



IBM FlashSystem 710 and IBM FlashSystem 810 IBM Redbooks Product Guide

IBM® FlashSystem™ 710 and IBM FlashSystem 810 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. These storage systems can either complement or replace traditional hard drive arrays in many applications, including online transaction processing (OLTP), business intelligence (BI), online analytical processing (OLAP), virtual desktop infrastructures, high-performance computing, and content delivery solutions (such as cloud storage and video on demand).

As standard shared primary data storage devices, FlashSystem 710 and FlashSystem 810 storage systems deliver performance beyond that of most traditional arrays, even those that incorporate SSDs or other flash technology. These 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® SAN Volume Controller or IBM Storwize® V7000 storage virtualization platforms.

Based on single level cell (SLC) flash, FlashSystem 710 is targeted to write-heavy enterprise workloads; enterprise multi level cell (eMLC) flash-based FlashSystem 810 is targeted to read-heavy workloads, where workload is distributed across multiple servers.

Figure 1 shows FlashSystem 710 and FlashSystem 810.



Figure 1. FlashSystem 710 and FlashSystem 810

Did you know?

IBM FlashSystem storage systems deliver up to 570,000 read IOPS and up to 5 GBps bandwidth with less than 100 microseconds latency, while they provide up to 10 TB of usable data storage just in 1U of rack space.

IBM FlashSystem storage systems offer enterprise-level availability and reliability with multiple layers of data correction, chip redundancy, and redundant hot swap components.

Key features

IBM FlashSystem storage systems deliver advanced performance, scalability, reliability, security, and energy-efficiency features. FlashSystem 710 and FlashSystem 810 storage systems are the appropriate choice for 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 (hundreds of thousands of I/O requests per second).

Scalability and performance

The FlashSystem storage systems offer numerous features to boost performance and improve scalability:

- FlashSystem storage systems can provide more than 500,000 IOPS and up to 5 GBps bandwidth for storage I/O-intensive enterprise workloads.
- FlashSystem 810 can scale up to 10 TB storage capacity in 2 TB increments, while FlashSystem 710 supports up to 5 TB in 1 TB increments.
- A single 42U rack containing 42 1U FlashSystem storage systems can provide up to 420 TB storage capacity with more than 20,000,000 IOPS and up to 210 GBps bandwidth.
- FlashSystem storage systems support up to 1,024 logical volumes.
- FlashSystem storage systems offer choice of 8 Gb Fibre Channel or 40 Gb QDR InfiniBand connectivity to match the performance of most demanding I/O intensive applications.

Availability and serviceability

The FlashSystem storage systems provide many features to simplify serviceability and increase system uptime:

- FlashSystem storage systems use overprovisioning and advanced wear leveling techniques to dramatically improve write endurance of the flash modules to extend their lifetime.
- FlashSystem storage systems offer multiple layers of data protection (ECC, Variable Strip RAID and Active Spare) to prevent a flash module failure.
- FlashSystem storage systems offer two redundant hot-swap power supplies and eight dual-motor non-hot-swap redundant fans to provide cost-efficient availability for applications.
- Easy-to-read LCD display indicates system errors to lead the technician to failed (or failing) components. This panel simplifies servicing and speeds up problem resolution, helping improve system availability.
- Two redundant batteries help prevent data loss by backing up data in RAM buffers allowing them to be written to a flash module in case of power failure.
- The built-in management module continuously monitors system parameters, triggers alerts, and performs recovery actions in case of failure, to minimize downtime.
- One-year customer replaceable unit and on-site limited warranty, next business day 9x5. Optional service upgrades available.

Manageability and security

Powerful systems management features simplify local and remote management of the FlashSystem storage systems:

- FlashSystem storage systems have a built-in LCD display allowing to perform basic configuration, management, and monitoring tasks, simplifying administration.
- FlashSystem storage systems include a management module to monitor server availability and perform remote management.
- The management module provides extensive security features, including role-based user authentication and access control, LDAP support, and SSH protocol for secure remote systems management.
- LUN masking feature allows to control access to a logical volume from the host side to prevent unauthorized data access and modification.

Energy efficiency

The FlashSystem storage systems offer the following energy-efficiency features to save energy, reduce operational costs, increase energy availability, and contribute to a green environment:

- Energy-efficient flash components help lower operational costs.
- FlashSystem storage systems offer one of industry's best IOPS per watt ratio enabling greater energy savings.
- FlashSystem storage systems use hexagonal ventilation holes, a part of IBM Calibrated Vectors Cooling™ technology. Hexagonal holes can be grouped more densely than round holes, providing more efficient airflow through the system.

Locations of key components and connectors

Figure 2 shows the internal components of the FlashSystem unit.

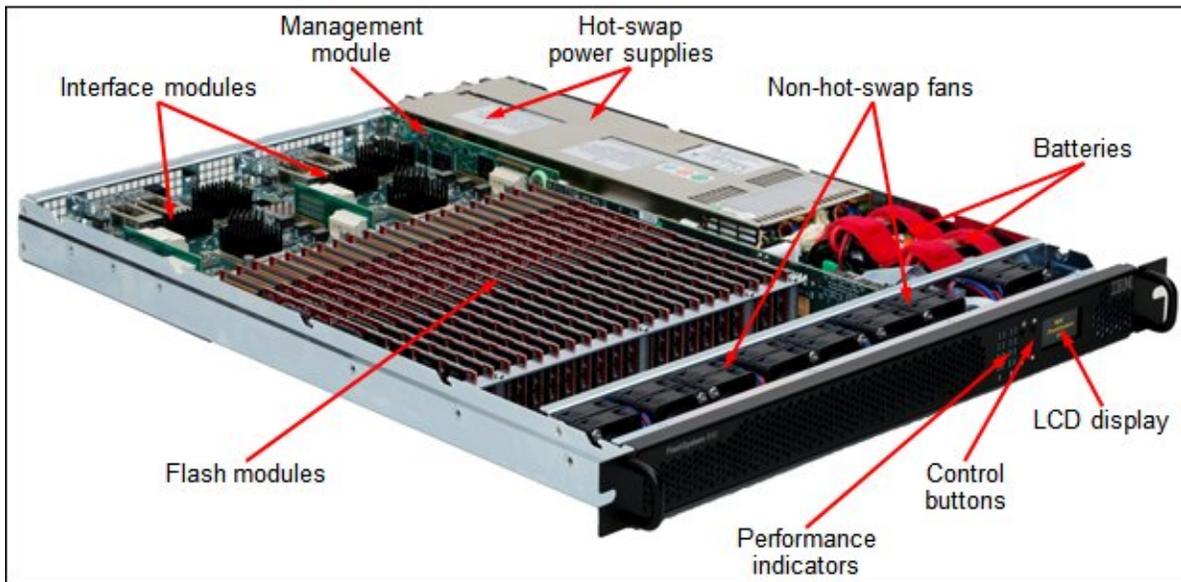


Figure 2. Internal view of the FlashSystem unit

Figure 3 shows the rear of the FlashSystem unit with the Fibre Channel interfaces.

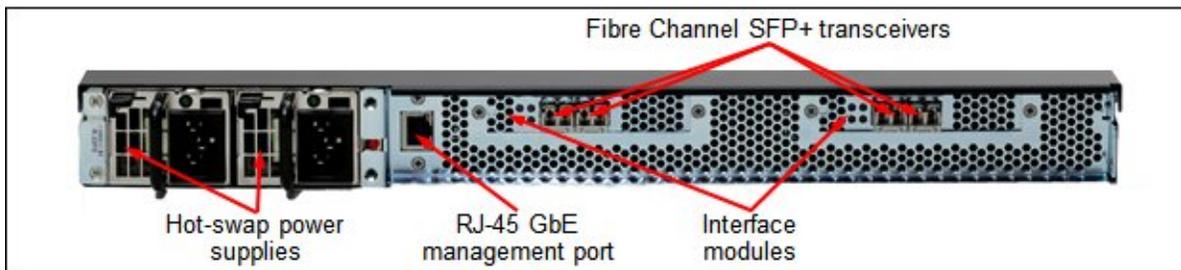


Figure 3. Rear view of the FlashSystem unit with the Fibre Channel interfaces

Figure 4 shows the rear of the FlashSystem unit with the InfiniBand interfaces.

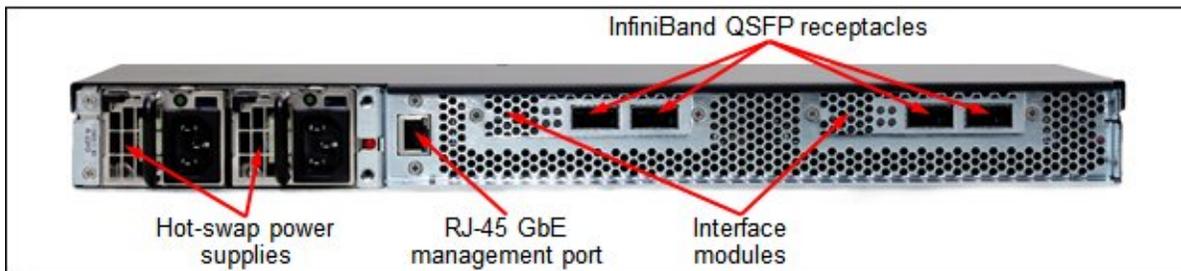


Figure 4. Rear view of the FlashSystem unit with the InfiniBand interfaces

Specifications

Table 1 lists the specifications.

Table 1. Specifications

Specification	FlashSystem 710	FlashSystem 810
Form factor	1U rack-mounted unit	
Flash module quantity	20+1	
Flash module type	Single level cell (SLC)	Enterprise multi level cell (eMLC)
Flash module capacity	256 GB	512 GB
Maximum capacity	Up to 5 TB with up to 20 flash modules with 1 TB increments*	Up to 10 TB with up to 20 flash modules with 2 TB increments*
Flash module protection	Overprovisioning, wear leveling, CRC checksum, ECC, and module-level Variable Stripe RAID (standard); Active Spare (optional).	
RAID support	No RAID (JBOF mode) or RAID 0 across flash modules	
Host interfaces	4x 8 Gb Fibre Channel (FC) or 4x 40 Gb QDR InfiniBand	
Read IOPS**	570,000	550,000
Write IOPS**	400,000 (FC); 470,000 (InfiniBand)	400,000 (FC); 470,000 (InfiniBand)
Read bandwidth***	3.3 GBps (FC); 5 GBps (InfiniBand)	3.3 GBps (FC); 5 GBps (InfiniBand)
Write bandwidth***	3.3 GBps (FC); 4.5 GBps (InfiniBand)	2.8 GBps (FC); 2.8 GBps (InfiniBand)
Read latency	100 μ s	110 μ s
Write latency	60 μ s	60 μ s
Systems management	LCD display with four control buttons; management module with one RJ-45 GbE port	
Cooling	Eight redundant non-hot-swap fans; each fan has two motors	
Power supply	Two redundant hot-swap 100 - 240 V ac auto-sensing power supplies	
Input power	280 W	350 W
Heat dissipation	955 BTU/hr	1194 BTU/hr
Hot-swap parts	Power supplies.	
Security features	Role-based user security, SSH, LDAP, and LUN masking	
Platforms supported	IBM System x®, IBM Power Systems™, non-IBM x86 servers; Windows, Linux, IBM AIX®, VIOS operating systems	
Limited warranty	One-year on-site limited warranty with 9x5 next business day response	
Service and support	Optional warranty service upgrades and post-warranty services are available: on-site with 24x7 2-hour, 24x7 or 9x5 same day, or 9x5 next business day response	
Dimensions	Height: 44 mm (1.7 in.), width: 432 mm (17.0 in), depth: 569 mm (22.4 in)	
Weight	13.6 kg (30 lb)	

* Flash modules are installed in sets of four.

** 4 KB I/O block size.

*** 256 KB I/O block size.

Models

Table 2 lists the FlashSystem 710 and FlashSystem 810 models.

Table 2. Models

Description	Machine type-model
IBM FlashSystem 710	9830-AS1
IBM FlashSystem 810	9830-AE1

The FlashSystem 710 and FlashSystem 810 storage systems are shipped with the following items:

- Statement of Limited Warranty
- Quick start guide
- Documentation CD containing *Installation and User's Guide*
- Fixed mount rail kit
- Two IEC 320-C13 to C14 rack PDU power cords

The FlashSystem 710 and FlashSystem 810 storage systems require interface and flash modules to be ordered with the base model. See "Interface modules" and "Flash modules" sections for details.

Interface modules

FlashSystem 710 and FlashSystem 810 support either 8 Gb Fibre Channel (FC) or 40 Gbps InfiniBand connectivity with the interface modules shown in Table 3 (only one feature can be selected).

Table 3. Supported interface modules

Description	Feature code	Maximum quantity supported
8 Gb FC 4 Port Ext Int	AF04	1
IB QDR 4 Port Ext Int	AF05	1

Each interface module feature code contains two dual-port cards (either 8 Gb Fibre Channel or QDR InfiniBand) for a total of four ports in the system. FC interface modules come standard with four (one per each port) 8 Gb FC shortwave SFP+ transceivers with LC duplex connector. InfiniBand interface modules have QSFP receptacles.

FC interfaces support Fibre Channel Protocol (FCP) only, with point-to-point (FC-P2P), arbitrated loop (FC-AL), and switched fabric (FC-SW) topologies. FC interfaces can be configured as N_port or NL_port types. InfiniBand interfaces support SCSI RDMA Protocol (SRP) only. Dual-port interface modules support full active-active load balancing and failover multi-pathing, though host software support for this function can vary.

Flash modules

FlashSystem 710 and FlashSystem 810 provide configurable capacity and optional spare feature with the flash modules listed in Table 4 and Table 5 respectively.

Table 4. Supported flash modules: FlashSystem 710

Description	Feature code	Maximum quantity supported
Base SLC flash module packs (only one pack can be ordered)		
1TB SLC (4-pack)	AF00	1
2TB SLC (8-pack)	AF0G	1
3TB SLC (12-pack)	AF06	1
4TB SLC (16-pack)	AF0H	1
5TB SLC (20-pack)	AF07	1
Spare SLC flash module (optional)		
Active Spare SLC Protection*	AF01	1
MES upgrade		
Upgrade - 1TB SLC (4-pack)**	AF08	4

* Optional feature that provides one additional SLC flash module preinstalled within the system for use as a spare for manually initiated data migration in case of failure of another flash module.

** SLC MES upgrade that increases a total usable capacity in the existing system by approximately 1 TB for a maximum of 5 TB.

Table 5. Supported flash modules: FlashSystem 810

Description	Feature code	Maximum quantity supported
Base eMLC flash module packs (only one pack can be ordered)		
2TB eMLC (4-pack)	AF0I	1
4TB eMLC (8-pack)	AF0L	1
6TB eMLC (12-pack)	AF09	1
8TB eMLC (16-pack)	AF0P	1
10TB eMLC (20-pack)	AF0A	1
Spare eMLC flash module (optional)		
Active Spare eMLC Protection*	AF0J	1
MES upgrade		
Upgrade - 2TB eMLC (4-pack)**	AF0B	4

* Optional feature that provides one additional eMLC flash module preinstalled within the system for use as a spare for manually initiated data migration in case of failure of another flash module.

** eMLC MES upgrade that increases a total usable capacity in the existing system by approximately 2 TB for a maximum of 10 TB.

FlashSystem 710 flash modules use 32 nm SLC flash chips, nominally rated for 100,000 program/erase

(P/E) cycles. Each FlashSystem 710 flash module has a raw capacity of approximately 340 GB, and a usable capacity of approximately 250 GB after overprovisioning and Variable Stripe RAID overhead.

FlashSystem 810 modules use 32 nm eMLC flash chips, nominally rated for 30,000 P/E cycles. Each FlashSystem 810 module has a raw capacity of approximately 680 GB, and a usable capacity of approximately 500 GB after overprovisioning and Variable Stripe RAID overhead.

Important: Flash module types cannot be mixed within a system.

The following flash module protection technologies are supported:

- Module-level Variable Stripe RAID
- Error correcting codes (ECC) to provide reconstruction of data from flash chips
- Checksums and data integrity fields protecting all internal data transfers within the system
- Overprovisioning to enhance write endurance and decrease write amplification
- Wear leveling algorithms that balance the number of writes among flash chips throughout the system
- Sweeper algorithms that ensure all data within the system is read periodically to avoid data fade issues
- Optional Active Spare feature to manually migrate data from the failing module

In addition, FlashSystem 710 and FlashSystem 810 include two redundant batteries that are used to destage lookup tables and data from RAM buffers to the flash storage in case of power failure.

Two modes of operation are supported by the systems:

- RAID 0
- JBOF (just a bunch of flash)

In a RAID 0 mode, data is striped across all available flash modules in a traditional RAID 0 layout (stripe size 4 KB). Up to 1024 logical volumes (sometimes referred to as LUNs) can be created in the system, with a minimum size of 1 GB and a maximum size of the full available system capacity.

JBOF mode allows each flash module to be treated separately without striping data across the modules. In JBOF mode, each flash module corresponds to a single logical volume.

In either mode, failures of a single flash module containing data will most likely compromise system data integrity for logical volumes stored on those flash modules. Data must be replicated independently of FlashSystem 710 and FlashSystem 810 storage systems for protection against complete flash module failures. Under the direction of the management module, the systems can coordinate data transfer between modules; for example, to migrate data to the Active Spare module in the system, if installed. (Note that such a data migration is a manually initiated process.)

Important: IBM recommends implementing a data replication strategy in high availability environments to maximize data availability beyond the protections available within individual FlashSystem 710 and FlashSystem 810 storage systems.

Network cables

FlashSystem 710 and FlashSystem 810 support network cables shown in Table 6.

Table 6. Supported cables

Description	Feature code	Maximum quantity supported
Fibre Channel cables (supported on Fibre Channel ports)		
1 m Fiber Cable (LC-LC)	3700	4
5 m Fiber Cable (LC-LC)	3701	4
InfiniBand cables (supported on InfiniBand ports)		
1 m IBM QSFP Cop IB	A0RD	4
3 m IBM QSFP Cop IB	A0RE	4
3 m IBM QSFP Opt QDR IB	5989	4
10 m IBM QSFP Opt QDR IB	5990	4
1 m Mlnx QSFP Cop FDR14 IB	A2YG	4
3 m Mlnx QSFP Cop FDR14 IB	A2YH	4
3 m Mlnx QSFP Opt FDR14 IB	A2YL	4
10 m Mlnx QSFP Opt FDR14 IB	A2YN	4

Network management port supports 1000BASE-T connectivity and requires UTP Category 5, 5E, or 6 cable with RJ-45 connector (up to 100 meters).

Power cords

FlashSystem 710 and FlashSystem 810 come standard with two 2.8m, 10A/100-250V, IEC 320-C13 to C14 rack PDU power cords. Optionally, country-specific line cords can be ordered if needed. (See Table 7.)

Table 7. Supported line cords

Description	Feature code or part number	Maximum quantity supported
Line cord - 2.8m (China)	6210	2
Line cord - 2.8m (AS/NZ)	6211	2
Line cord - 2.8m (Europe)	6212	2
Line cord - 2.8m (Denmark)	6213	2
Line cord - 2.8m (S. Africa)	6214	2
Line cord - 2.8m (UK)	6215	2
Line cord - 2.8m (Swiss)	6216	2
Line cord - 2.8m (Ita/Chile)	6217	2
Line cord - 2.8m (Israel)	6218	2
Line cord - 2.8m (S Korea)	6219	2
Line cord - 2.8m (Argentina)	6222	2
Line cord - 2.8m (India)	6269	2
Line cord - 2.8m (Japan)	6314	2
Line cord - 2.8m 120V (US)	6313	2
Line cord - 2.8m (Taiwan)	6386	2
Line cord - 2.8m (Brazil)	6532	2

Systems management

FlashSystem 710 and FlashSystem 810 have built-in LCD display (see Figure 5) to perform basic configuration and monitoring tasks.

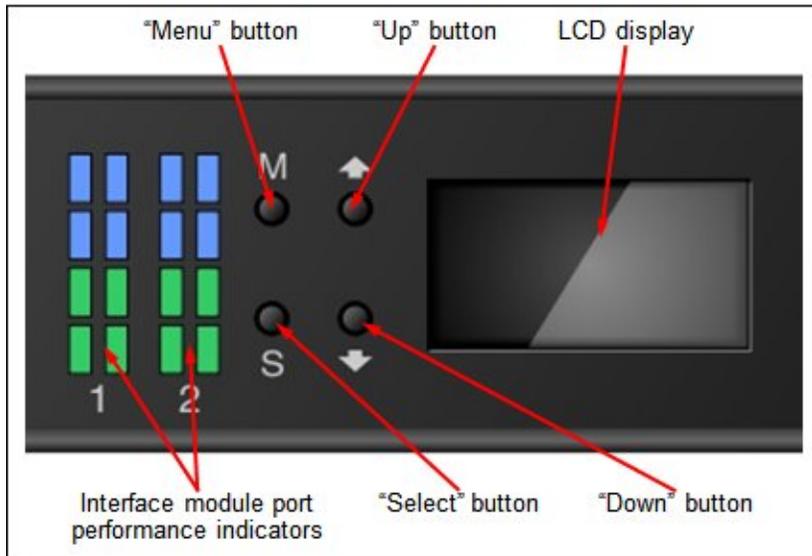


Figure 5. LCD display and controls

The following tasks can be performed through the LCD display:

- Configure IP addresses
- Reboot/shutdown the system
- Monitor system status

FlashSystem 710 and FlashSystem 810 have built-in management module which runs a highly customized Linux-based operating system that coordinates and monitors all significant functions in the system. Management module has one RJ-45 Gigabit Ethernet port for remote management. The following remote management methods are supported:

- Java-based graphical user interface (GUI) through web browser
- Command-line interface (CLI) through Telnet and Secure Shell (SSH)
- Simple network management protocol (SNMP)

The following tasks can be performed with the management module:

- Defining the user accounts and passwords
- Configuring email notifications
- Monitoring the status of the system:
 - Event log
 - Fans
 - Temperatures
 - Power
- Managing other FlashSystem units in the network from the single web console

- Controlling the FlashSystem unit:
 - Powering on/off
 - Updating firmware
 - Configuring network settings
 - Changing storage mode (JBOF or RAID 0)
 - Creating logical volumes (LUNs)
 - Configuring LUN masking
 - Configuring host interfaces
 - Configuring user security
 - Setting the date and time

Supported platforms

IBM FlashSystem systems support a wide range of operating systems (Windows Server 2003 and 2008, Linux, and IBM AIX®), hardware platforms (IBM System x®, IBM Power Systems, and x86 servers not from IBM), HBAs, and SAN fabrics. For specific information, see the System Storage Interoperation Center (SSIC): <http://ibm.com/systems/support/storage/ssic>

Physical and electrical specifications

FlashSystem 710 and FlashSystem 810 have the following physical, electrical, and environmental specifications:

- Dimensions and weight (approximate):
 - Height: 44 mm (1.7 in.)
 - Width: 432 mm (17.0 in)
 - Depth: 569 mm (22.4 in)
 - Weight: 13.6 kg (30 lb)
- Operating environment:
 - Temperature:
 - Operating: 10 - 35 degrees C (50 - 95 degrees F) at 30.5 m below to 3000 m above sea level (100 ft below to 9,840 ft above sea level)
 - Non-operating: -10 - 50 degrees C (14 - 125 degrees F)
 - Humidity:
 - Operating: 20% - 80%
 - Non-operating: 10% - 90%
 - Supported electrical input:
 - 100 - 240 (nominal) V ac; 50-60 Hz
 - Input electrical power (approximately):
 - FlashSystem 710: 280 watts
 - FlashSystem 810: 350 watts
 - BTU output:
 - FlashSystem 710: 955 BTU/hr
 - FlashSystem 810: 1194 BTU/hr
 - Acoustical:
 - Noise emission: 8.0 bels

Warranty options

FlashSystem 710 and FlashSystem 810 have a 1-year on-site warranty with 9x5 next business day terms. IBM offers optional warranty and maintenance service upgrades for these systems:

- Warranty service upgrades
 - 24x7 on-site repair with 2-hour target response time
 - 24x7 on-site repair with same day target response time
 - 9x5 on-site repair with same day target response time
- Maintenance (post-warranty) service offerings
 - 24x7 on-site repair with 2-hour target response time
 - 24x7 on-site repair with same day target response time
 - 9x5 on-site repair with same day target response time
 - 9x5 on-site repair with next business day target response time

Table 8 explains the warranty service level definitions in more detail.

Table 8. Warranty service level definitions

Term	Description
On-site service	A service technician comes to the machine's location for equipment repair.
24x7 2-hour	A service technician is scheduled to arrive at machine's location within two hours after remote problem determination is complete, if IBM determines on-site service is required. IBM provides 24-hour service, every day, including IBM holidays.
24x7 same day	A service technician is scheduled to arrive at machine's location within four hours after remote problem determination is complete, if IBM determines on-site service is required. IBM provides 24-hour service, every day, including IBM holidays.
9x5 same day	A service technician is scheduled to arrive at machine's location within four business hours after remote problem determination is complete, if IBM determines on-site service is required. IBM provides service from 8:00 a.m. to 5:00 p.m. in the client's local time zone, Monday through Friday, excluding IBM holidays. If it is after 1:00 p.m., and it is determined that on-site service is required, the client can expect the service technician to arrive the morning of the following business day. For noncritical service requests, a service technician will arrive by the end of the following business day.
9x5 next business day	A service technician is scheduled to arrive at machine's location on the business day after we receive your call, following remote problem determination, if IBM determines on-site service is required. IBM provides service from 8:00 a.m. to 5:00 p.m. in the client's local time zone, Monday through Friday, excluding IBM holidays.

Regulatory compliance

FlashSystem 710 and FlashSystem 810 conform to the following standards:

- FCC - Verified to comply with Part 15 of the FCC Rules, Class A
- Canada ICES-003, issue 4, Class A
- IEC/EN 60950-1
- CB Certificate
- UL60950-1 CAN/CSA C22.2 No. 60950-1
- CE Mark
- EN55022/CISPR 22, Class A

Fibre Channel switches

The systems can be connected to IBM System Networking Fibre Channel switches that are listed in Table 9.

Important: All possible configurations might not be supported. End-to-end configuration support must be verified through the SSIC web site: <http://ibm.com/systems/support/storage/ssic>

Table 9. IBM System Networking - Fibre Channel switches

Machine type-model	Description
IBM System Networking - Entry SAN switches	
2498-F24	IBM System Storage SAN24B-5 (up to 24 16 Gb FC ports)
2498-B24	IBM System Storage SAN24B-4 Express (up to 24 8 Gb FC ports)
2053-424	Cisco MDS 9124 Express for IBM System Storage (up to 24 4 Gb FC ports)
IBM System Networking - Midrange SAN switches	
2498-F48	IBM System Storage SAN48B-5 (up to 48 16 Gb FC ports)
2498-B80	IBM System Storage SAN80B-4 (up to 80 8 Gb FC ports)
2498-B40	IBM System Storage SAN40B-4 (up to 40 8 Gb FC ports)
2417-C48	Cisco MDS 9148 for IBM System Storage (up to 48 8 Gb FC ports)
IBM System Networking - Enterprise SAN directors	
2499-816	IBM System Storage SAN768B-2 (up to 384 16 Gb FC ports)
2499-416	IBM System Storage SAN384B-2 (up to 192 16 Gb FC ports)
2499-384	IBM System Storage SAN768B (up to 512 8 Gb FC ports)
2499-192	IBM System Storage SAN384B (up to 256 8 Gb FC ports)
2054-E11	Cisco MDS 9513 for IBM System Storage (up to 524 8 Gb FC ports)
2054-E07	Cisco MDS 9509 for IBM System Storage (up to 336 8 Gb FC ports)
2054-E04	Cisco MDS 9506 for IBM System Storage (up to 192 8 Gb FC ports)

Uninterruptible power supply units

The systems support attachment to the uninterruptible power supply (UPS) units listed in Table 10.

Table 10. Uninterruptible power supply units

Part number	Description
Rack-mounted UPS	
21303RX	IBM UPS 7500XHV
21304RX	IBM UPS 10000XHV
24195KX	IBM UPS5000
53951AX	IBM 1500VA LCD 2U Rack UPS (100V/120V)
53951KX	IBM 1500VA LCD 2U Rack UPS (230V)
53952AX	IBM 2200VA LCD 2U Rack UPS (100V/120V)
53952KX	IBM 2200VA LCD 2U Rack UPS (230V)
53953AX	IBM 3000VA LCD 3U Rack UPS (100 V/120 V)
53953JX	IBM 3000VA LCD 3U Rack UPS (200 V/208 V)
53956AX	IBM 6000VA LCD 4U Rack UPS (200 V/208 V)
53956KX	IBM 6000VA LCD 4U Rack UPS (230 V)
53959KX	IBM 11000VA LCD 5U Rack UPS (200V/208V/230V)

For more information, see the following IBM Redbooks® Product Guides:

- *IBM 3000VA LCD 3U Rack Uninterruptible Power Supply for IBM System x*, TIPS0782
<http://www.redbooks.ibm.com/abstracts/tips0782.html?Open>
- *IBM 6000VA LCD 4U Rack UPS*, TIPS0793
<http://www.redbooks.ibm.com/abstracts/tips0793.html?Open>

Power distribution units

The systems support attachments to the power distribution units (PDUs) listed in Table 11.

Table 11. Power distribution units (part 1)

Part number	Description
Switched and Monitored PDUs	
46M4002	IBM 1U 9 C19/3 C13 Active Energy Manager DPI® PDU
46M4003	IBM 1U 9 C19/3 C13 Active Energy Manager 60A 3 Phase PDU
46M4004	IBM 1U 12 C13 Active Energy Manager DPI PDU
46M4005	IBM 1U 12 C13 Active Energy Manager 60A 3 Phase PDU
46M4167	IBM 1U 9 C19/3 C13 Switched and Monitored 30A 3 Phase PDU
46M4116	IBM 0U 24 C13 Switched and Monitored 30A PDU
46M4119	IBM 0U 24 C13 Switched and Monitored 32A PDU
46M4134	IBM 0U 12 C19/12 C13 Switched and Monitored 50A 3 Phase PDU
46M4137	IBM 0U 12 C19/12 C13 Switched and Monitored 32A 3 Phase PDU
Enterprise PDUs	
71762MX	IBM Ultra Density Enterprise PDU C19 PDU+ (WW)
71762NX	IBM Ultra Density Enterprise PDU C19 PDU (WW)
71763MU	IBM Ultra Density Enterprise PDU C19 3 Phase 60A PDU+ (NA)
71763NU	IBM Ultra Density Enterprise PDU C19 3 Phase 60A PDU (NA)
39M2816	IBM DPI C13 Enterprise PDU without linecord
39Y8923	DPI 60A Three Phase C19 Enterprise PDU with IEC309 3P+G (208 V) fixed line cord
39Y8941	DPI Single Phase C13 Enterprise PDU without line cord
39Y8948	DPI Single Phase C19 Enterprise PDU without line cord
Front-end PDUs	
39Y8934	DPI 32 amp/250 V Front-end PDU with IEC 309 2P+Gnd connector
39Y8935	DPI 63amp/250 V Front-end PDU with IEC 309 2P+Gnd connector
39Y8938	30 amp/125 V Front-end PDU with NEMA L5-30P connector
39Y8939	30 amp/250 V Front-end PDU with NEMA L6-30P connector
39Y8940	60 amp/250 V Front-end PDU with IEC 309 60A 2P+N+Gnd connector

Table 11. Power distribution units (part 2)

Part number	Description
Universal PDUs	
39Y8951	DPI Universal Rack PDU with US LV and HV line cords
39Y8952	DPI Universal Rack PDU with CEE7-VII Europe LC
39Y8953	DPI Universal Rack PDU with Denmark LC
39Y8954	DPI Universal Rack PDU with Israel LC
39Y8955	DPI Universal Rack PDU with Italy LC
39Y8956	DPI Universal Rack PDU with South Africa LC
39Y8957	DPI Universal Rack PDU with UK LC
39Y8958	DPI Universal Rack PDU with AS/NZ LC
39Y8959	DPI Universal Rack PDU with China LC
39Y8962	DPI Universal Rack PDU (Argentina)
39Y8960	DPI Universal Rack PDU (Brazil)
39Y8961	DPI Universal Rack PDU (India)
0U Basic PDUs	
46M4122	IBM 0U 24 C13 16A 3 Phase PDU
46M4125	IBM 0U 24 C13 30A 3 Phase PDU
46M4128	IBM 0U 24 C13 30A PDU
46M4131	IBM 0U 24 C13 32A PDU
46M4140	IBM 0U 12 C19/12 C13 60A 3 Phase PDU
46M4143	IBM 0U 12 C19/12 C13 32A 3 Phase PDU

For more information, see the list of IBM Redbooks Product Guides in the Power infrastructure category:
<http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=power>

Rack cabinets

The systems support the rack cabinets listed in Table 12.

Table 12. Rack cabinets

Part number	Description
93072PX	IBM 25U Static S2 Standard Rack
93072RX	IBM 25U Standard Rack
93074RX	IBM 42U Standard Rack
93074XX	IBM 42U Standard Rack Extension
93084EX	IBM 42U Enterprise Expansion Rack
93084PX	IBM 42U Enterprise Rack
93604EX	IBM 42U 1200mm Deep Dynamic Expansion Rack
93604PX	IBM 42U 1200mm Deep Dynamic Rack
93614EX	IBM 42U 1200mm Deep Static Expansion Rack
93614PX	IBM 42U 1200mm Deep Static Rack
93624EX	IBM 47U 1200mm Deep Static Expansion Rack
93624PX	IBM 47U 1200mm Deep Static Rack
93634CX	IBM PureFlex™ System 42U Rack
93634DX	IBM PureFlex System 42U Expansion Rack
93634EX	IBM 42U 1100mm Dynamic Expansion Rack
93634PX	IBM 42U 1100mm Dynamic Rack
99564RX	IBM S2 42U Dynamic Standard Rack
99564XX	IBM S2 42U Dynamic Standard Expansion Rack

For more information, see the list of IBM Redbooks Product Guides in the Rack cabinets and options category:

<http://www.redbooks.ibm.com/portals/systemx?Open&page=pg&cat=rack>

IBM Global Financing

IBM Global Financing can help you obtain the IT solution you need while preserving funding for other strategic investments and optimizing cash flow. Our Fair Market Value (FMV) lease helps ensure that you have the latest IBM technology, and with our mid-lease upgrade capability, you can increase the capacity of the system with little to no change in monthly payments. At the end of the lease, take advantage of our flexible end-of-lease options to fit your changing business needs. IBM Global Financing has the breadth and depth of offerings, longevity, proven success, and global reach to help you develop a robust financing and asset management strategy that provides you the opportunity to use new technologies and turn your ambitious vision into a tangible solution.

Here are some other reasons why working with IBM makes solid financial sense:

- Expand your purchasing power: Affordable monthly payments allow you to change the technology acquisition discussion from “what can I afford now” to “what solution is really right for my business.” IBM Global Financing allows you to expand your purchasing power to get you the right solution.
- Accelerate your project’s cash flow break-even point: Acquire your IBM technology today and begin to realize its benefits now. An FMV lease can help you get the solution you need now, with low monthly payments that better align up-front costs with the anticipated return on investment (ROI) from the technology.
- Easy to acquire with affordable rates: We offer one-stop shopping for a total IT solution, so you can acquire IBM hardware, software, services and the financing you need from one IT provider.

Plus, we provide simple, easy-to-understand contracts and quick approvals. As the world’s largest IT financing provider, with an asset base of US\$35.8 billion and over 125,000 customers, IBM Global Financing offers highly competitive rates that promote low total cost of ownership (TCO) and low monthly payments.

IBM Global Financing operates in more than 50 countries. Go to <http://ibm.com/financing> for financing options in your country and to contact a local financing specialist.

IBM Global Financing offerings are provided through IBM Credit LLC in the United States and other IBM subsidiaries and divisions worldwide to qualified commercial and government clients. Rates and availability subject to client’s credit rating, financing terms, offering type, equipment and product type and options, and might vary by country. Non-hardware items must be one-time, nonrecurring charges and are financed by means of loans. Other restrictions might apply. Rates and offerings are subject to change, extension or withdrawal without notice and might not be available in all countries. Contact your local IBM Global Financing representative for additional detail.

Related publications and links

For more information, see these resources:

- US Announcement Letter - IBM FlashSystem 710 and IBM FlashSystem 810
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS113-046>
- IBM FlashSystem family product page
<http://www.ibm.com/storage/flash>
- IBM Redbooks Solution Guides for IBM FlashSystem family:
<http://www.redbooks.ibm.com/redbooks.nsf/searchsite?SearchView&query=flashss>
- IBM Support Portal
<http://ibm.com/support/entry/portal/>
- IBM System Storage Interoperation Center (SSIC)
<http://www.ibm.com/systems/support/storage/ssic>

Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service. IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing, IBM Corporation, North Castle Drive, Armonk, NY 10504-1785 U.S.A.

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you. This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk. IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you. Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products. This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs.

© Copyright International Business Machines Corporation 2013-2015. All rights reserved.

Note to U.S. Government Users Restricted Rights -- Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

This document was created or updated on June 23, 2015.

Send us your comments in one of the following ways:

- Use the online **Contact us** review form found at:
ibm.com/redbooks
- Send your comments in an e-mail to:
redbooks@us.ibm.com
- Mail your comments to:
IBM Corporation, International Technical Support Organization
Dept. HYTD Mail Station P099
2455 South Road
Poughkeepsie, NY 12601-5400 U.S.A.

This document is available online at <http://www.ibm.com/redbooks/abstracts/tips1002.html> .

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. These and other IBM trademarked terms are marked on their first occurrence in this information with the appropriate symbol (® or ™), indicating US registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at <http://www.ibm.com/legal/copytrade.shtml>

The following terms are trademarks of the International Business Machines Corporation in the United States, other countries, or both:

AIX®
Calibrated Vektored Cooling™
Easy Tier®
FlashSystem™
IBM®
IBM FlashSystem™
Power Systems™
PureFlex™
Redbooks®
Redbooks (logo)®
Storwize®
System Storage®
System x®

The following terms are trademarks of other companies:

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

Windows, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

Other company, product, or service names may be trademarks or service marks of others.