PS SERIES STORAGE ARRAYS QUICKSTART

PS5000 Storage Arrays
PS Series Firmware Version 3.3

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February 2008

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Preface

This manual describes how to install the PS5000 storage array hardware and create a PS Series group—a self-managing, iSCSI storage area network (SAN) that is affordable and easy to use, regardless of scale.

After setting up the group, see the PS Series *Group Administration* manual for information about managing the group.

Audience

This manual is designed for administrators responsible for installing PS5000 array hardware and creating a group. Although administrators do not need extensive network or storage system experience, it may be useful to understand:

- Basic networking concepts
- Current network environment
- User disk storage requirements
- RAID configurations
- Disk storage management

Note: This manual describes using PS Series arrays in some common network configurations. However, detailed information about setting up a network is beyond its scope.

Organization

This manual is organized as follows:

- *Introduction to PS Series Storage Arrays*
- *Steps for Setting Up and Using an Array*

  Step 1. Set Up the Array Hardware

  Step 2. Configure the Array and Create a Group

  Step 3. Set the Member RAID Policy

  Step 4. Create a Volume

  Step 5. Connect to the Volume from a Host System
- *Where to Go Next*

Documentation

For detailed information about PS Series arrays, groups, and volumes, see the following documentation:

- *Release Notes*. Provides the latest information about PS Series arrays.
- *QuickStart*. Describes how to set up the array hardware and create a PS Series group. Be sure to use the manual for your array model.
- *Group Administration*. Describes how to use the Group Manager graphical user interface (GUI) to manage a PS Series group. This manual provides comprehensive information about product concepts and procedures.
- *CLI Reference*. Describes how to use the Group Manager command line interface (CLI) to manage a PS Series group and individual arrays.
- *Hardware Maintenance*. Provides information about maintaining the array hardware. Be sure to use the manual for your array model.
- Online help. In the Group Manager GUI, expand `Tools` in the far left panel and then click `Online Help` for help on both the GUI and the CLI

The *QuickStart* and *Hardware Maintenance* manuals and the *Release Notes* are printed and shipped with the product. They are also located on the PS Series documentation CD-ROM that is shipped with the product, along with the *Group Administration* and *CLI Reference* manuals and the Group Manager online help.

Documentation for Host Integration Tools for Microsoft® Windows® systems is located on the Host Integration Tools CD-ROM that is shipped with the product.

Localized documentation is available on the localization CD-ROM that is shipped with the product in certain countries.

Technical Support and Customer Service

Dell's support service is available to answer your questions about PS Series arrays. If you have an Express Service Code, have it ready when you call. The code helps Dell's automated-support telephone system direct your call more efficiently.

Contacting Dell

Dell provides several online and telephone-based support and service options. Availability varies by country and product, and some services may not be available in your area.

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3. Click `Contact Us` on the left side of the window.
4. Select the appropriate service or support link based on your need.
5. Choose the method of contacting Dell that is convenient for you.

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- `www.euro.dell.com` (Europe only)
- `www.dell.com/la` (Latin American countries)
- `www.dell.ca` (Canada only)

You can access Dell Support through the following websites:

- `support.dell.com`
- `support.dell.com/EqualLogic`
- `support.jp.dell.com` (Japan only)
- `support.euro.dell.com` (Europe only)

Warranty Information

The PS5000 array warranty is included in the shipping box. For information about registering a warranty, visit `support.dell.com/EqualLogic`.

Introduction to PS Series Storage Arrays

PS Series storage arrays deliver the benefits of consolidated storage in a storage area network (SAN) that is affordable and easy to use—regardless of its size. With intelligent, automated management and fast, flexible scalability, PS Series arrays greatly reduce storage acquisition and management costs. This *QuickStart* describes how to start using your PS Series array.

By grouping together one or more PS Series arrays connected to an IP network, you can create a **PS Series group**—a highly-scalable iSCSI SAN with a shared pool of storage space. Integrated virtualization software makes a group easy to manage and provides automatic RAID configuration, data provisioning, and load balancing.

To ensure high reliability, PS Series arrays include RAID-protected disks, automatic disk sparing, redundant fans and power supplies, and dual high-performance control modules, each with three Gigabit Ethernet interfaces and a battery-backed cache.

A simple setup utility lets you quickly configure an array as a **member** of a new group. After you choose the RAID type, the array is automatically configured, and the storage is immediately ready for use. Data and network I/O are automatically load balanced across the disks and network interfaces—with no impact on data availability.

To increase SAN capacity and performance, connect another array to the network and add it to the group. Load balancing across the members occurs automatically, as needed. Management overhead remains the same, regardless of the group size.

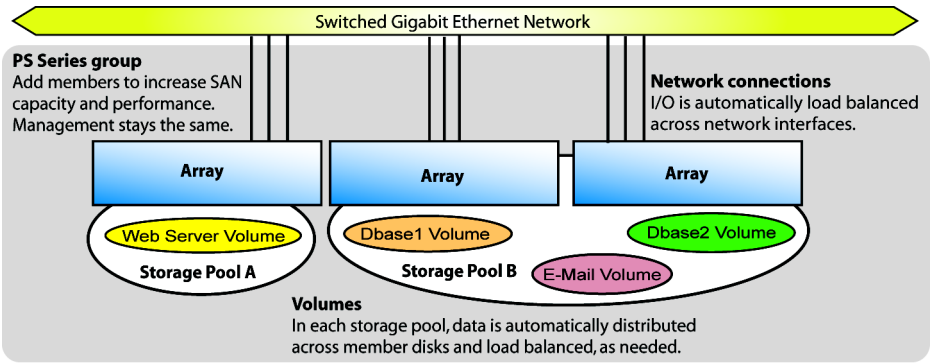
The Group Manager graphical and command line user interfaces enable you to manage the group as a single system.

To access group storage, you create **volumes**, assigning to each volume a pool, size, access controls, and other attributes. A volume can be spread across multiple disks and group members and is seen on the network as an **iSCSI target**.

To connect to a volume, a host needs only a standards-compliant **iSCSI initiator**. Volume access can be restricted through IP address, initiator name, or CHAP (Challenge Handshake Authentication Protocol) credentials. Once connected, the volume is seen by the host as a regular disk that can be formatted as usual.

In a multi-member group, you can separate space into **storage pools**, which allow you to organize storage according to usage, providing more control over resource allocation, while maintaining a single system management view. Members and volumes can move between pools, while data remains online.

PS Series Group With Multiple Members and Pools



Steps for Setting Up and Using an Array

To start using your PS5000 array, follow these steps:

Step 1. Set up the array hardware configuration.

Step 2. Configure the array on the network and create a group.

Step 3. Log in to the group and use the Group Manager GUI or CLI to specify the RAID policy for the new member.

Step 4. Use the GUI or CLI to create a volume.

Step 5. Connect to the volume from a host system.

Step 1. Set Up the Array Hardware

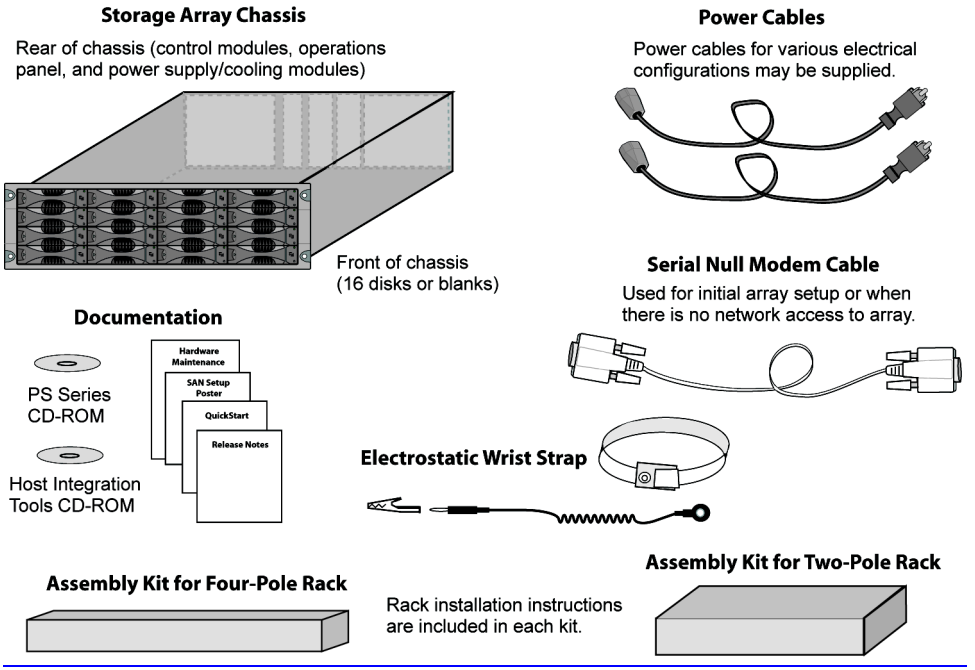
A. Unpack the Shipping Box and Collect the Hardware

The order in which you unpack the shipping box is important for safety:

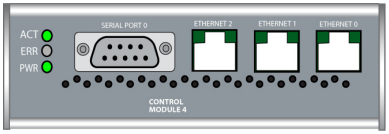
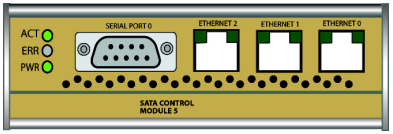
1. Open the outer shipping box and remove the accessory box.
2. Remove the accessories and ensure that you have the contents shown in the figure *PS5000 Series Shipping Box Contents* and described in the table *Description of Shipping Box Contents*.
3. Following the unpacking instructions included in the shipping box, lift the array and place it on a flat surface protected from electrostatic discharge. Do not remove the plastic bag until you are ready to install the array in a rack.
4. Collect the hardware that is not included in the box, as described in the table *Required Hardware – Not Supplied*.

The array is *heavy*. Do not attempt to lift or install it without help.

PS5000 Series Shipping Box Contents



Description of Shipping Box Contents

Component	Description
3U array chassis	Contains one or two control modules, two power supply and cooling modules, and eight or 16 disks, either Serial Attached SCSI (SAS) disks or Serial ATA (SATA) disks. At the time of this release, PS5000 arrays support two types of control modules, depending on the disks installed in the array: • Type 4 control modules (gray face plate) for use with SAS disks (black disk release button). • Type 5 (olive face plate) control modules for use with SATA disks (gray disk release button). Do not mix control module types in an array. Also, make sure the disk type is compatible with the control module type. **Note:** This manual shows PS5000 arrays with Type 5 control modules installed. The information is also applicable to arrays with Type 4 control modules. See the PS Series *Release Notes* for the latest supported control modules. **Type 4 Control Module**  **Type 5 Control Module** 
Power cables	Connect an array to power sources. The shipping box may contain multiple power cables to meet the electrical requirements of the country in which the array will reside. Use the cable that is right for your configuration. If power cables are not included in the shipping box, see your array support provider or reseller.
Serial null modem cable	Creates a serial connection between an array and a console or terminal emulator. The cable has two DB9, 9-pin, female connectors and is used only to run the `setup` utility or if there is no network access to the array or group.

Description of Shipping Box Contents (Continued)

Component	Description
Four-pole rack assembly kit	Enables you to install an array in a four-pole rack. Instructions for assembly are included in the kit. Supplementary four-pole rack instructions are included in the shipping box.
Two-pole rack assembly kit	Enables you to install an array in a two-pole rack. Instructions for assembly are included in the kit.
Electrostatic wrist strap	Protects sensitive hardware from electrical discharge.
Printed documentation and CD-ROMs	Includes the *QuickStart* and *Hardware Maintenance* manuals, *Release Notes,* SAN setup poster, license, warranty, documentation CD-ROM, the Host Integration Tools CD-ROM, and, in some countries, the localization CD-ROM.

Note: Product returns are accepted only in the original packaging or in authorized packaging from your array support provider or reseller.

Array installation also requires the hardware described in the table *Required Hardware – Not Supplied*. This hardware is not provided with your array.

Required Hardware – Not Supplied

Component	Description
Standard 19” two- or four-pole rack	Provides easy access to arrays and other hardware in your computing environment.
One to six network cables	Connects an array to a network switch. Use Category 5E or Category 6 cables with RJ45 connectors. Use Category 5 cables if they adhere to the TIA/EIA TSB95 standard. Only one network connection is required for operation.
Network switch	Connects devices to a network. If possible, connect the array to different switches for high availability.
Computer or a console terminal	Enables you to perform the initial array and group configuration or manage the group when there is no active network connection. A computer must be running a terminal emulator.

Optional hardware you can use with an array is described in the following table.

Optional Hardware – Not Supplied

Component	Description
One or two UPS systems	Provide a highly available source of power to an array. Each UPS system should be on a different circuit and must provide the correct type of voltage for an adequate amount of time.

B. Mount the Array in a Stable Rack

Instructions for mounting a PS5000 array in a two-pole or four-pole, 19” rack are included in each assembly kit in the shipping box. In addition, supplementary four-pole assembly kit instructions are included in the shipping box.

You must meet the following array racking recommendations and requirements:

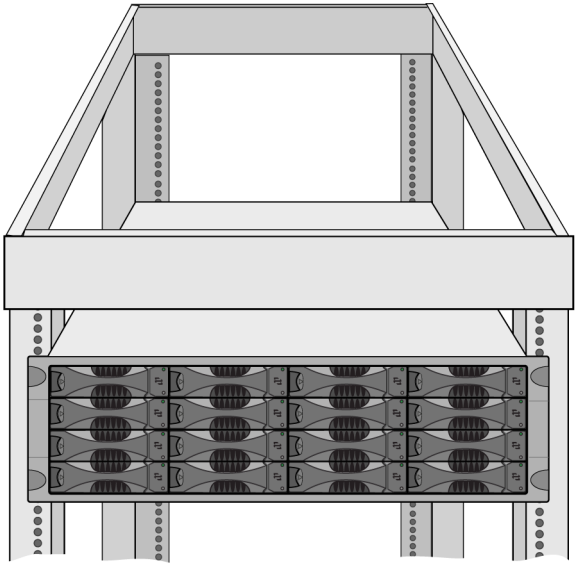
- Mount the array in a horizontal position. Otherwise, you will void your array warranty and support contract.
- Have sufficient space for air flow in front of and behind the array, and ensure that the location is properly vented.
- Attach the rack to the floor for added stability.
- Support the array until it is completely mounted in the rack.

Specifications for a PS5000 array are described in the following table.

PS5000 Environmental, Power, and Physical Specifications

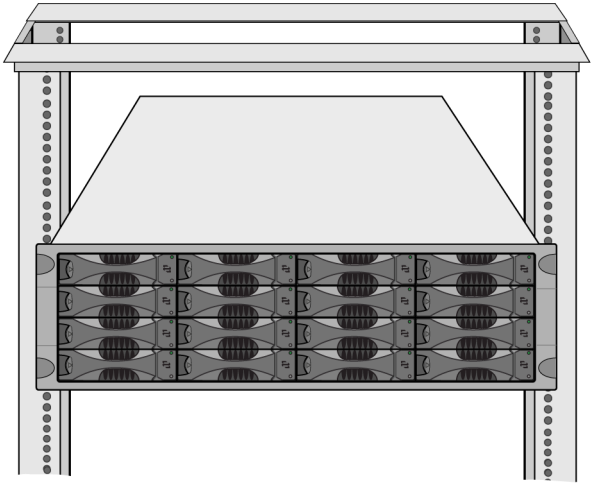
Component	Requirement
Weight of fully-loaded array	77.6 pounds or 35 kilograms
Operating temperature	41 to 95 degrees F / 5 to 35 degrees C
Storage temperature	-22 to 140 degrees F / -30 to 60 degrees C
Maximum operating altitude	10,000 feet (3048 meters)
Operational relative humidity	20 to 80% non-condensing
Thermal output (fully-loaded array)	1700 BTU/hour (SAS disks) 1550 BTU/hour (SATA disks)
Operational shock	5 G for 10 ms 1/2 sin
Operational vibration	Random 0.21grms 5 - 500 Hz
Input voltage	100 to 240 VAC (auto-sensing)
Input frequency	48 - 62 Hz
System input power	530 VA (maximum)
Power supplies	Dual, 450 watts DC output Maximum input power: 0.7 KVA Input current: 7 – 3.5A
Height/Width/Depth	5.12” x 19” x 21.7” (13 x 48.26 x 55.1 cm)

Four-Pole Rack Example



Be sure to support the array until it is completely mounted in the rack.

Two-Pole, Mid-Mount Rack Example



C. Connect Power Cables for Grounding

A PS5000 array includes two combined power supply and cooling modules. It is recommended that you connect both power supplies to different sources of power, preferably on separate circuits for increased availability.

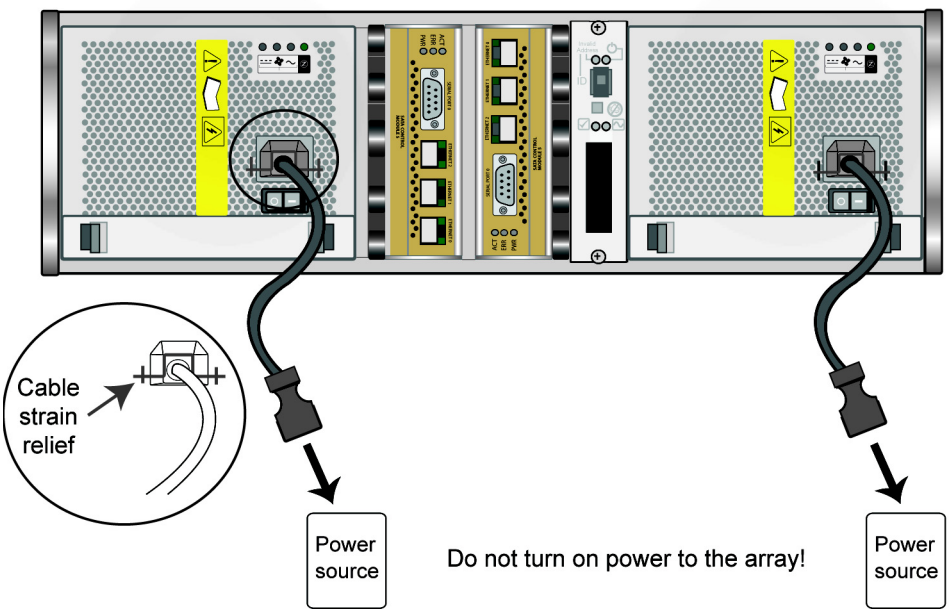
For a highly-available power configuration, connect one power supply to an uninterruptible power supply (UPS) system, and connect the other power supply to a different source of power. See the table *PS5000 Environmental, Power, and Physical Specifications* on page 6 for information about voltage requirements.

Notes: *Do not* turn on power to the array. At this time, the power cables are only for grounding purposes.

If your PS Series array was shipped with power cables, be sure to use these cables to meet safety requirements.

To connect power cables to an array, refer to the figure shown next. Be sure to use the cable strain relief to secure the power cable to the array.

Connecting Power Cables



D. Connect Array to a Network Switch

A PS5000 array includes one or two control modules (same type and color). Only one control module is active (serving network traffic) at one time. The secondary (redundant) control module mirrors cache data from the active control module. If the active control module fails, the secondary will take over network operations.

Each control module has three network interface ports, labeled Ethernet 0, Ethernet 1, and Ethernet 2, for up to three active connections to the network.

Be sure to follow the requirements and recommendations described in the following tables. In addition, all the usual rules for proper network configuration apply to group members. General network configuration is beyond the scope of this manual.

Network Requirements

Requirement	Description
One or more network connections	An array must have at least one functioning network interface connected to a network (through a network switch, if possible). When you configure the array, as described later in this *QuickStart*, you assign an IP address and netmask to this interface. In a dual control module array, to ensure network availability regardless of which control module is active, connect a cable to the network interface port on each control module.
Correct network cables	Use Category 5E or Category 6 cables with RJ45 connectors. Use Category 5 cables only if they meet the TIA/EIA TSB95 standard.

Network Recommendations

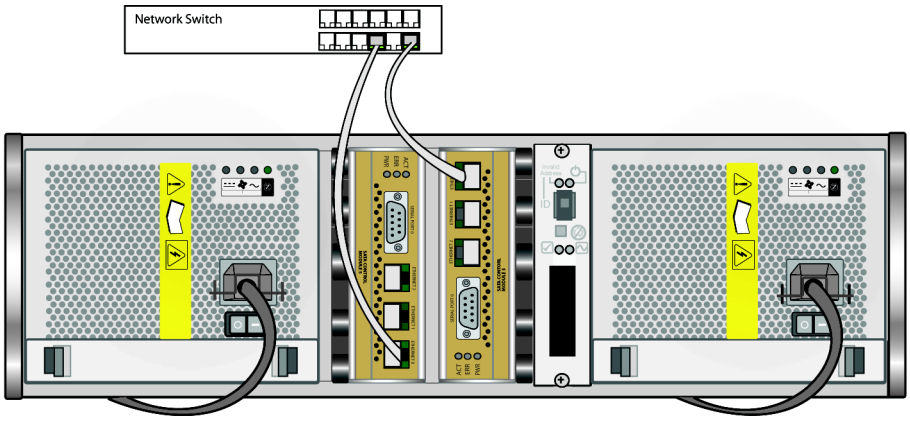
Recommendation	Description
Switched Gigabit Ethernet network	Connect arrays and hosts to a switched network and ensure that all network connections between hosts and arrays are Gigabit Ethernet. An array can operate at 10 and 100 Mbits, but performance will be significantly degraded.
Multiple network connections	For increased bandwidth and availability, connect multiple network interfaces to the network (and different switches, if possible). Connect interfaces in the following order: Ethernet 0, Ethernet 1, and Ethernet 2. After the initial setup, use the Group Manager GUI or CLI to assign an IP address and netmask to each additional interface.
Access to the group IP address	In a multi-subnet group, each configured network interface should have access to the subnet on which the group IP address resides.

Network Recommendations (Continued)

Recommendation	Description
Redundant network paths	Using a multipathing solution helps to ensure that no single point of failure exists between hosts and arrays.
For replication, a reliable, adequately sized network link	For effective and predictable replication, be sure that the network link between the primary and secondary groups is reliable and provides sufficient bandwidth for copying data.
No STP functionality on switch ports that connect end nodes	Do not use Spanning-Tree (STP) on switch ports that connect end nodes (iSCSI initiators or array network interfaces). However, if you want to use STP or RSTP (preferable to STP), you should enable the port settings available on some switches that let the port immediately transition into STP forwarding state upon link up. This functionality can reduce network interruptions that occur when devices restart, and should only be enabled on switch ports that connect end nodes. **Note:** The use of Spanning-Tree for a single-cable connection between switches is encouraged, as is the use of trunking for multi-cable connections between switches.
Flow Control enabled on switches and NICs	Enable Flow Control on each switch port and NIC that handles iSCSI traffic. PS Series arrays will correctly respond to Flow Control.
Unicast storm control disabled on switches	Disable unicast storm control on each switch that handles iSCSI traffic, if the switch provides this feature. However, the use of broadcast and multicast storm control is encouraged on switches.
Jumbo Frames enabled on switches and NICs	Enable Jumbo Frames on each switch and NIC that handles iSCSI traffic to obtain any performance benefit and ensure consistent behavior.
VLANs	Configure switches to use VLANs in order to separate iSCSI SAN traffic from other network traffic.

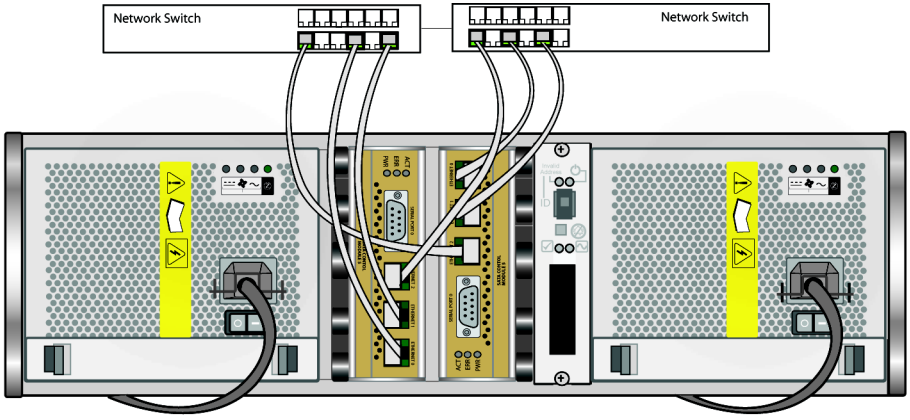
The minimum network configuration for a single control module array is one network connection to Ethernet 0. For a dual control module array, the minimum network configuration is one connection to Ethernet 0 on each control module, as shown in the figure *Minimum Dual Control Module Network Configuration*. This configuration protects against control module failure.

Minimum Dual Control Module Network Configuration



For maximum network bandwidth and availability, connect cables to all network ports and distribute the connections across multiple network switches, as shown in the figure *High Performance, High-Availability Network Configuration*.

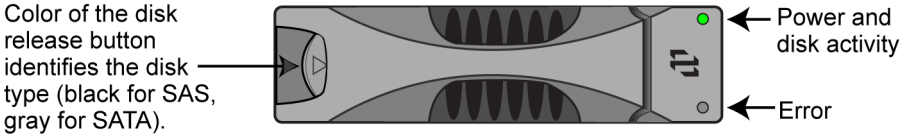
High Performance, High-Availability Network Configuration



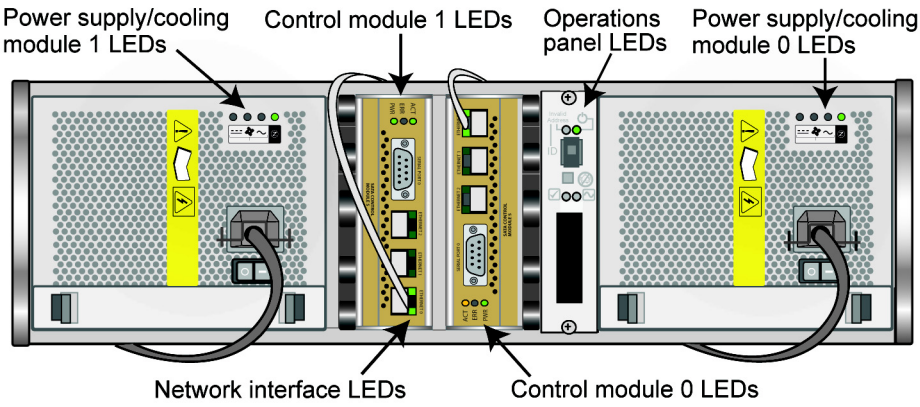
E. Turn on Power to Array and Check LEDs for Errors

Before turning on power, *be sure* the array is at room temperature. If an LED indicates a problem, contact your array support provider.

Disk LEDs



Backpanel LEDs



Disk LED Descriptions

Disk LEDs	Color	Description
Top	Off	No power or error condition.
	Green	Power.
	Flashing green	Disk activity.
Bottom	Off	No power or normal condition.
	Red	Error condition.

Operations Panel LED Descriptions

Operations LEDs	Color	Description
Power (upper right)	Off	No power.
	Green	Power.

Operations Panel LED Descriptions (Continued)

Operations LEDs	Color	Description
Array locator (upper left)	Off	No power or normal condition.
	Flashing orange	Administrator enabled the array locator function.
Warning condition (lower left)	Off	No power or normal condition.
	Flashing orange	One or more of the following has occurred: • RAID set is degraded but still functioning. • RAID set (volume level) has lost blocks. • Component temperature is near a limit. • Fan failed or fan RPMs exceed limit. • Power supply is not installed or has no power. • Only one control module installed or control module has failed over. • Control module has insufficient RAM. • Syncing active and secondary control modules. • No communication between control modules. • Installed spare disk does not have enough capacity to replace a disk in a RAID set. • A non-critical hardware component failed. • Real-time clock battery is low.
Error condition (lower right)	Off	No power or normal condition.
	Flashing orange	One or more of the following has occurred: • RAID is not functioning. • Lost block table is full. • Temperature exceeds upper or lower limit. • Control module cache has lost data. • A cooling module is not installed. • Both fans on a cooling module have failed. • Cache battery has less than 72 hours charge or temperature is too high to charge battery. • NVRAM coin cell battery failed. • Cache contains data that does not belong to any of the installed disks. • More than one valid RAID set exists in array. • Control modules are different models. • A critical hardware component has failed. • Operations panel failed or not installed. • Storage enclosure processor that monitors array components has experienced a failure.

Control Module LED Descriptions

Control Module LEDs	Color	Description
ACT	Off	No power, secondary control module is not synchronized with active control module, or error condition.
	Green	Active control module (serving network I/O).
	Orange	Secondary control module; cache is synchronized with active control module.
ERR	Off	No power or no error condition.
	Red	Array is starting up or error condition.
PWR	Off	No power.
	Green	Power.

Network Interface LED Descriptions

Network Interface LEDs	Color	Description
Left	Off	No power or not connected to network.
	Green	Connected to network.
Right	Off	No power or not transmitting.
	Green	Transmitting.

Power Supply and Cooling Module LED Descriptions

Power Supply/Cooling Module LED	Color	Description
⎓	Off	No power or normal condition
	Orange	DC power failure
	Off	No power or normal condition
	Orange	Fan failure
~	Off	No power or normal condition
	Orange	AC power failure
	Off	No power
	Green	Normal array operation

F. Connect Array to a Console Terminal

Establish a serial connection between the array and a console terminal (or a computer running a terminal emulator) to run the `setup` utility, which enables you to configure the array and add it to a group.

After setting up the array, the serial connection is no longer needed, but you should keep the serial cable. You can use a serial connection if there is no network access to the group or array.

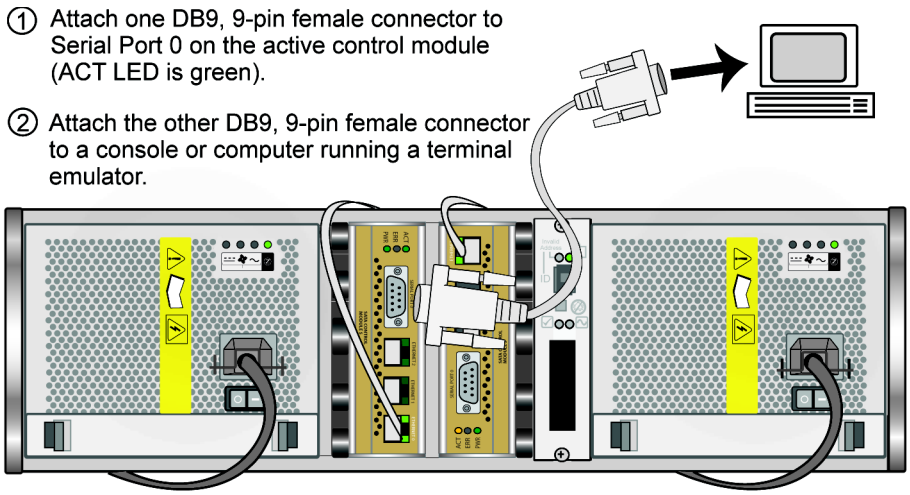
Note: If you have a Microsoft® Windows® system, you can use the Remote Setup Wizard to configure an array and create a group instead of using the `setup` utility. The wizard *does not* require the serial cable.

The serial connection must have the following characteristics:

- 9600 baud
- One STOP bit
- No parity
- 8 data bits
- No hardware flow control

To create a serial connection, obtain the null modem cable that shipped with the array and refer to the next figure. The serial cable must always be connected to Serial Port 0 on the active control module (ACT LED will be green).

Connecting the Serial Cable



Step 2. Configure the Array and Create a Group

The `setup` utility enables you to configure an array on the network and create a PS Series group with the array as the first member. The utility prompts for the array's network configuration and the group configuration, including the group IP address.

Note: See the tables *Network Requirements* and *Network Recommendations* on page 9 for additional network information.

After the `setup` utility completes, the group is available on the network. Next, log in to the group using the Group Manager GUI or CLI and set the RAID policy for the first member.

A. Before running the `setup` utility, gather the information described in table *Array Configuration* and table *Group Configuration*. Obtain IP addresses from your network administrator, as needed.

Array Configuration

Prompt	Description
Member name	Unique, descriptive name (up to 64 alphanumeric characters; no spaces). First character must be a letter or number. Used to identify and administer the array.
Network interface	Name of an array network interface (either `eth0`, `eth1`, or `eth2`) that is connected to a functioning port on a network switch.
IP address	Network address for the network interface above. **Note:** Each member must have at least one network interface on the same subnet as the group IP address.
Netmask	Combines with the IP address to identify the subnet on which the network interface above resides (default is 255.255.255.0).
Default gateway (optional)	Network address for the device used to connect subnets and forward network traffic beyond the local network. A default gateway is needed only if you want the named network interface to communicate outside the local network (for example, to allow access to volumes from hosts outside the local network). **Note:** The default gateway must be on the same subnet as the named network interface.

Group Configuration

Prompt	Description
Group name	Name of the group (up to 54 characters). Valid characters include letters, number, and dashes. The first character must be a letter or number. Identifies the group for the purposes of adding new members or setting up replication.
Group IP address	Network address for the group. The group IP address is used for group administration and host access to data stored in the group.
Password for managing group membership	Password required when adding members to the group. The password must have 3 to 16 alphanumeric characters and is case-sensitive.
Password for the default group administration account	Password that will override the factory-set password (`grpadmin`) for the default `grpadmin` account. The password must have 3 to 16 alphanumeric characters and is case-sensitive.

B. Using the serial connection you established in *Step 1-F* on page 15, press the Enter key. At the login prompt, enter the `grpadmin` account name and the factory-set password, which is also `grpadmin`. Note that passwords are not echoed on the screen.

```
Login: grpadmin
Password: grpadmin

               Welcome to Group Manager
         Copyright 2001 - 2007 EqualLogic, Inc.

It appears that the storage array has not been configured.
Would you like to configure the array now? (y/n) [n]
```

C. If you enter y, the `setup` utility starts. You can also enter `n` and, at a later time, type `setup` at the console prompt (>) to start the utility.

The `setup` utility prompts for the member and group configuration. Press the Enter key to accept a default value. Enter `?` to obtain help.

An example of running the `setup` utility is shown next. There may be a short delay after entering the group IP address as the array searches the network.

Example of Configuring an Array and Creating a Group

```
               Group Manager Setup Utility

The setup utility establishes the initial network and storage
configuration for a storage array and then configures the array
as a member or a new or existing group of arrays.

For help, enter a question mark (?) at a prompt.

Do you want to proceed (yes | no) [no]? yes

Initializing. This may take several minutes to complete.

Enter the network configuration for the array:

   Member name []: member01
   Network interface [eth0]: eth0
   IP address for network interface []: 192.17.2.41
   Netmask [255.255.255.0]: Enter
   Default gateway [192.17.2.1]: Enter

Enter the name and IP address of the group that the array will join.

   Group name []: group01
   Group IP address []: 192.17.2.40

Searching to see if the group exists. This may take a few minutes.

The group does not exist or currently cannot be reached. Make sure
you have entered the correct group IP address and group name.

Do you want to create a new group (yes | no) [yes]? yes

               Group Configuration

  Group Name:                    group01
  Group IP address:              192.17.2.40

Do you want to use the group settings shown above (yes | no) [yes]: yes

  Password for managing group membership:
  Retype password for verification:

  Password for the default group administration account:
  Retype password for verification:

Saving the configuration ...

Waiting for configuration to become active......Done

Group member member01 now active in the group.

Group group01 has been created with one member.

Use the Group manager GUI or CLI to set the RAID policy for the member.
You can then create a volume which a host can connect to using an iSCSI
initiator.
```

Step 3. Set the Member RAID Policy

After you create the group, use the Group Manager GUI or CLI to set the RAID policy for the member. This will automatically configure the disks according to the RAID policy, with the appropriate number of spare disks.

A member can be configured with one of the following RAID policies:

- RAID-10 – Striping on top of multiple RAID 1 (mirrored) sets, with one or two spare disks. RAID-10 provides good performance for random writes, in addition to the highest availability. However, since the disks are mirrored, RAID 10 provides the least capacity.
- RAID-50 – Striping on top of two RAID 5 (distributed-parity) sets, with one or two spare disks. RAID-50 provides a good balance of performance (especially for sequential writes), availability, and capacity.
- RAID-5 – One RAID 5 set, with one spare disk. RAID-5 is similar to RAID-50, with more capacity (two additional disks) but lower availability and performance.
- RAID-10, nospares – Striping on top of multiple RAID 1 sets, with no spares, if possible.
- RAID-50, nospares – Striping on top of two RAID 5 sets, with no spares, if possible.

Note: A no-spares RAID policy can be set only with the CLI and should be used only at installations where extra disks and personnel are available at all times to replace failed disks.

Be sure you choose the right RAID policy for a member. You can convert a member to a different RAID policy only if the new policy requires *less* disk space than the current policy.

After you set the RAID policy for the first group member, you can create volumes. Until the RAID configuration completes, performance will not be optimal, but the group is fully operational.

Using the GUI and, alternately, the CLI to set the RAID policy is described next.

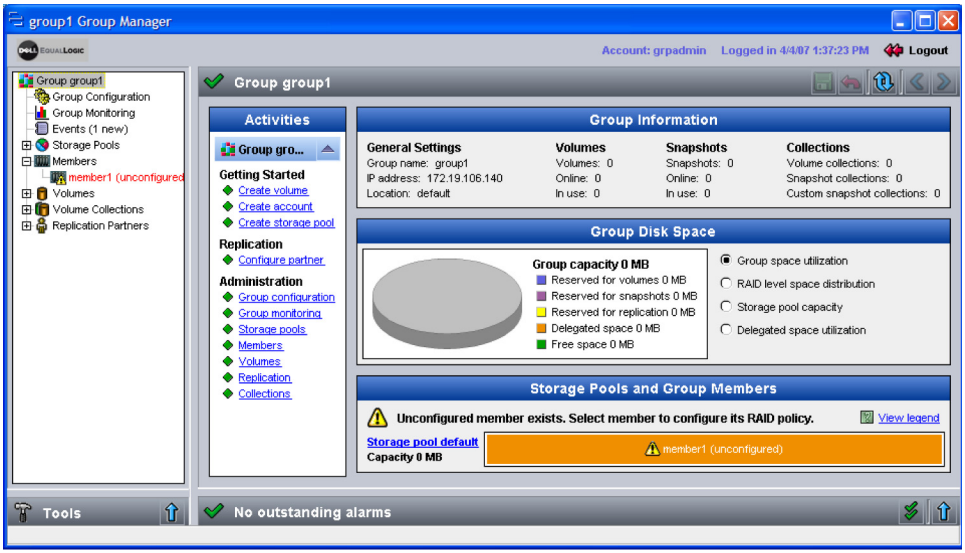
Using the GUI to Set the RAID Policy

See the PS Series *Release Notes* for GUI requirements. To start the GUI, specify the group IP address in a Web browser. When prompted, log in to the group by entering the `grpadmin` account name and the password that you specified when creating the group. The Group Summary window appears.

Note: To obtain Group Manager online help, click `Tools` in the bottom left corner of the GUI and then click `Online Help`.

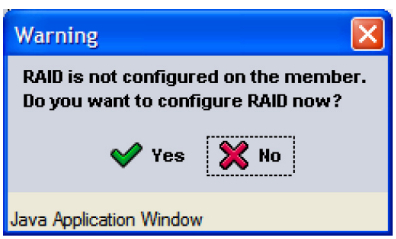
Initially, the Group Summary window shows no group capacity and indicates that a member exists with an unconfigured RAID policy. This is normal behavior.

Group Summary – RAID Policy Not Set



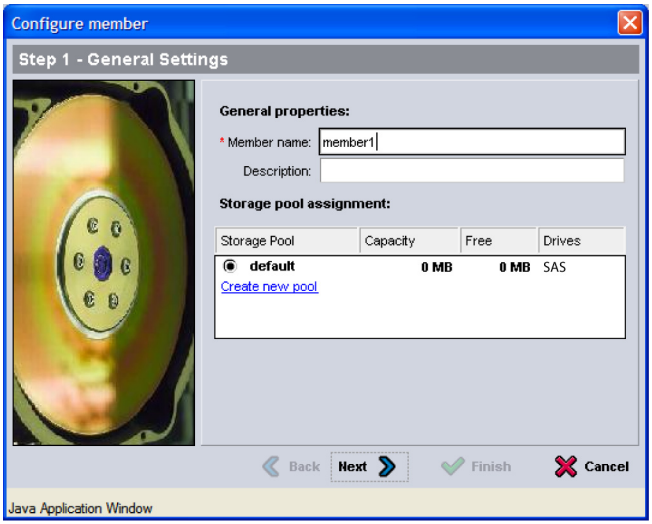
To set the RAID policy for the member, expand `Members` in the far left panel and select the member name. The following warning appears.

Warning RAID Not Configured



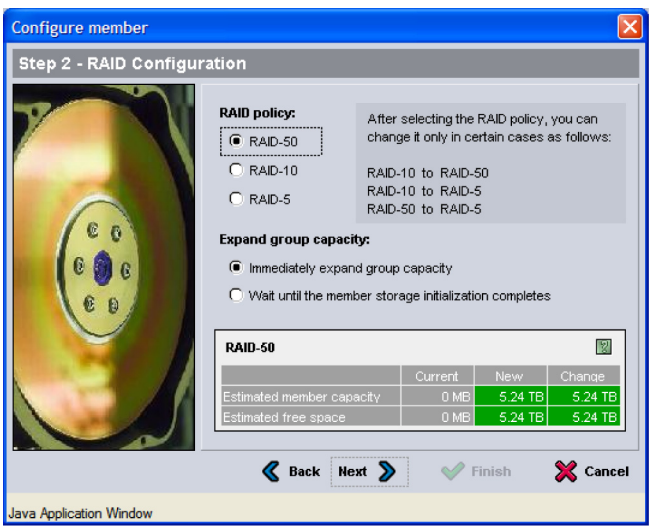
Click `Yes` and the Configure Member – General Settings dialog box appears.

Configure Member – General Settings



Enter an optional member description and click `Next`. The Configure Member – RAID Configuration dialog box appears.

Configure Member – RAID Configuration (RAID-50)

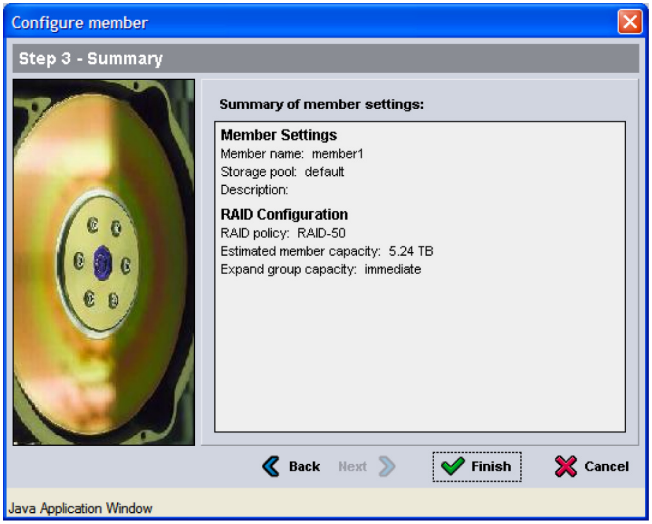


Select the RAID policy for the member. The pool capacity values in the dialog box table will change, depending on the selected RAID policy. For example, in

the preceding dialog box, selecting RAID-50 provides an estimated capacity of 5.24 TB. In contrast, selecting RAID-10 would provide less capacity, while selecting RAID-5 would provide more capacity.

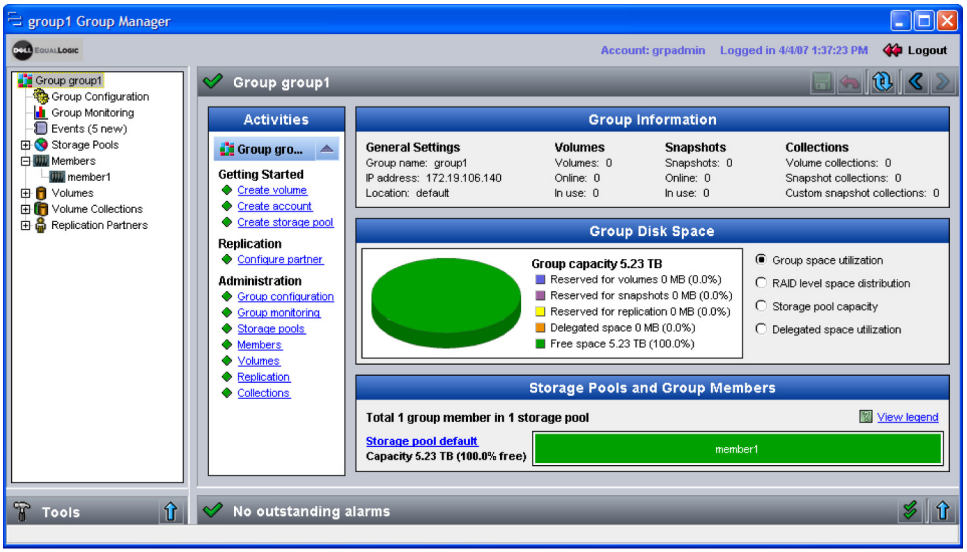
Click `Next` to continue. The Configure Member – Summary dialog box appears.

Configure Member – Summary



If the member configuration is satisfactory, click `Finish`. The following Group Summary window shows a completed configuration for a one-member group.

Group Summary – Completed Member Configuration



Using the CLI to Set the RAID Policy

To access the CLI, establish a telnet or SSH connection to the group IP address or use a serial connection to the array, as described in *Step 1-F* on page 15. When prompted, log in to the group by entering the `grpadmin` account name and the password that you specified when creating the group.

To set the RAID policy for a member, use the following command format:

`member select` *`member_name`* `raid-policy` *`policy`*

The *`policy`* variable can be one of the following:

- `RAID10`
- `RAID50`
- `RAID5`
- `raid10-nospares`
- `raid50-nospares`

For example, the following command configures member01 with RAID-50:

```
> member select member01 raid-policy raid50
```

Step 4. Create a Volume

After setting the RAID policy for a member, use the Group Manager GUI or CLI to create volumes. You can specify the following information about a volume:

- Volume name – Name, up to 64 characters (including letters, numbers, periods, hyphens, and colons), that is used to identify the volume for administrative purposes. The volume name appears at the end of the iSCSI target name that is generated for the volume.

- Description – The volume description is optional.

- Storage pool – All volume data will be restricted to the members that make up the pool. By default, the volume will be assigned to the default pool. If multiple pools exist, you can assign the volume to a different pool.

- Volume size – This is the reported size of the volume as seen by iSCSI initiators. The minimum volume size is 15 MB. In addition, volume sizes are rounded up to the next multiple of 15.

  Note: For a volume without thin provisioning, the volume reserve (allocated space) is the same as the reported size. For a thin-provisioned volume, the volume reserve will be less than or equal to the reported size.

- Snapshot reserve – If you want to create snapshots of the volume, specify the amount of pool space to reserve for snapshots, as a percentage of the volume reserve. The default is the group-wide volume setting. If you enter a value, this space is reserved even if you never create a snapshot.

  In addition, you can specify the limit at which you will be notified that snapshot space is being depleted, in addition to the action to take when snapshot space is exceeded (either delete the oldest snapshots or set the volume offline). The defaults are the group-wide settings.

- Thin provisioning setting – By default, thin provisioning is disabled on a volume. If you enable thin provisioning, you can specify the minimum volume reserve, the in-use space warning value, and the maximum amount of in-use space.

  Note: Thin provisioning is an advanced volume feature and may not be appropriate for all environments. See the PS Series *Group Administration* manual for detailed information.

- Access controls – Access control records are used to restrict volume access to hosts that supply the correct credentials. By default, no host can access a volume. A host must match a record in order to access a volume. You can restrict access according to the following:
  - CHAP user name – Restricts access to hosts that supply the specified CHAP user name (and its associated password or "secret"). The user name must match a local CHAP account or an account on an external RADIUS server.
  - IP address – Restricts access to hosts with the specified initiator IP address (for example, 12.16.22.123). Use asterisks for "wildcards," if desired (for example, 12.16.*.*). An asterisk can replace an entire octet, but it cannot replace a digit within an octet.
  - iSCSI initiator name – Restricts access to the specified iSCSI initiator.

Using the GUI and, alternately, the CLI to create a volume is described next.

Using the GUI to Create a Volume

To start the GUI, specify the group IP address in a Web browser. When prompted, log in to the group by entering the `grpadmin` account name and the password that you specified when creating the group. The Group Summary window appears, displaying the current group configuration and storage pool capacity.

To create a volume, click `Create volume` in the Activities panel. The Create Volume – Volume Settings dialog box appears.

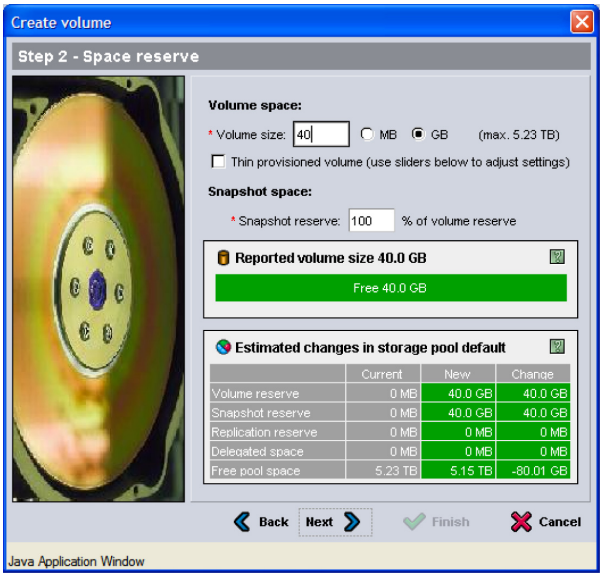
Create Volume – Volume Settings

Enter the following information:

- Volume name.
- Volume description (optional)
- Storage pool

Click Next. The Create Volume – Space Reserve dialog box appears.

Create Volume – Space Reserve



Enter the following information:

- Volume size. Be sure to specify the correct unit of measurement.
- Thin-provisioning setting. If selected, slider bars appear, enabling you to specify the minimum volume reserve, the in-use space warning value, and the maximum in-use space value for the thin-provisioned volume.
- Snapshot reserve. You can modify the snapshot space warning value and snapshot space recovery setting after creating the volume.

The values in the storage pool space table reflect the specified volume size, thin provisioning settings, and snapshot reserve.

Click `Next`. The Create Volume – iSCSI Access dialog box appears.

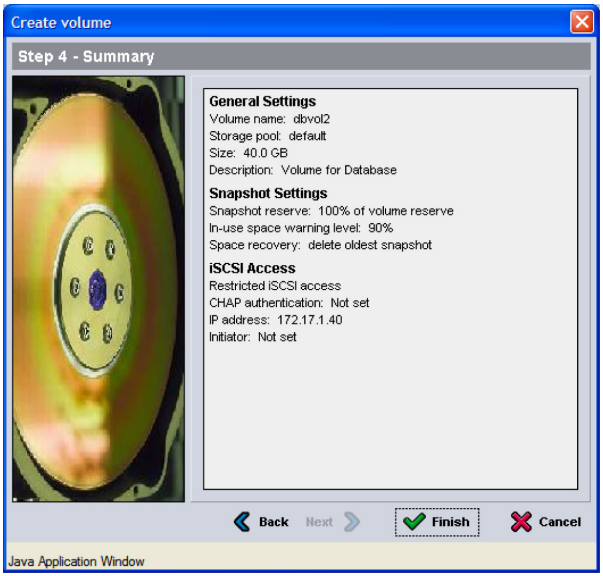
Create Volume – iSCSI Access

Specify the IP address, CHAP user name, or iSCSI initiator name to which the volume will be restricted. In the previous dialog box, volume access is restricted to IP address 172.17.1.40. You can set up more access controls after creating the volume.

Click `Next`.The Create Volume – Summary dialog box appears.

If the volume configuration is satisfactory, click `Finish` to create the volume. Click `Back` to make changes.

Create Volume – Summary



Once you create a volume, you can create snapshots of the volume or perform other tasks. The following Group Summary window shows a group with volumes and snapshots.

Group Summary – With Volumes

Using the CLI to Create a Volume

To access the CLI, establish a telnet or SSH connection to the group IP address or use a serial connection to the array, as described in *Step 1-F* on page 15. When prompted, log in to the group by entering the `grpadmin` account name and the password that you specified when creating the group.

To create a volume, use the following command format:

`volume create` *`volume_name size`*`[GB] [`*`optional_parameters`*`]`

Specify the volume name and size (the default is megabytes).

Optionally, specify one or more of the following snapshot space parameters:

- `snap-reserve` *`percent_volume_reserve`*
- `snap-depletion delete-oldest | volume-offline`
- `snap-warn` *`percent_snapshot_reserve_free`*

To enable thin provisioning on the volume, specify the `thin-provision` parameter and, optionally, one or more of the following parameters:

- `thin-min-reserve` *`n`*`%`
- `thin-growth-warn` *`n`*`%`
- `thin-growth-max` *`n`*`%`

After creating the volume, restrict host access by creating one or more access control records using the following command format:

`volume select` *`volume_name`* `access create` *`access_control`*

The *`access_control`* parameter can be one or more of the following:

- `initiator` *`initiator_name`*
- `ipaddress` *`ip_address`*
- `username` *`chap_username`* `authmethod chap`

The following example creates a 50 GB volume and two access control records for the volume. Only a host that has IP address 112.15.7.119 *or* 112.15.12.120 will be able to access the volume and its snapshots.

```
> volume create staff1 50GB
> volume select staff1 access create ipaddress 112.15.7.119
> volume select staff1 access create ipaddress 112.15.12.120
```

Step 5. Connect to the Volume from a Host System

A PS Series group volume is seen on the network as an **iSCSI target**. When you create a volume, its iSCSI target name is generated automatically. An example of an iSCSI target name for a volume named `dbvol` is as follows:

```
iqn.2001-05.com.equallogic.5-4a0900-2f00000-007eca92d654f160-dbvol
```

To display the iSCSI target name for a volume, do either of the following:

- In the CLI, enter the command: `volume show` *`volume_name`*
- In the GUI, select the volume name in the far left panel and then click the `Status` tab to display the iSCSI target name at the bottom of the iSCSI Connections panel.

To connect to a volume, the host must have an **iSCSI initiator** running and must match the security credentials in one of the volume's access control records. Hardware and software initiators are available from a variety of vendors. Configure your initiator using the instructions provided by the vendor.

Note: It is recommended that you visit the Technical Support website to obtain important information about using initiators to access PS Series group volumes.

The exact procedure for connecting to an iSCSI target depends on the initiator. See the initiator documentation for details. In most cases, you use the initiator configuration utility to specify the group IP address as either the **target portal** or the **discovery address**. If the initiator supports the discovery process, it will return a list of iSCSI targets (volumes) that the host can access.

If the initiator does not support discovery, you must also specify the target name. The standard iSCSI port number (3260) may also be required.

Using the initiator configuration utility, select the desired target and log in or connect to the target. If the volume's access control records use CHAP for initiator authentication, enter the CHAP credentials (user name and password or "secret") at this time. Note that CHAP must already be set up in the group, as described in the PS Series *Group Administration* manual.

Once the host connects to the iSCSI target, the volume is seen by the host as a regular disk that can be formatted using the normal operating system utilities. For example, you can partition the disk and create a file system, if desired.

Where to Go Next

After getting started, you can customize a PS Series group and also utilize the full set of product features and host-based solutions.

The following table lists group, volume, and member operations you can perform. The operations are fully documented in the *Group Administration* manual.

Advanced Operations

Group Task	Description
Add a member.	Although a one-member group is fully functional, adding more arrays expands storage pool capacity, increases network bandwidth, and improves overall group performance—without disrupting data availability.
Modify the date, time, or time zone or configure NTP.	Group time is based on the clock on the first member, which is set at the factory. The default time zone is EST. You can also configure the group to use an NTP server.
Create administration accounts.	The `grpadmin` account is the default administration account. You can set up additional accounts.
Set up event notification.	To be informed of significant events in a timely manner, set up e-mail or syslog notification.
Configure iSNS.	To automate iSCSI target discovery, you can configure the group to use an iSNS server.
Configure CHAP.	You can use CHAP to restrict host access to volumes. Both initiator and target CHAP authentication are supported.
Configure SNMP.	To monitor traps from the group, you can use SNMP.
Create pools.	With multi-member groups, you can create additional pools and assign members and volumes to the pools.

Advanced Operations (Continued)

Volume Task	Description
Create access control records for a volume.	An access control record specifies the criteria that a host must meet in order to access the volume.
Modify the snapshot or thin provisioning settings for a volume.	Various settings control when you are notified that reserved space is being depleted and the action to take when reserved space is consumed.
Create snapshots of a volume.	Snapshots are point-in-time copies of volume data that can be used for backups.
Set up replication across different groups.	Replicas are point-in-time copies of volume data that are stored separately from volumes for disaster recovery.
Clone a volume, snapshot, or replica.	Cloning creates a new volume in the group where the cloned volume, snapshot, or replica resides.
Promote a replica set.	Promotion stops replication, creates a new volume, and transforms the replicas into corresponding snapshots.
Create collections.	Collections provide a way to group multiple related volumes together for the purpose of creating snapshots or replication. The administrator can the create a multi-volume snapshot or replica in a single operation or through a single schedule.
Member Task	**Description**
Add network connections.	Multiple connections provide performance and availability.
Add disks.	Adding disks increases capacity.

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