



**hp
surestore e
disk array
XP512**

**version 2.07
configuration and
ordering guide**

october 1, 2000

hp restricted

HP SureStore E Disk Array XP512

Overview

This document provides an overview of the basic configurations as well as sales ordering information for the HP SureStore E Disk Array XP512 enterprise storage solution.

The new unparalleled Hewlett-Packard SureStore E Disk Array XP512 provides high-capacity, high-speed Enterprise Level storage with continuous data availability, heterogeneous systems support, and ease of serviceability, scalability, and connectivity. It can be attached to multiple open systems servers as well as to mainframes, meeting customer needs for a wide range of configurations up to a maximum raw capacity of 37 TB with 73 GB disk drives.

This exciting new storage solution consists of the following major components:

XP512 Hardware:

DKC Controller Cabinet—contains control panel, service processor (SVP), cache modules, shared memory modules, crossbar switch, Client-Host Interface Processors (CHIPs) and Array Control Processors (ACPs).
DKU—contains the disk drives. XP512 system may have one DKU cabinet up to a maximum of six DKU disk cabinets.

XP512 Software

Continuous Access XP (includes RAID Manager)
Continuous Access XP Extension
Business Copy XP (includes RAID Manager)
Secure Manager XP
Cache LUN XP
Performance Manager XP
Command View XP
LUN Configuration XP
Resource Manager XP
Data Exchange XP
Auto Path XP
Auto LUN XP

Support and Services:

Hardware Support
Software Support

Hardware

Hardware Components

Figure 4.7.8 shows the layout of the cabinets or frames comprising the subsystem. A minimum capacity system includes only one DKC and one DKU, while a maximum capacity system includes one DKC and six DKUs. The central frame or DKC contains the Array Control Processors (ACPs), redundant power, cache memory, shared memory, and Client Host Interface Processors (CHIPs). The DKUs contain the disk drives and redundant power.

Figure 4.7.8 XP512 Cabinet/Frame Configuration

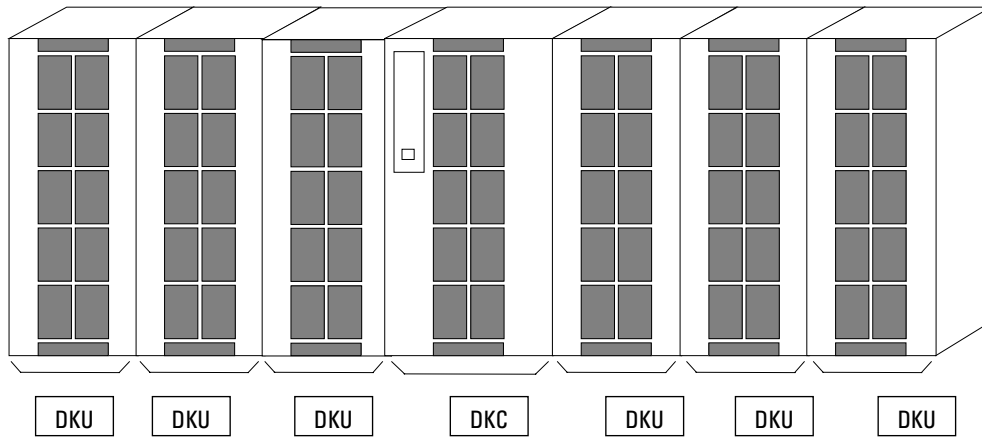
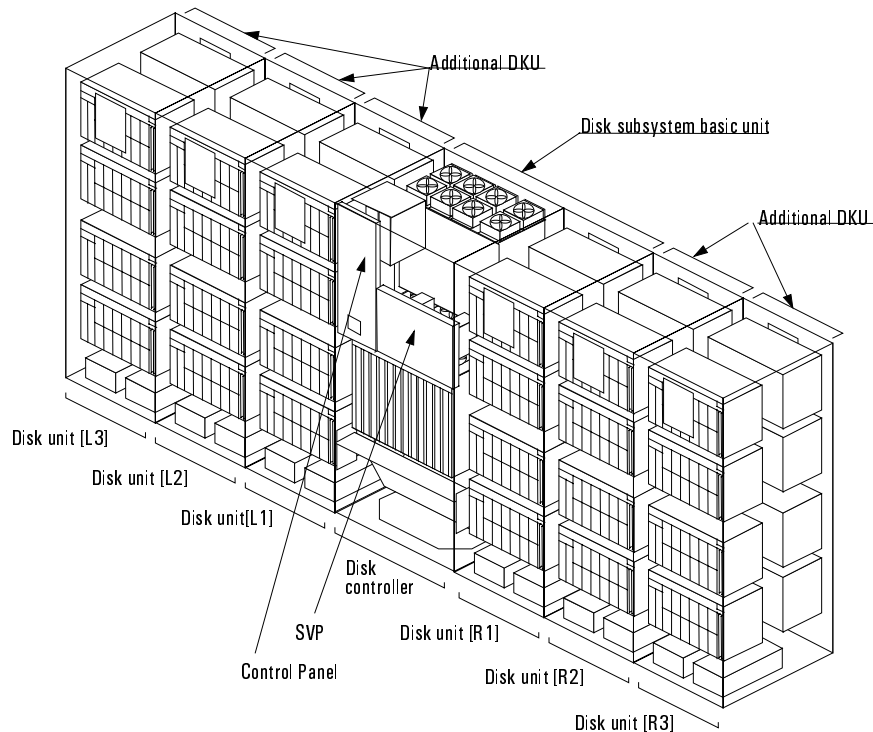


Figure 4.7.9 show a more detailed view of the SureStore E Disk Array XP512.

Figure 4.7.9 XP512 Detailed View



Controller Frame (DKC)

The Controller Frame (DKC) features the following:

Fully redundant components, with no single points of failure

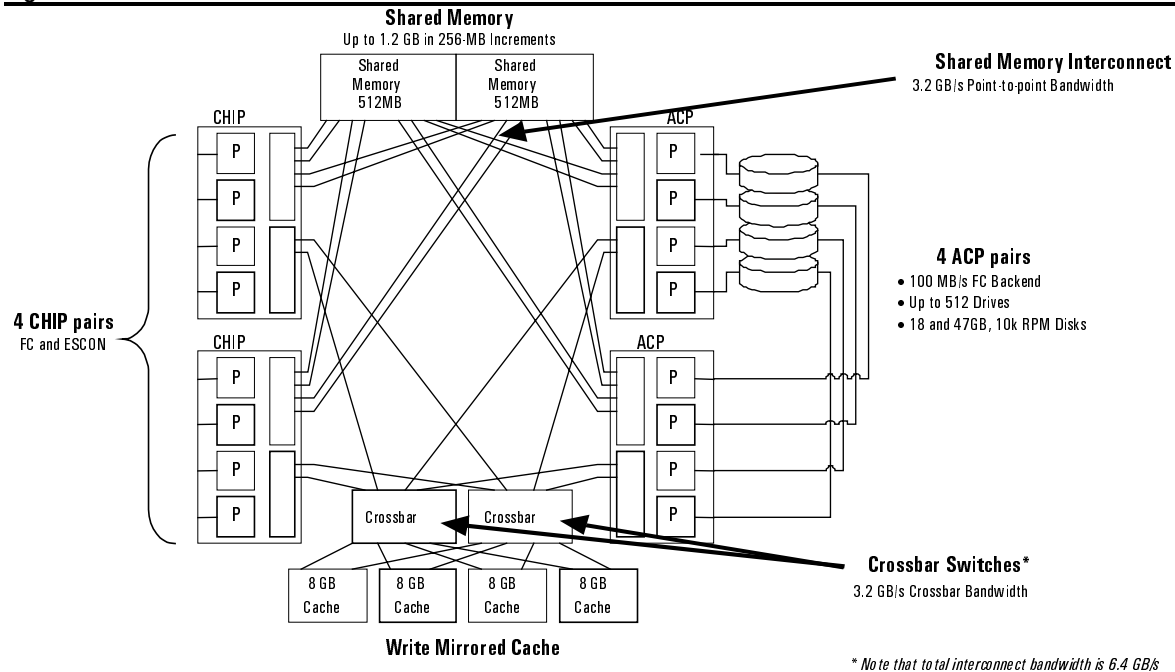
Dynamically-duplexed cache with battery backup—cache is expandable from 2 GB up to 32 GB total capacity in 2-GB increments.

Crossbar switch—fast, efficient, switching with direct point-to-point connections at 6.4 GB/sec.

Shared memory—stores command and control data so that the entire amount of cache memory is available for quick access to user data. Shared memory is expandable from 512 MB to 1.2 GB in 256-MB increments.

Power redundancy—single-phase or three-phase 50 or 60 Hz.

Figure 4.7.10 XP512 Architecture Overview



Client Host Interface Processors (CHIPs)

CHIPs are available in pairs with a minimum of one pair up to a maximum of four pairs of fully mixable CHIPs per XP512 system. Here are the available CHIP pairs:

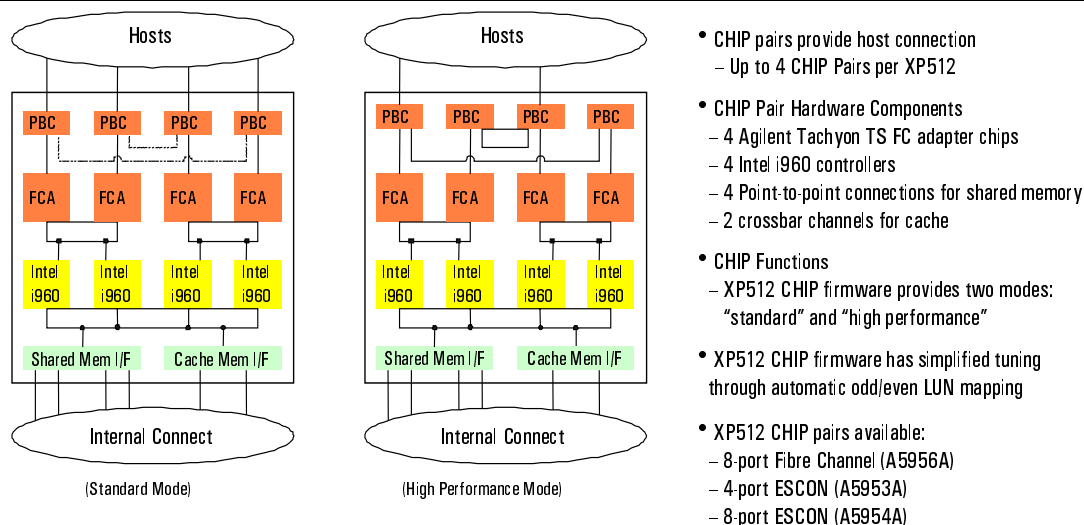
8-port Fibre Channel adapter pair

4-port and 8-port ExSA—Extended serial interface (ESCON compatible) adapter pair.

Notes:

- ESCON CHIP pairs must be used to interconnect two arrays in conjunction with Continuous Access XP for remote mirroring solutions.
- The XP512 does not offer native SCSI CHIP pairs. For SCSI connectivity, the A5814A router must be used to convert SCSI host protocol to FC. This router is supported in non-HA configurations for HP-UX, MPE/iX, and NT, point-to-point connections only.

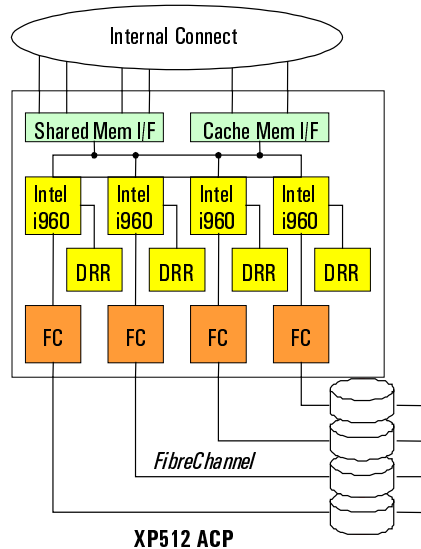
Figure 4.7.11



Array Control Processors (ACPs)

Array Control Processors (ACPs) are configured in pairs for redundancy, up to a maximum of four pairs per system. The exact number of ACP pairs chosen depends on the number and frame location of the disk drive configuration. The quantity may also be influenced by workload performance characteristics. Each ACP pair controls a single disk domain.

Figure 4.7.12



- Connect the disk drives to the DKC
 - Up to 4 ACP Pairs per XP512 Array
 - Up to 128 100 MB/s FibreChannel disks
 - 8 FC-AL loops per ACP pair (4 per card)
 - Uses Agilent Tachyon -TL FibreChannel Interface chips
- ACP Hardware Components:
 - 4 Intel i960 controllers
 - 4 Data Recovery and Restore (DPR) Parity Generator chips (RAID5 parity)
 - 4 Point-to-point connections for Shared Memory
 - 2 Crossbar channels for Cache
- ACP Functions:
 - Read/Write Control to Disks
 - Read Miss/Write Staging from Cache
 - Media Protection (disk scrubbing, Dynamic Spares, Dynamic Data rebuild)
 - Mirroring Control (RAID 0/1)
 - Hardware RAID5 parity generation
- HP Product Number: A5964A

Dynamic sparing disk details:

Minimum of one recommended for each capacity disk drive used in the array

Maximum of 16 spares are configurable (8 “dedicated”, 8 that require trade-off with data)

Any spare of “like capacity” can backup any other disk of the same capacity anywhere in the array

Dynamic sparing/rebuild causes no disruption in host I/O processing

Dynamic sparing is controlled by CAP firmware

Cache Memory

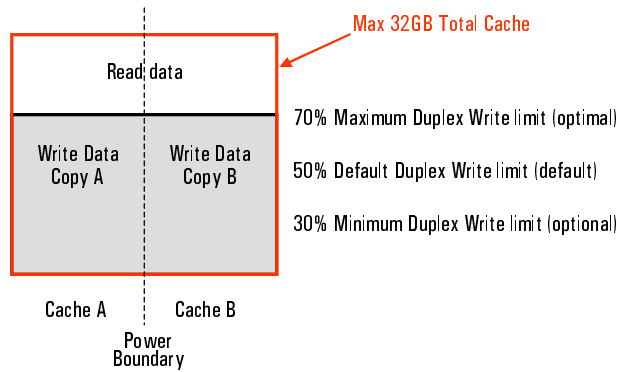
The XP512 base product comes standard with 2 GB of cache and is expandable up to 32 GB in increments of 2 GB. All cache is backed up by a fully redundant 48-hour battery (two 48-hour batteries for a total of 96 hours of backup).

Dynamic Duplex Cache is an area of cache set aside for “write” data. All data written to the cache is written to the Dynamic Duplex Cache and is duplicated across power boundaries. The write cache percentage may be modified manually or can be adjusted dynamically by the XP512.

2-GB XP512 Cache Increments (A5962A)

Note: Cache memory protection during powerfail—for HP-UX systems with a UPS, cache memory can be written to disk upon powerfail. Refer to the following URL for more details:
http://esbu.boi.hp.com/esbuatc/hw_prods/xp256/xp256.htm

Figure 4.7.13



Cache Expansion Platform Board (A5960A)

This board is required if more than 16 GB of cache is configured.

For all light workloads including OLTP, this board is not required.

This board is however, recommended for heavy sequential workloads >500 MB/s (data warehousing, decision support, supercomputer computations). For these workloads, a minimum cache size of 8 GB populated across all four cache boards is recommended.

Shared Memory—256-MB Shared Memory Module (A5963A)

Shared memory is independent of the cache memory and is used to store tables, side files, and other information overhead, thus freeing up the cache memory for user data. It is also used to store system configuration mapping of system components, LUN maps, cache pointers, hit rates, and RAID levels.

The base XP512 configuration contains 512 MB of shared memory and is expandable to a maximum of 1.28 GB of shared memory in increments of 256 MB.

Table 4.7.22 is intended as a guideline for configuration of cache and shared memory for the XP512. It assumes Open 8 or Open 9 emulation.

Table 4.7.22 XP512 Cache and Shared Memory Configuration Table

Recommended Cache Size (GB)	Usable Capacity	Number of Array Groups								Recommended Shared Memory Size (MB)
		RAID-1				RAID-5				
		18 GB	47 GB	73 GB	Raw Capacity	18 GB	47 GB	73 GB	Raw Capacity	
2	Up to 500 GB	1-16	1-6	1-4	Up to 1 TB	1-11	1-4	1-3	Up to 750 GB	512
4	500-800 GB	17-27	7-10	5-6	1-1.7 TB	12-17	5-6	4	750 GB-1.1 TB	512
6	800 GB-1.3 TB	28-38	11-15	7-10	1.7-2.8 TB	18-25	7-9	5-6	1.2-1.7 TB	512
8	1.3-7.4 TB	39-126	16-82	11-53	2.8-15.4 TB	26-126	10-53	7-35	1.7-10 TB	768
10	7.4 TB-max.	—	83-126	54-126	15.4-36.7 TB	—	54-126	36-126	10-36.7 TB	1,024

Note: Applications requiring > 500 MB/s throughput should configure the cache expander option and at least 8 GB of cache storage.

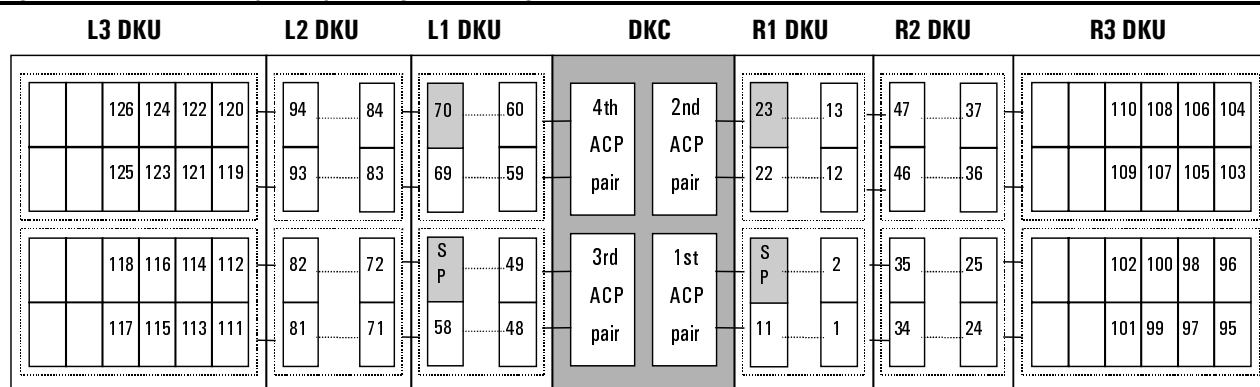
Note: Applications that make heavy use of the cache should use 1.5 times that amount of cache recommended above. This will increase the shared memory requirement and should be done in consultation with a suitable trained Back Office engineer (who has complete tables).

Note: Very large Oracle instances may require additional cache to absorb a synchronization fully without stalling. This is a very advanced topic in which HP Consulting or equivalent expertise should be engaged. Alternatively, install the recommended cache and then use Performance Manager to measure array performance in the real application adding cache until Performance Manager shows it is not the limited factor. Again, increasing cache size may require increased shared memory; a suitable trained person MUST be engaged.

XP512 System Layout (DKC and DKUs)

Each system can accommodate a minimum of one up to a maximum of six DKU frames. The maximum configuration contains 126 disk groups. R1 and L1 can accommodate 23 disk groups with 1 group for spares. R2 and L2 can accommodate 24 array groups. R3 and L3 can accommodate 16 array groups.

Figure:4.7.14 XP512 Array Group Configuration Diagram



The array group numbers do not represent loading sequences.

Disk Drives

Table 4.7.23 summarizes the specifications of the disk drives supported by the HP SureStore E Disk Array XP512. All disks are dual ported with fibre channel interface.

Table 4.7.23 XP512 Disk Drive Specifications

Disk Drives Specs	18 GB	47 GB	73 GB
Raw capacity	18.4 GB	47.2 GB	72.9 GB
Disk diameter	3 inches	3 inches	3 inches
Rotation speed	10,025 rpm	10,025 rpm	10,025 rpm
Mean latency time	3.0 ms	3.0 ms	3.0 ms
Mean seek time	5.2-6.0 ms	5.7-6.5 ms	5.7-6.5 ms
Internal data transfer rate	30-46 MB/sec	30-46 MB/sec	30-46 MB/sec
Interface type	Dual-Ported Fibre Channel	Dual-Ported Fibre Channel	Dual-Ported Fibre Channel
Group of four disks	A5966A	A5967A	A5968A

Disk Drive Emulation Types

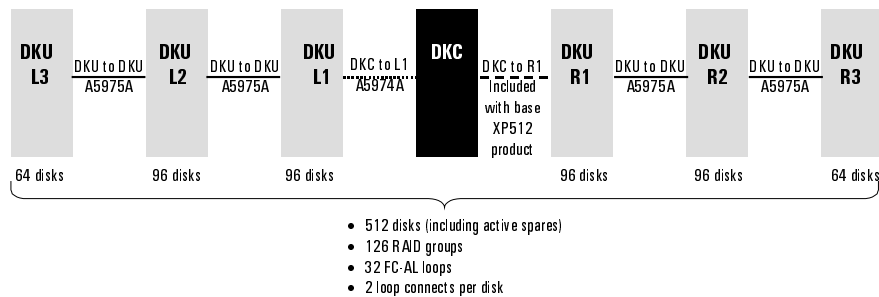
Table 4.7.24 XP512 Disk Drive Emulation Types

	18 GB			47 GB		
	Open 3	Open 8	Open 9	Open 3	Open 8	Open 9
RAID 5	22	7	7	57	19	19
RAID 0/1	14	5	4	38	12	12

Factory Defaults

- 1) RAID 5 default factory configuration.
- 2) "Open 8" emulation for RAID 0/1 provides 5 LDEVs versus 4 LDEVs with "Open 9".
- 3) Array Group Factory Defaults with RAID 5:
 - 18 GB Open 3: 22 LDEV per array group
 - 47 GB Open 9: 19 LDEV per array group

Figure 4.7.15 XP512 DKU Disk Cabinet Capacities and Interconnect Cables



AC Power Options

Single-phase and three-phase AC power options are available for the XP512. Power options must be specified for the DKC and DKU. This table summarizes the product number options related to power.

Cannot order mixed power options within a single XP512 system.

	Three-phase AC		Single-phase AC	
	60 Hz	50 Hz	60 Hz	50 Hz
DKC	A5951A	A5951A	A5951A Option 001	A5951A Option 002
DKU	A5965A Option 001	A5965A Option 002	A5965A Option 003	A5965A Option 004

XP512 Uninterruptible Power Supply (UPS) Recommendations

See the following URL for a white paper describing UPS recommendations for the XP512:
http://esbu.boi.hp.com/esbuatc/hw_prods/xp256/xp256.htm

XP512 Configuration Rules

One RAID level per ACP (RAID 1/0 or 5)
Up to 126, 4-disk array groups (18, 47, 73 GB)
1- to 4-channel host interface processor
8-port Fibre Channel
4- or 8-channel ESCON
1-16 dynamic spares
126 array groups available (with 8 spares)
124 array groups (with 16 spares)
Cache expansion
Required for >16 GB cache
Very large configuration only!
Cache—2 GB standard in base configuration expandable in 2-TB increments to 32 GB
Shared memory—512 MB standard in base configuration, expandable in 256-GB increments to 1.2 GB

Disk Drive Intermix Rules

Cannot mix emulation types within an array group
Cannot mix disk drive sizes within an array group
Cannot mix RAID levels on a single ACP pair

XP512 LDEV Creation

Determine usable disk and performance requirements for the XP512 array, then:
Select physical disk size: 18, 47, 73 GB
Select RAID level: RAID 0/1 or 5
Assign emulation types: Open 3, 8, 9
Assign LDEVs to open volumes
Assign LUNs to LDEVs

ESCON Director/Extenders and Converters

Introduction

Continuous Access XP and XP Extension are software products that enable remote mirroring XP array solutions. These solutions involve a primary XP and a secondary XP located some distance away from the primary site. A distance connection is required to connect the two XPs to allow for the remote mirroring process.

ESCON CHIP pairs (4-port/A5953A and 8-port/A5954A) provide the XP512 with the distance connection interface. Multiple links between ports on the primary and secondary XP systems comprise the distance connection. Each port (on both the primary and secondary system) is configured as either a listening/ receiving or talking/ transmitting port (in most cases there should be an equal number of listening and talking ports on each XP). A maximum of 16 ESCON links is possible.

Solution requirements for I/O response time, currency of the remotely mirrored data, and the distance between the remote and secondary XPs dictate the bandwidth requirements for the connection. The more links configured the greater the total bandwidth available for the remote mirroring process.

With the release of the XP512, mirroring solutions with a mixture of XP256 and XP512 arrays are conceivable. Though these configurations are fully supported, they are subject to the particular limitations of the arrays being employed arising from capability differences of the two platforms (i.e. Volume Pair and Command Unit count limitations). Please see the Continuous Access White Paper for more information.

Distance Connection Configurations

Due to limitations of the ESCON protocol, a Primary and a secondary XP can be a maximum of 3 km apart if connected to each other via ESCON without the use of extenders. Achieving a connection beyond 3 km can be accomplished for a pure ESCON link using Extenders/Directors and for an ESCON to WAN links using Converters.

ESCON only (Dark Fiber)

Some remote mirroring solutions involve relatively short distances between primary and secondary XP systems. For these solutions, an ESCON only connection may be possible. In this case, directors and/or extenders are employed. The following conditions apply:

43 km maximum total distance between XP systems

20 km maximum distance between directors and between directors and repeaters

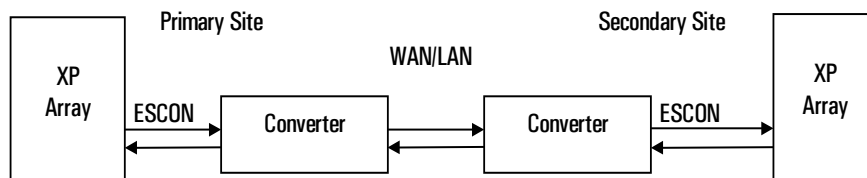
Maximum 2 directors in the link

For ESCON only configurations, ESCON directors/repeaters from any can be used with the XP/Continuous Access XP, as long as the link is entirely ESCON.

ESCON to WAN/LAN

Some solutions require connection over distances greater than 43 km, or do not allow for a Dark Fiber implementation (i.e. right-of-way issues). In these cases, ESCON to WAN/LAN converters are required to convert the ESCON protocol coming out of each XP to be able to travel back and forth over some kind of Wide Area Network (See **Figure 4.7.16.**).

Figure 4.7.16 Distance connections using ESCON to WAN/LAN Converters



Supported WAN/LAN Protocols

T-x and ATM are supported with Continuous Access XP over Converters. Note that T-1 is supported but is more often than not inappropriate for most solutions since it does not provide sufficient bandwidth. For ESCON to WAN connections there are no total distance limitations, though practical limitations may be imposed by solution requirements.

Wave Division Multiplexing (WDM/DWDM) Support

WDM/DWDM is fully supported with the XP in Continuous Access XP solutions. . Continuous Access XP over WDM/DWDM from any vendor is compatible with the XP Family of Arrays over the distance supported by the vendor. However, to ensure that remote link latencies are always less than 25 ms (the point at which volume pairs begin to experience the impact of link 'timeouts') HP recommends a maximum of 50 km total remote link distance between arrays. Also, for Continuous Access/MetroCluster solutions the remote link distance cannot exceed 50 km in order to comply with MetroCluster distance requirements for Node network connections (i.e. FDDI).

Converters That May Be Used with Continuous Access XP/XP Extension

Currently, specific CNT and Inrange Converters are certified for use with the XP/Continuous Access XP and XP Extension (asynchronous copy mode). Testing of these products with Continuous Access XP has been completed by Hitachi and HP.

Here is a summary of the CNT and InRange products that may currently be used with Continuous Access XP/XP Extension.

Converter	Continuous Access XP (Sync copy mode) support?	Continuous Access XP Extension (Async copy mode) support?
CNT CX500	Yes	Yes
CNT Ultraset	Yes	Yes
InRange 9801	Yes (less than 31 miles)	Yes (less than 100 miles)

ESCON to WAN/LAN Converters with Continuous Access XP/XP Extension

Both the CNT and InRange products are custom configurable to provide various WAN/LAN protocol support over a varying number of links. Requirements for bandwidth, in turn driven by solution requirements for distance and I/O response time and remote copy data currency, determine the number of links and the protocol required.

Hewlett Packard will continue to certify the XP family with new Converter products as they become available.

Important: *Until a formal Complementary Products process has been established for CNT and InRange Converters, please consult with your local CNT/InRange representative for a comprehensive pre-sales customer assessment and configuration recommendation and to make arrangements for the appropriate level of post-sales support.*

Metro Cluster support with ESCON Extenders and ESCON to WAN Converters

ESCON to WAN/LAN converters are not supported in HA/Remote Mirroring solutions employing the XP/Continuous Access XP along with MetroClusters. Only ESCON Extenders are supported in these configurations.

Operating System Support with ESCON Extenders and ESCON to WAN Converters

Since Extender and Converter technologies are OS independent there are no Operating System limitations when using them per se. However, OS limitations related to use of Continuous Access XP/XP Extension practically limit options for the total solution. Please refer to the Software Descriptions of this document for OS support for Continuous Access XP/XP Extension.

ESCON to WAN Converter References

CNT Website: <http://www.cnt.com/index2.htm>: More information on CNT Converter products

InRange Website: <http://www.inrange.com/>: More information on InRange Converter products

White paper: Employing XP256 Continuous Access Mirrors: Detailed discussion of Continuous Access Solutions, including performance data and information on ESCON Converters. User name and Password are required to access this white paper.

Access to this and other XP family technical documents is allowed on an as needed basis only. To gain access to this White Paper, go to the main XP256 Solutions Resources Website (<http://amsterdam.rose.hp.com/>) and request Access Authorization along with justification via XPSL link. Once Access Authorization has been issued, go to the Technical Materials/White Papers site (<http://amsterdam.rose.hp.com/WhitePapers/index.htm>) and access the white paper via the White paper: Employing XP256 Continuous Access Mirrors link.

Software

Software Descriptions

The following are brief descriptions of the software products available with the XP512:

Command View XP—B9357A

Command View XP is a web-based management platform for the HP SureStore E Disk Array XP family of products. Command View features a simple, web-browser based interface that provides quick access for you to view the status and health of your XP resources, configures and manages LUNs, analyzes I/O performance, migrates volumes and establishes LUN security.

Included with Command View XP is the windows-based application formerly known as Remote Control XP.

The XP512 must have the following firmware versions:

DKC Revision: 01-10-97-00/2

SVP Revision: 01-10-36/00

The following applications are integrated into the Command View XP interface: LUN Configuration Manager XP, Cache LUN XP and Secure Manager XP. All other applications are managed via Remote Control.

Command View XP installs a web server and Java applets and requires a dedicated PC for the web server and the management console. In the interim, this PC will also act as the Remote Control console that connects to both the private and public LANs. A single PC can manage sixteen (16) arrays.

Hewlett-Packard recommends the following HP Visualize Workstation as the dedicated PC. However, customers have the option of purchasing their own PC solution.

A5015A—HP Visualize P Class Personal Workstation

A6012A—PIII Enhanced 600 MHz CPU

A5028A—128-MB DIMM for P and X class systems (Qty 2)

A1270A—13-GB IDE disk

A5988A—48X CD ROM drive

A1290A—Elsa Synergy II AGP graphics card

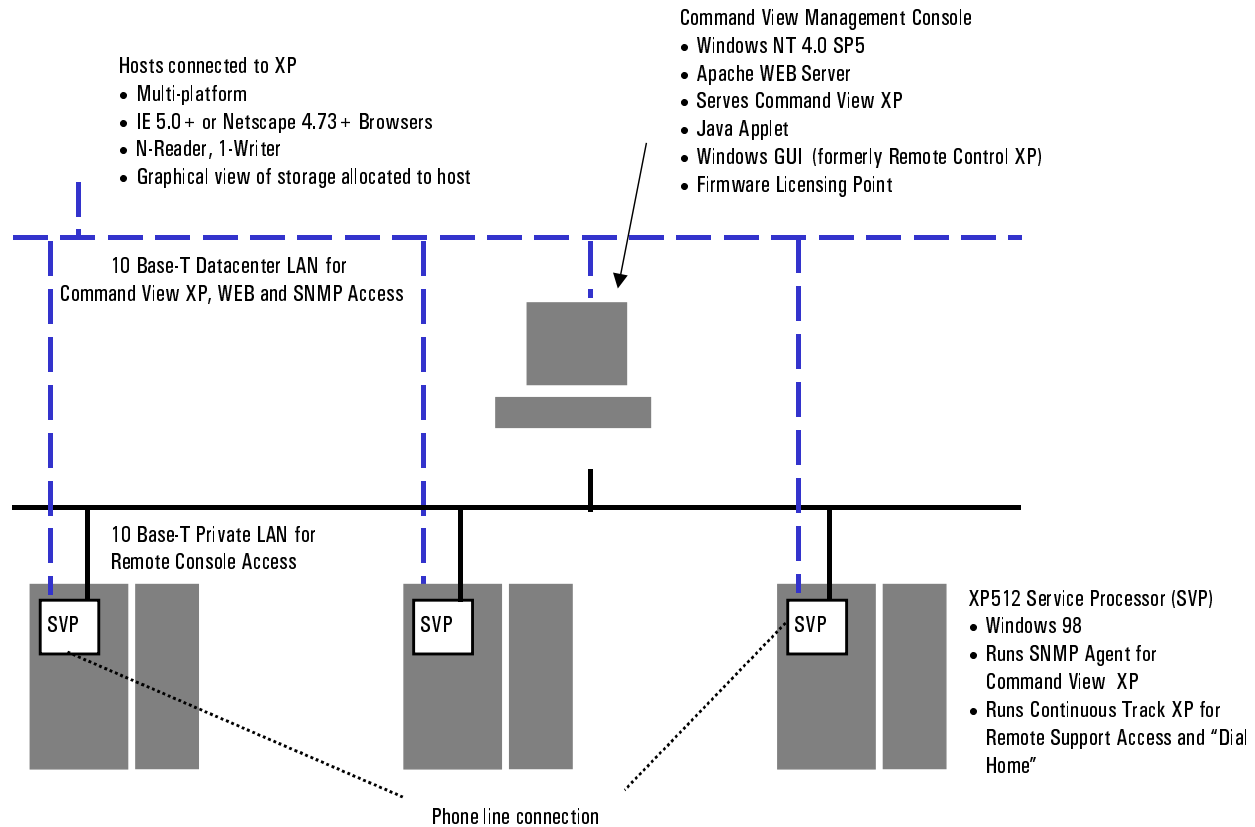
Microsoft Windows NT 4.0 SP5 (Workstation or Server)

Note: Only Microsoft Windows NT 4.0 SP5 is supported on the management station (Remote Control PC).

Included with Command View XP is a 60-day trial evaluation of the four supported applications. The 60-day trial evaluation is initialized via a special software key. A Software Enablement Certificate is provided in the Command View box. The customer needs to fill this Enablement Certificate completely, as the information will be used by HP to assign software keys. The 60-day evaluation will only start once the temporary software keys are entered into the SVP. The customer has the ability to evaluate these software solutions for only one 60-day timeframe. The evaluation timeframe cannot be extended. At the end of the 60-day evaluation, management through these software packages will cease. A 10-day key is available to HP personnel for emergency situations only. This “emergency” key can be used only once.

Customers can evaluate solutions individually or all at once. Customers can also purchase individually or purchase all of the solutions at once.

Figure 4.7.17 Command View XP Management Architecture



Continuous Access XP—Media: B9320A, Licenses: B9321A, B9322A, B9323A

Provides synchronous copy mode-only remote data mirroring, allowing data to be copied from an array at one site to an array at a remote site (Remote mirroring solutions requiring distancing of greater than 3 Km require ESCON Extenders or ESCON to WAN Converters. See page 17 for more information). This allows for implementation of a disaster recovery plan. RAID Manager is included with purchase of Continuous Access XP. RAID Manager provides OS-specific, host based software initiated from a server via a command line interface that allows full user control of Continuous Access XP (and Business Copy XP) from the host server. RAID Manager also provides functionality for synchronized operation with cache and OS, etc. If launching from a host using scripts, a consulting engagement may be recommended. RAID Manager must be installed on each host acting as failover controller/arbitrator. The customer can control this using Command View XP software.

ESCON CHIP pairs, RAID Manager XP (included), and Command View XP required.

Example: Scripting can be used to implement Metro Cluster ServiceGuard fail-over. The control lines are LAN-based and the data lines are ESCON-based. If a customer wants to manage from the host server using RAID Manager, and it is scripted at both the local and remote sites, then one RAID Manager will talk to a daemon at the copy of RAID Manager at other site through the LAN connect. In the event of a failure the remote site is notified, the mirrors are broken and the remote site takes over.

RAID Manager must be installed on each host acting as failover controller/arbitrator. The customer can control this Command View XP software. The Following OS are supported by RAID Manager:

HP-UX

Windows NT/2000

AIX

Solaris

Tru64

DYNIX

LINUX

Important: For Host systems employing Veritas Journal File System (JFS), at least version 3.3 must be used for proper operation of Fence level parameters.

Continuous Access XP Extension—Media: B9325A, Licenses: B9326A, B9327A, B9328A

Enables Continuous Access XP to operate in hi-performance asynchronous and/or synchronous copy mode. In Asynchronous copy mode, host writes to the local XP are confirmed immediately while copies of the write operations are transmitted over the distance link in bandwidth-effective asynchronous fashion to a remote XP. These operations are sequenced-stamped to ensure proper order of execution and sorted at the remote XP (See distance connection requirements in Continuous Access XP description). Continuous Access XP is required for full asynchronous mode capability. Continuous Access XP Extension makes more extensive use of Cache Memory resources. Rule-of-thumb recommendations are for 1.5-2x Cache Memory of a nominally configured system when using this product. Continuous Access XP Extension may also be purchased as an upgrade for customers currently using Continuous Access XP (sync mode) who wish to enable asynchronous copy mode capability. This product is currently supported with HP-UX, Sun Solaris, and Windows NT only. **ESCON CHIP pairs, Continuous Access XP, and Command View XP required.**

Business Copy XP—Media: B9330A, Licenses: B9331A, B9332A, B9333A

Provides local multi-mirroring, by creating up to 9 data copies, for a total of 10 images, including the original. This product is useful for allowing non-production activities such as backup and batch processes to take place on the copies. Control can be established RAID Manager and Command View XP software. Business Copy is also used for Remote Mirroring Solutions in conjunction with Continuous Access XP and XP Extension. RAID Manager is included with purchase of Business Copy XP. See Continuous Access XP for a description of RAID Manager functionality. **RAID Manager XP (included) and Command View XP required.**

Secure Manager XP—Media: B9351A, Licenses: B9352A, B9353A, B9354A

This application separates the storage of one server from unwanted access by another server. Works with native Fibre channel only to allow the array to hide the LUNs assigned to one server from other servers during IOSCAN. FC HBAs, Drivers, and CHIP pairs are required for operation. **Command View XP and LUN Configuration Manager XP required.**

Cache LUN XP—Media: B9345A, Licenses: B9346A, B9347A, B9348A

Allows a specified area within a LUN to be stored in cache. Accessing data from cache on reads makes the access time much faster. With Cache LUN XP you can designate all or part of a LUN for storage in cache. Customers can also control/ configure this product themselves if Command View XP Software is purchased. **Command View XP and LUN Configuration Manager XP required.**

Performance Manager XP—B7909A

Provides performance monitoring for the disk array. Runs on the Remote Control XP platform (Windows 95,98, or NT) to monitor and adjust disk array performance. A customer or service consultant can examine the workload and reallocate the cache read/write ratio according to user needs, i.e. optimize batch at nights, and OLTP days. This may not be run on the same PC at the same time as other Remote Control XP applications. If a customer wants to use this tool regularly, it is best to run a separate Remote Control XP on a separate PC. **Separate PC recommended. This can run on same PC as Command View (Remote Control).**

LUN Configuration Manager XP—Media: B9335A, Licenses: B9336A, B9337A, B9338A

Contains the following three applications and can be executed by the customer on the Command View XP management station:

LUN Manager—Allows the capability to create a LUN and assign it to a port.

LUSE—Allows up to 36 LUNs to be combined into a larger one.

CVS—For instance, allows creation of smaller size LUNs for data that had been locked in cache.

Command View XP required.

Resource Manager XP—B9358A

Allows the disk array to be connected to mainframe MVS systems and to Open Systems platforms. It allows the data on the array to be shared among MVS systems and Open Systems servers. ***ESCON CHIP pairs and Command View XP required.***

Data Exchange XP for XP512

Data Exchange for HP-UX—B9359A

Data Exchange for Windows NT—B9360A

Data Exchange for Sun Solaris—B9361A

Data Exchange for AIX—B9362A

Enables high-speed bi-directional data exchange between MVS systems via ESCON links and Open Systems via SCSI. Provides file translations as required through a file conversion utility. ***ESCON CHIP pairs, Resource Manager XP, and Command View XP required.***

Auto Path XP

Enables I/O path failover and load balancing control for dual path connection to servers. Allows for multiple paths (8 maximum) to be configured to a LUN and provides for automatic, application transparent fail over in the event of path failure. Allows for dynamic, multi-path load balancing to a LUN to prevent any single path from becoming overloaded with I/O operations.

There are separate products for NT, Windows 2000 and AIX. Ordering details for each are shown below.

Auto Path XP for NT—B7934A

There is a single product number for each NT server, regardless of the type of server. Supports either SCSI or FC paths. Supports both the XP256 and XP512.

Auto Path XP for AIX—B7936A

There are three ordering options for this product—001, 002 or 003. One, and only one, option must be ordered with each product. A separate license must be ordered for each server.

Option 001—Workgroup License. This option is for all RS/6000 models with the exception of SP models (9076).

Option 002—Enterprise License. This option is for all SP model RS/6000s. Only one license is required per server, regardless of the number of nodes on the SP.

Option 003—Workgroup to Enterprise License Upgrade. This option is for a customer who's already purchased a Workgroup License for a non-SP model RS/6000 server, and is now upgrading that server to a Model SP RS/6000 server.

Supports either SCSI or FC paths. Supports both the XP256 and XP512.

Auto Path XP for Windows 2000—Media B9500A; Licenses: B9501A, B9502A , B9503A, B9504A

Auto Path XP for Windows 2000 supports both XP256 and XP512 arrays. First release supports the D8602A FC HBA only. Other FC adapters will be supported in follow-on versions. SCSI adapters will not be supported.

Auto Path XP for Windows 2000 is structured differently than Auto Path for NT or AIX, but is structured similar to other XP software. That is, there is a no-cost media product, and license products for a different number of servers—from 1 to 25 servers.

B9500A—Auto Path for W2K/Pentium Media

B9501A—Auto Path for W2K/Pentium 1 Server LTU

B9502A—Auto Path for W2K/Pentium 5 Server LTU

B9503A—Auto Path for W2K/Pentium 10 Server LTU

B9504A—Auto Path for W2K/Pentium 25 Server LTU

Auto LUN XP—Media: B9340A, Licenses: B9341A, B9342A, B9343A

Auto LUN XP enables the user to monitor and analyze disk usage on an XP512. Auto LUN gathers historical data and utilizes this data to develop a suggested migration plan that the customer can accept or reject and develop their own solution. Migrations can be performed manually, automatically or the customer can pre-set volume migration capabilities. The following migrations are possible:

Similar RAID levels with same physical drive type

Different RAID levels with same physical drive type

Two different drive types (LDEV size and emulation mode must be identical).

Auto LUN can migrate up to 36 volumes—migration is performed sequentially.

Command View XP required.

Software Licensing

Capacity-licensed Software Titles

Certain XP Family Software Titles are licensed based on the raw storage capacity of the array. Thus, customers license the use of this software by purchasing License products which 'cover' them for the amount of raw storage capacity present on their array. License products come in 1-TB, 5-TB, and 10-TB increments. Customers may purchase any combination of these Licenses to provide for adequate License-to-use terms for each desired Software Title.

The product structure for Capacity-licensed Software titles has two elements:

1. **Media:** Zero-cost product that delivers Manuals, software enablement tools, and CD-ROMs (where applicable). Options specify the array platform on which the software is to be licensed. This product enables and activates the software title and provides any required host-based software. For all Capacity-licensed Software Titles, option #001 provides media for the XP256 and option #002 provide media for the XP512.
2. **Licenses:** Products that deliver LTU certificates in 1-, 5-, and 10-TB increments. These product numbers are common to all XP array platforms. These products authorize the use of the software for the raw storage capacity of their array.

Actual purchase of capacity-based Software falls into two categories:

3. **New Array purchase:** software Licenses are being purchased along with a new XP Family array
4. **LTU upgrade:** A customer is adding raw storage capacity to their system requiring a Software LTU upgrade.

Customers making new array purchases must order both Media and License products to provide full capability to use a given capacity-based Software title. For customers requiring Software LTU upgrade on an existing software license, only License products (in the combination of increments required) must be purchased. It is presumed that the customer has already obtained media deliverables through their initial software license purchase. See the following table for a summary of the licensing structure for firmware-based XP Software products.

1-, 5-, and 10-TB License products are priced on a sliding scale such that larger increment licenses are less expensive on a per TB basis than small increment licenses. As a result, a single larger increment license may be nominally less expensive than multiple smaller increment licenses for a given license capacity requirement. Because of this, sales personnel must ensure that the customer is ordering a combination of license increments that yields the lowest nominal price. **Table 4.7.25** summarizes the lowest cost combination of license increments for a given license capacity requirement. Note that for a given license capacity requirement the lowest cost combination is the same for any given software title. In other words, the relationship between license increment prices is the same across all capacity-licensed software titles and therefore yields the same lowest-cost combinations of licenses.

Table 4.7.25

License Capacity (raw TB)	Lowest Price Combination of LTU Increments		
	1 TB	5 T	10 TB
1	1		
2	2		
3	3		
4		1	
5		1	
6	1	1	
7			1
8			1
9			1
10			1
11	1		1
12	2		
13	3		1
14		1	1
15		1	1
16	1	1	1
17			2
18			2
19			2
20			2
21	1		2
22	2		2
23	3		2
24		1	2
25		1	2
26	1	1	2
27			3
28			3
29			3
30			3
31	1		3
32	2		3
33	3		3
34		1	3
35		1	3
36	1	1	3
37			4
38			4
39			4
40			4

It is also important that sales personnel work with the customer to understand the long-term storage capacity growth requirements when purchasing Capacity-licensed Software Titles. If a customer is expecting to aggressively add upgrade disk storage capacity over time, then it may make sense to initially purchase a larger increment license (beyond the reasons described above). Though the customer would initially have 'excess' license capacity, they may enjoy lower long-term software licensing costs since they have taken advantage of lower per TB costs of the larger increment licenses. In general, sales personnel should work together with the customer to minimize total long-term cost for software licenses.

Table 4.7.26 summarizes the licensing structure for capacity-licensed XP Software titles.

Licenses for Capacity-licensed Software titles are based on total array raw disk capacity of the array. Example: configuration with 35 each 15 GB and 75 each 47 GB storage disks would represent $(35 \times 18) + (75 \times 46.9) = 4,147.5$ GB (~4.2 TB) raw disk capacity.

Table 4.7.26

Software Title	Product Number	License Terms
Continuous Access XP	Media: B9320A#001 (XP256) B9320A#002 (XP512) Licenses: 1-TB - B9321A 5-TB - B9322A 10-TB - B9322A	License-to-use on one array based on total array raw disk capacity
Continuous Access XP Extension	Media: B9325A#001 (XP256) B9325A#002 (XP512) Licenses: 1-TB - B9326A 5-TB - B9327A 10-TB - B9328A	License-to-use on one array based on total array raw disk capacity
Business Copy XP	Media: B9330A#001 (XP256) B9330A#002 (XP512) Licenses: 1-TB - B9331A 5-TB - B9332A 10-TB - B9333A	License-to-use on one array based on total array raw disk capacity
Secure Manager XP	Media: B9351A#001 (XP256) B9351A#002 (XP512) Licenses: 1-TB - B9352A 5-TB - B9353A 10-TB - B9354A	License-to-use on one array based on total array raw disk capacity
Cache LUN XP	Media: B9345A#001 (XP256) B9345A#002 (XP512) Licenses: 1-TB - B9346A 5-TB - B9347A 10-TB - B9348A	License-to-use on one array based on total array raw disk capacity
LUN Configuration Manager XP	Media: B9335A#001 (XP256) B9335A#002 (XP512) Licenses: 1-TB - B9336A 5-TB - B9337A 10-TB - B9338A	License-to-use on one array based on total array raw disk capacity
Auto LUN XP	Media: B9340A#001 (XP256) B9340A#002 (XP512) Licenses: 1-TB - B9341A 5-TB - B9342A 10-TB - B9343A	License-to-use on one array based on total array raw disk capacity

Other Licensed Software Titles

Table 4.7.27 summarizes the licensing structure for other XP Software titles.

Table 4.7.27

Software Title	Product Number	License Terms
Performance Manager XP	B7909A	One PC client (remote console) XP256/XP512 common LTU
Command View XP	B9357A #001: new XP256 system #002: new XP512 system (except as described in #004) #003: Upgrade for existing XP256 (with Remote Control) #004: Remote Control for new XP512 added to an existing XP256/Command View environment	One PC Client (remote console)
Resource Manager XP	B9358A #001: new XP256 system #002: new XP512 system	One array connected to MVS systems
Data Exchange XP, HP-UX	B7914A: XP256 B9359A#002: XP512	One server connected to an XP array
Data Exchange XP, Win NT	B7920A: XP256 B9360A#002: XP512	One server connected to an XP array
Data Exchange XP, Solaris	B7921A: XP256 B9361A#002: XP512	One server connected to an XP array
Data Exchange XP, AIX	B7922A: XP256 B9362A#002: XP512	One server connected to an XP array
Auto Path XP for NT	B7934A	One Intel-X86-based server
Auto Path XP for AIX	B7936A #001: Workgroup Server #002: Enterprise Server #003: Upgrade from Workgroup to Enterprise	One RS/6000 Server Non-SP model SP model Upgrade for non-SP to SP
Auto Path XP for Windows 2000	Media: B9500A Licenses: 1 server: B9501A 5 servers: B9502A 10 servers: B9503A 25 servers: B9504A	Windows 2000/Pentium-based server

Server Connectivity

SCSI Host Connections

The XP512 has no native SCSI CHIP pairs. Therefore, any SCSI host connections require the A5814A SCSI to FC router product. This router will take the host server SCSI connection and convert it to fiber channel. It is supported only on HP-UX, MPE/iX, and NT 4.0 systems in non-HA environments. Only one point-to-point SCSI connection is supported from a host server to the XP512, and only one fibre cable can be connected directly to the XP512 (ONE-TO-ONE only). No switch or hub connections are supported.

Table 4.7.28 SCSI to FC Bridge Support for XP512 via A5814A SCSI-FC Router

Supported Connections	Supported OS	Supported Servers	Non-HA Support	HA Software Support ¹		
				MD/UX	MC/SG	SG-OPS
Direct Connect	MPE/iX 6.0, 6.5	E-Class (9x8), K-Class (9x9KS, T-Class (9x9)	Yes	No	No	No
	HP-UX 10.20	A-, D-, K-, R-Class	Yes	No	No	No
	HP-UX 11.0	A-, D-, K-, r-, V-, N-, L-Class	Yes	No	No	No
	W2K	HP and non-HP W2K servers	Yes	No support planned		
	NT EE4.0, SP6+	HP and non-HP NT servers	Yes	No support planned		

¹ MD/UX = MirrorDisk UX; MC/SG = MC/ServiceGuard; SG-OPS = ServiceGuard OPS Edition

HP-UX Workstations

Table 4.7.29 SureStore E Disk Array XP512 with HP Visualize UNIX Workstations

No SAN (switch or hub) products are supported between the workstation HBA and the XP512.

Supported Connections	Supported OS	Supported Workstations ²	Non-HA Only	HA Software Support ¹		
				MD/UX	MC/SG	SG-OPS
Direct Connect configurations without a hub. 500 meters maximum.	HP-UX 10.20	J7000, J5600, J5000 (J6000 currently under test)	Yes	No	No	No
	HP-UX 11.0		Yes	No	No	No

¹ MD/UX = MirrorDisk UX; MC/SG = MC/ServiceGuard; SG-OPS = ServiceGuard OPS Edition

² The HP Visualize Workstations Ordering Guide is available for Internal HP and Channel Partner use at: http://hp.techsalesinfo.com/home/products/workstation/orderinfo/doc/unix_us.doc. First, register at the site to access the information.

HP NetServer NT Support

Table 4.7.30 HP NetServer Support for Non-MSCS

Connection Supported	Host Bus Adapter	Supported OS	Supported HP NetServers
Fibre Channel Direct Connect L10/S10 Hub SW 2400/ 2800/F16	Emulex LP8000,LP7000/E	W2K	Q4-FY'00
		NT EE/SE/STS 4.0 SP6 +	Q4-FY'00
	HP D8602A (Tachlite 2.3)	W2K	All HP NetServers which meet the following conditions: 1) Listed on Microsoft HCL under the system/server field; and 2) The OS/HBA/Driver combination is supported by NSD or the HBA vendor.
		NT EE/SE/STS 4.0 SP6 +	(Same as above)
	Q-Logic QLA2202F -33/66 MHz QLA2200F -33/66 MHz	W2K	Q4-FY'00
SCSI via A5814A SCSI-FC router	HP A5252B (same as Adaptec AHA-2944UW)	W2K	All HP NetServers which meet the following conditions: 1) Listed on Microsoft HCL under the system/server field; and 2) The OS/HBA/Driver combination is supported by NSD or the HBA vendor.
		NT EE/SE/STS 4.0 SP6 +	(Same as above)

Table 4.7.31 HP NetServer Support for MSCS

Connection Supported	Host Bus Adapter	Supported OS	Supported HP NetServers
Fibre Channel Direct Connect	HP D8602A (Tachlite 2.3)	W2K	LT 6000r
Fibre Channel SAN	HP D8602A (Tachlite 2.3)	Windows 2000 SAN Support - Available August 2000	
Fibre Channel Direct Connect L10/S10 Hub SW 2400/ 2800/F16	HP D8602A (Tachlite 2.3)	NT EE 4.0 SP6 +	LT 6000r, LH 6000, LH 3000, LC 2000, LXr8500
Fibre Channel Direct Connect L10/S10 Hub SW 2400/ 2800/F16	Emulex LP8000	W2K	Under Investigation - Q4-FY'00
		NT EE 4.0 SP6 +	Under Investigation - Q4-FY'00
	Q-Logic QLA2202F-33/66 MHz QLA2200F-33/66 MHz	W2K	Under Investigation - Q4-FY'00
		NT EE 4.0 SP6 +	Under Investigation - Q4-FY'00

LUN Count Maximums

There are a number of factors that lead to LUN count maximums. The device itself can have limitations, the adapter/driver pair can have limitations and the Server itself can have limitations. There are tested limits, theoretical limits and physical limits. The numbers stated in the chart below deal with the device limits and the driver/adapter limits. The HP-UX Operating System supports 1024 active hardware paths concurrently (i.e. LUNs that are opened). The non-active hardware paths are not counted (i.e. alternate paths are not counted regardless of the number of alternate paths). If you need to configure more LUNs than stated here, contact the ATC at T-785-2500 or email to ESB, ATC (HP-Roseville,gen3.) Please insure that you consider all of the possible limitations across the device, driver/adapter and the system in your calculation of the maximum LUN count. The hardware paths to LUNs per HBA on the systems is 512 for a non-HA environment and 320 for a HA environment (MC/ServiceGuard, ServiceGuard OPS).

You may configure a system with as many LUNs as defined by the maximum LUN count per either the systems limit, the device limit or the driver/adapter limit. If the maximum number of LUNs needed exceeds the maximum LUNs calculated, you must contact the ATC for consultation. If the maximum number of LUNs does not exceed this number, you may quote and deliver the configuration.

Table 4.7.32 XP512 LUN Count Maximums

Storage Device	HP-UX 10.20 /11.0		HP-NT EE/SE/WTS 4.0 SP6 and W2K	
	Non-HA	HA	Non-MSCS	MSCS
XP512 FC LUNs per FC port on the XP512	256 total LUNs	256 total LUNs	256 total LUNs ¹	8 LUNs per cluster ²
XP512 FC with A5814A router, LUNs per host SCSI bus	128 total LUNs	NA	128 total LUNs	NA
XP512 Controller Frame	8192 LUNs/4096 LDEVs maximum	8192 LUNs/4096 LDEVs maximum	8192 LUNs/4096 LDEVs maximum	8192 LUNs/4096 LDEVs maximum

¹ The XP512 supports 256 LUNs/port, however the NT servers can ONLY support a maximum of 26 drive letters.

² Clustered NT servers support 8 shared LUNs per cluster.

Host Bus Adapter Support for SCSI to FC Router (A5814A)

Table 4.7.33 shows the support for the XP512 using the FC array adapter A5956A (private NL). Port Host Mode should be set to 08. No hubs or switches are supported.

Table 4.7.33 HBA Support for the SureStore E Disk Array XP512

Host Bus Adapter	Host Port Type	Patch/Driver (minimum level)	Supported Servers	Connection Supported			
				Direct Connect	SW 2400/2800	F16	L10/S10 Hubs
HP-UX 11.0							
A4800A (PCI)	FWD SCSI	PHKL-17258	V- (2200/2250/2500/2600), L-, N-Class	To router only.	N/A	N/A	N/A
A5159A (PCI)	FWD SCSI	PHKL-17258	L-, N-Class				
A4107A (HSC)	FWD SCSI	PHKL-17258	R-, D-, A-Class				
A2969A (HSC)	FWD SCSI	PHKL-17258	K-Class				
HP-UX 10.20							
A4107A (HSC)	FWD SCSI	PHKL-17468	R-, D-, A-Class	To router only			
A2969A (HSC)	FWD SCSI	PHKL-174658	K-Class				
NT4.0 SP6+ and W2K							
A5252B (PCI) (Adaptec AHA-2944UW)	FWD SCSI	NT Bundle	HP and non- HP Servers	To router only	N/A	N/A	N/A
MPE/iX 6.0, 6.5							
28696A (HPPB) rev 3728	FWD SCSI	6.0 – Power Patch 2 6.5 – Power Patch LX84	E-Class (9x8), K-Class (9x9KS), T-Class (9x9)	To router only	N/A	N/A	N/A

Host Bus Adapter Support for HP-UX Systems

Note: Fabric login for the XP512 will be supported in August 2000 for HP-UX 11.0.

Table 4.7.34 shows the support for the XP512 using the Fibre Channel array adapter A5956A (public NL). Port Host Mode should be set to 08.

Table 4.7.34 HBA Support for the SureStore E Disk Array XP512

Host Bus Adapter	Host Port Type	Patch/Driver (minimum level)	Supported Servers	Connection Supported			
				Direct Connect	SW 2400/2800	F16	L10/S10 Hubs
HP-UX 11.0							
A5158A (Tachlite)	Private NL	DART 48	V-, N-, L-Class (direct connect only), A400, A500 (at SR)	Yes	Yes	Yes	Yes
	Public NL (under investigation)	TBD					
	N Port (4QFY00)	TBD					
A3740A	Private NL	DART 48	V-, N-, L-Class				
A3636A	Private NL	DART 48	T-Class				
A3591B	Private NL	DART 48	R-, D-Class				
A3404A	Private NL	DART 48	K-Class				
HP-UX 10.20							
A3636A	Private NL	PHSS_18326	T-Class	Yes	Yes	Yes	Yes
A3591B	Private NL	PHSS_18326	R-, D-Class				
A3404A	Private NL	PHSS_18326	K-Class				
A3740A	Private NL	PHSS_18326	J-Class (direct connect only)				

Host Bus Adapter Support for Windows NT and Windows 2000

Table 4.7.35 shows the support for the XP512 using the fibre channel array adapter A5956A (public NL) in non-clustered environments. For the XP512, the host mode type should be set to the following when using the specific vendor's HBA: Compaq - Mode 00, Emulex HBA - Mode 00, HP HBA - Mode 08, and Q-Logic - Mode 00.

Table 4.7.35 HBA Support for the XP512 in Non-MSCS Configurations

Host Bus Adapter ¹	Host Port Type	Patch/Driver (min. level)	Supported Servers ¹	Connection Supported			
				Direct Connect	SW 2400/2800 ²	SW F16 ³	Hubs: L10/S10 ⁴ ; Vixel and Rapport 1000
Windows 2000 Server and Advance Server							
Emulex LP8000	N Port - Switch Public NL - D.C and Hub connect	V5-441a6	WinNT Servers ⁵	Yes	Q4-FY'00	Yes	Q4-FY'00
HP D8602A ⁷ (Tachlite 2.3)	Public NL	2.07 ⁸	HP Netservers, Dell PowerEdge, IBM NetFinity, Compaq Proliant ⁵	Yes	Yes	Yes	Yes (L10/S10 only)
Q-Logic ⁹ QLA2202F QLA2200F	Public NL	V7.04.02	WinNT Servers ⁵	Yes	4Q FY00	Yes	4Q FY00
Compaq DS-KGPSA-CX (120186-B21)	Public NL	V5.2.0.0	Compaq ⁵	Yes	4Q FY00	4Q FY00	4Q FY00 (L10/S10 only)
NT EE/SE/WTS 4.0 SP6+							
Compaq 64-bit/66-MHz (120186-B21)	Public NL	V4.16.14.63 a	Compaq ⁵	Yes	Yes	No	Yes (L10/S10 only)
Emulex LP8000	N Port - Switch Public NL - D.C and Hub connect	V4.31	WinNT Servers ⁵	Yes	4Q FY00	Yes, plus Ancor MKII	Yes, plus Emulex LH5000
HP D8602A ⁷ (Tachlite 2.3)	Public NL	2.0 or 2.02 for Direct Connect 2.07 - Switch and Hub connect ⁸	HP Netservers, Dell PowerEdge, IBM NetFinity, Compaq Proliant ⁵	Yes	Yes	Yes	Yes (L10/S10 only)
Q-Logic ⁹ QLA2202F QLA2200F	Public NL	V7.04.02	WinNT Servers ⁵	Yes	Q4-FY'00	Yes, plus Ancor MKII	Yes

¹ HP/NSD will only support the D8602A HBA with HP NetServers for the XP512. However, HP/HPSO will support the Non-HP HBAs listed in HP NetServer configurations with the XP512.

² The minimum firmware required on the SW 2400/2800 is v2.1.3.

³ The minimum firmware required on the F16 switch is v1.6d2.

⁴ The minimum firmware required on the L10/S10 Hubs is datecode > 3800.

⁵ XP512 will support all server configurations which meet the following conditions: 1) The server is listed on the Microsoft HCL under the system/server field; and 2) The OS/HBA/Driver combination specified is supported by the server or the HBA vendor

⁶ Cascading only up to 2 switches. Also, switch to hub cascade is supported.

⁷ The D8602A HBA when used with HP-NT servers, detects two ports total in a SAN. Once the driver sees two ports in a SAN, it stops checking for more ports. There is an HBA driver fix being implemented by Agilent for this problem - Availability TBD.

⁸ When using the D8602A HBA from Agilent in SAN configurations with the switches or hubs, driver version 2.07 must be used for the HBA. The driver is available from: <http://amsterdam.rose.hp.com/drivers>

⁹ For the Qlogic QLA2200F and QLA2202F HBAs, the 33- and 66-MHz versions of the HBAs are supported.

Table 4.7.36 shows the support for the XP512 using the Fibre Channel array adapter A5956A (Public NL) in clustered environments. For the XP512, the host mode type should be set to the following when using the specific vendor's HBA: Compaq - Mode 00, Emulex HBA - Mode 00, HP HBA - Mode 08, and Q-Logic - Mode 00.

Table 4.7.36 HBA Support for the XP512 in MSCS Configurations

Host Bus Adapter	Host Port Type	Patch/Driver (minimum level)	Supported Servers	Connection Supported			
				Direct Connect	SW2400/2800 ²	F16 ³	L10/S10 Hubs ⁴
Emulex LP8000 LP7000/E	W2K Support Under Investigation for HP and Non-HP WinNT Computers - Q4-FY'00 support						
HP D8602A ⁵ (Tachlite 2.3)	Public NL	2.07 ⁶	HP NT Servers: LT 6000, LH3000, LXR8500	Yes	SAN Support Under Investigation for August 2000 support		
Compaq 64-bit/66-MHz 120186-B21	W2K Support Under Investigation for Compaq WinNT Computers - Q4-FY'00 support						
Q-Logic ⁷ QLA2202F QLA2200F	W2K Support Under Investigation for HP and Non-HP WinNT Computers - Q4-FY'00 support						
Compaq 64-bit/66-MHz 120186-B21 (Part Number)	Public NL	V4.16.14.63 a	Compaq ProLiant 8500	Yes	Yes	No	Yes
Emulex LP8000	N Port - Switch Public NL - D.C and Hub connect	TBD	Q4-FY'00	Q4-FY'00	Q4-FY'00	No	Q4-FY'00
HP D8602A ⁵ (Tachlite 2.3)	Public NL	2.07 ⁶	HP NT Servers: LXR8500, LC 2000, LH 3000, LH 6000, LT 6000	Yes	Yes	No	Yes
Q-Logic ⁷ QLA2202F QLA2200F	Public NL	TBD	Q4-FY'00	Q4-FY'00	Q4-FY'00	No	Q4-FY'00

² The minimum firmware required on the SW 2400/2800 is v2.1.3.

³ The minimum firmware required on the F16 switch is v1.6d2.

⁴ The minimum firmware required on the L10/S10 Hubs is datecode > 3800.

⁵ The D8602A HBA when used with HP-NT servers, detects two ports total in a SAN. Once the driver sees two ports in a SAN, it stops checking for more ports. There is an HBA driver fix being implemented by Agilent for this problem - Availability TBD.

⁶ When using the D8602A HBA from Agilent in SAN configurations with the switches or hubs, driver version 2.07 must be used for the HBA. The driver is available from: <http://amsterdam.rose.hp.com/drivers>

⁷ For the Q-Logic QLA2200F and QLA2202F HBAs, the 33- and 66-MHz versions of the HBAs are supported.

Host Bus Adapter Support for Heterogeneous Systems

Table 4.7.37 shows the support for the XP512 using the Fibre Channel array adapter A5956A (Public NL) in IBM AIX configurations. For the XP512 configured in an AIX environment, the host mode type should be set to Mode 00 for Non-HACMP and to Mode 0F for HACMP.

Table 4.7.37 HBA Support for the XP512 with AIX

Host Bus Adapter	Host Port Type	Patch/Driver (min. level)	Supported Servers	Connection Supported			
				Direct Connect	SW 2400/2800 ¹	SW F16 ²	Hubs: L10/S10
AIX 4.3.3 (64-bit)							
IBM: 6227	N Port – Switch Public NL – D.C.	AIX Bundle	To be updated	Yes	Yes	Yes	No
AIX 4.3.3 (32-bit)							
IBM: 6227	N Port – Switch Public NL – D.C.	AIX Bundle	To be updated	Yes	Yes	Yes	No

Heterogeneous Support Notes:

1. Different OS platforms must be isolated to particular ports
2. Different modes must be selected for the FC ports according to the platform selected
3. This mode setting is for all LUNs on the same port, e. g. cannot mix HPUX (mode) with NT(mode 00) and Solaris (mode 09)
4. If an FC switch has four zones for 4 different server platform types, then there must be at least 4 links from that switch to the XP512.

Table 4.7.38 shows the support for the XP512 using the Fibre Channel array adapter A5956A (Public NL) in Sun Solaris configurations. For the XP512 configured in a Solaris environment, the host mode type should be set to Mode 09.

Table 4.7.38 HBA Support for the XP512 with Solaris

Host Bus Adapter	Host Port Type	Patch /Driver (min. level)	Supported Servers	Connection Supported			
				Direct Connect	SW 2400/2800 ¹	F16 ²	L10/S10 Hubs
Solaris 8							
Jaycor FCI-1063 (PCI)	N Port - Switch Public NL - D.C. and Hub connect	V2.5	Planned for August.	Yes	Yes	Yes	No - Emulex Hub LH5000 ONLY
Jaycor FC641063 (S Bus)	N Port - Switch Public NL - D.C. and Hub connect	V2.5 F-code V13.3.5	Planned for August.	Yes	Yes	Yes	No - Emulex Hub LH5000 ONLY
Solaris 7 (64 Bit)							
Jaycor FC641063 (S Bus)	N Port - Switch Public NL - D.C. and Hub connect	V2.2.1. Hit06.01;V2.3 F-code V13.3.5	To be updated	Yes	Yes	Yes	No - Emulex Hub LH5000 Only
Solaris 7 (32 Bit)							
Jaycor FCI-1063 (PCI)	N Port - Switch Public NL - D.C. and Hub connect	V2.2.1.Hit06 .01;V2.3 F-code V13.3.5	To be updated	Yes	Yes	Yes	No - Emulex Hub LH5000 Only
Jaycor FC641063 (S Bus)	N Port - Switch Public NL - D.C. and Hub connect	V2.2.1.Hit06 ,01;V2.3 F-code V13.3.5	To be updated	Yes	Yes	Yes	No - Emulex Hub LH5000 Only
Solaris 2.6							
Emulex LP7000/E	Public NL - D.C. and Hub connect	V3.38	To be updated	Yes	No	No	No - Emulex Hub LH5000 Only
Jaycor FCI-1063 (PCI)	N Port - Switch Public NL - D.C. and Hub connect	V2.2.1.Hit06 .01;V2.3	To be updated	Yes	Yes	Yes	No - Emulex Hub LH5000 Only
Jaycor FC641063 (S Bus)	N Port - Switch Public NL - D.C. and Hub connect	V2.2.1.Hit06 .01;V2.3 F-code V13.35	To be updated	Yes	Yes	Yes	No - Emulex Hub LH5000 Only
SUN X6729A (PCI)	Public NL	Patches: 107280-05 105356-12	To be updated	Yes	No	No	No

¹ The minimum firmware required on the SW 2400/2800 is v2.1.3.

² The minimum firmware required on the L10/S10 Hubs is datecode > 3800.

Hardware and Software Services

Services Overview

A significant differentiator for HP, especially in this enterprise storage business, is our ability to not only provide a broad range of storage services and support, but only HP can also provide Mission Critical levels of support and consulting for the entire IT environment. This includes multivendor NT servers as well as multivendor networks. As customers look for Stress-Free IT environments, make sure these HP strengths in the broad services and support areas are made clear.

HP has the services to complete enterprise-level mass storage solutions by providing customers with assistance in planning, implementing, enhancing, and maintaining their critical data storage environment.

HP's service and support offerings provide a robust level of bundled support (during the two-year warranty period) for the HP SureStore E Disk Array XP512. This includes a hardware support level called Availability Support, as well as Site Prep and Installation. We have also bundled in the support service called LUN/SW Initial Enablement and Implementation Service that provides a basic LUN map design and implementation (Note: a physical drive mechanism is configured or sliced up into software defined Logical Drives called LUNs), and a software implementation service that ensures the basic XP512 Software products are installed and functional.

Two additional support services are required for each XP512 software product. Every software product, on each A5951A frame, must be ordered with support option #0S6 which provides 24x7 Phone In Assistance, License to Use Software and Documentation Updates, and access to the IT Resource Center (ITRC, formerly ESC). For the more complex software products (listed later) option #0SY is also required to ensure installation and basic functionality.

Finally, based on our experience in mission critical environments, we highly recommend several services including Technical Account Services for Storage (TAS), storage focused account management and technical services, and storage specific Mission Critical Support Services. Contact your support sales colleagues to learn more about HP's broader suite of support and services capabilities.

HP also offers more in-depth consulting services including:

- Data migration
- SAN architecture
- Availability services
- SAN management implementation
- Backup integration
- Zero downtime backup for OmniBack and Veritas
- Performance consulting

Contact your local HP Consultant for more information about these custom-quoted services.

HP currently has the capabilities to deliver the consulting, implementation/installation, and ongoing support for the most commonly connected servers to our XP512 products. The process to ensure appropriate services are available for other server platforms are also included in this Services section. Consult with your support sales colleagues to clarify which services discussed here are available, either as standard or custom services, for varying levels of configuration complexities in the less common heterogeneous and multivendor server environments.

The following pages provide configuration and ordering details for our storage specific services designed for the XP512.

What's Included with the HP SureStore E Disk Array XP512?

As will be explained below, WARRANTY for this product (coded 1J) includes site prep, installation, 2 years of Availability Support, and an initial LUN/SW Initial Enablement and Implementation Service for most XP512 software products in simple configurations.

Hardware Support

The XP512 product comes with an exclusive level of hardware warranty support (during the two-year warranty period) called Availability Support. Availability Support provides 24x7 hardware support for two years and capitalizes on the proactive support technology features of the XP512:

- Parts redundancy
- Phone home (event-based)
- Remote repair

Availability Support can be characterized in the following way. HP responds quickly and proactively, 24x7x365, to information sent to our "Stress-Free Central facility via the XP512 phone home capabilities. When our remote diagnostic processes determine that some action is needed to ensure continuous uptime we take whatever steps are needed while the system is still performing normally (due to the parts redundancy built in). In the rare case of a customer calling in to report a problem, we respond immediately and urgently. In all cases, we quickly determine what needs to be done and we do it. That can involve remote reconfigurations, CE dispatching, or scheduling a parts replacement at our customer's convenience. We ensure the storage system is Always Up, Always Available!

***Note:** HP's ability to deliver this level of support, both during warranty and post warranty, requires modem access to the storage device.*

Availability Support Contracts Trigger—Option #2YB required

Option #2YB is a required, zero-priced product option has been structured to the HP SureStore E Disk Array product (A5951A). This #2YB option must be included in every A5951A order and is critical to ensure customers will be able to receive post-warranty support.

SureStore E LUN/SW Initial Enablement and Implementation Service

Software Enablement and LUN Implementation Services are delivered by Storage focused Account Support Engineers and are included for most XP512 software products configured in "simple" environments (described below). This service is available for the products listed, and only when purchased initially during the A5951A purchase. Follow-on software purchases are required to purchase option #0SY, with the exception of Business Copy and Continuous Access Extension, as described shortly. This service applies to all supported servers/OSs as indicated later in this Services section.

Basic LUN Implementation: This one-time service includes:
Create and or validate LUN Storage map
Implement and verify the configuration
Document and communicate configuration to customer

Basic Software Enablement

This one-time service is provided for each of the following specific XP512 software products. Also included is the required customizing or set-up of the customer-supplied Remote Control PC. For each of the specific software products this service provides for:

- Installation
- Enabling the software keys
- Verify functionality
- Demonstrate basic features and capabilities to the customer
- Respond to basic impromptu software operational usage questions

This LUN/SW Initial Enablement and Implementation Service is Included when the following XP512 software products are initially purchased with the A5951A:

B9335A—LUN Configuration Manager XP

B9345A—Cache LUN XP

B9351A—Secure Manager XP

B7909A/AU—Performance Manager XP

B9358A—Resource Manager XP

B9340A—Auto LUN XP

B9325A—Continuous Access XP Extension

B7934A—Auto Path XP for NT

B7936A—Auto Path XP for AIX

#0SY is required for these products if any of them are purchased later as follow-on products, with the exception of Continuous Access XP Extension. All other XP512 software products, including Continuous Access XP (B9320A), Data Exchange XP (B9359A, B9360A, B9361A, and B9362A), and HP SureStore E Command View XP (B9357A) always require the purchase of the Option #0SY with the software product. Business Copy XP (B9330A) always requires the purchase of #302 or #303, and therefore does not require an 0SY as explained shortly.

A "simple" environment is direct connection of up to four hosts without SAN interconnect devices such as switches/hubs, and without multi-connect software products such as ServiceGuard or Service Guard OPS Edition.

A "complex" environment can include SAN with interconnect devices or can include high availability products such as ServiceGuard or Service Guard OPS Edition. These configurations require the purchase of H9273A Option #301 to cover the additional time necessary to plan and execute these configurations. Additionally, SAN implementations exceeding two switches and four hosts cannot be scoped into the #301 fixed price option, so an appropriate quantity of H9273A Option #305/6 should be scoped and ordered to provide sufficient services to implement the solution in these cases. H9273A Option #305/6 can be used whenever the customer has a unique or unusual implementation.

What's Required for the HP SureStore E Disk Array XP512?

Every SureStore E Software product, on each A5951A frame, requires the #0S6 or #3Y6 option. The need to purchase a #0SY option for a software product depends on when a software product is purchased and which software product is involved (all explained below). The requirement to purchase H9273A with #302 or #303 with Business Copy XP (B9330A) is also explained.

#0S6 and #3Y6 Option—Software Foundation Services

Software Foundation Services provide round the clock response to software problems plus delivery of Update Materials and continuing Software License-to-Use. 24x7 is the standard service level that is implemented using standard upfront software support product options. #0S6 or #3Y6 is required for every purchase of a XP512 software product. #0S6 and #3Y6 both provide the same set of support and services (listed below). #0S6 provides them for the initial one year period, while #3Y6 provides them for the initial three year period. Both upfront options are more cost effective than the equivalent contractual support.

24x7x365 Software Phone In Assistance

Toll-free (in selected countries) access to the HP Response Center is provided to authorized callers. The Response Center will respond to customer software calls within 2 hours. The standard support provides 24x7 coverage for supported software products.

Software License to Use/Updates

Customers can use and copy updates to HP software updates as described in the HP Terms and Conditions of Sales and Service.

Software Media and Documentation Materials Updates

As HP releases updates to the customer's HP software, the latest revisions of the software and reference manuals are made available. Media types available for software and documentation updates will include floppy disk, CD-ROM, and paper.

IT Resource Center (ITRC, formerly ESC)

Customers will have electronic access to HP's support WEB site to receive the latest info on software changes, patches, and problem solutions and work-arounds.

#0SY Option – Software Enablement Service

This option provides Software Enablement (see previous definition of Basic Software Enablement) for XP512 software products that are purchased after the initial purchase of the A5951A array frame and to cover the more complex software products not included in the initial LUN/SW Initial Enablement and Implementation service. The more complex software products would include Continuous Access XP (B9320A), Data Exchange XP (B9359A, B9360A, B9361A, and B9362A), and HP SureStore E Command View XP (B9357A).

Business Copy XP (B9330A), does not require #0SY since this enablement service is included in the Business Copy required service of H9273A #302 for simple environments or H9273A #303 for complex environments.

Continuous Access XP Extension (B9325A) does not require an #0SY. The Software Enablement Service is effectively delivered for this product with Continuous Access (B9320A), a prerequisite for Continuous Access XP Extension purchase and implementation.

H9273A #302 for Business Copy XPSureStore E Business Copy Implementation Service in Simple Environments

Provides the implementation of the Business Copy XP product, including its host-based component Raid Manager XP (included with Business Copy XP). This includes the configuration of a single (1) frame and up to four (4) hosts.

H9273A #303 for Business Copy XPSureStore E Critical Data Availability Service in Complex Environments

Provides analysis, design, and implementation of the Business Copy XP product, including its host-based component Raid Manager XP (included with Business Copy XP). This assures the software products will support the customer's Mission Critical business, operational, and High Availability needs. The environment includes up to two (2) frames and four (4) hosts.

What's Recommended for the HP SureStore E Disk Array XP

Several technical services are recommended both for implementation and ongoing operational consulting for the SAN and mass storage environment.

H9273A #301—SureStore E LUN/SAN Implementation Service

Provides the customer with a LUN configuration specifically designed to meet current operational needs including application-specific LUN mappings. This service is highly recommended when transitioning from factory default or test configurations into production. RAID and mirroring reconfigurations are not included. This service applies to any supported OS. Implementation may involve any or all of the following previously enabled software products:

B9351A—HP SureStore Secure Manager XP
B9345A—HP SureStore Cache LUN XP
B9335A—HP SureStore LUN Configuration Manager XP
B7909A—HP SureStore Performance Manager XP
B9358A—HP SureStore Resource Manager XP
B9340A—HP SureStore Auto LUN XP
B7934A—HP SureStore Auto Path XP for NT
B7936A—HP SureStore Auto Path XP for AIX

H9273A #304—SureStore E Performance Optimization Service

Provides for the collection and analysis of performance data from one (1) HP SureStore E Disk Array product (A5951A), using the HP SureStore E Performance Manager XP software. Upon completing the analysis using the software product and other available data, the service provides a report of the current status of the array, and appropriate recommendations to optimize storage performance on the HP SureStore E Disk Array product (A5951A). The performance analysis is performed for the disk array only (no server based performance data is collected).

H9273A #305/306 Options—Additional 8 hours of SureStore E Technical Assistance

Provides one (1) day of additional assistance delivered by a storage focused Account Support Engineer. Select one option to H9273A as follows: use #306 for environments supported under a CSS-SAP contract; use #305 for all other environments.

A5951A—SureStore E Technical Account Services for Storage (TAS); Option #1YT (1 year)/Option #2YT (2 year). H9267A #T00 (per year)

HP XP512 Technical Account Services for Storage (TAS) are similar in concept to HP's Personalized System Support, but are storage centric. Although initial usage of the storage space is made simple for the customer through HP implementation services, ongoing management of space, configuring for performance, expansion considerations, and utilization of the unique capabilities of the XP512 (Business Copy, Continuous Access, SAN, etc) quickly cause the solution to become more complex.

Technical Account Services allow the customer to meet data management, and availability goals. Designed to be flexible and address specific customer needs, HP XP512 Technical Account Services for Storage provide for the support and skills needed to facilitate the management of the storage environment. Working as a team, the customers' storage system administrator and assigned storage trained Account Support Engineer will identify the areas of greatest benefit to the SAN environment. These focus activities will be formally documented in a special storage segment within the Account Support Plan. Some example services often requested include:

High Availability Single Point of Failure Assessment

San Environment Storage Profile

Consulting on Storage, SAN and server data management technology solutions

Operational assistance with capacity planning, performance , mirroring and recovery strategies

Micro-code and software upgrade planning assistance

Change Management process planning

Only one TAS service is recommended if the customer has a simple environment. If the SAN environment is complex, more ASE time will be required and more TAS options would be highly recommended. Purchasing Technical Account Services is highly recommended if the customer is not going to purchase Mission Critical support for the XP512 (it is included with Mission Critical levels). If the customer requires a "total" Mission Critical solution, the appropriate support options should be sold on the environment.

Mission Critical Support

The XP512 can be fully integrated into new and existing Mission Critical environments. Please note the availability of CSS has additional travel zone restrictions. The local delivery team should work with GSL to determine if the customers' site is within criteria. Mission Critical support provides storage focused proactive services above and beyond standard warranty deliverables (Availability Support). Mission Critical extensively reduces the possibility of downtime by taking full advantage of the redundant architecture and "phone-home" capabilities of the XP Product Family through proactive configuration planning and analysis. In the unlikely event of a hard-down scenario, immediate dispatch, business recovery and accelerated escalation processes are engaged to resolve the situation in the shortest time possible.

Technical Account Services (TAS) delivered by a storage trained ASE are included and a necessity for Mission Critical support on the XP512. The single point of failure analysis provision within TAS, is mandatory for Mission Critical customers. 6 Hour Call to Repair (CSS-HDS and HP Travel Zone Restricted), and 4 Hour Call To Restoration (BCS – HP Travel Zone Restricted) commitments are provided. Mission Critical Support cannot be sold standalone on the XP512. CSS/BCS for the server environment is a prerequisite. **6-hour call-to-repair should not be sold without CSS on the XP512.**

CSS is ordered for this product via the same support options (OTX/OVX) used when ordering HP servers, while BCS must be ordered as a standalone support contract. Please note that CSS can not be ordered up front for software products that run on NT. Additionally, CSS is not available on software products that do not run on a 9000 nor NT platform.

Support Contract Renewals

Technical Account Services for Storage (TAS), Critical Systems Support (CSS), and Business Continuity Support (BCS), have each been enhanced to include SureStore E service options as underlying products. The Support Admin teams will have further instructions for contract renewals.

Try 'n Buy Software Program

Trial licenses of four leading management applications for the HP SureStore E Disk Array family of products are available free-of-charge:

Auto LUN XP
Cache LUN XP
LUN Configuration Manager XP
Secure Manager XP

HP SureStore E Command View XP must be purchased to enter into the Try 'N Buy program. The Entitlement Certificate included in the Command View box is required by HP to provide the software key(s) to the customer for these management applications. A customer engineer then completes the process. (Note: the customer must purchase a OS6 and a OSY option with Command View. The support of Auto LUN XP, Cache LUN XP, LUN Configuration Manager XP and Secure Manager XP will be free-of-charge during the trial period.)

The Try 'n Buy option can be implemented at any time; however, this option can only be implemented once per array. After the evaluation period, management through the software will be discontinued.

Table 4.7.39 Summary of Services by Adding Options/Contracts to XP512 Products During Warranty and Post Warranty

XP512 Support Rules		Under Warranty		Post Warranty		
Customer wants order for year:		Year 1	Year 2	Year 3	Year 4	Year 5
Availability Support A5701A/B/C	HW2	Included 2YB	Included 2YB	O2N	O2N	O2N
	HW3	3YW	Included	Included	O2N	O2N
Software Support B79xxA)	SW1	OS6 and OSY*	H00 + H24 + L00	H00 + H24 + L00	H00 + H24 + L00	H00 + H24 + L00
	SW3	3Y6 and OSY*	Included	Included	H00 + H24 + L00	H00 + H24 + L00
Technical Account Services for Storage A5701A/B/C	TAS1	1YT	H9267A + T00	H9267A + T00	H9267A + T00	H9267A + T00
	TAS2	2YT	Included	H9267A + T00	H9267A + T00	H9267A + T00
Critical Systems Support	HW	OTX/OVX	O7V	O2V	O2V	O2V
	SW	OTX/OVX	H00 + H24 + L00	H00 + H24 + L00	H00 + H24 + L00	H00 + H24 + L00

	System Support (UPFRONT)
	Support Suffix (CONTRACT)

Standard 2-year warranty includes HW2 only. Option #OS6 is required for 1-year warranty.

HW2: Standard hardware warranty: 2 years. Must add zero cost option 2YB at product sale. Do not use HW2 with HW3.

HW3: Standard warranty of 2 years + 1 year warranty extension resulting in 3 years hardware coverage. Must be ordered at time of A5701A/B/C product sale. Note that 2YB option is still also required on purchase order (for tracking). Do not use HW3 with HW2.

SW1: Software Support: 1 year. Per software product. #OS6 is REQUIRED for XP256 software products. Do not use with SW3.

SW3: Software Support: 3 years of OS6 level of support. Per software product. Do not use with SW1.

TAS1: 1 year. Do not use with TAS2.

TAS2: 2 years. Do not use with TAS1.

CSS: 1 year mission critical levels of support. Options added to hardware and to software products. For hardware, this replaces what would be ordered for Availability Support in rows HW2 and HW3, but note that the 2YB option is still also required on purchase order. For software support in the CSS environment, the CSS OTx/OVx are structured as alternatives to the OS6 options for each software product.

OSY*: Enablement included with initial purchase of A5951A for the following specific software products:

- LUN Configuration Manager XP (B9335A)
- Cache LUN XP (B9345A)
- Secure Manager XP (B9351A)
- Performance Manager XP (B7909A/AU)
- Resource Manager XP (B9358A)
- Auto LUN XP (B9340A)
- Continuous Access XP Extension (B9325A)
- Auto Path XP for NT (B7934A)
- Auto Path XP for AIX (B7936A)

Also included is set-up and customization of customer supplied Remote Control PC. Enablement is not included with the initial array purchase for all other products.

Option OSY must be ordered with all software products purchased AFTER the initial A5951A purchase, and is required, even initially, for other complex XP512 software products, including:

- Continuous Access XP (B9320A)
- Data Exchange XP (B9359A, B9360A, B9361A, and B9362A)
- HP SureStore E Command View XP (B9357A)

Table 4.7.40 summarizes the deliverables of the options and support suffixes.

Table 4.7.40 Summary of Deliverable of Options and Support Suffixes

Suffix/Option	Deliverable	Comments
Hardware Services		
2YB	Availability Support Contracts Trigger (System Support Option)	\$0 mandatory option at initial XP256 purchase
02N	Availability support for hardware, one year (Contract)	Recommended for developing quote and price for 3rd, 4th and 5th year pricing (if the customer has purchased 3YW, the 02N pricing should only be included for the 4th and 5th years)
3YW	Availability Support for one additional year (System Support Option)	System Support Option to extend Availability Support (hardware support) to a third year after the 2 years of initial hardware warranty support.
Technical Account Services (TAS) for Storage		
1YT	Provides Technical Account Services for Storage as described in 2.5.a) for 1 year (System Support Option)	Optional option for the frame product number (A5701A/B/C)
2YT	Provides Technical Account Services for Storage as described in 2.5.a) for 2 years (System Support Option)	Optional option for the frame product number (A5701A/B/C)
T00	Used for Technical Account Services for Storage (Contract)	Optional on H9267A to order TAS
Software Services		
OSY ¹	Provides software enablement services (new for the XP256) (System Support Option)	Already included for some software products associated with the XP256 ¹
OS6	Phone-in Assistance; hardware 24 × 7, one year (System Support Option)	Required for all software products associated with the XP256
3Y6	Phone-in Assistance; hardware 24 × 7, three years (System Support Option)	Can be purchased, instead of OS6, for all software products associated with the XP256 to obtain OS6 levels of software services for three years
H00	Phone-in Assistance (Contract)	Required for 2nd year support for software. Recommended for developing the second to fifth year support pricing or years 4 and 5 if #3Y6 used.
H24	Phone in Assistance 24 × 7 (Contract) Must be used in addition to #H00 to obtain 24 × 7 Phone In assistance.	Required for second year support for software. Recommended for developing the second to fifth year support pricing or years 4 and 5 if #3Y6 used.
L00	License to Use Updates (Contract)	Required for second year support for software. Recommended for developing the second to fifth year support pricing or years 4 and 5 if #3Y6

¹ Only specific products include enablement as part of the initial array purchase. Option OSY must be purchased for all other software products including:

- Continuous Access XP (B9320A)
- Data Exchange XP (B9359A, B5960A, B5961A and B5962A)
- HP SureStore E Command View XP (B9357A)

Heterogeneous and Multivendor Host Connectivity

All necessary services to plan, design, implement, and maintain all XP256 hardware/software on the most common OSs of HP-UX (HP hardware), MPE/iX, and NT (on any major vendor's hardware) are available today from HP. For any other non-HP server or OS the following 3 steps should be followed to ensure success:

Step 1. Use the following Summary and Table as an initial guide.

Table 4.7.41 High Level Summary of Heterogeneous OS Connectivity

	HP-UX, MPE/iX, and NT on any hardware	Sun	Others
Simple configuration, matches XP512 heterogeneous connectivity summary	Includes HP Services support is adequate, TAS recommended	HP Services Installation and field support is best effort. SWAT teams are in place until formal intro. Contact local ASO mgmt.	HP Services Installation and field support is best effort only. Expect problems. Contact local ASO mgmt. for delivery capabilities.
Minor modification to connectivity summary		Included HP Services support is NOT adequate. Requires H9273A #301. TAS and additional ASE time is highly recommended. Expect problems.	NOT recommended. Expect significant problems. Contact local ASO mgmt. for delivery capabilities.
Highly complex configuration, never tested or installed elsewhere	Included HP Services support is NOT adequate. Requires H9273A #301. TAS and additional ASE time is highly recommended. Expect problems.		

The latest updated version of the following info can be found on:

http://sde.mayfield.hp.com/projects/alliance/hitachi/XP_Services_Matrix_A_100.doc

Services	HP Services Capabilities to Deliver					
	MPE/iX	HP-UX	NT	Solaris ¹	Linux	AIX
Environmental (total IT) Support						
Personalized System Support	Yes	Yes	Yes			
Critical Systems Support	Yes	Yes	Yes			
Business Continuity Support	Yes	Yes	No	No	No	No
3 Nines for HP NetServers/NT		N/A	Yes	N/A	N/A	N/A
5 Nines for HP-UX		Yes	No	No	No	No
Customer Support Plan (CSP)	Yes	Yes	Yes	Yes	Yes	Yes
XP256 Support Services						
Technical Account Servers (TAS) for Storage/SAN	Yes	Yes	Yes	Yes	Yes	Yes
SureStore Software Enablement Service	Yes	Yes	Yes	Yes	Yes	Yes
SureStore LUN/SAN Implementation Service	Yes	Yes	Yes	Yes	Yes	Yes
SureStore Business Copy Implementation Service	Yes	Yes	Yes	Yes	Yes	Yes
SureStore Critical Data Availability Service	Yes	Yes	Yes	Yes	Yes	Yes
SureStore Performance Optimization Service	Yes	Yes	Yes			
SureStore Technical Assistance	Yes	Yes	Yes	Yes	Yes	Yes
SureStore Storage System Performance Reviews	Yes	Yes	Yes			
SureStore Storage/Data Manager Operational Reviews	Yes	Yes	Yes			
SAN Manager Support Services						
SureStore E SAN Manager (DM) Implementation Service	No	Yes				
SureStore E SAN Manager (LM) Implementation Service	No	No	Yes	Yes		
Connectivity Maintenance Support ³	Yes	Yes	Yes	Yes	Yes	Yes
Support Services for Host Servers						
Hardware Call-to-Repair	Yes	Yes	Yes ²	No	Yes ²	No
Reactive hardware support	Yes	Yes	Yes	Yes ¹	Yes	No
Reactive software support	Yes	Yes	Yes	Yes ¹	Yes	No

Services	HP Services Capabilities to Deliver					
	MPE/iX	HP-UX	NT	Solaris ¹	Linux	AIX
Consulting Services						
SureStore Storage/SAN Assessment	Yes	May '00	May '00	Sep '00		
SureStore Storage/SAN Architecture	Yes	Yes	Yes	Sep '00		
SureStore Data Migration Service	Yes	Yes	Yes	Sep '00		
SureStore Zero Downtime Backup/OmniBack	Yes	Yes	Yes	Sep '00		
SureStore Zero Downtime Backup/Veritas	Yes	May '00	May '00	May '00		
SureStore Availability Services	Yes	Yes	Yes	Sep '00		
SureStore Performance Services	Yes	Yes	Yes	Sep '00		
SureStore E SAN Manager Integration/Implementation	Yes	Jul '00	Jul '00	TBD		
Customer Education						
Managing the HP SureStore E Disk Array XP256	Yes	Yes				
Finance Program						
HP Technology Finance	Yes	Yes	Yes	Yes	Yes	Yes

¹ Sun Solaris – Solaris OS support can be custom quoted at this time on a deal-by-deal basis. Check with your local HP support sales rep regarding areas of coverage.

Note that Solaris connectivity and XP512 Support Services are available.

² Hardware Call to Repair is available on all current Dell and Compaq server models in major countries worldwide.

³ Connectivity maintenance support would include services such as isolating/fixing a XP512 hardware problem, being able to install new XP512 software products and answer usage and implementation questions on these products, and identifying server HBA and storage driver problems that would be referred to the appropriate server support provider. No design capabilities in this service.

Step 2. If your potential storage sale is connected to a server with an OS that does not yet have a YES in the tables above, and if HP Services has indicated that custom services are not currently available, the sale can only proceed if other resources can be obtained to do the planning-designing-implementing services that are required to create a total, successful solution. These resources may come from Global Sales and Services (GSS), from ESBUX/PSO division technical resources, from HP storage peaked system integrators (SIs), or from very storage experienced customers.

The “Environmental Support” and “Support Services for Host Servers” services described in the above table refers to HP’s ability to provide the full range of support for the OSs including phone-in consulting, troubleshooting, patching, etc. with varying degrees of mission critical resource levels as indicated by the various services listed. These services, although very helpful in creating mission critical environments, are NOT REQUIRED for non-HP Server hardware or OSs if simple XP512 “connectivity maintenance support” is needed.

However, selective “XP512 Support Services” and “Consulting Services” significantly increase the chance of success and should be considered if complex solutions are to be initially created.

Step 3. In all cases, the on-going maintenance phase for the solution, once it is running smoothly, can be handled by HP Services. Connectivity Maintenance Support would include services such as isolating/fixing a XP512 hardware problem, being able to install new XP256 software products and answer usage and implementation questions on these products, and identifying server HBA and storage driver problems that would be referred to the appropriate server support provider. But, there is no solution design service implied in this connectivity support level.

Support Ordering Examples Years 1 Through 3

Sample Sales Order (Year 1)

This provides an example of a sales order for a single frame. The software products require option OS6. Implementation service offerings are optional. In the example below the customer has elected to purchase an additional SSE LUN/SAN Implementation service (H9273A –301).

Table 4.7.42 Example-XP512 Hardware Support Contract Renewal

Quantity	Product Number	Option Number	Description
1	A5951A		XP512 Disk Control Frame
1	A5951A	2YB ¹	ASE Technical Assistance (zero price option to trigger backend processes)
1	A5956A		8-port Fiber Channel Adapter Pair for Short Wave
4	A5962A		2-GB Nonvolatile Cache Memory Module
1	A5963A		256 MB Shared memory Module
1	A5964A		Array Control Processor (ACP) Pair
1	A5965A		XP256 Disk Frame – 60 Hz
23	A5967A		47 GB 10k rpm FC Disk Array Group (4 disk) RAID 5
1	A5967S		47 GB Spare Disk Drive
32	A5750A	001	16 meter FC Cable
1	A5752A		Fibre Optic Cables (ESCON)
1	B9353A		Secure Manager XP 5 TB LTU
1	B9351A	OS6	First Year of System Support Option
1	B7909A		Performance Manager XP, LTU on 1 PC
1	B7909A	OS6	First Year of System Support Option
1	B9357A		Command View XP (on one PC)
1	B9357A	OS6	First Year of System Support Option
1	B9357A	OSY	Technical Account Services
1	B9337A		LUN Configuration Manager XP, 5 TB LTU
1	B9337A	OS6	First Year of System Support Option
1	H9273A		SSE Support Enhancement
1	H9273A	301 ²	SSE LUN/SAN Implementation

¹ Required

² Optional/Recommended

Sample Contract (Year 2)

The following provides an example of the support contract renewal for the software purchased in the above example. The objective of the support contract is to continue software support into the second year of the product warranty. The XP512 disk array comes with a 2-year warranty, and therefore a hardware support contract renewal is not required in the second year.

Note this is a support contract. To obtain a quote or process a support order, contact the Support Business Administration group.

Also note the TAS service was initially purchased for the first year using the option #1YT. In future years this service is purchased using H9267A #T00.

Table 4.7.43 Example-XP512 Software Support Contract Renewal

Quantity	Product Number	Option Number	Description
1	B9353A	L00 ¹	LTU Update: Secure Manager XP 5 TB
1	B9353A	H00 ¹	Phone Assist: Secure Manager XP 5 TB
1	B9353A	H24 ¹	24×365 Phone Assist: Secure Manager XP 5 TB
1	B7909A	L00	LTU Update: Performance Manager
1	B7909A	H00	Phone Assist: Performance Manager
1	B7909A	H24	24×365 Phone Assist: Performance Manager
1	B9357A	L00	LTU Update: HP SureStore E Command View XP
1	B9357A	H00	Phone Assist: HP SureStore E Command View XP
1	B9357A	H24	24×365 Phone Assist: HP SureStore E Command View XP
1	B9337A	L00	LTU Update: LUN Configuration Manager
1	B9337A	H00	Phone Assist LUN Configuration Manager
1	B9337A	H24	24×365 Phone Assist: LUN Configuration Manager
1	H9267A	T00	SSE Technical Account Services for Storage

¹ Required**Sample Contract (Year 3+)**

This provides an example of the support contract which provides the same level of support the customer enjoys during the warranty period. The 02N support product will provide the hardware portion of the “Availability” support. The 02N support product number is new and exclusive to the XP512. This support product number must be appended to each of the hardware product numbers that make up the XP512 product configuration.

Table 4.7.44 Example-XP512 Hardware/Software Support Contract (extending warranty period support)

Quantity	Product Number	Option Number	Description
1	A5951A	02N ¹	Availability Support
4	A5962A	02N	Availability Support
1	A5963A	02N	Availability Support
1	A5964A	02N	Availability Support
1	A5965A	02N	Availability Support
23	A5967A	02N	Availability Support
1	A5967S	02N	Availability Support
32	A5750A	02N	Availability Support
1	A5752A	02N	Availability Support
1	A5956A	02N	Availability Support
1	B9353A	L00 ¹	LTU Update: Secure Manager XP 5 TB
1	B9353A	H00 ¹	Phone Assist: Secure Manager XP 5 TB
1	B9353A	H24 ¹	24×365 Phone Assist: Secure Manager XP 5 TB
1	B7909A	L00	LTU Update: Performance Manager
1	B7909A	H00	Phone Assist: Performance Manager
1	B7909A	H24	24×365 Phone Assist: Performance Manager
1	B9357A	L00	LTU Update: HP SureStore E Command View XP
1	B9357A	H00	Phone Assist: HP SureStore E Command View XP
1	B9357A	H24	24×365 Phone Assist: HP SureStore E Command View XP
1	B9337A	L00	LTU Update: LUN Configuration Manager
1	B9337A	H00	Phone Assist LUN Configuration Manager
1	B9337A	H24	24×365 Phone Assist: LUN Configuration Manager
1	H9267A	T00 ²	SSE Technical Account Services for Storage

¹ Required² Optional-Recommended

The example support contract above can also be used to quote support for years 4, 5 and beyond.

HP SureStore E Disk Array XP512 Configuration Template

Table 4.7.45 provides a step by step guide for specifying the configuration of an XP512.

Table 4.7.45 Configuration Steps for the XP512

Steps	Comments
1. Select the raw disk capacity desired	
Determine the quantity and type of disks desired (18, 47 or 73 GB) Calculate the number of 4-disk array groups	
2. Select the control frame components.	One DKC contains 1 ACP pair. Choose 3-phase or 1-phase AC power For 1-phase, choose 60 Hz or 50 Hz 1 GB cache, 512 MB shared memory base configuration Redundant power supply needed for greater than two CHIP pairs
Host interface (quantity and type) Additional cache Additional cache board Additional shared memory Additional array control processor pairs Redundant power supply for CHIP pairs 3 to 4	SCSI, Fiber Channel, ExSA (ESCON compatible) Cache can be configured up to 32 GB (see table) An additional cache board is needed for > 16 GB cache memory For SCSI, must use router A5814A to convert SCSI to FC
3. Select disk array frames and the array groups	Choose 3-phase or 1-phase AC power Choose 50-Hertz or 60-Hertz operation for the desired AC power Follow the minimum/maximum array group requirements for disk frames R1, R2, L1, and L2, as required.
4. Select host interface cables	
5. Select software and licenses	
6. Select upgrade products including spare disk drives	
7. Select hardware and software services and support features	
8. Import a configuration generated by Watson or SBW	

Simplified Manual Procedures for XP512 Configurations

Cautions and Warnings

These procedures make many general assumptions about the most common XP512 configurations and do not cover mixed drives sizes, mixed RAID-0/1 or RAID-5 configurations or many other special cases (which are supported). Please contact the appropriate GSS team (1-447-7070) for a more detailed analysis or review. Some of the selections in these procedures are not orderable from the factory. The factory will configure and ship based on the following rules:

All Subsystems from the factory will be configured with RAID 5.

LUN configurations will follow a "Fixed Standard" where:

All 47 GB Array Groups installed will be configured Open 9: 19 LDEVs per group.

All 18 GB Array Groups installed will be configured Open 3: 22 LDEVs per group

Intent

To provide rules of thumb and describe the basic configuration process as an educational tool, as well as provide enough information for the manual selection of required components as a starting point for a valid configuration (first order approximation). These procedures do not cover spares analysis and selection or storage requirements for the Business Copy or other additional software.

General Steps

The following general steps are required to determine the basic configuration parameters:

5. DKC
6. Disk Storage and Structure
7. Cash and Shared Memory Sizes
8. Front-end Interfaces
9. Software, Installation and Support
10. Console Requirements

DKC

A. Select DKC AC Power

3-phase and 1-phase AC Power is available for the XP512. Choose the appropriate product number for the desired phase option and mode (60Hz or 50Hz).

Disk Storage and Structure

B. Select Disk Size and RAID Level

Three drive sizes are currently supported with either RAID level. Choose the drive size and RAID level that most closely matches your existing drives and protection needs:

	RAID-1/0	RAID-5
18 GB	yes	yes
47 GB	yes	yes
73 GB	Yes	yes

RESULTS:

Disk Size: _____

RAID Level: _____

C. Select Emulation Type (Open3, Open 8, or Open9)

For 47-GB Array Groups, Open 9 emulation allows for the most efficient use of raw disk capacity. Its larger LDEV size (7.347 GB) also allows optimum scalability into larger configurations. Open 3 is used for 18-GB drives.

RESULT:

Open: _____

D. Compute Number of Array Groups Required

Consult the online Usable Disk Capacity Spreadsheet to compute the number of Array Groups required for the desired amount of useable storage.

RESULT:

Number of Array Groups: _____

E. Select ACP Pairs and DKU Cabinet Types

The following loading sequence is the recommended default and will provide the highest level of performance. Choose product numbers for the desired AC Power (3-phase or 1-phase) and mode (50Hz or 60Hz).

RESULTS:

ACP Pairs: _____
Cabinet Type: _____

Cache and Shared Memory Sizes

Use the Table shown earlier in this guide to determine the recommended minimum cache size. Simply use the useable storage capacity to select the minimum cache size. If the Cache LUN XP, LUN Configuration Manager XP, and Continuous Access XP Extension are being proposed, the cache memory requirements should be increased.

RESULTS:

Cache Size: _____
Shared Memory Size: _____

Front-end Interfaces

Open systems host connections are Fibre Channel based. Follow the appropriate procedures below:

SCSI Based Connections—Need to use the router product A5814A that converts SCSI on the host side to FC on the XP512 side. See configurations that are supported.

Fibre Channel Based Connections—One to four Client-Host Interface Processor pairs (CHIPS) can be specified, each pair providing 8 FC ports. Select the correct number based on the number of hosts and their connectivity and performance needs. Order the additional power supply for CHIP pairs 3 to 4.

Software, Installation and Support

See the configuration guide chapters for these topics.

Console Requirements

Command View XP requires an NT workstation or server. (See Command View XP section for details.)

HP SureStore E Disk Array XP512

Structured Solution Programs

	Description		Product #	Opt#	Ref. Price
1.0	HP SureStore E Disk Array XP512 Solution	[x]	A5950A		
2.0	SureStore E Disk Array XP512 Control Frame (1 required) Base DKC configuration is 3 phase 50/60 Hz . For single phase, select one single phase power option				
	XP512 Disk Control Frame with 1 ACP pair, Redundant Power Supplies for CHIP prs 1 and 2, HP Firmware (microcode) and Continuous Track XP with Modem and pcAnywhere	[]	A5951A		\$230,714
	XP512 Disk Control Frame				
	1 GB Cache Memory Module, Quantity 2				
	256 MB Shared Memory Module, Quantity 2				
	FC Device Cable Set, DKC to R1U-DKU				
	SNMP Support Kit				
	60 Hz Single Phase Power, DKC	[]	A5951A	#001	\$0
	Power Cable Kit, Single Phase 60HZ DKC				
	AC Box Kit for Single Phase DKC				
	50 Hz Single Phase Power, DKC	[]	A5951A	#002	\$0
	Power Cable Kit, Single Phase 50HZ DKC				
	AC Box Kit for Single Phase DKC				
	Delivery Trigger for Services (required)	[x]		2YB	
2.1	Client-Host Interface Processor pairs (Min1 pr Max 4 pr)				
	4 Port ExSA Channel Adapter Pair	[]	A5953A		\$31,540
	8 Port ExSA Channel Adapter Pair	[]	A5954A		\$63,080
	8 Port Fiber Channel Adapter Pair for Short Wave	[]	A5956A		\$90,468
2.2	Additional DKC Power Supply for CHIP pairs 3 and 4				
	Additional CHIP Power Supply	[]	A5961A		\$19,424
2.3	Additional Nonvolatile Cache (Min 0, Max 32 GB including 2 GB cache in base DKC configuration)				
	2 GB Cache Memory Module	[]	A5962A		\$58,500
2.4	Additional Cache Platform Board (Min 0, Max 1) Required for cache beyond 16 GB including 2 GB in base DKC configuration.				
	Additional Cache Platform Board	[]	A5960A		\$9,408
2.5	Additional Shared Memory (Min 0, Max 1,280 MB including 512 MB Shared Memory in base DKC configuration)				
	256 MB Shared Memory Module	[]	A5963A		\$9,028
2.6	Additional Array Control Processor (Min 0, Max 4 including 1 ACP pair in base DKC configuration)				
	Array Control Processor (ACP) pair	[]	A5964A		\$31,450
2.7	DKU Frame L1 Interconnect - FC Device Cable Set. Required if DKU is configured to position L1. (No cables required for DKU in position R1). Min 0, Max 1.				
	FC Device Cable Set, DKC to L1 or R1 DKU	[]	A5974A		\$1,785
3.0	Disk Array Frame (Min 1 position R1, Max 6) Must select one option and must match Power option of DKC, no intermixing of power options. FC Device Cable Set A5974A required for position L1 DKU.				
	XP512 Disk Array Frame (Must select one power option)	[]	A5965A		\$43,950
	XP512 Disk Array Frame				
	Disk Canister Mount Platform				
	3 Phase, 60 Hz, for DKU	[]	A5965A	#001	\$0
	AC Box for 3 Phase DKU				
	Power Cable Kit, 3 phase, 60 Hz DKU				
	3 Phase, 50 Hz, for DKU	[]	A5965A	#002	\$0
	AC Box for 3 Phase DKU				
	Power Cable Kit, 3 phase, 50 Hz DKU				
	Single Phase, 60 Hz, for DKU	[]	A5965A	#003	\$0
	AC Box for Single Phase, DKU				
	Power Cable Kit, single phase, 60 Hz DKU				
	Single Phase, 50 Hz, for DKU	[]	A5965A	#004	\$0
	AC Box for Single Phase, DKU				
	Power Cable Kit, single phase, 50 Hz DKU				
3.1	Disk Array Groups (min 1 max 126)(23 R1 and L1)(24 R2 and L2) (16 R3 and L3)				

	Description		Product #	Opt#	Ref. Price
	18 GB 10k rpm, FC Disk Array Group - 4 drives per group	[]	A5966A		\$25,568
	47 GB 10k rpm, FC Disk Array Group - 4 drives per group	[]	A5967A		\$32,521
	73 GB 10k rpm, FC Disk Array Group - 4 drives per group	[]	A5968A		\$39,950
3.2	Spare Disk Drives (Min 1 per array group size) Max Spare Drives per position: 4 in R1 and 4 in L1.				
	18 GB 10k rpm, FC Spare Disk Drive	[]	A5966S		\$6,392
	47 GB 10K rpm, FC Spare Disk Drive	[]	A5967S		\$8,130
	73 GB 10K rpm, FC Spare Disk Drive	[]	A5968S		\$9,988
3.3	DKU Frame Interconnect - FC Device Cable Set. DKUs in positions R2, R3, L2 and L3 require one set A5975A cable for each position configured. Min 0, Max 4. (No cables required for DKU position R1. One cable set A5974A required for DKU position L1 only.)				
	FC Device Cable Set, DKU to R2, R3, L2, or L3 DKU	[]	A5975A		\$1,462
	END SSP				
	Host Interface Cables				
	Fibre Channel Cables		A5750A		
	16 meter Fibre Channel Cable, 50 micron, multimode	[]	A5750A	#001	\$136
	50 meter Fibre Channel Cable, 50 micron, multimode	[]	A5750A	#002	\$446
	100 meter Fibre Channel Cable, 50 micron, multimode	[]	A5750A	#003	\$672
	Fibre Optic Cables (ESCON)		A5752A		
	Fiber Optic Cable - 7m	[]	A5752A	#001	\$213
	Fiber Optic Cable - 13m	[]	A5752A	#002	\$234
	Fiber Optic Cable - 22m	[]	A5752A	#003	\$276
	Fiber Optic Cable - 31m	[]	A5752A	#004	\$315
	Fiber Optic Cable - 46m	[]	A5752A	#005	\$378
	Fiber Optic Cable - 61m	[]	A5752A	#006	\$446
	Fiber Optic Cable - 92m	[]	A5752A	#007	\$645
	Fiber Optic Cable - 122m	[]	A5752A	#008	\$761

XP512 Upgrades

	Description		Product #	Opt. #	Ref. Price
	Order Configuration Rules: 1. Upgrade products are bundled with the solution, NOT integrated 2. Upgrades cannot be on the same order section with a SSP A5950A system order. 3. Cables and Software can be on the same order section as the upgrades.				
	UPGRADE PRODUCTS				
•	4 Port ExSA Channel Adapter Pair	[]	A5953U		\$35,325
•	8 Port ExSA Channel Adapter Pair	[]	A5954U		\$70,650
•	8 Port Fiber Channel Adapter Pair for Short Wave	[]	A5956U		\$101,324
•	Additional CHIP Power Supply	[]	A5961U		\$21,755
•	2 GB Cache Memory Module	[]	A5962U		\$65,520
•	Additional Cache Platform Board	[]	A5960U		\$10,537
•	256 MB Shared Memory Module	[]	A5963U		\$10,111
•	Array Control Processor (ACP) Pair	[]	A5964U		\$35,224
•	XP512 Disk Array Frame (Must select one power option)	[]	A5965U		\$49,224
	XP512 Disk Array Frame				
	Disk Canister Mount Platform				
•	3 Phase, 60 Hz, for DKU	[]	A5965U	001	\$0
	AC Box for 3 Phase DKU				
	Power Cable Kit, 3 phase, 60 Hz DKU				
•	3 Phase, 50 Hz, for DKU	[]	A5965U	002	\$0
	AC Box for 3 Phase DKU				
	Power Cable Kit, 3 phase, 50 Hz DKU				
•	Single Phase, 60 Hz, for DKU	[]	A5965U	003	\$0
	AC Box for Single Phase, DKU				

	Description		Product #	Opt. #	Ref. Price
	Power Cable Kit, single phase, 60 Hz DKU				
•	Single Phase, 50 Hz, for DKU	[]	A5965U	004	\$0
	AC Box for Single Phase, DKU				
	Power Cable Kit, single phase, 50 Hz DKU				
•	18 GB 10k rpm, FC Disk Array Group - 4 drives per group	[]	A5966U		\$28,636
•	47 GB 10k rpm, FC Disk Array Group - 4 drives per group	[]	A5967U		\$36,424
•	73 GB 10k rpm, FC Disk Array Group - 4 drives per group	[]	A5968U		\$44,744
•	18 GB 10k rpm, FC Spare Disk Drive	[]	A5966SU		\$7,159
•	47 GB 10K rpm, FC Spare Disk Drive	[]	A5967SU		\$9,106
•	73 GB 10K rpm, FC Spare Disk Drive	[]	A5968SU		\$11,186
•	FC Device Cable Set, DKC to L1 or R1-DKU Upgrade	[]	A5974U		\$1,999
•	FC Device Cable Set, DKU to R2, R3, L2, or L3 DKU Upgrade	[]	A5975U		\$1,637

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	Description		Product #	Opt#	Price
	Software				
	All LTU products for initial purchase or upgrade				
	Data Mirroring/Security				
•	Continuous Access XP Media	[]	B9320A		N/C
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
	Software Enablement Option (required)	[x]		OSY	\$9,105
•	Continuous Access XP Media For XP512 includes RAID Manager	[]	B9320A	002	N/C
•	Continuous Access XP 1 TB LTU	[]	B9321A		\$38,500
	First Year of System Support Option (required)	[x]		OS6	\$6,930
•	Continuous Access XP 5 TB LTU	[]	B9322A		\$125,000
	First Year of System Support Option (required)	[x]		OS6	\$22,500
•	Continuous Access XP 10 TB LTU	[]	B9323A		\$173,500
	First Year of System Support Option (required)	[x]		OS6	\$31,230
•	Continuous Access XP Extension Media	[]	B9325A		N/C
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
•	Continuous Access XP Ext. Media For XP512	[]	B9325A	002	N/C
•	Continuous Access XP Ext. 1 TB LTU	[]	B9326A		\$9,500
	First Year of System Support Option (required)	[x]		OS6	\$1,710
•	Continuous Access XP Ext. 5 TB LTU	[]	B9327A		\$31,000
	First Year of System Support Option (required)	[x]		OS6	\$5,580
•	Continuous Access XP Ext. 10 TB LTU	[]	B9328A		\$43,000
	First Year of System Support Option (required)	[x]		OS6	\$7,740
•	Business Copy XP Media	[]	B9330A		N/C
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
•	Business Copy XP Media For XP512 includes RAID Manager	[]	B9330A	002	N/C
•	Implimentation Service (#302 or #303 required)	[x]	H9273A		N/C
•	Implimentation Service for Simple environments	[]	H9273A	302	\$14,400
•	Implimentation Service for Complex environments	[]	H9273A	303	\$28,800
•	Business Copy XP 1 TB LTU	[]	B9331A		\$29,000
	First Year of System Support Option (required)	[x]		OS6	\$5,220
•	Business Copy XP 5 TB LTU	[]	B9332A		\$94,000
	First Year of System Support Option (required)	[x]		OS6	\$16,920
•	Business Copy XP 10 TB LTU	[]	B9333A		\$131,000
	First Year of System Support Option (required)	[x]		OS6	\$23,580
•	Secure Manager XP Media	[]	B9351A		N/C

	Description		Product #	Opt#	Price
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$2,280
•	Secure Manager XP Media For XP512	[]	B9351A	002	N/C
•	Secure Manager XP 1 TB LTU	[]	B9352A		\$6,000
	First Year of System Support Option (required)	[x]		OS6	\$1,080
•	Secure Manager XP 5 TB LTU	[]	B9353A		\$20,000
	First Year of System Support Option (required)	[x]		OS6	\$3,600
•	Secure Manager XP 10 TB LTU	[]	B9354A		\$27,000
	First Year of System Support Option (required)	[x]		OS6	\$4,860
•	Auto Path XP for NT	[]	B7934A		\$16,000
	First Year of System Support Option (required)	[x]		OS6	\$2,880
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$4,560
•	Auto Path XP for AIX	[]	B7936A		N/C
	First Year of System Support Option (required)	[x]		OS6	\$5,220
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$4,560
•	Auto Path XP for AIX, Work Group Server LTU	[]	B7936A	001	\$29,000
•	Auto Path XP for AIX, Enterprise Server LTU	[]	B7936A	002	\$64,000
•	Upgrade from Workgroup to Enterprise LTU	[]	B7936A	003	\$35,000
•	Auto Path for W2K/Pentium Media	[]	B9500A		\$0
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$4,560
•	Auto Path for W2K/Pentium 1 Server LTU	[]	B9501A		\$5,995
	First Year of System Support Option (required)	[x]		OS6	\$,840
•	Auto Path for W2K/Pentium 5 Server LTU	[]	B9502A		\$19,500
	First Year of System Support Option (required)	[x]		OS6	\$2,730
•	Auto Path for W2K/Pentium 10 Server LTU	[]	B9503A		\$29,975
	First Year of System Support Option (required)	[x]		OS6	\$4,200
•	Auto Path for W2K/Pentium 25 Server LTU	[]	B9504A		\$59,975
	First Year of System Support Option (required)	[x]		OS6	\$8,400
	Performance				
•	Cache LUN XP Media	[]	B9345A		N/C
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$2,280
•	Cache LUN XP Media For XP512	[]	B9345A	002	N/C
•	Cache LUN XP 1 TB LTU	[]	B9346A		\$10,000
	First Year of System Support Option (required)	[x]		OS6	\$1,800
•	Cache LUN XP 5 TB LTU	[]	B9347A		\$33,000
	First Year of System Support Option (required)	[x]		OS6	\$5,940
•	Cache LUN XP 10 TB LTU	[]	B9348A		\$45,000
	First Year of System Support Option (required)	[x]		OS6	\$8,100
•	Performance Manager XP	[]	B7909A		\$12,500
	First Year of System Support Option (required)	[x]		OS6	\$2,250
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$4,560
•	Auto LUN XP Media	[]	B9340A		N/C
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$4,560
•	Auto LUN XP Media For XP512	[]	B9340A	002	N/C

	Description		Product #	Opt#	Price
•	Auto LUN XP 1 TB LTU	[]	B9341A		\$20,000
	First Year of System Support Option (required)	[x]		OS6	\$3,600
•	Auto LUN XP 5 TB LTU	[]	B9342A		\$65,000
	First Year of System Support Option (required)	[x]		OS6	\$11,700
•	Auto LUN XP 10 TB LTU	[]	B9343A		\$90,000
	First Year of System Support Option (required)	[x]		OS6	\$16,200
	Array Management				
•	HP SureStore E Command View XP	[]	B9357A		N/C
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	\$4,320
	Software Enablement Option (required)	[x]		OSY	\$4,560
•	HP SureStore E Command View XP For New XP512 Installations	[]	B9357A	002	\$24,000
	Includes Remote Control XP For XP512				
	Includes Try'n Buy License Certificates For:				
	LUN Config Manager XP Media For XP512				
	Auto LUN XP Media For XP512				
	Cache LUN XP Media For XP512				
	Secure Manager XP Media For XP512				
•	Remote Control XP Upgrade For XP512	[]	B9357A	004	\$17,500
•	LUN Configuration Manager XP Media	[]	B9335A		N/C
	First Year of System Support Option zero-cost trigger (required)	[x]		OS6	N/C
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$4,560
•	LUN Configuration Mgr XP Media For XP512	[]	B9335A	002	N/C
•	LUN Configuration Mgr XP 1 TB LTU	[]	B9336A		\$9,000
	First Year of System Support Option (required)	[x]		OS6	\$1,620
•	LUN Configuration Mgr XP 5 TB LTU	[]	B9337A		\$29,000
	First Year of System Support Option (required)	[x]		OS6	\$5,220
•	LUN Configuration Mgr XP 10 TB LTU	[]	B9338A		\$41,000
	First Year of System Support Option (required)	[x]		OS6	\$7,380
	Mainframe Software				
•	Resource Manager XP	[]	B9358A		\$23,000
	First Year of System Support Option (required)	[x]		OS6	\$4,140
	Software Enablement Option (Included with initial array purchase, required for upgrade to an existing array)	[]		OSY	\$4,560
•	Resource Manager XP For XP512	[]	B9358A	002	N/C
•	Data Exchange XP For HP-UX	[]	B9359A		\$20,000
	First Year of System Support Option (required)	[x]		OS6	\$3,600
	Software Enablement Option (required)	[x]		OSY	\$4,560
•	Data Exchange XP HP-UX For XP512	[]	B9359A	002	N/C
•	Data Exchange XP For Windows NT	[]	B9360A		\$15,000
	First Year of System Support Option (required)	[x]		OS6	\$2,700
	Software Enablement Option (required)	[x]		OSY	\$4,560
•	Data Exchange XP Win NT For XP512	[]	B9360A	002	N/C
•	Data Exchange XP For Solaris	[]	B9361A		\$20,000
	First Year of System Support Option (required)	[x]		OS6	\$3,600
	Software Enablement Option (required)	[x]		OSY	\$4,560
•	Data Exchange XP Solaris For XP512	[]	B9361A	002	N/C
•	Data Exchange XP For AIX	[]	B9362A		\$20,000
	First Year of System Support Option (required)	[x]		OS6	\$3,600
	Software Enablement Option (required)	[x]		OSY	\$4,560
•	Data Exchange XP AIX For XP512	[]	B9362A	002	N/C