



# IBM Power Systems offers enhancements for IBM Power E850 memory and for Power Systems I/O

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## At a glance

IBM<sup>®</sup> Power Systems<sup>™</sup> announces multiple enhancements:

- The maximum memory capacity of the Power<sup>®</sup> E850 server is doubled to 4 TB, enhancing its ability to support memory-intensive applications.
- PCIe NVMe Flash Adapters provide a faster flash memory technology option for IBM POWER8<sup>®</sup> processor-based servers, enhancing Power Systems capabilities in cloud, hyperscale, and enterprise application.
- A new higher performance PCIe3 SAS RAID adapter can run up to 50% more solid-state disks (SSD) and provide up to 100% more write IOPs.
- The 2-Port 8 Gb Fibre Channel adapter offers new price/performance for POWER8 servers.
- The existing PCIe 4-Port Async EIA-232 Adapter (#5785/#5277) is now supported by IBM i, providing twice the async ports per PCIe slot.
- Power Enterprise Pools are enhanced with multiple managing HMC capability.
- Support for the 100 GB EDR InfiniBand PCIe adapter on the Power S812LC.

## Overview

Multiple Power Systems enhancements are being made.

The Power E850 server adds a larger capacity 128 GB CDIMM, which doubles maximum memory capacity of the E850. Using 32 feature EM8S CDIMMs provides 4 TB of memory capacity on a 4-socket populated E850. Using 16 feature EM8S CDIMMs provides 2 TB of memory capacity on a 2-socket populated E850. Using 24 feature EM8S CDIMMs provides 3 TB of memory capacity on a 3-socket-populated E850 server.

PCIe NVMe Flash Adapters can offer significant improvements in write latency and I/O throughput compared to using SAS-attached SSDs or FC-attached SSDs in SANs or FlashSystems for applications using the high performance NVMe interface protocol. Two NVMe Flash Adapters are introduced, a 1.6 TB adapter (#EC54/#EC55) and a 3.2 TB adapter (#EC56/#EC57). The adapters are supported in the system unit of a Power S812L, S822L, S824L, S814, S822, S824, E870, or E880 server running a Linux<sup>™</sup> environment.

The PCIe3 12 GB Cache RAID PLUS SAS Adapter (#EJ14) is the next iteration of IBM's leading-edge SAS technology for POWER8 servers. Based on the popular PCIe3 12 GB Cache RAID SAS Adapter (#EJ0L), this new adapter leverages additional chip capabilities on the PCIe3 12 GB Cache RAID PLUS SAS Adapter

to provide higher performance. The feature PCIe3 12 GB Cache RAID PLUS SAS Adapter can provide up to 100% more write IOPs than the earlier PCIe3 12 GB Cache RAID SAS Adapter. Plus the adapter can support up to 72 SSDs, which is 50% more than the earlier PCIe3 12 GB Cache RAID SAS Adapter. A pair of PCIe3 12 GB Cache RAID PLUS SAS Adapters can support up to 1.6 M read IOPS, or up to 360 K write IOPS, or up to 878 k IOPS using a 70-30 mix of writes and reads (see the [Description](#) section). The adapter is supported on a Power S812L, S822L, S824L, S814, S822, S824, E850, E870, or E880 server.

The new PCIe2 8Gb 2-Port Fibre Channel Adapter adds a lower price 8 Gb Fibre Channel option for AIX<sup>®</sup>, Linux, and VIOS usage on POWER8 servers. The new adapter (low-profile feature EN0F and full-high feature EN0G) are alternate choices to currently available 8Gb 2-port feature 5273 and feature 5735 adapters.

The existing PCIe 4-Port Async EIA-232 Adapter (#5785/#5277) is now supported by IBM i, providing twice the number of async ports per PCIe slot than was previously available by two-port adapters such as the feature 2893/2894, 5289/5290, EN27/EN28, or EN29. Support of the 4-port feature 5785/5277 for IBM i requires IBM i 7.2 TR4, or later, or IBM i 7.1 TR11, or IBM i 7.3 or later. Note that all the 2-port adapters above except feature EN29 are already withdrawn from marketing or have already been announced to be withdrawn from marketing in the next few months.

Support for multiple managing HMCs to support one Power Enterprise Pool is added with the latest 8.50 HMC firmware levels. One "master" HMC continues to be required for the pool, but now additional managing HMCs can be used. This greatly enhances the setup and operations for multisite pools.

The PCIe LP 2-port 100 GB EDR IB Adapter x16 (#EC3E) is now supported in the x16 PCIe slot of the Power S812LC (8348-21C). This adapter provides high bandwidth and low latency capabilities in an EDR InfiniBand environment.

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## Key prerequisites

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For the required operating system level support, refer to the specific I/O feature description section in the individual server sales manuals.

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## Planned availability date

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- April 15, 2016, for feature EB73
- May 27, 2016, for features EB52, EB5A, EB5B, EB5C, EB5D, EB5E, EB5F, EC3E, EC54, EC55, EC56, EC57, EJ14, EJRF, EJRG, EJRH, EJRJ, EME0, EN0F, EN0G, EPE0, and EU29
- June 10, 2016, for features EM8S, EMED, and EMEE
- June 17, 2016, for features EB50, EB51, EB52, EB54, EB5A, EB5B, EB5C, EB5D, EB5E, EB5F, EB5G, EB5H, EC3E, EC3T, and EL43

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## Description

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### Maximum memory doubled for Power E850 server

The Power E850 server adds a new, larger capacity DDR4 128 GB CDIMM (#EM8S). The new CDIMM has the same 1600 MHz as the existing DDR3 CDIMMs and has the same performance characteristics as the 64 GB DDR3 CDIMM. However, by doubling the memory capacity, the E850 is better able to support memory-hungry applications.

The 128 GB CDIMMs follow the same configuration rules as with all other size CDIMMs with one exception, which is "mixing." The 128 GB DDR4 CDIMMs cannot be

mixed with any other size CDIMMs on that server. The other configuration rules are the same. A minimum of four CDIMMs per populated sockets is required. Additional CDIMMs are plugged in pairs. A two-socket-populated E850 provides up to 2 TB memory. A three-socket-populated E850 provides up to 3 TB memory. A four-socket-populated E850 provides up to 4 TB memory.

<b>Populated sockets</b>	<b>Minimum 128 GB CDIMMs</b>	<b>Other valid CDIMM quantities</b>
2-socket = 16 memory slots	8	10, 12, 14, 16
3-socket = 24 memory slots	12	14, 16, 18, 20, 22, 24
4-socket = 32 memory slots	16	18, 20, 22, 24, 26, 28, 30, 32

If a Power E850 server was initially purchased with smaller memory DIMMs and needs to be updated to use the 128 GB CDIMMs, remove all smaller DIMMs from the server.

The same memory activation features (#EMAA (1 GB) and #EMAB (100 GB)) are used for the DDR4 128 GB CDIMMs as for the smaller memory CDIMMs. The same activation rule that a minimum of 50% of the physically installed memory must be permanently activated is used. The same Power IFL and memory bundle activation features (#ELJB, #EMAJ, #EMB9) are also used. Likewise, the same memory enablement and billing features for Elastic CoD are used.

Two server hardware prerequisites apply if DDR4 128 GB CDIMMs are to be used. First, the service processor (FSP) must be at the most current level as available in May 2016 with the availability of the DDR4 128 GB CDIMMs. Second, additional voltage regulator modules (VRMs) must be installed. Either feature EMED (field) or feature EMEE (plant) is used to order these components.

DDR4 Memory Enablement feature EMED is used when an already installed Power E850 server is changing from DDR3 memory and switching to 128 GB DDR4 CDIMMs in the field. Both a replacement service processor and additional VRMs are shipped.

DDR4 Memory Enablement feature EMEE is used when a new Power E850 server is shipped from the IBM manufacturing plant with DDR4 128 GB CDIMMs initially installed. Additional VRMs are included. A replacement service processor is not used because by that time all E850 service processors shipping will be at the proper level.

### **PCIe3 NVMe Flash Adapter for POWER8 Linux-only systems**

The PCIe3 NVMe Flash Adapter delivers more of the full potential of nonvolatile flash memory for POWER8 enterprise and scale-out servers for Linux workloads. Architected for performance, the PCIe3 NVMe Adapter provides the extreme performance capabilities to help meet the performance demands of cloud, Internet portal data centers, and other high-performance computing environments. It leverages Linux industry-standard software and NVMe drivers to provide a streamlined protocol that is efficient and scalable.

The PCIe3 NVMe Flash Adapter features extremely low latency and high bandwidth packaged onto a card that fits into a PCIe Gen3 x8 slot. A single adapter is rated at up to 750,000 random read-only IOPs and 3 GB/s read bandwidth and as little as 25 micro seconds write latency. Compared to eMLC3 generation SSDs, early measurements show:

- Up to three times better write latency
- Up to seven times more read IOPS
- Up to nearly five times more read throughput
- Up to nearly four times more write throughput

This technology is the best option for quickly moving content to or from volatile main memory. For example, if you have a high-priority, high-performance application running in memory that needs to be protected against an electrical

failure or other problem which might occur in the system memory, you can regularly copy key content to an NVMe Flash Adapter faster than alternative technologies. In case of power or memory failure, you would lose only the content that hadn't been saved to the NVMe Flash Adapter and you would be able to reload the saved content back into memory very quickly. It would be much faster than using SAS-attached SSDs or Fibre Channel-attached storage.

The NVMe Flash Adapter provides data redundancy protection for any single chips/module RAID protection scheme in the card. However, it is not protected against multiple chip/module failures within the card. Therefore, IBM strongly recommends having additional protection/redundancy if the NVMe Flash Adapter is used as a long-term storage medium, especially for high-value content. This would typically be accomplished using a mirroring between two or more NVMe Flash Adapters, which would be done by Linux software RAID utilities (see "mdadm"). Note that a small amount of CPU overhead will be incurred to write and maintain redundant copies across multiple NVMe adapters.

Both a 1.6 TB and a 3.2 TB capacity are available with either a full-high or a low-profile tailstock bracket. Four feature numbers are used to select the option appropriate to your server:

- PCIe3 LP 1.6 TB NVMe Flash Adapter (#EC54) and PCIe3 LP 3.2 TB NVMe Flash Adapter (#EC56) are supported in the 2U Power S812L, S822L, and S822 servers and in the Power E870 and E880 servers.
- PCIe3 1.6 TB NVMe Flash Adapter (#EC55) and PCIe3 3.2 TB NVMe Flash Adapter (#EC57) are supported in the 4U Power S824L, S814, and S824 servers.

The PCIe3 NVMe Flash Adapter is supported only in the system unit or system node. It is not supported in the PCIe Gen3 I/O drawer. Any of the PCIe slots in the POWER8 system unit or system node can be used to hold a NVMe PCIe adapter. Placement preference will be in a x16 slot or a direct x8 slot for this adapter, and placement in a shared x8 slot will be least preferred. The following adapter maximums apply to either 1.6 TB or 3.2 TB card (or a mix), but the 3.2 TB adapter is used to calculate the terabyte maximum:

- S812L with six PCIe slots, maximum of five NVMe Flash Adapters, maximum of 16 TB
- S822L/S822 with nine PCIe slots, maximum of seven NVMe Flash Adapters, maximum of 22.4 TB
- S814 with seven PCIe slots, maximum of six NVMe Flash Adapters, maximum of 19.2 TB
- S824L/S824 with 11 PCIe slots, maximum of eight NVMe Flash Adapters, maximum of 25.6 TB
- One-node E870/E880 with eight PCIe slots, maximum of eight NVMe Flash Adapters, maximum of 25.6 TB
- Two-node E870/E880 with 16 PCIe slots, maximum of 16 NVMe Flash Adapters, maximum of 51.2 TB
- Three-node E880 with 24 PCIe slots, maximum of 24 NVMe Flash Adapters, maximum of 76.8 TB
- Four-node E880 with 32 PCIe slots, maximum of 32 NVMe Flash Adapters, maximum of 102.4 TB

The NVMe Flash Adapter is a read-intensive adapter and is not designed for high write-intensive workloads. At about 17,500 TB - 35,000 TB of writes to the 3.2 TB adapter, it will be at its maximum projected write capability. A 1.6 TB adapter offers about 8,760 TB - 17,500 TB writes. Writes past the adapter's maximum write capacity will continue to work for some period of time, but much more slowly. A Predictive Failure Analysis message will indicate that it is time to replace the adapter. This message will be posted in the system log if enabled by the system administrator. If the predictive failure is ignored and writes continue to be sent to the adapter, eventually the adapter will be unable to accept write commands and will accept only read commands for a period of time. A failed write will result in a more serious error message, indicating that the adapter must be replaced.

The nature of the workload has a great impact on the maximum write capacity. For example, if a high percentage of more sequentially oriented writes is used instead of random writes, the maximum write capacity will be closer to the larger value in the range. With a high percentage of random writes, the maximum will be closer to the smaller value in the range. Another impact is whether more modern Linux file systems are used. More modern Linux file systems can be aware of flash memory and be more efficient in their usage of writes. The user should occasionally check to see what percentage of the adapters' write life remains and adjust the workload or adapter assignment as it makes sense to do so.

If the adapter reaches its maximum write capability during the warranty period, IBM will replace it at no charge to the client. The warranty period of the adapter is defined by the server under which the adapter feature code is ordered and will be either three years or one year for Power Systems. After the warranty period, the adapter's replacement is not covered under IBM maintenance if the maximum number of writes has been achieved. You would need to order a new, chargeable adapter as its replacement. Other aspects of adapter maintenance are consistent with other adapters that do not have flash memory.

### **Supported OS levels/environments:**

- Environments such as PowerVM<sup>®</sup> (not PowerKVM, not bare metal)
  - Red Hat Enterprise Linux 7.2, big endian, or later, with all available maintenance updates
  - Red Hat Enterprise Linux (RHEL) 7.2, little endian, or later, with all available maintenance updates
  - SUSE Linux Enterprise Server (SLES) 11, Service Pack 4, or later, with all available maintenance updates
  - Ubuntu Server 16.04, or later
- Bare metal systems (indicated by #EC16)
  - Not supported
- PowerKVM 3.1 systems (indicated by #EC40) or PowerKVM 2.1 (#EC20):
  - Not supported

The nvme-cli tool is available for download for RHEL and SLES from the IBM Power Tools repository at the [IBM Service and productivity tools for Linux on Power servers](#) website.

**Note:** Booting from this device is not supported at this time.

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

The PCIe3 12 GB Cache RAID PLUS SAS Adapter provides high-performance HDD or SSD controller function using PCIe Gen3 technology and IBM's industry leading SAS RAID adapter technology. It is a single-wide, full-height, short Gen3 PCIe adapter with four 6 Gb connectors.

The existing PCIe 12 GB RAID SAS Adapter (#EJ0L) and the new PCIe3 12 GB RAID PLUS SAS Adapter (#EJ14) are very similar physically, but the new adapter uses additional hardware processor chip resources on the adapter allowing it to provide additional performance. The additional performance capability is not that noticeable if just running disk drives. But with SSD, the new adapter is capable of supporting 50% more SSDs and up to 100% more writes than the existing adapter.

The performance of the PCIe3 12 GB RAID PLUS SAS Adapter is excellent, especially using RAID 5 and RAID 6 protection schemes. A pair of PCIe3 12 GB RAID PLUS SAS Adapters has attained 1.6 M read IOPS using RAID 0 and random 4 KB of data. Also, a pair of PCIe3 12 GB RAID PLUS SAS Adapters attained 360,000 write IOPS using RAID 5 and random 4 KB of data. Using RAID 5 data in 4 KB blocks and a mix of 70% reads and 30% writes, a pair of PCIe3 12 GB RAID PLUS SAS Adapters attained 878,000 IOPS. Note that performance is workload and environment dependent and client environments will differ from these values. However, these measured results prove the real potential.

The PCIe3 12 GB RAID PLUS SAS Adapter provides all the function available on the PCIe3 12 GB RAID SAS Adapter, including Easy Tier<sup>(R)</sup> function, and it uses the same HD SAS cables and connections to the EXP24S I/O drawer (#5887/#EL1S). The PCIe3 12 GB RAID PLUS SAS Adapter is supported on POWER8 servers, whereas the earlier PCIe3 12 GB RAID SAS Adapter is supported on both POWER7<sup>(R)</sup> and POWER8 servers.

A pair of adapters works together to deliver additional performance, redundancy, and write-cache protection. Patented active-active capability boosts performance for adapter pairs running at least two arrays. A single adapter configuration is not supported. A nonpaired PCIe SAS RAID indicator (#EJRL) is required by IBM Manufacturing to identify an AIX high-availability configuration when the PCIe3 12 GB RAID PLUS SAS Adapter pairing is across two servers. The pairing must be with two PCIe3 12 GB RAID PLUS SAS Adapters. You cannot pair two different adapters.

Like the existing PCIe3 12 GB RAID SAS Adapter, integrated flash memory provides protection of the PCIe3 12 GB RAID SAS Adapter write cache without batteries in case of power failure. Likewise, effectively up to 12 GB of write cache is provided using compression of 3 GB of physical cache. Compared to the earlier PCIe Gen2 adapters (#ESA3 or #5913), the PCIe3 12 GB RAID PLUS SAS Adapter and PCIe3 12 GB RAID SAS Adapter offer effectively about six times more cache.

Like the existing PCIe3 12 GB RAID SAS Adapter, the new PCIe3 12 GB Cache RAID PLUS SAS Adapter provides four mini-SAS HD (high density) narrow connectors for the attachment of SAS drives located in the SAS EXP24S expansion drawer. X, YO, or AT SAS cables with HD narrow connectors are used to attach to these drawers. A maximum of four EXP24S I/O drawers can be attached with a maximum of 96 HDDs or a maximum of 72 SSDs. The existing PCIe3 12 GB RAID SAS Adapter only supports 48 SSDs, but also supports 96 HDDs.

Like the existing PCIe3 12 GB RAID SAS Adapter, two AA SAS cables with HD narrow connectors are attached to the pair of PCIe3 12 GB RAID PLUS SAS Adapters to communicate status and cache content information. The two AA cables are required unless three or four ports are being used to attach HDDs or SSDs. Then one or zero AA cables per adapter pair is allowed. Four AA cable lengths are available: 0.6 m (#ECC0), 1.5 m (#ECC2), 3 m (#ECC3), and 6 m (#ECC4). The top one or two mini-SAS HD narrow connectors (labeled T3 and T2) on each card are used for this AA cable.

The eight ports of an adapter pair are treated as four pairs of ports. The bottom port (labeled T0) of each adapter of an adapter pair is connected to the same I/O drawer or to the same half of an I/O drawer, a specific range of SAS bays. Likewise, the next-to-bottom port (labeled T1) of each adapter pair is connected to one specific range of SAS bays. Similarly, the two ports labeled T2 of each adapter attach to the same range of bays or attach to each other through an AA cable. The top ports labeled T3 are cabled the same way as the T2 ports.

If an EXP24S drawer is in mode 2, then not all the SAS bays on the I/O drawer can be accessed by the adapter pair unless a second set of ports is used to access the other half of the drawer. If a second set of adapter ports is used to do this, then the maximum number of drawers per adapter pair is reduced. Thus the PCIe3 12 GB RAID PLUS SAS Adapters maximums of 96 HDDs or 72 SSDs for four mode 1 drawers become 48 HDDs or 48 SSDs with four mode 2 drawers.

If the I/O drawer is in mode 2, then half of its SAS bays can be controlled by one pair of SAS adapters such as a 12 GB write cache adapter pair (#EJ14) and the other half can be controlled by a different 12 GB write cache adapter pair or by zero-write-cache 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. For example, an EXP24S drawer in mode 2 could have a pair of PCIe3 12 GB RAID PLUS SAS Adapters controlling half its SAS bays and a pair of feature ESA3 adapters controlling the other half.

The maximum number of HDDs that can be controlled by one adapter pair depends on the number of I/O drawers and the drawers' mode setting. For example, the following numbers of HDDs can be controlled as indicated:

- Up to 96 HDDs by using four EXP24S drawers in mode 1
- Up to 48 HDDs by using two or four EXP24S drawers in mode 2
- Up to 72 HDDs by using two EXP24S drawers in mode 2 and two EXP24S drawers in mode 1

All the SFF (2.5-inch) SAS HDDs that are supported in the EXP24S (#5887) drawer are supported by the PCIe3 12 GB RAID PLUS SAS Adapters. Like the existing PCIe3 12 GB RAID SAS Adapters, the PCIe3 12 GB RAID PLUS SAS Adapters does not support the older EXP12S (#5886) drawer and its 3.5-inch HDDs.

SSD configuration options and maximums are different from HDD usage. A pair of PCIe3 12 GB RAID PLUS SAS Adapters can support a maximum of 72 SSDs. All these SSDs must be attached to the bottom one or two or three sets of ports (T0 or T1 or T2). SSDs and HDDs can be mixed on the same adapter pair; however, SSDs and HDDs cannot be attached to the same set of adapter ports. For example, having SSDs on the T0 ports and HDDs on the T1 and T2 ports is supported, but having SSDs and HDDs on the same T1 port is not. The maximum combined number of SAS drives (SSD+HDD) on an adapter pair is 96.

If more than 48 SSDs are used on a pair of PCIe3 12 GB RAID PLUS SAS Adapters, then no HDDs are supported on that pair. And if more than 48 SSDs are used, there is a maximum of three EXP24S drawers supported and a requirement for at least one AA cable.

Both the existing PCIe3 12 GB RAID SAS Adapters and new PCIe3 12 GB RAID PLUS SAS Adapter use mini-SAS HD narrow connectors. Previous PCIe2 adapters used mini-SAS HD cables, which are slightly wider and are not supported on the PCIe3 SAS adapters. Multiple HD narrow cable options are available to attach an EXP24S I/O Drawer (#5887/#EL1S). Five lengths of YO cables with mini-SAS HD narrow connectors are available: 1.5 meter (#ECBT), 3 meter (#ECBU), 6 meter (#ECBV), 10 meter (#ECBW), and 15 meter (#ECBx). Four lengths of X cables with mini-SAS HD narrow connectors are available: 3 meter (#ECBJ), 6 meter (#ECBK), 10 meter (#ECBL), and 15 meter (#ECBM). All of these cables support up to 6 Gb throughput except the longer 15 meter cables, which support up to 3 Gb throughput.

The PCIe3 12 GB RAID PLUS SAS Adapter supports a full set of protection options for its SAS drives. For AIX, Linux, and VIOS, this includes RAID 0, 5, 6, and 10 as well as Easy Tier function RAID 5T2, 6T2, and 10TR2 as well as operating system mirroring. For IBM i, this includes RAID 5, 6, and 10 or operating system mirroring. Hot spare is also supported for AIX, IBM i, Linux, and VIOS. RAID sets with up to a maximum of 32 devices can be configured, depending on the environment.

For additional performance, pairs of SAS adapters support Active/Active protocols. This means that as long as there are at least two arrays configured per pair of adapters, additional I/O performance is gained by using the bandwidth of both adapters in the pair.

The 12 GB write cache adapter is supported by:

- AIX version 6.1 with the 6100-09 Technology Level and Service Pack 7, or later
- AIX version 7.2 with the 7200-00 Technology Level and Service Pack 2, or later
- AIX version 7.1 with the 7100-04 Technology Level and Service Pack 2, or later
- AIX version 7.1 with the 7100-03 Technology Level and Service Pack 7, or later (planned availability September 8, 2016)
- IBM i 7.2 TR4, or later, or IBM i 7.3, or later
- Red Hat Enterprise Linux 7.2, little endian, or later
- Red Hat Enterprise Linux 7.2, big endian, or later
- SUSE Linux Enterprise Server 11, Service Pack 4, or later

- SUSE Linux Enterprise Server 12, Service Pack 1, or later
- Ubuntu 16.04, or later
- VIOS 2.2.4.20, or later
- PowerKVM - No support currently provided with PowerKVM

The SAS drives attached to a pair of PCIe3 12 GB RAID PLUS SAS Adapters must use 4224-byte sector (4k) or 528-byte sector (5xx) formatting. The 4096-byte or 512-byte sector (JBOD) formatted drives are not supported except when initially formatting to 4224 or 528 bytes under AIX or Linux. Thus, any AIX, Linux, and VIOS drives that are not already formatted to 4224-byte or 528-byte sectors need to be reformatted to 4224-byte or 528-byte before being added to a PCIe3 12 GB RAID PLUS SAS Adapter array.

Additional protection capabilities called T10 Data Integrity Function (DIF) are designed into Power Systems PCIe3 or PCIe2 SAS adapters. As a result, the formatting of HDD/SSD arrays on PCIe3/PCIe2 SAS adapters differs slightly compared to the formatting on the older PCIe Gen1 SAS adapters such as the feature 5904, 5906, 5908, 5805, or 5903 adapters.

Like the PCIe2 SAS adapters (#5913 or #ESA3) and unlike PCIe1 SAS adapters with write caches, batteries are not used in the PCIe3 SAS adapters (#EJ14 or #EJ0L) to protect cache contents in case of a power failure. Built-in flash memory protection with capacitors is used instead. This avoids the need to change batteries as they age.

The 528-byte formatted SAS drives or arrays can usually be easily moved off of older PCIe1 SAS adapters to the PCIe3 or PCIe2 SAS adapter and will automatically be converted by the PCIe2 or PCIe3 SAS adapter. The word "usually" is used because AIX, Linux, and VIOS drives that were placed in an array that did not use the default 256,000 stripe size or that were individually included into an existing array will require reformatting before being moved to the PCIe3 or PCIe2 adapter.

**Note:** Moving drives off the PCIe3 or PCIe2 adapter and onto older PCIe1 or PCI-X SAS adapters requires the HDDs or SSDs to be reformatted before being placed on the older adapters.

One no-charge specify code is used with each EXP24S (#5887/#EL1S) to communicate to IBM configurator tools and to 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 represented by these specify codes. IBM Manufacturing and IBM configurator tools such as e-config only understand and support EXP24S configurations represented by these specify codes. EXP24S I/O Drawer (#5887/EL1S) specify codes used with the PCIe3 12 GB RAID PLUS SAS Adapter include:

- #EJRF Mode 1 and two #EJ14 and two YO cables for AIX/IBM i/Linux/VIOS
- #EJRG Mode 2 and two #EJ14 and two X cables (assumes the adapter pair running all SAS bays) for AIX/Linux/VIOS
- #EJRH Mode 2 and two #EJ14 and one X cable (the adapter pair only running half the SAS bays for future growth) for AIX/Linux/VIOS
- #EJRJ Mode 2 and four #EJ14 and two X cables (assumes the adapter pairs running all SAS bays) for AIX/Linux/VIOS

### **PCIe2 2-Port 8 Gb Fibre Channel Adapter**

The PCIe2 2-Port 8 Gb Fibre Channel Adapter (#EN0F/#EN0G) offers the same functionality as the existing PCIe 2-Port 8 Gb Fibre Channel Adapter (#5273/#5735), but at a lower price. See the [IBM System Storage<sup>®</sup> Interoperation Center \(SSIC\)](#) website for supported combinations. The adapter is supported by AIX and Linux. It is supported by IBM i through VIOS.

### **4-Port Async Adapter expanded support**



The PCIe 4-port Async EIA-232 Adapter (#5785/#5277) has been supported by AIX and Linux for years, but support is just now announced for IBM i. IBM i 7.2 TR4, or later, or IBM i 7.1 TR11, or later, or IBM i 7.3, or later, is required. The additional support is important to IBM i clients who want to use a PCIe async card because other async adapter options have been withdrawn or are being withdrawn from marketing. The only 2-port async adapter that has not been withdrawn or announced for withdrawal as of April 2016 is the feature EN29 adapter.

The functionality of the 2-port and 4-port async cards is essentially the same, including the ability to run IBM i Facsimile for i 5.8, or later (previously named Fax/400). The adapter has one port, but comes with a 1.2 m (4 foot) fan-out cable, which provides four DB 9-pin D-Sub (Male DB-9) connectors. See PCIe adapter placement information in IBM Knowledge Center.

### **Enterprise Pools HMC enhancement**

Support for multiple HMCs and virtual appliance HMCs (vHMCs) to support one Power Enterprise Pool is added with the latest 8.50 HMC firmware level. There continues to be one pool master HMC or vHMC, but now additional managing HMCs and vHMCs can be used. This greatly enhances the setup and operations for multisite pools. Previously, in addition to the pool master HMC, only one managing HMC/vHMC was supported and its functionality was limited.

For more detail, see the Software Announcement [AP16-0141](#), dated April 12, 2016.

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## **Statement of general direction**

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To address the need for acceleration on advanced analytics and cognitive platforms, IBM Power Systems intends to announce a next-generation High Performance Data Analytics (HPDA) and Computing (HPC) server that natively embeds POWER8 with NVIDIA NVLink high-speed interconnect technology and NVIDIA Tesla P100 GPU accelerators. This server is intended to deliver the enhanced bandwidth of NVLink between the POWER8 based CPU and NVIDIA Tesla P100 GPUs. This is planned to enable differentiated acceleration for data and compute-intensive workloads requiring superior throughput and performance and rapid data transfer between CPU and GPU in addition to GPU to GPU.

IBM plans to support the PCIe NVMe Flash Adapter on the Power E850 server. This planned support is to be consistent with NVMe Flash support already announced on the Power S812L, S814, S822, S822L, S824, S824L, E870, and E880 servers.

IBM's statements regarding its plans, directions, and intent are subject to change or withdrawal without notice at IBM's sole discretion. Information regarding potential future products is intended to outline our general product direction and it should not be relied on in making a purchasing decision. The information mentioned regarding potential future products is not a commitment, promise, or legal obligation to deliver any material, code, or functionality. Information about potential future products may not be incorporated into any contract. The development, release, and timing of any future features or functionality described for our products remain at our sole discretion.

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## **Product number**

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The following are newly announced features on the specific models of the IBM Power Systems 8202, 8205, 8231, 8233, 8247, 8268, 8284, 8286, 8348, 8408, 9109, 9117, 9119, and 9179:

### **New features available April 15, 2016**

Description	Machine type	Model	Feature number
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IBM i 7.3 Indicator	8202	E4B	EB73
	8202	E4C	
	8202	E4D	
	8205	E6B	
	8205	E6C	
	8205	E6D	
	8231	E1C	
	8231	E1D	
	8231	E2B	
	8231	E2C	
	8231	E2D	
	8233	E8B	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8D	
	9109	RMD	
	9117	MMB	
	9117	MMC	
	9117	MMD	
	9119	FHB	
	9119	MHE	
	9119	MME	
	9179	MHB	
	9179	MHC	
	9179	MHD	

The following are newly announced features on the specific models of the IBM Power Systems 8202, 8205, 8231, 8233, 8247, 8268, 8284, 8286, 8348, 8408, 9109, 9117, 9119, and 9179:

### New features available May 27, 2016

Description	Machine type	Model	Feature number
2.0M EDR IB / 100GbE Copper Cable QSFP	8247	21L	EB52
	8247	22L	
3M EDR IB / 100GbE Optical Cable QSFP	8247	21L	EB5A
	8247	22L	
5M EDR IB / 100GbE Optical Cable QSFP	8247	21L	EB5B
	8247	22L	
10M EDR IB / 100GbE Optical Cable QSFP	8247	21L	EB5C
	8247	22L	
15M EDR IB / 100GbE Optical Cable QSFP	8247	21L	EB5D
	8247	22L	
20M EDR IB / 100GbE Optical Cable QSFP	8247	21L	EB5E
	8247	22L	
30M EDR IB / 100GbE Optical Cable QSFP	8247	21L	EB5F
	8247	22L	
Note: EC3E FEATURE ON 8247-21L AND 8247-22L IS RESTRICTED FOR USE ONLY ON ESS.			
PCIe3 LP 2-port 100Gb EDR IB Adapter x16	8247	21L	EC3E
	8247	22L	
PCIe3 LP 1.6TB NVMe Flash Adapter	8247	21L	EC54
	8247	22L	
	8284	22A	
	9119	MHE	
	9119	MME	
PCIe3 1.6TB NVMe Flash Adapter	8247	42L	EC55
	8286	41A	
	8286	42A	
PCIe3 LP 3.2TB NVMe Flash Adapter	8247	21L	EC56
	8247	22L	
	8284	22A	
	9119	MHE	
	9119	MME	
PCIe3 3.2TB NVMe Flash Adapter	8247	42L	EC57
	8286	41A	
	8286	42A	

PCIe3 12GB Cache RAID PLUS SAS Adapter Quad-port 6Gb x8	8247	21L	EJ14
	8247	22L	
	8247	42L	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Specify Mode-1 & (2)EJ14 for EXP24S (#5887/EL1S)	8247	21L	EJRF
	8247	22L	
	8247	42L	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Specify Mode-2 & (2)EJ14 for EXP24S (#5887/EL1S)	8247	21L	EJRG
	8247	22L	
	8247	42L	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Specify Mode-2 & (2)EJ14 for EXP24S (#5887/EL1S)	8247	21L	EJRH
	8247	22L	
	8247	42L	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Specify Mode-2 & (4)EJ14 for EXP24S (#5887/EL1S)	8247	21L	EJRJ
	8247	22L	
	8247	42L	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Static to Mobile Memory Auto Conversion	9119	MHE	EMEO
	9119	MME	
PCIe2 LP 8Gb 2-Port Fibre Channel Adapter	8247	21L	EN0F
	8247	22L	
	8284	22A	
	9119	MHE	
	9119	MME	
PCIe2 8Gb 2-Port Fibre Channel Adapter	8247	21L	EN0G
	8247	22L	
	8247	42L	
	8284	22A	
	8286	41A	
	8286	42A	
	8408	E8E	
	9119	MHE	
	9119	MME	
Static to Mobile Processor Auto Conversion	9119	MHE	EPE0
	9119	MME	

The following are newly announced features on the specific models of the IBM Power Systems 8202, 8205, 8231, 8233, 8247, 8268, 8284, 8286, 8348, 8408, 9109, 9117, 9119, and 9179:

### New features available June 10, 2016

Description	Machine type	Model	Feature number
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128 GB CDIMM, 1600MHZ, DDR4 Memory	8408	E8E	EM8S
DDR4 Memory Enablement (field)	8408	E8E	EMED
DDR4 Memory Enablement (plant)	8408	E8E	EMEE

The following are newly announced features on the specific models of the IBM Power Systems 8202, 8205, 8231, 8233, 8247, 8268, 8284, 8286, 8348, 8408, 9109, 9117, 9119, and 9179:

### New features available June 17, 2016

Description	Machine type	Model	Feature number
0.5M EDR IB / 100GbE Copper Cable QSFP	8348	21C	EB50
1.0M EDR IB / 100GbE Copper Cable QSFP	8348	21C	EB51
2.0M EDR IB / 100GbE Copper Cable QSFP	8348	21C	EB52
1.5M EDR IB / 100GbE Copper Cable QSFP	8348	21C	EB54
3M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5A
5M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5B
10M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5C
15M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5D
20M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5E
30M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5F
50M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5G
100M EDR IB / 100GbE Optical Cable QSFP	8348	21C	EB5H
PCIe3 LP 2-port 100Gb EDR IB Adapter x16	8348	21C	EC3E
PCIe3 LP 1-port 100Gb EDR IB Adapter x16	8348	21C	EC3T
PCIe3 LP 16Gb 2-port Fibre Channel Adapter	8348	21C	EL43

### Model conversions

#### Feature conversions

The existing components being replaced during a model or feature conversion become the property of IBM and must be returned.

Feature conversions are always implemented on a "quantity of one for quantity of one" basis. Multiple existing features may not be converted to a single new feature. Single existing features may not be converted to multiple new features.

The following conversions are available to customers:

#### Feature conversions for 9117-MMD to 9119-MHE processor features:

From FC:	To FC:	Return parts
ELJ1 - Power IFL Processor Activation	ELJ9 - Power IFL Processor Activation	No
ELJ4 - Power IFL Processor Activation	ELJ9 - Power IFL Processor Activation	No
EPM0 - 4.22 GHz Proc Card, 0/12 Core POWER7+™, 16 DDR3 Memory Slots	EPBS - 4.19GHz, 40-core POWER8 processor	Yes
EPM1 - 3.80 GHz Proc Card, 0/16 Core POWER7+, 16 DDR3 Memory Slots	EPBS - 4.19GHz, 40-core POWER8 processor	Yes
EPMA - 1-Core Activation for Processor Feature EPM0	EPBU - 1 core Processor Activation for #EPBS	No
EPMB - 1-Core Activation for Processor Feature EPM1	EPBU - 1 core Processor Activation for #EPBS	No
EPMC - #EPM0 Processor Activation, Mobile Enabled	EPBV - 1 core Mobile Enabled Processor Activation for #EPBS, Mobile Enabled	No
EPMD - #EPM1 Processor Activation, Mobile Enabled	EPBV - 1 core Mobile Enabled Processor Activation for #EPBS, Mobile Enabled	No

## Feature conversions for 9179-MHD to 9119-MHE processor features:

From FC:	To FC:	Return parts
ELJ1 - Power IFL Processor Activation	ELJ9 - Power IFL Processor Activation	No
ELJ4 - Power IFL Processor Activation	ELJ9 - Power IFL Processor Activation	No
EPH0 - 4.42 GHz Proc Card, 0/16 Core POWER7+, 16 DDR3 Memory Slots	EPBS - 4.19GHZ, 40-core POWER8 processor	Yes
EPH2 - 3.72 GHz Proc Card, 0/32 Core POWER7+, 16 DDR3 Memory Slots	EPBS - 4.19GHZ, 40-core POWER8 processor	Yes
EPHA - 1-Core Activation for Processor Feature EPH0	EPBU - 1 core Processor Activation for #EPBS	No
EPHC - 1-Core Activation for Processor Feature EPH2	EPBU - 1 core Processor Activation for #EPBS	No
EPHL - #EPH0 Processor Activation, Mobile Enabled	EPBV - 1 core Mobile Enabled Processor Activation for #EPBS, Mobile Eabled	No
EPHM - #EPH2 Processor Activation, Mobile Enabled	EPBV - 1 core Mobile Enabled Processor Activation for #EPBS, Mobile Eabled	No

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## Publications

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No publications are shipped with the announced products.

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.

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## Services

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### Global Technology Services

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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 <http://www.ibm.com/services/> website.

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

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

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## Technical information

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### **Specified operating environment**

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#### ***Physical specifications***

For physical specifications, refer to the Sales Manual.

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

### **Planning information**

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#### ***Cable orders***

No cables required.

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

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

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## IBM Electronic Services

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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.

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## Terms and conditions

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### **MES discount applicable**

Equal to the volume commitment discount

**Field-installable feature**

Yes

**Warranty period**

This feature assumes the same warranty or maintenance terms as the machine in which they are installed for the full warranty or maintenance period announced for such machine.

PCIe NVMe Flash Adapters have a maximum number of write cycles. PCIe NVMe Flash device failures will be replaced during the standard warranty period for the attached server at IBM's expense regardless of usage levels. IBM Maintenance Agreements after the warranty period are limited to 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 client's expense. Individual service life may vary and can be monitored using an OS command.

**Customer setup**

Yes

**Machine code**

Same license terms and conditions as base machine

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**Prices**

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For all local charges, contact your IBM representative.

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**AP distribution**

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<b>Country/Region</b>	<b>Announced</b>
AP IOT	
ASEAN *	Yes
India/South Asia **	Yes
Australia	Yes
Hong Kong	Yes
Macao SAR of the PRC	Yes
Mongolia	Yes
New Zealand	Yes
People's Republic of China	Yes
South Korea	Yes
Taiwan	Yes
Japan IOT	
Japan	Yes

\* Brunei Darussalam, Cambodia, Indonesia, Lao People's Democratic Republic, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Timor-Leste Vietnam

\*\* Bangladesh, Bhutan, India, Maldives, Nepal, and Sri Lanka

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