

Overview

HP LeftHand P4000 SAN Solutions deliver enterprise functionality that enhances virtual environments, simplifies management, and reduces costs. Easy to deploy, scale and maintain, HP P4000 SANs ensure that crucial business data remains available. The innovative approach to storage provides unique double fault protection across the entire SAN, reducing vulnerability without driving up costs the way traditional SANs can.

Product Overview

Your storage needs are growing. You need a SAN for virtualized servers, and you want your next investment to have a long term payoff.

The HP LeftHand P4000 SAN Solutions are optimized for database and email applications, as well as virtualized servers. With a pay-as-you-grow, all-inclusive pricing model and intuitive storage management software, the SAN is perfect for the budget-minded.

Do high availability and disaster recovery seem out of your reach? The P4000 eliminates single points of failure across the SAN with an innovative approach to data availability, reducing risk without driving up costs.

Unsure that current storage can meet your future needs? Built on a storage clustering architecture, the HP P4000 SAN allows you to scale capacity and performance linearly without incurring downtime or performance bottlenecks, or forcing expensive upgrades.

Need creative ways to stretch your IT budget? Reservationless thin provisioning substantially increases your storage efficiency, making you look like a rock star.

HP LeftHand P4000 SANs Models At a Glance:

- Family of highly scalable, easy to use storage solution with superior HA and DR capabilities
- Consolidate storage for Windows and Linux environments, and for server virtualization environments
- Rack mount chassis form factor for Starter, Virtualization and Multi-site SAN solution
- Based on HP LeftHand SAN/iQ storage software
- Models with SAS or SATA drives
- Software included support for
 - Network RAID Synchronous Replication
 - Snapshot with Built In Application Integration
 - Remote Copy Asynchronous Replication with Bandwidth Throttling
 - Multi-Site HA/DR Solution Synchronous Replication
 - Online Volume Migration and Software Upgrades
 - Self-Healing Storage
- Storage Controllers: minimum of 2 per SAN, a cluster of 3 Storage systems provides triple redundancy
- Network RAID Levels (per volume) 0,2, 3, 4 protect against double disk, system, and site failures
- Hardware RAID Levels 10, 5, 6
- Hardware Availability features
 - Hot-plug hard drives and redundant power
 - ECC memory
 - Integrated storage controller w/ battery-backed DDR2 cache
 - Hyper-redundant clustered storage



Overview

	SATA Starter SAN	SAS Starter SAN	Virtualization SAN	Multi-Site SAN	Custom Solution Storage Nodes
Number of drives	16 - 256	16 - 256	24 - 384	48 - 384	Varies
Starting Capacity	12.0 TB SATA	4.8 TB 15K SAS	10.8 TB 15K SAS	21.6 TB 15K SAS	Varies
Dual Active/Active Controllers	Included	Included	Included	Included	Requires 2 Nodes
Dual Active/Active Site Failover				Included	
SAN/iQ, all features	Included	Included	Included	Included	Included
3 Yrs 9x5 Software Support	Included	Included	Included	Included	1 yr 9x5 Software Support
3 Yrs Hardware Maintenance On-Site, Next Business Day	Included	Included	Included	Included	1 yr Hardware Maintenance On-Site, NBD
HP LeftHand P4000 SAN Basic or Advanced Training (1 seat, expires after 90 days)	Included	Included	Included	Included	Optional
Customer Self Installable	Included	Included	Included	Included	Included
Windows Solution Pack	Included	Included	Included	Included	Included
P4000 Replication for Remote Offices	Optional	Optional	Included (10 license pack)	Included (10 license pack)	Optional
Multi-Site HA/DR Solution	Included	Included	Included	Included	Included



Features and Benefits

All inclusive feature set enables enterprise functionality at an affordable price

- **Storage Clustering simplifies scalability**
Storage Clustering allows a customer to consolidate multiple storage nodes into pools of storage. All available capacity and performance is aggregated and available to every volume in the cluster. As storage needs increase the HP P4000 can scale performance and capacity on-line.
- **Network RAID delivers new levels of data availability**
Network RAID stripes and mirrors multiple copies of data across a cluster of storage nodes, eliminating any single point of failure in the HP P4000 SAN. Applications have continuous data availability in the event of a power, network, disk, controller, or entire storage node failure.
- **Thin Provisioning reduces costs by increasing storage efficiency**
Thin Provisioning allocates space only as data is actually written without requiring pre-allocation of storage. This raises the overall utilization and efficiency of the HP P4000 SAN and ultimately increases the ROI.
- **Snapshots simplify data protection**
Snapshots create thinly provisioned, instant point-in-time copies of data on a per-volume basis. Built in application integrated snapshots enable automated quiescing for Microsoft VSS enabled applications. Administrators can access HP P4000 SAN snapshots to recover individual files/folders from the volume, or rollback an entire volume to a prior state.
- **Remote Copy reduces costs for disaster recovery**
Remote Copy replicates snapshots between HP P4000 SANs at primary and remote locations. Copies are thinly provisioned with no space reservation required at the remote location. Remote Copy enables centralized backup and disaster recovery on a per-volume basis.

Superior availability and disaster recovery

- **Data remains available during site failures**
HP P4000 SANs stripe and mirror multiple copies of data across a cluster of storage nodes, eliminating any single point of failure in the SAN. Applications have continuous data availability in the event of a power, network, disk, controller, or entire storage node failure.
- **Integrated replication for disaster recovery**
HP P4000 SANs include integrated replication at no additional cost that simplifies management with simple failover and failback.
- **Change configurations without incurring downtime**
Administrators can add capacity, increase performance, grow and migrate volumes between HP P4000 SAN clusters on the fly with no application downtime.

Scalable Performance

- **Purchase only what you need today**
Avoid up-front cost and the potential performance constraints. Purchase only what's needed today, then grow the performance, capacity, and redundancy of your HP P4000 SAN online as storage requirements evolve. Buying storage only when needed simplifies planning and relieves budget pressures.
- **Scale performance and capacity simultaneously**
Each time a storage node is added to the HP P4000 SAN, the capacity, performance, and redundancy of the entire storage solution increases.
- **Avoid disruptive upgrades**
Add resources to the HP P4000 SAN non-disruptively as capacity and performance requirements increase. Applications remain online during maintenance events for best in class availability.

Easy to manage SANs for virtualized environments

- **Centralized Management Console**



Features and Benefits

Multiple data centers and sites can be managed from an all inclusive "single pane-of-glass." All of the HP P4000 SAN features are managed from the Centralized Management Console (CMC) for simple, easy-to-manage storage.

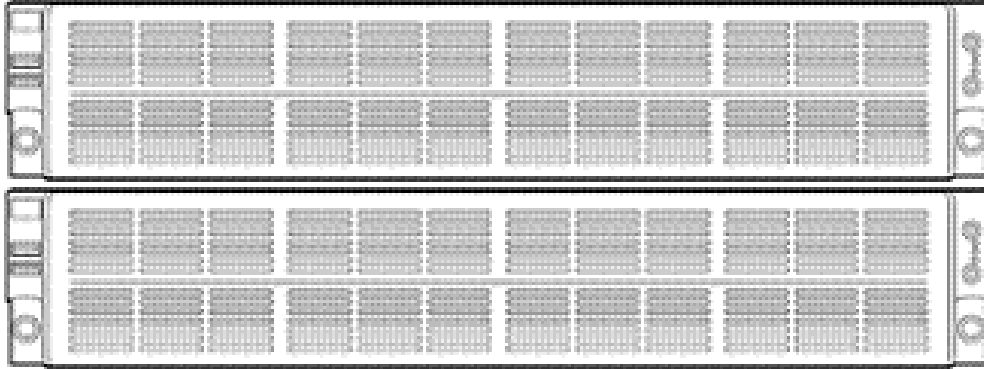
- **Business continuance with integrated HA and DR**

Every HP P4000 SAN includes integrated synchronous and asynchronous replication at no additional cost. This approach reduces costs and simplifies management of high availability/fault tolerant and disaster recovery storage solutions.



Family Information

Models



HP LeftHand P4000 SANs

The P4000 SANs are bundle configurations that provide High Availability, Scalable Performance and Enterprise Features for any budget. Each P4000 SAN includes hardware, software, and 3yrs support to get you up and running in one swift motion.

HP LeftHand P4300 SATA starter SAN Solution HP LeftHand P4300 12TB SATA Starter SAN Solution AT016A
SATA Starter SAN Software:

- SAN/iQ Storage Clustering
- SAN/iQ Network RAID
- SAN/iQ Thin Provisioning
- SAN/iQ Snapshots
- SAN/iQ Remote Copy (asynch rep)
- SAN/iQ Multi-Site/DR Solution (synch rep)
- SAN/iQ Solution Pack for Microsoft Windows

SATA Starter SAN Hardware:

- Dual redundant, active-active storage controllers
- 16 SATA Drives, 750GB, 7,200 RPM
- 8 GB RAM
- Redundant hot swap power supplies
- 1024 MB battery backed cache
- Support for RAID 5, 6, 10
- 4 1Gbit NICs
- Integrated DVD/CD-Rom

SATA Starter SAN Services:

- 3 years 9x5 software phone support & software updates
- 3 years hardware maintenance on-site, next business day
- HP LeftHand P4000 SAN Basic or Advanced Training (1 seat, expires after 90 days)
- Customer Self Installable

HP LeftHand P4300 6TB SATA Starter SAN Expansion Node AT018A

HP LeftHand P4300 SAS HP LeftHand P4300 4.8TB SAS Starter SAN Solution AT017A



Family Information

Starter SAN Solution

SAS Starter SAN Software:

- SAN/iQ Storage Clustering
- SAN/iQ Network RAID
- SAN/iQ Thin Provisioning
- SAN/iQ Snapshots
- SAN/iQ Remote Copy (asynch rep)
- SAN/iQ Multi-Site/DR Solution (synch rep)
- SAN/iQ Solution Pack for Microsoft Windows

SAS Starter SAN Hardware:

- Dual redundant, active-active storage controllers
- 16 SAS Drives, 300GB, 15,000 RPM
- 4 GB RAM
- Redundant hot swap power supplies
- 1024 MB battery backed cache
- Support for RAID 5, 6, 10
- 4 1Gbit NICs
- Integrated DVD/CD-Rom

SAS Starter SAN Services:

- 3 years 9x5 software phone support & software updates
- 3 years hardware maintenance on-site, next business day HP LeftHand P4000 SAN Basic or Advanced Training (1 seat, expires after 90 days)
- HP LeftHand P4000 SAN Basic or Advanced Training (1 seat, expires after 90 days)
- Customer Self Installable

HP LeftHand P4300 2.4TB SAS Starter SAN Expansion Node

AT019A

HP LeftHand Virtualization SAN Solution HP LeftHand P4500 10.8TB SAS Virtualization SAN Solution

AT011A

Virtualization SAN Software:

- SAN/iQ Storage Clustering
- SAN/iQ Network RAID
- SAN/iQ Thin Provisioning
- SAN/iQ Snapshots
- SAN/iQ Remote Copy (asynch rep)
- SAN/iQ Multi-Site/DR Solution (synch rep)
- SAN/iQ Solution Pack for Microsoft Windows
- P4000 Replication for Remote Offices (DR for 10 remote sites)

Virtualization SAN Hardware:

- Dual redundant, active-active storage controllers
- 24 450 GB 15K SAS disk drives
- 4 GB RAM
- Redundant hot swap power supplies
- 1,024 MB battery backed cache
- Support for RAID 5, 10, 6
- 4 1Gbit NICs



Family Information

- Integrated DVD/CD-Rom

Virtualization SAN Services:

3 years 9x5 software phone support & software updates

- 3 years hardware maintenance on-site, next business day
- HP LeftHand P4000 SAN Basic or Advanced Training (1 seat, expires after 90 days)
- Customer Self Installable

HP LeftHand P4500 5.4TB SAS Virtualization SAN Expansion Node

AT020A

HP LeftHand Multi-Site SAN Solution

HP LeftHand P4500 21.6TB SAS Multi-Site SAN Solution
Multi-site SAN Software:

AT012A

- Dual active/active site failover
- SAN/iQ Storage Clustering
- SAN/iQ Network RAID
- SAN/iQ Thin Provisioning
- SAN/iQ Snapshots
- SAN/iQ Remote Copy (asynch rep)
- SAN/iQ Multi-Site/DR Solution (synch rep)
- SAN/iQ Solution Pack for Microsoft Windows
- P4000 Replication for Remote Offices (DR for 10 remote sites)

Multi-site SAN Hardware:

- Dual redundant active-active controllers
- 48 450 GB 15K SAS disk drives, 24 per site
- 8 GB RAM
- Redundant hot swap power supplies
- 2,048 MB battery backed cache
- Support for RAID 5, 10, 6
- 8 1Gbit NICs, 4 per site
- Integrated DVD/CD-Rom

Multi-site SAN Services:

- 3 years 9x5 software phone support & software updates
- 3 years hardware maintenance on-site, next business day
- HP LeftHand P4000 SAN Basic or Advanced Training (1 seat, expires after 90 days)
- Customer Self Installable

HP LeftHand P4500 10.8TB Multi-Site SAN Expansion Node

AT021A

HP LeftHand P4000 Spare Components

While HP LeftHand P4000 SAN Solutions have everything you need to be up and running, the following spare kits are available for purchase.

System Fan	454350-001
750-W Power Supply	454353-001
HP 750GB 3G SATA 7.2K 3.5" MDL HDD	458930-B21
HP 450GB 3G SAS 15K 3.5" DP ENT HDD	454232-B21



Family Information

HP 300GB 3G SAS 15K 3.5" DP ENT HDD

416127-B21

HP LeftHand P4000 Storage System Custom Solutions

The P4000 Storage System Custom Solutions are single SKU bundle configurations. Each P4000 SAN includes hardware, software, 1 year NBD support. All P4000 Storage System Custom Solutions include the following:

P4000 Storage System Software:

- SAN/iQ Storage Clustering
- SAN/iQ Network RAID
- SAN/iQ Thin Provisioning
- SAN/iQ Snapshots
- SAN/iQ Remote Copy (asynch rep)
- SAN/iQ Multi-Site/DR Solution (synch rep)
- SAN/iQ Solution Pack for Microsoft Windows

P4300/P4500 Storage System Hardware:

- 15K SAS or 7.2K SATA HDDs
- 2GB RAM (4GB for systems with HDDs larger than 750GB)
- Redundant hot swap power supplies
- 512 MB battery backed cache
- Support for RAID 5, 6, 10
- Dual port 1Gbit NIC
- Integrated DVD/CD-Rom

P4300/P4500 Services:

- 1 year 9x5 software phone support & software updates
- 1 year hardware maintenance on-site, next business day

HP LeftHand P4300 Storage System	HP LeftHand P4300 2.4TB SAS Storage System 8 SAS Drives, 300 GB, 15,000 RPM	AT013A
	HP LeftHand P4300 4TB SATA Storage System 8 SATA Drives, 500 GB, 7,200 RPM	AT014A
	HP LeftHand P4300 6TB SATA Storage System 8 SATA Drives, 750 GB, 7,200 RPM	AT015A
HP LeftHand P4500 Storage System	HP LeftHand P4500 1.8TB SAS Storage System 12 SAS Drives, 146GB, 15,000 RPM	AT004A
	HP LeftHand P4500 3.6TB SAS Storage System 12 SAS Drives, 300GB, 15,000 RPM	AT005A
	HP LeftHand P4500 5.4TB SAS Storage System 12 SAS Drives, 450GB, 15,000 RPM	AT006A
	HP LeftHand P4500 3TB SATA Storage System 12 SATA Drives, 250GB, 7,200 RPM	AT007A
	HP LeftHand P4500 6TB SATA Storage System 12 SATA Drives, 500GB, 7,200 RPM	AT008A
	HP LeftHand P4500 9TB SATA Storage System 12 SATA Drives, 750GB, 7,200 RPM	AT009A
	HP LeftHand P4500 12TB SATA Storage System 12 SATA Drives, 1TB, 7,200 RPM	AT010A
HP LeftHand P4000 Spare Components	While HP LeftHand P4000 Storage Systems have everything you need to be up and running, the following spare kits are available for purchase.	
	System Fan	454350-001
	750-W Power Supply	454353-001
	HP 1TB 3G SATA 7.2K 3.5" MDL HDD	454146-B21



Family Information

HP 750GB 3G SATA 7.2K 3.5" MDL HDD	458930-B21
HP 500GB 3G SATA 7.2K 3.5" MDL HDD	458928-B21
HP 450GB 3G SAS 15K 3.5" DP ENT HDD	454232-B21
HP 300GB 3G SAS 15K 3.5" DP ENT HDD	416127-B21
HP 146GB 3G SAS 15K 3.5" DP ENT HDD	384854-B21

HP LeftHand P4000 SANs Product Information:

Overview	
Server Compatibility	Supports most HP ProLiant servers including HP ProLiant DL, MLHP ProLiant c-Class Blade Servers
Industry Standard x86/x64 servers support	<ul style="list-style-type: none"> • Supports most multi-vendor industry standard 32-bit and 64-bit Intel and AMD based servers. HP requires the Third-Party Server to be logo'd and listed on the Microsoft Windows Server Catalog. • Refer to the Microsoft website: http://www.microsoft.com/windows/catalog/server/ • HP Storage Division recommends that the Third-Party Server Vendor is an active member of TSANet. Refer to the TSANet website for details: www.tsanet.com
OS Support	<ul style="list-style-type: none"> • Microsoft Windows Server 2003 R2 - all editions, x86/x64 • Microsoft Windows Server 2008 - all editions, x86/x64 • Microsoft Windows Server 2008 R2 - all editions • VMware ESX / ESXi 3.5 • VMware vSphere ESX / ESXi Server 4 • VMware Site Recovery Manager • RedHat Enterprise Linux AS 4.6/4.7 • RedHat Enterprise Linux 5.0/5.1/5.2 • Novell NetWare 6.5 • SUSE Linux Enterprise Server 9/10/10.1/10.2, x86/x64 • Fedora 6/8/9/10 • Solaris 10 (SPARC) • HP-UX 11i v1 (PA-RISC 11.11), v2 (PA-RISC 11.23) • IBM AIX 5L Version 5.3 ML2 • Citrix XenServer 5.0/5.5 • OS X Leopard 10.5.4/10.5.5
Interconnects	<ul style="list-style-type: none"> • 2ea 1 GbE iSCSI, optional upgrade to 10 GbE
Management	<ul style="list-style-type: none"> • The Centralized Management Console supports <ul style="list-style-type: none"> ○ Microsoft Windows XP ○ Windows Vista ○ Windows 7 ○ Windows Server 2003 ○ Windows Server 2008 ○ Windows Server 2008 R2 ○ SUSE Linux Enterprise 10 ○ RedHat Enterprise Linux 4/5 ○ Fedora Core 6 ○ Fedora 6/8/9 ○ HP-UX 11i v1 (PA-RISC 11.11), v2 (PA-RISC11.23) • HP ProLiant Lights Out 100i Remote Management • Baseboard Mgmt Controller IPMI 2.0



Family Information

All of the following benchmarks were designed to help characterize the actual performance users can expect in similar production environments. Each benchmark measures different storage characteristics. The Cache Only benchmarks illustrate the maximum performance limits of the SAN in an optimal scenario. While these numbers are often used as a basis of comparison between different storage vendors, they aren't representative of the workload typically found in production environments. The following benchmarks are real-world benchmarks designed to mimic actual application workloads. 8K OLTP and 4k Email benchmarks illustrate the expected performance in those application environments. Sequential Reads and Writes show throughput in megabytes per second (MB/sec), an indicator of performance for applications such as file share or streaming media.

HP LeftHand P4000 SANs Performance:

RAID 5 Performance Results (rounded down)				
	SATA Starter SAN	SAS Starter SAN	Virtualization SAN	Multi-Site SAN
Cache only IOPs	120,000	120,000	120,000	240,000
Cache only MB/s	448	448	448	896
Sequential Reads MBs	70	210	306	410
Sequential Writes MBs	40	125	183	220
8K OLTP	844	1,759	2,764	5,025
4k Email IOPS	800	2,200	3,400	7,000

RAID 10 Performance Results (rounded down)				
	SATA Starter SAN	SAS Starter SAN	Virtualization SAN	Multi-Site SAN
Cache only IOPs	120,000	120,000	120,000	240,000
Cache only MB/s	448	448	448	896
Sequential Reads MBs	70	210	306	410
Sequential Writes MBs	40	125	183	220
8K OLTP	965	2,010	3,015	6,030
4k Email IOPS	1,200	3,100	5,100	10,500



Software

HP LeftHand P4000 All Inclusive Software

Product Features Storage Clustering

- SAN/iQ Storage Clustering allows a customer to create pools of storage by consolidating storage nodes on the network into clusters. Storage Clustering provides online scalability, both within a volume and across the entire storage pool. All available physical capacity is aggregated and available to the volumes created on the SAN.
- In order to scale capacity and/or performance, the IT administrator simply adds nodes to the storage cluster. SAN/iQ software automatically redistributes the data for optimal data availability and performance. All the capacity, processing power, and bandwidth included in each node are aggregated into the entire SAN, ensuring an increase in performance as the SAN grows. To make the process even easier, LeftHand P4000 SANs let IT administrators expand volumes and add storage nodes online, without taking the volumes offline or causing application downtime.
- For increased access to hardware, customers can install storage nodes anywhere on the IP network. Within a facility, storage nodes in a cluster can be spread out between the server room and a network closet. A single cluster can also be spread across physical sites or data centers to eliminate the risk of data loss from a site or data center failure.
- Customers can use SAN/iQ Storage Clustering to implement different tiers of storage in their SAN. For instance a storage cluster of SAS-based storage nodes can be implemented for performance while a storage cluster of SATA-based storage nodes is implemented for higher density, all managed from a single interface.

Network RAID

- SAN/iQ Network RAID stripes and mirrors multiple copies of data across a cluster of storage nodes, eliminating any single point of failure in the SAN. Applications have continuous data availability in the event of a power, network, disk, controller, or entire storage node failure.
- SAN administrators can manage redundancy on a per-volume basis to optimize storage utilization and match the data protection of the volume to the application data on that volume. Customers choose one, two, three or four copies of data across the storage nodes, only allocating additional storage space for data that warrants additional protection. For increased protection, Network RAID can also be integrated into environments where application servers are clustered, enabling true, seamless, geo-cluster solutions that provide both application and storage clustering across geographies.

Thin Provisioning

- Most SAN vendors place the provisioning burden on SAN administrators, asking them to predict how much space will be needed in the future for volumes, snapshots and remote copies, and what the SAN's expected growth rate will be. That information is required because most storage provisioning models call for pre-allocation of storage space on the SAN. Errors in estimation are inevitable, and can be expensive or cause snapshots and backups to fail. Worse yet, if administrators over-allocate storage, it is nearly impossible to reclaim that unused space.
- LeftHand P4000 SANs do not require pre-allocation of storage space. SAN/iQ software manages all the storage allocations underneath a given volume, and the Thin Provisioning feature allocates space only as data is actually written to that volume. SAN/iQ Thin Provisioning allows customers to purchase only the storage needed today and then add more storage to the clusters as application data grows. This raises the overall utilization and efficiency of the SAN and ultimately increases the ROI associated with the SAN.

Snapshots

- Snapshots create instant point-in-time copies of data on a per-volume basis. Snapshots can be



Software

created in a variety of ways to meet business or application requirements. Administrators can create them manually ad-hoc, on a scheduled or scripted basis, or via the Microsoft VSS framework, and can then access these point-in-time snapshots to recover individual files or folders from the volume, or rollback an entire volume. Unlike most SAN vendors that require a snapshot reserve, SAN/iQ Snapshots are always thin provisioned for efficiency, only consuming storage space on the SAN for the data written to the snapshot, eliminating any upfront space reservation or guesswork that could lead to snapshot and backup job failures.

- Built into the SAN and Centralized Management Console, application integrated snapshots provide automated quiescing for Microsoft VSS enabled applications without additional software or hardware requirements.

Remote Copy

- SAN/iQ Remote Copy lets customers replicate thin provisioned snapshots between primary and remote locations. Because LeftHand remote copies are thin provisioned no space reservation at the remote location is required. Remote Copy is used for centralized backup and disaster recovery and can be set up on a per-volume basis. Remote copies placed on a recurring schedule allow customers to achieve point-in-time asynchronous replication of the data between locations, sites, or data centers.
- Integrated into the SAN/iQ Remote Copy software is intelligent bandwidth management ensuring that the data traffic can be sent across shared WAN links without adversely impacting other network traffic. Administrators simply set the bandwidth limit for remote copies between the two sites and the SAN/iQ software holds that limit.
- A failover/failback wizard is also included with Remote Copy for step-by-step, easy to execute disaster recovery procedures when needed most.
- Remote-Copy leverages application integrated snapshots to enable Microsoft VSS applications to be replicated in a quiesced state, providing faster application recovery.

Performance Management

- The SAN/iQ Performance Management System is designed from the ground up to make it easy to obtain the performance metrics that customers need, when they need them. One click of the mouse and the Performance Monitor is up and running in the Centralized Management Console (CMC) so there is no external software to install. The monitor provides a short list of relevant statistics and counters, letting administrators obtain performance metrics rolled up to their preferred level of abstraction.
- The SAN/iQ Performance Monitor provides performance information on a per-application server/virtual machine, logical volume, snapshot, storage cluster, and storage node basis, so there's no wading through irrelevant statistics in search of pertinent information. The Performance Monitor's graphical user interface is simple and elegant, and each statistic includes a detailed explanation of what it means for SAN performance.

SmartClone Technology

- SAN/iQ SmartClone technology instantly replicates data volumes and data sets into virtual copies or "clones" without requiring additional storage space. Each volume clone lets administrators save time and space in a variety of environments and applications, from server and desktop provisioning, to boot-from-SAN provisioning, to the rapid copying of production data into test and development environments.
- SmartClone technology is based on the space-efficient SAN/iQ Thin Provisioning architecture, and the volume clones can be used without limitation along with all other SAN/iQ features like Network RAID, Thin Provisioning, Snapshot, and Remote Copy. The feature works by taking any volume or snapshot and making one or many clones in an instant. The cloning function makes a permanent, read/write volume on the SAN, pointing back to the original volume's blocks instead



Software

of duplicating the blocks. By managing each clone as a pervasive volume, SmartClone eliminates any requirement for a volume, snapshot, or any of its predecessors to exist after the clone has been created, and also eliminates the need to run de-duplication software, because there are no duplicate blocks. The clone shares the original volume's blocks and uses copy-on-write semantics. SmartClone technology reduces storage costs and increases overall storage efficiency. Administrators can store "gold-master" system images on the SAN for virtual desktop and boot-from-SAN implementations, and quickly provision test environments using real production data. To simplify management, administrators can view all of the relationships between clones, volumes, and snapshots graphically in the Control Management Console.

- SmartClone technology leverages application integrated snapshots to enable Microsoft VSS applications to be cloned in a quiesced state, providing easier application testing and recovery.

Control Management Console

- The entire LeftHand P4000 SAN is managed from the SAN/iQ Centralized Management Console (CMC). An administrator simply connects via the IP network to the storage nodes. Multiple data centers and sites of storage can be managed from a "single pane-of-glass" no matter where the nodes are physically located. The CMC also includes an integrated Performance Monitor providing administrator with detailed, real-time metrics and the ability to export statistics. All of the SAN/iQ features are managed from the CMC for simple, easy-to-manage storage.

HP LeftHand P4000 Optional Software

Replication for Remote Offices

- For IT departments struggling to implement Disaster Recovery at remote sites, the HP LeftHand P4000 Replication for Remote Offices Solution Pack delivers IP based replication from remote and branch offices for a corporate-wide, cost-effective solution. Leveraging the HP LeftHand P4000 Virtual SAN Appliance Software (VSA), no SAN hardware is required at the sites. All sites including other HP LeftHand P4000 SANs are managed from a single console through a simple, user-friendly interface. The Remote Office Solution Pack is certified with VMware's Site Recovery Manager, delivering efficient, affordable SAN replication and failover management.
- Requires VMware ESX at each remote site and a Physical HP LeftHand P4000 SAN (any model) as the replication target.
- Software phone support and software upgrades inherited from the active HP LeftHand P4000 SAN support contract at the replication target.

HP LeftHand P4000 Related Software

HP LeftHand P4000 Virtual SAN Appliance Software (VSA)

- The HP LeftHand P4000 Virtual SAN Appliance Software (VSA) is a VMware Certified SAN/Storage device and Virtual Appliance that provides complete SAN functionality for VMware Infrastructure without external SAN hardware. By virtualizing the internal disk capacity of the server running VMware ESX, the VSA Software eliminates the need for external shared storage required to implement the advanced features of VMware Infrastructure.
- Multiple VSA's running on multiple VMware ESX hosts create a clustered pool of storage with the ability to replicate data across the hosts allowing volumes to stay on-line in the event of a server failure
- Small to medium businesses and remote office customers can lower their IT infrastructure costs and enable higher levels of protection for business critical systems without the purchase of additional hardware.
- VSA Software deployed at remote sites are managed as virtual storage nodes using the same Centralized Management Console used to manage your HP LeftHand P4000 SANs.
- 1 year 9x5 software phone support and software upgrades included

NOTE: For more information visit: www.hp.com/go/vsa

HP X3000 Network

Stretch your HP LeftHand P4000 SAN Solution investment by adding file and print services with an



Software

Storage Gateways:

Add more value to your HP LeftHand P4000 SAN Solution

X3000 Series Network Storage Gateway platform. X Series Network Storage Gateways are optimized file and print server solutions that are built on industry-standard HP ProLiant servers and come with Microsoft Windows Storage Server 2008 operating system pre-installed. Since they're Windows-based, network integration is easy, your tools and data protection applications run right on the box, and management has a familiar look and feel. Like many Network Attached Storage (NAS) devices, they support heterogeneous file serving environments and are pre-configured to install in minutes.

An X3000 Network Storage Gateway is a file server gateway that adds IP-based services to your P4000. In addition to providing file and print services, all of your important client and server data can be managed, scaled, and protected on a P4000 SAN solution.

NOTE: For more information visit: www.hp.com/go/X3000

HP X3400 Network Storage Gateway

AP796A

HP X3800 Network Storage Gateway

AP797A

HP X3800sb Network Storage Blade

AP806A

NOTE: Microsoft Windows Storage Server 2008 Enterprise x64 Edition O/S with file/print and cluster services on a blade form factor platform. For more info:

www.hp.com/go/storageblades

Backup Options

Creating and end-to-end IP SAN storage solution

When combining a HP LeftHand SAN Storage Solution with the HP D2D Backup System, users can create an affordable end-to-end IP SAN storage solution that is both easy to implement and easy to maintain. From entry-level solutions for a remote or branch office to mid-range solutions that scale for multiple sites, HP D2D Backup Systems provide the optimal balance of affordability, manageability, and reliability to handle the data protection needs of your HP LeftHand SAN Solution.

HP D2D4112 Backup System

The HP D2D Backup Systems provide price leading disk-based data protection for small or medium-sized data centers and distributed environments. Automate and consolidate the backup of multiple servers onto a single, rack-mountable device. Improve reliability by reducing errors caused by media handling. With 1.5 to 18 TB of usable capacity and speeds of up to 720 GB/hour you can significantly reduce your backup window and restore time. The D2D Backup Systems feature HP Dynamic deduplication allowing you to retain more data on disk for longer and enabling low bandwidth replication for cost-effective off-site backup and recovery. Included as standard on all D2D systems, support for both virtual tape library and NAS (CIFS/NFS) targets offers the ease of use and flexibility needed to integrate into your current IT environment.

**Actual performance is dependent upon data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication.*

The HP D2D4112 Backup System is focused on the needs of mid-sized data centers and used as a replication target device for remote and branch offices, the 2U D2D4112 series delivers a scalable solution from 9 to 18 TB of useable capacity using a simple and cost effective 2U capacity upgrade and speeds of up to 720 GB/hour*. These devices automate the daily backup of multiple distributed servers through the flexibility of virtual tape library and NAS (CIFS and NFS) targets for backup applications.

**Actual performance is dependent upon data set type, compression levels, number of data streams, number of devices emulated and number of concurrent tasks, such as housekeeping or replication.*

For more information on HP D2D Backup Systems, please go to: www.hp.com/go/d2d.



Service and Support, HP Care Pack, and Warranty Information

Warranty

- The HP LeftHand P4000 SANs and expansion nodes (SATA Starter SAN solution, SATA Starter SAN expansion node, SAS Starter SAN solution, SAS Starter SAN expansion node, Virtualization SAN solution, Virtualization SAN expansion node, Multi-site SAN solution, Multi-site SAN expansion node) come with standard 3-3-3 warranty (3 years parts exchange, 3 years labor and 3 years onsite, next business day response)
- The HP LeftHand P4000 Storage Systems comes with a standard 1-1-1 warranty (1 year parts exchange, 1 year labor and 1 year onsite, next business day response)

Services Included with the Product

- The HP LeftHand P4000 SANs (SATA Starter SAN , SAS Starter SAN, Virtualization SAN, Multi-site SAN) come with three years of HP Software Support, standard 9x5 business hours phone support (software technical support and software product and documentation updates). Additionally, each SAN Solution includes HP LeftHand P4000 SAN Basic or Advanced Training (1 seat, expires after 90 days).
- The HP LeftHand P4000 Storage Systems comes with one year of HP Software Support, standard 9x5 business hours phone support (software technical support and software product and documentation updates).

HP Care Pack Services

Scalable, Flexible, Dependable. Like your storage.

Your storage is evolving. Get scalable support that evolves with it. HP Care Pack Services is an easy-to-buy, easy-to-use portfolio of packaged services covering your lifecycle needs. You can rely on our highly skilled, HP certified professionals to offer a breadth of expertise across leading storage technologies, and work side by side with you for optimal results. Partner with HP Technology Services to boost availability and avoid costly downtime by mitigating technology-related business risks. To help take the worry out of deploying, supporting and managing your storage technologies, we've designed a portfolio of service options that are as flexible, scalable and affordable as our storage.

Protect your business beyond the warranty

Standard warranty protects against product defects and some causes of downtime. HP Care Pack Services helps you proactively guard against unplanned downtime which can reduce your productivity and profitability. By using a standard approach to warranty uplifts, such as HP Care Pack Services, customers can be certain of consistency of operations for both mission-critical and standard business computing.

Extending warranties with HP Care Pack Services

The key to normalizing the warranty of combined solutions-is making service uplift simple: HP Care Pack Services. This portfolio of predefined packages, extending across the entire IT lifecycle, offering consulting, education, technical support, optimization, risk assessment, and more. It's entirely flexible allowing customers to extend the cover to the precise level of support required. Customer's standard hardware warranty, for example, can be upgraded to next-business-day response, to same-day coverage, or even to a committed six-hour call-to-repair service available 24 hours every day of the week.

Provide consistent, predictable levels of support across your entire department or business

Give you direct access to proven technical and problem-solving expertise

Offer a choice of response-time and repair-time commitments

Are available whenever and wherever you do business

For many products, post-warranty HP Care Pack Services are available when your original warranty has expired. Choose the support levels that meet your business requirements, from basic to mission-critical.



Service and Support, HP Care Pack, and Warranty Information

In the new world of business technology, when your technology has to work for your business to work, who can you trust to make your technology work? HP Technology Services, the trusted business technology experts who manage your technology in action, because when technology works, business works. <http://www.hp.com/hps/storage>

NOTE: Care Pack Services availability may vary by product and country.

Recommended Services HP Care Pack Services recommended for optimal satisfaction of all deployments of your product.

3-Year HP Support Plus 24 3-Year HP Support Plus 24 provides integrated hardware and software support services designed specifically for your technology. HP Services engineers deliver reactive onsite hardware support and over-the-phone software support around-the-clock.

Installation and Startup While all HP LeftHand P4000 products are easily self installed by the customer, HP offers optional installation and startup to assist in set-up. HP Installation and Startup for LeftHand SAN Solutions provides service planning, service deployment, installation verification test (IVT) and a customer orientation session to help deploy functionality of the LeftHand P4000 SAN Solutions products.

Product Number	Product Name	Service Name	Care Pack Services Product # and Band	Alternate Care Pack Services Product #
AT004A	HP LeftHand P4500 1.8TB SAS Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT005A	HP LeftHand P4500 3.6TB SAS Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT006A	HP LeftHand P4500 5.4TB SAS Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT007A	HP LeftHand P4500 3TB SATA Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT008A	HP LeftHand P4500 6TB SATA Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT009A	HP LeftHand P4500 9TB SATA Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT010A	HP LeftHand P4500 12TB SATA Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT011A	HP LeftHand P4500 10.8TB SAS Virtualization SAN Solution	3-Year HP Support Plus 24	HA110A3#	UQ029E
AT012A	HP LeftHand P4500 21.6TB SAS Multi-site SAN Solution	3-Year HP Support Plus 24	HA110A3#	UQ047E



Service and Support, HP Care Pack, and Warranty Information

AT013A	HP LeftHand P4300 2.4TB SAS Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT014A	HP LeftHand P4300 4TB SATA Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT015A	HP LeftHand P4300 6TB SATA Storage System	3-Year HP Support Plus 24	HA110A3#	UQ011E
AT016A	HP LeftHand P4300 12TB SATA Starter SAN Solution	3-Year HP Support Plus 24	HA110A3#	UQ029E
AT017A	HP LeftHand P4300 4.8TB SAS Starter SAN Solution	3-Year HP Support Plus 24	HA110A3#	UQ029E
AT018A	HP LeftHand P4300 6TB SATA Starter SAN Expansion Node	3-Year HP Support Plus 24	HA110A3#	UQ065E
AT019A	HP LeftHand P4300 2.4TB SAS Starter SAN Expansion Node	3-Year HP Support Plus 24	HA110A3#	UQ065E
AT020A	HP P4500 5.4TB SAS Virtualization SAN Expansion Node	3-Year HP Support Plus 24	HA110A3#	UQ065E
AT021A	HP LeftHand P4500 10.8TB SAS Multi-Site SAN Expansion Node	3-Year HP Support Plus 24	HA110A3#	UQ029E

Related Services

Services that will enhance the user experience in many product deployments.

HP Proactive Select Service

HP Proactive Select Service improves IT performance and manageability through the use of cost effective flexible proactive services. This proactive service allows you to accelerate the ROI of your technology environment, by tailoring specific services to more quickly take advantage of your investment.

Service Name	Care Pack Services Product # and Band	Alternate Care Pack Service Product #
HP Proactive Select Service	Contact your HP sales rep or Channel Partner for assistance.	Contact your HP sales rep or Channel Partner for assistance.

Available Services

	3-Yr Support Plus	3-Yr Support Plus24	3-Yr Support Plus w/DMR	3-Yr Support Plus 24 w/DMR
Commercial Care Packs	•	•	•	•
Enterprise Care Packs	•	•	•	•



Service and Support, HP Care Pack, and Warranty Information

4-Yr and 5-Yr Enterprise Care Packs are available.

Contractual HP Hardware Maintenance Onsite, HP Software Technical Unlimited Support and HP Software Updates Service are also available.

eSupport

HP eSupport is a portfolio of technology-based services that assist you with managing your business environment - from the desktop to the data center.

Support Portal

The HP support portal provides one-stop access to the information, tools and services you need to manage the daily operations of your IT environment.

Features include:

- Access to self-solve tools (including search technical knowledge base)
- Efficient logging and tracking of support cases
- Collaboration with other business and IT professionals
- Download of patches and drivers
- Access to diagnostic tools
- Proactive notification of relevant information

Access to certain features of the support portal requires an HP service agreement. To access the support portal, visit: <http://www.hp.com/support>

Customer Technical Training

Consider education as an integral part of your strategy to get the best return on investment for your HP storage solution. HP offers a variety of training courses on storage software, networking, archiving and disk storage systems. Our classes are available in many delivery modalities from traditional instructor-led courses at one of our 80 training centers worldwide to on-site training customized to your needs or online. www.hp.com/learn/storage

HP Services Awards

HP Services continues to be recognized for service and support excellence by customers, partners, industry organizations and publications around the world. Recent honors and award reflect our services team's dedications, technical expertise, professionalism and uncompromising commitment to customer satisfaction. For a list of all our awards, please visit: <http://h20129.www2.hp.com/services/cache/77318-0-0-225-121.html>.

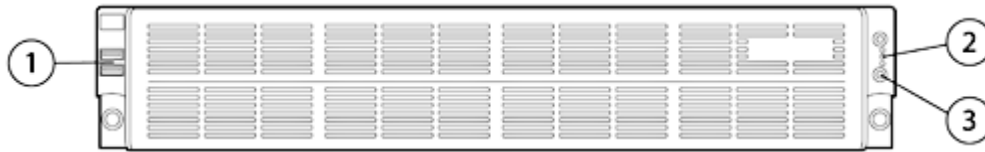
Additional Services Information

For more information about HP Care Pack Services for Storage, please visit: <http://www.hp.com/hps/storage>

If you have specific questions, contact your local HP representative. Contact information for a representative in your area can be found at "Contact HP" <http://www.hp.com>

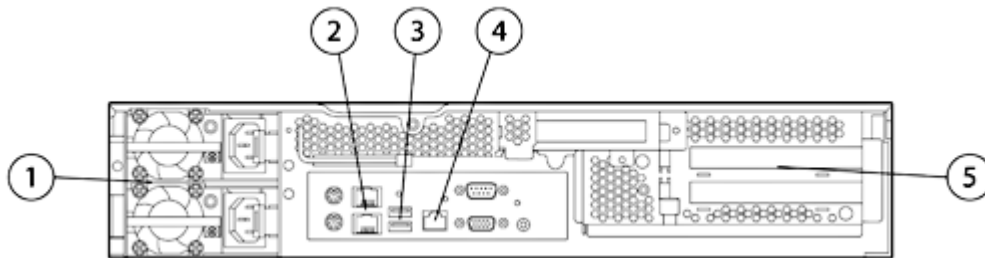


Configuration Information



P4300 / P4500 Storage Solution Front

- 1. Front USB Ports (2)
- 2. Front LED Indicators
- 3. Power on/off



P4300 / P4500 Storage Solution Rear

- 1. Hot Plug Power Supplies
- 2. GbE LAN Ports
- 3. Rear USB Ports (2)
- 4. Management LAN Port
- 5. PCI Expansion Card Slot

Step 1 - P4000 Base Configuration

Choose a SAN that best fits your needs

SAN Configuration	Model Description	Part Number
HP LeftHand P4300 SATA Starter SAN Solution	HP LeftHand P4300 12TB SATA Starter SAN Solution	AT016A
	HP LeftHand P4300 6TB SATA Starter SAN Expansion Node	AT018A
HP LeftHand P4300 SAS Starter SAN Solution	HP LeftHand P4300 4.8TB SAS Starter SAN Solution	AT017A
	HP LeftHand P4300 2.4TB SAS Starter SAN Expansion Node	AT019A
HP LeftHand Virtualization SAN Solution	HP LeftHand P4500 10.8TB SAS Virtualization SAN Solution	AT011A
	HP LeftHand P4500 5.4TB SAS Virtualization SAN Expansion Node	AT020A
HP LeftHand Multi-Site SAN Solution	HP LeftHand P4500 21.6TB SAS Multi-Site SAN Solution	AT012A
	HP LeftHand P4500 10.8TB SAS Multi-Site SAN Expansion Node	AT021A
Custom Configuration	HP LeftHand P4300 2.4TB SAS Storage System	AT013A
	HP LeftHand P4300 4TB SATA Storage System	AT014A
	HP LeftHand P4300 6TB SATA Storage System	AT015A
HP LeftHand P4500 Storage Systems	HP LeftHand P4500 1.8TB SAS Storage System	AT004A
	HP LeftHand P4500 3.6TB SAS Storage System	AT005A
	HP LeftHand P4500 5.4TB SAS Storage System	AT006A
	HP LeftHand P4500 3TB SATA Storage System	AT007A
	HP LeftHand P4500 6TB SATA Storage System	AT008A
	HP LeftHand P4500 9TB SATA Storage System	AT009A
	HP LeftHand P4500 12TB SATA Storage System	AT010A



Configuration Information

HP LeftHand P4000 Spare Components While HP LeftHand P4000 Storage Systems have everything you need to be up and running, the following spare kits are available for purchase.

System Fan	454350-001
750-W Power Supply	454353-001
HP 1TB 3G SATA 7.2K 3.5" MDL HDD	454146-B21
HP 750GB 3G SATA 7.2K 3.5" MDL HDD	458930-B21
HP 500GB 3G SATA 7.2K 3.5" MDL HDD	458928-B21
HP 450GB 3G SAS 15K 3.5" DP ENT HDD	454232-B21
HP 300GB 3G SAS 15K 3.5" DP ENT HDD	416127-B21
HP 146GB 3G SAS 15K 3.5" DP ENT HDD	384854-B21

Step 2 - Options

P4000 upgrade options	HP LeftHand P4000 Replication for Remote Offices 10-pack Media Stock LTU	TA686AB
	HP LeftHand P4000 Replication for Remote Offices 10-pack Media LTU	TA686AA
	HP LeftHand P4000 Replication for Remote Offices 10-pack Media E-LTU	TA686AAE
	HP LeftHand P4000 Replication for Remote Offices 1-pack Media Stock LTU	TA687AB
	HP LeftHand P4000 Replication for Remote Offices 1-pack Media LTU	TA687AA
	HP LeftHand P4000 Replication for Remote Offices 1-pack Media E-LTU	TA687AAE
	HP LeftHand P4000 10G BASE-CX4 Upgrade Kit	AT022A
	NOTE: Use this kit to upgrade P4000 Storage Systems to 10 GB, and connect to a 10 GbE iSCSI network. It as 2 x 10GbE CX4 ports per kit. One kit is needed for a Storage System, 2 kits are needed for a SAS Starter SAN / SATA Starter SAN / Virtualization SAN, and 4 kits are needed for a Multi-Site SAN.	
HP LeftHand P4000 Virtual SAN Appliance Software	HP LeftHand P4000 Virtual SAN Appliance Software for VMware ESX Server Stock LTU	TA688AB
	HP LeftHand P4000 Virtual SAN Appliance Software for VMware ESX Server LTU	TA688AA
	HP LeftHand P4000 Virtual SAN Appliance Software for VMware ESX Server E-LTU	TA688AAE

Step 3 - Other P4000 SANs Options

Description

NOTE: Four power cords (2 ea. Power Cord, 110/220 VAC, US/Canada/Mexico (121565-001), and 2 ea. Power Cord, IEC to IEC (142263-001) are shipped with each P4000 Storage System. An optional longer 2meter PDU power cable (C14 to C13 style connector) for customers who would like additional length for connections to existing power distribution modules located on the right side of the rack. If desired, the quantity to order is 1 AF573A HP RDNT 2m,10A, C13-C14 JMPR CORD

If a local power cord is required, please reference the following power cord matrix: <http://www.hp.com/go/powercordmatrix>. Ensure quantity 2 are ordered per P4000 Storage System due to the dual redundant power supplies.

Must choose optional Power Cord for Non-U.S. Configurations	Quantity	Part Number
Power Cord, 220/240 VAC, (US/Canada/Mexico)	2	227099-001
Power Cord, (Australia/China/New Zealand)	2	227098-001
Power Cord, (Central Europe)	2	157215-001



Configuration Information

Power Cord, (United Kingdom/Hong Kong)	2	157216-001
Power Cord, (Switzerland)	2	157219-001
Power Cord, (Italy)	2	157217-001
Power Cord, (Denmark)	2	157218-001
Power Cord, (Japan)	2	139867-001
Power Cord, (South East Asia/India)	2	157220-001

Step 4 - Choose Supported Options For iSCSI Infrastructure

Select each required option with quantities specified.

The P4000 SANs supports industry standard Gigabit and 10 Gigabit (CX4) Ethernet components from various manufacturers that conform to IEEE 802.3ab (1000base-T) standards.

Description with Parts Shipped:

For details on standard Gigabit Ethernet components (including Gigabit Ethernet switches, Network Interface cards and Ethernet cables) from HP <http://welcome.hp.com/country/us/en/prodserv/networking.html>

Step 5 - Choose Rack Options

Select each required option with quantities specified.

HP Rack 10000 G2	14U rack	
Series (Carbon/Graphite Metallic)	HP S10614 Rack with Shock Pallet	292302-B22
	Rack Cabinets 10622 G2	
	10622 G2 Universal Rack w/Shock Pallet	AF022A
	10622 G2 Universal Rack w/Standard Pallet	AF021A
	Rack Cabinets under 10636 G2	
	10636 G2 (36U) Rack Cabinet - Pallet	AF011A
	10636 G2 (36U) Rack Cabinet - Shock Pallet	AF012A
	10636 G2 (36U) Rack Cabinet - Crated	AF013A
	10636 G2 (36U) Rack Cabinet, with Extension - Shock Pallet	AF014A
	Rack Cabinets 10642 G2	
	10642 G2 (42U) Rack Cabinet - Pallet	AF001A
	10642 G2 (42U) Rack Cabinet - Shock Pallet	AF002A
	10642 G2 (42U) Rack Cabinet - Crated	AF003A
	10642 G2 (42U) Rack Cabinet, with Extension - Shock Pallet	AF004A
	Rack Cabinets 10842 G2	
	10842 G2 Universal Rack w/Shock Pallet	AF042A
	10842 G2 Universal Rack w/Standard Pallet	AF041A
	Rack Cabinets 10647 G2	



Configuration Information

10647 Rack G2 Pallet

AF031A

NOTE: Cat5e cables are required to connect Interface Adapters to Console Switches. Cat5e cables can be found at the following URL: <http://www.hp.com/go/kvm>.

NOTE: It is mandatory to use a shock pallet when shipping racks with equipment installed.

NOTE: Please see the QuickSpecs for Technical Specifications and additional information:

http://h18000.www1.hp.com/products/quickspecs/12402_div/12402_div.html

NOTE: For additional information regarding Rack Cabinets, please see the following URL: <http://www.hp.com/go/rackandpower>.



Technical Specifications

	SATA Starter SAN	SAS Starter SAN	Virtualization SAN	Multi-Site SAN	P4300 Custom Solution	P4500 Custom Solution	
Dimensions	4U			8U	2U		
	6.88 x 17.64 x 27.50 in (17.5 x 44.80 x 69.88 cm)			13.76 x 17.64 x 27.50 in (35 x 44.80 x 69.88 cm)	3.44 x 17.64 x 27.50 in (8.75 x 44.80 x 69.88 cm)		
Weight	89 lbs/33.22 kg		103 lbs /38.44 kg	206 lbs /76.88 kg	44.5 lbs/16.61 kg	51.5 lbs /19.22 kg	
Power/Cooling	Redundant hot-plug power supplies						
	Auto-switching universal 110/220 Volts						
	6.7 belsA-weighted						
	5.2 Amp @ 115 Volts		6.4 Amp @ 115 Volts	12.8 Amp @ 115 Volts	2.6 Amp @ 115 Volts	3.2 Amp @ 115 Volts	
	1996 BTU/hr		2484 BTU/hr	4968 BTU/hr	998 BTU/hr	1242 BTU/hr	
	586 watts		728 watts	1456 watts	293 watts	364 watts	
Environmental	System Inlet Temperature	Operating	10° to 35°C (50° to 95°F) at sea level with an altitude Derating of 1.0°C per every 305 m (1.8°F per every 1000 ft) above sea level to a maximum of 3050 m (10,000 ft), no direct sustained sunlight. Maximum rate of change is 10°C/hr (18°F/hr). The upper limit may be limited by the type and number of options installed. System performance may be reduced if operating with a fan fault or above 30°C (86°F).				
		Non-operating	-30°to 60°C (-22°to 140°F). Maximum rate of change is 20°C/hr (36°F/hr).				
	Relative Humidity (non-condensing)	Operating 10% to 90% relative humidity (Rh), 28°C (82.4°F) maximum wet bulb temperature, non-condensing. Non-operating 5% to 95% relative humidity (Rh), 38.7°C (101.7°F) maximum wet bulb temperature, non-condensing.					
	Altitude	Operating 3050 m (10,000 ft). This value may be limited by the type and number of options installed. Maximum allowable altitude change rate is 457 m/min (1500 ft/min). Non-operating 9144 m (30,000 ft). Maximum allowable altitude change rate is 457 m/min (1500 ft/min).					
Regulatory	FCC Rating	Class A					
	Normative Standards	CISPR 22; EN55022; EN55024; FCC CFR 47, Pt 15; ICES-003; CNS13438; GB9254; K22;K24; EN 61000-3-2; EN 61000-3-3; EN 60950-1; IEC 60950-1					



Technical Specifications

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