BROCADE
A Broadcom Inc. Company

# Brocade® 7810 Extension Switch

## HIGHLIGHTS

- Moves more data faster over distance
- Cost-effectively replicates data using less-expensive WAN connections
- Drives more throughput with advanced compression technology to expand WAN capacity
- Consolidates replication workloads from Fibre Channel and IP storage arrays
- Encrypts storage data flows over distance without a performance penalty
- Provides load balancing and network resilience with Brocade Extension Trunking to increase WAN utilization and protect against WAN link failures
- Delivers comprehensive management over distance for greater control and insight
- Pre-validates the WAN infrastructure with a built-in Flow Generator and WAN Test Tool (Wtool) to ensure a worry-free deployment
- Extends proactive monitoring between data centers to automatically detect WAN anomalies and avoid unplanned downtime

NetApp®

## Fast, Reliable, and Secure Data Protection Over Distance

With the world's embrace of digital business, data has become more valuable than ever. Expectations for that data to be accessible from anywhere, at any time, on any device are pushing infrastructures to the limit. IT organizations are under pressure to keep pace with the growing avalanche of data and ensure their valuable information is protected from a disaster. The loss of any crucial data could lead directly to lost revenue or damage to the company's brand reputation. To safeguard data from a disaster, storage administrators need a way to achieve sufficient replication performance over distance, keep data flowing over unreliable WAN connections, and secure data-in-flight while containing costs for equipment and long-distance connections.

The Brocade 7810 Extension Switch addresses these challenges by providing a modern replication connectivity solution that cost-effectively and quickly replicates data across sites for fast, continuous data protection. With powerful performance, non-stop reliability, and strong security, the Brocade 7810 can handle the unrelenting transfer of data between data centers, minimize the impact of disruptions to maintain service-level agreements (SLAs), and secure data-in-flight between data centers. The switch has built-in technology that overcomes the inherent challenges of latency and packet loss over long distance. It dramatically speeds up replication performance and enables organizations to substantially reduce costs by deploying less-expensive WAN connections.

### A Purpose-Built Extension Platform for Midrange Storage

The Brocade 7810 is a robust platform for medium-scale, multisite data center environments implementing block, file, and tape data protection solutions. It is an ideal platform for building a high-performance data center-to-data center infrastructure for multisite asynchronous and synchronous storage replication and centralized tape backup, recovery, and archiving solutions (see Figure 1). Brocade extension maximizes replication and backup throughput over distance, using WAN-optimized TCP, disk and tape protocol acceleration, and data compression. Without the use of extension, the long distance required for disaster recovery often makes it

impossible or impractical for organizations to meet their Recovery Point Objective (RPO) and Recovery Time Objective (RTO). In addition, the platform offers both Fibre Channel over IP (FCIP) and IP extension technology, and is designed to handle simultaneous replication from Fibre Channel and IP storage arrays to consolidate replication workloads over WAN connections.

Whether supporting point-to-point connections, a multisite SAN, or remote offices, the Brocade 7810 Extension Switch offers enterprise-class capabilities to meet demanding disaster recovery requirements. With twelve 32 Gb/s-capable Fibre Channel ports and six 1/10-Gigabit Ethernet (GbE) ports, this switch provides the bandwidth and throughput required for maximum application performance over WAN connections.

Designed to be affordable, the Brocade 7810 offers flexible configurations. To meet current and future requirements, organizations can purchase a full config-uration with 2.5 Gb/s WAN capacity or pay as they grow with an on-demand upgrade license to quickly and cost-effectively scale their WAN rate from 1 Gb/s to 2.5 Gb/s. With a compression ratio of 4 to 1, organizations can scale up to 10 Gb/s replication throughput, depending on the type of data and the characteristics of the WAN connection. (Note: 4:1 is typical, but the compression ratio is data dependent and will vary significantly depending on whether the data is easily compressible or already compressed.)

The Brocade 7810 base configuration provides four 32 Gb/s-capable Fibre Channel ports and six 1GbE ports with Adaptive Rate Limiting (ARL) and IPsec. The on-demand upgrade license enables all 12 Fibre Channel ports, 10GbE on the Ethernet ports, Brocade Fabric Vision® technology, Brocade Extension Trunking, Brocade Fibre Channel Trunking, and Brocade Integrated Routing. The full configuration is a comprehensive bundle that enables all ports and includes Brocade Fabric Vision technology, Extension Trunking, Fibre Channel Trunking, ARL, IPsec, and Integrated Routing.

## Move More Data Faster over Distance with Powerful Performance

The advanced performance and network optimization features of the Brocade 7810 enable replication and backup applications to send more data over metro and WAN links in less time, and optimize available WAN bandwidth. Supporting up to 250 ms Round-Trip Time (RTT) latency, the Brocade 7810 enables cost-effective extension solutions over distances up to 25,500 kilometers (15,845 miles).

The Brocade 7810 maximizes replication and backup throughput over distance using data compression, disk and tape protocol acceleration, WAN-optimized TCP, and other extension networking technologies. Advanced features and technologies include:

· **Extension Trunking:** Combines multiple WAN connections into a single, logical, high-bandwidth trunk, providing active load balancing and network resilience to protect against WAN link failures.

· **Lossless Link Loss (LLL):** Part of Extension Trunking, providing recovery of data lost in-flight when a link goes
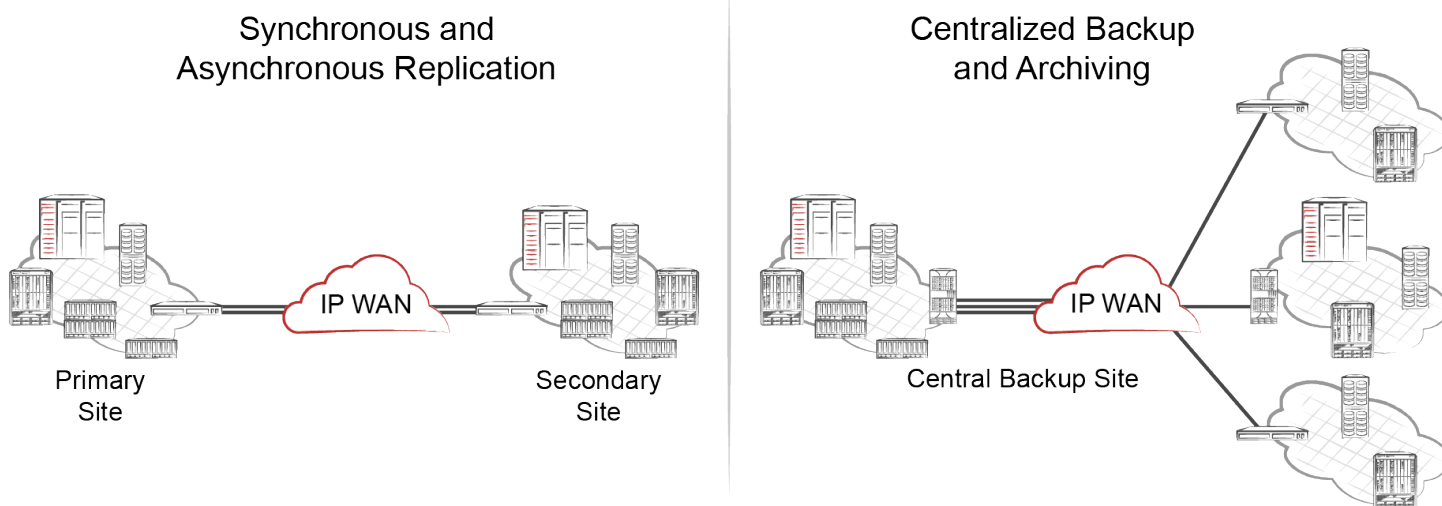


**Figure 1:** The Brocade 7810 Provides Scalable Deployment Options to Extend Multiprotocol Disaster Recovery and Data Protection Storage Solutions over Long Distances

offline. From the perspective of the storage applications, nothing ever occurs because all data is delivered—and delivered in order.

- **Failover/failback with failover groups:** Circuits are assigned metrics and put in a failover group. If all circuits of the lower metric within the failover group go offline, the higher metric circuits take over. This uses LLL, and all data is delivered and delivered in order. The storage application will not know that a failover/failback has occurred.

- **Adaptive Rate Limiting (ARL):** Dynamically adjusts bandwidth sharing between minimum and maximum rate limits to optimize bandwidth utilization and maintain maximum WAN performance during disruptions.

- **IPsec:** Ensures secure transport of data over WAN links without a performance penalty or excessive added latency by encrypting data-in-flight with a hardware-implemented, standard 256-bit AES algorithm.

- **Unparalleled, extremely efficient architecture:** Uniquely permits the high-speed, low-latency processing of IP datagrams and Fibre Channel, making extension of synchronous applications possible.

- **WAN-optimized TCP:** An aggressive TCP stack, optimizing TCP window size and flow control, and accelerating TCP transport for high-throughput storage applications.

- **Streams:** Is a feature of WAN-optimized TCP and used with Brocade IP extension to prevent Head-of-Line Blocking (HoLB) across the WAN.

- **PerPriority TCP Quality of Service (PTQ):** Provides high-, medium-, and low-priority handling of Fibre Channel and Brocade IP extension flows within the same tunnel for transmission over the WAN using autonomous individual TCP sessions per QoS priority.

- **Advanced compression architecture:** Provides multiple modes to optimize compression ratios for various throughput requirements.

- **FCIP FastWrite (FCIP-FW):** Accelerates SCSI write processing, maximizing performance of synchronous and asynchronous replication applications across high-latency WAN connections over any distance.

- **Open Systems Tape Pipelining (OSTP):** Accelerates read and write tape processing over distance, significantly reducing backup and recovery times over distance anywhere in the world.

Midrange and IP storage arrays with native replication applications generally do not handle latency and packet loss well. The Brocade 7810 provides a robust extension solution that delivers local performance at long distance—along with strong encryption—for comprehensive disaster recovery. It leverages Brocade TCP Acceleration to help achieve the fastest replication speeds possible from storage devices, and Brocade WAN-optimized TCP to ensure in-order, lossless transmission of extension data.

Brocade extension solutions help to significantly increase the performance of IP storage applications across the WAN—even with encryption turned on. The more latency and packet loss between the data centers, the greater the performance gain using these solutions. The Brocade 7810 can move more data than native TCP/IP stacks to meet rigorous recovery objectives. These performance gains enable use cases that were previously unattainable.

Brocade extension also offers other, more far-reaching benefits. The Brocade 7810 supports and manages Fibre Channel and IP-based data flows, enabling storage administrators to consolidate I/O flows from heterogeneous storage devices and multiple protocols. The consolidation of these applications into a single, managed tunnel between data centers across the WAN has significant operational, availability, security, and performance value.

Consolidating IP storage flows, or both Fibre Channel and IP storage flows, into a single tunnel contributes significantly to operational excellence. Operational advantages are gained with Fabric Vision, Monitoring Alerting Policy Suite (MAPS), WAN Test Tool (Wtool), and Brocade SAN management software. Using custom, browser-accessible dashboards for IP storage, or combined Fibre Channel and IP storage, storage administrators have a centralized management tool to monitor the health and performance of their networks.

Brocade extension supports a range of common storage applications, including array native IP Remote Data Replication (RDR), IP-based centralized backup, virtual machine (VM) replication, host-based and database replication over IP, NAS head replication between data centers, and data migration between data centers.

## Protect Data from Network Disruptions and Outages

Today's organizations depend on fast, reliable access to data, regardless of location. The ramifications and potential business impact of an unreliable disaster recovery and data protection infrastructure are greater than ever.

The Brocade 7810 provides a suite of features—from pre-deployment validation to advanced network failure recovery technologies—to ensure a continuously available storage extension infrastructure.

The Brocade 7810 has built-in tools to validate the condition of WAN links and network paths, as well as to validate the proper setup of configurations prior to deployment. Administrators can validate and troubleshoot the physical infrastructure with the built-in Flow Generator and WAN Test Tool (Wtool), thereby easing deployment and avoiding potential issues.

Extension Trunking protects against WAN link failures with tunnel redundancy for lossless path failover and guaranteed in-order data delivery using Lossless

*Brocade Fabric Vision technology, an extension of Gen 6 Fibre Channel, is supported on Brocade extension products to provide unprecedented insight and visibility across the storage network. With its powerful integrated monitoring, management, and diagnostic tools, Fabric Vision technology enables organizations to:*

### Simplify monitoring:

- *Deploy more than 20 years of storage networking best practices with a single click to simplify the deployment of monitoring with predefined, threshold-based rules, actions, and policies*

- *Simplify troubleshooting of end-to-end I/O flows over distance with Fabric Vision monitoring and alerting*

- *Gain comprehensive visibility into disaster recovery and business continuity network health and performance using browser-accessible dashboards with drill-down capabilities*

### Increase availability:

- *Extend proactive monitoring between data centers to automatically detect WAN anomalies and address problems before they impact operations*

- *Facilitate planning to improve storage extension network capability, health, and stability through intuitive reporting and trend analysis*

- *Minimize downtime and accelerate troubleshooting with live monitoring, integrated diagnostics, and point-in-time playback*

### Dramatically reduce costs:

- *Eliminate nearly 50% of maintenance costs through automated testing and diagnostic tools that validate the health, reliability, and performance of the network prior to deployment*

- *Save up to millions of dollars on CapEx by eliminating the need for expensive third-party tools through built-in monitoring and diagnostics*

- *Leverage specialized tools for pretesting and validating IT infrastructure to accelerate deployment, simplify support, and reduce operational costs*

Link Loss (LLL). The advanced Extension Trunking feature allows multiple network paths to be used simultaneously, and when there is a failure for a network path, Extension Trunking will retransmit the lost packets to maintain overall data integrity. The storage application will be protected with no disruption.

With Adaptive Rate Limiting (ARL), organizations can optimize bandwidth utilization and maintain full WAN performance of the link during periods when a path is offline due to an extension platform, IP network device, or array controller outage. ARL uses dynamic bandwidth sharing between minimum (floor) and maximum (ceiling) rate limits to achieve maximum available performance during failure situations.

The Brocade 7810 leverages the core technology of Brocade Gen 6 Fibre Channel platforms, consistently delivering 99.9999% uptime in the world's most demanding data centers. These capabilities enable a high-performance and highly reliable network infrastructure for disaster recovery and data protection.

## Secure Data from Network Breaches

Growing concerns about potential damage to brand reputation, class-action lawsuits, and costly downtime are causing executives to pay greater attention to the security practices of their organizations. Leaving data exposed in-flight over distance while replicating to a remote location can result in data breaches and unwanted publicity. With security-related outages on the rise, organizations do not want to leave themselves exposed and need to ensure that all data leaving the confines of their data center is secure.

The Brocade 7810 Extension Switch uses unbreakable network encryption to ensure that data-in-flight is protected from threats over the WAN. This switch features robust, hardware-based IPsec with AES 256-bit encryption to keep data secure and meet security compliance requirements. In addition, hardware-based IPsec

encrypts data flows over distance without a performance penalty. The Brocade 7810 Extension Switch includes IPsec; no additional licenses or fees are required.

## Simplified Management and Robust Network Analytics

Brocade Fabric Vision technology provides a breakthrough hardware and software solution that helps simplify monitoring, maximize network availability, and dramatically reduce costs. Featuring innovative monitoring, management, and diagnostic capabilities, Fabric Vision technology enables administrators to avoid problems before they impact operations, helping their organizations meet SLAs. The Brocade 7810 Extension Switch supports the following Fabric Vision technology features for storage extension management:

- Monitoring and Alerting Policy Suite (MAPS)

- Fabric Performance Impact (FPI) Monitoring

- Integrated dashboards

- Configuration and Operational Monitoring Policy Automation Services Suite (COMPASS)

- Brocade ClearLink® Diagnostics

- Flow Vision

- Forward Error Correction (FEC)

- Credit Loss Recovery

For disaster recovery, it is important to have visibility and insight for greater control of WAN traffic to guarantee that the RPO and RTO are met. Flow Vision enables administrators to quickly identify, monitor, and analyze specific application flows to simplify troubleshooting, maximize performance, avoid congestion, and optimize resources. Flow Vision includes Flow Learning, Flow Monitor, and Flow Generator.

Flow Learning enables administrators to discover all flows that go to or come from a specific host port or storage port, or traverse Inter-Switch Links (ISLs), Inter-

Fabric Links (IFLs), or Fibre Channel over Internet Protocol (FCIP) tunnels to monitor fabric-wide application performance. In addition, Flow Learning enables discovery of top and bottom bandwidth-consuming devices to help manage capacity planning.

Flow Monitor provides comprehensive visibility into flows across a storage extension network. It automatically learns and non-disruptively monitors all flows from a specific storage device that are writing to or reading from a destination storage device or logical unit numbers (LUNs), or across a storage extension network. Additionally, LUN-level monitoring of specific frame types can be performed to identify resource contention or congestion that is impacting application performance.

Flow Generator provides a built-in traffic generator for pretesting and validating the storage extension infrastructure—including route verification, QoS zone setup, Extension Trunking configuration, WAN access, IPsec policy setting, and integrity of optics, cables, and ports—for robustness before deploying applications.

## Integrated Architecture and Management

The Brocade 7810 utilizes the same Brocade Fabric OS® (FOS) that supports the entire Brocade Fibre Channel product family—from the Brocade G610 Switch to the Brocade X6 Director with Gen 6 Fibre Channel—as well as the Brocade extension platforms, the Brocade 7840 Extension Switch and the Brocade SX6 Extension Blade. This helps ensure seamless interoperability with advanced features in Brocade FOS version releases, such as Brocade Integrated Routing, Brocade Extension Trunking, Brocade Fibre Channel Trunking, and Brocade Fabric Vision technology.

In addition, organizations can perform management and administrative tasks through familiar Brocade management tools, including Brocade Web Tools, Brocade SAN Health® utility tool, and Command Line Interface (CLI).

## Improve Efficiency with Fabric Automation

IT organizations spend nearly half of their time performing repetitive daily management tasks, such as zoning, inventory reporting, and operational validation checks. By automating these repetitive tasks, IT organizations can significantly improve their efficiency and dramatically decrease the risk of operational mistakes. Automation in large-scale IT environments integrates diverse infrastructure components with consistency and predictability to deliver greater operational efficiency and agility. With more than 20 years of storage networking experience, Brocade, A Broadcom Inc. Company, understands the nuances that go into infrastructure management and the tasks that can benefit from automation. By introducing REST APIs directly into its switch and management products, Brocade offers a broad range of choices to enable any SAN management solution. IT organizations that couple Brocade's robust data collecting capabilities with automation and orchestration tools (such as Ansible) gain the ability to automate configuration tasks and the visibility to monitor and detect any performance or health changes.

Brocade automation solutions are based on these pillars:

- Make standard REST APIs available directly from the switch in order to automate repetitive daily tasks, such as fabric inventory, provisioning, and operational state monitoring.

- Quickly integrate systems with open source PyFOS, a Python language, to simplify common SAN management practices.

- Leverage Ansible to easily scale automation and orchestration across the entire infrastructure.

## Brocade Global Support

Brocade Global Support has the expertise to help organizations build resilient, efficient SAN infrastructures. Leveraging 20+ years of expertise in storage networking, Global Support delivers world-class technical support, implementation, and migration services to enable organizations to maximize their hardware and software investments, accelerate new technology deployments, and optimize the overall performance of their network.

## Maximizing Investments

To help optimize technology investments, Brocade and its partners offer complete solutions that include professional services, technical support, and education. For more information, contact a Brocade sales partner or visit www.broadcom.com/brocade.

# Brocade 7810 Specifications

**System Architecture**

| | |
|---|---|
| Enclosure | 1U chassis designed to be mounted in a 19-in. cabinet |
| Fibre Channel ports | 12 ports, 32 Gb/s capable, universal (E, F, M, D, and EX ports) |
| Ethernet ports | 6 ports of 1/10 GbE for LAN and WAN connectivity |
| Scalability | Full fabric architecture with 239 switches maximum |
| Certified maximum | Single fabric: 56 domains, 7 hops |
| Fibre Channel performance | 8.5 Gb/s line speed, full duplex; 14.025 Gb/s line speed, full duplex; 28.05 Gb/s line speed, full duplex; auto-sensing of 8, 16, and 32 Gb/s port speeds |
| Ethernet interfaces | 1GbE and 10GbE |
| Brocade Trunking | Up to eight 32 Gb/s links aggregating to 256 Gb/s per trunk. There is no limit to how many trunk groups can be configured per switch. |
| Fabric latency | Non-blocking shared memory, 900 ns with no contention, cut-through switching at 32 Gb/s |
| Maximum Fibre Channel frame size | 2112-byte payload |
| Maximum IP MTU size | Jumbo Frames 1280 bytes to 9216 bytes |
| Classes of service | Class 2, Class 3, Class F (inter-switch frames) |
| Port types | F_Port, E_Port, EX_Port, (FCR E_Port), D_Port (Diagnostic), M_Port (Mirror), and self-discovery based on switch type (U_Port); VE_Port (FCIP and IP extension) |
| Data traffic types | Fibre Channel, FCIP, and IP extension |
| USB | One USB port for system log file downloads or firmware upgrades |
| Media types | Fibre Channel: Brocade hot-pluggable Small Form-Factor Pluggable (SFP) and SFP+, short wavelength (SWL), and long wavelength (LWL) transceivers (available wavelength options vary for 8, 16, and 32 Gb/s SFPs) |
| Fabric services | Simple Name Server (SNS); Registered State Change Notification (RSCN), NTP, RADIUS, RCS (Reliable Commit Service), Dynamic Path Selection (DPS), Exchange-based routing, device-based routing, port-based routing, lossless, Brocade Advanced Zoning, Web Tools, Brocade Trunking, Extended Fabrics, Fabric Vision, SDDQ |
| Extension services | Extension Trunking, Adaptive Rate Limiting (ARL), WAN Test Tool (Wtool), Open Systems Tape Pipelining (OSTP), FastWrite (FCIP-FW), QoS Marking, Bandwidth Enforcement, PerPriority TCP QoS, (PTQ), Advanced Extension, and Integrated Routing (FCR) |
| Optional upgrade license | The following optional extension features can be enabled on the Brocade 7810 base configuration via the upgrade license: <br> · Enable WAN-side throughput from 1 Gb/s to 2.5 Gb/s <br> · Enable 10 GbE port speed on the Ethernet ports <br> · Turn on additional 8 Fibre Channel ports, includes 16 Gb/s SFPs <br> · Enable advanced software features, including Brocade Fabric Vision technology, Extension Trunking, Fibre Channel Trunking, and Integrated Routing |

# Brocade 7810 Specifications *(continued)*

## Management

| | |
|---|---|
| Supported management | Serial port (9600, 8, 1, no parity, no flow), Command Line Interface (CLI): SSHv2 or Telnet, Brocade Web Tools: HTTP/HTTPS, SNMPv1/v3 (FE MIB, FC Management MIB),  SMI-S, RADIUS, LDAP |
| Security | AES-GCM-256 encryption on FC ISLs (E_Port), DH-CHAP (between switch and end-device), FCAP switch authentication; FIPS 140-2 L2-compliant, HTTPS, IP filtering, LDAP with IPv6, OpenLDAP, Port Binding, RADIUS, TACACS+, Role-Based Access Control (RBAC), Secure Copy (SCP), Secure RPC, SFTP, SSHv2, SSL, Switch Binding, Trusted Switch |
| Extension security | Encryption: AES-GCM-256 IPsec on tunnel (VE_Port), Authentication: ECDSA-P384, Diffie-Hellman: ECDH-P384, PRF: PRF-HMAC-384, Integrity: HMAC-384-192, ESP, Suite B, Connected pWWN FCIP checking |
| Management access | 10/100/1000 Ethernet (RJ-45); serial port (RJ-45) and one USB port |
| Diagnostics | POST and embedded online/offline diagnostics, including D_Port, WAN Test Tool, FCIP ping, FCIP traceroute, FCping, Pathinfo (FCtraceroute), SupportSave, RAS Log, Syslog, MAPS, SDDQ, Flow Vision, and Ftrace |

## Mechanical

| | |
|---|---|
| Enclosure | Back-to-front airflow/non-port-side air intake and power, 1RU, 19-in., EIA-compliant |
| Size | Width: 44.0 cm (17.32 in.)<br>Height: 4.4 cm (1.73 in.)<br>Depth: 45.7 cm (17.74 in.) |
| System weight | 7.98 kg (17.6 lb.) empty<br>8.35 kg (18.4 lb.) fully loaded |

## Environment

| | |
|---|---|
| Temperature | Operating: 0°C to 40°C (32°F to 104°F)<br>Non-operating: −25°C to 70°C (−13°F to 158°F) |
| Relative humidity (non-condensing) | Operating: 10% to 85% at 40°C (104°F)<br>Non-operating: 10% to 90% |
| Altitude (above sea level) | Operating: 0 to 3000m (9842 ft)<br>Storage: 0 to 12 km (39,370 ft) |
| Shock | Operating: 10G, 10 ms, half-sine wave<br>Non-operating: 33G, 11 ms, half-sine wave, 3G Axis |
| Vibration | Operating: 0.25g sine, 0.4 grms random, 5 Hz to 500 Hz<br>Non-operating: 5 Hz at 0.5 grms, 10 Hz to 500 Hz at 1.0 grms (sine vibration), 3 Hz to 500 Hz @ 1.12 grms (random vibration) |
| Airflow | Maximum: 45.0 CFM<br>Nominal: 22.4 CFM |

## Power

| | |
|---|---|
| Power supply | Dual, hot-swappable, redundant, AC input power supplies with integrated system cooling fans |
| Power inlet | C14; requires C13 plug |
| Input voltage | 100 VAC to 240 VAC (nominal), 90 VAC to 264 VAC (range) |
| Input line frequency | 50/60 Hz (nominal), 47 Hz to 63 Hz (range) |
| Max inrush current | 50A peak @ 240 VAC for <10 ms to 150 ms, <15A peak<br>50A peak @ 240 VAC at cold start for <10 ms<br>15A peak for cycles 10 ms to 150 ms, <3.5A peak for >150 ms |
| Power consumption | @100 VAC: 1.29A, 130W, 444 BTU/hr, 135 VA (max config)<br>@200 VAC: 0.65A, 132W, 449 BTU/hr, 146 VA (max config) |

For product information, visit www.broadcom.com/brocade/extension.

For information about supported SAN standards, visit www.broadcom.com/sanstandards.

For information about switch and device compatibility, visit www.broadcom.com/compatibility.

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