IBM Power System S812LC server is designed to improve managing Hadoop and Spark workloads with a system optimized for efficiency and designed for big data

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At a glance

The Power(R) S812LC (8348-21C) server is a powerful one-socket IBM(R) OpenPower server that is initially targeted to provide Power infrastructure as a service (IaaS) and run IBM Watson(TM) workloads in SoftLayer(R).

The Power S812LC server offers 8 or 10 fully activated cores and I/O configuration flexibility to meet today’s processing needs. Server features:

- Potential to reduce the cost of managing Hadoop and Spark workloads with a system optimized for efficiency and designed for big data
- Superior throughput and performance for high-value Linux(TM) workloads such as LAMP, big data analytics, or industry applications
- Low acquisition cost through system optimization (industry standard memory, focused configurations, focused I/O and expansion, and industry standard warranty)
- A system that is optimized for Hadoop with up to 14 LFF (3.5-inch) drives in the system unit
- A solution that is optimized for clusters and scale-out deployments that are built on a 1S2U platform with up to 10 cores of IBM POWER8(TM) performance
- Ability to optimize your data center for cloud and business-critical applications with the only open standards-based system that guarantees system utilization to achieve superior cloud economics
- Powerful POWER8 processors that offer 3.32 GHz or 2.92 GHz performance with 8 or 10 fully activated cores
- Up to 1024 GB memory
- Four PCIe Gen3 slots
- Integrated:
  - Three USB 3.0 ports
  - SATA RAID controller for two LFF/SFF bays
  - VGA port, Serial over LAN port, baseT IPMI port
- Two redundant power supplies
- 19-inch rack-mount hardware (2U)
Overview

The Power System S812LC server with POWER8 processors is optimized for data and Linux. It is designed to deliver superior performance and throughput for high-value Linux workloads such as industry applications, open source, big data, and LAMP. The Power S812LC with POWER8 processors incorporates OpenPOWER foundation community innovation for clients that want the advantages of running their big data, Java™, open source, and industry applications on a platform designed and optimized for data and Linux. And with its modular design, the Power S812LC is simple to order and can scale from single racks to hundreds.

The Power S812LC server supports one processor socket, offering 8-core 3.32 GHz or 10-core 2.92 GHz POWER8 configurations in a 19-inch rack-mount, 2U (EIA units) drawer configuration. All the cores are activated.

The server provides 32 DIMM memory slots. Memory features supported are 4 GB (#EM5A), 8 GB (#EM5E), 16 GB (#EM5C), and 32 GB (#EM5D), allowing for a maximum system memory of 1024 GB.

The Power S812LC server also offers:

- Application performance gains and higher application throughput (CPU performance, multithreading for throughput)
- Rich I/O options in the system unit, including:
  - One PCIe x16 G3 LP slot
  - Three PCIe x8 G3 LP slots
- Fourteen SATA LFF/SFF bays for disk or SSD, 12 of which support RAID function
- One front and two rear USB 3.0 ports
- VGA port, Serial over LAN port, baseT IPMI port
- Two redundant, hot-swap ac power supplies
- 19-inch rack-mount 2U configuration
- Ubuntu Server 14.04.3

Key prerequisites

Ubuntu Server 14.04.3

Planned availability date

- October 30, 2015, for all features except:
  - November 20, 2015, for feature EC40
  - December 4, 2015, for features EC3Y and EC3S
  - February 9, 2016, for features ECS0 and ECSJ

Description

Summary of standard features for Power S812LC server:

- Power Systems™ server built with POWER8 processor modules
  - 8-core, 3.32 GHz
  - 10-core 2.92 GHz
  - 32 high-performance DDR3 memory slot
- 4 GB (#EM5A), 8 GB (#EM5E), 16 GB (#EM5C), and 32 GB (#EM5D) memory DIMM features
- Up to 1 TB memory
- Fourteen SATA bays for disk or SSD
- Four PCIe Gen3 low profile slots
  - One PCIe x16
  - Three PCIe x8
- Integrated:
  - Three USB 3.0 ports (two rear, one front)
  - SATA RAID controller for two LFF/SFF bays
  - VGA port
  - Serial over LAN port
  - BaseT IPMI port
- Two redundant power supplies
- 19-inch rack-mount hardware (2U)

**PowerKVM**

IBM PowerKVM provides server virtualization based on open source Kernel-based Virtual Machine (KVM) Linux technology. The PowerKVM virtualization technology allows sharing of real compute, memory, and I/O resources through server virtualization. These virtual resources are used by virtual machines that are running on the PowerKVM virtualized server.

Server virtualization with PowerKVM allows optimization and overcommitment of resources like CPU and memory. This allows clients to achieve superior agility, flexibility, and resource utilization, resulting in reduced cost-through-scale economies. It provides the ability to move VMs and workloads by using Live Migration without taking application downtime, thereby increasing overall availability and flexibility. The solution leverages existing Linux administration skills for virtualization administration and open administration tools like OpenStack to potentially reduce the overall cost of operating and owning this virtualization solution. PowerKVM also includes a local graphical virtualization administration tool called Kimchi that greatly simplifies initial setup and basic virtualization operation.

**Power 8348-21C system configuration**

The minimum Power 8348-21C initial order must include: one processor module, 128 GB of memory, one LAN adapter, two power supplies, two line cords, rack-mounting hardware, a system software indicator, a rack integrator specify, and a Language Group Specify.

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

<table>
<thead>
<tr>
<th>Feature number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EP0A x 1</td>
<td>8-core 3.32 GHz POWER8 Processor Module</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>EP0B x 1</td>
<td>10-core 2.92 GHz POWER8 Processor Module</td>
</tr>
<tr>
<td>EM5A x 32</td>
<td>4 GB DDR3 1333 MHz memory DIMM</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>EM5B x 16</td>
<td>8 GB DDR3 1333 MHz memory DIMM</td>
</tr>
<tr>
<td>EL3Z x 1</td>
<td>PCIe2 LP 2-port 10/10Gbe Base T RJ45 Adapter</td>
</tr>
<tr>
<td>EC16 x 1</td>
<td>OPAL Bare Metal</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>EC40 x 1</td>
<td>OPAL with POWERKVM 3.1</td>
</tr>
</tbody>
</table>
Processor modules

One processor module is used in a Power S812LC. The eight processor core module is ordered with feature EP0A. The ten processor core module is ordered with feature EP0B. All processor cores are activated. There is no option to change the processor module from a feature EP0A to feature EP0B or vice versa after it has been manufactured.

System memory (DRAM)

The Power S812LC has 32 memory slots. The minimum number of these slots filled is either 16 or 32 with one exception. And the minimum memory capacity is 128 GB with one exception. The one exception is that only eight 4 GB DIMMs can be used, providing only 32 GB total memory if ordering the feature EHJW quick-to-order configuration. Configurations using a different number of DIMMs are not supported.

Mixing of memory features is not allowed. Use all 4 GB, 8 GB, 16 GB, or 32 GB DIMMs. Therefore, plans for future memory upgrades should be considered when you decide which memory feature size to use at the time of initial system order.

Memory features

<table>
<thead>
<tr>
<th>Feature name</th>
<th>Feature number</th>
</tr>
</thead>
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<tr>
<td>4 GB DDR3 DIMM Memory</td>
<td>EM5A</td>
</tr>
<tr>
<td>8 GB DDR3 DIMM Memory</td>
<td>EM5E</td>
</tr>
<tr>
<td>16 GB DDR3 DIMM Memory</td>
<td>EM5C</td>
</tr>
<tr>
<td>32 GB DDR3 DIMM Memory</td>
<td>EM5D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DIMMs</th>
<th>8' DIMMs installed</th>
<th>16 DIMMs installed</th>
<th>32 DIMMs installed</th>
<th>DRAM Frequency (MHz)</th>
<th>Peak DRAM Bandwidth (GB/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 GB</td>
<td>X</td>
<td></td>
<td></td>
<td>1333</td>
<td>85.3</td>
</tr>
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<td>#EM5A</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 GB</td>
<td></td>
<td>N/A</td>
<td></td>
<td>1333</td>
<td>170.6</td>
</tr>
<tr>
<td>#EM5A</td>
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<td></td>
<td></td>
<td>133</td>
<td>170.6</td>
</tr>
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<td>8 GB</td>
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<td>X</td>
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<td>1333</td>
<td>170.6</td>
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<td>170.6</td>
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<tr>
<td>#EM5C</td>
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<td>133</td>
<td>170.6</td>
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<tr>
<td>16 GB</td>
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<td>X</td>
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<td>1333</td>
<td>170.6</td>
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<td>1066</td>
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<tr>
<td>#EM5D</td>
<td></td>
<td></td>
<td></td>
<td>1066</td>
<td>136.4</td>
</tr>
</tbody>
</table>

Eight 4 GB DIMMs only supported with feature EHJW quick-to-order configuration.

For peak bandwidth, use at least 16 DIMMs. Note that for the very largest system memory configuration (1 TB) the peak memory bandwidth is slightly lower. But for
many applications the larger amount of memory may be more significant than this bandwidth reduction.

- The first 16 DIMMs plug into memory slots C3\(^R\), C5, C6, C8, C11, C13, C14, C16, C19, C21, C22, C24, C28, C30, C31, and C33.
- The second 16 DIMMs plug into the remaining memory slots.
- If using the exception configuration of eight 4 GB DIMMs with the feature EHJW configuration, use slots C3, C5, C11, C13, C19, C21, C31, and C33.

**PCIe slots**

The S812LC has four PCIe Gen3 low-profile

- Slot 1 is x8 half-length slot, which is not CAPI enabled and shares bandwidth with slot 2.
- Slot 2 is x8 full-length slot, which is not CAPI enabled and shares bandwidth with slot 1.
- Slot 3 is a x16 full-length slot, which is CAPI enabled and does not share bandwidth.
- Slot 4 is a x8 half-length slot, which is CAPI enabled and does not share bandwidth.

Note that the feature EN0T PCIe Ethernet adapter is not supported in slot 1.

If disk or SSD is placed in a SATA bay in front of the server, the one or two slots will be used for a PCIe RAID adapter.

PCIe slots are not hot plug and scheduled downtime is required to safely add or remove a PCIe adapter.

Blind swap cassettes are not used. See the list of features for supported PCIe adapters.

**SATA Storage Bays and Drives**

The Power S812LC has 14 SATA bays for either HDDs or SSDs. Each bay includes mounting hardware for a larger form factor (LFF) or 3.5-inch drive or a small form factor (SFF) or 2.5-inch drive. There is no ordering feature number required for the 14 bays.

Two of the bays are in the rear of the server and are controlled by a storage mezzanine card (#EC3Q). Both these bays are located on a single tray on carrier. Withdrawing the tray from the server pulls both bays from the server. Physically moving one drive also moves the second.

Twelve of the bays are in the front of the server and are controlled by a PCIe RAID adapter (either #EC3S or #EC3Y). These bays do not share a carrier or tray and can be independently moved.

SATA HDD options:

- 1 TB 7.2k RPM 5xx SATA LFF Disk Drive (#ELD2)
- 6 TB 7.2k RPM 5xx SATA LFF Disk Drive (#ELD4)

SATA SSD:

- 960 GB Read Intensive SATA 5xx SFF SSD (#ELS2)

See the base and quick-to-order configuration descriptions for the minimum configurations orderable. After the server is shipped from IBM manufacturing additions/deletions to the drives can be made. Any resulting combination of 14 HDD or SSD drives selected from the above list is supported. Different capacity disk drives can be mixed. HDDs and SSDs can be mixed. Note normal RAID array configuration considerations for drives in the 12 front bays would apply.
Using 6 TB drives in all 14 bays provides 84 TB system capacity.

The 12 SATA bays in the front of the server are hot plug. Normal data protection considerations by either OS mirroring or RAID protection apply. The two SATA bays in the rear of the server are not hot plug and scheduled downtime is required to safely add or remove a drive.

**SATA controllers**

The feature EC3Q storage mezzanine card is a SATA controller for the two bays in the rear of the server. It does not support RAID function. It is located in a dedicated slot in the system unit and does not require a PCIe slot.

There are two PCIe RAID adapters that can run the 12 SAS bays in the front of the server. If you want to run one or more drives in any of these 12 bays, one of these adapters is required:

- PCIe LP internal SATA/SAS RAID 1 GB cache Adapter (#EC3S) with protected write cache
- PCIe3 LP internal SATA/SAS RAID UP-Cache Adapter (#EC3Y) with unprotected write cache

The feature EC3S adapter in PCIe slot 4 and its super capacitor power protection is placed in PCIe slot 1. Thus two PCIe slots are required for this feature. If power is lost to the server, the super capacitor protects the contents of the write cache until power is restored. This protection can help avoid lengthy recovery times which can result when data is lost before written to an HDD or SSD. The adapter supports RAID 0, 1, 1E, 5, 6, 10, 50, and 60 and supports hybrid RAID 1 and 10.

The feature EC3Y adapter is placed in PCIe slot 4. It offers a lower price than the feature EC3S adapter, but its smaller write cache is not protected in case the problems such as power loss to the server. It uses just one PCIe slot. The adapter supports RAID 0, 1, 1E, and 10.

**Predefined base and quick-to-order configurations**

To simply ordering and manufacturing of the Power S812LC server, specific predefined configurations are initially available from IBM. Ordering different initial configurations from IBM Manufacturing is not announced.

In summary, these predefined configurations are:

- A base configuration as either 8-Core (#EHJU) or 10-Core (#EHJV)
- Three quick-to-order configurations:
  - Feature EHJW including 8-Core, 32 GB memory and one 1 TB HDD
  - Feature EHJX including 10-Core, 256 GB memory and two 1 TB HDD
  - Feature EHJY including 10-Core, 512 GB memory, two 960 GB SSD, twelve 6 TB HDD, PCIe RAID adapter

Additions or deletions from these configurations by IBM Manufacturing plants on an initial order of a server is not provided. MES additions can be ordered after the server is installed. The base or quick-to-order configuration feature number is ignored later by the IBM e-config tool when later adding/deleting feature numbers via an MES order.

These configurations are for authorized channels only.

**Base configuration (#EHJU (8-core) and #EHJV (10-core))**

Required configuration features:

- One POWER8 Processor Module of either #EP0A 8-core 3.32 GHz or #EP0B 10-core 2.92 GHz
- Zero memory
• Zero disk
• Zero SSD
• One Storage Mezzanine Card (#EC3Q)
• Zero PCIe RAID card
• Zero PCIe Ethernet adapters
• Two AC Power supplies (2 x #EB2Y)
• Two power cords (same feature number) offered for Power S812LC
• One Hypervisor of either OPAL PowerKVM 3.1 (#EC40) or OPAL Bare metal (#EC16)
• One Language Group Specify - (93xx) from list of supported language group features
• One Shipping and Handling feature (#ESC5)
• One Rack Indicator - Not Factory Integrated (#4650)
• One Primary OS - Linux (#2147)
• Zero software preload

Quick-to-order configuration #EHJW - 8-core, 32 GB

Required configuration features:

• One POWER8 Processor Module #EP0A 8-core 3.32 GHz
• 32 GB memory using quantity 8 #EM5A 4 GB DIMMs
• One 1 TB SATA disk drive #ELD2
• Zero SSD
• One Storage Mezzanine Card (#EC3Q)
• Zero PCIe RAID card
• One PCIe Ethernet adapter: #5260 4-port 1 Gb
• Two AC Power supplies (2 x #EB2Y)
• Two power cords (same feature number) offered for Power System S812LC
• One Hypervisor of either OPAL PowerKVM 3.1 (#EC40) or OPAL Bare metal (#EC16)
• One Language Group Specify - (#93xx) from list of supported language group features
• One Shipping and Handling feature (#ESC5)
• One Rack Indicator - Not Factory Integrated (#4650)
• One Primary OS - Linux (#2147)

Quick-to-order configuration #EHJX - 10-core, 256 GB

Required configuration features:

• One POWER8 Processor Module #EP0B 10-core 2.92 GHz
• 256 GB memory using quantity 16 #EM5C 16 GB DIMMs
• Two 1 TB SATA disk drives, quantity two of #ELD2
• Zero SSD
• One Storage Mezzanine Card (#EC3Q)
• Zero PCIe RAID card
• One PCIe Ethernet adapter: #EN0T 4-port (2 x 10 Gb + 2 x 1 Gb)
• Two AC Power supplies (2 x #EB2Y)
• Two power cords (same feature number) offered for Power System S812LC
• One Hypervisor of either OPAL PowerKVM 3.1 (#EC40) or OPAL Bare metal (#EC16)
• One Language Group Specify - (#93xx) from list of supported language group features
• One Shipping and Handling feature (#ESC5)
• One Rack Indicator - Not Factory Integrated (#4650)
• One Primary OS - Linux (#2147)

Quick-to-order configuration #EHJY - 10-core, 512 GB

Required configuration features:
• One POWER8 Processor Module #EP0B 10-core 2.92 GHz
• 512 GB memory using quantity 16 #EM5D 32 GB DIMMs
• Twelve 6 TB SATA disk drives, quantity 12 of #ELD3
• Two 960 GB SATA SSD, quantity 2 of #ELS2
• One Storage Mezzanine Card (#EC3Q)
• One PCIe RAID card (#EC3Y)
• One PCIe Ethernet adapter: #EN0T 4-port (2 x 10 Gb + 2 x 1 Gb)
• Two AC Power supplies (2 x #EB2Y)
• Two power cords (same feature number) offered for Power System S812LC
• One Hypervisor of either OPAL PowerKVM 3.1 (#EC40) or OPAL Bare metal (#EC16)
• One Language Group Specify - (#93xx) from list of supported language group features
• One Shipping and Handling feature (#ESC5)
• One Rack Indicator - Not Factory Integrated (#4650)
• One Primary OS - Linux (#2147)

Integrated ports

Three USB 3.0 ports are provided. Two are on the rear and one is on the front of the server. A USB 1.0 port is also located on the rear of the server, but is not available for client use.

Three other ports are located on the rear of the server in addition to the above USB port:
• One VGA port
• One Serial over LAN port
• One Intelligent Platform Management Interface (IPMI) port. This is 10M/100M baseT

Power supply

• Two ac power supplies are required and are ordered using feature EB2Y (quantity two).
• The power supply supports either 100-120 V or 200-240 V power sources. But using 200-240 V allows the power supply to support a heavier load (1200 watt versus 1000 watt). The power sources must be the same for the server, both 200-240 V or both 100-120 V.

Power cords

Two power cords are required. Two feature 6458 cords for attaching the server to one or two IBM PDUs are defaulted in the e-config tool. Refer to the feature listing for other power cord options.

Rack considerations

The Power S812LC requires 2U (2EIA) in a standard 19-inch rack such as the IBM 7014-T42, 7014-T00, or 7965-94Y. Included with the server are rails to mount the
in an IBM or OEM rack. These are included without a separate feature number. The rails can be adjusted to fit racks which have depths from approximately 22.5 to 32 inches.

IBM Manufacturing does not provide rack integration with the Power S812LC system. The server is shipped separately. An IBM rack can be ordered and shipped separately.

Reliability, Availability, and Serviceability

Reliability, fault tolerance, and data correction

The Power S812LC server brings POWER8 processor and memory RAS functions into a highly competitive cloud data center with open source Linux technology providing the operating system and virtualization.

The Open Power Abstraction Layer (OPAL) firmware provides a hypervisor and operating system-independent layer that uses the robust error detection and self-healing functions that are built into the POWER8 processor and memory buffer modules. The processor address-paths and data-paths are protected with parity or error-correction codes (ECC). The control logic, state machines, and computational units have sophisticated error detection. The processor core soft errors or intermittent errors are recovered with processor instruction retry. Unrecoverable errors are reported as machine check. Errors that affect the integrity of data lead to system check-stop.

The Level 1 (L1) data and instruction caches in each processor core are parity protected and data are stored through to L2 immediately. L1 caches have a retry capability for intermittent errors and a cache set delete mechanism for handling solid failures. The L2 and L3 caches in the POWER8 processor and L4 cache in the memory buffer chip are protected with double-bit detect, single-bit ECC.

In addition, a threshold of correctable errors that are 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. The L3 cache can dynamically substitute a spare bit-line for a faulty bit-lane, allowing an entire faulty "column" of cache, impacting multiple cache lines, to be repaired. An uncorrectable error that is detected in these caches can also trigger a purge and delete of cache lines. This results in no loss of operation if the cache lines contained data unmodified from what was stored in system memory.

The memory subsystem has proactive memory scrubbing to prevent the accumulation of multiple single-bit errors. The ECC scheme can correct the complete failure of any one memory module within an ECC word. After marking the module as unusable, the ECC logic can still correct single symbol (two adjacent bit) errors. An uncorrectable error of data of any layer of cache up to the main memory is marked to prevent usage of fault data. The processor's memory controller and the memory buffer have retry capabilities for certain fetch and store faults.

Special Uncorrectable Error handling

Special Uncorrectable Error (SUE) handling prevents an uncorrectable error in memory or cache from immediately causing a machine check (MC) with uncorrectable error (UE). The system marks the data so that if the data is read again, it generates an MC with UE. Termination might be limited to the program/partition or hypervisor that owns the data. If the data is referenced by an I/O adapter, it freezes if data is transferred to an I/O device.

Thermal management, current/voltage monitoring

The On Chip Controller (OCC) monitors various temperature sensors in the processor module, memory modules, and environmental temperature sensors and steers the throttling of processor cores and memory channels if the temperature rises over thresholds that are defined by the design. The power supplies have their own independent thermal sensors and monitoring.
Power supplies and voltage regulator modules monitor over-voltage, under-voltage, and over-current conditions. They report into a power good tree that is monitored by the service processor.

**Chassis policy after input power loss and auto restart after system-check-stop**

The boot parameter "chassis policy" controls whether the server returns to the previous state or powers up axiomatically after an input power loss. The system automatically restarts after a system-check-stop, and it is up to the system management software to decide whether to use the server with potentially fewer resources.

**Serviceability**

The server is designed for system installation and setup, feature installation and removal, proactive maintenance, and corrective repair that is performed by the client:

- Customer Install and Setup (CSU)
- Customer Feature Install (CFI)
- Customer Repairable Units (CRU)

Warranty Service Upgrades are offered for an Onsite Repair (OSR) by an IBM System Services Representative (SSR) or an authorized warranty service provider.

IBM Knowledge Center provides up-to-date documentation to effectively service the system:

- Quick Installation Guide
- User's Guide
- Troubleshooting Guide
- Boot Configuration Guide

The documentation can be downloaded in PDF format or used online with an Internet connection.

**Service processor**

The service processor supports the Intelligent Platform Management Interface (IPMI 2.0) and Data Center Management Interface (DCMI 1.5) for system monitoring and management. The service processor provides platform system functions such as power on/off, power sequencing, power fault monitoring, power reporting, fan/thermal control, fault monitoring, VPD inventory collection, Serial over LAN (SOL), Service Indicator LED management, code update, and event reporting through System Event Logs (SEL). All SELs can be retrieved either directly from the service processor or from the host OS (Linux). The service processor monitors the operation of the firmware during the boot process and also monitors the hypervisor for termination. The firmware code update is supported through the service processor and IPMI interface. Multiple firmware images exist in the system, and the backup copy is used if the primary image is corrupted and unusable.

**Service interface**

The service interface enables clients and support personnel to communicate with the service support applications in a server by using a browser. It delivers a clear, concise view of available service applications. The service interface allows the support client to manage system resources and service information in an efficient and effective way.

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

- Service processor: Ethernet Service Network with IPMI version 2.0
• Service indicator LEDs: System attention and system identification (front and back)
• Service processor: Ethernet Service Network with IPMI version 2.0
• Host operating system: Command-line interface

Concurrent maintenance

The following components can be replaced without powering off the server:
• Drives in the front bay
• Power supplies

Error handling and reporting

In the event of system hardware or environmentally induced failure, the system error capture capability systematically analyzes the hardware error signature to determine the cause of failure. The CEC recoverable errors are handled through the CEC diagnostics capability in a Linux application and generates a System Event Log (SEL). One eSEL contains extra FFDC from the Hostboot, OCC, and OPAL subsystems that is associated with each SEL. For system checkstop errors, On Chip Controller (OCC) collects FIR data to PNOR and hostboot CEC diagnostics creates a SEL based on the FIR data in PNOR. When the system can be successfully restarted either manually or automatically, or if the system continues to operate, the host Linux OS can monitor the SELs on the service processor through the IPMI tool. Hardware and software failures are recorded in the SELs and can be retrieved through IPMI interface. The reporting of SELs in the system log of the operating system is planned.

The system can report errors that are associated with PCIe adapters/devices as well.

Product positioning

IBM Power server solutions and services, which are designed for midsized businesses, help your business capitalize on new opportunities, manage business risk while meeting high service levels, and keep within tight budget constraints.

Mobile

Worklight® on Power provides a mobile application platform to speed development and ongoing management of mobile applications, enabling clients to extend their business to mobile devices. It includes a comprehensive development environment, mobile-optimized runtime middleware, a private enterprise application store, and an integrated management and analytics console. Worklight on Power enables clients to achieve the following benefits:
• Simplify operations and reduce complexity by co-locating applications on a more scalable and reliable server.
• Streamline access to data and applications with secure, high-performance virtual networking.
• Grow seamlessly and accelerate deployment of new applications and services.
• Reduce overhead by using existing production and disaster recovery infrastructure.

Cloud

The IBM Power Systems Solution Edition for Scale-Out Cloud is a low-cost platform for cloud delivery that is built on the unique compute-intensive and memory bandwidth advantages of POWER8 technology with the flexibility of open source hypervisor and virtualization management tools. The Solution Edition for Scale-Out cloud includes these features:
• PowerKVM and OpenStack-based cloud delivery tools for community-driven innovation and maximum flexibility
• Choice of configuration customized for the skills and work at hand: 1-socket Linux server with 8-core or 10-core POWER8 processor modules, a choice of IBM or customer-provided storage, and a choice of Linux operating system
• Centralized management tools to create a control point for cloud, including cross-platform support for Power, x86, and IBM z Systems®, and a choice of hypervisors, including PowerVM®, z/VM®, VMware, HyperV, and KVM

Hadoop

IBM Power System S812LC server extends the IBM Power Systems family with a low acquisition cost, storage-dense system with up to 14 LFF drives or solid-state disks that can be optimized to simplify and accelerate big data and analytics using technologies such as Hadoop and Spark. Combining S812LC with these open source technologies can deliver fast insights from big data and deliver leading reliability and resiliency, resulting in fewer outages and fewer performance problems.

Statement of general direction

IBM intends to continue working with Red Hat to support the Power S822LC and Power S812LC servers with an upcoming Red Hat Enterprise Linux 7 release. For additional questions about the availability of this release and supported Power servers, consult the Red Hat Hardware Catalog at https://hardware.redhat.com

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Reference information

Refer to the following European documents:

• European Announcement Letter ZS03-0150 for IBM Customer Agreement (ICA)
Product number

The following are newly announced features on the specific models of the IBM Power Systems 8348 machine type:

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<td>Full Width Keyboard -- USB, Slovenian, #234</td>
<td>8348</td>
<td>21C</td>
<td>EK82</td>
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<tr>
<td>Full Width Keyboard -- USB, US English Euro, #103P</td>
<td>8348</td>
<td>21C</td>
<td>EK83</td>
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<tr>
<td>PCIe LP 8Gb 2-Port Fibre Channel Adapter</td>
<td>8348</td>
<td>21C</td>
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<tr>
<td>PCIe2 LP 2-port 10/1GbE Base RJ45 Adapter</td>
<td>8348</td>
<td>21C</td>
<td>EL3Z</td>
</tr>
<tr>
<td>1TB 7.2K RPM 5xx SATA LFF Disk Drive</td>
<td>8348</td>
<td>21C</td>
<td>ELD2</td>
</tr>
<tr>
<td>6TB 7.2K RPM 5xx SATA LFF Disk Drive</td>
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<td>21C</td>
<td>ELD4</td>
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<tr>
<td>960GB Read Intensive SATA 5xx SFF SSD</td>
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<td>21C</td>
<td>ELS2</td>
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<td>4 GB DDR3 DIMM Memory</td>
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<td>21C</td>
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<td>16 GB DDR3 DIMM Memory</td>
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<td>21C</td>
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<td>32 GB DDR3 DIMM Memory</td>
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<td>21C</td>
<td>EM5D</td>
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<td>8 GB DDR3 DIMM Memory</td>
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<td>21C</td>
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<td>21C</td>
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<td>21C</td>
<td>EN0T</td>
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<td>8-core 3.32 GHZ POWER8 Processor Module</td>
<td>8348</td>
<td>21C</td>
<td>EP0A</td>
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<tr>
<td>10-core 2.92 GHZ POWER8 Processor Module</td>
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<td>ESC5</td>
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**Model conversions**

Not applicable.
Feature conversions

Not applicable.

Publications

IBM 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

http://www.ibm.com/support/knowledgecenter/POWER8

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

The following information is shipped with the 8348-21C:

- Power Hardware Information DVD - SK5T-7087
- Installing the IBM Power System S812LC
- Important Notices
- Warranty Information
- License Agreement for Machine Code

You can access documentation about Linux on IBM systems at


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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.

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http://www.ibm.com/services/

For details on available IBM Business Continuity and Recovery Services, contact your IBM representative or visit

http://www.ibm.com/services/continuity

For details on education offerings related to specific products, visit


Technical information

Specified operating environment

Physical specifications

- Width: 450 mm (17.72 in.)
- Depth: 711 mm (28 in.)
- Height: 87 mm (3.43 in.)
- Weight: 21 kg (46 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:
  - Allowable: 10° - 35°C (50° - 95°F)
  - Recommended: 18° - 30°C (64° - 86°F)

  Heavy workloads might see some performance degradation above 30°C if internal temperatures trigger a CPU clock reduction.

- Relative humidity:
  - 90% noncondensing at 35°C (95°F) In/Nonoperating humidity

- Operating voltage: 110 to 240 V ac
- Operating frequency: 47 to 63 Hz
- Power consumption: 900 watts maximum
- Power source loading: 0.918 kVA maximum
- Thermal output: 3072 Btu/hr maximum
- Maximum altitude: 3,050 m (10,000 ft)
- Noise level:
- Typically configured enclosure:
  -- 6.6 bels (idle: A-Weighted Upper-Limit Sound Power Level)
  -- 7.9 bels (operating: A-Weighted Upper-Limit Sound Power Level)
- One maximally configured 4-socket enclosure:
  -- 7.4 bels (operating/idle: A-Weighted Upper-Limit Sound Power Level)
  -- 8.1 bels (heavy workload: A-Weighted Upper-Limit Sound Power Level)

**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 CFR, Title 47, Part 15, EMI Class A3
- **Japan**: VCCI Council, EMI Class A3
- **Korea**: KCC, EMI Class A3
- **China (PRC)**: CPCS, EMI Class A3
- **Taiwan**: Taiwan BSMI, EMI Class A3
- **Australia/New Zealand**: ACMA, EMI Class A3
- **Canada**: ICES-003, EMI Class A3
- **Russia**: GOST R, EMI Class A3
- **Saudi Arabia**: MoCI, EMI Class A3
- **Vietnam**: MPT, EMI Class A3

**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.

The Power System S812LC server is not certified for connection by any means whatsoever to interfaces of public telecommunications networks. Certification can 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
- **CAN/CSA22.2 No.** 60950-1-07
- **EN60950-1:2006** European Norm
- **IEC** 60950-1 2nd Edition + all National Differences

**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).

**Homologation**

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

**Hardware requirements**

The Power S812LC server offers 8-core or 10-core configurations with two processor modules. The system can contain up to 1024 GB of system memory and up to four adapter cards. Two 1200 watt 220 V ac power supplies are required in the system.
This flexibility is made available through the optional features for the Power S812LC server.

The server consists of one system central electronics complex (CEC) enclosure with the following items:

- **Choose a processor module from:**
  - One 8-core 3.32 GHz POWER8 Processor Card (#EP0A)
  - One 10-core 2.92 GHz POWER8 Processor Card (#EP0B)

  **Note:** All the cores are activated.

- **Choose 128 GB minimum memory from:**
  - 4 GB DDR3 DIMM, 1333 MHz, 8 Gb DDR3 DRAM (#EM5A)
  - 8 GB DDR3 DIMM, 1333 MHz, 8 Gb DDR3 DRAM (#EM5E)

**Notes:**

- A minimum of 32 EM5A memory features must be ordered.
- A minimum of 16 EM5E memory features must be ordered. (With exception of predefined configuration which allow eight 4 GB, 1333 MHz DDR3 memory modules (#EM5A).)
- No mixing of memory DIMM features on the S812LC server is allowed.
- **Choose Ethernet adapter from:**
  - PCIe2 LP 4-port 1 GbE (#5260)
  - PCIe2 LP 2-port 10/1Gbe BaseT RJ45 (#EL3Z)
  - PCIe2 LP 4-Port (10Gb+1GbE) SR+RJ45 (#EN0T)
- **One Language Group, Specify (#9300)**
  - This may be changed to any other #9xxx language group feature listed in this Power Systems server.
- **One Storage Mezzanine Card (#EC3Q)**
- **Two AC power supply, 1200 Watts (200-240 Volt) (#EB2Y)**
- **Two power cords (#6458, #6460, #6469, #6472, #6473, #6474, #6475, #6476, #6477, #6478, #6488, #6493, #6494, #6496, #6651, #6659, #6660, #6665, #6669, #6671, #6672, or #6680)**
- **Choose system software from:**
  - Open Power Abstraction Layer (OPAL) Firmware (#EC16)
  - OPAL with PowerKVM 3.1 (#EC40)
- **Indicator -- Drawer not factory integrated (#4650)**

**Software requirements**

Ubuntu Server 14.04.3

**Limitations**

The integrated system ports are supported for modem and asynchronous terminal connections with Linux. Any other application using serial ports requires a serial port adapter to be installed in a PCI slot. The integrated system ports do not support HACMP™ configurations.
Planning information

Cable orders
No cables are required.

Security, auditability, and control

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

Global Technology Services

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

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.

To learn how Electronic Services can work for you, visit

http://www.ibm.com/support/electronic

Terms and conditions

Volume orders
Contact your IBM representative.

Products - terms and conditions

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

Three years

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.

The following have been designated as consumables or supply items and are, therefore, not covered by this warranty:

- Time and Date Battery

**Warranty service**

If required, IBM provides repair or exchange service, depending on the type of warranty service specified below for the machine. IBM will attempt to resolve your problem over the telephone or electronically by access to an IBM Web site. 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 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 and location-specific information.

The type of service is Customer Replaceable Unit or Parts Only Service.

**Customer Replaceable Unit (CRU) Service**

IBM provides a replacement CRU to you for you to install. CRU information and replacement instructions are shipped with your machine and are available from IBM at any time on your request. Based upon availability, a CRU 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, and 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.

**Advanced Part Exchange Warranty Service**

Advanced Part Exchange warranty service allows you to order and track replacement parts directly under Customer Replaceable Unit or Parts Only Service following procedures that are provided by IBM. Replacement parts are shipped to your location for you to install. IBM will use commercially reasonable delivery methods to ship the replacement part for NBD delivery. Advanced Part Exchange warranty service is not available in all countries. You must be approved and registered to use this service. Contact your IBM representative or your reseller for further information.

**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


Service level is:
• 9 hours per day, Monday through Friday, excluding public or national holidays, next-business-day response, Latest Call Registration 15:00, with 100% CRU.

Additional reference for Europe
For additional information refer to the Europe HW Operations Guide and Service Level Description Table available at

http://www-5.ibm.com/services/europe/maintenance/

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.

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 above 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
The following on-site response-time objectives are available as warranty service upgrades for your machine. Available offerings are:

• IBM On-site Repair, Same-Business-Day, On-site Response Time, Latest call Registration 12:00, 9 hours per day, Monday through Friday, excluding public or national holidays.
• IBM On-site Repair, Same-Business-Day, On-site Response Time, Latest call Registration 18:00, 18 hours per day, Monday through Saturday, excluding public or national holidays.
• IBM On-site Repair, Same-Business-Day, 6 hours average On-site Response Time, 24 hours per day, Monday through Sunday, 365 days a year.

Customer Replaceable Units (CRUs) may be provided as part of the machine’s standard warranty CRU Service except that you may install a CRU yourself or request IBM installation, at no additional charge, under the 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, via 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 for your machine type.

**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.

Service levels are:

- IBM On-site Repair Limited, Next-Business-Day, On-site Response Time, Latest Call Registration 15:00, 9 hours per day, Monday through Friday, excluding public or national holidays.
- IBM On-site Repair, Next-Business-Day, On-site Response Time, Latest Call Registration 15:00, 9 hours per day, Monday through Friday, excluding public or national holidays.
- IBM On-site Repair, Same-Business-Day, Latest Call Registration 12:00, On-site Response Time, 9 hours per day, Monday through Friday, excluding public or national holidays.
- IBM On-site Repair, Same-Business-Day, 6 hours average, On-site Response Time, 24 hours per day, Monday through Sunday, 365 days a year.
- ESA and SSU customers: 2-hour coverage extension at no additional charge

**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.

Based upon availability, CRUs will be shipped for next-business-day delivery. 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 Tier 1 (mandatory) 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.

All CRUs in S812LC are considered Tier 1 CRUs, including but not limited to the following:
• DASD SFF Drive
• Fan
• Fan Cage
• All PCI Adapters
• RAID Card Cable
• Memory DIMMs
• Native USB Serial Card
• Operator Panel
• Operator Panel Cable
• Power Supply
• Line/power cord
• Keyboard
• Mouse
• External cables
• Display
• Sheet Metal trays and dividers
• Planar
• Air Duct
• Processors
• Hink Sinks
• Rails
• TPM Card

To service a Linux system end to end, Linux service and productivity tools must be installed from the web page at


The tools are automatically loaded if IBM manufacturing installs the Linux image or IBM Installation Toolkit.

PowerPack is the best way to install required service packages from the website.

The Linux call home feature is also supported in a stand-alone system configuration to report serviceable events.

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

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<th>Type/Model</th>
<th>Feature number</th>
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<tbody>
<tr>
<td>8348-21C</td>
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Usage plan machine
No

IBM hourly service rate classification
D / Three

When a type of service involves the exchange of a machine part, the replacement may not be new, but will be in good working order.
**Maintenance service offerings**
This machine is eligible under terms and conditions of IBM ServiceElite, the IBM Enterprise Service Agreement (ESA), or the IBM Maintenance Agreement. Consult your IBM representative for details.

**General terms and conditions**

**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 or visiting


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**
C.) Acceptance-By-Use Machine: No, the LIC 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.

**Prices**
For all local charges, contact your IBM representative.
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http://www.ibm.com/planetwide/

Corrections

(Corrected on February 10, 2016)
The Description, Limitations, and Product number sections were revised.

(Corrected on January 15, 2016)
The Limitations section was revised.

(Corrected on December 16, 2015)
The Reliability, Availability, and Serviceability section was revised to remove the PCI extended error handling information.

(Corrected on November 3, 2015)
The Description section and Limitations section were revised.

(Corrected on November 2, 2015)
The Description section was revised to remove a required configuration feature.

(Corrected on October 22, 2015)
The Operating environment section was revised.