

MODELS

MA6000

Fibre Channel storage solution with industry-leading storage area network (SAN) support in easy to configure building blocks. FC switched fabric and arbitrated loop (FC-AL) support; provides data protection, high availability, exceptional performance, and multi-vendor platform support for the most demanding storage requirements.

MA6000 Models

MA6000 D14

- 1 Controller enclosure
- 1 HSG60 controller
- 1 Dual Bus 14 bay drive enclosure

MA6000 S14

- 1 Controller enclosure
- 1 HSG60 controller
- 2 Single Bus 14 bay drive enclosures

See the options section for FC hubs, FC switches, platform software, host adapters, and disk options for complete solutions.

*StorageWorks*TM Modular Array 6000

MA6000 is the entry-level member of the family of fully integrated Fibre Channel storage solutions that support the latest *StorageWorks* modular enclosure architecture. It is the outgrowth of years of *StorageWorks* experience, successfully delivering quality solutions into applications with mission-critical requirements.

MA6000 maintains the support of the HSG60 controller and associated features and adds the benefits of universal drive support, higher density of drives per enclosure, flexible configurations and higher capacity per cabinet.

Fibre Channel Technology

MA6000 takes advantage of the benefits of Fibre Channel in distance, performance and connectivity. The use of optical fibre cabling allows distances between connected segments to be up to 500 meters using short wave multi-mode cable, and up to 10 kilometers when using long wave cable. The rated speed is 100 MB per second on each FC path. MA6000 storage area networks (SANs) can be constructed using 8 or 16 port switches for fabric connectivity and 7 or 12 port hubs for arbitrated loop (FC-AL) connectivity.

MA6000 Product Packaging

MA6000 solutions are built with the *StorageWorks* modular enclosure packaging. The packaging consists of a RAID controller enclosure (Compaq *StorageWorks* Enclosure Model 2100) and the 14 bay drive enclosures (Compaq *StorageWorks* Enclosure Model 4200 and 4300). The controller and drive enclosures are independent of each other to allow for a wide range of configuration options. The MA6000 models were designed to address medium capacity needs as well as high performance options. The models are available in Compaq Modular Storage Cabinets based on Series 9000 opal or top gun blue RETMA cabinets.

Multi-Vendor Platform Support

Support for industry-leading platforms including: Tru 64TM UNIX; Windows 2000; Windows NT *ProLiant* & x86; Novell Netware; Compaq Open VMS; Sun Solaris, HP-UX; SGI-IRIX; IBM AIX; Linux *ProLiant* & x86; Linux Alpha; visit <http://www.compaq.com/products/StorageWorks> for the latest platform support information and Operating System platform connection kit availability.

High Availability

All MA6000 models provide redundant cooling, N+1 power redundancy and environmental monitoring. Drives and most solution components are hot swappable. Each solution can be configured with dual controllers that can operate in dual redundant mode. Each controller has a pair of FC host ports. In the event of a path failure the controllers can automatically failover to the remaining path.

No Single Point-Of-Failure

The MA6000 FC redundant architecture eliminates single points-of-failure from server to storage in clustered or single server configurations. For additional protection, Dual Host Bus Adapter (HBA) failover software is available on many platforms.

Clustered Server and High Availability System Support

Dual and multi-node cluster support for host level fault tolerance and high system availability. Microsoft Cluster Server (MSCS) support for Windows NT platforms, Tru Clusters support on Tru64 UNIX, OpenVMS clusters. Multi-vendor HA support with HACMP, Veritas FirstWatch, and MC ServiceGuard. Visit <http://www.compaq.com/products/StorageWorks> for additional support information.

Multi-Server Shared Support for storage consolidation

Heterogeneous and homogeneous host support provides the ability to share storage between multiple servers. The MA6000 provides storage access control assuring that a host cannot access data intended for exclusive access by other hosts.

Fibre Channel Loop & Switch Support

Support for 8 and 16 port fibre channel switches allows the full benefits of a storage area network (SAN), providing exceptional connectivity while increasing the effective bandwidth of the network. Supported SAN features include zoning for communication isolation, switch to switch segments up to 10KM, and FC-AL connections into Brocade QuickLoop port handling.

Fault Tolerance

Redundant power supplies, fans, controllers, cache battery backup, hot global spare drives and a multi-level RAID architecture (0, 1, 3/5, 0+1) ensure fault tolerance against system outages and data loss.

Scalability

Each drive enclosure in the MA6000 holds up to 14 (9, 18, or 36 GB) 1" Ultra2 or Ultra 3 SCSI drives. The highest capacity pre-configured MA6000 model features 2 drive enclosures allowing for up to a maximum of 28 drives in one cabinet. (**Note:** Current ACS 8.5L supports only 12 drives per enclosure - ACS v8.6 will support all 14 drives.)

Performance

Fibre Channel host connections provide up to 100 MB/s bandwidth for each path. Each controller has 2 FC host ports or 4 ports in a dual redundant pair of controllers, assuring the availability of bandwidth for the most stringent applications. In addition, up to 1 GB of cache per controller pair ensures high performance. Mirrored cache write capability maintains optimal performance while assuring data integrity in the event of a failure.

Bandwidth

The MA6000 has two fibre channel ports per storage controller or redundant controller pair. Each controller-to-host interface provides up to 100 MB/sec of data throughput for 200 MB/sec available capacity in each controller.

Hot Pluggable Drives

Hot Pluggable SCSI backplane allows drives to be added and removed without powering down the system.

Manageability

StorageWorks Command Console (SWCC) provides a graphical user interface (GUI) to setup/configure, monitor, and troubleshoot storage subsystems.

Servers - Single and clustered systems

- *ProLiant* Servers
- Alpha Servers
- Multi-vendor SUN, HP platforms and X86 servers.

Check <http://www.compaq.com/products/StorageWorks> for up to date platform information for *ProLiant*, multi-vendor and specific operating system version support.

MA6000 MODELS

MA6000 Model D14	187738-B21
MA6000 Model S14	187739-B21

OPTIONS

Model 2100 Controller Enclosure	187741-B21
HSG60 Controller w/256-MB cache	174134-B21
256MB Cache Upgrade	380674-B21
Cache Battery	135823-B21
I/O Module Upgrade Kit, 4 Modules	187740-B21
Model 4214R Single Bus, Single Power	103381-001
Model 4254 Dual Bus, Dual Power	138151-001
Ultra2 Dual Bus I/O Module	119829-B21
4200 Power Supply	119826-B21
Model 4200 Dual Bus I/O	119829-B21
Model 4314R Single Bus, Single Power	190209-001
Model 4354R Dual Bus, Dual Power	190211-001
Ultra3 Single Bus I/O Module	190212-B21
Ultra3 Dual Bus I/O Module	190213-B21

Controller Software

ACS V8.5L Controller FC-AL/FC-SW software. (EVM- Cloning only)	180319-B21
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OPTIONS *(continued)*

OS Software/Platform Kits

Tru64	192211-B21
Sun Solaris	192212-B21
IBM AIX	192213-B21
Windows NT for <i>ProLiant</i> X86	192214-B21
SGI IRIX	192215-B21
HP-IX RISC	192216-B21
Open VMS	192217-B21
Novell Netware	192218-B21
Linux Alpha	196351-B21
Linux <i>ProLiant</i> & x86	196352-B21

Visit www.compaq.com for availability.

Optional Software

Secure Path V3.0 multi-path for NT	165989-B21
Secure Path V2.0 for Sun (Switch & Loop)	165991-B21
Enterprise Volume Manager for NT	160094-B21

Host Bus Adapters

PCI 64/FC HBA for WinNT, Win2000	176479-B21
PCI 64/FC HBA for Tru64,OVMS	168794-B21
PCI/FC LC HBA for Novell	120186-B21/291
SBUS 64/FC HBA for Sun	123503-001
PCI 32/FC HBA for Sun	380576-001
PCI/FC HBA for IBM	149841-B21

Supported HBAs

FC PCI HBA for NT, 2K, Tru64,OVMS	380574-001
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Fibre Channel Switches

Fibre Channel SAN Switch, 16 port	158223-B21
Fibre Channel SAN Switch, 8 port	158222-B21
FC SAN Switch Redundant Power option	160407-B21

Fibre Channel Hubs

Fibre Channel Hub 12 (includes universal mounting for 41U/42U cabinets)	295573-B22
Fibre Channel Hub 7	234453-001 Domestic 234453-B31 Intl 234453-291 Japan
Hub 7 Mounting Kit	242795-B22

GBICS for Hubs/Switches

FC Short wave GBIC	380561-B21
FC Long Wave GBIC	127508-B21
FC Connection Kit 3 SW GBICS, 2 Cables	380579-B21
FC Connection Kit 2 SW GBICS, 2 Cables	380596-B21

Fibre Channel Cables

FC Short Wave 2-Meter Cable	234457-B21
FC Short Wave 5-Meter Cable	234457-B22
FC Short Wave 15-Meter Cable	234457-B23
FC Short Wave 30-Meter Cable	234457-B24
FC Short Wave 50-Meter Cable	234457-B25

OPTIONS *(continued)*

StorageWorks Drives

36.4-GB Ultra3 SCSI 10K rpm 1" drive	176496-B22
18.2-GB Ultra3 SCSI 15K rpm 1" drive	188122-B22
18.2-GB Ultra3 SCSI 10K rpm 1" drive	142673-B22
9.1-GB Ultra3 SCSI 15K rpm 1" drive	188120-B22
9.1-GB Ultra3 SCSI 10K rpm 1" drive	142671-B22

Legacy Drives Supported

18.2-GB Ultra2 SCSI 10K rpm 1" drive	128418-B22
18.2-GB Ultra2 SCSI 7.2K rpm 1" drive	388144-B22
9.1GB Ultra2 SCSI 10K rpm 1" drive	328939-B22
9.1GB Ultra2 SCSI 7.2K rpm 1" drive	123065-B22

MA6000 Cabinets

42U Modular Storage Cab (opal) 60Hz	180311-B21
42U Modular Storage Cab (opal) 50Hz	180312-B22
36U Modular Storage Cab (opal) 60Hz	180313-B21
36U Modular Storage Cab (opal) 50Hz	180314-B22
22U Modular Storage Cab (opal) 60Hz	180315-B21
22U Modular Storage Cab (opal) 50Hz	180316-B22
41U Modular Storage Cab (blue) 60Hz	180317-B21
41U Modular Storage Cab (blue) 50Hz	180318-B22

OPTIONAL SERVICES AND SUPPORT AVAILABLE

Software Product Services (recommended for all installations)

- Telephone support
- New version update services, including license and media/documentation subscription services

Hardware Product Services

- Installation services
- On-site Maintenance (includes warranty support)
- Response time upgrades during the warranty period
- Post-warranty coverage
- RAID setup and performance consulting via statement of work

Note: Certain restrictions and exclusions apply. Consult the Compaq Customer Support Center for details.

SPECIFICATIONS

Model	MA6000
Controller Model	HSG60
Controller Cache	256 MB per controller standard, 512 MB optional
Battery Backup for Cache	YES
Array Controller Software (ACS)	FC-AL /SW support ACS V8.5L
Host Interface	Arbitrated Loop (FC-AL) or Fibre Channel Switched Fabric
Host Ports per Controller	2, Multi-bus with Transparent Failover
Drive Interface	SE Ultra-wide SCSI, 6 channels
RAID Levels	0, 1, 0+1, 3/5 and Partitioning
Max. Disks Supported	24 per Controller Pair
Non-RAID JBOD Support	YES
Fibre Channel Switches	16 Port Optical, 8 Port Optical
Fibre Channel Hubs	7 Port Optical, 12 Port Optical
Disks	Compaq Universal Drives

SPECIFICATIONS *(continued)*

O/S Support	Tru 64 Unix V4.0F, V4.0G; NT 4.0 WIN2000; SUN Solaris V2.6 Solaris 7; Novell NetWare V4.2, V5.0; Open VMS V 7.2, V7.2-1; HP UX V10.2, V11.0;
Sustained I/O Rate	Over 20K IOPS per Controller Pair
Redundant Fans	YES. N+1
Environmental Monitoring Unit	Yes. Monitors Power and Temperature
Regulatory approvals	UL, CSA, TUV, FCC, CE MARK, CTICK, BCIQ
Management Software	<i>StorageWorks</i> Command Console (SWCC)

PHYSICAL SPECIFICATIONS

Power requirements (Domestic/Japan)		
AC plug type	Domestic – 3 wire NEMA No. L6-30(208-240V 60Hz 30A) Japan – 3 Wire, 2 Pole IEC 309 (202-210V 50/60Hz 32A) Europe – 3 wire, 2 pole IEC 309 (220-240V 50Hz 32A)	
Number of phases	Single	
Rated current	30A Domestic, 32A Europe/Japan	
BTU rating	5,113 per hour	
Nominal airflow	400 cubic ft/minute	
Wattage	1,800 Watts maximum (input)	
Operating environment		
Temperature	50° to 95°F/10° to 35°C – Reduce rating by 1°F for each 1000 ft altitude (1.8°C/1,000 m)	
Humidity	10% to 90% at maximum wet bulb temp of 90°F/32°C and minimum dew point of 36°F/2°C	
Altitude	Up to 8,000 ft /2,400 m	
Air Quality	Not to exceed 500,000 particles per cubic foot of air at a size of 0.5 micron or larger	
Regulatory approvals	UL, CSA, TUV, FCC, CE MARK, C TICK, BCIQ	
Physical dimensions MA6000 D14		
	Unpacked	Shipping
Height	12.25 inches/311 mm	35 inches/889 mm
Width	19 inches/483 mm	48 inches/1219 mm
Depth	23 inches/584 mm	32 inches/813 mm
Weight (maximum)	106.4 lbs/48 kg	216.3 lbs/98 kg
Required Front Clearance	21.3 inches/542 mm	
Required Rear Clearance	22.8 inches/580 mm	
Physical dimensions MA6000 S14		
	Unpacked	Shipping
Height	17.5 inches/444 mm	35 inches/889 mm
Width	19 inches/483 mm	48 inches/1219 mm
Depth	23 inches/584 mm	32 inches/813 mm
Weight (maximum)	151.4 lbs/69 kg	312.3 lbs/142 kg
Required Front Clearance	21.3 inches/542 mm	
Required Rear Clearance	22.8 inches/580 mm	