New IBM FlashSystem 720 and FlashSystem 820 high-performance flash storage systems

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At a glance

IBM® FlashSystem 720 and IBM FlashSystem 820 deliver fast storage in a compact 1U rack mount design:

- Four 8 Gbps Fibre Channel (FC) or 40 Gbps quadruple data rate (QDR) InfiniBand interface ports
- Up to 10 TB of usable RAID 5 protected single-level cell (SLC) flash storage capacity (12.4 TB usable RAID 0, 16.5 TB raw capacity), or 20 TB of usable RAID 5 protected enterprise multi-level cell (eMLC) flash (24.7 TB usable RAID 0, 33.0 TB raw capacity) storage
- Dual power supplies with batteries to shut down safely in power loss events
- Web-based user interface with Service Center software for centralized and simplified service and support
- One-year warranty with customer replaceable units (CRU) and on-site service, along with optional warranty and service upgrades

For ordering, contact your IBM representative, an IBM Business Partner, or IBM Americas Call Centers at 800-IBM-CALL (Reference: YE001).

Overview

IBM introduces the FlashSystem portfolio of flash-based storage systems. Leveraging flash solid state storage technology, FlashSystem devices are designed for cost-effective, high storage performance used to accelerate critical business applications. IBM FlashSystem 720 and IBM FlashSystem 820 devices feature Variable Stripe RAID, 2D Flash RAID, and other unique reliability technologies. Connectivity options include four 8 Gbps FC or four 40 Gbps QDR InfiniBand interface ports. FlashSystem 720 and FlashSystem 820 storage systems occupy 1U of standard 19-inch rack space and are available in the following models:

- IBM FlashSystem 720 provides 5 or 10 TB of usable RAID 5 protected capacity (6 or 12 TB with RAID 0), based on SLC Flash technology
- IBM FlashSystem 820 provides 10 or 20 TB of usable RAID 5 protected capacity (12 or 24 TB with RAID 0), based on eMLC Flash technology

Key prerequisites

IBM FlashSystem 720 and FlashSystem 820 support FC and InfiniBand attachment to selected:

- IBM System x® servers
- IBM Power Systems™ servers
- IBM Flex System™ , IBM BladeCenter® , and IBM Power® System blades
- Intel™ and AMD processor-based servers

Refer to the IBM System Storage® Interoperation Center (SSIC) for additional details

http://www.ibm.com/systems/support/storage/ssic

Planned availability date

April 15, 2013

Description

IBM FlashSystem 720 and FlashSystem 820 storage systems are external, shared flash solid state storage devices that provide high performance, density, and efficiency in small integrated rackmount footprints. FlashSystem 720 and FlashSystem 820 have a unique combination of extremely low latency and high performance that offers customers scalable usable capacity points from 5 up to 20 TB (fully protected) using either SLC or eMLC flash storage media. FlashSystem 720 and FlashSystem 820 products also incorporate advanced reliability technology, including 2D Flash RAID and Variable Stripe RAID self-healing data protection.

FlashSystem 720 and FlashSystem 820 storage systems are important building blocks for today's high-performance storage environments. As standard primary data storage devices, FlashSystem 720 and FlashSystem 820 products deliver performance beyond that of most traditional arrays, even those that incorporate solid state drives (SSDs) or other flash technology. FlashSystem 720 and FlashSystem 820 storage systems can also be used as the top tier of storage in tiered storage architectures, such as the IBM Easy Tier® functionality available in IBM System Storage SAN Volume Controller (SVC) or Storwize® V7000 storage virtualization platforms. Variable Stripe RAID provides innovative data protection within each flash module of the FlashSystem 720 and FlashSystem 820 storage system. Variable Stripe RAID technology allows each flash storage module to recover internally from most common flash failures. The systems are designed to recover without requiring downtime, loss of usable capacity, or loss of data protection. Variable Stripe RAID rebuilds are managed by distributed controllers on each flash module, rather than centralized controllers. This higher granularity of Variable Stripe RAID versus traditional RAID arrangements minimizes rebuild times and helps to improve data availability.

2D Flash RAID technology within FlashSystem 720 and FlashSystem 820 provides two independent layers of RAID 5 data protection within each system: the module-level Variable Stripe RAID technology, and an additional system-level RAID 5 across flash modules. When operating in system-level RAID 5 mode, redundant centralized RAID controllers create a 10+1+1 RAID 5 arrangement across the twelve flash modules in the system. The system-level RAID 5 complements the Variable Stripe RAID technology implemented within each flash module, and provides protection

against data loss and data unavailability resulting from flash module failures. It also allows data to be rebuilt onto a hot spare module, so flash modules can be replaced without data disruption.

In addition to 2D Flash RAID and Variable Stripe RAID data protection, FlashSystem 720 and FlashSystem 820 storage systems incorporate other reliability features, including:

- Error correcting codes to provide bit-level reconstruction of data from flash chips
- Checksums and data integrity fields designed to protect all internal data transfers within the system
- Overprovisioning to enhance write endurance and decrease write amplification
- Wear leveling algorithms balance the number of writes among flash chips throughout the system
- Sweeper algorithms to help ensure all data within the system is read periodically to avoid data fade issues

IBM recommends implementing a data replication strategy in high availability environments to maximize data availability beyond the protections available within FlashSystem 720 and FlashSystem 820 storage systems.

Based on unique field-programmable gate array (FPGA) technology, IBM FlashSystem 720 and FlashSystem 820 storage systems are designed with the following attributes:

- Four external interface ports, with a choice of either 8 Gbps FC or 40 Gbps QDR InfiniBand
- Single or double density flash modules for two capacity points per model
- Two redundant RJ45 10/100/1000BASE-T Ethernet ports for management, monitoring, and support connectivity via web, secure shell (SSH), and simple network monitoring protocol (SNMP) interfaces
- Two redundant, hot-swappable power supply modules compatible with single-phase AC power systems around the world (100 - 240 V ac 50/60 Hz)

FlashSystem 720 and FlashSystem 820 storage systems require firmware version 5.6.0, or later. The following firmware features are included with all FlashSystem 720 and FlashSystem 820 storage systems:

- **Service Center connectivity** provides a call-home link to IBM for proactive and reactive support purposes
- **Java-based web interface** allows administrators to configure, manage, and monitor the system, update firmware, and conduct support tasks, supporting multiple systems within the same interface
- **Live system statistics** allows administrators to view performance, data flow, and other key metrics in real time
- **LUN Masking** allows administrators to restrict access to volumes on the system based on host addresses
- **Data Stat Archive** allows administrators to store and access up to one year of system statistics on the system
- **SSH console access** provides full access to system administration functions via scriptable SSH command line connectivity
- **SNMP interface with trap functionality** provides common monitoring mechanisms for system events
- **RAID 5 (protected)** , **RAID 0 (striped)** , or **JBOF (just a bunch of Flash)** data layout across all active Flash modules in the system

Compatible with standard FC or InfiniBand SAN infrastructures, FlashSystem 720 and FlashSystem 820 storage systems interoperate with most common data center equipment, including IBM System x and Power Systems servers running a variety of operating systems.

Required feature codes

IBM FlashSystem 720 (9831-AS2) and FlashSystem 820 (9831-AE2) require the selection of one external interface feature code:

- **8 Gb FC 4 Port external interface (#AF04):** Two dual-ported 8 Gbps FC external interface cards installed in the system for a total of four 8 Gbps FC ports in the system. Four 8 Gbps shortwave SFP transceivers are included.
- **InfiniBand QDR 4 Port external interface (#AF05):** Two dual-ported 40 Gbps QDR InfiniBand external interface cards installed in the system for a total of four 40 Gbps InfiniBand ports in the system with QSFP connectors.

IBM FlashSystem 720 requires the selection of one SLC flash capacity feature code:

- **6 TB SLC RAID 0 (12-pack) (#AF02):** Twelve 500 GB SLC Flash modules installed in the system for a total usable system capacity of approximately 6 TB in RAID 0 mode or 5 TB in RAID 5 mode (8.25 TB raw).
- **12 TB SLC RAID 0 (12-pack) (#AF03):** Twelve 1 TB SLC Flash modules installed in the system for a total usable system capacity of approximately 12 TB in RAID 0 mode or 10 TB in RAID 5 mode (16.49 TB raw).

IBM FlashSystem 820 requires the selection of one eMLC flash capacity feature code:

- **12 TB eMLC RAID 0 (12-pack) (#AF0E):** Twelve 1 TB eMLC Flash modules installed in the system for a total usable system capacity of approximately 12 TB in RAID 0 mode or 10 TB in RAID 5 mode (16.49 TB raw).
- **24 TB eMLC RAID 0 (12-pack) (#AF0F):** Twelve 2 TB eMLC Flash modules installed in the system for a total usable system capacity of approximately 24 TB in RAID 0 mode or 20 TB in RAID 5 mode (32.99 TB raw).

Optional feature code

RAID 5 protection (#AF0K): Added by default to configure system in RAID 5 storage mode. Remove if RAID 0 mode is desired. RAID 5 mode is required for maximum data availability.

Accessibility by people with disabilities

A US Section 508 Voluntary Product Accessibility Template (VPAT) containing details on accessibility compliance can be requested at

   http://www.ibm.com/able/product_accessibility/index.html

Product positioning

IBM FlashSystem 720 (9831-AS2) and FlashSystem 820 (9831-AE2) storage systems deliver high performance, efficiency, and reliability for shared enterprise storage environments, helping clients around the world address performance issues with their most important applications and infrastructure. FlashSystem 720 and FlashSystem 820 storage systems may be used as data storage for important large-scale applications that need high performance (particularly, low latency). Such applications include large-scale databases supporting line of business applications, as well as virtualization platforms (virtual servers and VDI).

FlashSystem 720 and FlashSystem 820 storage systems form part of the IBM Flash portfolio, which also includes other shared flash storage systems, SSD devices provided in disk storage systems, and server-based flash devices.

FlashSystem 720 and FlashSystem 820 storage systems can either complement or replace traditional hard drive arrays in many applications. As standard shared primary data storage devices, FlashSystem 720 and FlashSystem 820 storage systems deliver performance beyond that of most traditional arrays, even those that incorporate SSDs or other flash technology. FlashSystem 720 and FlashSystem 820

storage systems can also be used as the top tier of storage alongside traditional arrays in tiered storage architectures, such as the IBM Easy Tier functionality available in IBM System Storage SVC or Storwize V7000 storage virtualization platforms.

FlashSystem 720 and FlashSystem 820 storage systems may deliver significant benefits to server-based infrastructures which depend on large quantities of locally attached flash devices, such PCIe Flash cards or SAS/SATA SSDs. While locally attached flash devices typically work well for accelerating applications located on single servers, such devices can be more difficult to share across multiple servers, scale to large capacities, and centrally manage than FlashSystem 720 and FlashSystem 820 storage systems. Additionally, FlashSystem 720 and FlashSystem 820 storage systems have sophisticated reliability features like Variable Stripe RAID that are typically not present on locally attached Flash devices.

Based on SLC Flash, FlashSystem 720 storage systems are the appropriate choice for those with the following characteristics:

- High storage performance requirements, such as low latency (microseconds as opposed to milliseconds), high bandwidth (gigabytes per second), or high IOPS (thousands of I/O requests per second).
- Write-heavy workloads distributed across multiple servers
- Usable capacity requirements up to 10 TB per system
- Entry-level usable capacity point of 5 TB per system
- Absolute maximum bandwidth and performance per unit of capacity
- Minimal single points of failure within each system

Based on eMLC Flash, FlashSystem 820 storage systems are the appropriate choice for large-scale enterprise environments with the following characteristics:

- High storage performance requirements, such as low latency (microseconds as opposed to milliseconds), high bandwidth (gigabytes per second), or high IOPS (thousands of I/O requests per second)
- Read-heavy workloads distributed across multiple servers
- Usable capacity requirements up to 20 TB per system
- Entry-level usable capacity point of 10 TB per system
- Minimal single points of failure within each system

IBM recommends implementing a data replication strategy in high availability environments to maximize data availability beyond the protections available within individual FlashSystem 720 and FlashSystem 820 storage systems.

Product number

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                              Machine
      Description             type      Model        Feature

      IBM FlashSystem 720     9831      AS2

      IBM FlashSystem 820     9831      AE2

      Host interface cards:

      - 8 Gb FC 4 Port Ext Int   9831   AS2, AE2     AF04
      - IB QDR 4 Port Ext Int    9831   AS2, AE2     AF05

      Flash capacity:

      - 6TB SLC RAID 0 (12-pack)   9831   AS2        AF02
      - 12TB SLC RAID 0 (12-pack)  9831   AS2        AF03
      - 12TB eMLC RAID 0 (12-pack) 9831   AE2        AF0E
      - 24TB eMLC RAID 0 (12-pack) 9831   AE2        AF0F
      - RAID 5 Protection          9831   AS2, AE2   AF0K
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Bundle features:

- IBM FlashSystem Solution cf1  9831      AE2         AF0W
- IBM FlashSystem Solution cf2  9831      AE2         AF0X
- IBM FlashSystem Solution cf3  9831      AE2         AF0Y
- IBM FlashSystem Solution cf4  9831      AE2         AF0Z


Fibre Channel cables:

- 1 m Fiber Cable (LC-LC)       9831      AS2, AE2    3700
- 5 m Fiber Cable (LC-LC)       9831      AS2, AE2    3701


InfiniBand cables:

- 1 m IBM QSFP Cop IB           9831      AS2, AE2    A0RD
- 3 m IBM QSFP Cop IB           9831      AS2, AE2    A0RE
- 3 m IBM QSFP Opt QDR IB       9831      AS2, AE2    5989
- 10 m IBM QSFP Opt QDR IB      9831      AS2, AE2    5990
- 1 m Mlnx QSFP Cop FDR14 IB    9831      AS2, AE2    A2YG
- 3 m Mlnx QSFP Cop FDR14 IB    9831      AS2, AE2    A2YH
- 3 m Mlnx QSFP Opt FDR14 IB    9831      AS2, AE2    A2YL
- 10 m Mlnx QSFP Opt FDR14 IB   9831      AS2, AE2    A2YN


Line cords:

- Line cord - 2.8m (China)      9831      AS2, AE2    6210
- Line cord - 2.8m (Aus/NZ)     9831      AS2, AE2    6211
- Line cord - 2.8m (Europe)     9831      AS2, AE2    6212
- Line cord - 2.8m (Denmark)    9831      AS2, AE2    6213
- Line cord - 2.8m (S. Africa)  9831      AS2, AE2    6214
- Line cord - 2.8m (UK)         9831      AS2, AE2    6215
- Line cord - 2.8m (Swiss)      9831      AS2, AE2    6216
- Line cord - 2.8m (Ita/Chile)  9831      AS2, AE2    6217
- Line cord - 2.8m (Israel)     9831      AS2, AE2    6218
- Line cord - 2.8m (S Korea)    9831      AS2, AE2    6219
- Line cord - 2.8m (Argentina)  9831      AS2, AE2    6222
- Line cord - 2.8m (India)      9831      AS2, AE2    6269
- Line cord - 2.8m 120V (US)    9831      AS2, AE2    6313
- Line cord - 2.8m (Japan)      9831      AS2, AE2    6314
- Line cord - 2.8m (Taiwan)     9831      AS2, AE2    6386
- Line cord - 2.8m (Brazil)     9831      AS2, AE2    6532
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Business Partner information

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

https://www.ibm.com/partnerworld/mem/sla.jsp?num=113-047

Publications

The following publications are shipped with the product.

Additional copies of individual publications are available at

http://ibm.com/systems/storage/flash

```
                                     Order      Availability
Title                                number     date

IBM FlashSystem DVD                  SK5T-8819  04/11/13

Which contains:
  IBM FlashSystem 720 user information
  IBM FlashSystem 820 user information
  IBM FlashSystem SCSI interface information
  IBM FlashSystem SNMP information
  IBM FlashSystem web interface information
  IBM FlashSystem integration information
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IBM FlashSystem installation for ESXi
IBM FlashSystem service information
IBM FlashSystem Quick Start installation
License Agreement for Machine Code (Z125-5468)
Warranty flyer (GI11-9891)
Safety Notices (G229-99054)
Environmental notices (Z125-5823)
Information about other IBM FlashSystem products
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Services

Global Technology Services

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

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

For details on available services, contact your IBM representative or visit

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

http://www.ibm.com/services/learning/index.html

Select your country, and then select the product as the category.

Technical information

Specified operating environment

Physical specifications

IBM FlashSystem 720 and FlashSystem 820:

- Width: 432 mm (17 in)
- Depth: 638 mm (25.1 in)
- Height: 44 mm (1.7 in)
- Weight: 12.7 kg (27.99 lb) with single density capacity. 13.6 kg (29.98 lb) with double density capacity.

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

Operating environment

IBM FlashSystem 9831

- Air temperature

  - Operating: 10°C - 35°C (50°F - 95°F) at 30.5 m below to 3,000 m above sea level (100 ft below to 9,840 ft above)
  - Non-operating: -10°C - 50°C (14°F - 125°F)

- Relative humidity:
  - Operating: 20% - 80%
  - Non-operating: 10% - 90%
- Electrical power:
  - Voltage range: 100 - 240 V ac
  - Frequency: 50 - 60 Hz
- Acoustical noise emission:
  - 8.0 bels (idling)
  - 8.0 bels (operating)
- **9831-AS2**
  - Power consumption: 350 watts
  - Heat dissipation: 1194 BTU per hour
- **9831-AE2**
  - Power consumption: 300 watts
  - Heat dissipation: 1023 BTU per hour

Homologation

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

Hardware requirements

When equipped with FC interfaces (feature number AF04), IBM FlashSystem 720 (9831-AS2) and FlashSystem 820 (9831-AE2) storage systems are designed to support FC storage connectivity to the following:

Servers

- IBM Power Systems , including many IBM System p® servers with standard FC interfaces. Host interfaces must be capable of at least 8 Gbps operation for maximum performance. Virtual I/O Server (VIOS) hardware support is required for some environments.
- IBM System x servers and other x86 architecture servers with various standard FC interfaces. Host interfaces must be capable of at least 8 Gbps operation for maximum performance.

Infrastructure

- Most standard optical FC cables with LC connectors, or replacement SFP modules. Cables must be capable of at least 8 Gbps operation for maximum performance.
- Most standard switches and directors. All switch and director infrastructure must be capable of at least 8 Gbps operation for maximum performance.
- IBM System Storage SVC and IBM Storwize V7000 storage virtualization platforms, as well as other selected storage virtualization platforms with FC connectivity. Interfaces must be capable of at least 8 Gbps operation for maximum performance. Consult appropriate hardware compatibility lists for details.

When equipped with InfiniBand interfaces (feature number AF05), FlashSystem 720 and FlashSystem 820 storage systems are designed to support InfiniBand storage connectivity to the following:

Servers

- IBM Power Systems , including IBM System p servers with standard InfiniBand interfaces. Host interfaces must be capable of at least 40 Gbps QDR operation for maximum performance.

- IBM System x servers and other x86 architecture servers with various standard InfiniBand interfaces. Host interfaces must be capable of at least 40 Gbps QDR operation for maximum performance.

Infrastructure

- Most standard InfiniBand cables with QSFP connectors. Cables must be capable of at least 40 Gbps QDR operation for maximum performance.
- Most standard InfiniBand switches. All InfiniBand infrastructure must be capable of at least 40 Gbps QDR operation for maximum performance.

FlashSystem 720 and FlashSystem 820 storage systems require two standard RJ45 10/100/1000BASE-T Ethernet connections for redundant access to management and support interfaces.

For specific support information and hardware requirements, visit

   http://ibm.com/systems/storage/flash

Software requirements

IBM FlashSystem 720 and FlashSystem 820 storage systems typically do not require specific software packages to access data beyond standard FC (FCP only) or InfiniBand (SRP only) driver stacks typically included with the host adapters for those networks. On some operating systems, multipathing may require additional host software configuration. Some Power Systems operating environments may require the use of VIOS (Virtual I/O Server) for data access. IBM FlashSystem 720 and FlashSystem 820 storage systems require a web browser with Java™ support for management web GUI access. SSH management and SNMP notifications require appropriate standard software support from server platforms.

Planning information

Customer responsibilities

IBM FlashSystem 720 and FlashSystem 820 storage systems occupy one rack unit (RU) and can be supplied by either power distribution unit (PDU) or line cord power. FlashSystem 720 and FlashSystem 820 products use two RJ45 Ethernet connections for redundant management interface connections, and four host interface connections, which are either SFP+ FC or QSFP InfiniBand connections depending on selected features.

You are responsible for downloading or obtaining from IBM , and installing designated Machine Code (microcode, basic input/output system code (called BIOS), utility programs, device drivers, and diagnostics delivered with an IBM machine) and other software updates in a timely manner from an IBM Internet website or from other electronic media, and following the instructions that IBM provides. You may request IBM to install Machine Code changes; however, you may be charged for that service.

Cable orders

With the use of FC and InfiniBand host interfaces, either fiber optic or InfiniBand cables are required to attach the IBM FlashSystem products to the server. Customers are responsible for selecting and ordering the correct cables to match the IBM FlashSystem 720 and IBM FlashSystem 820 interface and the server interface. Refer to the feature descriptions section of the FlashSystem 710 and 810 Sales Manual for detailed information about the cables available.

Installability

Hardware installation time for FlashSystem 720 and FlashSystem 820 is estimated at less than one hour.

Security, auditability, and control

This product uses a system log to record all changes.

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

Terms and conditions

IBM Global Financing

Yes

Warranty period

One year

An IBM part or feature installed during the initial installation of an IBM machine is subject to a full warranty effective on the date of installation of the machine. 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 effective on its date of installation. 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.

Warranty service

If required, IBM provides repair or exchange service depending on the types of warranty service specified for the machine. IBM will attempt to resolve your problem over the telephone, or electronically 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. If applicable to your product, parts considered Customer Replaceable Units (CRUs) will be provided as part of the machine's standard warranty service.

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

CRU Service

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

Tier 1 (mandatory) CRU

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

Tier 2 (optional) CRU

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

Based upon availability, CRUs will be shipped for next business day (NBD) delivery. IBM specifies, in the materials shipped with a replacement CRU, whether a defective

CRU must be returned to IBM . When return is required, return instructions and a container are shipped with the replacement CRU. You may be charged for the replacement CRU if IBM does not receive the defective CRU within 15 days of your receipt of the replacement.

The following parts have been designated as Tier 1 CRUs:

- Power supply modules
- Power cords
- C13 to C14 PDU line cords
- FC cables
- InfiniBand cables

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 level is:

- 9 hours per day, Monday through Friday, excluding holidays, next business day response. Calls must be received by 5:00 p.m. local time in order to qualify for next business day response.

Non-IBM parts service

Warranty service

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

Note: Flash memory cells have an intrinsic, finite number of program/erase cycles that each cell can incur. As a result, Flash modules have a maximum amount of program/erase cycles to which it can be subjected. IBM's warranty for Flash modules is limited to devices that have not reached the maximum number of program/erase cycles, as documented in the *Official Published Specifications* for the product. Any flash module that reaches this limit may fail to operate according to its specifications.

Maintenance service options

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:

- 9 hours per day, Monday through Friday, excluding holidays, next business day response. Calls must be received by 5:00 p.m. local time in order to qualify for next business day response.
- 9 hours per day, Monday through Friday, excluding holidays, 4 hour average, same business day response
- 24 hours per day, 7 days a week, same day response
- 24 hours per day, 7 days a week, 2 hour average response, same day

Non-IBM parts service

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

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

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

Warranty service upgrades

Usage plan machine

No

IBM hourly service rate classification

Two

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

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

No

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 at

   http://www.ibm.com/systems/support/machine_warranties/machine_code.html

IBM may release changes to the Machine Code. IBM plans to make the Machine Code changes available for download from the IBM System Storage technical support website

   http://www.ibm.com/systems/storage/flash/

You may also obtain updated code by contacting your IBM representative.

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

Acceptance-By-Use Machine: Yes, acceptance of the Machine Code license terms is conveyed through the user's initial use of the Machine.

Educational allowance

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

The educational allowance is 15% for the products in this announcement.

Prices

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                          Machine    Feature
Description               type Model number

IBM FlashSystem 720    9831 AS2

Host interface cards:

- 8 Gb FC 4 Port Ext  9831 AS2   AF04
  Int
- IB QDR 4 Port Ext   9831 AS2   AF05
  Int

Flash capacity:

- 6TB SLC RAID 0       9831 AS2   AF02
  (12-pack)
- 12TB SLC RAID 0      9831 AS2   AF03
  (12-pack)
- RAID 5 Protection    9831 AS2   AF0K

Fibre Channel cables:

- 1 m Fiber Cable      9831 AS2   3700
  (LC-LC)
- 5 m Fiber Cable      9831 AS2   3701
  (LC-LC)

InfiniBand cables:
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- 1 m IBM QSFP Cop IB 9831 AS2  A0RD
- 3 m IBM QSFP Cop IB 9831 AS2  A0RE
- 3 m IBM QSFP Opt    9831 AS2  5989
  QDR IB
- 10 m IBM QSFP Opt   9831 AS2  5990
  QDR IB
- 1 m Mlnx QSFP Cop   9831 AS2  A2YG
  FDR14 IB
- 3 m Mlnx QSFP Cop   9831 AS2  A2YH
  FDR14 IB
- 3 m Mlnx QSFP Opt   9831 AS2  A2YL
  FDR14 IB
- 10 m Mlnx QSFP Opt  9831 AS2  A2YN
  FDR14 IB

Line cords:

- Line cord - 2.8m    9831 AS2  6210
  (China)
- Line cord - 2.8m    9831 AS2  6211
  (AS/NZ)
- Line cord - 2.8m    9831 AS2  6212
  (Europe)
- Line cord - 2.8m    9831 AS2  6213
  (Denmark)
- Line cord - 2.8m    9831 AS2  6214
  (S. Africa)
- Line cord - 2.8m    9831 AS2  6215
  (UK)
- Line cord - 2.8m    9831 AS2  6216
  (Swiss)
- Line cord - 2.8m    9831 AS2  6217
  (Ita/Chile)
- Line cord - 2.8m    9831 AS2  6218
  (Israel)
- Line cord - 2.8m    9831 AS2  6219
  (S Korea)
- Line cord - 2.8m    9831 AS2  6222
  (Argentina)
- Line cord - 2.8m    9831 AS2  6269
  (India)
- Line cord - 2.8m    9831 AS2  6313
  120V (US)
- Line cord - 2.8m    9831 AS2  6314
  (Japan)
- Line cord - 2.8m    9831 AS2  6386
  (Taiwan)
- Line cord - 2.8m    9831 AS2  6532
  (Brazil)
```

Description	Machine type	Model	Feature number
IBM FlashSystem 820	9831	AE2	

```
Host interface cards:

- 8 Gb FC 4 Port Ext  9831 AE2  AF04
  Int
- IB QDR 4 Port Ext   9831 AE2  AF05
  Int

Flash capacity:

- 12TB eMLC RAID 0    9831 AE2  AF0E
  (12-pack)
- 24TB eMLC RAID 0    9831 AE2  AF0F
  (12-pack)
- RAID 5 Protection   9831 AE2  AF0K

Bundle features:

- IBM FlashSystem      9831 AE2  AF0W
```

```
          Solution cf1
- IBM FlashSystem       9831 AE2  AF0X
 Solution cf2
- IBM FlashSystem       9831 AE2  AF0Y
 Solution cf3
- IBM FlashSystem       9831 AE2  AF0Z
 Solution cf4


Fibre Channel cables:

- 1 m Fiber Cable      9831 AE2  3700
 (LC-LC)
- 5 m Fiber Cable      9831 AE2  3701
 (LC-LC)


InfiniBand cables:

- 1 m IBM QSFP Cop IB 9831 AE2   A0RD
- 3 m IBM QSFP Cop IB 9831 AE2   A0RE
- 3 m IBM QSFP Opt     9831 AE2  5989
 QDR IB
- 10 m IBM QSFP Opt    9831 AE2  5990
 QDR IB
- 1 m Mlnx QSFP Cop    9831 AE2  A2YG
 FDR14 IB
- 3 m Mlnx QSFP Cop    9831 AE2  A2YH
 FDR14 IB
- 3 m Mlnx QSFP Opt    9831 AE2  A2YL
 FDR14 IB
- 10 m Mlnx QSFP Opt  9831 AE2   A2YN
 FDR14 IB


Line cords:

- Line cord - 2.8m     9831 AE2  6210
 (China)
- Line cord - 2.8m     9831 AE2  6211
 (AS/NZ)
- Line cord - 2.8m     9831 AE2  6212
 (Europe)
- Line cord - 2.8m     9831 AE2  6213
 (Denmark)
- Line cord - 2.8m     9831 AE2  6214
 (S. Africa)
- Line cord - 2.8m     9831 AE2  6215
 (UK)
- Line cord - 2.8m     9831 AE2  6216
 (Swiss)
- Line cord - 2.8m     9831 AE2  6217
 (Ita/Chile)
- Line cord - 2.8m     9831 AE2  6218
 (Israel)
- Line cord - 2.8m     9831 AE2  6219
 (S Korea)
- Line cord - 2.8m     9831 AE2  6222
 (Argentina)
- Line cord - 2.8m     9831 AE2  6269
 (India)
- Line cord - 2.8m     9831 AE2  6313
 120V (US)
- Line cord - 2.8m     9831 AE2  6314
 (Japan)
- Line cord - 2.8m     9831 AE2  6386
 (Taiwan)
- Line cord - 2.8m     9831 AE2  6532
 (Brazil)
```

		Field	Plant
	Feature	Install	Install
Description	number	only	only

Host interface cards:

```
- 8 Gb FC 4 Port Ext Int        AF04      N        Y
- IB QDR 4 Port Ext Int         AF05      N        Y

Flash capacity:

- 6TB SLC RAID 0 (12-pack)      AF02      N        Y
- 12TB SLC RAID 0 (12-pack)     AF03      N        Y
- 12TB eMLC RAID 0 (12-pack)    AF0E      N        Y
- 24TB eMLC RAID 0 (12-pack)    AF0F      N        Y
- RAID 5 Protection             AF0K      N        Y

Bundle features:

- IBM FlashSystem Solution cf1  AF0W      N        Y
- IBM FlashSystem Solution cf2  AF0X      N        Y
- IBM FlashSystem Solution cf3  AF0Y      N        Y
- IBM FlashSystem Solution cf4  AF0Z      N        Y

Fibre Channel cables:

- 1 m Fiber Cable (LC-LC)       3700      N        N
- 5 m Fiber Cable (LC-LC)       3701      N        N

InfiniBand cables:

- 1 m IBM QSFP Cop IB           A0RD      N        N
- 3 m IBM QSFP Cop IB           A0RE      N        N
- 3 m IBM QSFP Opt QDR IB       5989      N        N
- 10 m IBM QSFP Opt QDR IB      5990      N        N
- 1 m Mlnx QSFP Cop FDR14 IB    A2YG      N        N
- 3 m Mlnx QSFP Cop FDR14 IB    A2YH      N        N
- 3 m Mlnx QSFP Opt FDR14 IB    A2YL      N        N
- 10 m Mlnx QSFP Opt FDR14 IB   A2YN      N        N

Line cords:

- Line cord - 2.8m (China)      6210      N        Y
- Line cord - 2.8m (AS/NZ)      6211      N        Y
- Line cord - 2.8m (Europe)     6212      N        Y
- Line cord - 2.8m (Denmark)    6213      N        Y
- Line cord - 2.8m (S. Africa)  6214      N        Y
- Line cord - 2.8m (UK)         6215      N        Y
- Line cord - 2.8m (Swiss)      6216      N        Y
- Line cord - 2.8m (Ita/Chile)  6217      N        Y
- Line cord - 2.8m (Israel)     6218      N        Y
- Line cord - 2.8m (S Korea)    6219      N        Y
- Line cord - 2.8m (Argentina)  6222      N        Y
- Line cord - 2.8m (India)      6269      N        Y
- Line cord - 2.8m 120V (US)    6313      N        Y
- Line cord - 2.8m (Japan)      6314      N        Y
- Line cord - 2.8m (Taiwan)     6386      N        Y
- Line cord - 2.8m (Brazil)     6532      N        Y

NC = No charge
N = No
Y = Yes
```

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Alternative service

ICA Warranty upgrade

```
                              IOR
                         IBM same day
                         on-site repair
    Machine type-model   (IOR, 24 x 7)

    9831-AS2
    9831-AE2
```

ICA Maintenance

```
                              IOR                 IO8
                         IBM same day        IBM next day
    Machine              on-site repair       on-site repair
    type-model-feature   (IOR, 24 x 7)       (IOR, NBD 9 x 5)

    9831-AS2
    9831-AS2  AF02
    9831-AS2  AF03
    9831-AS2  AF04
    9831-AS2  AF05

    9831-AE2
    9831-AE2  AF04
    9831-AE2  AF05
    9831-AE2  AF0E
    9831-AE2  AF0F
```

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Corrections

(Corrected on May 9, 2013)
Updates have been made to the Title and the Description section.