

RA8000/ESA12000

FC-AL Configurations

for Windows NT - Intel

COMPAQ
STORAGeworks

Application Note

3-Sep-99 AA-RH0RA-TE

Visit Our Web Site for the Latest Information

At Compaq we are continually making additions to our storage solutions product line. Please check our web site for more information on the complete line of Fibre Channel storage products, product certification, technical information, updates, and documentation. This information can be accessed through our web page at:

www.compaq.com/storageworks

NOTE

This application note describes RA8000/ESA12000 FC-AL standard configurations. For Fibre Channel Arbitrated Loop high availability configurations refer to "RA8000/ESA12000 FC-AL High Availability Configurations for Windows NT - Intel".

Enterprise Network Storage Architecture (ENSA)

Compaq StorageWorks RAID Array 8000 (RA8000 FC) and Enterprise Storage Array 12000 (ESA12000 FC) products are the latest in fully integrated Fibre Channel RAID storage solutions. These products provide the key initial step in delivering on Compaq's ENSA vision. ENSA addresses the issues that customers expect to face now and in the future. Both products address today's issues including: economical capacity growth, data protection, high availability, increased distance, multi-vendor platform support, and investment protection by being the base for building the ENSA vision.

Product Overview

The RA8000 and ESA12000 FC storage systems are based on a common architecture and offer customers centralized management, high availability, and exceptional performance and scalability in open systems environments. These products provide a Fibre Channel storage solution with industry leading SAN (Storage Area Network) support utilizing FC-AL (arbitrated loop) technology.

The RA8000 FC is a mid-range storage system available in a pedestal enclosure for departmental use in the office. It can also be installed in server racks for small data centers. An easy-to-deploy, flexible solution for open systems, the RA8000 supports up to 2.6 TB of storage.

The ESA12000 FC, designed for the data center, is available in three easy-to-order building blocks, each optimized for specific, high-capacity customer requirements. The ESA12000 FC offers unprecedented levels of storage, scaling in performance and capacity as user requirements increase.

These storage systems incorporate the latest in RAID technology providing RAID levels 0, 1, 0+1, adaptive 3/5, and non-RAID disks. Compaq's implementation of RAID capability assures that data availability will be maintained despite hardware failure. Features such as read ahead cache and mirrored write back cache improve or minimize the affect on performance while preserving data availability and supporting high availability.

The RA8000/ESA12000 FC platform kits contain the necessary operating system specific software and documentation needed to install, configure, and monitor your storage system. All platform kits include the StorageWorks Command Console (SWCC) for storage management operations including configuring, status inquiry and notification facilities. SWCC provides a user oriented graphical user interface (GUI) simplifying the most complex of storage management operations.

Performance Considerations

The performance of an application on a system that includes RA8000 or ESA12000 FC storage can be limited by many different components of the system. Some of the possible component limitations include the host CPU(s), memory size, the host bus adapter(s) (HBA), the fibre channel bus, the RAID controller, or the specific configuration of disks used behind the controller. The limiting factor can move to any of these components depending on the workload. Identifying the limits will assist in determining the best configuration for a given application.

Table 1 lists the upper limit performance specifications for the components of the RA8000 and ESA12000 FC storage systems based on testing using standard storage performance tests and methodologies. These numbers should be used to compare component level performance as a means to determine the best configuration from a performance perspective. User application tests may not necessarily reach these levels of performance as applications may perform additional levels of processing for each I/O. The controller specifications listed show both cache (no disk access) and media (with disk access) limitations.

To further aid in evaluating the performance aspects of specific configurations, additional information is included within each configuration section. The configurations are rated based on I/O performance (I/O's per second) - typical of small transfer applications such as databases and mail, and bandwidth performance (MB's per second) - typical of large transfer applications such as video and graphics. Note that other factors, such as connectivity needs, may require tradeoffs be made such that performance is a secondary consideration.

Table 1 Performance Maximums of FC-AL Components

Transfer Size	IO/sec (small transfer sizes, random access)		MB/sec (large transfer sizes, sequential access)	
	Read	Write	Read	Write
FC HBA - KGPSA-BC	15,500	14,250	86	51
FC Hub	25,000	25,000	100	100
Single HSG80 Controller (1 Active Port)	12,000 Cache 4,100 Media	9,000 Cache 4,000 Media	77 Cache 54 Media	50 Cache 44 Media
Single HSG80 Controller (2 Active Ports)	12,000 Cache 4,100 Media	9,000 Cache 4,000 Media	98 Cache 54 Media	100 Cache 47 Media
Dual HSG80 Controllers (2 Active/2 Standby Ports)	24,000 Cache 8,200 Media	18,000 Cache 8,000 Media	154 Cache 102 Media	101 Cache 88 Media
Dual HSG80 Controllers (4 Active Ports)	24,000 Cache 8,200 Media	18,000 Cache 8,000 Media	195 Cache 102 Media	178 Cache 88 Media

NOTE

FC Hub performance limits are theoretical. Actual measured performance is lower due to limits unrelated to the hub.

General Configuration Guidelines

Fibre Channel storage technology offers more configuration flexibility than parallel SCSI storage. This application note describes typical RA8000/ESA12000 FC Windows NT configurations based on the configuration maximums listed. This document is not intended to describe all possible configurations. For configurations not shown here, the configuration maximums should be used to determine the viability of a proposed configuration. It is strongly recommended that you not exceed the maximums listed.

The maximums and notes listed apply to all configurations, additional information specific to particular configurations is provided in each configuration section.

Configuration Maximums

- 500 meters per optical cable segment, 1 kilometer distance between server and storage
- The maximum number of FC HBAs per server is 4 (or the total allowed in the server if less than 4). When configuring more than one FC HBA in a single server, each HBA must be connected to a different fibre channel hub (i.e., different loop)
- Server maximums using Controller Transparent Failover Mode (assumes one FC HBA per server)
 - Up to 4 servers on a single FC hub with up to 2 storage systems - using 4 controllers with 2 active and 2 standby controller host ports per controller pair (refer to Configuration 7)
 - Up to 8 servers on two FC hubs (4 servers per hub) with 1 storage system - using 2 controllers with 2 active and 2 standby controller host ports (refer to Configuration 8)
- The maximum storage capacity stated (2.6 TB) assumes 36GB disks, increases in disk drive capacity will increase overall storage capacity for the same enclosure footprint

General Configuration Notes

- All single controller enclosure configurations can be upgraded to dual controller configurations
- Dual redundant controllers can be configured for Transparent Failover Mode or Multiple-Bus Failover Mode (Note: This application note describes Transparent Failover configurations only)
- All configuration diagrams show a front view of the storage system, Controller A is the top controller; Controller B is the bottom controller. Controller Host Port 1 is the left port; Host Port 2 is the right port
- Each storage system can be configured using SWCC or the Command Line Interface (CLI) configured through either the HSG80 controller maintenance serial port or a TCP/IP interface
- All configurations utilize ACS V8.3 (Array Controller Software) configured for FC-AL topology
- All configurations utilize short wavelength lasers and multi-mode fibre channel optical cables in each cable segment. Label both ends of each FC cable with the same unique identification marking (number, letter, etc.) prior to installation
- All configurations require the *Arbitrated Loop Physical Address* (ALPA) for each loop device be set to hard and be unique (refer to the product documentation for a list of valid addresses)
- All configurations require the Connection Name *Operating System* parameter set to "WINNT"
- By default the HSG80 Command Console LUN (CCL) is enabled. This must be disabled for Windows NT (using the CLI, "SET *controller* NOCOMMAND_CONSOLE_LUN")
- For configurations with more than one server on the same loop accessing the same controller host port;
 - Use the Connection Name *Unit Offset* value to set the range of unit numbers to be visible from each server (using the CLI, "SET *connection-name* UNIT_OFFSET = n")
 - Use the Unit *Connection Name* parameter to allow exclusive access to units from each server (using the CLI, "SET *unit-number* DISABLE_ACCESS_PATH = ALL
ENABLE_ACCESS_PATH = *connection-name*")
 - Set the ALPA to a unique hard address for each FC HBA
- For single controller configurations with two active controller host ports on the same loop;
 - Use the Connection Name *Unit Offset* value to set the range of unit numbers to be visible from controller host port 2

- For two enclosure (4 controller) configurations with more than one controller host port on the same loop, set the *ALPA* for each controller host port in the second enclosure to a different hard address (using the CLI, “SET controller PORT_1_AL_PA = nn”)
- Record the FC HBA *Worldwide ID* (WWID) IEEE address shown on the back of each FC HBA prior to installing into a server
- Use the recorded WWID to identify the connection name displayed from the CLI at the controller using the “SHOW CONNECTIONS” command
- Rename connection names. By default new connection names are automatically added to the controller connection name table as “!NEWCONnn” (where nn is a number from 1 to 32). The controllers add a connection when a path to an adapter from each active controller host port is detected. Once you have identified each connection using the FC HBA WWID, rename the connection names to a name meaningful to the specific configuration i.e., SERVER1P1, using the CLI, “RENAME *old-name new-name*”. (Note: Connection names can be a maximum of 9 characters)
- Each active controller host port on a loop presents one SCSI Target ID with up to eight LUNs to each FC HBA on the same loop. LUNs (logical units) can consist of single disks (JBOD), a storage set of multiple disks or a partition (up to 8), configured for a specific RAID level of 0, 1, 0 + 1, or 3/5

Configuration Descriptions

Table 2 lists the most common RA8000 / ESA12000 FC Windows NT configurations and the pages of this document where a description of capacities, configuration notes, and performance considerations are provided.

Table 2 Typical RA8000 / ESA12000 FC-AL Windows NT Configurations - Index

Configuration #	Description	Pages
1	One Server, Single Controller	5 – 6
2	One Server, Dual Controller Transparent Failover	7 – 8
3	One Server, Two Dual Controller Pairs Transparent Failover	9 - 10
4	Two Servers, Single Controller, Shared Storage Enclosure	11
5	Two Servers, Dual Controller Transparent Failover, Shared Storage Enclosure	12
6	Up to Four Servers, Dual Controller Transparent Failover, Shared Storage Enclosure	13 - 14
7	Up to Four Servers, Two Dual Controller Pairs Transparent Failover, Shared Storage Enclosure	15 - 16
8	Up to Eight Servers, Dual Controller Transparent Failover, Shared Storage Enclosure	17 - 18

Configuration Parts Lists

A list of parts for each specific configuration is provided at the end of this document following the configuration descriptions.

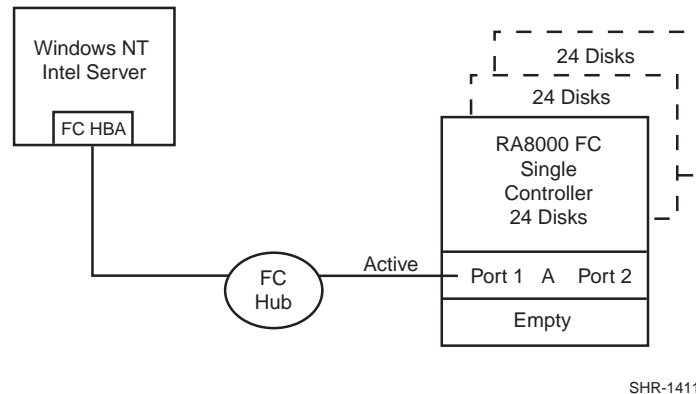
Additional Information/References

For reference information refer to Table 3 at the end of this application note. Refer to the documents listed for more details on the product installation and configuration.

Configuration 1 - One Server, Single Controller

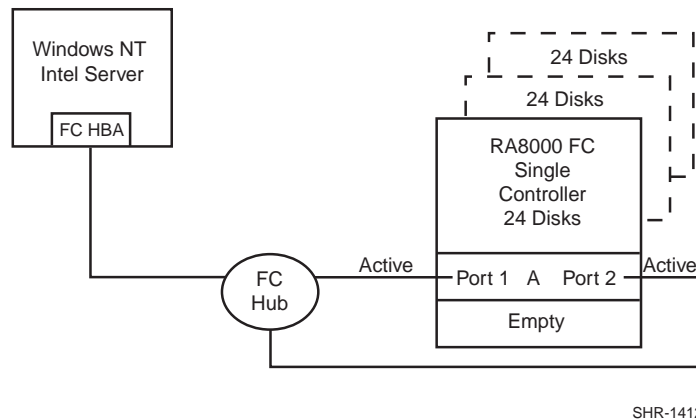
The single controller configuration (Figure 1) is an entry-level RA8000 or ESA12000 that can be expanded to accommodate additional storage capacity or performance needs as required. The configuration consists of an RA8000 or ESA12000 storage enclosure with a single HSG80 array controller on a single fibre channel loop. In the initial configuration a single controller host port (Port 1) is active providing up to 8 LUNs across up to 24 disks. An additional 48 disks can be added using two expansion enclosures. Additional servers can be added to this configuration as required using the existing hub (refer to configuration 6).

Figure 1 Configuration 1



LUN capacity can be doubled by the use of a third fibre channel cable connected to the second controller host port (Port 2), resulting in the configuration shown in Figure 2.

Figure 2 Configuration 1 with Double LUN Capacity



Configuration 1 Notes

- Single Fibre Channel Loop
- This configuration consists of a single HSG80 controller, controller failover is not available
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 8 LUNs with 1 active controller host port (first diagram). Suggested controller unit number assignment: Port 1 units D0 – D7. In this configuration, 1 logical connection is available
- Up to 16 LUNs with 2 active controller host ports (second diagram). Suggested controller unit number assignment: Port 1 units D0 – D7, Port 2 units D100 – D107. In this configuration, 2 logical connections are available
- Utilization of controller host port 2 requires a third cable and enabling of the port through the Command Line Interface (CLI) using the following commands:
“SET THIS PORT_2_TOPOLOGY = LOOP_HARD”
“SET THIS PORT_2_AL_PA = 72”

- In the Figure 1 configuration, one logical connection is available
- In the Figure 2 configuration, two logical connections are available
- Rename the connection names, i.e., SERVER1P1, SERVER1P2
- Set the connection name unit offset value for port 2, “SET SERVER1P2 UNIT_OFFSET = 100”

Configuration 1 Performance Considerations

The configuration as shown in the first diagram utilizes a single controller host port. This results in a throughput limit of 12,000(cache)/4,100(media) I/O/sec and a data rate limit of 77(cache)/54(media) MB/sec. Utilizing the second controller host port, as shown in the second diagram, results in a performance increase up the FC HBA limit of 86 MB/sec for data rate. The I/O rate limit however would be maintained at the single controller limit of 12,000(cache)/4,100(media) I/O/sec.

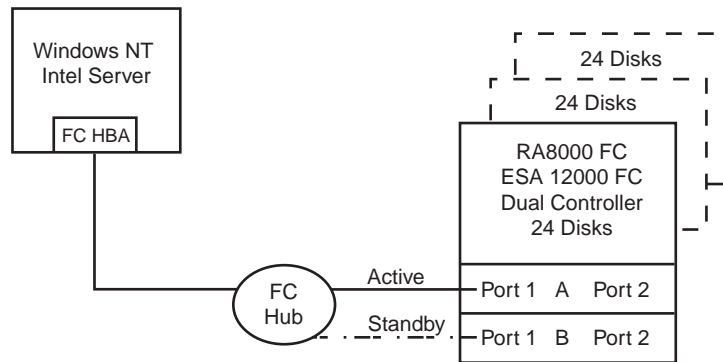
This is a general-purpose configuration that can be utilized for typical I/O applications and typical bandwidth applications. Using the second controller host port will increase performance to allow for moderately intensive I/O and moderately intensive bandwidth applications.

An alternative to the configuration shown in the second diagram is to segregate the controller host ports on separate loops by adding a second FC HBA in the server and connect this to a second separate hub cabled to controller host Port 2. This would increase the performance to the single controller 2 active port limit of 98(cache)/54(media) MB/sec. The I/O/sec rate would remain at 12,000(cache)/4,100(media) I/O/sec.

Configuration 2 - One Server, Dual Controller Transparent Failover

This two-controller configuration (Figure 3) provides dual redundant controllers configured in Transparent Failover mode. The configuration consists of an RA8000 or ESA12000 storage enclosure with two HSG80 array controllers on a single loop. In normal operation Controller A provides the active path for all storage sets to the server through Port 1. A second controller, Controller B is a hot standby. Controller B will automatically become active in the event of a failure in Controller A. All units being accessed through Port 1 of Controller A will become accessible through Port 1 of Controller B. In the initial configuration a single controller host port (Port 1) is active providing up to 8 LUNs across up to 24 disks. An additional 48 disks can be added using two expansion enclosures. Additional servers can be added to this configuration as required using the existing hub (refer to configuration 6).

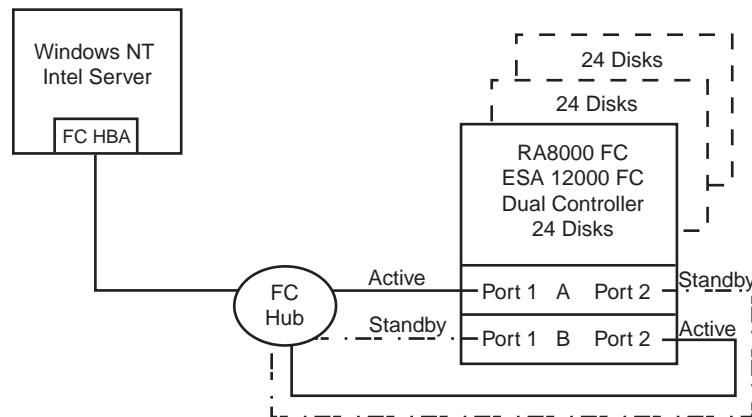
Figure 3 Configuration 2



SHR-1413

Utilization of the second controller (Controller B) as an active controller to increase performance and double LUN capacity can be accomplished without sacrificing redundancy. Two fibre channel cables, one connected to Controller A Port 2, and one connected to Controller B Port 2, result in the configuration shown in Figure 4. This configuration provides full controller redundancy in the event that Controller A or Controller B fails. In either failover scenario the surviving controller will transition a standby port to the active state providing access to all units to the server.

Figure 4 Configuration 2 with Increased Performance and Double LUN Capacity



SHR-1414

Configuration 2 Notes

- Single Fibre Channel Loop
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 8 LUNs with 1 active controller host port (first diagram). Suggested controller unit number assignment: Port 1 units D0 – D7
- Up to 16 LUNs with 2 active controller host ports (second diagram). Suggested controller unit number assignment: Port 1 units D0 – D7, Port 2 units D100 – D107
- Utilization of controller host Port 2 requires two fibre channel cables
- By default, setting the controller pair in Transparent Failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set the unit offset values to 0 for Port 1 and 100 for Port 2
- In the Figure 3 configuration 1 logical connections is available
- In the Figure 4 configuration 2 logical connections are available
- Rename the connection names. i.e., SERVER1P1, SERVER1P2

Configuration 2 Performance Considerations

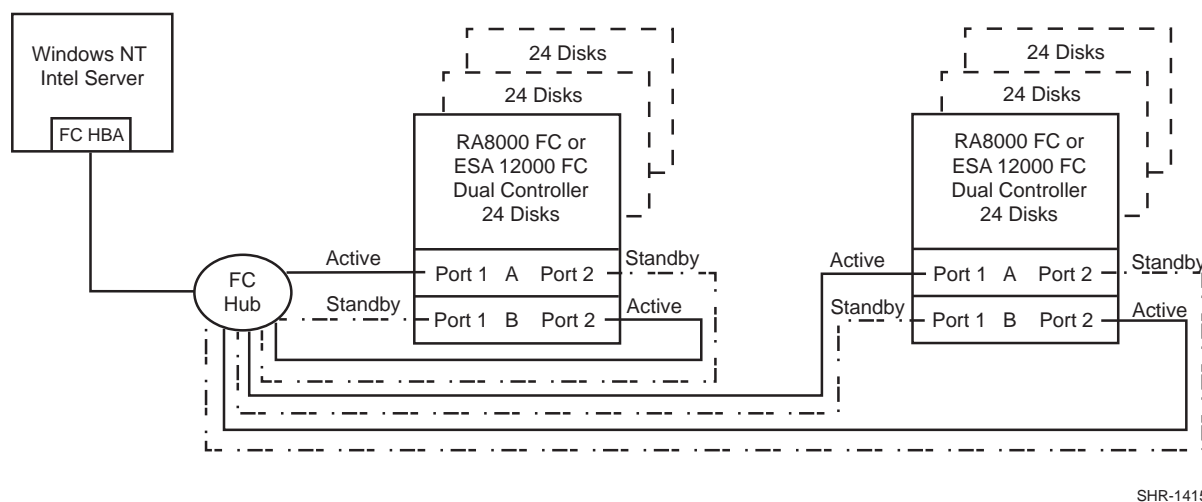
The configuration, as shown in the first diagram, utilizes a single controller host port resulting in a throughput limit of 12,000(cache)/4,100(media) I/O/sec and a data rate limit of 77(cache)/54(media) MB/sec. Utilizing the second controller host port, as shown in the second diagram, results in a performance increase up the FC HBA limit of 15,500 I/O/sec and 86 MB/sec data rate.

This is a general-purpose configuration that can be utilized for typical I/O applications and typical bandwidth applications. Using the second controller will increase performance to allow for moderately intensive I/O and moderately intensive bandwidth applications.

An alternative to the configuration shown in the second diagram is to segregate the controller host ports on separate loops by adding a second FC HBA in the server and connect this to a second separate hub cabled to controller host Port 2. This would increase the performance to the dual controller 2 active port limit of 24,000(cache)/8,200(media) I/O/sec and 154(cache)/102(media) MB/sec.

Configuration 3 - One Server, Two Dual Controller Pairs Transparent Failover

Configuration 3 (Figure 5) is a two dual-controller configuration providing two dual-redundant controller pairs using two RA pedestal enclosures or a single ESA enclosure. The controllers are configured in Transparent Failover mode providing controller redundancy in each storage enclosure. This configuration takes advantage of the high capacity of a single fibre channel loop allowing for expansion of storage capacity without the addition of another hub. As with configuration 2, full controller redundancy and two controller capacity is provided in both storage enclosures. In this configuration four active controller ports provide up to 32 LUNs across up to 48 disks. An additional 96 disks can be added using four expansion enclosures. Additional servers can be added to this configuration as required using the existing hub (refer to configuration 7).



SHR-1415

Figure 5 Configuration 3

Configuration 3 Notes

- Single Fibre Channel Loop
- Two Dual HSG80 controller pairs configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 144 disks with 4 optional expansion enclosures
- Up to 32 LUNs with 4 active controller host ports. Suggested controller unit number assignment: In each storage enclosure, Port 1 units D0 – D7, Port 2 units D100-D107
- By default, setting the controller pairs in Transparent Failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set the unit offset values to 0 for Port 1 and 100 for Port 2
- In this configuration 4 logical connections are available, 2 in each enclosure
- For each enclosure (controller pair), rename the connection names, i.e., SERVER1P1, SERVER1P2, SERVER2P1, SERVER2P2, etc.
- For the second controller enclosure set each controller host port *ALPA* to a different hexadecimal address then set on the first enclosure. Suggested settings: Controller Enclosure 1 Port 1 = 71, Port 2 = 72, Controller Enclosure 2 Port 1 = 73, Port 2 = 74
- The configuration of units for both controller pairs can be set identical to that described above. This is possible because the FC HBA will see each active controller host port as a unique target ID with a unique set of LUNs. Although LUN numbering is identical for each controller pair, when viewed by the server the LUNs on the active controller host ports in the second enclosure are assigned under different SCSI target IDs.

Configuration 3 Performance Considerations

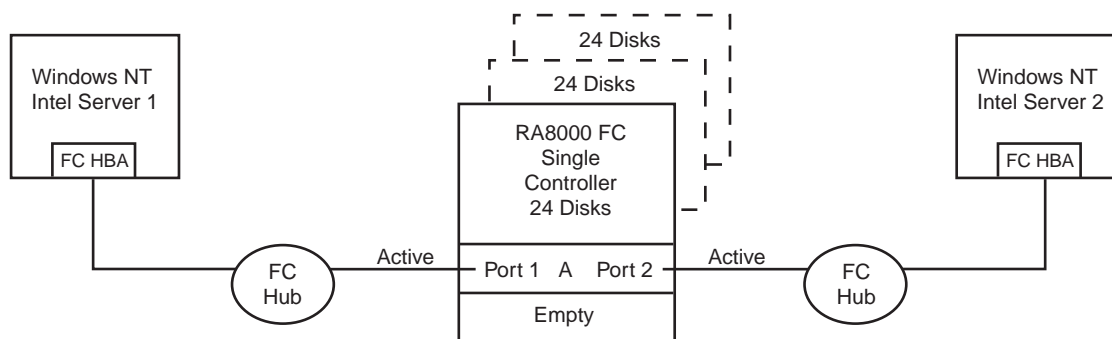
This configuration utilizes two dual controller pairs with an overall limit of the FC HBA of 15,500 I/O/sec and 86 MB/sec data rate. The primary advantage of this configuration is the added storage and LUN capacity.

This is a general-purpose configuration that can be utilized for moderately intensive I/O applications and typical bandwidth applications. It is more suited for I/O intensive applications and high capacity requirements.

Configuration 4 – Two Servers, Single Controller, Shared Storage Enclosure

Configuration four (Figure 6) utilizes the second controller host port to provide storage to a second separate (non-cooperating) server. The two servers share the storage enclosure in that each server has exclusive access to its own LUNs through the use of mutually exclusive LUN numbering. This configuration utilizes two separate fibre channel loops. Additional servers can be added to this configuration as required using the existing hubs (refer to configuration 8).

Figure 6 Configuration 4



SHR-1416

Configuration 4 Notes

- Two Fibre Channel Loops
- Shared storage enclosure
- This configuration consists of a single HSG80 controller, controller failover is not available
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 16 LUNs total, 8 available to each server with 2 active controller host ports. Suggested controller unit number assignment: Server 1 Port 1 units D0 – D7, Server 2 Port 2 units D100-D107
- In this configuration 2 logical connections are available
- Utilization of controller host Port 2 requires a third cable and enabling of the port through the Command Line Interface (CLI) using the following commands:
“SET THIS PORT_2_TOPOLOGY = LOOP_HARD”
“SET THIS PORT_2_AL_PA = 72”
- Rename the connection names, i.e., SERVER1P1, SERVER2P2
- Set the connection name unit offset value for port 2, “SET SERVER2P2 UNIT_OFFSET = 100”

Configuration 4 Performance Considerations

This configuration utilizes a single controller with two active controller host ports. The overall limit is based on the single controller, two active port limit of 12,000(cache)/4,100(media) I/O/sec and 98(cache)/54(media) MB/sec data rate. The primary advantage of this configuration is the ability to share the storage enclosure between two independent servers.

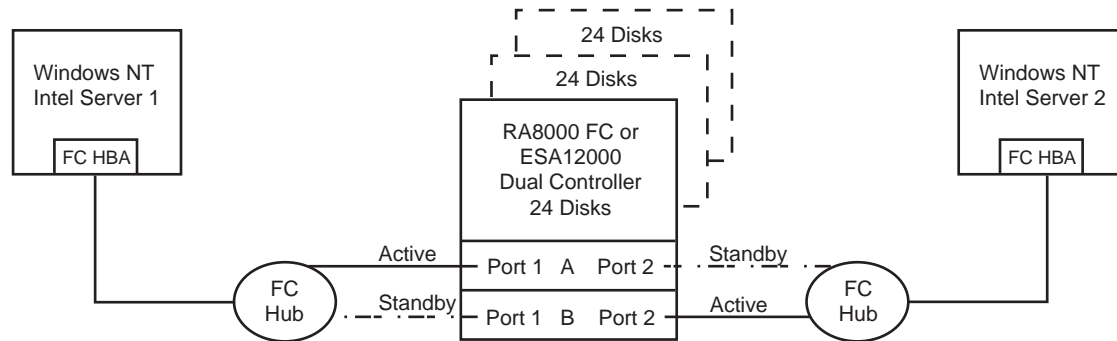
This is a general-purpose configuration that can be utilized for typical I/O and intensive bandwidth applications. It is more suited for bandwidth intensive applications.

Configuration 5 – Two Servers, Dual Controller Transparent Failover, Shared Storage Enclosure

Configuration 5 (Figure 7) utilizes a dual controller pair to provide storage and controller redundancy to a second separate (non-cooperating) server. The two servers share the storage enclosure in that each server has exclusive access to its own LUNs through the use of mutually exclusive LUN numbering. This configuration utilizes two separate fibre channel loops. Each server has access to its own dedicated controller. In the event of a controller failover, the surviving controller will continue to provide full access to units to both servers.

In normal operation Controller A provides the active path for all storagesets assigned to server 1 through Port 1. A second controller, Controller B provides the active path for all storagesets assigned to server 2 through Port 2. Each server also has a dedicated standby port in the event that there is a controller failover. Additional servers can be added to this configuration as required using the existing hubs (refer to configuration 8).

Figure 7 Configuration 5



SHR-1417

Configuration 5 Notes

- Two Fibre Channel Loops
- Shared storage enclosure
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 16 LUNs total, 8 available to each server with 2 active controller host ports. Suggested controller unit number assignment: Server 1 Port 1 units D0 – D7, Server 2 Port 2 units D100-D107
- In this configuration 2 logical connections are available
- Rename the connection names, i.e., SERVER1P1, SERVER2P2
- By default, setting the controller pair in Transparent Failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set the unit offset values to 0 for Port 1 and 100 for Port 2
- Utilization of the second controller host port requires a second Windows NT Intel Server, FC host bus adapter, hub and cables

Configuration 5 Performance Considerations

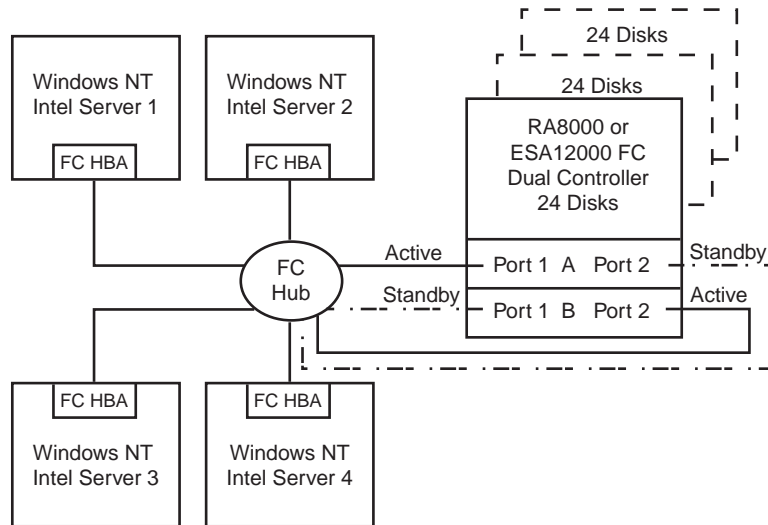
This configuration utilizes dual controllers with two active and two standby controller host ports. The overall limit is based on the dual controller, two active port limit of 24,000(cache)/8,2000(media) I/O/sec and 154(cache)/102(media) MB/sec data rate. The primary advantage of this configuration is the ability to share the storage enclosure between two independent servers without any performance degradation.

This is a general-purpose configuration that can be utilized for intensive I/O applications and very intensive bandwidth applications.

Configuration 6 – Up to Four Servers, Dual Controller Transparent Failover, Shared Storage Enclosure

Configuration 6 (Figure 8) builds on Configurations 2 and 5 utilizing a dual controller pair on a single loop to provide storage and controller redundancy for up to four separate (non-cooperating) servers. The four servers share the storage enclosure in that each server has exclusive access to its own set of LUNs. This is made possible by the setting of explicit “host access” at the unit level and using connection name “unit offsets” to give each server an accessible range of unit numbers. Additional levels of access control are necessary for this configuration because all servers are sharing the single fibre channel loop. As with all dual controller configurations, controller failover and performance benefits are inherent.

Figure 8 Configuration 6



SHR-1418

Configuration 6 Notes

- Single Fibre Channel Loop
- Shared storage enclosure
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 64 LUNs total, 16 available to each server with 2 active controller host ports
- In this configuration 8 logical connections are available
- Rename the connection names, i.e., SERVER1P1, SERVER1P2, SERVER2P1, etc.
- Set the connection name unit offset values. By default, setting the controller pair in Transparent failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set unit offset values to 0 for Port 1 and 100 for Port 2. Use the default connection unit offset values for one of the servers and set new unit offset values for connections to the other three servers as shown below.
- Set exclusive unit access for each unit to a specific server connection name, i.e., for unit D0 ENABLE = SERVER1P1, for unit D100 ENABLE = SERVER2P2
- Set each FC HBA ALPA to a unique hexadecimal hard address.
Suggested settings: HBA1 = 01, HBA2 = 02, HBA3 = 04, HBA4 = 08

- Suggested unit numbering and connection parameters would result in the units being distributed equally across controller host ports as follows:

Server 1: Port 1 units D0 – D7, Port 2 units D100 – D107
Connection name, unit offset value: SERVER1P1, 0. SERVER1P2, 100
Server 2: Port 1 units D10 – D17, Port 2 units D110 – D117
Connection name, unit offset value: SERVER2P1, 10. SERVER2P2 110
Server 3: Port 1 units D20 – D27, Port 2 units D120 – D127
Connection name, unit offset value: SERVER3P1, 20. SERVER3P2, 120
Server 4: Port 1 units D30 – D37, Port 2 units D130 – D137
Connection name, unit offset value: SERVER4P1, 30. SERVER4P2, 130

Configuration 6 Performance Considerations

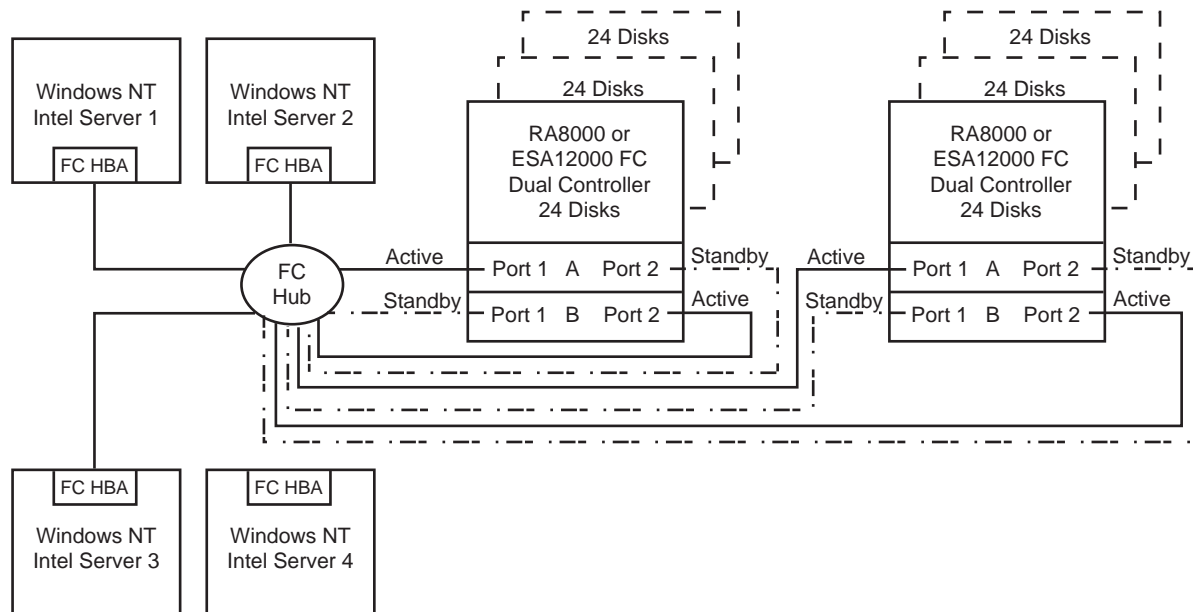
This configuration utilizes dual controllers with two active and two standby controller host ports. The overall limit is based on the dual controller, 2 active port limit of 24,000 I/O/sec and the theoretical single loop limit of 100 MB/sec data rate. The primary advantage of this configuration is the ability to connect up to four servers on a single fibre channel loop.

This is a high connectivity configuration that can be utilized for intensive I/O and very intensive bandwidth applications. It is more suited for bandwidth intensive applications.

Configuration 7 – Up to Four Servers, Two Dual Controller Pairs Transparent Failover, Shared Storage Enclosure

Configuration 7 (Figure 9) builds on Configurations 3 and 6 utilizing two dual controller pairs on a single loop to provide storage and controller redundancy for up to four separate (non-cooperating) servers. The four servers share the storage enclosures in that each server has exclusive access to its own set of LUNs within each enclosure. This is made possible by the setting of explicit “connection name access” at the unit level and using connection name “unit offsets” to give each server an accessible range of unit numbers. Additional levels of access control are necessary for this configuration because all servers are sharing the single fibre channel loop. The addition of a second controller pair doubles the disk and LUN capacity available to the four servers.

Figure 9 Configuration 7



SHR-1419

Configuration 7 Notes

- Single Fibre Channel Loop
- Shared storage enclosure
- Two Dual HSG80 controller pairs configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 144 disks with 4 optional expansion enclosures
- Up to 128 LUNs, 32 available to each server with 4 active controller host ports
- In this configuration 16 connections are available, 8 in each enclosure
- The configuration of units for both enclosures can be set identical to that described in Configuration 6. This is possible because each server will see each active controller host port as a unique target ID with a unique set of LUNs. Although LUN numbering is identical within each enclosure, when viewed by each server the LUNs on the active controller host ports in the second enclosure are assigned under different SCSI target IDs.
- For each enclosure (controller pair), rename the connection names, i.e., SERVER1P1, SERVER1P2, SERVER1P1, SERVER1P2, etc.
- For the second controller enclosure set each controller host port *ALPA* to a different hexadecimal address then set on the first enclosure. Suggested settings: Controller Enclosure 1 Port 1 = 71, Port 2 = 72, Controller Enclosure 2 Port 1 = 73, Port 2 = 74

- Set each FC HBA ALPA to a unique (hexadecimal) hard address.
Suggested settings: HBA1 = 01, HBA2 = 02, HBA3 = 04, HBA4 = 08
- Set the connection name unit offset values. By default, setting the controller pairs in Transparent failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set unit offset values to 0 for Port 1 and 100 for Port 2. Use the default connection unit offset values for one of the servers and set new unit offset values for connections to the other three servers as shown below.
- Set exclusive unit access for each unit to a specific server connection name, i.e., for unit D0 ENABLE = SERVER1P1, for unit D100 ENABLE = SERVER1P2
- Suggested unit numbering and connection parameters would result in the units being distributed equally across enclosures and controller host ports as follows:

Controller Enclosure 1

ALPA settings: Controller Host Port 1 = 71, Port 2 = 72

Server 1, Enclosure 1: Port 1 units D0 – D7, Port 2 units D100 – D107

Connection names, unit offset values: SERVER1P1, 0. SERVER1P2, 100

Server 2, Enclosure 1: Port 1 units D10 – D17, Port 2 units D110 – D117

Connection names, unit offset values: SERVER2P1, 10. SERVER2P2, 110

Server 3, Enclosure 1: Port 1 units D20 – D27, Port 2 units D120 – D127

Connection names, unit offset values: SERVER3P1, 20. SERVER3P2, 120

Server 4, Enclosure 1: Port 1 units D30 – D37, Port 2 units D130 – D137

Connection names, unit offset values: SERVER4P1, 30. SERVER4P2, 130

Controller Enclosure 2

ALPA settings: Controller Host Port 1 = 73, Port 2 = 74

Server 1, Enclosure 2: Port 1 units D0 – D7, Port 2 units D100 – D107

Connection names, unit offset values: SERVER1P1, 0. SERVER1P2, 100

Server 2, Enclosure 2: Port 1 units D10 – D17, Port 2 units D110 – D117

Connection names, unit offset values: SERVER2P1, 10. SERVER2P2, 110

Server 3, Enclosure 2: Port 1 units D20 – D27, Port 2 units D120 – D127

Connection names, unit offset values: SERVER3P1, 20. SERVER3P2, 120

Server 4, Enclosure 2: Port 1 units D30 – D37, Port 2 units D130 – D137

Connection names, unit offset values: SERVER4P1, 30. SERVER4P2, 130

Configuration 7 Performance Considerations

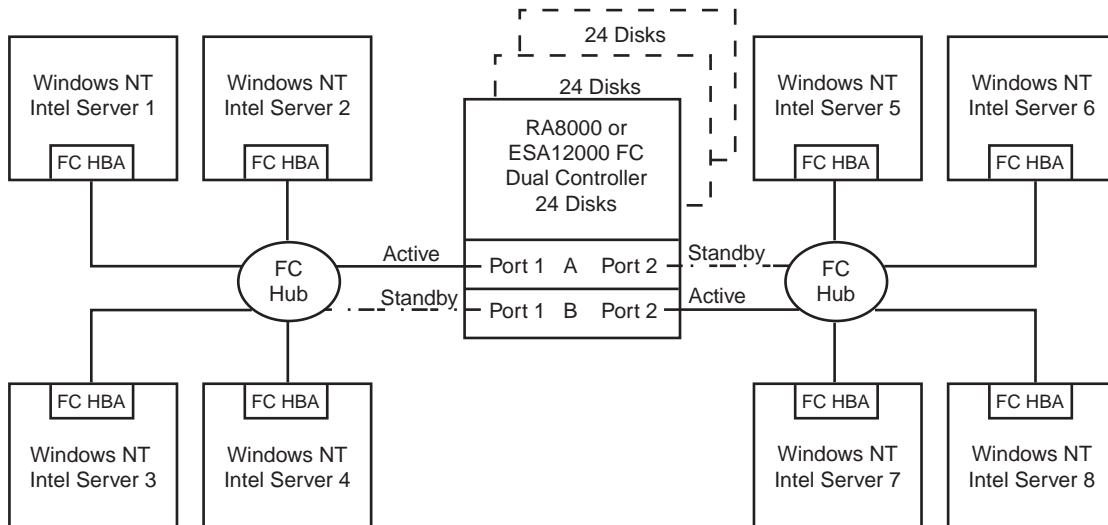
This configuration utilizes 2 dual controller pairs with an overall limit based on a theoretical single loop limit of 25,000 I/O/sec and 100 MB/sec data rate. The primary advantages of this configuration are the ability to connect up to four servers and two storage systems on a single fibre channel loop, and the added storage and LUN capacity.

This is a high connectivity configuration that can be utilized for moderately intensive I/O applications and intensive bandwidth applications. It is more suited for I/O applications.

Configuration 8 – Up to Eight Servers, Dual Controller Transparent Failover, Shared Storage Enclosure

Configuration 8 (reference Figure 10) builds on Configurations 5 and 6 utilizing a dual controller pair on two fibre channel loops to provide storage and controller redundancy to two groups of up to four separate (non-cooperating) servers. The eight servers share the storage enclosure in that each server has exclusive access to its own set of LUNs. This is made possible by the setting of explicit “host access” at the unit level and using connection name “unit offsets” to give each server an accessible range of unit numbers. Additional levels of access control are necessary for this configuration because each group of four servers is sharing the same loop.

Figure 10 Configuration 8



SHR-1420

Configuration 8 Notes

- Two Fibre Channel Loops
- Shared storage enclosure
- Dual HSG80 controllers configured in Transparent Failover Mode
- Up to 500 meters per cable segment
- Up to 72 disks with 2 optional expansion enclosures
- Up to 64 LUNs 8 available to each server with 2 active controller host ports
- In this configuration 8 connections are available
- Rename the connection names, i.e., SERVER1P1, SERVER2P1, SERVER5P2, etc.
- Set the connection name unit offset values. By default, setting the controller pair in Transparent failover mode will automatically configure Port 1 and Port 2 of both controllers to the Active and Standby state indicated, and set unit offset values to 0 for Port 1 and 100 for Port 2. Use the default connection unit offset values for one of the servers on each loop and set new unit offset values for connections to the other six servers as shown below.
- Set exclusive unit access for each unit to a specific server connection name, i.e., for unit D0 ENABLE = SERVER1P1, for unit D100 ENABLE = SERVER5P2
- Set each FC HBA ALPA to a unique hexadecimal hard address.
Suggested settings: HBA1 = 01, HBA2 = 02, HBA3 = 04, HBA4 = 08

- Suggested unit numbering and connection parameters would result in the units being distributed equally across enclosures and controller host ports as follows:

Server 1: Port 1 units D0 – D7
Connection name, unit offset value: SERVER1P1, 0
Server 2: Port 1 units D10 – D17
Connection name, unit offset value: SERVER2P1, 10
Server 3: Port 1 units D20 – D27
Connection name, unit offset value: SERVER3P1, 20
Server 4: Port 1 units D30 – D37
Connection name, unit offset value: SERVER4P1, 30
Server 5: Port 2 units D100 – D107
Connection name, unit offset value: SERVER5P2, 100
Server 6: Port 2 units D110 – D117
Connection name, unit offset value: SERVER6P2 110
Server 7: Port 2 units D120 – D127
Connection name, unit offset value: SERVER7P2, 120
Server 8 : Port 2 units D130 – D137
Connection name, unit offset value: SERVER8P2, 130

Configuration 8 Performance Considerations

This configuration utilizes dual controllers with two active and two standby controller host ports. The overall limit is based on the dual controller, two active port limit of 24,000(cache)/8,200(media) I/O/sec and 154(cache)/102(media) MB/sec data rate. The primary advantage of this configuration is the ability to share the storage enclosure and connect up to eight independent servers across two fibre channel loops.

This is a general-purpose configuration that can be utilized for intensive I/O applications and very intensive bandwidth applications. It is more suited for bandwidth intensive applications however it offers adequate performance for I/O applications as well.

Configuration 1 Parts List

- One Intel Server with Microsoft Windows NT 4.0, Service Pack 3 (minimum)

Compaq Part #	Description	Quantity
380551-001	RA8000/ESA12000 FC Solution Software V8.3A for Windows NT/Intel	1
380577-001	ACS V8.3 FC-AL Controller SW	1
380574-001	KGPSA-BC PCI FC HBA	1
380550-B21 (Blue) 380550-B22 (Opal) 380660-B21	RA8000 Pedestal w/single HSG80 RA8000 Pedestal w/single HSG80 RA8000 Rackable w/single HSG80	Choose 1
234453-001/B31/291 295573-B22	FC 7-Port Hub/Domestic/Intl/Japan FC 12-Port Hub 41U/42U Bracket	Choose 1
380561-B21	FC Optical GBIC	2
234457-B21 234457-B22 234457-B23 234457-B24 234457-B25	FC 2 Meter Optical Cable FC 5 Meter Optical Cable FC 15 Meter Optical Cable FC 30 Meter Optical Cable FC 50 Meter Optical Cable	Choose 2
380691-B21 380595-B21 380694-B21 380588-B21 380589-B21 147599-001	4GB UW 7200 RPM Disk 9GB UW 7200 RPM Disk 18GB UW 7200 RPM Disk 9GB UW 10000 RPM Disk 18GB UW 10000 RPM Disk 36GB UW 7200 RPM Disk	Choose up to 24

Configuration 1 Optional Components

Compaq Part #	Description	Quantity
380570-B21 (Blue) 380570-B22 (Opal) 380568-B21	Pedestal Expansion w/add'l 24 slots Pedestal Expansion w/add'l 24 slots Rackable Expansion w/add'l 24 slots	Up to 2
See Above	Additional Disks Drives Additional FC Optical GBIC Additional FC Optical Cable	Up to 48 1 1

Configuration 2 Parts List

- One Intel Server with Microsoft Windows NT 4.0, Service Pack 3 (minimum)

Compaq Part #	Description	Quantity
380551-001	RA8000/ESA12000 FC Solution Software V8.3A for Windows NT/Intel	1
380577-001	ACS V8.3 FC-AL Controller SW	2
380574-001	KGPSA-BC PCI FC HBA	1
380560-B21 (Blue) 380560-B22 (Opal) 380670-B21 380580-B21 (Blue) 380580-002 (Opal) 380590-B21 (Blue) 380590-B22 (Opal) 380600-001 (Blue) 380600-002 (Opal) 380610-B21 (Blue) 380610-B22 (Opal)	RA8000 Pedestal w/dual HSG80 RA8000 Pedestal w/dual HSG80 RA8000 Rackable w/dual HSG80 ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 50HZ	Choose 1
234453-001/B31/291 295573-B22	FC 7-Port Hub/Domestic/Intl/Japan FC 12-Port Hub 41U/42U Bracket	Choose 1
380561-B21	FC Optical GBIC	2
234457-B21 234457-B22 234457-B23 234457-B24 234457-B25	FC 2 Meter Optical Cable FC 5 Meter Optical Cable FC 15 Meter Optical Cable FC 30 Meter Optical Cable FC 50 Meter Optical Cable	Choose 2
380691-B21 380595-B21 380694-B21 380588-B21 380589-B21 147599-001	4GB UW 7200 RPM Disk 9GB UW 7200 RPM Disk 18GB UW 7200 RPM Disk 9GB UW 10000 RPM Disk 18GB UW 10000 RPM Disk 36GB UW 7200 RPM Disk	Choose up to 24 (48 for ESA 48 slot)

Configuration 2 Optional Components

Compaq Part #	Description	Quantity
380570-B21 (Blue) 380570-B22 (Opal) 380568-B21 380640-001 (Blue) 380640-002 (Opal) 380650-B21 (Blue) 380650-B22 (Opal)	Pedestal Expansion 24 slots Pedestal Expansion 24 slots Rackable Expansion 24 slots ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 50HZ ESA12000 Expansion 48 Slot 50HZ	Up to 2 OR Choose 1
See above	Additional Disks Drives Additional FC Optical GBIC Additional FC Optical Cable	Up to 48 2 Choose 2

Configuration 4 Parts List

- Two Intel Servers with Microsoft Windows NT 4.0, Service Pack 3 (minimum)

Compaq Part #	Description	Quantity
380551-001	RA8000/ESA12000 FC Solution Software V8.3A for Windows NT/Intel	1
380577-001	ACS V8.3 FC-AL Controller SW	1
380574-001	KGPSA-BC PCI FC HBA	2
380560-B21 (Blue) 380560-B22 (Opal) 380670-B21 380580-001 (Blue) 380580-002 (Opal) 380590-B21 (Blue) 380590-B22 (Opal) 380600-001 (Blue) 380600-002 (Opal) 380610-B21 (Blue) 380610-B22 (Opal)	RA8000 Pedestal w/dual HSG80 RA8000 Pedestal w/dual HSG80 RA8000 Rackable w/dual HSG80 ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 50HZ	Choose 1
234453-001/B31/291 295573-B22	FC 7-Port Hub/Domestic/Intl/Japan FC 12-Port Hub 41U/42U Bracket	Choose 2
380561-B21	FC Optical GBIC	4
234457-B21 234457-B22 234457-B23 234457-B24 234457-B25	FC 2 Meter Optical Cable FC 5 Meter Optical Cable FC 15 Meter Optical Cable FC 30 Meter Optical Cable FC 50 Meter Optical Cable	Choose 4
380691-B21 380595-B21 380694-B21 380588-B21 380589-B21 147599-001	4GB UW 7200 RPM Disk 9GB UW 7200 RPM Disk 18GB UW 7200 RPM Disk 9GB UW 10000 RPM Disk 18GB UW 10000 RPM Disk 36GB UW 7200 RPM Disk	Choose up to 24 (48 for ESA 48 slot)

Configuration 4 Optional Components

Compaq Part #	Description	Quantity
380570-B21 (Blue) 380570-B22 (Opal) 380568-B21 380640-001 (Blue) 380640-002 (Opal) 380650-B21 (Blue) 380650-B22 (Opal)	Pedestal Expansion 24 slots Pedestal Expansion 24 slots Rackable Expansion 24 slots ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 50HZ ESA12000 Expansion 48 Slot 50HZ	Up to 2 OR Choose 1
See above	Additional Disks Drives	Up to 48

Configuration 5 Parts List

- Two Intel Servers with Microsoft Windows NT 4.0, Service Pack 3 (minimum)

Compaq Part #	Description	Quantity
380551-001	RA8000/ESA12000 FC Solution Software V8.3A for Windows NT/Intel	1
380577-001	ACS V8.3 FC-AL Controller SW	2
380574-001	KGPSA-BC PCI FC HBA	2
380560-B21 (Blue) 380560-B22 (Opal) 380670-B21 380580-001 (Blue) 380580-002 (Opal) 380590-B21 (Blue) 380590-B22 (Opal) 380600-001 (Blue) 380600-002 (Opal) 380610-B21 (Blue) 380610-B22 (Opal)	RA8000 Pedestal w/dual HSG80 RA8000 Pedestal w/dual HSG80 RA8000 Rackable w/dual HSG80 ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 50HZ	Choose 1
234453-001/B31/291 295573-B22	FC 7-Port Hub/Domestic/Intl/Japan FC 12-Port Hub 41U/42U Bracket	Choose 2
380561-B21	FC Optical GBIC	6
234457-B21 234457-B22 234457-B23 234457-B24 234457-B25	FC 2 Meter Optical Cable FC 5 Meter Optical Cable FC 15 Meter Optical Cable FC 30 Meter Optical Cable FC 50 Meter Optical Cable	Choose 6
380691-B21 380595-B21 380694-B21 380588-B21 380589-B21 147599-001	4GB UW 7200 RPM Disk 9GB UW 7200 RPM Disk 18GB UW 7200 RPM Disk 9GB UW 10000 RPM Disk 18GB UW 10000 RPM Disk 36GB UW 7200 RPM Disk	Choose up to 24 (48 for ESA 48 slot)

Configuration 5 Optional Components

Compaq Part #	Description	Quantity
380570-B21 (Blue) 380570-B22 (Opal) 380568-B21 380640-001 (Blue) 380640-002 (Opal) 380650-B21 (Blue) 380650-B22 (Opal)	Pedestal Expansion 24 slots Pedestal Expansion 24 slots Rackable Expansion 24 slots ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 50HZ ESA12000 Expansion 48 Slot 50HZ	Up to 2 OR Choose 1
See above	Additional Disks Drives	Up to 48

Configuration 6 Parts List

- Four Intel Servers with Microsoft Windows NT 4.0, Service Pack 3 (minimum)

Compaq Part #	Description	Quantity
380551-001	RA8000/ESA12000 FC Solution Software V8.3A for Windows NT/Intel	1
380577-001	ACS V8.3 FC-AL Controller SW	2
380574-001	KGPSA-BC PCI FC HBA	4
380560-B21 (Blue) 380560-B22 (Opal) 380670-B21 380580-001 (Blue) 380580-002 (Opal) 380590-B21 (Blue) 380590-B22 (Opal) 380600-001 (Blue) 380600-002 (Opal) 380610-B21 (Blue) 380610-B22 (Opal)	RA8000 Pedestal w/dual HSG80 RA8000 Pedestal w/dual HSG80 RA8000 Rackable w/dual HSG80 ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 50HZ	Choose 1
295573-B22	FC 12-Port Hub 41U/42U Bracket	1
380561-B21	FC Optical GBIC	8
234457-B21 234457-B22 234457-B23 234457-B24 234457-B25	FC 2 Meter Optical Cable FC 5 Meter Optical Cable FC 15 Meter Optical Cable FC 30 Meter Optical Cable FC 50 Meter Optical Cable	Choose 8
380691-B21 380595-B21 380694-B21 380588-B21 380589-B21 147599-001	4GB UW 7200 RPM Disk 9GB UW 7200 RPM Disk 18GB UW 7200 RPM Disk 9GB UW 10000 RPM Disk 18GB UW 10000 RPM Disk 36GB UW 7200 RPM Disk	Choose up to 24 (48 for ESA 48 slot)

Configuration 6 Optional Components

Compaq Part #	Description	Quantity
380570-B21 (Blue) 380570-B22 (Opal) 380568-B21 380640-001 (Blue) 380640-002 (Opal) 380650-B21 (Blue) 380650-B22 (Opal)	Pedestal Expansion 24 slots Pedestal Expansion 24 slots Rackable Expansion 24 slots ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 50HZ ESA12000 Expansion 48 Slot 50HZ	Up to 2 OR Choose 1
See above	Additional Disks Drives	Up to 48

Configuration 8 Parts List

- Eight Intel Servers with Microsoft Windows NT 4.0, Service Pack 3 (minimum)

Compaq Part #	Description	Quantity
380551-001	RA8000/ESA12000 FC Solution Software V8.3A for Windows NT/Intel	1
380577-001	ACS V8.3 FC-AL Controller SW	2
380574-001	KGPSA-BC PCI FC HBA	8
380560-B21 (Blue) 380560-B22 (Opal) 380670-B21 380580-001 (Blue) 380580-002 (Opal) 380590-B21 (Blue) 380590-B22 (Opal) 380600-001 (Blue) 380600-002 (Opal) 380610-B21 (Blue) 380610-B22 (Opal)	RA8000 Pedestal w/dual HSG80 RA8000 Pedestal w/dual HSG80 RA8000 Rackable w/dual HSG80 ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 60HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 24 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 60HZ ESA12000 w/dual HSG80 48 Slot 50HZ ESA12000 w/dual HSG80 48 Slot 50HZ	Choose 1
234453-001/B31/291 295573-B22	FC 7-Port Hub/Domestic/Intl/Japan FC 12-Port Hub 41U/42U Bracket	Choose 2
380561-B21	FC Optical GBIC	12
234457-B21 234457-B22 234457-B23 234457-B24 234457-B25	FC 2 Meter Optical Cable FC 5 Meter Optical Cable FC 15 Meter Optical Cable FC 30 Meter Optical Cable FC 50 Meter Optical Cable	Choose 12
380691-B21 380595-B21 380694-B21 380588-B21 380589-B21 147599-001	4GB UW 7200 RPM Disk 9GB UW 7200 RPM Disk 18GB UW 7200 RPM Disk 9GB UW 10000 RPM Disk 18GB UW 10000 RPM Disk 36GB UW 7200 RPM Disk	Choose up to 24 (48 for ESA 48 slot)

Configuration 8 Optional Components

Compaq Part #	Description	Quantity
380570-B21 (Blue) 380570-B22 (Opal) 380568-B21 380640-001 (Blue) 380640-002 (Opal) 380650-B21 (Blue) 380650-B22 (Opal)	Pedestal Expansion 24 slots Pedestal Expansion 24 slots Rackable Expansion 24 slots ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 60HZ ESA12000 Expansion 48 Slot 50HZ ESA12000 Expansion 48 Slot 50HZ	Up to 2 OR Choose 1
See above	Additional Disks Drives	Up to 48

Product Details

The RA8000/ESA12000 storage systems utilize the Compaq HSG80 RAID controller running Array Controller Software (ACS) V8.3. The ACS software is designed to support multiple platforms providing features including: dual controller operation, two controller failover modes – Transparent and Multiple-Bus, mirrored write back cache, read ahead cache, RAID implementation, disk mirroring, and disk partitioning capabilities. In addition, ACS manages host interconnect and protocol services to provide data for event notification and status such as displayed by SWCC.

The HSG80 controller has two FC host ports providing up to a total of nearly 200 Mbytes per second of available bandwidth. Disk drives are connected to the controller through 6 UltraSCSI channels providing up to 40 Mbytes per second per channel of available bandwidth. Servers can use multiple host bus adapters (HBAs) to multiple RA8000 FC systems for unlimited storage capacity.

The RA8000 FC is supplied in two basic building blocks, a pedestal style cabinet and what has been termed a “rackable” model. The pedestal is a self-contained desk height cabinet, it is available in Digital Classic Top Gun blue and in Compaq Opal. The rackable is shipped ready to be mounted in a 19” Compaq rack or a 19” cabinet/rack using an included universal RETMA/metric mounting kit.

RA8000 FC controllers come with 64 MB of cache. Cache options allow for 128 MB, 256 MB and 512MB of cache in each controller. ESA12000 FC controllers come with 256 MB of cache. Cache options allow for 512MB of cache in each controller. Cache features include read ahead and mirrored write back cache for use in optimizing performance where redundant capabilities are required for high availability system configurations. In the rare event that a storage controller fails the mirrored data is immediately available to the remaining controller for continuing operation.

The RA8000 FC pedestals and rackables come in both single controller and in dual controller models to allow the customer to select the level of high availability required for their application. A single controller model can be upgraded to a dual controller model when warranted by the application.

High availability is supported by the use of redundancy and hot swappable components. The RA8000 FC disk enclosures include redundant cooling, and have 5 power supplies providing N+1 redundancy. Power can be upgraded to full redundancy with the addition of 3 more supplies and a 2nd power distribution unit for AC input redundancy. StorageWorks components are “hot” swappable including storage controllers when operating as a redundant pair.

You can configure and monitor the RA8000 and ESA12000 FC using the StorageWorks Command Console (SWCC). SWCC is included in the HSG80 Software Solutions Platform kit. Using this client/server tool, you can configure RAID sets locally or over a TCP/IP network. The client provides an easy to use graphical user interface. It can be used to monitor your storage system and notify you of events by updating a graphical display, sending electronic mail, or alerting via a pager. The Command Console Client includes applications (or Storage Windows) that communicate with the Command Console Agent software running on the host platform.

The Command Console client is available on Windows 95 and on Intel/Alpha platforms running Windows NT. A Storage Window for the HSG80 controller supports the Array Controller Software (ACS) V8.3 and offers integration with Compaq's Insight Manager(CIM). Insight Manager can receive SNMP traps from the Command Console Agent and Insight Manager services can directly launch SWCC for notification or configuring operations.

Configuration References

Table 3 lists the documents that provide further information on the configuration of RA8000 and ESA12000 Fibre Channel Storage Systems:

Table 3 Configuration Reference Material

Topic	Document Title	Order Number
<i>RA8000/ESA12000 High Availability FC-AL Configurations Application Note</i>	<i>RA8000/ESA12000 FC-AL High Availability Configurations for Windows NT</i>	<i>AA-RH0SA-TE</i>
<i>Windows NT - Intel HSG80 Array Controller</i>	<i>Release Notes, HSG80 Array Controller (ACS V8.3) for Windows NT Server - Intel</i>	<i>AA-RFA8A-TE</i>
<i>Quick Setup Guide</i>	<i>RAID Array 8000/ESA12000 Fibre Channel Storage Subsystem for Windows NT Server - Intel</i>	<i>AA-RFA7A-TE</i>
<i>Windows NT - Intel RA8000/ESA12000 Installation</i>	<i>RA8000/ESA12000 Fibre Channel Solution Software V8.3 for Windows NT – Intel Installation Reference Guide</i>	<i>AA-RFA9A-TE</i>
<i>Windows NT Clusters</i>	<i>RAID Array 8000/ESA12000 Fibre Channel Cluster Solutions for Windows NT</i>	<i>EK-NTC8K-IG</i>
<i>Secure Path Installation</i>	<i>StorageWorks Secure Path for Windows NT Installation Guide</i>	<i>EK-WNTMP-MH</i>
<i>HSG80 Array Controller Configuration</i>	<i>HSG80 Array Controller ACS Version 8.3 Configuration and CLI Reference Guide</i>	<i>EK-HSG80-RG</i>
<i>HSG80 Array Controller Maintenance</i>	<i>HSG80 Array Controller ACS Version 8.3 Maintenance and Service Guide</i>	<i>EK-HSG80-SV</i>
<i>StorageWorks Command Console</i>	<i>Command Console V2.1 (HSG80) for RAID Array 8000/ESA12000, User's Guide</i>	<i>AA-RFA2A-TE</i>
<i>Warranty Information</i>	<i>DIGITAL StorageWorks Warranty Terms and Conditions</i>	<i>EK-HSXS-WC</i>
<i>HSG80 Array Controller Parts</i>	<i>HSG80 Array Controller Illustrated Parts Map</i>	<i>EK-HSG80-MP or 355217-001</i>
<i>RA8000/ESA12000 Configuration</i>	<i>RA8000/ESA12000 Fibre Channel HSG80 Storage Subsystem Configuration Poster</i>	<i>EK-HSG80-CP or 355207-001</i>

Intel is a registered trademark of Intel Corporation.

Windows NT and MSCS are trademarks of Microsoft Corporation.

STORAGEWORKS and the Compaq Logo are trademarks of Compaq Computer Corporation.

All other trademarks and registered trademarks are the property of their respective owners.