PART NUMBER	EDITION NUMBER	
96103	2	

BladeStore

Disk Subsystem

PRESALES TECHNICAL REFERENCE

STORAGETEK®

BladeStore
Disk Subsystem

Pre-Sales Technical Reference

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Second Edition (January 2004)
This edition contains 92 pages. See for the revision history and a summary of changes made to this document.

Information contained in this publication is subject to change. In the event of changes, the publication will be revised. Comments concerning its contents should be directed to:

> Global Learning Solutions
> Storage Technology Corporation
> One StorageTek Drive
> Louisville, CO 80028-2129
> USA

A Reader's Comment Form at the back of this publication is for communicating suggestions and requests for change. We encourage and appreciate your feedback.

Summary of Changes

Date	Edition	Description
May 2003	First	Initial Release
Dec 2003	Second	Added B250 information, including the new 2 Gigabit ESM, new B220/B280, and the new BladeStore 8.46 software

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Preface

This *Pre-Sales Technical Reference Guide* is intended for StorageTek Professional Services, System Engineers, Marketing and Sales Representatives.

Note: StorageTek Partners, Resellers, Distributors, or anyone else interested in the engagement process or sale of BladeStore are welcome to use the information in this manual.

This manual describes:

- The BladeStore solution
- The BladeStore performance and configuration considerations
- How to order and implement a solution

■ Organization

The organization of this manual is:

Chapter 1   "Introduction" contains two parts. The first introduces BladeStore's hardware and software. The second summarizes some facts about information lifecycle management.

Chapter 2   "Identifying Customer Needs" is intended to help you identify your potential customer's needs.

Chapter 3   "Designing a Solution" describes the necessary components for a solution.

Chapter 4   "Ordering a BladeStore Solution" describes how to order BladeStore.

Chapter 5   "Following-Up" discusses the final activities of a customer engagement.

Glossary   Defines new or special terms and abbreviations for BladeStore.

Index   Lists key words that assist you in locating information.

■ Related Information

For additional information about BladeStore Disk Subsystem, refer to the portable document format (PDF) documents found inside the docs folder on the BladeStore Disk Subsystem product shipment CD.

This documenation set is available online in StorageTek's Customer Resource Center (CRC). The information is also available on Documents on CD, as well as on the engineering web pages. Additional information is available on the following sites, which may also provide some education content as well as allow the ability to download (firmware, drive code, and updates to manuals).

StorageTek's External Web Site

StorageTek's external Web site provides marketing, product, event, corporate, and service information. The external Web site is accessible to anyone with a Web browser and an Internet connection.

The URL for the StorageTek external Web site is http://www.storagetek.com

Customer Resource Center

StorageTek's CRC is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation. CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, addenda to product documentation books, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page. StorageTek employees may enter the CRC through PowerPort.

The URL for the CRC is http://www.support.storagetek.com.

Partners

StorageTek's Partners is a Web site that provides information about products, services, customer support, upcoming events, training programs, and sales tools to support StorageTek's Partners. Access to this site, beyond the Partners Login page, is restricted. On the Partners Login page, StorageTek employees and current partners who do not have access can request a login ID and password and prospective partners can apply to become StorageTek resellers.

The URL for the Partners site is http://members.storagetek.com.

Global Services Support Tools

StorageTek's Global Services Support Tools Web site provides tools that aid in the sales and support of StorageTek's products and services. This is an internal Web site for StorageTek employees.

The URL for the Global Services Support Tools is http://wwssto.stortek.com

Sales Community

StorageTek's Sales Community is a Web site that provides a single source for information that assists account executives and systems engineers in selling StorageTek products and solutions. You can find pre-sales marketing, competitive, and product information for our direct channel. The Sales Community provides information about products and services, sales tools, sales support, and case studies.

Note: This Web site also provides access to the SE Configurator Helper Tool.

The URL for the Sales Community is http://salescommunity.storagetek.com/Sales/Home/

Documents on CD

Documents on CD (3106600xx) contains portable document format (PDF) files of StorageTek's hardware product publications. To order *Documents on CD*, contact your local Customer Services Logistics Depot.

Note: *Documents on CD* is only for StorageTek employees.

Engineering Web Pages

One additional location to obtain documentation as well as some product photographs, is on the engineering web pages. The main web page is at:

http://gandalf.stortek.com/ctp/index.html

There are many hyperlinks here that can take you to various D-Series and B-Series locations. Many of these pages are common to both product lines.

The BladeStore Disk Subsystem engineering web page is at:

http://gandalf.stortek.com/ctp/B150/index.html

The BladeStore Storage Manager engineering web page can be found on a common software web page at:

http://gandalf.stortek.com/ctp/manager/index.html

Special installation instructions for each operating system are at:

http://gandalf.stortek.com/ctp/installation/index.html

Note: There are additional hyperlinks on various web pages that can help educate you about performance tuning, alternative configurations, switch zoning, the command line interface, and part numbers. It will serve you well to become very familiar with these web pages.

BladeStore Storage Manager

Last but not least is the storage management GUI, which has a tremendous amount of information embedded into the software help function. One could spend hours educating themselves on how to use premium features such as SANshare Storage Partitioning, Snapshot, Remote Volume Mirroring, Internal Volume Copy, and Persistent Reservations.

As these and other premium features become available and/or are purchased, the GUI will provide information on how to use the new software capabilities. It will serve you well to become very familiar with the help function.

Introduction

<div style="text-align: right">1</div>
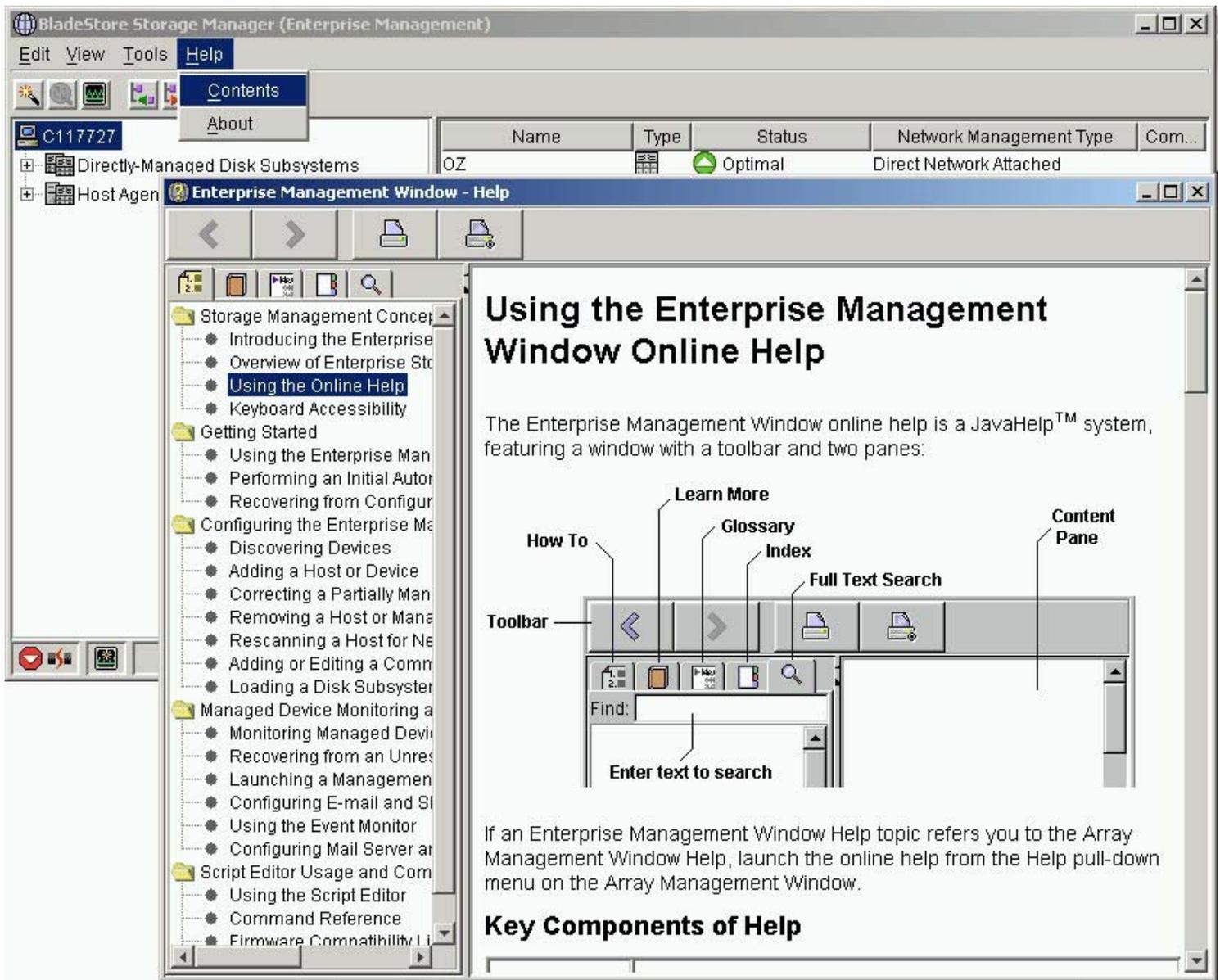
The first part of this chapter:

- Introduces BladeStore
- Describes the hardware and software components
- Lists various performance considerations
- Lists ways of configuring the storage, including: redundant paths, zoning, and different storage management methods.

The second part of this chapter:

- Summarizes facts about information lifecycle management (ILM)
- Identifies areas of pain and frustration for the customer
- Lists common concerns about backups
- Describes engagement opportunities for BladeStore
- Targets customer environments
- Compares applications that could be run on BladeStore.

■ BladeStore Defined

The BladeStore Disk Subsystem has evolved to three different Control Module selections that connect to the host server and the new B250 Blade Module, which has a storage capacity of 1.25 Terabytes per blade, up to 12.5 Terabytes per blade tray, up to 75 Terabytes per cabinet, and up to 150 Terabytes in a two-cabinet disk subsystem configuration. The following pages provide the main sales factors for positioning this capacity-centric solution.

A minimum of a 1x2 configuration is recommended, in order to maximize performance. This means that you would have one BC84/B220/B280 Control Module and two B250 Blade Modules—providing four fibre channel loops to the blades (using BC84/B280) or two backend FC loops using the B220.

The two-cabinet, 1x12 configuration (120 blades) is the maximum disk subsystem recommended for customer sites. This limit ensures that we maintain high performance, no matter what the storage configuration.

The BladeStore Disk Subsystem is designed for secondary "Inline" storage, as well as primary storage when the customer's storage requirement primarily involves large files (over 2 Gigabytes)—used as non mission-critical data.

The BladeStore Disk Subsystem is meant to be low-cost disk storage, which attaches many high-capacity storage blades behind a fully populated a set of controllers, supporting multiple hosts using LC to LC (2 Gb) fibre channel cable connected directly or through a switch.

The software (storage management GUI) element of the BladeStore Disk Subsystem is called BladeStore Storage Manager version 8.46. It is almost identical to the D-Series GUI; and it uses the same SANshare Storage Partitioning premium feature. The storage management software works in conjunction with highly sophisticated ESM firmware and drive code, which internally stripes the data across the storage media. This design serves to do workload sharing using two fibre channel paths (on each blade module disk array). Internal to the blade, the design spreads data records across five drives using RAID 0.

Within the disk subsystem various RAID configurations are possible, which may incorporate the use of hot spares. The assignment of hot spares further increases the reliability and availability of this fully redundant storage solution.

Note: Since striping occurs across blades as well as internal to the blade, no one blade or no one drive within the blade can reproduce the data that was on it. This solution serves to create a high-security environment due to the physical size of the blade (minimizing theft). In a 1x4 subsystem, it is impossible for anyone to obtain information from a stolen set of randomly selected blades or from the drives inside. In smaller systems the possibility exists only if someone steals all the blades or if they are lucky enough to steal the blades associated with one particular volume group.

The following screen shows the BladeStore Storage Manager GUI, and how the volume group and its volume are logically associated with the software.

Figure 1. BladeStore Storage Manager - Array Management Window
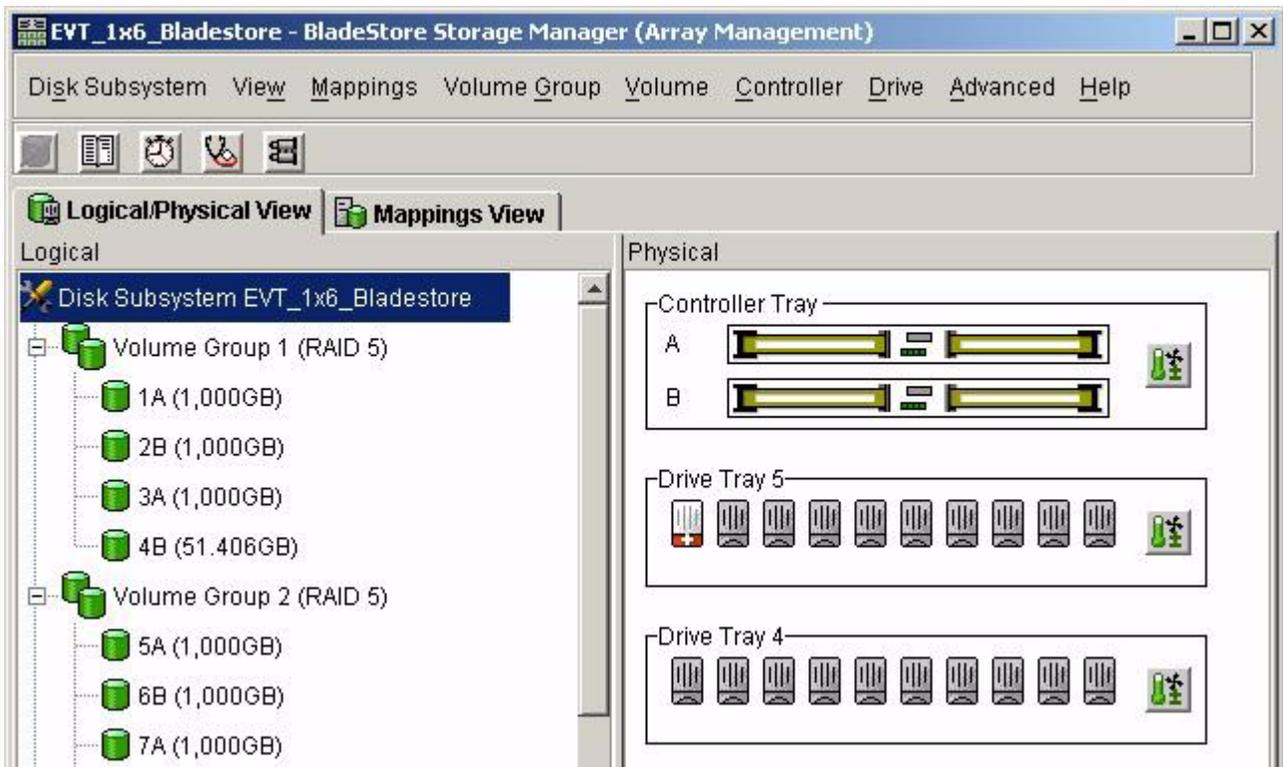
The array management window also provides a physical view, showing the blades associated with any one volume group.
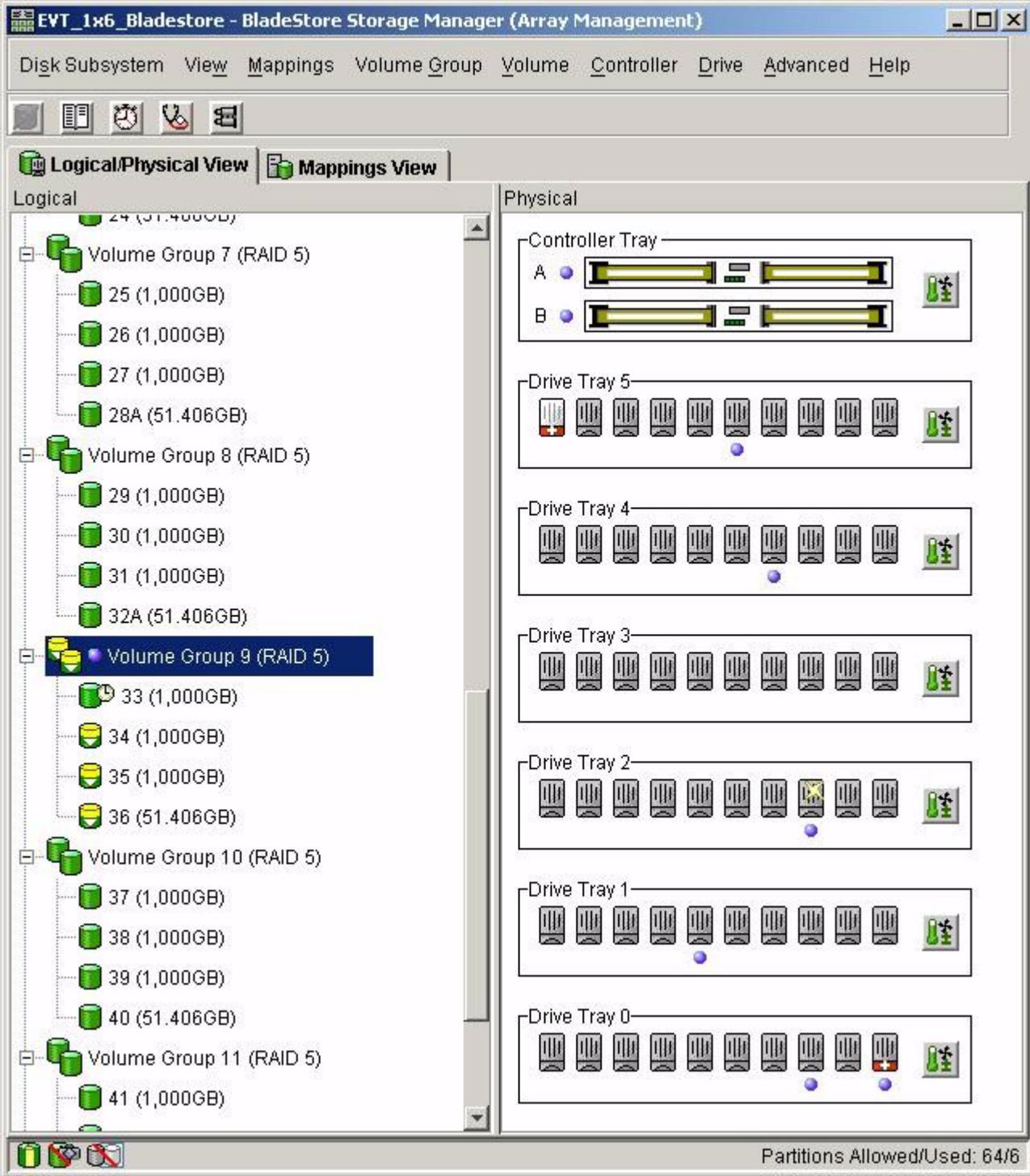
By selecting Volume Group 9 the GUI shows the blades physically associated with the volumes.

Note: In the above example the blade failure process is being tested, which marks the hot spare that is involved in the reconstruction.

The software also provides environmentals, which assist with trouble shooting and repairing the disk subsystem. Redundant parts and paths are available to maximize system reliability and data availability so that the customer's business needs are fulfilled. The GUI provides information so that you are aware of fault and degraded conditions that are present within the storage subsystem.

■ About BladeStore Configurations

This section is meant to enhance your understanding of the BladeStore Disk Subsystem, and provide information on how best to configure your subsystem for the targeted large file or secondary storage customer environments.

Large files are files larger than 2 Gigabytes (2**31 bytes), such as streaming video, surveillance video, and large tar files that would be stored as disk backup. Typically only a 256K segment size would be used.

As presented earlier, the minimum BladeStore recommended is a 1x2 (one control module and two blade modules with 20 total blades). This would provide approximately 23.4 Terabytes of usable storage and provide four 2 Gigabit fibre channels, provided you assign your LUNs (Volume Groups/ Volumes) vertically -- typically using a 4+1 Raid 5 configuration with at least 2 blades from each tray. This would mean that your stripes run across two trays and four blades, which are all being written to (or read from) in parallel. This provides better performance. Typically, the more trays that you have (to a point), and the more blades involved in the LUN, the better the performance. This, however, presents a challenge. Large Volume Group sizes will take a long time to reconstruct if there is a blade failure. This is especially true if you are running high I/O during the reconstruction process. This is why the BladeStore is recommended to be used as secondary storage, or used to store large files.

Configuration Examples

If we assume that the customer is running streaming video to your storage (files greater than 2 Gigabytes), the recommended configuration using 800 GB blades is:

- Set your disk subsystem up with 3 Terabyte volume groups (5 blades)
- Set your LUN at Raid 5 when specifying volume parameters
- Select `customize settings` and configure for 256K segments.

The recommended configuration using the new 1.25 TB blades is:

- Set your disk subsystem up with 5 Terabyte volume groups (5 blades)
- Set your LUN at Raid 5 when specifying volume parameters
- Select `customize settings` and configure for 256K segments.

The GUI provides for these selections so that you may properly configure your BladeStore Disk Subsystem for your particular customer environment. If the needs of the customer require mission-critical storage or uses small database-type data, then you should be recommending that they install an access-centric (D-Series) solution.

Note: An analogy that could be used might say: you use your jets to haul small or critical data; and use your cargo planes for the big bulky stuff.

BladeStore, as with D-Series, works best with balanced loads. So controller A should be handing about the same as controller B. It is also recommended that you only assign from one to four volumes per volume group.

■ BladeStore Performance

The BladeStore was designed to be primarily secondary disk, for mostly large files. We recommend you use a LUN segment size of 256, LUN read ahead at 12, shutting off mirrored cache and disk systems cache at 16k block size. Furthermore, we recommend you shut off the mirrored cache as a secondary disk only.

Ideally, for performance issues you would want to use two B150 drawers. This would use all four backend loops if using BC84/B280 Control Modules. We also recommend using the largest volume sizes the server can handle. By striping several LUNs across the same Volume group, it could cause a performance issue when multiple volumes are being used at the same time on the same volume group.

Note: Too small a volume group would use fewer drives. Look for a happy medium. It is suggested that you use a 4+1 blade set. Refer to the best practices sections documented in the installation manuals.

We highly recommend using RAID 5. It seems to do the best of any of the RAID types that the controllers supports, while using the most blades for performance.

We have seen where some have used two volumes in the same volume group, one volume on the A controller and the other volume on the B controller thinking that would increase performance by attaching the two volumes to different controllers. But then just stripe them back together with VXVM or ASM in the server. This causes the same physical disks to read or write at the same time on two different volumes, which we believe results in head thrashing.

Since the five drives on the blade look like one physical disk to the controllers, I would concentrate my thinking on the blade as one drive, not five. The five drives on the Blade are setup as RAID 0. We cannot effect any changes on the blade from the field. It looks like one 763 GB disk (for a 800 Gigabyte blade) or one 1.168 TB disk (for a 1.25TB blade).

Note: On cache flush, you may have to experiment with it. The default is 80high/80low, thus maxing out the cache at 80%. We have not found

any obvious performance improvement in changing this value—maybe with small I/O, but not with large I/O.

Reconstruction

Depending on the configuration, an array may automatically reconstruct data to a new storage blade. If the array uses hot spares, it might have to complete reconstruction on the hot spare before it copies the data to a replacement drive. This increases the time required to complete this procedure. Use BladeStore Storage Manager to determine the current status of the new storage blade module or drive(s) and the progress of any reconstruction or copyback. It will indicate the status of the subsystem, and indicate when the subsystem is back to an optimal state.

Using a 800 GB Blade and a 4+1 Raid 5 configuration example, we would have slightly over 3 Terabytes of storage (assuming all storage capacity within the volume group is used). If one blade is lost, the disk subsystem reconstructs (rebuilds) the volume group's lost stripe to the hot spare—one volume at a time (assuming a hot spare is assigned). Assuming we have three volumes with sizes of 2 TB, 1 TB, and 54 GB; it would take many hours to reconstruct the 2 TB volume, many hours to reconstruct the 1 TB volume, and an hour or two to reconstruct the 54 GB volume. The process depends on the amount of I/O activity; and in the above scenario the whole reconstruction could take the better part of a day, or longer if there is high I/O activity. After rebuilding the stripe to the hot spare as well as adding new data to the volume group (which the hot spare is now temporarily a part of), BladeStore Storage Manager starts the copy back process—rebuilding the stripe onto the newly replaced blade as well as updating data (based on I/O activity) until the whole copy back process is done.

Note: Impact on performance due to the degradation seems to be minimal. With secondary storage you may not notice any impact on performance.

Note: Reconstruction (and copyback) times have been significantly reduced due to the new 2 Gigabit speeds.

BladeStore Data Paths

Figure 2 on page 7 shows the flow of data from the host servers through the BladeStore Disk Subsystem's major components—showing both the primary (red) and secondary (blue) path, which may be used in the event of a failover condition. The BladeStore software keeps track of all alternate paths, and finds a new way to the data in the event that one of the redundant elements fails.

Components that are in-the-path as shown below are: HBAs, fibre channel cables, host minihubs, controllers, drive minihubs, and the ESM CRUs. Each of these components has a redundant partner, which serves to increase the

reliability of the subsystem, as well as contribute to our goal of 100% Availability for our customers.

Figure 2. BladeStore Data Flow
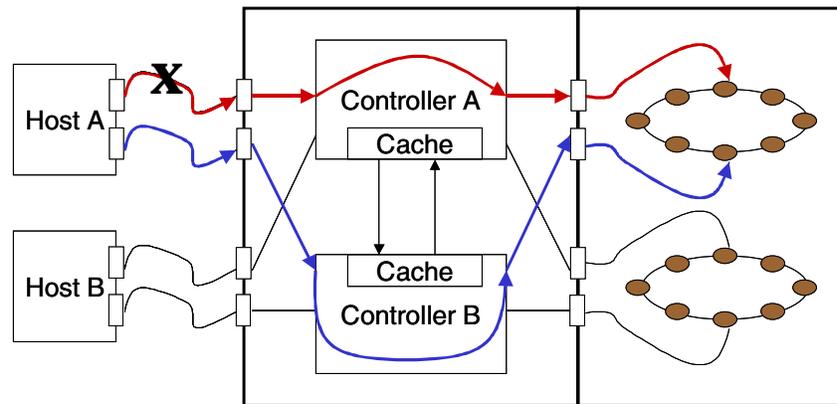
Note: If the fibre channel cable became faulty (as indicated with the X above), then the alternate (blue) path would be selected and used until such time that the primary path is repaired.

Installation Instructions are written for each operating system. Refer to these manuals to do your host setup. This manual will walk you through parameters that must be set to properly configure both the front end and the back end storage components. The Installation Instructions are available on the BladeStore CD, on *Documents on CD*, on the CRC, and on the engineering web page at:

http://gandalf.stortek.com/ctp/installation/index.html

Components such as switches may also be used, which would add another layer of data protection. Switch zones can be used to define what host servers can see and can't see.

BladeStore Zoning

The following provides information about zoning a switch. This allows the customer to partition the BladeStore backend storage into logical groupings, with various zones set up to share or not share the information within the particular zone(s). Also various servers can be connected to a particular zone(s), and then allowed only to see/access the contents of that particular zone(s). Zones can be used to:

- Administer security
- Customize environments
- Optimize IT resources

Brocade Switch Zoning Basics

Zoning can be administered from any switch in the fabric. Changes configured to one switch will automatically replicate to all switches in the fabric; and are

automatically applied to new switches added to the storage network. Zones can be configured dynamically without interrupting port, device, or data traffic.

Policy-based administration is used to separate zone specification from zone enforcement. This means you can manage multiple zone configurations, which is controlled either with telnet commands or with the GUI web tools. Refer to the engineering web page at http://gandalf.stortek.com/ctp/zoning/ for more information.

To use Brocade Web Tools:

1. Launch your browser.

2. Enter the switch name or IP address in the **Location/Address** field.

3. When the Fabric View appears, click on the appropriate switch icon.

4. When the Switch View appears, click the **admin** button.

5. When the Administration View appears, click the **License Admin** tab, enter the license key, and click **Add License**.

More on Zones

A zone is a group of fabric-connected devices arranged into a specific grouping. Any device connected can be included in one or more zones.

Devices within a zone are aware of the other devices within the zone; however, they are not aware of devices outside of their zone. Zone members (ports, WWNs, or aliases) are grouped in a zone configuration (a collection of zones). Zones may overlap where one device belongs to more than one zone. A zone configuration can include both hard and soft zones, and numerous zone configurations can be resident on the switch (with only one active/ enabled at a time). A hard zone is identified by the physical port, whereas a soft zone is identified by its WWN.

When zoning is enabled, zoning is enforced throughout the fabric, and devices can communicate only within their zones. Zone configurations must first be defined as zone objects (RAM) and then saved (stored in flash memory). An enabled zone places one of the zones in the active state where:

- all aliases are expanded
- inconsistencies are checked
- switch hardware is loaded with the zoning information
- zone members are loaded
- registered state change notifications are generated.

Defining a Zone and Zone Configuration

To define a zone, specify the list of members to be included, and assign a unique zone case-sensitive name (alpha-numeric string beginning with an alpha character). Note: The underscore character is also allowed. Specify

zone members by port number, WWN, alias, or any combination of these three.

When defining a zone configuration, specify the zones to be included and name the configuration using the same method as described above.

Create a configuration that best meets your customer's storage, networking, and security needs.

BladeStore Storage Management Methods

The most common configuration is the in-band Host-agent managed configuration, which assigns at least one host (attached via fibre channel) as the management station. Two HBAs are used on the host and two fibre channel cables are used with one attached to controller A and the other attached to controller B (via the appropriate controller minihubs on the host interface). Another two ports on the other minihubs could be used for another host, or to route to a switch. In this configuration the host acts as the Agent (getting commands through fibre); therefore both SMagent and SMclient (the GUI) need to be loaded.

Note: The SMagent translates commands and formats them to go over fibre.

Another configuration is called out-of-band or direct-managed, which uses ethernet cable connections instead of managing through the fibre channel. This method attaches two ethernet cables from the controller ports to the local subnet, which your management station is also attached to. In this configuration you only need to install SMclient (the GUI).

Note: On the blade interface side, fibre channel cables route from the four minihubs to the Blade Module trays on the backend. Here, it is important to structure the storage as equal or balanced workloads so that no one controller is over-worked or under-utilized.

The BladeStore CD

The CD that goes out with BladeStore shipments has folders for documents, software, and drivers. Firmware, MIB files, and NVSRAM folders may also be present on the BladeStore CD.

The **docs** folder has all the BladeStore documentation you need to do an installation. Updates to these documents can be found on *Documents on CD* as well as on the CRC and on the engineering web pages at:

http://gandalf.stortek.com/ctp/B150/

http://gandalf.stortek.com/ctp/manager/

http://gandalf.stortek.com/ctp/installation/

Various other helpful web pages are available from hyperlinks on the bottom of the main engineering web page at:

http://gandalf.stortek.com/ctp/index.html

For more information about the BladeStore Disk Subsystem and module selections, refer to the *BladeStore Site Preparation Guide*, p/n 96083.

■ Sales Information

Table 1 lists some of the features and benefits for BladeStore:

Table 1. Features and Benefits

Feature	Benefit
Hardware Redundany The BladeStore Disk Subsystem provides redundant controllers, fans, DCPSs, and minhubs in the Control Modules. Redundant blower modules, DCPSs, and ESM CRUs are available in the Blade Modules.	Subsystem reliability and virtually 100% availability through a system of hardware backups, which both share the load to minimize the strain on any one part as well as maintaining continuous operations.
Path Redundancy Front end and back end fibre channel cables provide two fibre channel loops (up to four).	Subsystem reliability and availability are enhanced again by having alternates paths to the data. These paths also serve to share data streams, increasing the overall bandwidth of the disk storage subsystem.
BladeStore Storage Manager The user-friendly software that is used to maintain both B-Series and D-Series Disk Subsystems, featuring: • easy management of data • environmental reports • help function with additional information and user instructions • SANshare storage partitioning	Because BladeStore uses virtually the same stoarge management software as D-Series, users can create volume groups and volumes, and maintain the storage solution as they did with D-Series. No learning curve, and no new terminology. Also previous software functionality that were only in the field tool software have been added to the BladeStore Storage Manager, enabling one to download both controller and ESM firmware as well as three varieties of drive (blade) code.

Additional information about the value of BladeStore can be found in the BladeStore Site Preparation Guide, p/n 96083, and in the BladeStore Storage Manager Concept Guide, p/n 96090.

System Requirements

System requirements for the BladeStore Disk Subsystem, including required operating system levels and patches, are available in the BladeStore Planning Guide, p/n 96147, for all of the operating systems that are supported, i.e. AIX, HP-UX, LINUX, Netware, IRIX, Solaris, Windows NT, 2000, and WS2003.

Note: This information is often in the installation instructions.

A connectivity matrix is also available on the Sales Community. It provides HBA and driver information to help you configure a viable and certified solution for your customer.

Information Lifecycle Management

Information lifecycle management (ILM) is a new approach that can help you:

- Sell more products
- Initiate meaningful conversations–not presentations–with customers
- Offer answers to customers questions about long-term storage and strategy
- Provide solutions, not just more devices

The rest of this chapter describes how BladeStore fits this new approach.

■ Pain and Frustration

Ask your customer or new prospective if they agree that these are some of the potential problems they are currently facing:

- Storage demands are growing faster than disk is growing cheaper.

  One of the problems that customers face is that information and the requirement to store it is outpacing the cost of disk storage.

  We can no longer afford to "throw disk at the storage problem" anymore. Besides costs, there are also space and environmental limitations to consider.

- IT budgets are flat to declining.

  Besides the growth in storage, flat or declining IT budgets compound the problem. There are no *"extra"* dollars to pay for storage, infrastructure, and administrative costs.

- Storage is growing faster than storage management productivity is improving.

  The demand on storage is growing *much* faster than the ability of people to manage it. The vast majority of storage growth is occurring in the UNIX, Windows, and Linux environments. These are the environments least well-equipped to manage storage.

- Failing to properly manage the growth of information, storage resources, and administrative costs puts the business (company) at risk.

  These things are happening at a time when information is critical to the success, even the survival, of the business.

A Change is Needed:

StorageTek believes its approach through information lifecycle management can bring about a change in behavior (let's add more disk).

To support the business goals and objectives of our customers, storage management must become a strategic business consideration.

A Strategic Foundation:

A foundation for a strategic approach lies in the fact that the activity level and value of information changes over time.

Once data is created, it is most volatile and subject to change during the first hours and days of its life, then it declines in both reference value and immediate value.

Figure 3 demonstrates this statement:

Figure 3. Data Creation and Reuse
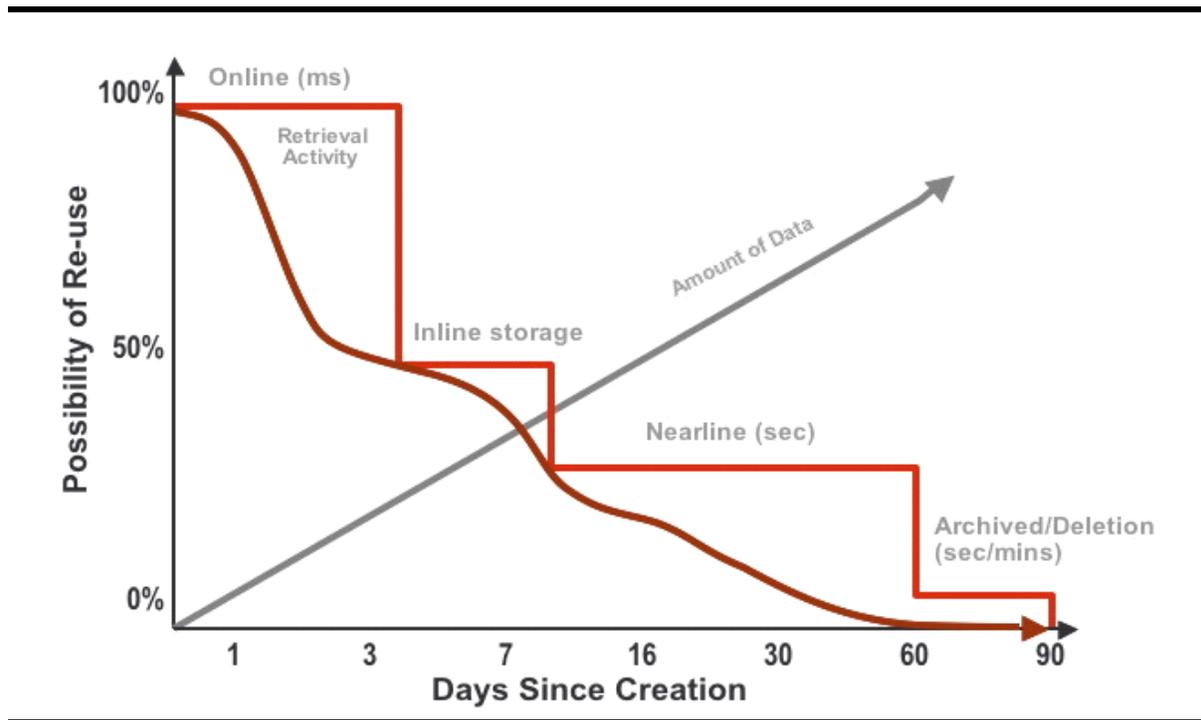
In addition to changes over time, how well are storage devices utilized? For example: Actual disk capacity utilization is less than 50%; there is data that has not been accessed in weeks, months, even years.

Observations about Data Storage:

There are a number of observations we can make about data and use it to discuss the advantages of the **BladeStore Disk Subsystem** solution:

- Some data are over-protected and for too long
- Some data are under-protected or even not at all
- Not all data has the same value to the business
- The value of data to the business is not constant through the life of the data
- Only 20% of stored data is original
- About 80% of stored data is a replication of the 20% that is original
- More than half of the disk's capacity is unused
- Most of activity involves a small portion of the data
- Most of the data are inactive.

We can use the information lifecycle management approach to understand the relationship between BladeStore and the customer's business priorities.

Using the BladeStore solution allows the customer to be very specific about how each application's data should be stored, managed, and replicated. In other words, BladeStore allows the customer to be proactive and strategic about storage.

■ Backups

The definition of a backup is:

To copy files to a second medium (such as disk or tape) as a precaution in case the first medium fails. One of the rules in computing is *backup your files regularly.*

Many professionals recommend that companies make *two*, or even *three*, backups of *all* their files. Then, to be especially safe, keep one of the backups in a different location away from the others at an offsite location.

This recommendation drives home the observation that 80% of the customer's data is a replication of the original 20%.

Table 2. Backup Concerns

Concerns	Ask This:
Data recovery	How often do you need to restore data?
Downtime	Are backup windows being met?
Backup window constraints	What time of the day are backups taken? What type of backup is being performed? What type of data needs backing up?
System complexity	Are your servers on a network? What type of disks are you backing up?
Administration	Are your administration costs too high?

■ Engagement Opportunities

StorageTek has been doing information lifecycle management for many years. If you look back, our knowledge and experience has evolved around storage: from mainframe to open systems, from disk to archive, from server-attached to network-attached, not to mention tape and automated cartridge systems.

StorageTek is not just about devices; StorageTek also offers cost-effective, disciplined, packaged solutions for your storage-intensive needs that are available today.

Meet BladeStore, a high-storage capacity-centric disk subsystem solution.

BladeStore is a new type of offering from StorageTek, which provides a low-cost, in-line secondary storage solution for the customer. It is designed to solve specific storage problems, specifically addressing performance, back-up or restore, and fixed content storage environments.

A basic foundation of the information lifecycle management objectives is to:

- Become more strategic about storage
- Align storage costs with business priorities
- Determine how and at what cost the customer can *store*, *manage*, *replicate* and *integrate* their information

BladeStore meets some of these objectives by:

- Automating the *management* of data, which is consistent with customer priorities and at a cost that is easy to manage too.

- Providing a data protection, backup, and restore solution to protect your mission-critical data.

- Providing a fixed content and rich media solution for scanned and video-type data (such as check imaging and x-rays)

Why buy BladeStore?

BladeStore provides in-line storage in a solution that provides:

1. 6.25 Terabytes to 150 Terabytes of low-cost storage capacity

2. 400 MB/sec to 800 MB/sec throughput (bandwidth)

3. Highest storage density per cubic inch (small footprint)

4. Hardware redundancy and path redundancy (availability)

5. RAID 5 and the D-Series storage management GUI.

In brief, BladeStore allows the customer to significantly *reduce* storage infrastructure costs and *simplify* storage management.

■ Target Customers

All customers need to protect their data, and BladeStore is the low-cost open systems in-line solution for customer environments using AIX, HP-UX, LINUX, Netware, SGI IRIX, Solaris, Windows NT, Windows 2000, and Windows Server 2003. BladeStore is particularly well-suited to those customers who:

- Place great value on their data, and therefore, are adverse to the risk of data loss

- Suffer from data management or system administration issues

- Encounter difficulties protecting their data using traditional backup and recovery techniques.

Markets

BladeStore is a capacity-centric solution that is best suited for:

- Large companies who use distributed open system platforms
- IT Help Desks with support responsibility for many end users
- Large heterogeneous, open systems environments
- Large files that are over 2 Gigabytes
- Video or surveillance archival
- Exchange archives

The current version of BladeStore is not suited for:

- Big UNIX environments with services to thousands of users
- Enterprise OLTP applications
- Customers/applications with high write rates
- Mainframe systems and applications

Company Profiles

BladeStore is also suited for mid-sized to large companies with:

- Greater than $100M in annual revenue
- Greater than 1000 Employees or over 1000 customers
- Greater than 12 TB of storage
- Greater that $100,000 in storage spending

Note: The bigger the company, the more need for BladeStore, especially if storing tar files, zip files, imaging, video, or large archive files.

Environments

Customers with open systems environments will be interested in BladeStore.

Note: Other platforms may be added as requests and resources allow.

Requirements

Customers with these requirements would also be interested in BladeStore:

- Version control
- Backup consolidation
- Rapid recovery
- High-accessibility to business important files
- Simple administration

Qualifying Checklist

Here are some quetions you can ask about a potential customer:

- Does the customer have a data protection problem?

- How would the customer classify the value of their data or information?

- Does the customer have large amounts of flat file storage?

- Does the customer have departmental level data bases?

- Does the customer use any replication technologies (mirroring, snapshot, other)?

- Is the customer looking for advances in data protection?

- Is the customer an entry level VERITAS Backup Exec/Autoloader user looking for greater scalability?

- Is the customer investigating disk-based backup enhancements to their current environments?

■ Secondary Storage Applications

There is nothing like BladeStore in the industry today; and there are various premium features that could be used if your inline secondary solutiuon involves StorageTek's D-Series products or LSI's E-Series products. Also other applications are available from various vendors, such as:

- Virtual Tape – Quantum, ATL, and Alacritus
- Disk-to-Disk Backup – VERITAS (NetBackup), Legato (NetWorker), and Tivoli Storage Manage (TSM)
- SnapShot – VERITAS (Volume Manager)

Table 3 provides a comparison of the strengths and weaknesses of all of these various applications that could be used with BladeStore.

Table 3. Application Comparison of Strengths and Weaknesses

Type of Application	Strengths	Weaknesses	Application Name
Backup & Recovery	• Accepted practice • High market penetration • Consolidate administration	• Disruptive to production • Slow recoveries • High failure rates	VERITAS NetBackup Tivoli Storage Manage Legato NetWorker CA BrightStor HP OmniBack
Network or SAN-based Replication	• Instant recoveries to a point-in-time • Potential LAN-free, application-free backup • Closes the backup window • Consolidates source data • Management functions such as pooling	• New practice • No market penetration • Disruptive installation • Performance issues • Increased risk of failure • Limited throughput • Slower disk performance	FalconStor IPstor
Controller-based Replication (RVM)	• Instant recoveries to a point-in-time • Potential LAN-free, application-free backup • Closes the backup window • Consolidates source data • Management functions such as virtualization	• Performance penalty • Risks of data loss because logical copies are on the same subsystem	StorageTek or LSI SANtricity Storage Manager's Remote Volume Manager (RVM) BladeStore Storage Manager RVM is not yet available.

If applicable you may use:

Host-based Replication (if used as primary disk - for files greater than 2 GB only)	• Instant recoveries to a point-in-time • Closes the backup window • Management functions such as capacity utilization	• Impact on performance • Disruptive installation • Host-specific • Potential data loss	VERITAS VxVM FlashSnap NetApp SnapShot

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Second Edition

Identifying Customer Needs

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This chapter is intended to help you identify your potential customer's needs by providing a list of questions to ask.

When asking these questions, keep in mind the information in Chapter 1 and the topics in the "Information Lifecycle Management" on page 11.

Note: Forms are available from professional services for use during this engagement phase.

■ System Requirements

The system requirements to support BladeStore include:

- Operating system levels — refer to the *BladeStore Planning Guide*, p/n 96147, for more information

- Current patch levels maintained — refer to the *BladeStore Planning Guide*, p/n 96147, for more information

- HBAs and drivers — refer to the *Connectivity Matrix* and to the *BladeStore Installation Instructions* for more information concerning your specific operating system

- Two separate branch 240 Vac power circuits for redundancy

- StorageTek supplied F40 cabinet or sufficient rack space

- A floor that can support the weight of a fully configured cabinet, which is approximately 500 kg (1100 lbs) — refer to the *BladeStore Site Prepartion Guide*, p/n 96083, for more information on floor loading

- One phone line and modem for remote access/event notification — refer to the *Preconfiguration and Maintenance Setup Instructions*, p/n 95966 for more information.

■ Gathering Information

Below is a list of questions (specific to a secondary storage environment) that you can ask to help you identify your customer needs and help determine their BladeStore configuration.

Note: You may not need to ask all these questions for each customer.

Table 4. Questions and Answers

Question	Answer
System Configuration:	
1. How many and what types of servers does the customer have? Make: Model:	
2. What types of platforms are used? AIX, HP-UX, LINUX, IRIX, Netware, Solaris, Windows NT, Windows 2000, Windows Server 2003	
3. How many servers are used as: Backup servers? File servers? Print servers? Exchange servers?	
4. Are there any servers being migrated? If so, what is the timeframe?	
5. Is there any advanced planning underway to migrate servers to Microsoft .NET? If so, what is the timeframe?	
6. What type and size of disk drives does the customer have? Make: Model: Capacity:	
7. How are the disk drives partitioned?	

Table 4. Questions and Answers (Continued)

Question	Answer
Storage:	
1. How much primary storage is there?	
2. Does all primary storage require data protection from BladeStore? If not, how much does?	
3. What Data Base Management Systems (DBMS) does the customer have?	
4. What types of databases need protecting?	
5. What is the size of the smallest database?	
6. What is the size of the largest database?	
7. What type of data is the customer backing up?	
8. How valuable is the data in each database?	
9. Do the different databases have different protection requirements?	
10. How many logical volumes is the database spread across?	
11. What is the approximate write rate and update per database? per day?	
12. How is the customer protecting the databases? (tape backup, mirroring, snapshot?)	
13. If mirroring, how many mirrors? Is mirroring installed because failover is required?	
14. If tape backup, is there an SLA that defines when media has to be offsite?	
15. Are there any requirements for remote protection?	
16. How often does the customer protect each database?	

Table 4. Questions and Answers (Continued)

Question	Answer
Backups and Applications:	
1. How many servers perform backups?	
2. What backup and recovery applications archive data?	
3. By application, how much data is there?	
4. How are backups performed? (manually or automatically)	
5. On what days are backups performed?	
6. What types of backups are performed and when? Full: Incremental: Differential:	
7. How much data is backed up: Per day? Per week? Per month?	
8. How long does the customer keep the different levels of backed up data?	
9. Are backup windows being met?	
10. How long should backups take?	
11. How many hours does it take?	
12. Is a different backup schedule needed?	
13. What is the average update rate?	
14. Are there any measures that identify the peak write rates?	
15. Are there any applications that use proprietary device drivers? If so which applications?	
16. How often are restores necessary?	
17. Why?	
18. What are the restore requirements?	
19. What are the restore objectives?	

Designing a Solution

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3

</div>

Using the data gathered so far, this chapter describes the necessary components for an BladeStore Disk Subsystem solution, showing examples of how to tune and configure. Also space is provided so that you can list the customer's details and/or draw a potential configuration.

Note: You might consider bringing in professional services, who has can do an analysis of the customer's environment and design a solution using their process steps and templates.

Upon completion of your design, you should use the disk pre-qualification process to ensure the technical viability of the proposed configuration; and prior to an actual installation, it is recommended that the installation team use the technical qualification worksheet to ensure site readiness.

■ Configurations

The following pages show examples of certified and tested configurations with specifics about each configuration. This information should give you a level of confidence when designing a configuration to support and meet your customers needs. The first configuration shown is a "Single Host Server Configuration Example" on page 25. Using this and subsequent examples, you will see how the connectivity matrix is used to configure a storage solution. The following illustration shows the bottom portion of the connectivity matrix.

Figure 4. Connectivity Matrix - Selection Tabs

	EZFibre 2.2	NA	5.1.1	NA	NA	NA	NA	NA
ic, 66MHz,PCI,								
, optic,	NA	5.1.1	NA	NA	NA	NA	NA	NA

Fibre no FO 2.5.6 or

ry / Important Support Notice / SANtricity Storage MGR / SUPPORTING SW \BC84 HBAs & Drivers / CABLES / DRIVE CODE / HUB & SWITC

Select these tabs to discover the components that have been certified to work with the BladeStore Disk Subsystem.

When we select the SUPPORTING SW tab, we obtain supported software information for each supported operating system, as shown below.

Figure 5. Connectivity Matrix - Supported Software

	A	B	C	D	F	G	H	I
2		BC84 Supporting Software						
3	NA=Not applicable N/T=Not Tested							
4	SOFTWARE	NT PCI 4.0	Solaris PCI & SBUS 2.6/2.7/2.8	HP/UX 11.0	AIX/RS6K 4.3.3	AIX/RS6K 5.1	WIN 2000 5.0	LINUX Red Hat 7.2
5								
6								
7	GUI	YES	YES	YES	YES	YES	YES	YES
8								
9	FAILOVER	RDAC	RDAC or DMP 3.2 or higher	PVLINK	CAMBEX SCSI FO 1.5.19.2	CAMBEX Future	RDAC	QLOGIC
10								
11	MC SERVICE GUARD 9000/Series 800	NA	NA	V11.05/ 11.09	NA	NA	NA	NA
12								
19	VERITAS VOLUME MANAGER	NA	3.2 or higher	NA	NA	NA	NA	NA
20								
21	VERITAS CLUSTER SERVER		VERITAS Server 1.3.0					
22								
23	MICROSOFT CLUSTER SERVER	N/T	NA	NA	NA	NA	N/T	NA
24								
25	SERVER CLUSTERING (SUN)	NA	Sun Cluster 2.2,3.0	NA	NA	NA	NA	NA

A SAN interoperability matrix is also available for additional information. It is available at:

`http://goldlab.stortek.com/resource/sanStorehouse.shtml`

Click the **Browse configurations** hyperlink, and select one or two items to see if someone has already tested the particular solution you have planned.

Single Host Server Configuration Example

The following figure and details are for attaching a BladeStore Disk Subsystem to a Windows NT intel-based PC using a host-agent management configuration.

Note: Various photos and illustrations are available (showing back-side ports) to help you do your network configuration drawings.

See:
http://gandalf.stortek.com/ctp/photos/
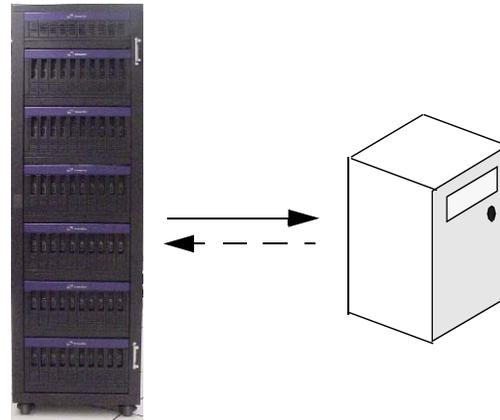
Based on the connectivity matrix shown below, we ensure that our site has certified HBAs, drivers, etc. that have been verified to work with this operating system. The following screen displays when we select the HBAs & Drivers tab.

	A	B	C	D	E	F
1	Located at:	http://salescommunity.storagetek.com/Sales/ProductsServices/Disk/B-				
2						
3	REV:	4.0	HBAs MUST BE ORDERED SEPARATELY on the Sal			
4	DATE:	04/02/2003		BC84 HBAs and Driv		
5			Host Attach Operati			
6		NT PCI	Solaris Sun Sbus	Solaris Sun PCI	HP	VIN 2000
7	OS VERSION level	4.0,SP5,SP6	2.6,2.7,2.8	2.6,2.7,2.8	11.0	5.0
8	HBA/DRIVER					
9	QLA 2310F - 2Gb optic, 66MHz, PCI-X single port	8.1.5.12	NA	4.06	NA	8.1.4.10
10	QLA2342 - 2Gb optic, 133MHz, PCI-X, dual port	8.1.5.12	NA	4.06	NA	8.1.4.10
11	NOTE: QLA23XX must be zoned separate from other HBA types.					
12						
13	LSI 409190 -2Gb Single port PN 5-00001-01	1.02.03	NA	5.03.01	NA	1.08.50
14	LSI 449290 -2Gb, dual port PN 348-0045858	Not Supported	NA	5.03.01	NA	1.08.50
15						
16	Emules LP9002L-F2 2Gb optic, 33-66MHz, PCI, single port	4-4.82.a4	NA	5.00i	NA	5-4.82a4
17	LP9802 2Gb optic, 33-133MHz, PCI/PCI-X, single port	NA	NA	NA	NA	5-4.82a4
18						
19	IBM 6228	NA	NA	NA	NA	NA
20						
	JNI --FCE2-6410-N - 1Gb , optic,					

We identify the HBA and driver that works for our Windows NT configuration, and then we select the CABLES tab on the connectivity matrix to find the appropriate fibre channel cable. See the cable description below, which assumes our disk subsystem is located fairly close to the server for our example configuration.

Component	Descriptive Information
O/S	Windows NT
HBAs	QLA 2310F, 2Gb, optic, 66MHz, PCI-X single port
Drivers	8.1.5.12
FC Cable	2 Gb/2Gb, p/n 10800221 -- 10M, LC-LC duplex, 50/125
Switch	Brocade Silkworm 3800 16 Port 2Gb

Selecting the HUB & SWITCH tab, we select the Brocade Silkworm 3800 16 Port 2Gb switch, for this example. We also note that it is approved for all operating systems, so if we add more host types, we know that there will be no issues.

In the above example configuration, we would actually order two HBAs and drivers, two FC cables, and possibly two switches. This would help eliminate any one single point of failure—again maximizing the reliability and availability of the storage network. The following illustration depicts this configuration.

Silkworm 3800 Switch

Intel-based PC running Windows NT, with two QLogic HBAs and drivers loaded.
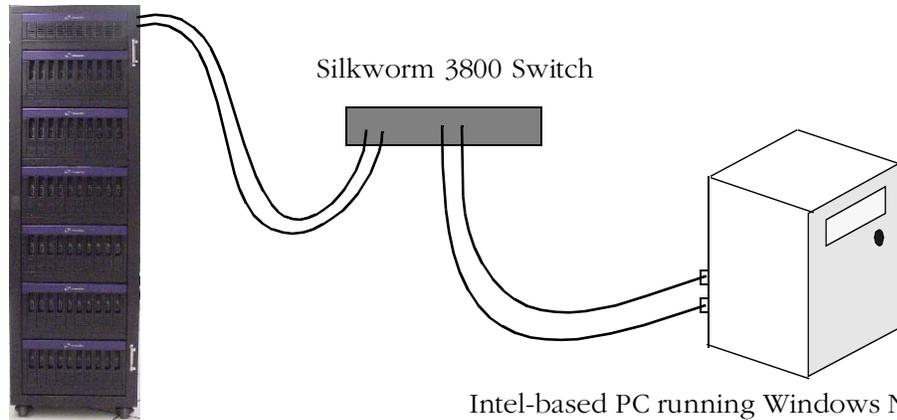
BladeStore Disk Subsystem (BC84/B280 on top)

From this basic configuration you could add another switch, add multiple hosts, and zone the switch(es) so that only certain hosts will see certain data. You could also attach other storage subsystems up to the switch(es), and run an application to automatically backup one disk subsystem to the BladeStore at midnight. Another host could have its assigned disk subsystem run the backup at 2:00am; and yet another host could run its backup at 4am. With 75 Terabytes of storage as shown in this BladeStore full cabinet configuration, a lot of storage subsystems could be backed up to this one BladeStore Disk Subsystem.

The following illustration shows valid hubs and switches on the connectivity matrix.

	A	B	C	D	E	F	G
1		Located at: http://salescommunity.storagetek.com/Sales/ProductsServices/Disk/B-S					
2							
3			HUB and SWITCH Certification				
4	Supported	NT PCI 4.0	Solaris Sun Sbus 2.6,7,8	Solaris Sun PCI 2.6,7,8	HP 11.0	AIX 4.3.3,5.1	SGI-IR 6.5.1
5	N/T= Not tested						
6							
7	HUBS						
8	Vixel Rapport 2100	1.20 Build 277	1.20 Build 277	1.20 Build 277	1.20 Build 277	1.20 Build 277	1.20 Bu 277
9							
10	SWITCH						
11	Silkworm 3800 16 Port 2Gb	3.0 or higher	3.0 or higher	3.0 or higher	3.0 or higher	3.0 or higher	3.0 or higher
12	StorageTek 4108	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a o higher
13	StorageTek 4116	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a o higher
14	Brocade 2400/2800	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a o higher
15	StorageTek 6400	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a or higher	2.4.0a o higher
16	Qlogic SANbox 2-16A 2Gb	1.1-15-0	1.1-15-0	1.1-15-0	1.1-15-0	N/T-2Gb	1.1-15
17	Qlogic SANbox 8/16,1Gb	3.04.30	3.04.30	3.04.30	3.04.30	3.04.30	3.04.3
18	Vixel 9100/9200, 2Gb Cannot cascade more than two switches	FW 5_00 Build 205	FW 5_00 Build 205	FW 5_00 Build 205	FW 5_00 Build 205	FW 5_00 Build 205	FW 5_ Build 2

Hundreds of configurations are possible. Refer to the latest connectivity matrix, which is available on the Sales Community at:

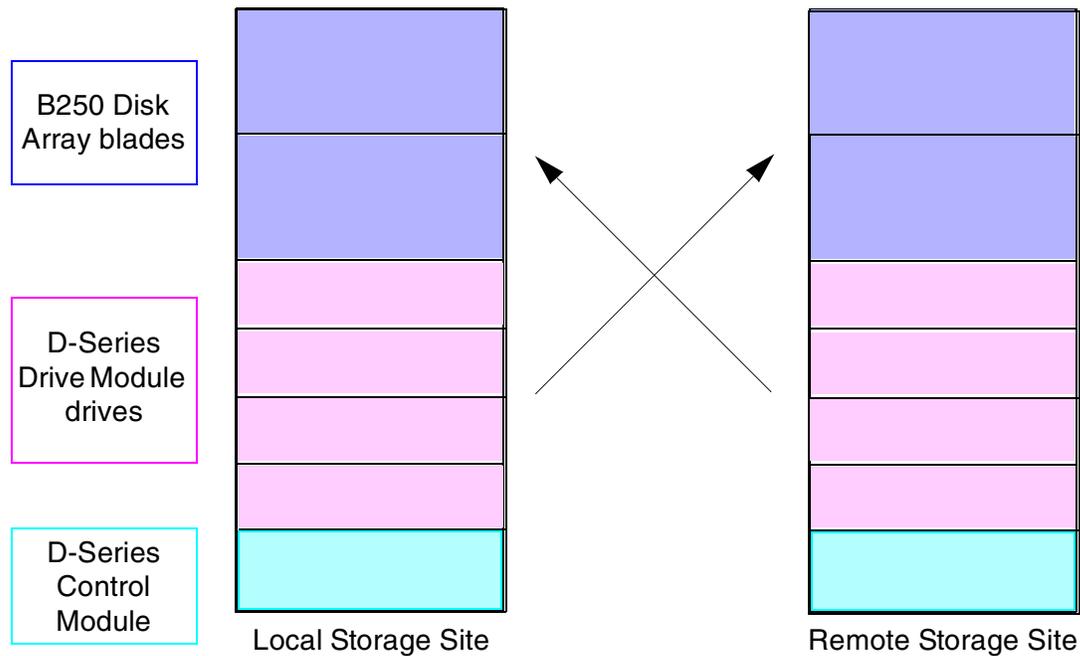http://salescomm.stortek.com/Sales/ProductsServices/Disk/B-Series/BladeStore/

Adding BladeStore to enhance the D-Series Solution

One other configuration that needs to be presented is the D-Series and B-Series mix. Future releases of software and firmware will enable you to have B250 Disk Arrays attached as D-Series expansion trays. This would enable you to:

- Create 5.5 Terabyte volume groups specifically for large files (over 2 Gigabytes) using the B250 blade trays
- Assign volume groups specifically for a RVM repository, which backups to a remote site, which could be a dual backup method, as shown below.

Figure 6. Dual RVM Backup Configuration

B250 Disk Array blades

D-Series Drive Module drives

D-Series Control Module

Local Storage Site   Remote Storage Site

In the above scenerio the primary D-Series disk at the local site would be saved to a remote site's Inline secondary disk section using the GUI's Remote Volume Mirroring (RVM) premium feature. The remote site's disk subsystem could also be mixed, and its primary disk could be backed up back to the other site.

Note: There are also various backup and data replication applications available that could be used. These programs could then allow you to backup to tape without interfering with your primary disk.
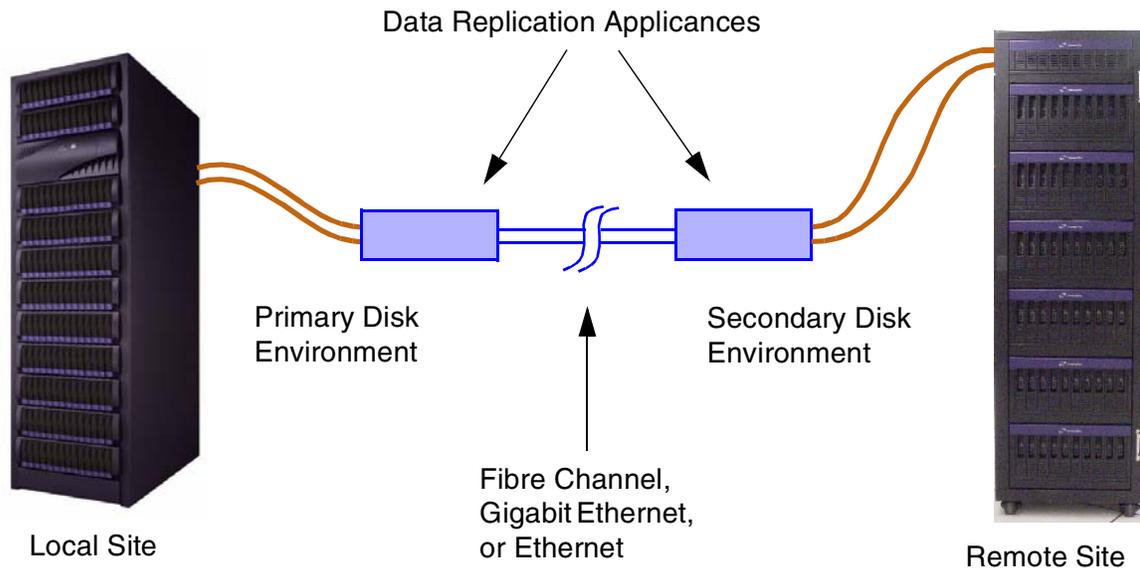
Backups using fibre channel could enable the remote site to be 10 km (6 miles) away; or if you backup over IP, backups could be to a remote site in the next city or further.

Contact your systems engineer or sales representative for more information about these solutions.

Adding a Data Replication Appliance

Another configuration would involve using B-Series Disk to backup D-Series Disk. The following diagram depicts this configuration.

Figure 7. Data Replication Configuration

Data Replication Applicances

Primary Disk Environment

Secondary Disk Environment

Fibre Channel, Gigabit Ethernet, or Ethernet

Local Site

Remote Site

In the above configuration, you would have your disk subsystem management station (not shown) attached using the direct managed method. Refer to your BladeStore Storage Manager Concept Guide, p/n 96090 for information about host-agent and direct managed methods.

Your host minihubs using 2 Gigabit fibre channel LC-LC cables, attach to your appliance, which now manages data flow to and from the primary disk, as well as to the remote site if the volumes have been designated for data replication.

Furthermore, a switch could be added between the primary disk and the first appliance, allowing you to attach more D-Series Disk Subsystems—or you could attach additional disk directly to the appliance or through a SCSI to FC bridge. Or you could add another switch on the back-end to do data replication to another remote site.

There are many different appliances and configurations available for your storage environment. Contact your systems engineer or sales representative for more information about these solutions. Our labs constantly test the possibilities to ensure that there are solutions to fulfill customer needs.

Refer to the connectivity matrix at: http://salescomm.stortek.com/Sales/ProductsServices/Disk/B-Series/BladeStore/ and to the SAN interoperability matrix at: http://goldlab.stortek.com/resource/sanStorehouse.shtml to obtain more information about the solution possibilities.

■ Customer Designs

The remainder of this chapter provides space for you to capture the customer's information, and use the graph paper (or Visio) to sketch the components and design the BladeStore solution that best fits your customer's business storage needs.
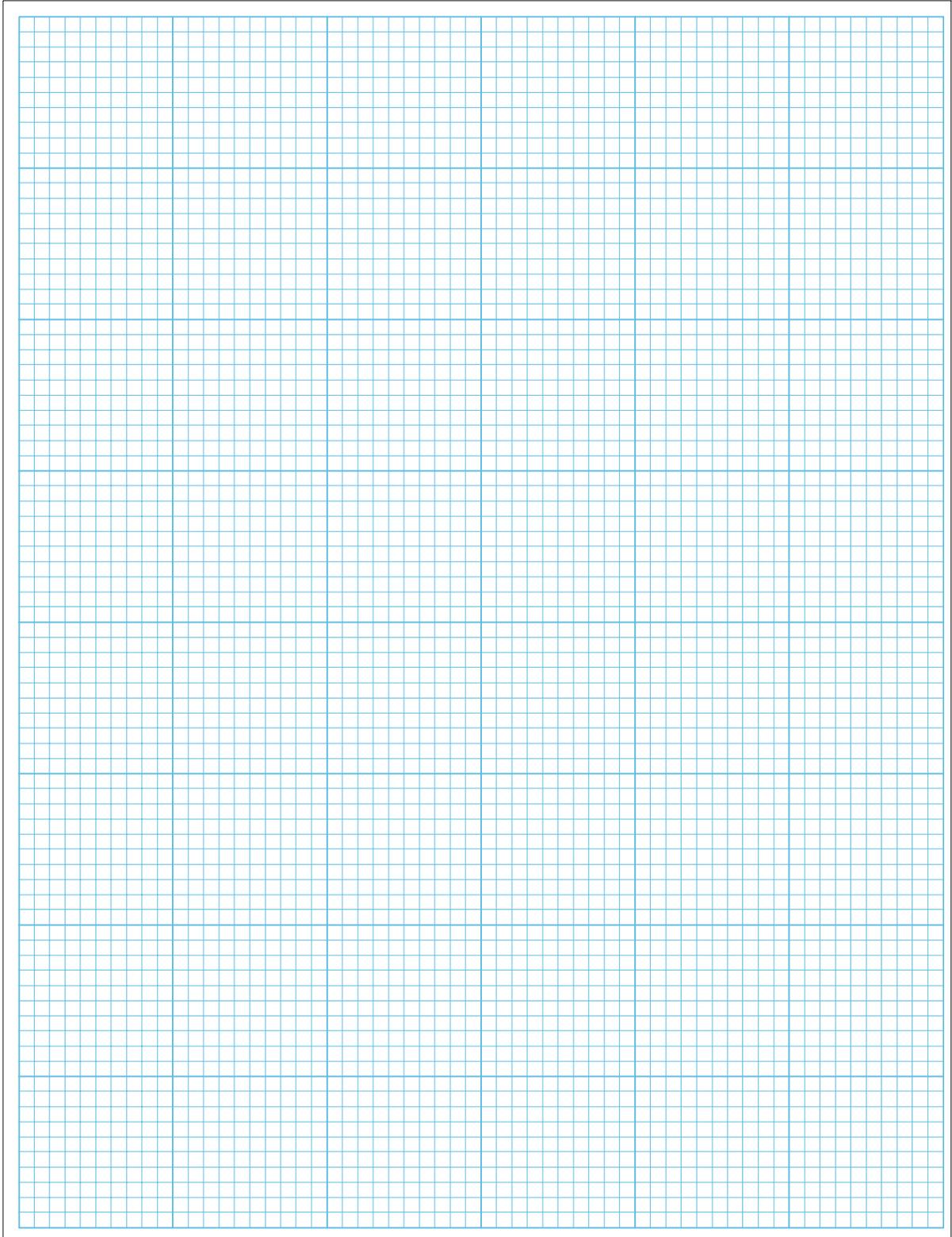
Note: Various photos and illustrations are available (showing back-side ports) to help you do your network configuration drawings. See:
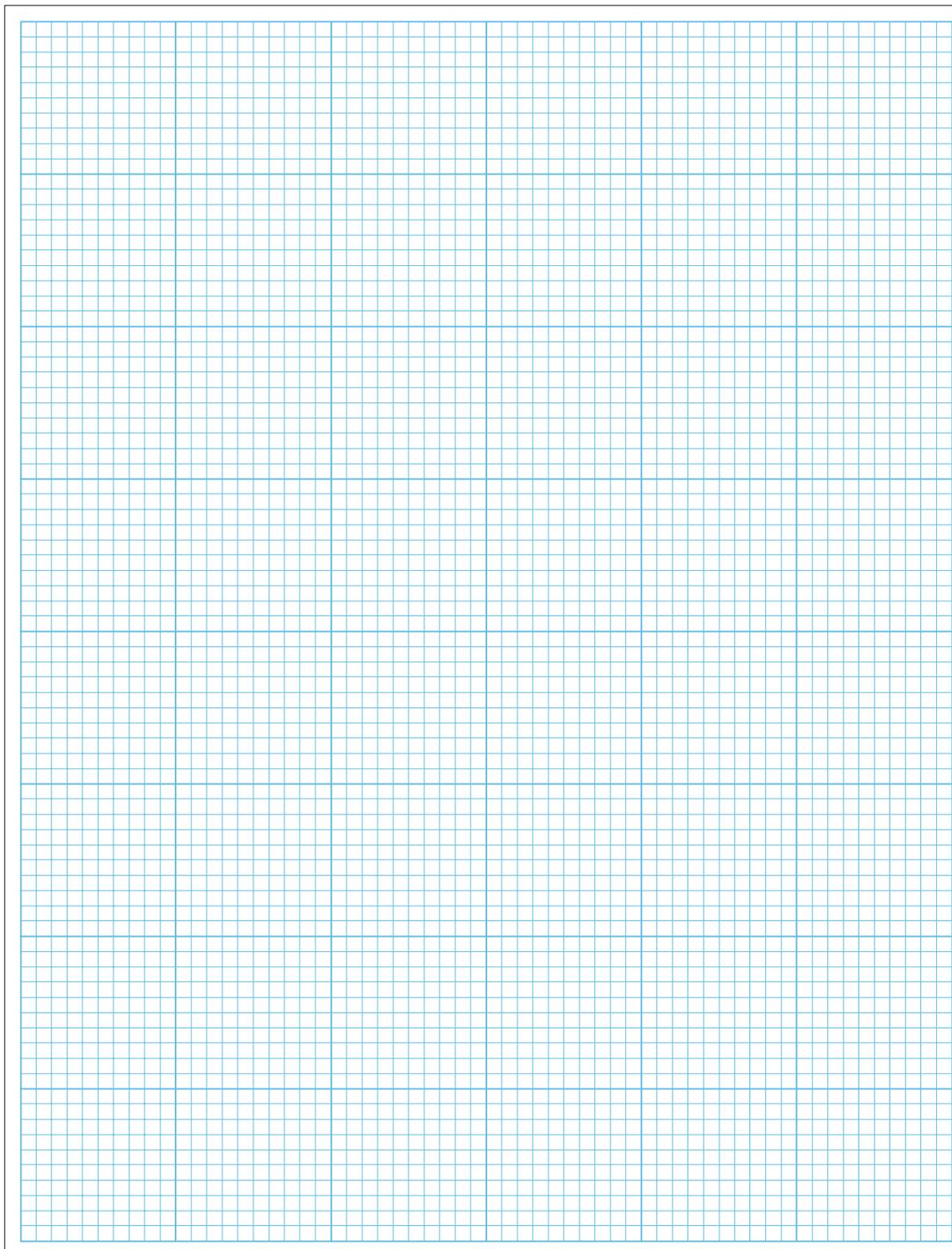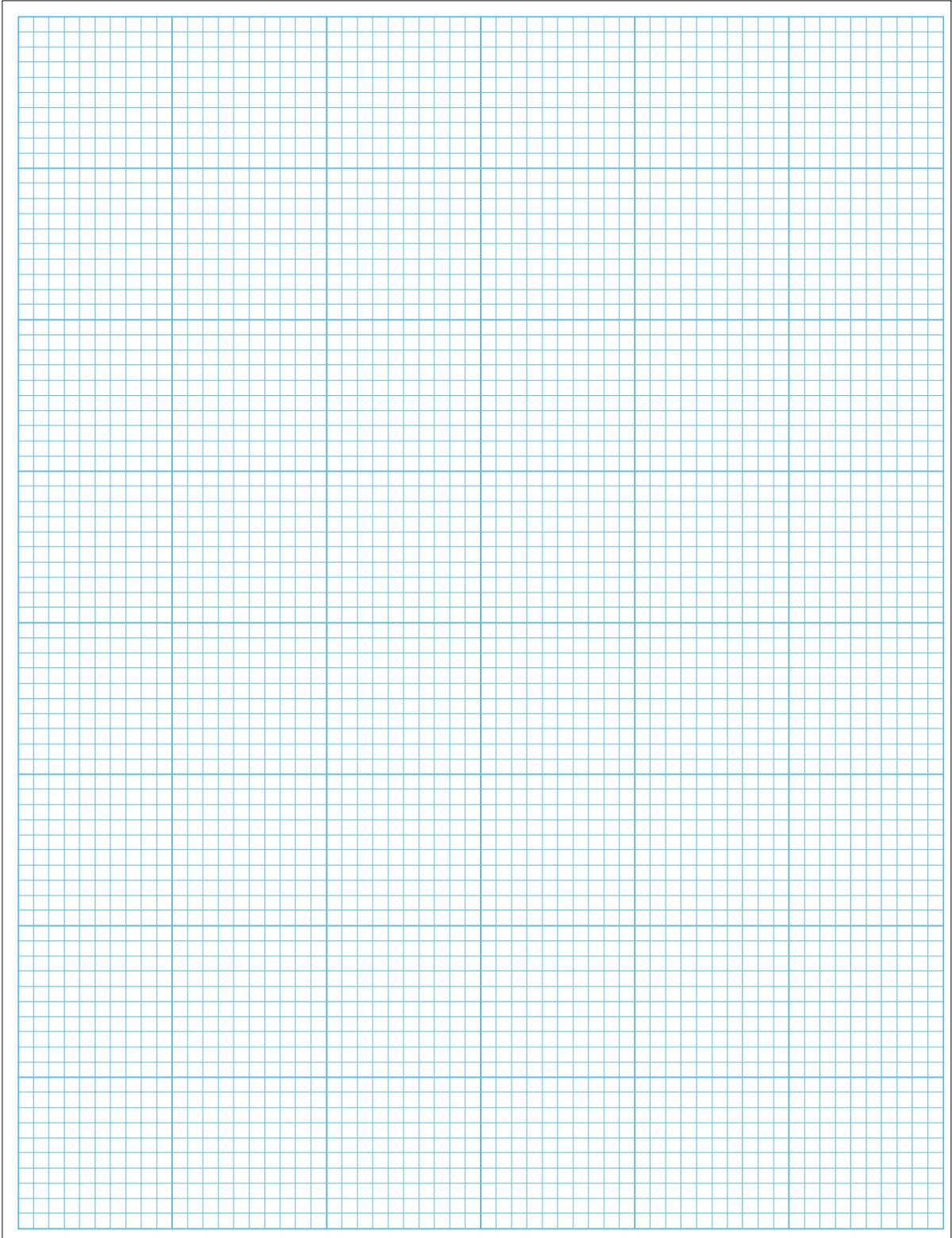
http://gandalf.stortek.com/ctp/photos/

Table 5 is for you to record the components and appliances needed for your customer's BladeStore storage solution.

Table 5. Customer's Design ~ Component Worksheet

Component	Descriptive Information
O/S	
HBAs	
Drivers	
FC Cable	
Switch	
Appliance	

Ordering a BladeStore Solution   4

Using the data gathered so far, this chapter describes the components of an BladeStore Disk Subsystem solution, lists costs for offerings and services, and describes how to order BladeStore.

This chapter provides an overview of equipment ordering procedures, as well as key information (model numbers, feature codes, part numbers, etc.) required for ordering B-Series equipment.

Note: There is a brief description of BladeStore in Chapter 1 of this manual, and in Chapter 1 of the BladeStore Site Preparation Guide, p/n 96083.

The next few pages describe, in more detail, the components as they relate to what you need to order to create a solution for your customer.

■ Ordering With Siebel

Siebel is the equipment-ordering tool used by StorageTek sales representatives for U.S./Canada accounts, and eventually will become the common ordering tool used worldwide. For information about Trilogy, the ordering tool used for international accounts, see "Ordering With Trilogy" on page 47.

This section reviews the Siebel ordering process, showing how to select required and optional hardware, cabling, and software for a typical BladeStore configuration.

Siebel software is loaded on the laptop computers of all U.S./Canada sales representatives, and interactively links to a master database at StorageTek headquarters (Colorado, USA) to allow downloading of order information.

The configurator tool in SAP, called the IPC (Internet Pricing and Configurator) configurator in this document, is integrated into Siebel. Since SAP and Siebel use the same configuration technology and rule set, the IPC configurator works whether or not a user's PC is connected to the StorageTek network.

Siebel can be used either to order specific equipment configurations for an initial installation of a storage system at a site, or to order additional equipment for a previously-installed storage system.

Siebel lists all features and options, including cabling and software, that can be selected for any available BladeStore configuration, from a complete disk subsystem to additional Control Modules or Blade Modules.

> **Note:** Siebel is <u>not</u> intended or designed for ordering individual FRUs. Individual FRUs typically are ordered by CSEs (rather than sales representatives), and ordering is coordinated through customer service managers and local parts depots.

Siebel Ordering Process - BladeStore Example

Using the starting screen in Siebel (Figure 8 below), a StorageTek sales representative completes the following steps to order a disk subsystem.

1. From the available choices, select a top-level configurable material (KMAT) code that corresponds to the type of configuration being ordered:

   - <u>BC84002</u> – identifies a BC84 (or B220 or B280) Control Module as the top-level KMAT (the 'base model'); select this code when ordering the Control Module portion of your BladeStore Disk Subsystem.
   - <u>B150001 (or B250001)</u> – identifies a B150/B250 Disk Array as the top-level KMAT (the 'base model'); select this code for disk array orders.

   Note: Applicable lower-level (nested) KMATs, including feature codes and model numbers, are determined by the top-level KMAT selected in Step 1.

Figure 8. Siebel Ordering – Selecting a Top-Level KMAT (Base Model)
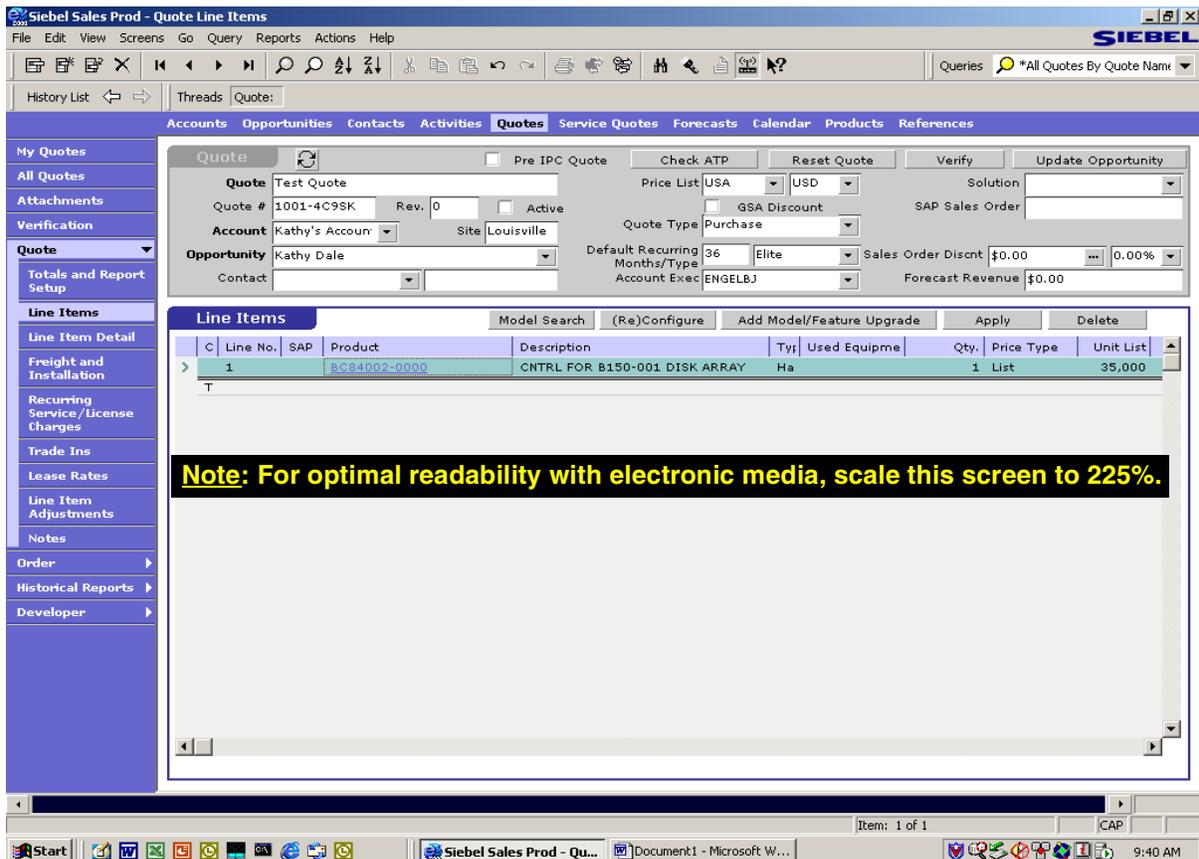
2. Once a top-level KMAT code/base model is selected, click '(Re)Configure' to go to the IPC configurator FEATURES page (Figure 9 on page 37), where a mounting choice is ordered for the base model.

Note: In this example, clicking '(Re)Configure' in Step 2 defaults to the IPC configurator FEATURES page (Figure 9 below). The BASE MODEL page is bypassed here since the base model (BC84 in the example) selected at the base model selection page (Figure 8 on page 36) became the default for all lower-level (nested) KMATs.

Figure 9. Siebel Ordering – Selecting a Mounting Option
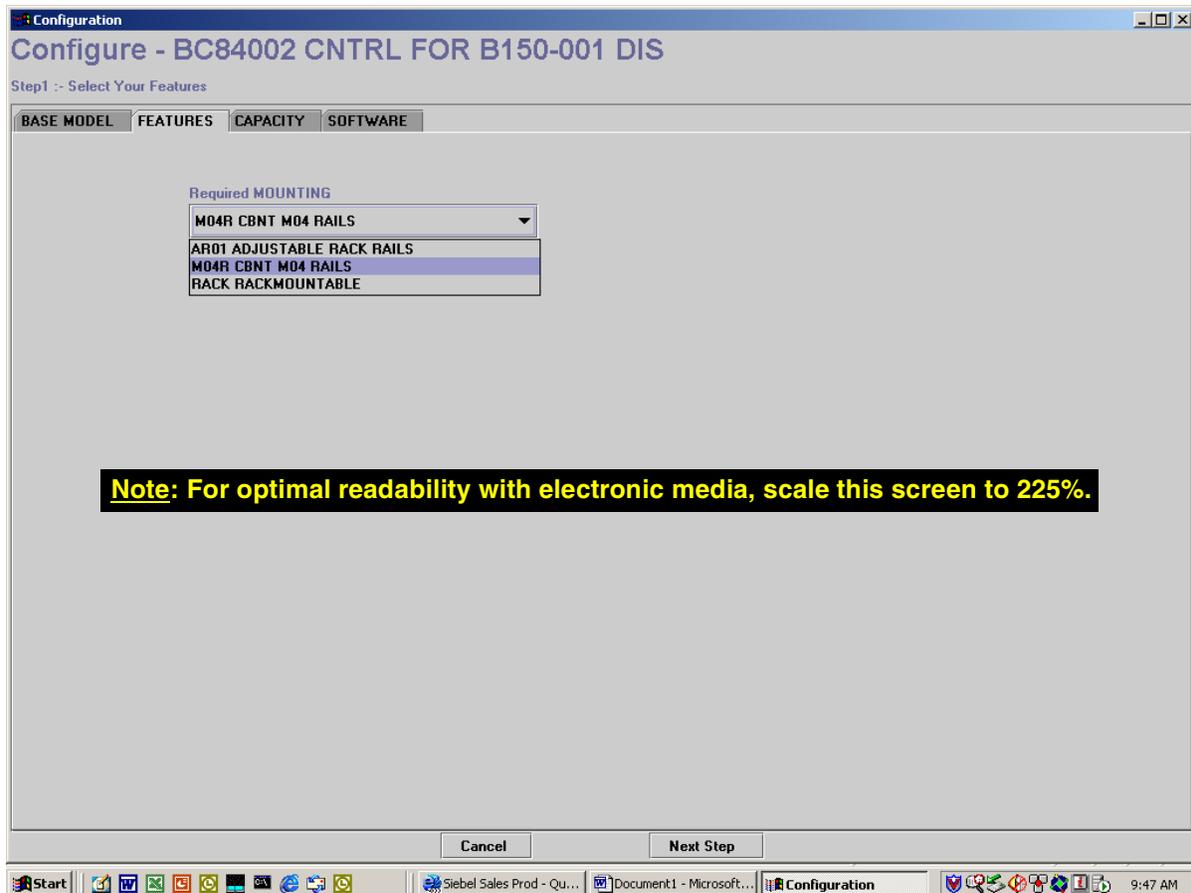
3. The FEATURES page (above) has only one field ('Required MOUNTING'), used to select a mounting option for the top-level KMAT/base model (here, a BC84 Controller). From the drop-down list, select one:

    - 'AR01 ADJUSTABLE RACK RAILS' – adjustable mount rails; use this code if the base model will be mounted in a non-StorageTek cabinet.
    - 'M04R CBNT M04 RAILS' – rackmount rails for M04 or F40 cabinets; use this code if the base model will be mounted in a M04 or F40 cabinet.
    - 'RACK RACKMOUNTABLE' – no rails; select this code if the base model will stand alone, outside a cabinet, instead of being mounted in a cabinet.

4. Once a mounting option is selected, click the CAPACITY tab to go to the CAPACITY page (Figure 10 on page 38), where the number and configuration of B150 arrays is selected.

Figure 10. Siebel Ordering – Selecting the B150/B250 Arrays
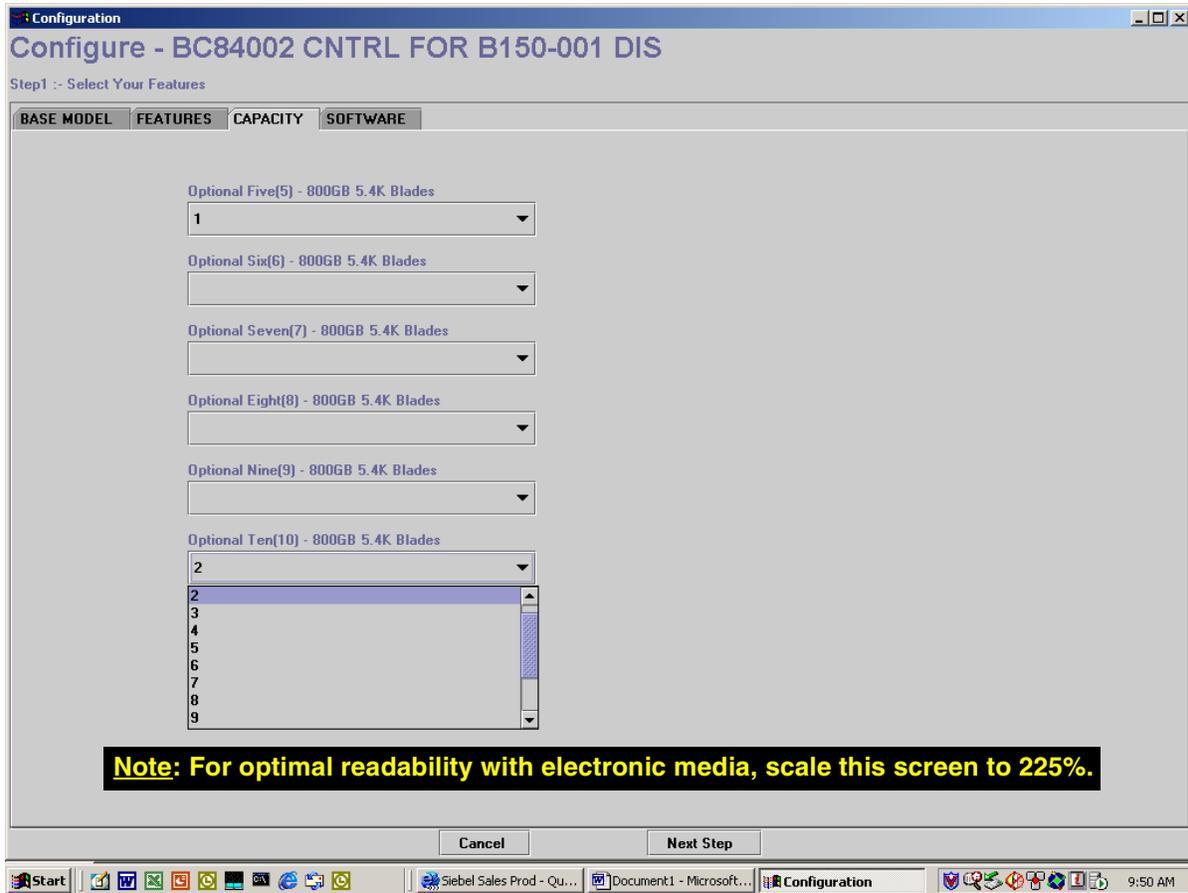
The CAPACITY page (above) has six fields for selecting the number and configuration of B150/B250 arrays. Despite its title, this page is not used for selecting the actual capacity of the blades, which is done in Steps 10 and 11.

5. From the drop-down lists, select the needed number of B150/B250 arrays for each configuration type (5 or 10 blades). In this example, one 5-blade array and two 10-blade arrays are being ordered, for a total of 25 blades in three arrays.

6. Once the number and configuration of B150/B250 arrays is selected, click the SOFTWARE tab to go to the SOFTWARE page (Figure 11 on page 39), where the number of required Storage Manager software copies and optional Storage Partitions software copies are selected.

**Figure 11. Siebel Ordering – Selecting Software**

The SOFTWARE page (above) has two fields. The first is used to select the number of Storage Manager software <u>copies</u> required for the base model selected in Step 1 (a BC84 Controller). The second is used to select the number of SANshare Storage Partitioning software <u>copies</u> for the base model, <u>not</u> to select the <u>partitioning level</u> of the software, which is done in Step 18.

7. From the first drop-down list ('Required Qty Storage Man (req. w/BDDC)'), select '1'. No other quantity can be selected.

8. From the second drop-down list ('Optional Qty SANshare Storage Partition'), select the <u>number</u> of SANshare Storage Partitioning software <u>copies</u>, if any. SANshare software is an <u>optional</u> feature.

9. Once all software is selected, click 'Next Step' to go to the first BDDA/ DRIVES page (Figure 12 on page 40), where the <u>capacity</u> of each 5-blade B150 array is selected.

Note: In this example, clicking 'Next Step' in Step 9 defaults to the first BDDA/DRIVES page (Figure 12 on page 40). The BDDA/BASE MODEL page is bypassed since a different base model than the one selected in Step 1 (a BC84 Controller) cannot be selected here. The BDDA/FEATURES page also is bypassed since a different mounting

option than the one selected in Step 3 (M04R CBNT M04 RAILS) cannot be selected here.

Figure 12. Siebel Ordering – Selecting Blade Capacity (Page 1)
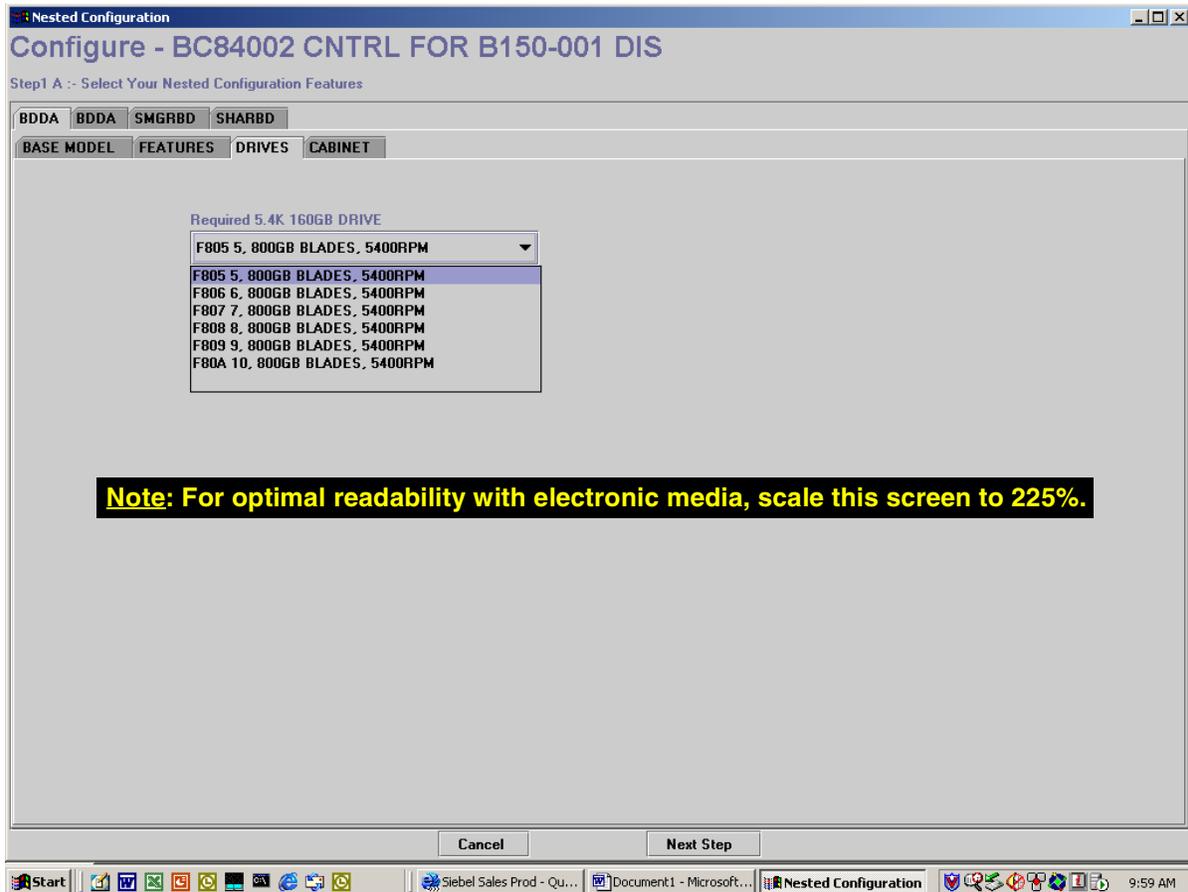
The first BDDA/DRIVES page (above) has only one field ('Required 5.4K 160GB Drive'), however, with the introduction of the 5.4K 250 GB Drive, new screens will provide more selections, which are used to define the capacity of the 5-blade array(s) selected in Step 5.

Note: To avoid order-processing errors in Steps 10 and 11 until a fix is developed, select only the default blade capacity on each BDDA/ DRIVES page. Blade sizes will increase as new technical advances and product are made available.

10. From the drop-down list of the first BDDA/DRIVES page, select the default blade capacity ('F805 5, 800GB BLADES, 5400RPM'), then click the next BDDA/DRIVES tab to go to the second BDDA/DRIVES page.

    Note: The latest Blades have a 1250GB storage capacity, and currently will be the only selection on the screen. As new higher capacities and speeds are incorporated into the blade design, these new selections will be made available.

The second page BDDA/DRIVES page (not shown) will show various fields depending on the drive sizes available (e.g. 'Required 5.4K 160GB Drive' may define the capacity of the 10-blade arrays selected in Step 5).

11. From the drop-down list of the second BDDA/DRIVES page, select the default blade capacity (e.g. 'F80A 10, 800GB BLADES, 5400RPM').

Note: The default now is the 1.25 Terabyte Blade. As higher capacity or higher speed blades are developed, they will be added.

12. Once the blade capacity is selected for each array, click 'Next Page' to go to the first BDDA/CABINET page (Figure 13 on page 41), where M04 cabinets are selected.

Figure 13. Siebel Ordering – Selecting the Quantity of Cabinets
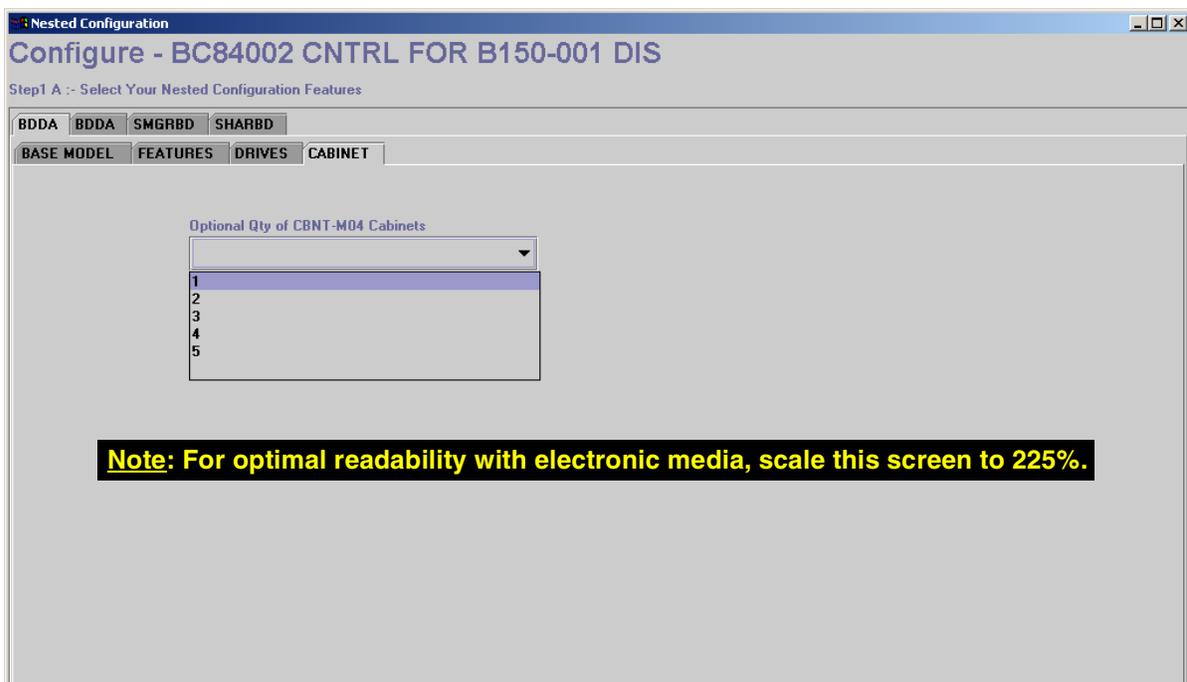
The first BDDA/CABINET page (above) has only one field ('Optional Qty of CBNT-M04 Cabinets'), used to select the number of cabinets of the type (in this example, an M04 cabinet) that corresponds to the mounting option selected in Step 3 ('M04R CBNT M04 RAILS').

Note: The new CBNT F40 cabinet will display on the latest screens. This 40U cabinet will likely be your only cabinet selection.

13. From the drop-down list, select the number of cabinets needed for the configuration.

Note: Until a fix is developed, cabinets can also be selected from the second BDDA/CABINET page (not shown), which is displayed by clicking the second BDDA/CABINET tab. To avoid double-ordering cabinets, select cabinet quantities only from the first BDDA/CABINET page (Figure 13).

14. Once the number of cabinets is selected, click the SMGRBD tab to go to the SMGRBD/FEATURES page (Figure 14 on page 42), where the Storage Manager software level and host OS types are selected.

Figure 14. Siebel Ordering – Selecting Software and Host Types

)
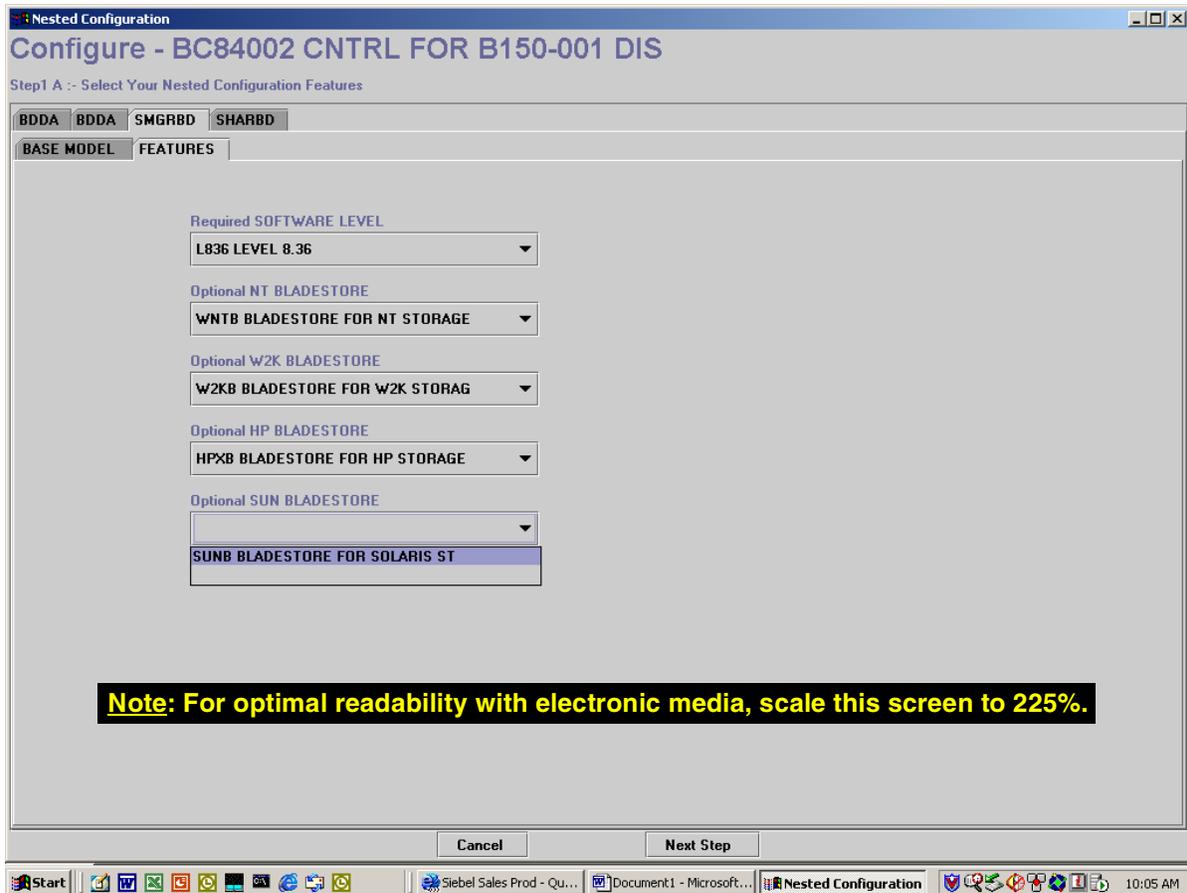
The SMGRBD/FEATURES page (above) has five fields. The first is used for selecting the underline level (version) of Storage Manager software; remaining fields are used for selecting one or more host operating systems (OSs) that the Storage Manager software will be used with.

15. From the first drop-down list ('Required SOFTWARE LEVEL'), select the Storage Manager software level that will be used.

Note: In this example, Storage Manager 8.36 software is the required level for the top-level KMAT/base model selected in Step 1 (a BC84 Controller). Storage Manager 8.46 is the latest software level.

16. From the remaining drop-down lists, select one or more host OSs that the software will be used with. More than one OS can be selected, and any combination can be chosen, but a mimimum of one OS must be selected.

17. Once all Storage Manager software features are selected, click the SHARBD tab to go to the SHARBD/FEATURES page (Figure 15 on page

43), where partition capacity is selected for the SANshare Storage Partitioning software.

**Figure 15. Siebel Ordering – Selecting SANshare Storage Partitioning**
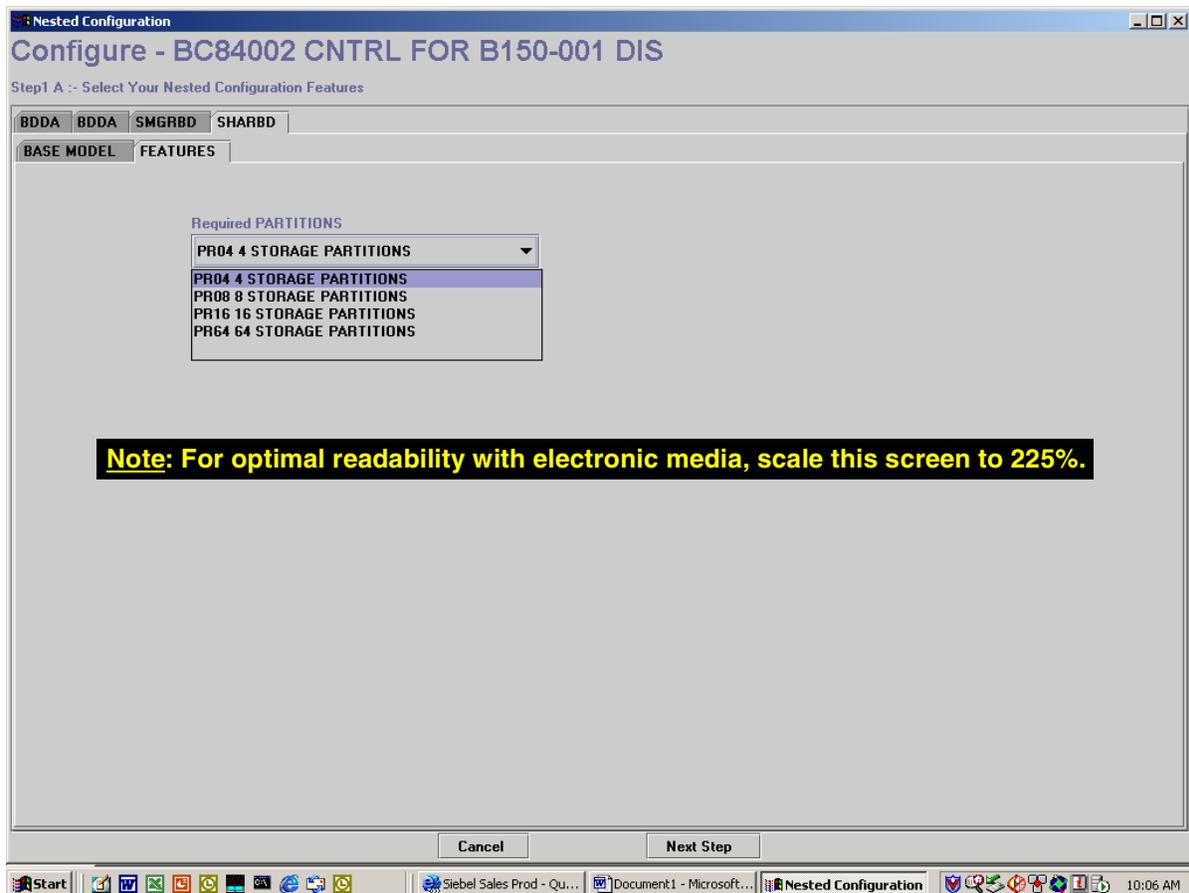
The SHARBD/FEATURES page (above) has only one field ('Required PARTITIONS'), used to select the partitioning level for the SANshare software that was selected in Step 8.

18. From the drop-down list, select the desired partitioning level for the SANshare software. For the top-level KMAT/base model selected in Step 1 (a BC84 Controller), the default value is set at 4 partitions, but this can be changed to 8, 16, or 64 partitions as needed.

19. Once the partitioning level is selected, click 'Next Step' to go to the CBNTMU/FEATURES page (Figure 16 on page 44), where cabinet options are selected.

Note: In this example, clicking 'Next Step' in Step 19 defaults to the CBNTMU/FEATURES page (Figure 12). The CBNTMU/BASE MODEL page is bypassed here since a different base model than the one selected in Step 1 (a BC84 Controller) cannot be selected here.

Figure 16. Siebel Ordering – Selecting Cabinet Features and Options
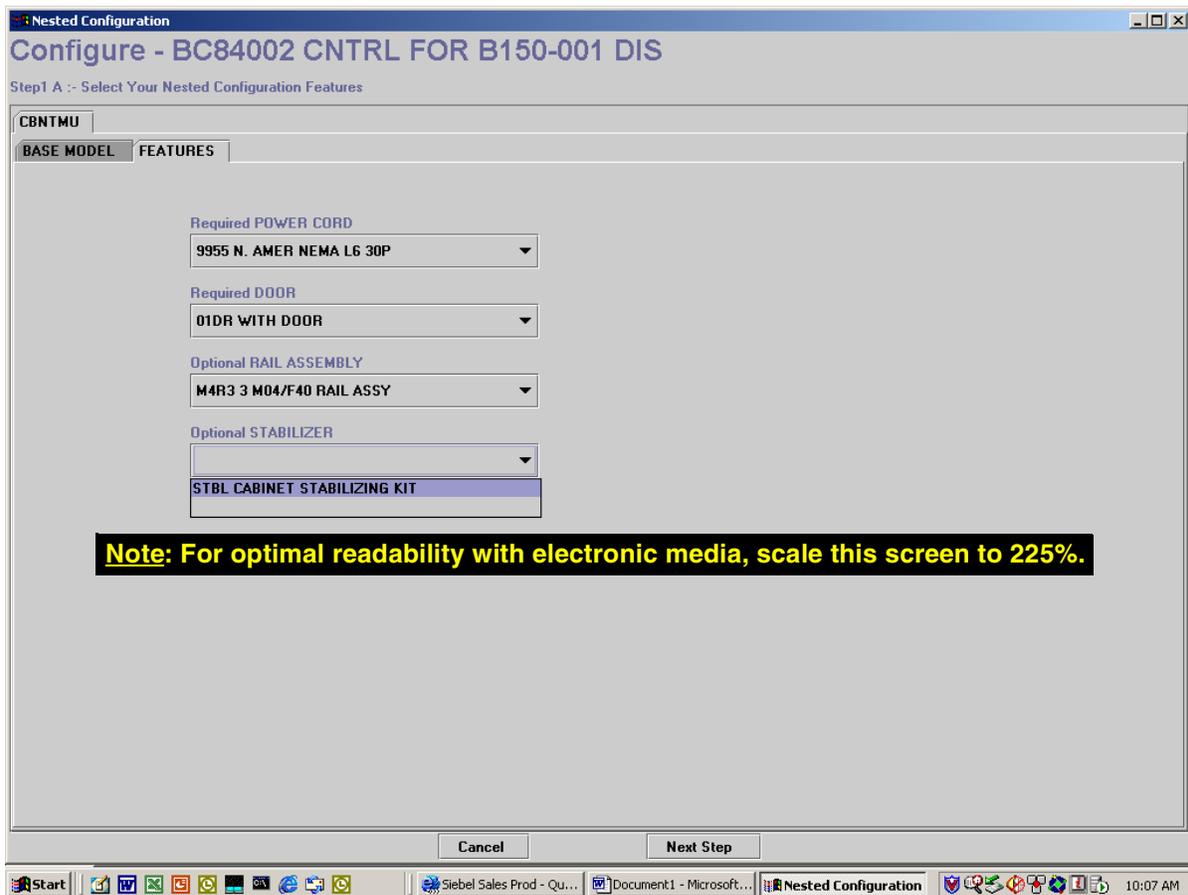
The CBNTMU/FEATURES page (above) has four fields, used to select features for the cabinet type (in this example, an M04 cabinet) that corresponds to the mounting option selected in Step 3 ('M04R CBNT M04 RAILS'), including power cords, door options, rail assemblies, and stabilizers.

20. From the first drop-down list, select the required cabinet power cord type ('9955 N. AMER NEMA L6 30P' for U.S./Canada accounts; '9954 INTERNATIONAL' for international accounts).

21. From the second drop-down list, select a front door option. In, this example, a front door ('01DR WITH DOOR') is selected, but there is also a 'no-door' option that can be selected ('00DR WITHOUT DOOR').

22. From the remaining two fields, select optional rail assemblies (if additional rails are needed for additional devices such as a switch or server) and stabilizers for the selected cabinet type (in this example, an M04 cabinet).

23. Once all cabinet features have been selected, click 'Next Step' to go to the Review Configuration screen, where all selected models, features, and options can be reviewed under their respective KMATs.

Figure 17. Siebel Ordering – Reviewing Configuration Choices (two screens combined)

24. If any changes are needed, click 'Revise Features' to return to the Siebel start screen (Figure 8 on page 36). If no changes are needed, click 'Save Configuration' to save all selections and go to the Siebel order assurance message screen (Figure 18 on page 46).

**Figure 18. Siebel Ordering – Order Assurance Message**
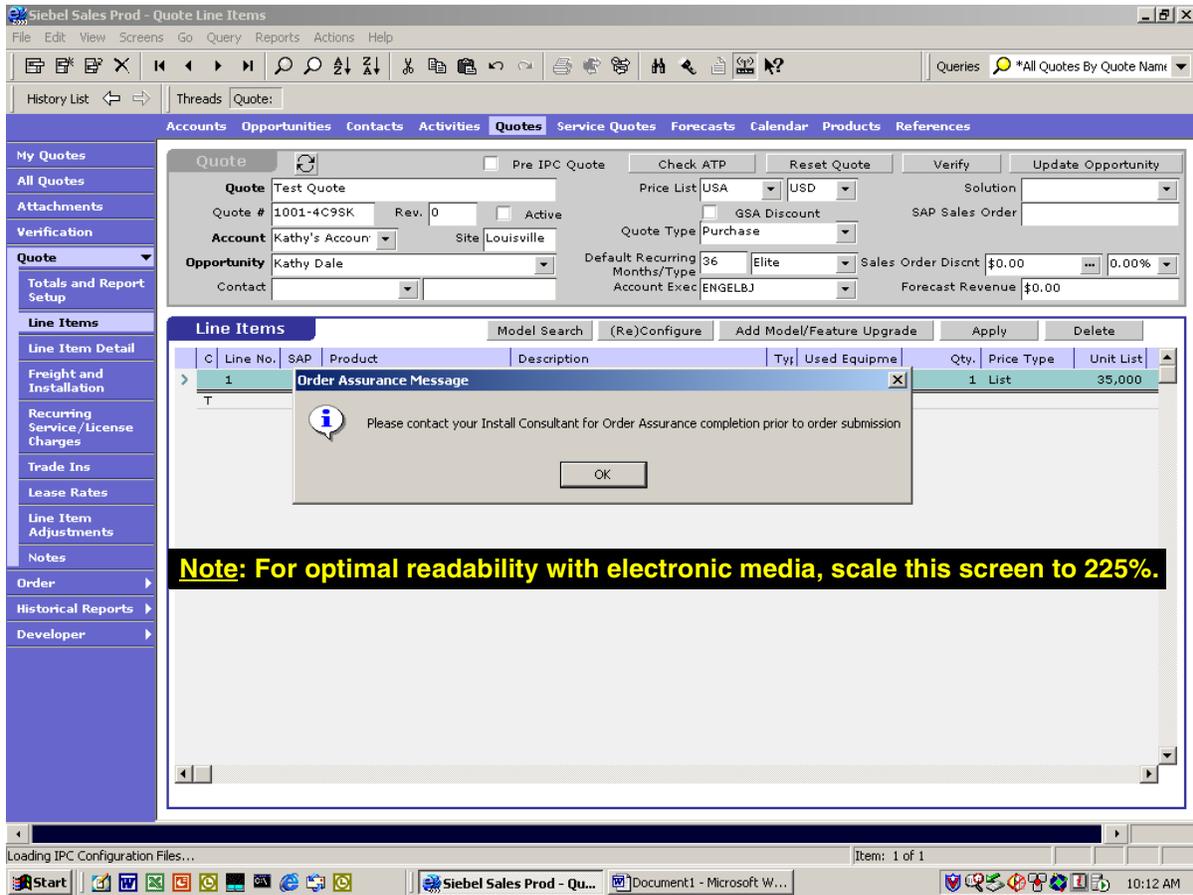
The message above appears each time a completed configuration is forwarded to Siebel from the IPC configurator.

25. In the 'Order Assurance Message' window, click 'OK' to acknowledge the reminder to contact an installation coordinator for order assurance completion before submitting the order, and to go to the completed 'Quote Line Items' screen (), which displays all line items for the selected configuration.

Note: After the order is submitted and prior to the actual installation, it is highly recommended that the technical qualification worksheet (aka SAG checklist) be completed to ensure that the customer site is ready to receive the cabinet and its disk subsystem hardware and software.

This questionnaire asks about such things as AC power, flooring, and cable routing distances to trigger a response, ensuring that all things are considered prior to the actual installation. This site-readiness form helps ensure that we have an error-free installation.

Figure 19. Siebel Ordering – Completed 'Quote Line Items' (Summary) Screen
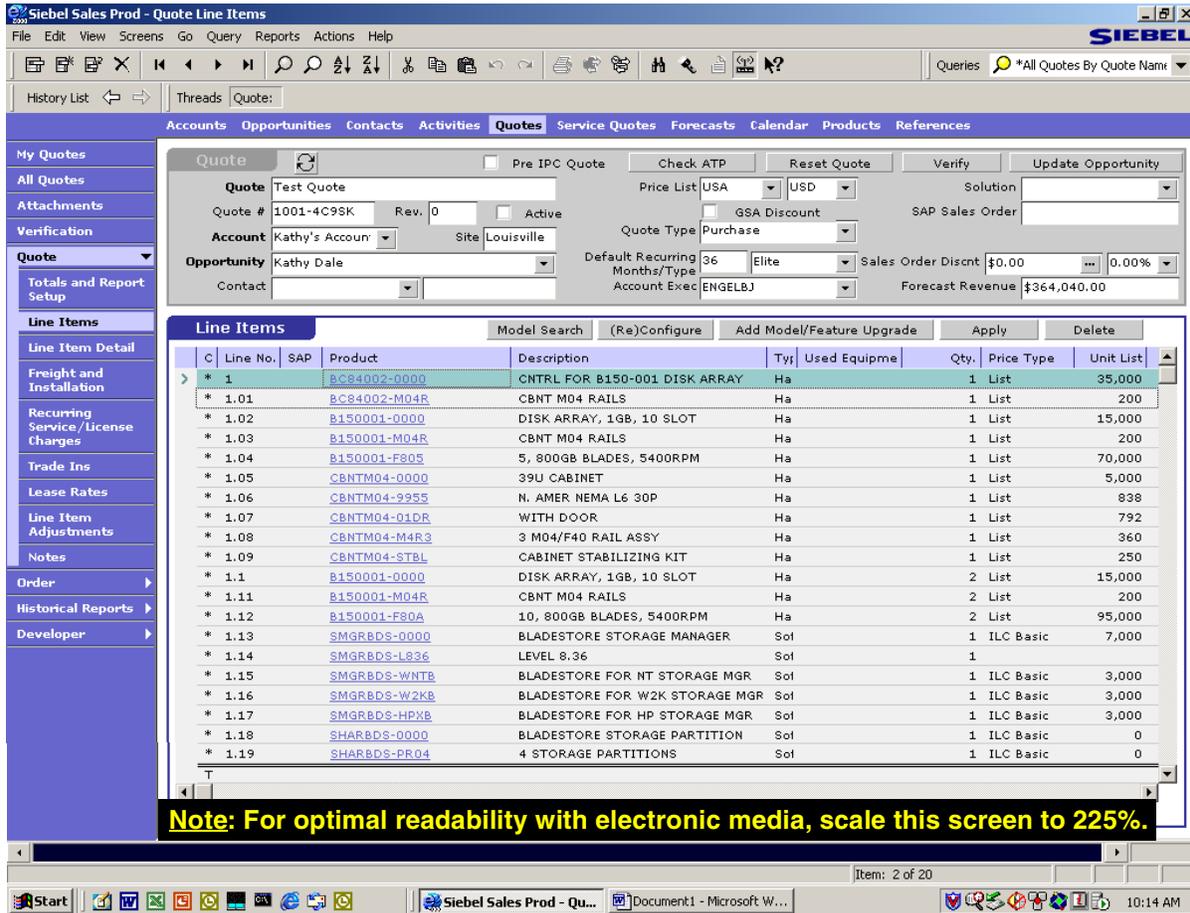
The completed 'Quote Line Items' screen (above) displays all line items for the selected configuration, as well as prices for each model or feature, as calculated by Siebel. The configuration of the BC84002 base model selected in Step 1 is now complete.

Note: When you place your order, Siebel will display the latest hardware and software allowing you to select: BC84, B220, or B280 Control Modules; or B250 Blade Modules and the latest blade capacities and speeds. You will also be able to select cabinet and configuration extras.

■ Ordering With Trilogy

Trilogy is the equipment-ordering tool used by StorageTek sales representatives for international accounts. Siebel, the ordering tool used for U.S./Canada accounts, eventually will become the common tool used worldwide. For information about Siebel, see .

This section reviews the Trilogy ordering process, showing how to select required and optional hardware, cabling, and software for a typical BladeStore configuration.

Trilogy software is loaded on the laptop computers of all international sales representatives, and interactively links to a master database at StorageTek headquarters (Colorado, USA) to allow downloading of order information.

Trilogy can be used either to order specific equipment configurations for an initial installation of a storage system at a site, or to order additional equipment for a previously-installed storage system.

Trilogy lists all features and options, including cabling and software, that can be selected for any available BladeStore configuration, from a complete disk subsystem to additional Control Modules or Blade Modules.

Note: Trilogy is not intended or designed for ordering individual FRUs that will be used for servicing and maintenance. Individual FRUs typically are ordered by CSEs (rather than sales representatives), and ordering is coordinated through customer service managers and local parts depots.

■ Feature Codes and Part Numbers

This section provides key ordering information (feature codes, part numbers, etc.) needed for ordering BladeStore hardware, cabling, and software.

M04 and F40 Cabinets – Available Features and Options

Table 6 lists ordering information for M04 and F40 cabinet options.

Table 6. M04 and F40 Cabinets – Available Features and Options

Ordering Feature Code/Name	Description
9954 International Power Cord	Power cord type for all international (i.e., outside North America) shipments
9955 N.A. NEMA L6-30P Power Cord	Power cord type for all North America (i.e., U.S./Canada) shipments
01DR With Door	Cabinet locking front door
00DR Without Door	No door
M4R1 Single Rail Assembly	One stationary rail pair
M4R2 Two Rail Assemblies	Two stationary rail pairs
M4R3 Three Rail Assemblies	Three stationary rail pairs

Note:
• A StorageTek M04-type cabinet (CBNT M04) has 39U of internal vertical space, so can contain one Control Module (3U or 4U) and up to five B150/B250 Blade Modules (6U each).
• A StorageTek F40-type cabinet (CBNT F40) has 40U of internal vertical space, so can contain one 4U BC84 or B280, or one 3U B220 Control Module and up to six B150/B250 Blade Modules (6U each).

Ordering Feature Code/Name	Description
M4S1 Single Slide Assy	Single sliding rail assembly; enables BC84 controller and B150 array trays to slide out of cabinet for easier access.
STBL Cabinet Stabilizing Kit	Components for securing cabinet to ceiling and floor.

Note:
- A StorageTek M04-type cabinet (CBNT M04) has 39U of internal vertical space, so can contain one Control Module (3U or 4U) and up to five B150/B250 Blade Modules (6U each).
- A StorageTek F40-type cabinet (CBNT F40) has 40U of internal vertical space, so can contain one 4U BC84 or B280, or one 3U B220 Control Module and up to six B150/B250 Blade Modules (6U each).

Control Module – Mounting Options

Table 7 lists ordering information for Control Module mounting options.

Table 7. Control Module – Mounting Options

Control Module Mounting Status	Description	Ordering Feature Code
Mounting in StorageTek M04/F40-type cabinets	M04R Rackmount Rails for StorageTek cabinet CBNT M04 or CBNT F40	M04R
Mounting in non-StorageTek (other vendor) cabinet	AR01 Adjustable Rackmount Rails	AR01
Will not be cabinet-mounted (i.e., no rails needed)	Rack-mountable StorageTek Control Module that will not be cabinet-mounted.	RACK

Note: One of the mounting features listed above *must* be selected for each Control Module.

BladeStore – Certified HBAs

Table 8 lists ordering information for HBAs certified for use with a Control Module.

Table 8. BladeStore – Certified HBAs

HBA Type/Name	Supported Host Platforms	Ordering P/N
HBA HP A5158A or A6795A	HP-UX	Contact Hewlett-Packard
HBA Emulex LP9002	Windows NT; Windows 2000 (TBD)	LP9002L-F2
HBA QLogic SANblade 2200	Windows NT (TBD)	QLA2200F66
HBA QLogic SANblade 2310	Windows NT (with driver 8.1.5.12); Windows 2000 (with driver 8.0.8.0); Solaris 8 (with driver 4.04)	QLA2310F
HBA QLogic SANblade 2342	Windows NT (TBD); Windows 2000 (TBD)	QLA2342

Note: Host bus adapters (HBAs) used with BladeStore are certified by host type.

HBA Type/Name	Supported Host Platforms	Ordering P/N
HBA JNI FCE-1473	Solaris 8 (with driver 5.1.1)	FCE1473N
HBA JNI FCE-6460	Solaris 8 (with driver 5.1.1) Windows NT (with driver EZFibre2.2)	FCE6406N
Note: Host bus adapters (HBAs) used with BladeStore are certified by host type.		

Note: As new operating systems and HBAs are certified, they will be added to Siebel and Trilogy, and to the connectivity matrix on the Sales Community website at **http://salescommunity.storagetek.com**.

Go to **Products >> Disk** and then select BladeStore in the left-hand column. Then scroll down until you see the **Technical Information** heading.

BladeStore – Fibre Channel Cables

Table 9 lists ordering information for fibre channel (FC) optical cables available for use with BladeStore.

Table 9. BC84 002 Controller – FC Optical Cables

Cable Type/Name	Cable Length and Ordering P/N
Cables FC OPTICAL CABLE 2 Gbit to 2 Gbit[1]	• 10.0 meters (32.8 ft.) – P/N 10800221 • 50.0 meters (164.0 ft.) – P/N 10800222 • 100.0 meters (328.1 ft.) – P/N 10800223
Cables FC OPTICAL CABLE 2 Gbit to 1 Gbit[2]	• 10.0 meters (32.8 ft.) – P/N 10800231 • 50.0 meters (164.0 ft.) – P/N 10800232 • 100.0 meters (328.1 ft.) – P/N 10800233
Note: • All FC cables listed above are supported on all HBAs in all host platforms. • [1] 2 Gbit to 2 Gbit cables (LC to LC) are for controller-to-host connections. • [2] 2 Gbit to 1Gbit cables (LC to SC) are for connections with older HBAs.	

B150/B250 Blade Module – Mounting Options

Table 10 list ordering information for B150/B250 mounting options.

Table 10. B150/B250 – Mounting Options

B150/B250 Mounting Status	Description	Ordering Feature Code
Mounting in StorageTek M04/F40-type cabinets	M04R Rackmount Rails for StorageTek cabinet CBNT M04 and CBNT F40	M04R
Mounting in non-StorageTek (other vendor) cabinet	AR01 Adjustable Rackmount Rails	AR01
Will not be cabinet-mounted (i.e., no rails needed)	Rack-mountable StorageTek BC84 Controller that will not be cabinet-mounted.	RACK
Note: One of the mounting features listed above *must* be selected for each tray.		

B150/B250 – Blade Capacities

Table 11 lists ordering information for the blade capacities available for use with a B150/B250 Blade Module.

Table 11. B150/B250 – Blade Capacities

Number of Blades and Description	Ordering Feature Code
5 – 1250 GB blades, 5400 RPM	F125
6 – 1250 GB blades, 5400 RPM	F126
7 – 1250 GB blades, 5400 RPM	F127
8 – 1250 GB blades, 5400 RPM	F128
9 – 1250 GB blades, 5400 RPM	F129
10 – 1250 GB blades, 5400 RPM	F12A
Note: B150/B250 Disk Arrays have 10 available blade slots, but can be populated with 5, 6, 7, 8, 9, or 10 blades. Each F40 cabinet can hold 5 to 60 blades in one to six B150 Disk Arrays. The BC84 002 Controller supports up to 120 drives, i.e. up to 12 B150/B250 Disk Arrays with 10 blades apiece (which requires the use of two F40 cabinets). Refer to the BladeStore manual, p/n 96080 for information.	

> **Note:** As technical advances are made, higher capacity and higher speed blades will be introduced to the marketplace.

BladeStore Software – Storage Manager 8.36/8.46

Table 12 lists ordering information for BladeStore Storage Manager software (code SMGR BDS) available for compatible host operating systems.

Table 12. Storage Manager 8.36/8.46 Software – Available Host O/S Versions

Storage Manager Host Operating System Version	Ordering Feature Code
Level 8.36 Storage Manager	L836
Storage Manager for Windows 2000	W2KB
Storage Manager for HP/UX	HPXB
Storage Manager for Sun (Solaris)	SUNB
Storage Manager for Windows NT	WNTB
Note: In the Siebel ordering tool, Storage Manager 8.36/8.46 software must be ordered by entering three codes: (1) the Storage Manager designator ('SMGR BDS'); (2) the Storage Manager software level (e.g. 'L836'); and (3) the appropriate host operating system version (e.g. 'WNTB' for Windows NT).	

> **Note:** As new Operating Systems and new levels of software are released, new feature codes and the associated operating system feature code will be added to the Siebel screen.
>
> Also new premium features such as Snapshot, Remote Volume Mirroring, and Internal Volume Copy may be ordered. Expect to see new premium feature selection screens with these new releases.

BladeStore Software – Storage Partitions

Table 13 below lists ordering information for Storage Manager SANshare Storage Partitioning software (code SHAR BDS).

Table 13. Storage Partitions – Available Levels

Number of Available Partitions	Ordering Feature Code
4 Storage Partitions (included)	PR04
8 Storage Partitions	PR08
16 Storage Partitions	PR16
64 Storage Partitions	PR64
Note: Four storage partitions are included in the base B-Series Software Suite. Additional partition levels (8, 16, and 64 partitions) are available as an optional premium feature.	

■ Ordering Software Features and Upgrades

If a customer needs a post-installation software upgrade for B-Series equipment, an order is places through the CRC website (rather than through Siebel or Trilogy).

Currently, the only post-installation premium feature available for ordering is an increase in the number of storage partitions for the SANshare Storage Partitioning software, from 4 partitions to 8, 16, or 64 partitions.

Three key pieces of information must be provided on the CRC ordering form before our supplier can issue a software key for the premium feature.

The information required on the CRC ordering form is as follows: (1) the Control Module serial number (Figure 20 below); (2) a 32-character Feature Enabler Identification number, obtained from the GUI; (3) the e-mail address of the individual who will receive and load the software key.

Figure 20. Control Module – Serial Number Location

Control Module serial number location
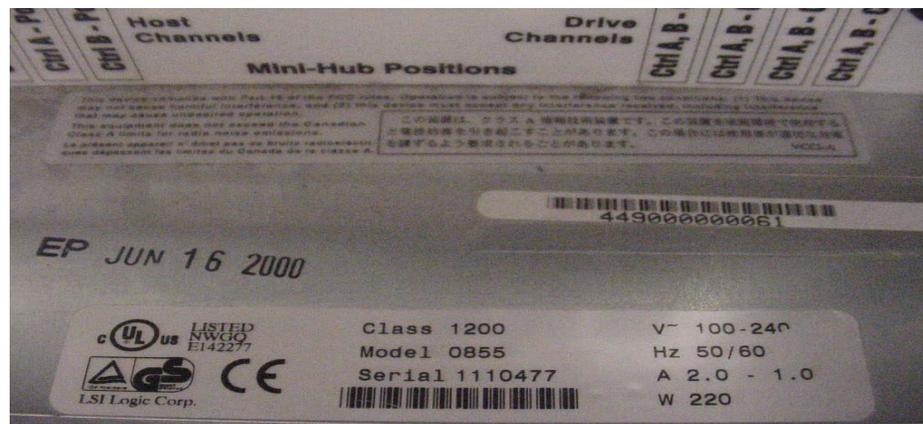
Software License Keys

Software License Keys are used to enable StorageTek's software products. License keys can be obtained online through the StorageTek Customer Resource Center (CRC) at:

www.support.storagetek.com

You select Tools & Services, and follow the procedures as written up in the Premium Feature Enabling Process Guide, p/n 96081. As new premium features are released for the BladeStore Storage Manager software, they will be added to the online selection form, as well as to the initial sales ordering process via Siebel.

■ Training and Publications

Sales, Installation, and Maintenance courses are available in support of the BladeStore Disk Subsystem solution. These courses supplement the Learning Network deliverables, which are displayed on the Docent system. The primary requirement for B-Series product solution is that you attend D-Series training.

After receiving D-Series training, you should either:

• Obtain the BladeStore B150 Disk Array Differences (CD), which is course CRS-101235

  or

• Attend the BladeStore Overview, which provides some hands-on classroom experience. This is course # CRS-100973.

In addition to the above, it is recommended that you attend the SANtricity 8.3 Discovery Series. These courses cover the D-Series software, which is virtually the same as the BladeStore software; and it will introduce you to premuim features, which are now available in the BladeStore product solution. Refer to the Learning Network for more information.

Documentation

The following publications are available in support of the BladeStore Disk Subsystem solution. The connectivity matrix is available on the Sales Community at **http://salescommunity.storagetek.com**, and the product documentation is available on:

• The BladeStore product shipment CD inside the docs folder

• Documents on CD, which is distributed once a quarter to field locations

• The Customer Resource Center (CRC) under:

  - Disk >> B-Series Client Server Disk (for hardware)

- Software >> B-Series Client Server Software (for software)

• The engineering web pages at:

http://gandalf.stortek.com/ctp/B150/index.html

Each of the above document locations has a title description of the manuals along with their part number. In addition to documentation, you will find software, firmware, NVSRAM, and RDAC (as applicable) on the product CD.

Updates to the firmware can be found on the CRC, and updates to the documents can be found on both the CRC and the engineering web pages.

Note: An index has been created for most manuals, which should enable you to quickly find information. If you were unable to find information using the index, please email benneg@louisville.stortek.com with the manual p/n and the word(s) you were looking up.

■ Order Information Worksheet

Table 14 provides space for you to list the items that you need to order:

Table 14. Order Worksheet

Component	Quantity
Operating Systems:	❏_____ ❏_____ ❏_____ ❏_____
BladeStore Models:	❏_____ ❏_____
Power Cords:	
Host Bus Adapters:	❏_____ ❏_____

Table 14. Order Worksheet

Component	Quantity
Switches:	
Cables:	❏_____ ❏_____
Appliances:	
Premium Features (License Keys):	❏_____ ❏_____ ❏_____

Following-Up

<div style="text-align: right">**5**</div>

This chapter discusses the final activities of a customer engagement.

■ Knowledge Transfer

It is important to some take time with the customer and their support structure to make sure they are familiar with:

• Roles of the Administrator and other support personnel

• How to use a BladeStore Disk Subsystem, including:

  - Configuration and performance tuning

  - Graphical user interface (GUI) screens

• How to obtain support if something should go wrong.

Roles of Support Personnel

BladeStore is designed to reduce the administrative efforts involved in data protection. Once a server has been connected to BladeStore and a protection policy is in place, no operator intervention is required to ensure continuous data protection. BladeStore has various methods to monitor environmentals, ensuring the storage subsystem is fully functional, furthermore, email alert can be sent to notify service personnel when conditions are unfavorable within the disk subsystem—prompting correction action or close monitoring.

The administrative roles is important to ensure that BladeStore service levels are set appropriately, and that storage is both secure and accessible enough. It is also important to ensure that exceptional events are handled promptly. This section explains how to plan for and assign the administrative activities necessary to take advantage of the BladeStore Disk Subsystem.

BladeStore defines three administrative roles. In some installations, the same person or persons may fulfill all three roles. At other sites, the roles may be strictly segregated. The BladeStore administrative roles are defined according to the security domain different BladeStore-related activities occur within. Since these security conventions are determined by operating system and networking rules, they will be similar at nearly every BladeStore installation.

Client Administrator Role

A client administrator is an individual who has root or administrative authority on one or more application servers that are clients of a BladeStore storage solution. General responsibilities of the client administrator include:

- Partitioning the primary disk resources of the server
- Installing application software
- Starting and stopping applications
- Assigning access permissions to users of the server's resources

Client administrators may or may not be responsible for data protection. Where network backup applications are in use, backup is typically a different area of responsibility. With BladeStore used as secondary storage, however, the client administrator must carry out some data protection activities.

BladeStore-related activities of the client administrator include:

- Protecting individual volumes
- Defining groups of volumes to be protected under a single policy
- Deciding whether to permit end-user recovery, and, if so, setting up a publication convention for views accessible to end-users
- Selecting and readying recovery views to meet special recovery requirements
- Requesting rollbacks
- Selectively disabling and re-enabling functions during certain I/O intensive operations.

BladeStore Administrator Role

The BladeStore administrator is an individual who has system administrator authority concerning the BladeStore storage subsystem. BladeStore is a disk subsytem that requires operating-system level administration during installation, and little attention once installed. The BladeStore administrator controls and monitors the resources of the BladeStore storage and how they are used.

The BladeStore administrator's responsibilities include:

- Setting up the network BladeStore uses to manage and protect data
- Configuring BladeStore to operate as a member of the local network for administrative purposes
- Providing out-going mail server names and additional destinations for BladeStore to send out e-mail and SNMP event notifications
- Granting requests by protected servers for the creation of histories, and setting up appropriate policies for each history
- If needed, creating trust relationships that will allow other servers access to views on histories

Backup Administrator Role

The backup administrator is responsible for the care and feeding of the application used to copy data from disk to disk or disk to tape for the purpose of creating long-term and off-site backups.

BladeStore is designed to eliminate or dramatically reduce the need to restore primary operating data from tape. However, tape backups may still be needed to meet regulatory requirements, as permanent archives, and in case of a site disaster that results in the destruction of both the primary servers and the BladeStore secondary storage solution.

The Backup Administrator may choose to what extent BladeStore affects his or her role. Because BladeStore does not alter the original primary server or disk configuration, many benefits can be obtained:

- Eliminate the backup window
- Eliminate disk contention between backup jobs and primary applications
- Relax constraints on the backup schedule
- Simplify the backup network

The BladeStore administrator and the Backup Administrator (if not the same person) must collaborate to ensure that BladeStore's policies support the requirements of the backup application.

Obtaining Support

Complete and give the customer the *How to Obtain Support* information. Make sure they know how and who to contact for help. The following information should be provided to the customer (as appropriate) in the event that a there is a need to contact technical support personnel.

- Phone number for support:
- Account name:
- Site location number:
- Hardware serial number:
- Software serial number:
- License key:
- Contact name:
- Telephone number:
- Product name:
- Version/Release:
- Hardware platform:
- Operating system level:
- System configuration:

Note: The BladeStore GUI has extensive problem identifying and reporting capabilities, however, if this functionality isn't enough and technical support is needed, be ready to provide a problem description and its urgency at the time of the call.

Field Troubleshooting

The BladeStore Disk Subsystem has built-in redundancy, and will use a redundant part, failover to a spare part, or find an alternate path to keep on working and providing data to the customer and the customer's customer.

The only thing that can disrupt this process is when someone accidently pulls the wrong part or interferes with the redundancy process. Field personnel should become very familiar with the BladeStore Storage Manager screens to understand the information that is available to them. A help function is also available, which will allow you to understand a problem or to understand how to use a new feature. The following Never Do This list provides helpful hints.

Table 15. Never Do This - a recommended list of things to avoid

Never unplug the controller while it is loading (upgrading) firmware
Never unplug a blade hot spare that is undergoing reconstruction
Never unplug a blade that is being rebuilt (doing a copy back)
Never disable a function such as AVT while it is in use
Never remove power from the disk subsystem when loading controller or ESM firmware, or loading the drive code,
Never work on the equipment unless you have been trained and certified, or until you have read the complete set of BladeStore documents

Best Practices

The following is from engineering concerning the use of BladeStore.

The BladeStore was designed to be primarily, secondary disk, for mostly large files. In most cases you will want to configure a volume designed for large files. Some typical configurations would be:

- segment size of 256
- read ahead at 16,
- possibly shutting off mirrored cache
- disk systems cache at 16k block size.

A disk segment size is comprised of 512 bytes, which means:

- A disk segment size of 256k = a block size of 128K from the server file system
- A disk segment size of 128k = a block size of 64K from the server file system
- A disk segment size of 64k = a block size of 32K from the server file system
- A disk segment size of 32k = a block size of 16K from the server file system

The Read Ahead cache setting does not give much benefit of going any higher, and in several cases can cause a performance hit in the backend of the disk subsystem. Disabling the mirrored cache as a secondary disk only, would increase performance; however, this could cause data integrity issues if a path failover occurs or a controller fails. Do this **only** when the customer is aware of this possibility.

A disk systems cache of 16k block size gives a performance improvement for large file transfers.

Ideally, for performance reasons you would want to use two or more B150/ B250 drawers, and use all four backend loops of the 4884/5884 controllers. We also suggest using the largest volume sizes the server can handle. The BC84/B280 has a limitation of a 2036GB volume size(s). This is per the current SCSI-3 spec.

Striping several LUNs across the same Volume group causes a performance issue when multiple volumes are being used at the same time on the same volume group. Again too small of a volume group results in the use of fewer drives. Look for a happy medium. We might suggest using a 4+1 disk set, depending on your scenario. Refer to the best practices statements in the installation manuals. Note: a larger disk set has a positive effect (more spindles means better performance; however, more volumes use more internal disks in the blade, and expose a risk (assuming they're full) during the rebuild time in the case of a blade failure. If a double disk fault were to happen, a 8+1 raid group would nearly double this chance. Since the Blades are comprised of 5 RAID 0 disks, any one of the physical drives faulting would cause the entire blade to fail. In a 4+1 RAID group, there would be a total of 25 physical drives. An 8+1 RAID group would have a total of 45 physical drives.

We highly recommend using RAID 5. It seems to do the best of any of the RAID types the 4884 controllers can handle, while using the most drives for performance. Having two volumes in the same volume group, one volume on the A controller and the other volume on the B controller would increase performance by attaching the two volumes to different controllers. But then just striping them back together with VXVM or ASM in the server would cause a performance problem. This causes the same physical disks in the same Volume Group to read or write at the same time on two different volumes. A good chance of drive contention. Try to avoid this. It would be better to have two large volumes in two different volume groups going to the same server, than to have several volumes in the same volume group going to the same server.

Since the five drives on the Blade look like one physical disk to the controllers (or even as JBOD), concentrate your thinking on the Blade as one drive when configuring them, not five. We cannot effect any changes on the Blade from the field. It looks like one 1.2TB disk (approximately). The five drives on the Blade are setup as RAID0. This would be similar to a single disk with five platters. If a single disk on the blade faults, the entire blade is faulted. Just the same as if were one of five platters on a single disk.

As far as cache flush goes, you may have to experiment with that a little. The default is 80high/80low, thus maxing out the cache at 80%. We have not found any obvious performance improvement in changing this value much. Maybe with small files, but not with large files.

Understanding the BladeStore

Think of the BladeStore as an 18 wheeler semitrailer truck packed full of bundled mail, packages, and boxes. This content can be thought of as zip files, tar files, and large video files. In comparison the D-Series is the mailperson's delivery truck, which is designed to get information (smaller unbundled data packages) from one place to another.

The semi is designed to get a lot of product from one place to another. Let's say the product is mail. A mail truck can carry several individual pieces of mail envelopes and packages from one place to another, and for the most part carry what is needed.

Note: You wouldn't want to put the individual envelopes and packages in a semi. You would, however, put them into larger boxes and crates, which in the data center may be thought of as tar files.

The BladeStore was not designed to be a database disk system. It is designed for large files. Making several volumes across the same volume group, would be the same as making several partitions in our semi. Having several servers accessing those volumes, would be like having several people trying to access several partitions of the semi; and doing it all at the same time would even be more difficult.

If for some reason the mailperson's delivery truck breaks down, we can easily transfer our mail from one truck to another, and keep on going within a small amount of time. If, however, the semitrailer truck breaks down, transferring our product from one semi to another will take a lot longer—just the same as the Blade takes longer to rebuild.

Installation Recommendations

- RAID groups should be no larger than 4+1
- Enable media scan
- Install a modem for remote support
- Enable event notification to ensure timely resolution

Note: This disk system is not architected to be self-maintained. Any service actions performed must be at the instruction of a qualified StorageTek service professional using manuals such as the *Preconfiguration and Maintenance Set-up Instructions* as well as *Installation, Operation, and Maintenance* for specific information concerning the above activities.

Glossary

This glossary defines terms related to disk storage subsystem hardware and software in open systems environments. Terms listed in this glossary are not necessarily used elsewhere in this document.

A

Address The drive tray ID that a Disk Subsystem uses to map data.

Arbitrated Loop Physical Address (AL_PA) A one-byte value used to identify each specific port in an Arbitrated Loop topology. The actual value of the AL_PA corresponds to bits 7:0 of the 24-bit Native Address Identifier.

Automatic Volume Transfer (AVT) A function of the controller that allows a method of transferring ownership of a volume to the other controller (due to an IO request down the alternate path).

B

Blade A term to depict the new three-dimensional storage technology introduced with the BladeStore Disk Subsystem.

BladeStore Disk Subsystem A high-capacity storage solution for the open systems environment, which stores up to 48 Terabytes of data in a single 19 in., 40U (CBNT F40) rackmount cabinet.

BladeStore Storage Manager A GUI-based storage management software that manages the BladeStore disk subsystems with or without the optional premium features that come with it.

Blower Module CRU An assembly containing four blowers used to create air flow through every component in the Disk Subsystem.

C

Cabinet (M04/F40) A 19" rackmount cabinet that conforms to EIC-STD-310D, and allows a controller and disk arrays to stack.

Control Module The term used to represent the part of the subsystem that houses the controllers that interface with the host's operating system as well as the ESM firmware.

Controller The term used to describe the control module storage processor. This is the component that houses the controller firmware and communicates to the drive modules. When used with the model name, it refers to the entire (control) module.

CRU Customer Replaceable Units are verified to be safely handled and replaced by customers with little or no training. Common sense is expected, however, to avoid such things as inserting hands or metal objects into empty CRU sockets with the power on.

D

D-Series A term to depict the D173, D178, D240, D280 and D200 product solutions, which use the SANtricity Storage Manager to manage the back-end storage.

DC power supply (DCPS) In a BladeStore disk subsystem, a power component that converts AC power received from PDUs into DC power required for contol module and storage tray components.

Disk Controller The control unit that serves as the interface between the servers or host network devices and the back end storage. Controller firmware is loaded here to help manage the disk subsystem.

-

Drive An individual storage device, which combined with other drives forms a blade.

Drive Tray or Blade Tray A generic term used to refer to the storage devices, blades, or media, which in this case is called a B150 or B250 Disk Array. The trays may also be known together as the back end storage.

E

ESM Environmental Services Monitor—monitors and manages the condition of the disk array—checking the status of the FRUs to ensure continuous redundancy and cooling as well as managing blade storage.

ESM Module The CRU that interfaces with the Controller via a Fibre Channel-Arbitrated Loop (FC-AL) using fibre copper or optical cables. Also known as ESM Fibre Module or Loop Card.

external (source) power redundancy providing two power connections on separate and independent circuits to a disk subsystem.

F

Fibre Channel The communication media used between a host and the Control Modules, and between the controller and to each B150 disk array. This media is used to transfer data commands and I/Os.

Firmware The code that is loaded to each of the controllers (controller firmware), loaded to the fibre channel interface (ESM firmware), or loaded to the blades (drive firmware) that makes these devices intelligent and able to communicate (interface) with the host or other interim part.

Free Capacity A contiguous region of unassigned capacity on a designated volume group. The space can be used to create one or more volumes.

FRU Field Replaceable Units are designed to be replaced by trained service personnel who understand electronics, mechanics, and the dangers of electical shock and electro-static discharge, commonly referred to as ESD. They must also understand the subsystem, especially when quiescing is required.

G

GBIC Giga Bit Interface Convertor is an adaptor that enables a hub, a controller, or an array to use various types of copper or optical Fibre Channel cabling.

H

Heterogeneous A storage solution feature, enabled by the controller firmware, which allows numerous servers/hosts the capability to see all or some portion of the back-end storage, thereby sharing data with any host.

I

Inline Storage The marketing term that refers to a secondary storage solution, which uses, for example, a server application to backup from primary storage to secondary disk storage, and then backup up from secondary storage to tape.

Intelligent Storage The ability to manage, control, diagnose, and troubleshoot various aspects of the back end storage. The storage management software GUI provides this functionality to enable easy management.

internal power redundancy In a disk subsystem, an architecture that provides duplicate power FRUs to avoid loss of power within the unit; external power redundancy requires proper routing of internal power cables between the PDUs and DCPSs on both the A and B sides of a subsystem.

L

LUN The Logical Unit Number the host uses to access a volume.

Logical Volume Manager (LVM). An application used to manage path failover within a storage subsystem.

Logical Units basic structure created in a RAID subsystem to retrieve and store data. It is a set of physical blades that make up a drive/blade group, all configured for a specific RAID level. The operating system views the logical unit as one drive (rather than a set of drives or blades).

M

MIB A file that defines the identifier and format of SNMP traps that are sent out via Ethernet by the controller.

N

NVSRAM A configuration file that defines how a controller functions and how it reacts to a particular host type.

O

Open Systems StorageTek's RAID Disk product solutions that are targeted to fulfill the needs of customers in the multi-platform computing environment.

P

Partition A methodology used to logically divide storage into sections or divisions, so that the OS treats them separately. The feature enabling this function is called SANshare Storage Partitioning (aka LUN masking).

power distribution unit A power component that receives AC source power and distributes it to DCPSs within a

subsystem. In a BladeStore disk subsystem, each PDU is designed to handle all power requirements if the other (redundant) PDU fails.

Q

Quiesce The verb meaning to end a process by allowing operations to complete normally.

Quiescing The process of bringing a device or a system to a halt by rejection of new requests for work.

R

RAID Redundant Arrays of Independent Disks used to assign a LUN to different levels of data protection with varying degrees of performance.

RDAC Redundant Dual Active Controller. Path management software that interacts with controller firmware to ensure continuous data availability by using a secondary data path upon failure within the primary path.

Remote Volume Mirroring (RVM) A premium feature available with D-Series. It enables the creation of repository volumes on a remote disk subsystem to be assigned to a primary volume as its remote mirror volume. This action will automatically back-up the primary volume on the local subsystem and update the mirror as changes are made to the primary.

S

SAN Storage Area Network is a storage networking configuration that optimizes communications between various servers, applications, and a disk storage subsystem designed for the open systems environment to communicate and function with various operating systems and network devices.

SANtricity Storage Manager The web-styled GUI storage management software used for the D-Series Disk Subsystems. It has increased capabilities, adding Snapshot, Dynamic LUN Expansion, 2048 Volume Support, and Remote Volume Mirroring. Also enhanced Storage Partitioning as well as a GUI wizard add value to this storage management solution.

Script A macro-like function that can be run from the command line or script interface that modifies the controller settings.

SFP Small Form-factor Pluggable is a new technology being introduced with the 2 Gigabit transfer speeds. Smaller connectors, cables, and transceivers are used to enable this larger bandwidth capability.

Snapshot A logical point-in-time image of another volume (logical equivalent of a complete physical copy).

Storage Blade Module A CRU that contains Terabytes of storage capacity or media, which may be a set of high-capacity hard drives, with capacity sizes and rotational speeds that match the customer's order. Note: Some of this storage capacity is used for formatting/addressing.

Storage Manager (SM) A GUI-based storage management software used for the 8.x.x level of software. It manages disk subsystems with or without the premium features that come with it.

SMagent A program that allows the SMclient to manage the disk array over the fibre channel connections.

SMclient The management software (GUI) that allow one to manage the storage array, including the creation of volumes, mirrors, and snapshots; and mapping them to the appropriate hosts.

StorageNet A network of devices, which includes a host, applications, and storage to accommodate the customer's needs.

StorageTek D173 Disk Subsystem An entry-level storage solution for the open systems environment, which has one or two 1 Gb controllers and up to 30 drives.

StorageTek D220/D240 Disk Subsystems Entry-level storage solutions for the open systems environment with two 2 Gb controllers and up to 14 drives (D220) or up to 112 drives (D240).

Storage Manager A web-styled GUI storage software for intelligent management of open systems storage devices. It includes Client, Agent, Util, Runtime, NVSRAM, and RDAC program packages, as appropriate for the operating system. It enables storage configuration as well as device monitoring, diagnostics, and troubleshooting aids (identifying faults and suggesting actions). StorageTek Object Manager 7.10 introduced the heterogeneous capability, which enables hosts to share more data. BladeStore Storage Manager and SANtricity Storage Manager introduce more premium features to manage the customer's high-performance and high-storage capacity environments.

U

U A standard unit of 44.5 mm (1.75 in.) of internal vertical space inside a cabinet. The M04 cabinet has 39U of internal vertical space, and the F40 cabinet has 40U of internal vertical space.

V

Volume A certain portion of data, together with its carrier, that can be easily handled as a unit (in RAID this is usually a stripe within the disk, drive module, or blade). A volume may also refer to a portion of a single read/write mechanism, portions of various arrays, or an entire array, better known as a logical unit or LUN.

Volume Group A collection of mass storage volumes, which the space manager

defines as a group, volume group, or mass
storage volume group.

Z

Zoning A group of fabric-connected
devices arranged into logical groups and
zones to allow storage partitioning and
isolation.

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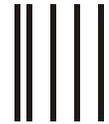
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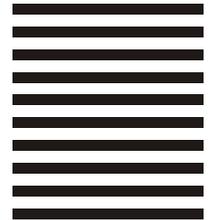
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