECBU
SAS YO Cable 6m - HD Narrow 6Gb Adapter to Enclosure	9008	22L	ECBV
SAS YO Cable 10m - HD Narrow 6Gb Adapter to Enclosure	9008	22L	ECBW
SAS YO Cable 15m - HD Narrow 3Gb Adapter to Enclosure	9008	22L	ECBX
SAS AE1 Cable 4m - HD Narrow 6Gb Adapter to Enclosure	9008	22L	ECBY
SAS YE1 Cable 3m - HD Narrow 6Gb Adapter to Enclosure	9008	22L	ECBZ
SAS AA Cable 0.6m - HD Narrow 6Gb Adapter to Adapter	9008	22L	ECC0
SAS AA Cable 1.5m - HD Narrow 6Gb Adapter to Adapter	9008	22L	ECC2
SAS AA Cable 3m - HD Narrow 6Gb Adapter to Adapter	9008	22L	ECC3
SAS AA Cable 6m - HD Narrow 6Gb Adapter to Adapter	9008	22L	ECC4
SAS Cable	9008	22L	ECC5
3M Optical Cable Pair for PCIe3 Expansion Drawer	9008	22L	ECC7
10M Optical Cable Pair for PCIe3 Expansion Drawer	9008	22L	ECC8
System Port Converter Cable for UPS	9008	22L	ECCF
Variable Length, Blue Cat5e Cable	9008	22L	ECCG
Variable Length, Green Cat5e Cable	9008	22L	ECCH
3M Copper CXP Cable Pair for PCIe3 Expansion Drawer	9008	22L	ECCS
3.0M SAS X12 Cable (Two Adapter to Enclosure)	9008	22L	ECDJ
4.5M SAS X12 Active Optical Cable (Two Adapter to Enclosure)	9008	22L	ECDK
10M SAS X12 Active Optical Cable (Two Adapter to Enclosure)	9008	22L	ECDL
1.5M SAS YO12 Cable (Adapter to Enclosure)	9008	22L	ECDT
3.0M SAS YO12 Cable (Adapter to Enclosure)	9008	22L	ECDU
4.5M SAS YO12 Active Optical Cable (Adapter to Enclosure)	9008	22L	ECDV
10M SAS YO12 Active Optical Cable (Adapter to Enclosure)	9008	22L	ECDW
0.6M SAS AA12 Cable (Adapter to Adapter)	9008	22L	ECE0
3.0M SAS AA12 Cable	9008	22L	ECE3
4.5M SAS AA12 Active Optical Cable (Adapter to Adapter)	9008	22L	ECE4
2.0 Meter Slim Rack	9008	22L	ECR0
Rack Front Door High-End appearance	9008	22L	ECRF
Rack Rear Door Black	9008	22L	ECRG
Rack Side Cover	9008	22L	ECRJ
Rack Rear Extension 5-In	9008	22L	ECRK
Rack Front Door for Rack (Black/Flat)	9008	22L	ECRM
Indicator Assembled and Tested in China	9008	22L	ECS0
Custom Service Specify, Montpellier, France	9008	22L	ECSF
NeuCloud Indicator/Specify	9008	22L	ECSJ
Custom Service Specify, Mexico	9008	22L	ECSM
Custom Service Specify, Poughkeepsie, USA	9008	22L	ECSP
Integrated Solution Packing	9008	22L	ECSS
Optical Wrap Plug	9008	22L	ECW0
Boot Drive / Load Source in EXP12SX Specify (in #ESLL or #ELLL)	9008	22L	EHR1
Boot Drive / Load Source in EXP24SX Specify (in #ESLS or #ELLS)	9008	22L	EHR2
SSD Placement Indicator - #ESLS/#ELLS	9008	22L	EHS2
SAS Port/Cabling for single IOA Backplane	9008	22L	EJ00
PCIe3 Optical Cable Adapter for PCIe3 Expansion Drawer	9008	22L	EJ05
PCIe3 SAS Tape/DVD Adapter Quad-port 6Gb x8	9008	22L	EJ10
PCIe3 12GB Cache RAID PLUS SAS Adapter Quad-port 6Gb x8	9008	22L	EJ14
PCIe3 Crypto Coprocessor BSC-Gen3 4767	9008	22L	EJ33

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Non-paired Indicator EJ14 PCIe SAS RAID+ Adapter  9008  22L  EJRL
Front OEM Bezel for 8-Bay BackPlane               9008  22L  EJU7
Front IBM Bezel for 8-Bay BackPlane               9008  22L  EJUC
Specify Mode-1 & (1)EJ0J/EJ0M/EL3B/EL59 &
(1)YO12 for EXP12SX #ESLL/ELLL                     9008  22L  EJV1
Specify Mode-1 & (2)EJ0J/EJ0M/EL3B/EL59 &
(2)YO12 for EXP12SX #ESLL/ELLL                     9008  22L  EJV2
Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP12SX #ESLL/ELLL                             9008  22L  EJV3
Specify Mode-2 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP12SX #ESLL/ELLL                             9008  22L  EJV4
Specify Mode-4 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP12SX #ESLL/ELLL                             9008  22L  EJV5
Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 &
(2)YO12 for EXP12SX #ESLL/ELLL                     9008  22L  EJV6
Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 &
(2)YO12 for EXP12SX #ESLL/ELLL                     9008  22L  EJV7
Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 &
(1)YO12 for EXP12SX #ESLL/ELLL                     9008  22L  EJVA
Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12
for EXP12SX #ESLL/ELLL                             9008  22L  EJVB
Specify Mode-4 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)X12
for EXP12SX #ESLL/ELLL                             9008  22L  EJVC
Specify Mode-4 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12
for EXP12SX #ESLL/ELLL                             9008  22L  EJVD
Specify Mode-4 & (3)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP12SX #ESLL/ELLL                             9008  22L  EJVE
Specify Mode-1 & (2)EJ14 & (2)YO12 for EXP12SX
#ESLL/ELLL                                         9008  22L  EJVF
Specify Mode-1 & Controller & (1)YO12 for
EXP12SX #ESLL/ELLL                                 9008  22L  EJVU
Specify Mode-1 & (1)EJ0J/EJ0M/EL3B/EL59 &
(1)YO12 for EXP24SX #ESLS/ELLS                     9008  22L  EJW1
Specify Mode-1 & (2)EJ0J/EJ0M/EL3B/EL59 &
(2)YO12 for EXP24SX #ESLS/ELLS                     9008  22L  EJW2
Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP24SX #ESLS/ELLS                             9008  22L  EJW3
Specify Mode-2 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP24SX #ESLS/ELLS                             9008  22L  EJW4
Specify Mode-4 & (4)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP24SX #ESLS/ELLS                             9008  22L  EJW5
Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 &
(2)YO12 for EXP24SX #ESLS/ELLS                     9008  22L  EJW6
Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 &
(2)YO12 for EXP24SX #ESLS/ELLS                     9008  22L  EJW7
Specify Mode-2 & (1)EJ0J/EJ0M/EL3B/EL59 &
(1)YO12 for EXP24SX #ESLS/ELLS                     9008  22L  EJWA
Specify Mode-2 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12
for EXP24SX #ESLS/ELLS                             9008  22L  EJWB
Specify Mode-4 & (1)EJ0J/EJ0M/EL3B/EL59 & (1)X12
for EXP24SX #ESLS/ELLS                             9008  22L  EJWC
Specify Mode-4 & (2)EJ0J/EJ0M/EL3B/EL59 & (1)X12
for EXP24SX #ESLS/ELLS                             9008  22L  EJWD
Specify Mode-4 & (3)EJ0J/EJ0M/EL3B/EL59 & (2)X12
for EXP24SX #ESLS/ELLS                             9008  22L  EJWE
Specify Mode-1 & (2)EJ14 & (2)YO12 for EXP24SX
#ESLS/ELLS                                         9008  22L  EJWF
Specify Mode-2 & (2)EJ14 & (2)X12 for EXP24SX
#ESLS/ELLS                                         9008  22L  EJWG
Specify Mode-2 & (2)EJ14 & (1)X12 for EXP24SX
#ESLS/ELLS                                         9008  22L  EJWH
Specify Mode-2 & (4)EJ14 & (2)X12 for EXP24SX
#ESLS/ELLS                                         9008  22L  EJWJ
Specify Mode-1 & Controller & (1)YO12 for
EXP24SX #ESLS/ELLS                                 9008  22L  EJWU
AC Power Supply - 1400W (200-240 VAC)              9008  22L  EL1B
300GB 15k RPM SAS SFF-2 Disk Drive (Linux)         9008  22L  EL1P
600GB 10k RPM SAS SFF-2 Disk Drive (Linux)         9008  22L  EL1Q
PCIe LP 8Gb 2-Port Fibre Channel Adapter           9008  22L  EL2N
PCIe3 LP 4-port (10Gb FCoE & 1GbE) SRIOV SR&RJ45   9008  22L  EL38
PCIe3 LP RAID SAS Adapter Quad-Port 6Gb x8         9008  22L  EL3B
PCIe3 LP 4-port(10Gb FCoE & 1GbE) SFP+Copper&RJ45  9008  22L  EL3C
PCIe2 LP 2-port 10/1GbE BaseT RJ45 Adapter         9008  22L  EL3Z
PCIe3 LP 2-port 16Gb Fibre Channel Adapter         9008  22L  EL43
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PCIe2 4-port 1GbE Adapter	9008	22L	EL4L
PCIe2 LP 4-port 1GbE Adapter	9008	22L	EL4M
PCIe2 2-port 10/1GbE BaseT RJ45 Adapter	9008	22L	EL55
PCIe3 4-port (10Gb FCoE & 1GbE) SR&RJ45	9008	22L	EL56
PCIe3 4-port (10Gb FCoE & 1GbE) SFP+Copper&RJ45	9008	22L	EL57
PCIe 8Gb 2-port Fibre Channel Adapter	9008	22L	EL58
PCIe3 RAID SAS Adapter Quad-port 6Gb x8	9008	22L	EL59
PCIe3 16Gb 2-port Fibre Channel Adapter	9008	22L	EL5B
PCIe3 32Gb 2-port Fibre Channel Adapter	9008	22L	EL5U
PCIe3 LP 2-port 32Gb Fibre Channel Adapter	9008	22L	EL5V
PCIe3 16Gb 4-port Fibre Channel Adapter	9008	22L	EL5W
PCIe3 LP 16Gb 4-port Fibre Channel Adapter	9008	22L	EL5X
PCIe3 LP SAS Tape/DVD Adapter Quad-port 6Gb x8	9008	22L	EL60
3.82-4.0 TB 7200 RPM 4K SAS LFF-1 Nearline Disk Drive (Linux)	9008	22L	EL62
7.72-8.0 TB 7200 RPM 4K SAS LFF-1 Nearline Disk Drive (Linux)	9008	22L	EL64
Base Storage Backplane 8 SFF-3 Bays	9008	22L	EL66
Expanded Function Storage Backplane 8 SFF-3 Bays/ Single IOA with Write Cache	9008	22L	EL67
Split #EL66 to 4+4 SFF-3 Bays: Add 2nd SAS Controller	9008	22L	EL68
387GB SFF-2 SSD 5xx eMLC4 for Linux	9008	22L	EL78
775GB SFF-2 SSD 5xx eMLC4 for Linux	9008	22L	EL7E
387GB SFF-3 SSD 5xx eMLC4 for Linux	9008	22L	EL7K
775GB SFF-3 SSD 5xx eMLC4 for Linux	9008	22L	EL7P
1.9TB Read Intensive SAS 4k SFF-2 SSD for Linux	9008	22L	EL80
931GB Mainstream SAS 4k SFF-3 SSD for Linux	9008	22L	EL83
387GB SFF-2 SSD 4k eMLC4 for Linux	9008	22L	EL85
775GB SFF-2 SSD 4k eMLC4 for Linux	9008	22L	EL8C
1.55TB SFF-2 SSD 4k eMLC4 for Linux	9008	22L	EL8F
1.9TB Read Intensive SAS 4k SFF-3 SSD for Linux	9008	22L	EL8J
387GB SFF-3 SSD 4k eMLC4 for Linux	9008	22L	EL8N
775GB SFF-3 SSD 4k eMLC4 for Linux	9008	22L	EL8Q
1.55TB SFF-3 SSD 4k eMLC4 for Linux	9008	22L	EL8V
931GB Mainstream SAS 4k SFF-2 SSD for Linux	9008	22L	EL8Y
1.86TB Mainstream SAS 4k SFF-3 SSD for Linux	9008	22L	EL92
1.86TB Mainstream SAS 4k SFF-2 SSD for Linux	9008	22L	EL96
One Processor Core Activation for #ELPV	9008	22L	ELAV
One Processor Core Activation for #ELPW	9008	22L	ELAW
One Processor Core Activation for #ELPX	9008	22L	ELAX
PDU Access Cord 0.38m	9008	22L	ELC0
600GB 10K RPM SAS SFF-3 Disk Drive (Linux)	9008	22L	ELD5
300GB 15K RPM SAS SFF-3 Disk Drive (Linux)	9008	22L	ELDB
3.72TB Mainstream SAS 4k SFF-3 SSD for Linux	9008	22L	ELE1
3.72TB Mainstream SAS 4k SFF-2 SSD for Linux	9008	22L	ELE7
600GB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4096	9008	22L	ELEV
300GB 15K RPM SAS SFF-2 4K Block - 4096 Disk Drive	9008	22L	ELEZ
1.2TB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4096	9008	22L	ELF3
600GB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4096	9008	22L	ELF5
1.2TB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4096	9008	22L	ELF9
300GB 15K RPM SAS SFF-3 4K Block - 4096 Disk Drive	9008	22L	ELFB
600GB 15K RPM SAS SFF-3 4K Block - 4096 Disk Drive	9008	22L	ELFF
600GB 15K RPM SAS SFF-2 4K Block - 4096 Disk Drive	9008	22L	ELFP
1.8TB 10K RPM SAS SFF-2 Disk Drive 4K Block - 4096	9008	22L	ELFT
1.8TB 10K RPM SAS SFF-3 Disk Drive 4K Block - 4096	9008	22L	ELFV
387GB Enterprise SAS 5xx SFF-2 SSD for Linux	9008	22L	ELG5
387GB Enterprise SAS 5xx SFF-3 SSD for Linux	9008	22L	ELG9
387GB Enterprise SAS 4k SFF-2 SSD for Linux	9008	22L	ELGB
387GB Enterprise SAS 4k SFF-3 SSD for Linux	9008	22L	ELGD
775GB Enterprise SAS 5xx SFF-2 SSD for Linux	9008	22L	ELGF
775GB Enterprise SAS 5xx SFF-3 SSD for Linux	9008	22L	ELGH
775GB Enterprise SAS 4k SFF-2 SSD for Linux	9008	22L	ELGK
775GB Enterprise SAS 4k SFF-3 SSD for Linux	9008	22L	ELGM

1.55TB Enterprise SAS 4k SFF-2 SSD for Linux	9008	22L	ELGP
1.55TB Enterprise SAS 4k SFF-3 SSD for Linux	9008	22L	ELGR
EXP12SX SAS Storage Enclosure	9008	22L	ELLL
EXP24SX SAS Storage Enclosure	9008	22L	ELLS
PCIe3 6-Slot Fanout Module for PCIe3 Expansion Drawer	9008	22L	ELMF
PCIe3 6-Slot Fanout Module for PCIe3 Expansion Drawer	9008	22L	ELMG
PCIe Gen3 I/O Expansion Drawer	9008	22L	ELMX
8-core Typical 3.4 to 3.9 Ghz (max) POWER9 Processor	9008	22L	ELPV
10-core Typical 2.9 to 3.8 Ghz (max) POWER9 Processor	9008	22L	ELPW
12-core Typical 2.7 to 3.8 Ghz (max) POWER9 Processor	9008	22L	ELPX
Quantity 150 of #ELFP (600GB SSD SFF-2)	9008	22L	ELQ1
Quantity 150 of #ELF3 (1.2TB 10k SFF-2)	9008	22L	ELQ2
Quantity 150 of #EL85 387GB SFF-2 SSD 4k	9008	22L	ELQ5
Quantity 150 of #EL96 (1.86TB SFF-2)	9008	22L	ELQ6
Quantity 150 of #ELE7 (3.72TB SFF-2)	9008	22L	ELQ7
Quantity 150 of #EL78 387GB SFF-2 SSD 5xx	9008	22L	ELQ8
Quantity 150 of #EL8C 775GB SFF-2 SSD 4k	9008	22L	ELQC
Quantity 150 of #EL7E 775GB SFF-2 SSD 5xx	9008	22L	ELQE
Quantity 150 of #EL8F 1.55TB SFF-2 SSD 4k	9008	22L	ELQF
Quantity 150 of #EL1P	9008	22L	ELQP
Quantity 150 of #EL1Q	9008	22L	ELQQ
Quantity 150 of #ELFT (1.8TB 10k SFF-2)	9008	22L	ELQT
Quantity 150 of #ELEV (600GB 10k SFF-2)	9008	22L	ELQV
Quantity 150 of #EL8Y (931GB SFF-2)	9008	22L	ELQY
Quantity 150 of #ELEZ (300GB SSD SFF-2)	9008	22L	ELQZ
Quantity 150 of EL80 1.9TB SSD	9008	22L	ELR0
Quantity 150 of #EL62 3.86-4.0 TB 7200 rpm 4k LFF-1 Disk	9008	22L	ELR2
Quantity 150 of #EL64 7.72-8.0 TB 7200 rpm 4k LFF-1 Disk	9008	22L	ELR4
Quantity 150 of #ELG5 (387GB SAS 5xx)	9008	22L	ELR5
Quantity 150 of #ELGB (387GB SAS 4k)	9008	22L	ELRB
Quantity 150 of #ELGF (775GB SAS 5xx)	9008	22L	ELRF
Quantity 150 of #ELGK (775GB SAS 4k)	9008	22L	ELRK
Quantity 150 of #ELGP (1.55TB SAS 4k)	9008	22L	ELRP
16 GB DDR4 Memory	9008	22L	EM62
32 GB DDR4 Memory	9008	22L	EM63
64 GB DDR4 Memory	9008	22L	EM64
128 GB DDR4 Memory	9008	22L	EM65
AC Power Supply Conduit for PCIe3 Expansion Drawer	9008	22L	EMXA
1m (3.3-ft), 10Gb E'Net Cable SFP+ Act Twinax Copper	9008	22L	EN01
3m (9.8-ft), 10Gb E'Net Cable SFP+ Act Twinax Copper	9008	22L	EN02
5m (16.4-ft), 10Gb E'Net Cable SFP+ Act Twinax Copper	9008	22L	EN03
PCIe3 LP 4-port(10Gb FCoE & 1GbE) LR&RJ45 Adapter	9008	22L	EN0N
PCIe2 4-Port (10Gb+1GbE) SR+RJ45 Adapter	9008	22L	EN0S
PCIe2 LP 4-Port (10Gb+1GbE) SR+RJ45 Adapter	9008	22L	EN0T
PCIe2 4-port (10Gb+1GbE) Copper SFP+RJ45 Adapter	9008	22L	EN0U
PCIe2 LP 4-port (10Gb+1GbE) Copper SFP+RJ45 Adapter	9008	22L	EN0V
PCIe2 LP 8Gb 4-port Fibre Channel Adapter	9008	22L	EN0Y
PCIe3 4-port 10GbE SR Adapter	9008	22L	EN15
Horizontal PDU Mounting Hardware	9008	22L	EPTH
High Function 9xC19 PDU: Switched, Monitoring	9008	22L	EPTJ
High Function 9xC19 PDU 3-Phase: Switched, Monitoring	9008	22L	EPTL
High Function 12xC13 PDU: Switched, Monitoring	9008	22L	EPTN
High Function 12xC13 PDU 3-Phase: Switched, Monitoring	9008	22L	EPTQ
42U Slim Rack	9008	22L	ER05
Bulk Packaging Request ID	9008	22L	ERB0
Bulk Packaging ID #1	9008	22L	ERB1
Bulk Packaging ID #2	9008	22L	ERB2
Bulk Packaging ID #3	9008	22L	ERB3
Bulk Packaging ID #4	9008	22L	ERB4
Bulk Packaging ID #5	9008	22L	ERB5

Bulk Packaging ID #6	9008	22L	ERB6
Bulk Packaging ID #7	9008	22L	ERB7
Bulk Packaging ID #8	9008	22L	ERB8
Bulk Packaging ID #9	9008	22L	ERB9
Bulk Packaging ID #10	9008	22L	ERBA
Bulk Packaging ID #11	9008	22L	ERBB
Bulk Packaging ID #12	9008	22L	ERBC
Bulk Packaging ID #13	9008	22L	ERBD
Bulk Packaging ID #14	9008	22L	ERBE
Bulk Packaging ID #15	9008	22L	ERBF
Bulk Packaging ID #16	9008	22L	ERBG
Bulk Packaging ID #17	9008	22L	ERBH
Bulk Packaging ID #18	9008	22L	ERBJ
Bulk Packaging ID #19	9008	22L	ERBK
Bulk Packaging ID #20	9008	22L	ERBL
No Bulk Packaging Specify	9008	22L	ERBZ
RFID Tags for Servers, Compute Nodes, Chassis, Racks, and HMCs	9008	22L	ERF1
Rear rack extension	9008	22L	ERG0
Mainstream 400GB SSD NVMe M.2 module	9008	22L	ES14
S&H - No Charge	9008	22L	ESC0
S&H-a	9008	22L	ESC5
Specify AC Power Supply for EXP12SX/EXP24SX Storage Enclosure	9008	22L	ESLA
300GB 15K RPM SAS SFF-3 4k Block Cached Disk Drive (Linux)	9008	22L	ESRL
300GB 15K RPM SAS SFF-2 4k Block Cached Disk Drive (Linux)	9008	22L	ESRM
600GB 15K RPM SAS SFF-3 4k Block Cached Disk Drive (Linux)	9008	22L	ESRP
600GB 15K RPM SAS SFF-2 4k Block Cached Disk Drive (Linux)	9008	22L	ESRR
Quantity 150 of #ESRM (300GB 15k SFF-2)	9008	22L	ESVM
Quantity 150 of #ESRR (600GB 15k SFF-2)	9008	22L	ESVR
1TB Removable Disk Drive Cartridge	9008	22L	EU01
RDX USB External Docking Station for Removable Disk Cartridge	9008	22L	EU04
RDX 320 GB Removable Disk Drive	9008	22L	EU08
Operator Panel LCD Display	9008	22L	EU0B
1.5TB Removable Disk Drive Cartridge	9008	22L	EU15
Cable Ties & Labels	9008	22L	EU19
2TB Removable Disk Drive Cartridge (RDX)	9008	22L	EU2T
RDX USB External Docking Station	9008	22L	EUA4
Standalone USB DVD drive w/cable	9008	22L	EUA5
Core Use HW Feature	9008	22L	EUC6
Core Use HW Feature 10X	9008	22L	EUC7

The following are newly announced features on the specific models of the IBM Power Systems 7014 and 7965 machine type:

New features available March 20, 2018

Description	Machine type	Model	Feature number
Rack Content Specify: 9008-22L - 2EIA	7014	T00	ER2W
	7014	T42	
	7965	94Y	
	7965	S42	

Business Partner information

If you are a Direct Reseller - System Reseller acquiring products from IBM, you may link directly to Business Partner information for this announcement. A PartnerWorld(R) ID and password are required (use IBMid).

BP Attachment for Announcement Letter 118-022

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 9008-22L:

- Power Hardware Information DVD SK5T-7087
- Installing the 9008-22L
- 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 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.

IBM Knowledge Center provides you with a single point of reference 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 by going to IBM Knowledge Center for all your product information needs.

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.

Services

IBM Systems Lab Services

IBM Systems Lab Services offers a wide array of services available for your enterprise. It brings expertise on the latest technologies from the IBM development community and can help with your most difficult technical challenges.

IBM Systems Lab Services exists to help you successfully implement emerging technologies so as to accelerate your return on investment and improve your satisfaction with your IBM systems and solutions. Services examples include initial implementation, integration, migration, and skills transfer on IBM systems solution capabilities and recommended practices. IBM Systems Lab Services is one of the service organizations of IBM's world-renowned IBM Systems Group development labs.

For details on available services, contact your IBM representative or go to the Lab Services website.

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[R] 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 authorized training website.

Technical information

Specified operating environment

Physical specifications

- Width: 482 mm (18.97 in.)
- Depth: 766.5 mm (30.2 in.)
- Height: 86.7 mm (3.4 in.)
- Weight: 30.4 kg (67 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) 5C° - 45°C (41F° - 113°F); recommended temperature (operating) 18C° - 27°C (64F° - 80°F); allowable operating temperature 5C° - 40°C (41F° - 104°F)
- Relative humidity: Nonoperating 8% - 80%; recommended 5.5°C (42°F) dew point to 60% RH and 15°C (59°F) dew point

- Maximum dew point: 21°C (70°F)(allowable operating)
- Operating voltage: 1400 W PSU: 200 - 240 V AC
- Operating frequency: 47/63 Hz
- Maximum power consumption: 1880 watts (maximum)
- Power factor: 0.98
- Thermal output: 6,416 Btu/hour (maximum)
- Power-source loading
  - 1.94 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: 6.5 bels operating; 5.3 bels idling

See the *Installation Planning Guide* in IBM Knowledge Center for additional detail.

For example, the actual 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 L922 system configuration

The minimum Power L922 initial order must include a processor module, two 16 GB DIMM, two power supplies and line cords, an operating system indicator, a cover set indicator, and a Language Group Specify. Also, must include one of the storage options and the network options below:

Storage options:

- For boot from NVMe: One NVMe carrier and one NVMe M.2 Module.
- For boot from local SFF-3 HDD/SDD: One storage backplane and one SFF-3 HDD or SDD.
- 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	
Processors			
ELPV	8-core, typical 3.4 to 3.9 GHz (max) POWER9 Processor	1	
or			
ELPW	10-core, typical 2.9 to 3.8 GHz (max) POWER9 Processor	1	
Processor activations			
ELAV	One Processor Core Activation for #ELPV	8	
or			
ELAW	One Processor Core Activation for #ELPW	10	
Memory DIMMs			
EM62	16 GB DDR4 Memory	2	

Feature number	Description	Quantity	Notes
or			
EM63	32 GB DDR4 Memory	2	
or			
EM64	64 GB DDR4 Memory	2	
or			
EM65	128 GB DDR4 Memory	2	
Storage Backplane			
EL66	Storage Backplane 8 SFF-3 Bays	1	Optional split card EL68
or			
EC59	PCIe3 NVMe carrier card w/2 M.2 module slots	1	Must order, at a minimum, one of feature ES14
Disk Drive			
ELDB	300 GB 15K RPM SAS SFF-3 Disk Drive (Linux)	1	
LAN Adapter			
EL4M	PCIe2 LP 4-port 1 GbE Adapter	1	
Power supplies/ Power cord			
EL1B	AC Power Supply - 1400 W for Server (200 - 240 V AC)	2	
6458	Power Cord 4.3 m (14 ft), Drawer to IBM PDU (250V/10A)	2	6458 - (default)
9300/97xx	Language Group Specify		9300 - (default)
Front Bezel			
EJUC	Front IBM Bezel for 8-Bay BackPlane		
or			
EJU7	Front OEM Bezel for 8-Bay BackPlane		
Operating System			
2147	Primary Operating System Indicator - Linux		

- 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.
- If NVMe carrier card feature EC59 is selected, no disk units are required to be ordered. If neither feature EC59 nor feature 0837 (SAN boot) is ordered, then at least one disk unit is required to be ordered. If no HDD/SSD/SAN boot (0837) is ordered, then feature EC59 (with at least one of #ES14) is the load source.
- Adapter feature EL4M is the default 1 Gb Ethernet adapter. Options of a 10 Gb Ethernet adapter include one of either EC2R, EC2T, EL38, EL3C, EL3Z, EN0T, or EN0V.

Hardware Management Console (HMC) machine code

An HMC is required to manage the Power L922 server (9008-22L) implementing partitioning. Multiple POWER7[R], POWER8, 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 IBM Support: Fix Central website.

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 IBM Power System S922, S924, S914, and L922 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

If installing the Linux operating system LPAR (one of these):

- Red Hat Enterprise Linux 7 for Power LE, version 7.4, or later
- SUSE Linux Enterprise Server 12 Service Pack 3, or later
- Ubuntu Server 16.04.4, or later

Limitations

- The integrated system port is not supported under 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 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

Cable orders

No additional cables are required.

Security, auditability, and control

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

The customer 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

For details on available services, contact your IBM representative or go to the Lab Services website.

IBM Electronic Services

IBM has transformed its delivery of hardware and software support services to help you achieve higher system availability. Electronic Services is a web-enabled solution that offers an exclusive, no-additional-charge enhancement to the service and support available for IBM servers. These services are designed to provide the opportunity for greater system availability with faster problem resolution and preemptive monitoring. Electronic Services comprises two separate, but complementary, elements: Electronic Services news page and Electronic Services Agent.

The Electronic Services news page is a single internet entry point that replaces the multiple entry points traditionally used to access IBM Internet services and support. The news page enables you to gain easier access to IBM resources for assistance in resolving technical problems.

The Electronic Service Agent™ is no-additional-charge software that resides on your server. It monitors events and transmits system inventory information to IBM on a periodic, client-defined timetable. The Electronic Service Agent automatically reports hardware problems to IBM. Early knowledge about potential problems enables IBM to deliver proactive service that may result in higher system availability and performance. In addition, information collected through the Service Agent is made available to IBM service support representatives when they help answer your questions or diagnose problems. Installation and use of IBM Electronic Service Agent for problem reporting enables IBM to provide better support and service for your IBM server.

To learn how Electronic Services can work for you, go to the IBM Electronic Support website.

Terms and conditions

Volume orders

Contact your IBM representative.

IBM Global Financing

Yes

Products - terms and conditions

Warranty period

Warranty and additional coverage options:	Coverage summary[1]:
Warranty Period:	3 years
Service Level:	IBM On-Site Limited, 9x5 Next Business Day
Service Upgrade Options :	
Warranty Service Upgrade	IBM On-Site Repair, 9x5 Same Day[2] 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[3]:	Y

[1] See complete coverage details below.

[2] Offered in US and EMEA only.

[3] Not offered in the US.

Three years.

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
- NVMe M.2 Carrier card and Flash Modules
- SAS Card
- Op Panel - Base
- Op Panel - LCD
- Memory DIMM
- All PCI Adapters
- FAN
- TPM Card
- Power Supplies
- Service Processor Card/FSP
- TOD Battery
- Air Baffles
- 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 services

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:

- On-Site Repair, Monday through Friday (excluding holidays), 8 AM to 5 PM, 4-hour on-site response objective. Response times are objectives and are not guaranteed
- On-Site Repair, 7 days a week, 24hrs/day
- On-Site Repair, 7 days a week, 24hrs/day, 2-hour response objective. Response times are objectives and are not guaranteed

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.

- On-Site Repair, Monday through Friday (excluding holidays), 8 AM to 5 PM, next business day.
- On-Site Repair, Monday through Friday (excluding holidays), 8 AM to 5 PM, 4-hour response objective. Response times are objectives and are not guaranteed.
- On-Site Repair, 7 days a week, 24hrs/day.
- On-Site Repair, 7 days a week, 24hrs/day, 2-hour response objective. Response times are objectives and are not guaranteed.

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
- NVMe M.2 Carrier card and Flash Modules
- SAS Card
- Op Panel - Base
- Op Panel - LCD
- Memory DIMM
- All PCI Adapters
- FAN
- TPM Card
- Power Supplies
- Service Processor Card/FSP
- TOD Battery
- Air Baffles
- 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.

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

Two

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.

General terms and conditions

Field-installable features

Yes

Model conversions

No

Machine installation

Customer setup. Customers 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 customer 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
customer. 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 website.

Machine using LMC Type Model 9008-22L

Access to 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 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.

Machine Code License Acceptance Requirement

B.) Acceptance-By-Use Machine: No, the Machine Code license requires signed
acceptance by the machine's end user directly with IBM, applicable to orders for a
new machine, machine type conversion MES, and to machines transferred to another
user.

Educational allowance

A reduced charge is available to qualified education customers. The educational
allowance may not be added to any other discount or allowance.

The educational allowance is 18% for the products in this announcement.

Prices

For additional information and current prices, contact your local IBM representative.

The following are newly announced features on the specific models of the IBM Power Systems 9008 machine type:

Description	Model number	Feature number	Purchase price	Minimum Monthly Maint. Charge	Initial/ MES/ Both/ Support	CSU	RP MES
IBM Power System L922							
	22L					Yes	
One CSC Billing Unit							
	22L	0010			Both	Yes	No
Ten CSC Billing Units							
	22L	0011			Both	Yes	No
Linux Partition Specify							
	22L	0266			Both	Yes	No
V.24/EIA232 6.1m (20 Ft) PCI C							
	22L	0348			Both	Yes	No
V.35 6.1m (20 Ft) PCI Cable							
	22L	0353			Both	Yes	No
X.21 6.1m (20 Ft) PCI Cable							
	22L	0359			Both	Yes	No
Customer Specified Placement							
	22L	0456			Initial	N/A	No
19 inch, 1.8 meter high rack							
	22L	0551			MES	Yes	No
19 inch, 2.0 meter high rack							
	22L	0553			MES	Yes	No
Rack Filler Panel Kit							
	22L	0599			Both	Yes	No
Load Source Not in CEC							
	22L	0719			Both	Yes	No
SAN Load Source Specify							
	22L	0837			Both	Yes	No
US TAA Compliance Indicator							
	22L	0983			Both	Yes	No
Asm in USA manufacturing plant							
	22L	0984			Both	Yes	No
USB 500 GB Removable Disk Dr							
	22L	1107			Both	Yes	No
3m, Blue Cat5e Cable							
	22L	1111			Both	Yes	No
10m, Blue Cat5e Cable							
	22L	1112			Both	Yes	No
25m, Blue Cat5e Cable							
	22L	1113			Both	Yes	No
CAT5E Ethernet Cable 3M GREEN							
	22L	1115			Both	Yes	No
CAT5E Ethernet Cable 10M GREEN							
	22L	1116			Both	Yes	No
CAT5E Ethernet Cable 3M YELLOW							
	22L	1118			Both	Yes	No
CAT5E Ethernet Cbl 10M YELLOW							
	22L	1119			Both	Yes	No
Custom Serv. Specify, Roch							
	22L	1140			Both	Yes	No
Primary OS Linux							
	22L	2147			Both	Yes	No
Factory Deconfiguration of 1 c							

	22L	2319	Initial	N/A	No
LC-SC 50 Micron Fiber Conv Cab	22L	2456	Both	Yes	No
LC-SC 62.5 Mic.Fib.Conv.Cable	22L	2459	Both	Yes	No
Asynch.Termin/Print.Cbl EIA232	22L	2934	Both	Yes	No
Asynchronous Cable EIA 232/V	22L	2936	Both	Yes	No
Ser to Ser Port Cab Draw/Draw	22L	3124	Both	Yes	No
Serial to Se.Port Cbl Rack 8M	22L	3125	Both	Yes	No
Widescreen LCD Monitor	22L	3632	Support	Yes	No
0.3M Serial Prt Converter Cbl	22L	3925	Both	Yes	No
Serial Port Null Mod Cab 3.7M	22L	3927	Both	Yes	No
Ser.Port Null Modem Cable,10M	22L	3928	Both	Yes	No
System Serial Port Converter C	22L	3930	Both	Yes	No
6Foot Extend.Cbl for Displays	22L	4242	Support	Yes	No
Extender Cable USB Keybo 1.8M	22L	4256	Both	Yes	No
VGA to DVI Connection Converte	22L	4276	Both	Yes	No
Rack Integration Services: BP	22L	4648	Initial	N/A	No
Rack Integration Services	22L	4649	Initial	N/A	No
One and only one rack indicator feature is required on all orders (#4650 to #4666). No Factory Integration Ind.	22L	4650	Initial	N/A	No
Rack Indicator, Rack 1	22L	4651	Initial	N/A	No
Rack Indicator, Rack 2	22L	4652	Initial	N/A	No
Rack Indicator, Rack 3	22L	4653	Initial	N/A	No
Rack Indicator, Rack 4	22L	4654	Initial	N/A	No
Rack Indicator, Rack 5	22L	4655	Initial	N/A	No
Rack Indicator, Rack 6	22L	4656	Initial	N/A	No
Rack Indicator, Rack 7	22L	4657	Initial	N/A	No
Rack Indicator, Rack 8	22L	4658	Initial	N/A	No
Rack Indicator, Rack 9	22L	4659	Initial	N/A	No
Rack Indicator, Rack 10	22L	4660	Initial	N/A	No
Rack Indicator, Rack 11	22L	4661	Initial	N/A	No
Rack Indicator, Rack 12	22L	4662	Initial	N/A	No
Rack Indicator, Rack 13	22L	4663	Initial	N/A	No
Rack Indicator, Rack 14	22L	4664	Initial	N/A	No
Rack Indicator, Rack 15	22L	4665	Initial	N/A	No
Rack Indicator, Rack 16	22L	4666	Initial	N/A	No
Software Preload Required	22L	5000	Initial	N/A	No
PCIe LP POWER GXT145 Graphics	22L	5269	Both	Yes	No

	Feature	Code		Type	Field	Supported
PCIe2 8Gb 4-port Fibre Channel	22L	5729		Both	Yes	No
4 Port Async EIA 232 PCIe Adap	22L	5785		Both	Yes	No
PCIe2 4-port 1GbE Adapter	22L	5899		Support	Yes	No
Opt Front Door for 1.8m Rack	22L	6068		MES	Yes	No
Opt Front Door for 2.0m Rack	22L	6069		MES	Yes	No
1.8m Rack Acoustic Doors	22L	6248		MES	Yes	No
2.0m Rack Acoustic Doors	22L	6249		MES	Yes	No
1.8m Rack Trim Kit	22L	6263		MES	Yes	No
2.0m Rack Trim Kit	22L	6272		MES	Yes	No
Pwr Crd 4.3m 14ft to IBM PDU	22L	6458		Both	Yes	No
Pwr Crd (14FT), Drwr - OEM PDU	22L	6460		Both	Yes	No
Pwr Crd 4.3m 14ft Wall OEM PDU	22L	6469		Both	Yes	No
Pwr Crd 1.8m 6ft Wall 125V/15A	22L	6470		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6471		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6472		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6473		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6474		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6475		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6476		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6477		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6478		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6488		Both	Yes	No
4.3m (14 Ft) 3PH/24A Power Cor	22L	6489		MES	Yes	No
4.3m (14 Ft) 1PH/63A Pwr Cord	22L	6491		MES	Yes	No
4.3m (14 Ft) 1PH/48 60A Pwr Co	22L	6492		MES	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6493		Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU	22L	6494		Both	Yes	No
Pwr Crd 2.7m 9ft Wall 250V,10A	22L	6496		Both	Yes	No
Power Cable Drawer to IBM PD	22L	6577		Both	Yes	No
Optional Rack Security Kit	22L	6580		MES	Yes	No
Pwr Crd 2.7m 9ft Wall 125V,15A	22L	6651		Both	Yes	No
4.3m 3PH/16A Power Cord	22L	6653		MES	Yes	No
4.3m 1PH/24-30A Pwr Cord	22L	6654		MES	Yes	No
4.3m 14Ft 1PH/24 30A WR Pwr	22L	6655		MES	Yes	No
4.3m 14Ft 1PH/24A Power Cord	22L	6656		MES	Yes	No
4.3m 14Ft 1PH/32A Power Cord	22L	6657		MES	Yes	No
4.3m 14Ft 1PH/24A Pwr Cd Kor	22L	6658		MES	Yes	No

Description	Model	Code	Type		
Pwr.Cord(9ft),To Wall/OEM PDU					
	22L	6659	Both	Yes	No
Pwr Crd 14ft 4.3m WallOEM PDU					
	22L	6660	Both	Yes	No
Pwr Crd 2.8m 9.2ft PDU					
	22L	6665	Both	Yes	No
4.3m 14Ft 3PH/32A Pwr Cd Aus					
	22L	6667	MES	Yes	No
Pwr Crd 4.3M, Drwr - OEM PDU					
	22L	6669	Both	Yes	No
Pwr Crd 2.7m, Drwr - IBM PDU					
	22L	6671	Both	Yes	No
Pwr Crd 2M, Drwr - IBM PDU					
	22L	6672	Both	Yes	No
Pwr Crd 2.7m 9ft Wall OEM PDU					
	22L	6680	Both	Yes	No
IIntelligent PDU+ 1 EIA Unit					
	22L	7109	MES	Yes	No
Environmental Monitoring Probe					
	22L	7118	Both	Yes	No
Power Distribution Unit					
	22L	7188	MES	Yes	No
PowDistribUnit(US)Fixed PowCrd					
	22L	7196	Both	Yes	No
Eth Cbl 15M HW Management					
	22L	7802	Both	Yes	No
Linux Software Preinstall					
	22L	8143	Initial	N/A	No
USB Mouse					
	22L	8845	Support	Yes	No
Order Routing Indicator Syste					
	22L	9169	Initial	N/A	No
Language Group Spcf-US Eng					
	22L	9300	Initial	N/A	No
New Red Hat Lic Core Counter					
	22L	9442	Initial	N/A	No
New SUSE Lic Core Counter					
	22L	9443	Initial	N/A	No
Other Linux Lic Core Counter					
	22L	9445	Initial	N/A	No
3rd Party Linux Lic Core Cnt					
	22L	9446	Initial	N/A	No
VIOS Core Counter					
	22L	9447	Initial	N/A	No
Other License Core Counter					
	22L	9449	Initial	N/A	No
Ubuntu Linux License Core Cntr					
	22L	9450	Initial	N/A	No
Month Indicator					
	22L	9461	Initial	N/A	No
Day Indicator					
	22L	9462	Initial	N/A	No
Hour Indicator					
	22L	9463	Initial	N/A	No
Minute Indicator					
	22L	9464	Initial	N/A	No
Qty Indicator					
	22L	9465	Initial	N/A	No
Countable Member Indicator					
	22L	9466	Initial	N/A	No
Language Group Spcf-Dutch					
	22L	9700	Initial	N/A	No
Language Group Spcf-French					
	22L	9703	Initial	N/A	No
Language Group Spcf-German					
	22L	9704	Initial	N/A	No
Language Group Spcf-Polish					
	22L	9705	Initial	N/A	No
Lang Group Specify - Norwegian					
	22L	9706	Initial	N/A	No
Lang.Group Spcf-Portuguese					
	22L	9707	Initial	N/A	No
Language Group Spcf-Spanish					
	22L	9708	Initial	N/A	No

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Language Group Spcf-Italian
                22L     9711                        Initial  N/A No
Langua Gr Speci Canadian Frenc
                22L     9712                        Initial  N/A No
Language Group Spcf-Japanese
                22L     9714                        Initial  N/A No
Language Group Specify Tr Chin
                22L     9715                        Initial  N/A No
Language Group Spcf-Korean
                22L     9716                        Initial  N/A No
Language Group Spcf-Turkish
                22L     9718                        Initial  N/A No
Language Group Spcf-Hungarian
                22L     9719                        Initial  N/A No
Language Group Spcf-Slovakian
                22L     9720                        Initial  N/A No
Language Group Spcf-Russian
                22L     9721                        Initial  N/A No
Lang Group Spcf Simpl Chinese
                22L     9722                        Initial  N/A No
Language Group Spcf-Czech
                22L     9724                        Initial  N/A No
Language Group Spcf-Romanian
                22L     9725                        Initial  N/A No
Lang Group Specify - Croatian
                22L     9726                        Initial  N/A No
Language Group Spcf-Slovenian
                22L     9727                        Initial  N/A No
Lang Group Specify - Braz Port
                22L     9728                        Initial  N/A No
Lang Group Specify - Thai
                22L     9729                        Initial  N/A No


10m QSFP+ MTP Optical Cable
                22L     EB2J                        Both     Yes No
30m QSFP+ MTP Optical Cable
                22L     EB2K                        Both     Yes No
Lift tool GenieLift GL-8
                22L     EB3Z                        Both     Yes No
10Gb Optical TransceiverSFP+
                22L     EB46                        Both     Yes No
25Gb Opt Transceiver SFP28
                22L     EB47                        Both     Yes No
0.5 SFP/25GbE CU Cable
                22L     EB4J                        Both     Yes No
1.0 SFP/25GbE CU Cable
                22L     EB4K                        Both     Yes No
1.5 SFP/25GbE CU Cable
                22L     EB4L                        Both     Yes No
2.0 SFP/25GbE CU Cable
                22L     EB4M                        Both     Yes No
2.5 QSFP28/100GbE CU Cable
                22L     EB4P                        Both     Yes No
Service wedge shelf for EB3Z
                22L     EB4Z                        Both     No   No
0.5m EDR IB Copper Cable
                22L     EB50                        Both     Yes No
1.0m EDR IB Copper Cable
                22L     EB51                        Both     Yes No
2.0M EDR IB Copper Cable
                22L     EB52                        Both     Yes No
1.5M EDR IB Copper Cable
                22L     EB54                        Both     Yes No
100Gb Optic Transceiver QSFP28
                22L     EB59                        Both     Yes No
3M EDR IB Optical Cable
                22L     EB5A                        Both     Yes No
5M EDR IB Optical Cable
                22L     EB5B                        Both     Yes No
10M EDR IB Optical Cable
                22L     EB5C                        Both     Yes No
15M EDR IB Optical Cable
                22L     EB5D                        Both     Yes No
20M EDR IB Optical Cable
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Description	Machine	Feature	Type	Yes	No
	22L	EB5E	Both	Yes	No
30M EDR IB Optical Cable					
	22L	EB5F	Both	Yes	No
50M EDR IB Optical Cable					
	22L	EB5G	Both	Yes	No
100M EDR IB Optical Cable					
	22L	EB5H	Both	Yes	No
0.5M 100GbE Cu Cable QSFP28					
	22L	EB5J	Both	Yes	No
1.0M 100GbE Cu Cable QSFP28					
	22L	EB5K	Both	Yes	No
1.5M 100GbE Cu Cable QSFP28					
	22L	EB5L	Both	Yes	No
2.0M 100GbE Cu Cable QSFP28					
	22L	EB5M	Both	Yes	No
25M EDR IB Optical Cable					
	22L	EB5N	Both	Yes	No
3M 100GbE Optic Cable QSFP28					
	22L	EB5R	Both	Yes	No
5M 100GbE Optic Cable QSFP28					
	22L	EB5S	Both	Yes	No
10M 100GbE Optic Cable QSFP28					
	22L	EB5T	Both	Yes	No
15M 100GbE Optic Cable QSFP28					
	22L	EB5U	Both	Yes	No
20M 100GbE Optic Cable QSFP28					
	22L	EB5V	Both	Yes	No
30M 100GbE Optic Cable QSFP28					
	22L	EB5W	Both	Yes	No
50M 100GbE Optic Cable QSFP28					
	22L	EB5X	Both	Yes	No
100M 100GbE Optic Cable QSFP28					
	22L	EB5Y	Both	Yes	No
Rack Front Door (Black)					
	22L	EC01	MES	Yes	No
Rack Rear Door					
	22L	EC02	MES	Yes	No
Rack Side Cover					
	22L	EC03	MES	Yes	No
Rack Suite Attachment Kit					
	22L	EC04	MES	Yes	No
Slim Rear Acoustic Door					
	22L	EC07	MES	Yes	No
Slim Front Acoustic Door					
	22L	EC08	MES	Yes	No
Rear Door Heat Exchanger					
	22L	EC15	MES	Yes	No
IBM PowerVM for IBM PowerLinux					
	22L	EC22	Both	Yes	No
PCIe3 LP 2-port 10GbE NIC Ro					
	22L	EC2R	Both	Yes	No
PCIe3 2-Port 10Gb NIC&ROCE					
	22L	EC2S	Both	Yes	No
PCIe3 LP 2-port 25/10GbE NIC					
	22L	EC2T	Both	Yes	No
PCIe3 2-Port 25/10Gb NIC&Ro					
	22L	EC2U	Both	Yes	No
PCIe3 LP 2-port 100GbE Adptx16					
	22L	EC3L	Both	Yes	No
PCIe3 NVMe carrier card					
	22L	EC59	Both	Yes	No
PCIe4 LP 1-port 100Gb EDR					
	22L	EC62	Both	Yes	No
PCIe4 LP 2-port 100Gb EDR					
	22L	EC64	Both	Yes	No
SAS X Cable 3m - HD Narrow					
	22L	ECBJ	Both	Yes	No
SAS X Cable 6m - HD Narrow					
	22L	ECBK	Both	Yes	No
SAS X Cable 10m - HD Narrow					
	22L	ECBL	Both	Yes	No
SAS X Cable 15m -HD Narrow 3Gb					
	22L	ECBM	Both	Yes	No
SAS YO Cable 1.5m - HD Narrow					

Description		Feature			
	22L	ECBT	Both	Yes	No
SAS YO Cable 3m - HD Narrow					
	22L	ECBU	Both	Yes	No
SAS YO Cable 6m - HD Narrow					
	22L	ECBV	Both	Yes	No
SAS YO Cable 10m - HD Narrow					
	22L	ECBW	Both	Yes	No
SAS YO Cable 15m-HD Narrow 3Gb					
	22L	ECBX	Both	Yes	No
SAS AE1 Cable 4m - HD Narrow					
	22L	ECBY	Both	Yes	No
SAS YE1 Cable 3m - HD Narrow					
	22L	ECBZ	Both	Yes	No
SAS AA Cable 0.6m - HD Narrow					
	22L	ECC0	Both	Yes	No
SAS AA Cable 1.5m - HD Narrow					
	22L	ECC2	Both	Yes	No
SAS AA Cable 3m - HD Narrow					
	22L	ECC3	Both	Yes	No
SAS AA Cable 6m - HD Narrow					
	22L	ECC4	Both	Yes	No
SAS Cable					
	22L	ECC5	Both	Yes	No
3M Optical Cable Pair					
	22L	ECC7	Both	Yes	No
10M Optical Cable Pair					
	22L	ECC8	Both	Yes	No
Port Converter Cable for UPS					
	22L	ECCF	Both	Yes	No
Var lth Blue Cat5e Cable					
	22L	ECCG	Initial	N/A	No
Var lth Green Cat5e Cable					
	22L	ECCH	Initial	N/A	No
3M Copper CXP Cable Pair					
	22L	ECCS	Both	Yes	No
3.0M SAS X12 Cable					
	22L	ECDJ	Both	Yes	No
4.5M SAS X12 Cable					
	22L	ECDK	Both	Yes	No
10M SAS X12 Cable					
	22L	ECDL	Both	Yes	No
1.5M SAS YO12 Cable					
	22L	ECDT	Both	Yes	No
3.0M SAS YO12 Cable					
	22L	ECDU	Both	Yes	No
4.5M SAS YO12 Cable					
	22L	ECDV	Both	Yes	No
10M SAS YO12 Cable					
	22L	ECDW	Both	Yes	No
0.6M SAS AA12 Cable					
	22L	ECE0	Both	Yes	No
3.0M SAS AA12 Cable					
	22L	ECE3	Both	Yes	No
4.5M SAS AA12 Cable					
	22L	ECE4	Both	Yes	No
2.0 M Slim Rack					
	22L	ECR0	MES	Yes	No
Rack Front Door					
	22L	ECRF	MES	Yes	No
Rack Rear Door Black					
	22L	ECRG	MES	Yes	No
Rack Side Cover					
	22L	ECRJ	MES	Yes	No
Rack Rear Extension 5-In					
	22L	ECRK	MES	Yes	No
Rack Front Door (Black/Flat)					
	22L	ECRM	MES	Yes	No
Assembled and Tested in China					
	22L	ECS0	Both	Yes	No
Custom Serv. Specify, France					
	22L	ECSF	Both	Yes	No
NeuCloud Indicator/Specify					
	22L	ECSJ	Both	Yes	No
Custom Serv. Specify, Mexico					

22L	ECSM	Both	Yes	No
Custom Serv. Spec Poughkeepsie				
22L	ECSP	Both	Yes	No
Integrated Solution Packing				
22L	ECSS	Initial	N/A	No
Optical Wrap Plug				
22L	ECW0	Both	Yes	No
Boot Drive in EXP12SX Specify				
22L	EHR1	Both	Yes	No
Boot / Load in EXP24SX Specify				
22L	EHR2	Both	Yes	No
SSD Placement Ind- #ESLS/#ELLS				
22L	EHS2	Both	Yes	No
SAS Port/single Backplane				
22L	EJ00	Both	Yes	No
PCIe3 Optical Cable Adapter				
22L	EJ05	Both	Yes	No
PCIe3 SAS Tape/DVD Adapter				
22L	EJ10	Both	Yes	No
PCIe3 12GB Cache RAID+ SAS Ada				
22L	EJ14	Both	Yes	No
PCIe3 Crypto Coproc BSC-3 4767				
22L	EJ33	Both	Yes	No
Non-paired Indicator EJ0L PCIe				
22L	EJRL	Both	Yes	No
Front OEM Bezel 8-Bay BackP				
22L	EJU7	Both	Yes	No
Front IBM Bezel 8-Bay BackPl				
22L	EJUC	Both	Yes	No
Specify Mode-1 for EXP12SX 1&1				
22L	EJV1	Both	Yes	No
Specify Mode-1 for EXP12SX 2&2				
22L	EJV2	Both	Yes	No
Specify Mode-2 for EXP12SX 2&2				
22L	EJV3	Both	Yes	No
Specify Mode-2 for EXP12SX 4&2				
22L	EJV4	Both	Yes	No
Specify Mode-4 for EXP12SX 4&2				
22L	EJV5	Both	Yes	No
Specify Mode-2 for EXP12SX 1&2				
22L	EJV6	Both	Yes	No
Specify Mode-2 for EXP12SX 2&2				
22L	EJV7	Both	Yes	No
Specify Mode-2 for EXP12SX 1&1				
22L	EJVA	Both	Yes	No
Specify Mode-2 for EXP12SX 2&1				
22L	EJVB	Both	Yes	No
Specify Mode-4 for EXP12SX 1&1				
22L	EJVC	Both	Yes	No
Specify Mode-4 for EXP12SX 2&1				
22L	EJVD	Both	Yes	No
Specify Mode-4 for EXP12SX 3&2				
22L	EJVE	Both	Yes	No
Specify Mode-1 for EXP12SX 2&2				
22L	EJVF	Both	Yes	No
Specify Mode-1 for EXP12SX				
22L	EJVU	Initial	N/A	No
Specify Mode-1 for EXP24SX 1&1				
22L	EJW1	Both	Yes	No
Specify Mode-1 for EXP24SX 2&2				
22L	EJW2	Both	Yes	No
Specify Mode-2 for EXP24SX 2&2				
22L	EJW3	Both	Yes	No
Specify Mode-2 for EXP24SX 4&2				
22L	EJW4	Both	Yes	No
Specify Mode-4 for EXP24SX 4&2				
22L	EJW5	Both	Yes	No
Specify Mode-2 for EXP24SX 1&2				
22L	EJW6	Both	Yes	No
Specify Mode-2 for EXP24SX 2&2				
22L	EJW7	Both	Yes	No
Specify Mode-2 for EXP24SX 1&1				
22L	EJWA	Both	Yes	No
Specify Mode-2 for EXP24SX 2&1				

22L	EJWB		Both	Yes	No
Specify Mode-4 for EXP24SX 1&1					
22L	EJWC		Both	Yes	No
Specify Mode-4 for EXP24SX 2&1					
22L	EJWD		Both	Yes	No
Specify Mode-4 for EXP24SX 3&2					
22L	EJWE		Both	Yes	No
Specify Mode-1 for EXP24SX 2&2					
22L	EJWF		Both	Yes	No
Specify Mode-2 for EXP24SX 2&2					
22L	EJWG		Both	Yes	No
Specify Mode-2 for EXP24SX 2&1					
22L	EJWH		Both	Yes	No
Specify Mode-2 for EXP24SX 4&2					
22L	EJWJ		Both	Yes	No
Specify Mode-1 for EXP24SX					
22L	EJWU		Initial	N/A	No
Power Supply 1400W 200-240 VAC					
22L	EL1B		Both	Yes	No
300GB 15k RPM SAS SFF-2 Disk					
22L	EL1P		Both	Yes	No
600GB 10k RPM SAS SFF-2 Disk					
22L	EL1Q		Both	Yes	No
PCIe LP 8Gb 2 Port Fibre Chann					
22L	EL2N		Both	Yes	No
PCIe3 LP 4-port 10GB FCoE & 1G					
22L	EL38		Both	Yes	No
PCIe3 LP RAID SAS ADAPTER					
22L	EL3B		Both	Yes	No
PCIe3 LP 4-port 10GB FCoE &1GE					
22L	EL3C		Both	Yes	No
PCIe2 LP2-pt10/1GbE BaseT RJ45					
22L	EL3Z		Both	Yes	No
PCIe3 LP 16Gb 2-port Fibre Cha					
22L	EL43		Both	Yes	No
PCIe2 4-port 1GbE Adapter					
22L	EL4L		Both	Yes	No
PCIe2 LP 4-port 1GbE Adapter					
22L	EL4M		Both	Yes	No
PCIe2 2-pt 10/1GbE BaseT RJ45					
22L	EL55		Both	Yes	No
PICe3 4-port 10Gb FCoE & 1GbE					
22L	EL56		Both	Yes	No
PCIe3 4-port 10GB FCoE & 1GbE					
22L	EL57		Both	Yes	No
PCIe 8Gb 2-port Fibre Channel					
22L	EL58		Both	Yes	No
PCIe3 RAID SAS Adapter 4-port					
22L	EL59		Both	Yes	No
PCIe3 16Gb 2-port Fibre Channe					
22L	EL5B		Both	Yes	No
PCIe3 32Gb 2-port FC Adapter					
22L	EL5U		Both	Yes	No
PCIe3 LP 32Gb 2-port FC Adap					
22L	EL5V		Both	Yes	No
PCIe3 16Gb 4-port FC Adapter					
22L	EL5W		Both	Yes	No
PCIe3 LP 16Gb 4-port FC Adap					
22L	EL5X		Both	Yes	No
PCIe3 LP SAS Tape/DVD Adapter					
22L	EL60		Both	Yes	No
3.86TB 7200 RPM SAS LFF Disk					
22L	EL62		Both	Yes	No
7.72TB 7200 RPM SAS LFF Disk					
22L	EL64		Both	Yes	No
Backplane 8 SFF-3 Bays					
22L	EL66		Both	No	No
Backplane 8 SFF & Single IOA					
22L	EL67		Both	No	No
Split#EL66 Add 2nd Control					
22L	EL68		Both	No	No
387GB SFF-2 SSD 5xx for Linux					
22L	EL78		Both	Yes	No
775GB SFF-2 SSD 5xx for Linux					

22L	EL7E	Both	Yes	No
387GB SFF-3 SSD 5xx for Linux				
22L	EL7K	Both	Yes	No
775GB SFF-3 SSD 5xx for Linux				
22L	EL7P	Both	Yes	No
1.9TB RI SAS 4k SFF-2 SSD Lin				
22L	EL80	Support	Yes	No
931GB Mainstream SAS 4k SSD				
22L	EL83	Both	Yes	No
387GB SFF-2 SSD 4k for Linux				
22L	EL85	Both	Yes	No
775GB SFF-2 SSD 4k for Linux				
22L	EL8C	Both	Yes	No
1.55TB SFF-2 SSD 4k for Linux				
22L	EL8F	Both	Yes	No
1.9TB RI SAS 4k SFF-3 SSD Lin				
22L	EL8J	Support	Yes	No
387GB SFF-3 SSD 4k for Linux				
22L	EL8N	Both	Yes	No
775GB SFF-3 SSD 4k for Linux				
22L	EL8Q	Both	Yes	No
1.55TB SFF-3 SSD 4k for Linux				
22L	EL8V	Both	Yes	No
931GB Mainstream SAS 4k SSD				
22L	EL8Y	Both	Yes	No
1.86TB Mainstream SAS 4k SSD				
22L	EL92	Both	Yes	No
1.86TB Mainstream SAS 4k SSD				
22L	EL96	Both	Yes	No
One Proc Activation for ELPV				
22L	ELAV	Both	Yes	No
One Proc Activation for ELPW				
22L	ELAW	Both	Yes	No
One Proc Activation for ELPX				
22L	ELAX	Both	Yes	No
PDU Access Cord 0.38m				
22L	ELC0	MES	Yes	No
600GB 10K RPM SAS SFF-3 Disk				
22L	ELD5	Both	Yes	No
300GB 15K RPM SAS SFF-3 Disk				
22L	ELDB	Both	Yes	No
3.72TB Mainstream SAS 4k SSD				
22L	ELE1	Both	Yes	No
3.72TB Mainstream SAS 4k SSD				
22L	ELE7	Both	Yes	No
600GB 10K RPM SFF-2 Disk 4K				
22L	ELEV	Both	Yes	No
300GB 15K SAS SFF-2 4K BLK HDD				
22L	ELEZ	Both	Yes	No
1.2TB 10K RPM SFF-2 Disk 4K				
22L	ELF3	Both	Yes	No
600GB 10K RPM SFF-3 Disk 4K				
22L	ELF5	Both	Yes	No
1.2TB 10K RPM SFF-3 Disk 4K				
22L	ELF9	Both	Yes	No
300GB 15K SAS SFF-3 4K BLK HDD				
22L	ELFB	Both	Yes	No
600GB 15K SAS SFF-3 4K BLK HDD				
22L	ELFF	Both	Yes	No
600GB 15K SAS SFF-2 4K BLK HDD				
22L	ELFP	Both	Yes	No
1.8TB 10K RPM SFF-2 Disk 4K				
22L	ELFT	Both	Yes	No
1.8TB 10K RPM SFF-3 Disk 4K				
22L	ELFV	Both	Yes	No
387GB Enterprise SAS 5xx SSD				
22L	ELG5	Both	Yes	No
387GB Enterprise SAS 5xx SSD				
22L	ELG9	Both	Yes	No
387GB Enterprise SAS 4k SSD				
22L	ELGB	Both	Yes	No
387GB Enterprise SAS 4k SSD				
22L	ELGD	Both	Yes	No
775GB Enterprise SAS 5xx SSD				

	22L	ELGF	Both	Yes No
775GB Enterprise SAS 5xx SSD				
	22L	ELGH	Both	Yes No
775GB Enterprise SAS 4k SSD				
	22L	ELGK	Both	Yes No
775GB Enterprise SAS 4k SSD				
	22L	ELGM	Both	Yes No
1.55TB Enterprise SAS 4k SSD				
	22L	ELGP	Both	Yes No
1.55TB Enterprise SAS 4k SSD				
	22L	ELGR	Both	Yes No
EXP12SX SAS Storage Enclosure				
	22L	ELLL	Both	Yes No
EXP24SX SAS Storage Enclosure				
	22L	ELLS	Both	Yes No
PCIe3 6-Slot Fanout Module				
	22L	ELMF	Support	Yes No
PCIe3 6-Slot Fanout Module				
	22L	ELMG	Both	Yes No
PCIe Gen3 I/O Expansion Drawer				
	22L	ELMX	Both	Yes No
8-core 3.4/3.9 GHz POWER9				
	22L	ELPV	Both	No No
10-core 2.9/3.8 GHz POWER9				
	22L	ELPW	Both	No No
12-core 2.7/3.8 GHz POWER9				
	22L	ELPX	Both	No No
Quantity 150 of #ELFP 600GB				
	22L	ELQ1	Both	Yes No
Quantity 150 of #ELF3 1.2TB				
	22L	ELQ2	Both	Yes No
Qty 150 #EL85 SSD 387GB 4k				
	22L	ELQ5	Both	Yes No
Quantity 150 of EL96 1.86TB				
	22L	ELQ6	Both	Yes No
Quantity 150 of ELE7 3.72TB				
	22L	ELQ7	Both	Yes No
Qty 150 #EL78 SSD 387GB 5xx				
	22L	ELQ8	Both	Yes No
Qty 150 #EL8C SSD 775GB 4k				
	22L	ELQC	Both	Yes No
Qty 150 #EL7E SSD 775GB 5xx				
	22L	ELQE	Both	Yes No
Qty 150 #EL8F SSD 1.55TB 4k				
	22L	ELQF	Both	Yes No
Quantity 150 of #EL1P				
	22L	ELQP	Both	Yes No
Quantity 150 of #EL1Q				
	22L	ELQQ	Both	Yes No
Quantity 150 of #ELFT 1.8TB				
	22L	ELQT	Both	Yes No
Quantity 150 of #ELEV 600GB				
	22L	ELQV	Both	Yes No
Quantity 150 of EL8Y 931GB				
	22L	ELQY	Both	Yes No
Quantity 150 of #ELEZ 300GB				
	22L	ELQZ	Both	Yes No
Quantity 150 of EL80 1.9TB SSD				
	22L	ELR0	Support	Yes No
Qty 150 #EL62 3.86TB LFF Dsk				
	22L	ELR2	Both	Yes No
Qty 150 #EL64 7.72TB LFF Dsk				
	22L	ELR4	Both	Yes No
Quantity 150 of #ELG5				
	22L	ELR5	Both	Yes No
Quantity 150 of #ELGB				
	22L	ELRB	Both	Yes No
Quantity 150 of #ELGF				
	22L	ELRF	Both	Yes No
Quantity 150 of #ELGK				
	22L	ELRK	Both	Yes No
Quantity 150 of #ELGP				
	22L	ELRP	Both	Yes No
16 GB DDR4 Memory				

	22L	EM62	Both	Yes	No
32 GB DDR4 Memory					
	22L	EM63	Both	Yes	No
64 GB DDR4 Memory					
	22L	EM64	Both	Yes	No
128 GB DDR4 Memory					
	22L	EM65	Both	Yes	No
AC Power Supply Conduit					
	22L	EMXA	Both	Yes	No
1m 10GbE Cable SFP+ Act Twinax					
	22L	EN01	Both	Yes	No
3m 10GbE Cable SFP+ Act Twinax					
	22L	EN02	Both	Yes	No
5m 10GbE Cable SFP+ Act Twinax					
	22L	EN03	Both	Yes	No
PCIe3 LP 4-port 10Gb FCoE &1GE					
	22L	EN0N	Support	Yes	No
PCIe2 4-pt(10+1 GbE)SR+RJ45					
	22L	EN0S	Both	Yes	No
PCIe2 LP4-pt(10+1 GbE)SR+RJ45					
	22L	EN0T	Both	Yes	No
PCIe2 4-pt(10+1GbE)CRSR+RJ45					
	22L	EN0U	Both	Yes	No
PCIe2 LP4-pt(10+1GbE)CRSR+RJ45					
	22L	EN0V	Both	Yes	No
PCIe2 LP 8Gb 4-port Fibre Chan					
	22L	EN0Y	Both	Yes	No
PCIe3 4-port 10GbE SR Adapter					
	22L	EN15	Both	Yes	No
Horizontal PDU Mounting Hardwr					
	22L	EPTH	Both	Yes	No
High Function 9xC19 PDU					
	22L	EPTJ	Both	Yes	No
High Function 9xC19 PDU 3Phase					
	22L	EPTL	Both	Yes	No
High Function 12xC13 PDU					
	22L	EPTN	Both	Yes	No
High Function 12xC13 PDU 3-Phs					
	22L	EPTQ	Both	Yes	No
42U Slim Rack					
	22L	ER05	MES	Yes	No
Bulk Pack Request Indicator					
	22L	ERB0	Initial	N/A	No
Bulk Packaging Identifier #1					
	22L	ERB1	Initial	N/A	No
Bulk Packaging Identifier #2					
	22L	ERB2	Initial	N/A	No
Bulk Packaging Identifier #3					
	22L	ERB3	Initial	N/A	No
Bulk Packaging Identifier #4					
	22L	ERB4	Initial	N/A	No
Bulk Packaging Identifier #5					
	22L	ERB5	Initial	N/A	No
Bulk Packaging Identifier #6					
	22L	ERB6	Initial	N/A	No
Bulk Packaging Identifier #7					
	22L	ERB7	Initial	N/A	No
Bulk Packaging Identifier #8					
	22L	ERB8	Initial	N/A	No
Bulk Packaging Identifier #9					
	22L	ERB9	Initial	N/A	No
Bulk Packaging Identifier #10					
	22L	ERBA	Initial	N/A	No
Bulk Packaging Identifier #11					
	22L	ERBB	Initial	N/A	No
Bulk Packaging Identifier #12					
	22L	ERBC	Initial	N/A	No
Bulk Packaging Identifier #13					
	22L	ERBD	Initial	N/A	No
Bulk Packaging Identifier #14					
	22L	ERBE	Initial	N/A	No
Bulk Packaging Identifier #15					
	22L	ERBF	Initial	N/A	No
Bulk Packaging Identifier #16					

| | | Model | Feature | Purchase | Minimum Monthly Maint. | Initial/ MES/ Both/ | | RP |
Description		number	number	price	Charge	Support	CSU	MES
		22L	ERBG			Initial	N/A	No
Bulk Packaging Identifier #17								
		22L	ERBH			Initial	N/A	No
Bulk Packaging Identifier #18								
		22L	ERBJ			Initial	N/A	No
Bulk Packaging Identifier #19								
		22L	ERBK			Initial	N/A	No
Bulk Packaging Identifier #20								
		22L	ERBL			Initial	N/A	No
Single Pack Request Indicator								
		22L	ERBZ			Initial	N/A	No
RFID Tags for Compute Nodes								
		22L	ERF1			Initial	N/A	No
Rear rack extension								
		22L	ERG0			MES	Yes	No
Mainstream 400GB SSD NVMe								
		22L	ES14			Both	Yes	No
S&H - No Charge								
		22L	ESC0			Both	N/A	No
S&H-a								
		22L	ESC5			Initial	N/A	No
Specify AC Power Supply								
		22L	ESLA			Both	Yes	No
300GB 15K SAS SFF-3 4k HDD								
		22L	ESRL			Both	Yes	No
300GB 15K SAS SFF-2 4k HDD								
		22L	ESRM			Both	Yes	No
600GB 15K SAS SFF-3 4k HDD								
		22L	ESRP			Both	Yes	No
600GB 15K SAS SFF-2 4k HDD								
		22L	ESRR			Both	Yes	No
Quantity 150 of #ESRM 300GB								
		22L	ESVM			Both	Yes	No
Quantity 150 of #ESRR 600GB								
		22L	ESVR			Both	Yes	No
1TB Removable Disk Cartridge								
		22L	EU01			Both	Yes	No
RDX USB External Docking								
		22L	EU04			Support	Yes	No
RDX 320 GB Removable Disk Driv								
		22L	EU08			Support	Yes	No
Operator Panel LCD Display								
		22L	EU0B			Both	Yes	No
1.5TB Removable Disk Cartridge								
		22L	EU15			Support	Yes	No
Cable Ties & Labels								
		22L	EU19			Both	Yes	No
2TB Removable Disk Cartrdg-RDX								
		22L	EU2T			Both	Yes	No
RDX USB External Docking Sta								
		22L	EUA4			Both	Yes	No
Standalone USB DVD drive w/c								
		22L	EUA5			Both	Yes	No
Core Use HW Feature								
		22L	EUC6			MES	Yes	No
Core Use HW Feature 10								
		22L	EUC7			MES	Yes	No

The following are newly announced features on the specific models of the IBM Power Systems 7014 and 7965 machine type:

Description Machine type 7014	Model number	Feature number	Purchase price	Minimum Monthly Maint. Charge	Initial/ MES/ Both/ Support	CSU	RP MES
Rack Specify 9008-22L- 2EIA							
	T00	ER2W			Initial	N/A	No
	T42				Initial	N/A	No

```
                                          Minimum Initial/
                                          Monthly MES/
Description              Model  Feature Purchase Maint.  Both/        RP
Machine type 7965        number number  price   Charge  Support  CSU MES


Rack Specify 9008-22L- 2EIA
                          94Y    ER2W                     Initial  N/A No
                          S42                             Initial  N/A No
```

CSU = Customer setup
RP MES = Return parts, miscellaneous equipment specifications

Pricing terms

Prices in the following PDF prices link are suggested list prices on day of announcement for the U.S. only. They are provided for your information only. Dealer prices may vary, and prices may also vary by country. IBM list price does not include tax or shipping and is subject to change without notice.

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Annual minimum maintenance charges

Not applicable.

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Corrections

(Corrected on March 27, 2018)

The Description and Operating environment sections were revised.

(Corrected on February 23, 2018)

The Description and Hardware requirements sections were revised.