HP StorageWorks
Disk Array XP128
Disk Array XP1024
owner's guide

This guide describes the general operations, components, specifications, and options for the HP StorageWorks Disk Array XP128 and Disk Array XP1024.

Contents

About this guide

This guide describes the general operations, components, specifications, and options for the HP StorageWorks Disk Array XP128 and Disk Array XP1024.

Intended audience

This guide is intended for use by system administrators who have expertise with the mass storage systems, software, and related topics:

- data processing concepts
- direct-access storage device subsystems and their basic functions
- disk arrays and RAID technology
- operating system commands and utilities

Disk arrays

Unless otherwise noted, the term *disk array* refers these disk arrays:

HP StorageWorks Disk Array XP128
HP StorageWorks Disk Array XP1024

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Command View XP for XP Disk Arrays: User Guide*
- *HP StorageWorks Disk Array XP128 Site Preparation Guide*
- *HP StorageWorks Disk Array XP1024 Site Preparation Guide*

For information about operating system commands and third-party products, refer to the manufacturer's documentation.

Conventions

This guide uses the following text conventions.

Figure 1	Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target.
www.hp.com	Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target.
literal	Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles.
variable	Italics indicates that you must supply a value. Italics is also used for manual titles.
`input/output`	Monospace font denotes user input and system responses, such as output and messages.
Example	Denotes an example of input or output. The display shown in this guide may not match your configuration exactly.
[ ]	Indicates an optional parameter.
{ }	Indicates that you must specify at least one of the listed options.
|	Separates alternatives in a list of options.

Getting help

If you have additional questions, contact an HP authorized service provider or access our website:

www.hp.com

HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

http://h18006.www1.hp.com/storage/arraysystems.html

Be sure to have the following information available before calling:

- technical support registration number (if applicable)
- product serial numbers
- product model names and numbers
- applicable error messages
- operating system type and revision level
- detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP storage website

For the most current information about HP StorageWorks XP products, visit the support website. Select the appropriate product or solution from this website:

http://h18006.www1.hp.com/storage/arraysystems.html

For information about product availability, configuration, and connectivity, consult your HP account representative.

HP authorized reseller

For the name of your nearest HP authorized reseller, you can obtain information by telephone:

United States   1-800-345-1518

Canada   1-800-263-5868

Or contact: www.hp.com

Revision history

May 2002	First Edition
Oct. 2002	Second Edition
May 2004	Third Edition
May 2005	Fourth Edition

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Overview

The Disk Array XP128 and Disk Array XP1024 are part of the HP StorageWorks Disk Array family of products. These disk arrays provide reliable and secure data storage and protection, featuring redundant circuitry and RAID storage options for data security. These disk arrays also support multiple operating systems, platforms, and RAID groups. The advantages include:

- Continuous data availability
- Nondisruptive service and upgrades
- Connectivity
- Scalability
- Data integrity

Continuous data availability

The HP StorageWorks Disk Array XP family are the first RAID disk arrays to provide truly continuous data availability. They are designed for nonstop operation and continuous access to all user data.

HP StorageWorks Disk Array XP128 and XP1024 disk arrays have no single point of component failure, which enables uninterrupted access to data.

The disk array has component and function redundancy, providing full fault tolerance for disk array microprocessors, control storage, control and data buses, power supplies, and cooling fans. The disk array can sustain multiple component failures and still continue to provide full access to your stored data.

While access to your data is never compromised, the failure of a key component can cause a temporary reduction in disk array performance.

Nondisruptive service and upgrades

Monitoring software detects internal hardware component problems and notifies the HP Storage Technology Center automatically. At the support center, the problem is verified and the appropriate maintenance activity is executed by an HP service representative. The are no user serviceable components. Only an HP service representative should open the cabinets.

All hardware subassemblies can be removed, serviced, repaired, or replaced non-disruptively during disk array operation. All microcode upgrades can be performed during normal disk array operations (provided array connectivity infrastructure requirements are satisfied), using your disk array's built-in service processor (SVP). Alternate paths can be set by host failover software and/or alternate Fibre Channel paths.

Connectivity

The HP StorageWorks Disk Array XP128 and HP StorageWorks Disk Array XP1024 are connected to host systems using one of these types of connections:

- Fibre Channel
- ESCON
- FICON
- iSCSI

Fibre Channel connectivity

HP StorageWorks Disk Array XP128

The XP128 supports a maximum of three pairs of channel adapters that can support up to 48 Fibre Channel ports. Your disk array can support up to 8,192 LDEVs which can be configured as up to 24,576 LUNs through the Fibre Channel. The Fibre Channel provides data transfer rates up to 2Gb/sec depending on which Fibre Channel interface option is installed. The disk array can support Fibre Channel Arbitrated Loop (FC-AL) and Fabric Fibre Channel topologies.

HP StorageWorks Disk Array XP1024

The XP1024 supports a maximum of four pairs of channel adapters that can support up to 64 Fibre Channel ports. Your disk array can support up to 8,192 LDEVs which can be configured as up to 32,768 LUNs through the Fibre Channel. The Fibre Channel provides data transfer rates up to 2Gb/sec depending on which Fibre Channel interface option is installed. The disk array can support Fibre Channel Arbitrated Loop (FC-AL) and Fabric Fibre Channel topologies.

ESCON connectivity

HP StorageWorks Disk Array XP128

The XP128 supports a maximum of three pairs of channel adapters that can support 24 ESCON ports for connection to mainframe hosts. The disk array can support up to 8,192 LDEVs.

HP StorageWorks Disk Array XP1024

The XP1024 supports a maximum of six pairs of channel adapters that can support 48 ESCON ports for connection to mainframe hosts. The disk array can support up to 8,192 LDEVs.

Note: When more than four pairs of ESCON channel adapters are configured, the number of disk drives that can be installed is reduced. Other restrictions may apply, depending on what other types of channel adapters are installed.

FICON connectivity

HP StorageWorks Disk Array XP128

The XP128 supports a maximum of three pairs of channel adapters that can support up to 24 FICON ports. The disk array can support up to 8,192 LDEVs.

HP StorageWorks Disk Array XP1024

The XP1024 supports a maximum of four pairs of channel adapters that can support up to 32 FICON ports. The disk array can support up to 8,192 LDEVs.

iSCSI connectivity

HP StorageWorks Disk Array XP128

The XP128 supports a maximum of three pairs of channel adapters that can support up to 24 iSCSI ports. The disk array can support up to 6,144 LDEVs through iSCSI.

HP StorageWorks Disk Array XP1024

The XP1024 supports a maximum of four pairs of channel adapters that can support up to 32 iSCSI ports. Your disk array can support up to 8,192 LDEVs through iSCSI.

Data integrity

HP disk arrays provide the highest levels of data integrity. This is accomplished using RAID technologies, together with redundant hardware throughout the disk array. The following hardware features allow the HP StorageWorks Disk Array XP family to achieve its high availability and data integrity:

- RAID1, RAID5
- Mirrored write cache
- Dual channel adapters (CHAs) and array control processors (ACPs)
- Dual and concurrently active data and control paths through the array
- Split power domains on internal data paths
- Hot-pluggable boards
- Hot-pluggable fans, power supplies, and controllers
- Online upgradable firmware

Some of the available software features and products that complement the disk array hardware are listed below:

- HP StorageWorks Disk Array XP128 support

  "Phone Home" capability to the multidisciplinary Storage Technology Center

  advanced remote diagnostics

  full solution (Host-SAN-Storage) support

- Full software and solution integration

  local and remote mirroring for online backup and disaster recovery (HP StorageWorks Business Copy XP and Continuous Access XP)

  security for multiple server consolidation (HP StorageWorks LUN Configuration and Security Manager XP)

  zero downtime backup (HP OmniBack, Exchange, Oracle, or SAP)

  centralized resource management (HP StorageWorks Command View XP, HP StorageWorks SAN Manager LM/DM, Performance Advisor XP and Auto LUN XP)

- I/O path failover and load balancing (HP StorageWorks AutoPath XP).To obtain updates to the software, go to the following main web site and access the appropriate support product:

  http://www.hp.com

Summary of features

Table 1. XP128 and XP1024 Features

Feature	XP128	XP1024 with XP1024 & XP512 DKU Support	XP1024 XP1024 DKU Support
Power	Single-phase or 3-phase		Single-phase or 3-phase
DKC/DKU	Single cabinet unit only (no expansion)	One DKC with either: 1 or 2 XP1024 DKUs, and 1 to 3 XP512 DKUs	One DKC cabinet with 1 to 4 XP1024 DKU cabinets
Maximum hard disk drives	128	768	1024
Maximum spare disk drives	4	16	16
Maximum parity groups/subsystem	31	191	255
Maximum Disk Drive Capacity	36 TB	121 TB	149 TB
Max. cache	64 GB	128 GB	128 GB
			(continued)

Table 1. XP128 and XP1024 Features (Continued)

Feature	XP128	XP1024 with XP1024 & XP512 DKU Support	XP1024 XP1024 DKU Support
Available hard disk drives	73GB 10K rpm Fibre Channel disk drive	73GB 10K rpm Fibre Channel disk drive	73GB 10K rpm Fibre Channel disk drive
	36GB 15K rpm Fibre Channel disk drive	47GB 10K rpm Fibre Channel disk drive[1]	36GB 15K rpm Fibre Channel disk drive
	73GB 15K rpm Fibre Channel disk drive	18GB 10K rpm Fibre Channel disk drive[1]	73GB 15K rpm Fibre Channel disk drive
	146GB 10K rpm Fibre Channel disk drive	18GB 15K rpm Fibre Channel disk drive[1]	146GB 10K rpm Fibre Channel disk drive
	300GB 10K rpm Fibre Channel disk drive	181GB 7200 rpm Fibre Channel disk drive[1]	300GB 10K rpm Fibre Channel disk drive
		36GB 15K rpm Fibre Channel disk drive[2]	
		73GB 15K rpm Fibre Channel disk drive[2]	
		146GB 10K rpm Fibre Channel disk drive[2]	
		300GB 10K rpm Fibre Channel disk drive[2]	
		[1]XP512 DKU Only [2]XP1024 DKU Only	
Max shared memory	4.0 GB	4.0 GB	4.0 GB
Max ACP pairs	2	4	4

Table 1. XP128 and XP1024 Features (Continued)

Feature	XP128	XP1024 with XP1024 & XP512 DKU Support	XP1024 XP1024 DKU Support
			(continued)
Max CHIP pairs	3 2 if >1 ACP pair installed	4	4
Configuration disk	XP128-specific	XP1024-specific	XP1024-specific
SVP code	XP128-specific	XP1024-specific	XP1024-specific
High Availaility SVP	Optionally Available	Optionally Available	Optionally Available
RAID level	RAID 1 (2D+2D) RAID 1 (4D+4D) RAID 5 (3D+1P) RAID 5 (7D+1P)	RAID 1 (2D+2D) RAID 1 (4D+4D)* RAID 5 (3D+1P) RAID 5 (7D+1P)*	RAID 1 (2D+2D) RAID 1 (4D+4D) RAID 5 (3D+1P) RAID 5 (7D+1P)
Maximum LDEV #	8192	8192	8192
Available LUNs	24,576	32,768	32,768
Maximum LU #/port	512	512	512

*XP1024 DKU supported only.

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XP128 Hardware

General safety guidelines

Read the following safety guidelines carefully and follow them when you work with the HP StorageWorks Disk Array XP128 disk array.

- Remember that the maintenance of your machine must be done only by trained and qualified HP field engineers. Only an HP service representative can power off the disk array in a non-emergency situation.

- Please read and follow the safety guidelines and procedures in this manual and you other disk array manuals.

- In this manual and on the machine, hazard warnings are provided to aid you in preventing or reducing the risk of death, personal injury, or product damage. Understand and follow these hazard warnings fully.

- The hazard warnings that appear on the warning labels on the machine or in the manual have one of the following alert headings consisting of an alert symbol and a signal word, "**Warning**," or "**Caution**":

⚠ Warning

This indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

Caution *This indicates a hazardous situation which, if not avoided, will or can result in serious damage to the product or loss of data.*

- The signal word "NOTICE" is used to present warnings that are not directly related to personal injury hazards.

- When warning labels become dirty or start peeling off, replace them.

- If any physical accident such as abnormal noise, smell, or smoke occurs on the disk array while it is running, immediately power off the disk array by pulling the UNIT EMERGENCY POWER OFF switch on the disk array.

- Do not power off the system unless it is an emergency power-off situation.

- Keep the front and rear doors closed at all times.

- Keep the tops and sides of the cabinets clear to allow air to flow properly.

- Do not perform any procedures not described in this document. If you have any questions or concerns, please contact your HP service representative.

⚠ Warning

Do not touch areas marked HAZARDOUS, even with the power off. These areas contain high-voltage power.

Keep in mind that the hazard warnings in this manual or on the machine cannot cover every possible case, as it is impossible to predict and evaluate all circumstances before hand.

Follow the procedures in this guide carefully and always be alert for any unusual equipment indications or behavior. If you have any questions, contact your HP service representative.

Physical components

The HP StorageWorks Disk Array XP128 is a high-performance disk array system. It is used to store large quantities of data in an efficient and secure manner.
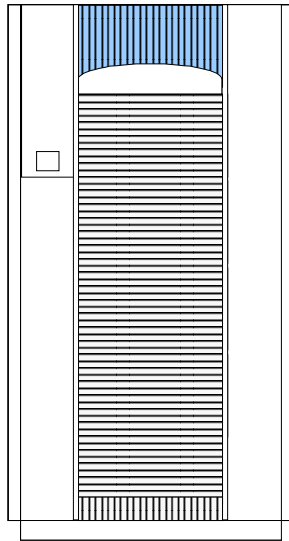
Figure 1. HP StorageWorks Disk Array XP128

Your disk array has the following major hardware components:

- Disk array cabinet

  The single disk array frame cabinet contains the control panel, connection hardware, the service processor, control boards and hard disk drives.

- One service processor (SVP)

  The service processor (SVP) is a built-in PC inside the disk array cabinet. The SVP gives your HP service representative a method of accessing the software system on the disk array.

  Your HP service representative uses the SVP to configure, maintain, and upgrade your disk array software and hardware. The service

processor also collects performance data about the disk array for diagnostic testing and analysis.

To ensure data security, the SVP does not have access to any user data stored on the disk array.

- (*Optional*) second service processor

  This is available for users with extreme high availability requirements. This is not a required feature.

- Control panel

  The control panel is your view of the disk array. Once the disk array is powered on and running normally, there are no user operations required at the control panel, except in the case of a power failure recovery. The control panel is discussed in further detail on page 31.

- Hard disk drives

  The disk array uses 3.5-inch disk drives, and different disk capacities are available. Ask your HP service representative about currently available disk drives or visit the XP128 web site at http://www.hp.com. Any of the disk drives in the disk array frames can be replaced without disrupting user activity. The disk array automatically detects and corrects disk errors.

- (*Optional*) management station PC

  The management station PC is attached to your disk array by a local area network (LAN) connection. The management station PC runs HP Command View XP, which, combined with other optional applications, allows you to monitor and manage disk array operations.

The following figure illustrates how the management station PC and host connect to the XP128.
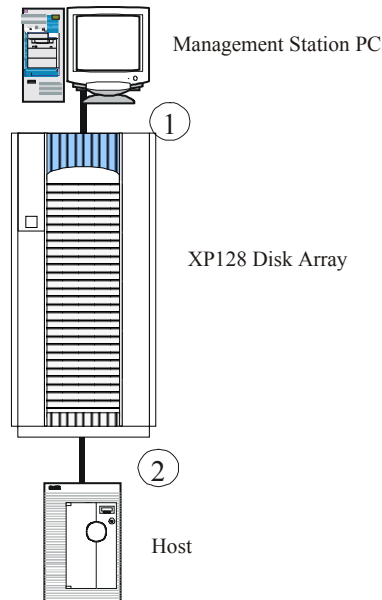
Figure 2. The XP128 connections

1. The management station connects to the XP128 by means of a public LAN connection. The XP128 has an Ethernet connection to connect for this purpose.

2. The host server uses a Fibre Channel, FICON, iSCSI, or ESCON connection.

The hardware requirements for your management station PC, such as the required processor speed, storage capacity, and memory, will vary depending on the optional software that you use and the number of disk array frames you have connected to the system.

To ensure data security, the HP Command View XP software does not have access to any user data stored on the disk array.

There is no single point of failure in the disk array. It is designed with redundant logic assemblies, disk drives and power supplies, all of which can be removed or replaced without interrupting access to your data.

Caution   *Only your HP service representative can remove or replace hardware.*

Control panel

Figure 3 and Table 2 on page 32 show the control panel and its functions, respectively.
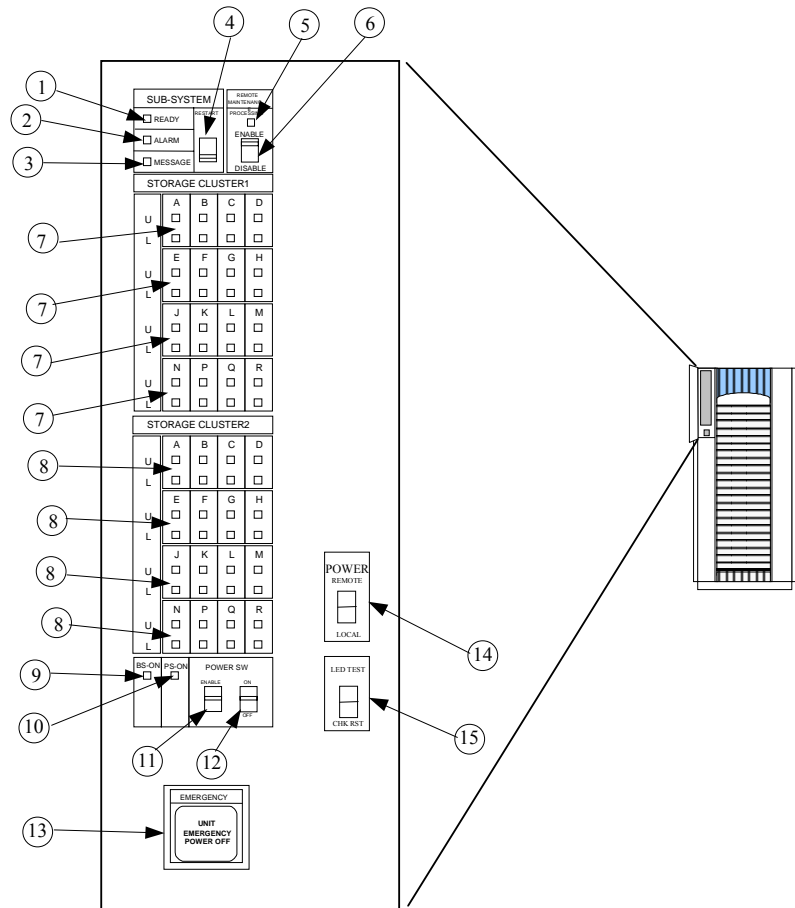
Figure 3. Control Panel

Table 2. Control or indicator function on control panel

Item	Label	Indicator	Description
1	SUBSYSTEM READY	LED (Green)	Indicates that channel interface input/output operations are enabled. If the LED is off, the system is not accepting data.
2	SUBSYSTEM ALARM	LED (Red)	Indicates DC under voltage, DC over current, abnormally high temperature, or an unrecoverable failure. If your disk array is set up to report messages to the remote center, your HP service representative is notified automatically. If the disk array is not set up to report messages to the remote center, you should place a service call to HP to have the message evaluated to determine if any action is required.
3	SUBSYSTEM MESSAGE	LED (Amber)	ON: Indicates that a message has been issued from either cluster. If your disk array is set up to report messages to the remote center, your HP service representative is notified automatically. If your disk array is not set up to report messages to the remote center, you should place a service call to HP to have the message evaluated to determine if any action is required. Blinking: Indicates the internal service processor has failed. The disk array will continue to operate normally. You should place a service call to HP to ensure notification. Service processor failures may not be reported automatically to the remote center.
4	SUBSYSTEM RESTART	Switch	Used to unfence the fenced drive path and to release Write Inhibit. There is a blocked path somewhere between a host and a disk drive. By restarting the subsystem, a soft reset will be performed to try to recover. If system restart does not unblock the path, an HP service representative will be notified.

Table 2. Control or indicator function on control panel (Continued)

Item	Label	Indicator	Description
5	REMOTE MAINTENANCE PROCESSING	LED (Amber)	Indicates remote maintenance activity. An HP service representative is checking your system, but the system is online and accepting data.
6	REMOTE MAINTENANCE ENABLE/DISABLE	Switch	Used to permit remote service maintenance. **Disable:** No one can provide maintenance **Enable:** HP service representative can provide maintenance.
7	STORAGE CLUSTER 1 CHANNEL A-M U: UPPER L: LOWER	LED (Green)	Serial Channel/Fibre Channel: (1) On: Indicates some of the logical paths are established. (2) Fast blinking: Indicates the corresponding channel route is executing the channel command. (Only Serial Channel) (3) Slow blinking: Indicates none of the logical paths are established. (4) Off: Indicates the corresponding channel route is not enabled.

Table 2. Control or indicator function on control panel (Continued)

Item	Label	Indicator	Description
8	STORAGE CLUSTER 2 CHANNEL A-M U: UPPER L: LOWER	LED (Green)	Serial Channel/Fibre Channel: (1) On: Indicates some of the logical paths are established. (2) Fast blinking: Indicates the corresponding channel route is executing the channel command. (Only Serial Channel) (3) Slow blinking: Indicates none of the logical paths are established. (4) Off: Indicates the corresponding channel route is not enabled.
9	BS ON	LED (Yellow)	When the LED is on, unit is plugged in and receiving power from either AC power source. The SVP is receiving power from the outlet. If BS is off, the disk array is not receiving power from either AC power source. Check the electrical outlets in your building.
10	PS ON	LED (Green)	When the LED is on power is on and the array is ready to process data. Off means the disk array power is off. The disk array is not ready to process data.

Table 2. Control or indicator function on control panel (Continued)

Item	Label	Indicator	Description
11	PWR SW ENABLE	Switch	Used to enable the PWR on/off switch. To enable the PWR on/off switch, turn the PWR SW ENABLE switch to the ENABLE position. If the automatic power on restart feature is not being used, this switch should be in the DISABLE (opposite of ENABLE) position during normal operation.
12	PWR ON/PWR OFF	Switch	To switch on/off the subsystem, use this switch while turning the PWR SW ENABLE switch is in the ENABLE position. This switch only performs this function when the REMOTE/LOCAL switch is set to the LOCAL position.This switch should be in the PWR ON position during normal operation. The position of this switch should only be changed when directed by HP service personnel.
13	EMERGENCY POWER OFF	Switch	Used to power off the storage subsystem in an emergency situation.
14	PWR ON/PWR OFF REMOTE/LOCAL	Switch	Determines how the disk array is powered on or off. REMOTE: Disk array power on/off is controlled by the power control interface to the CPU (mainframe only). LOCAL: Disk array power on/off is controlled by the PWR ON/PWR OFF switch,
15	LED TEST/CHK RESET	Switch	LED TEST position: The LEDs on the panel go on. CHK RESET position: The PS ALARM and TH ALARMS are reset.

Emergency power-off

A switch is provided on the control panel for an emergency powering off. See

If you detect an abnormal sound, smell, or smoke, power off the disk subsystem by operating the UNIT EMERGENCY POWER OFF switch following the procedure below. The procedure for operating the switch is as follows:

1. Push the operator panel cover at the location where PUSH is marked, open the operator panel cover, then operate the EMERGENCY POWER OFF switch.

2. In using a UNIT EMERGENCY POWER OFF switch, first pull it up and then pull it toward you as illustrated in the figure below.

Caution   *Pulling the UNIT EMERGENCY POWER OFF switch on the disk array cabinet instantly shuts down the array, neglecting the system's power-off sequence. Jobs in process are aborted and their integrity after recovery is not guaranteed. Therefore, this method should be used only in an emergency and not in normal operation.*

Caution   *The UNIT EMERGENCY POWER OFF switch on the disk array cabinet only partially removes power from the array. AC input power remains present at the primary circuit. Therefore, do not use the Emergency Power-Off switch unless you need to power off of the unit as an emergency measure.*

When pulled, a UNIT EMERGENCY POWER OFF switch locks itself to prevent further powering on and requires a trained and qualified HP field engineer for recovery. Any time the unit Emergency/Only OFF switch is pulled, place a service call to Hewlett-Packard to have the switch reset and have the disk array restored to service.

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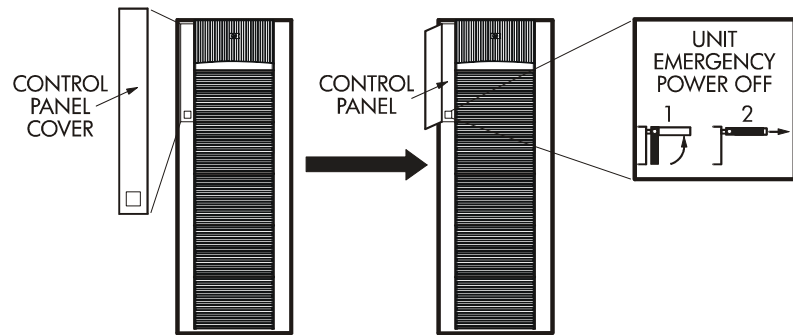
Figure 4. Pulling Unit Emergency Power OFF Switch

Normal operations

The disk array does not require user intervention. The disk array automatically reports any remote system information messages (R-SIMs) to your management station PC running HP Command View XP, to the internal disk array service processor, and also to the HP Service Center. For more information on SIMs, see Chapter 5, "Troubleshooting" on page 89.

Powering down the disk array

Situations may arise in the operation of the disk array that require you to power down the disk array. These situations include:

- Emergency power-off
- Planned power-off

Emergency power-off

An emergency is a critical situation such as a physical plant catastrophe. In an emergency, the critical need is to quickly remove power from the disk array. A quick restart is not necessary.

In an emergency, the operator should trip the Emergency Power-Off (EPO) switch. The disk array emergency power-off (EPO) switch is located on the control panel.

Caution *Use this switch only in case of an emergency. An HP service representative is required to reset the EPO and to power-on the disk array.*

To power off the disk array in an emergency:

1. Open the control panel cover by pushing on the point marked **PUSH**.

2. Pull the emergency power-off switch up and then out towards you as illustrated on the switch. See .

3. Call the HP support center. The EPO switch must be reset by an HP service representative before the disk array can be powered on again.

Planned power-off

There may be times when a site power outage is planned. These situations would include alterations to the data center, inspections, or work by the electric company. If a scheduled power outage affects an HP StorageWorks Disk Array XP128, the power down of the disk array must be scheduled with a trained HP support representative.

Caution   *Only a trained HP representative can shut down and power-off a disk array. Shutting down and powering off a disk array is not a customer activity. A user should not attempt to power down the disk array at any time other than an emergency.*

When planning for your planned power outage, please contact your HP CE to schedule a customer visit.

Recovering from a power outage to the disk array

If AC input power is lost, the disk array maintains its state and recovers when power is restored. The array cache is backed up by batteries that will maintain its state for a minimum of 48 hours. This length of time will provide coverage for most outages. In cases where the outage will extend beyond 48 hours, the batteries can be replaced by a HP to extend the time, if necessary. To extend the backup time beyond 48 hours, you must notify HP support in time to receive service.

Manual restart of the disk array after power is restored

Caution   *Before you restore power to the disk array after an outage, HP recommends you have an electrician check the power to ensure it is stable and clean.*

You may opt to call a trained HP representative or you may restore power to the disk array yourself:

1. Move the ENABLE/DISABLE switch to the ENABLE position. Move the PWR ON/OFF switch to the PWR ON position (Figure 3 on page 31, items 11 & 12)

2. The following LED sequence will occur:

   The BS-ON LED (Figure 3 on page 31, item 9) will turn amber and the PS ON LED (10, Figure 3 on page 31, item 10) will turn green.

   The CHANNEL LED (Figure 3 on page 31, item 7) will light green for every adapter installed.

   The MESSAGE LED (Figure 3 on page 31, item 3) may turn amber if your disk array is not configured for automatic maintenance notification, signifying a SIM was generated (because the disk array went down unexpectedly).

   Finally, the Ready LED (Figure 3 on page 31, item 1) will light green when the system is ready, which may take up to 10 minutes, depending on the number of disks installed in your disk array.

3. Move the ENABLE/DISABLE switch to the DISABLE position.

Automatic power on restart

Caution   *As with all sophisticated electronic equipment, unstable power during a restart can induce problems. Hewlett-Packard recommends automatic power on restart only when the power to the disk array is conditioned to ensure stability (for example, using a UPS). If your site does not have a UPS, HP recommends configuring the disk array for manual restart by keeping the ENABLE/DISABLE switch in the DISABLE position and using the manual restart procedure when power has been restored and verified.*

Your disk array will automatically restart and return to service when power is restored. To enable this feature, place the ENABLE/DISABLE switch in the ENABLE position and the PWR ON/OFF switch in the PWR ON position (Figure 3 on page 31, items 11 & 12). When power is restored, your disk array will restart and the following LED sequence will occur:

The BS-ON LED (Figure 3 on page 31, item 9) will turn amber and the PS ON LED (10, Figure 3 on page 31, item 10) will turn green.

The CHANNEL LED (Figure 3 on page 31, item 7) will light green for every adapter installed.

The MESSAGE LED (Figure 3 on page 31, item 3) may turn amber if your disk array is not configured for automatic maintenance notification, signifying a SIM was generated (because the disk array went down unexpectedly).

Finally, the Ready LED (Figure 3 on page 31, item 1) will light green when the system is ready, which may take up to 10 minutes, depending on the number of disks installed in your disk array.

Specifications

Some of the HP StorageWorks Disk Array XP128 disk array specifications are listed in this section. For a complete set of environmental specifications, refer to the *HP Disk Array XP128 Site Prep Guide* on the following main web site and access the appropriate support product:

http://www.hp.com

Temperature

Table 3. Temperature Specifications

Temperature Specification (Degrees F = 1.8 x Degrees C + 32)	
Nonoperating temperature Range	−10° to +43° C
Operating Temperature	+16° to + 32° C
Recommended Operating Temperature Range	+21° to +24° C
Shipping and storage temperature	−25° to 60° C
Temperature Shock Immunity—Maximum rate of change	10° C per hour
Over-Temperature shutdown	Shutdown at 60° C

Humidity

Table 4. Humidity Specifications

Humidity Specification	
Nonoperating/storage Humidity Range	8% to 90% RH
Operating Humidity Range at 22° C	20% to 80 % RH
Recommended Operating Humidity Range at 22° C	50% to 55 % RH
Procedure for recovery from moisture condensation	None

Mechanical vibration

Table 5. Mechanical vibration

Mechanical vibration	
Maximum Operating Acceleration	0.05G at a frequency range of 10 to 300 Hz

AC line voltage

The following AC power recommendations for the HP StorageWorks Disk Array XP128 are for each power cord. Each array frame has two power cords (with the AC power cord option there are four cords). In case of a failure of the power source for one cord, the power requirements and the current requirement for the remaining power cord will double.

Table 6 (page 44) lists the basic AC power requirements for a 50-amp single-phase XP128 DKU. Table 7 (page 44) lists the basic AC power requirements for a 30-amp single-phase XP128 DKU.

Table 6. 50-Amp, 50 or 60 Hz, Single-Phase DKU Operation

Parameter	Nominal Rated Voltage (Vac)				
	200	208*	220	230	240
Rated line current per power cord (Arms)	16.2	15.1	14.9	14.3	13.8
Number of power cords	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2
Recommended circuit breakers	50A	50A	50A	50A	50A

* 60 Hz only.

Table 7. 30-Amp, 50 or 60 Hz, Single-Phase DKC Operation

Parameter	Nominal Rated Voltage (Vac)				
	200	208*	220	230	240
Rated line current per power cord (Arms)	10.2	9.5	9.4	9.0	8.7
Number of power cords	4	4	4	4	4
Number of circuit breakers	4	4	4	4	4
Recommended circuit breakers	30A	30A	30A	30A	30A

* 60 Hz only.

Table 8 (page 45) lists the basic AC power requirements for three-phase operation of the XP128 DKC.

Table 8. 30-Amp, 50 or 60 Hz, Three-Phase DKU Operation

Parameter	Nominal Rated Voltage (Vac)							
	200	208[*]	220	230	240	380	400	415
Rated line current per power cord (Arms)	11.1	10.7	10.0	9.6	9.1	6.0	5.5	5.3
Number of power cords	2	2	2	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2	2	2	2
Recommended circuit breakers	30 A	30 A	30 A	30 A	30 A	30 A	30 A	30 A

* 60 Hz only.

Web site

For the most current support information on the HP StorageWorks Disk Array XP128, please visit the following main web site and access the appropriate support product:

http://www.hp.com

3

XP1024 Hardware

General safety guidelines

Read the following safety guidelines carefully and follow them when you work with your XP1024 disk array.

- Remember that maintenance of your machine must be done only by trained and qualified HP field engineers. Only an HP service representative can power off the disk array.

- Please read and follow the safety guidelines and procedures in this manual and any of your related manuals.

- In this manual and on the machine, hazard warnings are provided to aid you in preventing or reducing the risk of death, personal injury, or product damage. Understand and follow these hazard warnings fully.

- The hazard warnings that appear on the warning labels on the machine or in the manual have one of the following alert headings consisting of an alert symbol and a signal word, "**Warning**," or "**Caution**":

Warning

This indicates a potentially hazardous situation which, if not avoided, can result in death or serious injury.

Caution   *This indicates a hazardous situation which, if not avoided, will or can result in serious damage of product or loss of data.*

- The signal word "NOTICE" is used to present warnings that are not directly related to personal injury hazards.

- When warning labels become dirty or start peeling off, replace them.

- If any physical accident such as abnormal noise, smell, or smoke occurs on the disk subsystem while running, immediately power off

the disk subsystem by pulling the UNIT EMERGENCY POWER OFF switch on the disk subsystem.

- Do not power off the system unless it is in an emergency power-off state.

- Keep the front and rear doors closed at all times.

- Keep the tops and sides of the cabinets clear to allow air to flow properly.

- Do not perform any procedures not described in this document. If you have any questions or concerns, please contact your HP service representative.

⚠ Warning

Do not touch areas marked HAZARDOUS, even with the power off. These areas contain high-voltage power.

Keep in mind that the hazard warnings in this manual or on the machine cannot cover every possible case, as it is impossible to predict and evaluate all circumstances before hand.

Be alert and use your common sense. If you have any questions, contact your HP service representative.

Physical components

The HP Disk Array XP1024 is a high-performance RAID-capable disk array system. It is used to store large quantities of data in an efficient and secure manner.

Minimum Disk Subsystem

DKU frame   DKU frame   DKC   DKU frame   DKU frame
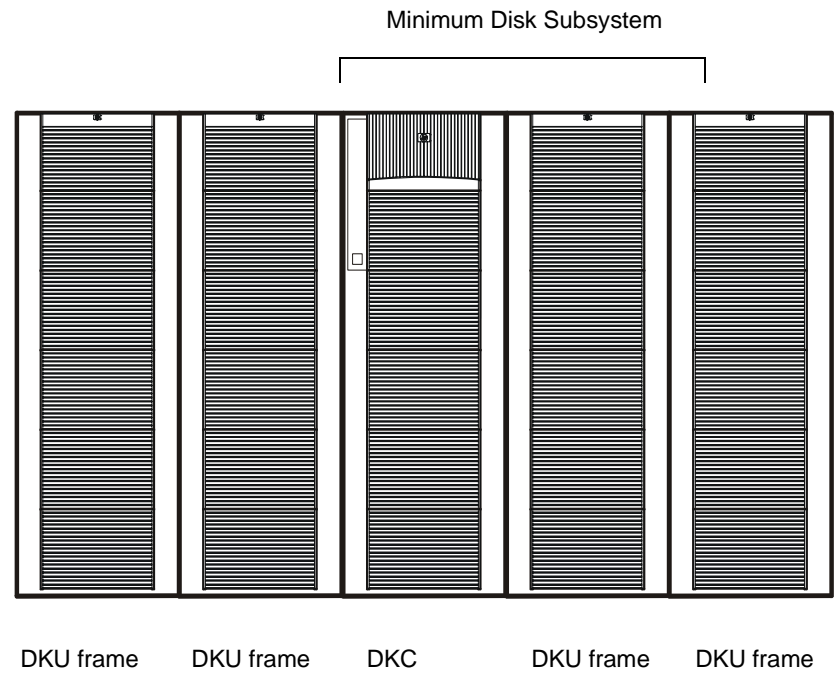
Table 9. HP StorageWorks 1024 Disk Array

Minimum Disk Subsystem

DKU frame	DKU frame	DKU frame	DKC	DKU frame	DKU frame
(L3)	(L2)	(L1)	frame	(R1)	(R2)
5th DKU	4th DKU	3rd DKU		1st DKU	2nd DKU
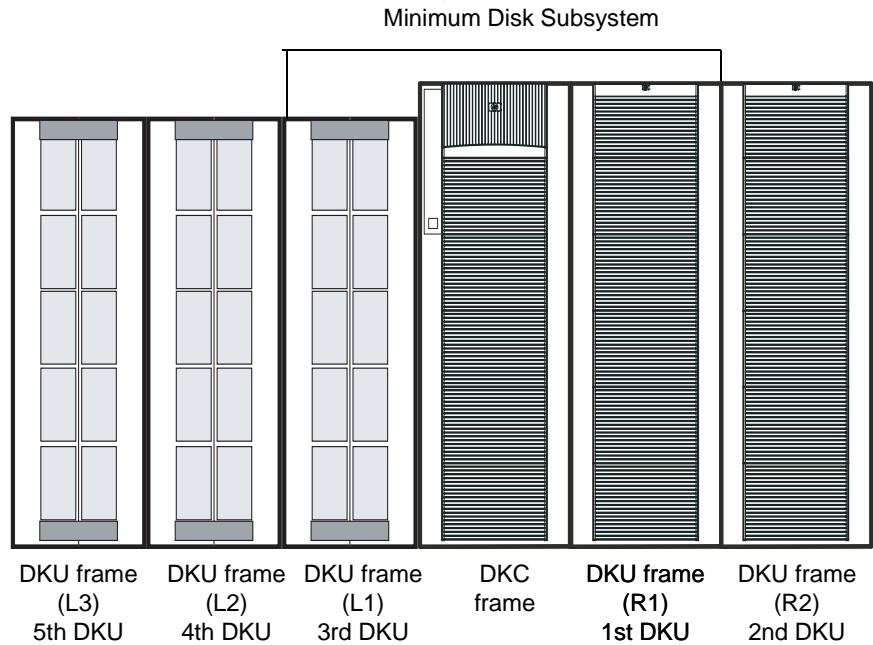
Figure 5. HP Disk Array XP1024 with HP Disk Array XP512 DKUs

The maximum HDD configuration for an XP1024 with XP512 DKUs is 768. This is due to specifications for the 3 XP512 DKUs, which can contain a total of 256 HDDs (96+96+64).

The disk array has the following major hardware components:

- One disk control frame (DKC)

    The single disk control frame cabinet contains the control panel, connection hardware, the service processor, and control boards for the disk arrays.

- One to four XP1024 disk array frames (DKU) or
- One to two XP1024 disk array frames and one to three XP512 DKU frames.

    The DKU cabinets contain your disk drives.

    When using only XP1024 DKUs, you can connect up to 4 DKUs.

    When connecting XP512 DKUs to the XP1024 disk array, the supported configuration is a maximum of 2 XP12024 DKUS on the right, and a maximum of 3 XP512 DKUs on the left.

⚠ Warning

XP1024 and XP512 DKUs may not be configured on the same side of the DKC. Only XP1024 DKUs may be installed on the right of the DKC and only XP512 DKUs may be installed on the left of the DKC in configurations that support both types of DKUs.

- One service processor (SVP)

    The SVP is an internally mounted notebook computer used for maintenance. The SVP is located in the disk control frame cabinet. The SVP is used by your HP service representative only.

- (*Optional*) second service processor

    This is available for users with extreme availability requirements. This is not a required feature.

Disk control frame

The disk control frame controls your disk array. It provides you with a control panel, power supplies, controller boards, and your service processor. See Figure 6.

Control Panel
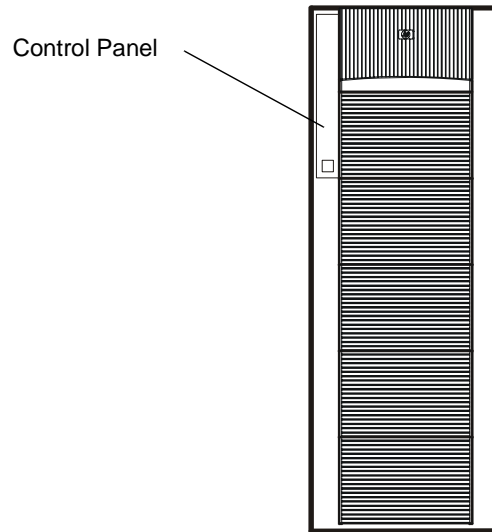
Figure 6. Disk Control Frame

There is no single point of failure in the disk array. It is designed with redundant controllers and redundant power supplies, all of which can be removed or replaced without interrupting access to your data. Only your HP service representative can remove or replace hardware.

Control panel

The control panel is your view to the disk array. Once the disk array is powered on and running normally, there are no user operations required at the control panel, except in case of a power failure recovery. The control panel will be discussed in further detail later in this chapter.

Service processor

The service processor (SVP) is a built-in PC connected inside the disk control frame. The SVP gives your HP service representative a method to access the software system on the disk array.

Your HP service representative uses the SVP to configure, maintain, and upgrade your disk array software and hardware. The service processor also collects performance data on the disk array for diagnostic testing and analysis.

To protect the user's security, the SVP does not have access to any user data stored on the disk array.

An optional service processor is available for users with extreme availability requirements. This is not a required feature.

Disk array frames

The disk array frames are where the physical disk drives, the disk groups, and any dynamic spare disk drives are located. You must have at least one disk array frame to operate the system, and you may have up to a maximum of four disk array frames installed on your system. If you have four disk array frames that are fully populated with disk drives, you will have a maximum of 149 TB. You may also have one to two XP1024 disk array frames grouped with one to three XP512 DKU frames.

| DKU frame (L2) | DKU frame (L1) | DKU frame (R1) | DKU frame (R2) |
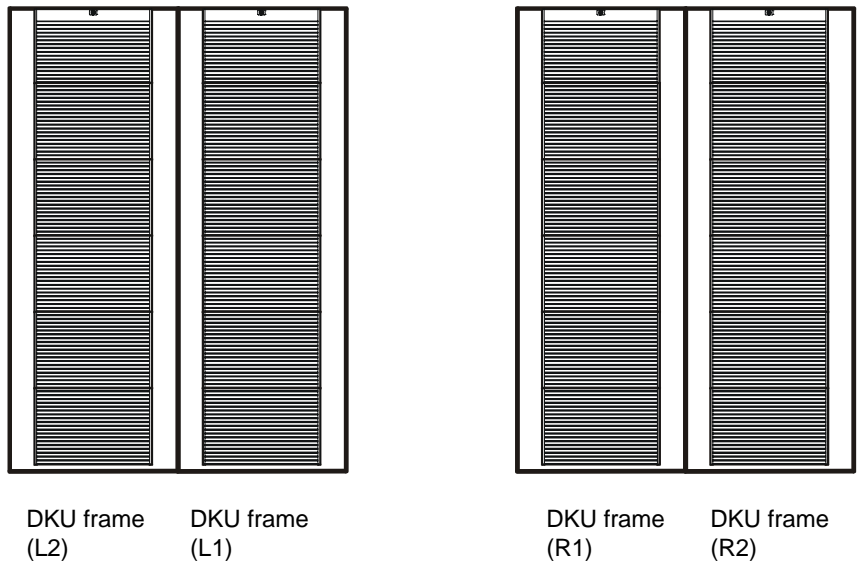
Figure 7. XP1024 Disk Array Frames

DKU frame	DKU frame	DKU frame	DKU frame	DKU frame
(L3)	(L2)	(L1)	(R1)	(R2)
5th DKU	4th DKU	3rd DKU	1st DKU	2nd DKU
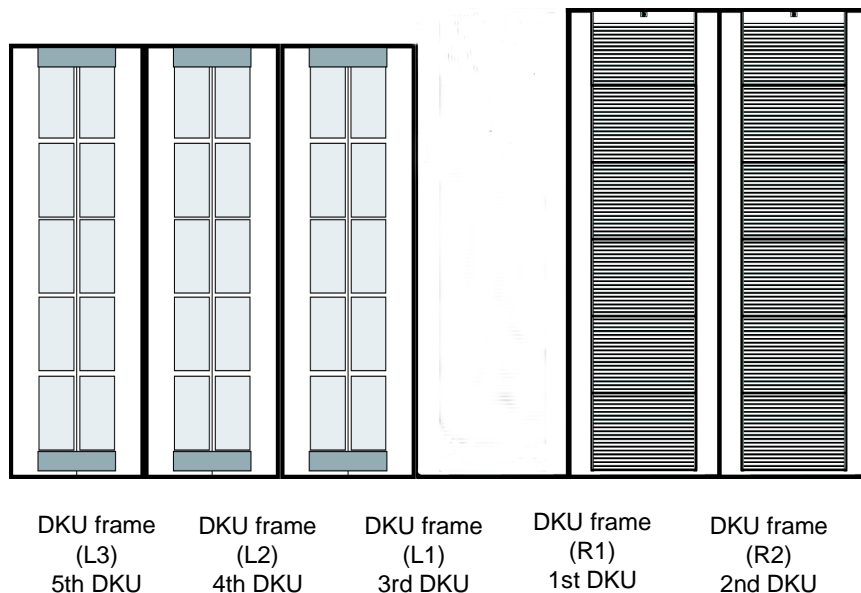
Figure 8. XP1024 and XP512 Disk Array Frames

Available disk drives

The disk array uses 3.5-inch disk drives, and a variety of disk capacities are available. Ask your HP service representative about currently available disk drives. Any of the disk drives in your disk array frames can be replaced without disrupting user activity. The disk array automatically detects and corrects disk errors. All HP Disk Array XP512 disk drives are supported in XP512 DKU frames.

XP512 DKUs can be used in conjunction with the XP1024.

RAID options

Any of your spare disk drives can back up any other disk drive of the same or lesser capacity (and equal rotational speed), in any DKU frame, even if the failed disk and the spare disk are in different array domains, whether you are using RAID1 or RAID5 array groups.

XP512 DKU Supported disk drives must have a spare drive in the XP512 DKU domain(s).

Your disk arrays can be configured with a minimum of one and a maximum of 16 spare disk drives.

Management console PC (optional)

The management console is for user access to the system software. Your management console runs a main remote control application and other standard and optional software to manage and monitor the disk array. The management console can be connected to up to eight disk arrays using a special LAN connection. See Figure 9. See Table 10 on page 58.
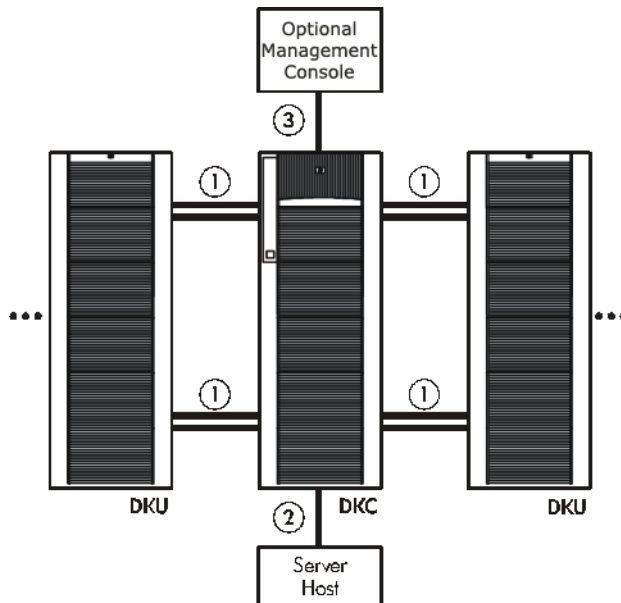
Figure 9. XP1024 Disk Array

Table 10. Connections to the XP1024 Disk Array

Callout in figure 9 (page 57)	Connecting	Type
1	A DKC to a DKU; A DKU to another DKU	Fibre Channel
2	The DKC to the server host	Fibre Channel ESCON FICON iSCSI
3	DKC to the Management Console	LAN

The specific hardware requirements for your management console PC, such as the required processor speed, storage capacity, and memory, vary depending on the optional software that you use and the number of disk array frames you have connected to the system.

To protect your user's security, the HP Command View XP software for the management console PC does not have access to any user data stored on the disk array.

There is no single point of failure in the disk array. It is designed with redundant logic assemblies, disk drives, and the power supplies, all of which can be removed or replaced without interrupting access to your data.

Caution   *Only your HP service representative can remove or replace hardware.*

Control panel

and show the control panel and its functions, respectively.
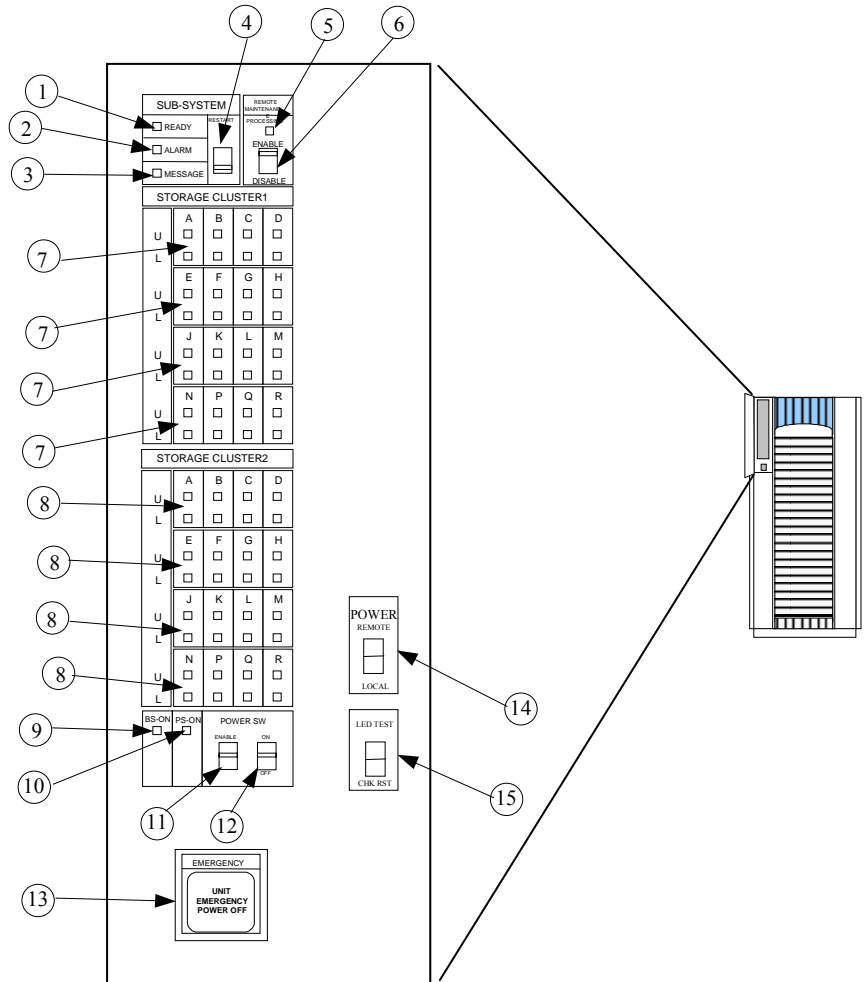
Figure 10. Control panel

Table 11. Control panel functions

Item	Label	Indicator	Description
1	SUBSYSTEM READY	LED (Green)	Indicates that input/output operation on the channel interface is enabled. If the LED is off, the system is not accepting data.
2	SUBSYSTEM ALARM	LED (Red)	Indicates DC under voltage, DC over current, abnormally high temperature, or an unrecoverable failure has occurred. If your disk array is set up to report messages to the remote center, your HP service representative is notified automatically. If your disk array is not setup to report messages to the remote center, you should place a service call to HP to have the message evaluated to determine if any action is required.
3	SUBSYSTEM MESSAGE	LED (Amber)	ON: Indicates a message has been issued from either Cluster. If your disk array is set up to report messages to the remote center, your HP service representative is notified automatically. If your disk array is not set up to report messages to the remote center, you should place a service call to HP to have the message evaluated to determine if any action is required. Blinking: Indicates the internal service processor has experienced a failure. The disk array will continue to operate normally. You should place a service call to HP to ensure notification. Service processor failures may not be reported automatically to the remote center.
4	SUBSYSTEM RESTART	Switch	Used to unfence the fenced drive path and to release Write Inhibit. There is a blocked path somewhere between a host and a disk drive. By restarting the subsystem, a soft reset will be performed to try to recover. If system restart does not unblock the path, an HP service representative will be notified.
5	REMOTE MAINTENANCE PROCESSING	LED (Amber)	Indicates remote maintenance is being processed. An HP service representative may be working on your system, but the system is online and accepting data.

Table 11. Control panel functions

Item	Label	Indicator	Description
6	REMOTE MAINTENANCE ENABLE/DISABLE	Switch	Used to permit remote service maintenance. **Disable:** No one can provide maintenance **Enable:** HP service representative can provide maintenance.
7	STORAGE CLUSTER 1 CHANNEL A-R ENABLE	LED (Green)	Serial Channel/Fibre Channel: (1) On: Indicates some of the logical paths are established. (2) Fast blinking: Indicates the corresponding channel route is executing the channel command. (Only Serial Channel) (3) Slow blinking: Indicates none of the logical paths are established. (4) Off: Indicates the corresponding channel route is not enabled.
8	STORAGE CLUSTER 2 CHANNEL A-R ENABLE	LED (Green)	Serial Channel/Fibre Channel: (1) On: Indicates some of the logical paths are established. (2) Fast blinking: Indicates that the corresponding channel route is executing the channel command. (Only Serial Channel) (3) Slow blinking: Indicates none of the logical paths are established. (4) Off: Indicates that the corresponding channel route is not enabled.

Table 11. Control panel functions

Item	Label	Indicator	Description
9	BS ON	LED (Yellow)	When the LED is on, unit is plugged in and receiving power from the primary AC outlet. The SVP is receiving power from the outlet. If BS is off, then the disk array is not receiving power from the primary AC outlet. Check the electrical outlets in your building.
10	PS ON	LED (Green)	When the LED is on power switch is on, the array is ready to receive data. Off means the power switch is off; the disk array is not powered on and is not ready to receive data.
11	PWR SW ENABLE	Switch	Used to enable the PWR on/off switch. To enable the PWR on/off switch, turn the PWR SW ENABLE switch to the ENABLE position. If the automatic power on restart feature is not being used, this switch should be in the DISABLE (opposite of ENABLE) position during normal operation.
12	PWR ON/PWR OFF	Switch	To switch on/off the subsystem, use this switch while turning the PWR SW ENABLE switch is in the ENABLE position. This switch only performs this function when the REMOTE/LOCAL switch is set to the LOCAL position. This switch should be in the PWR ON position during normal operation. The position of this switch should only be changed when directed by HP service personnel.
13	EMERGENCY POWER OFF	Switch	Used to power off the storage subsystem in an emergency situation.

Table 11. Control panel functions

Item	Label	Indicator	Description
14	PWR ON/PWR OFF REMOTE/LOCAL	Switch	Determines how the disk array is powered on or off. REMOTE: Disk array is powered on/off by the instructions of the host power control interface (mainframe only). LOCAL: Disk array is powered on/off by the PWR ON/PWR OFF switch,
15	LED TEST/CHK RESET	Switch	LED TEST position: The LEDs on the panel go on. CHK RESET position: The PS ALARM and TH ALARMS is reset.

Emergency power-off

A switch is provided on the operator panel on the front side of the disk control frame (DKC) for turning power off in an emergency.

If you encounter any abnormality such as an abnormal sound, smell, or smoke, power off the disk subsystem by operating the UNIT EMERGENCY POWER OFF switch following the procedure below. The procedure for operating the switch is as follows:

1. Push the operator panel cover at the location where PUSH is marked, open the operator panel cover, then operate the EMERGENCY POWER OFF switch.

2. In using a UNIT EMERGENCY POWER OFF switch, first pull it up and then pull it toward you as illustrated in the figure below.

Caution *Pulling a UNIT EMERGENCY POWER OFF switch on the disk controller instantly shuts down, neglecting the system's power-off sequence. Jobs in process are aborted and their integrity after recovery is not guaranteed. Therefore, this method should be used only in an emergency and not in usual maintenance.*

Caution *The UNIT EMERGENCY POWER OFF switch on the disk controller only provides partial power-off capability. AC input power remains present at the primary circuit. Therefore, do not use the switches on these units unless you need to power off of the unit as an emergency measure.*

When pulled, the UNIT EMERGENCY POWER OFF switch mechanically locks itself in the off position to prevent restoring power in a potentially hazardous situation. A qualified HP service representative is required on site to restore power. Any time the unit Emergency/Only OFF switch is pulled, place a service call to Hewlett-Packard to have the switch reset and have the disk array restored to service.
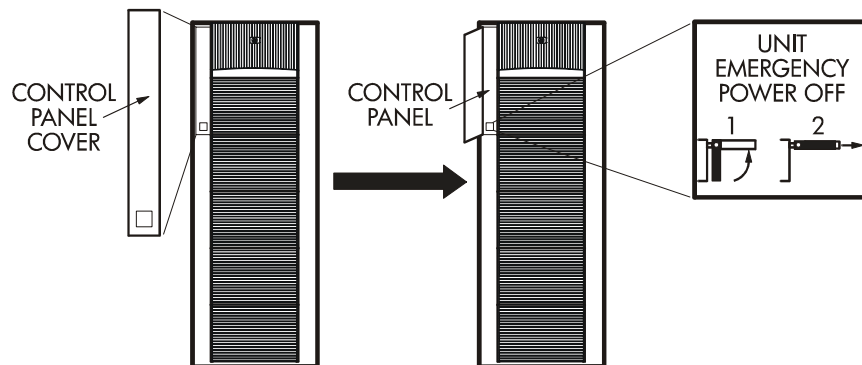
Figure 11. Pulling Unit Emergency Power OFF Switch

Normal operations

The disk array does not require intervention from the user. The disk array reports any remote system information messages (R-SIMs) to your management console PC running HP Command View XP. The internal disk array service processor also sends the report to the HP Service Center automatically. For more information on SIMs, see Chapter 5, "Troubleshooting" on page 89.

Powering down the disk array

Situations may arise in the operation of the disk array that require the user to power down the disk array. These situations include:

- Emergency power-off
- Planned power-off

Emergency power-off

An emergency is a critical situation such as a physical plant catastrophe. In an emergency, the critical need is to quickly remove power from the disk array. A quick restart is not necessary.

In an emergency, you should trip the Emergency Power-Off (EPO) switch, which is located on the control panel.

Caution *Use this switch only in case of an emergency. An HP service representative is required to reset the EPO and to power-on the disk array.*

To power off the disk array in an emergency:

1. Open the control panel cover by pushing on the point marked **PUSH**.

2. Pull the emergency power-off switch (Figure 11 on page 65) up and then out towards you as illustrated on the switch.

3. Call the HP support center. The EPO switch must be reset by an HP service representative before the disk array can be powered on again.

Planned power-off

There may be times when a site power outage is planned, such as to make alterations to the data center, do inspections, or to allow work by the electric company. If a scheduled power outage affects an HP Disk Array XP1024, the power down of the disk array must be scheduled with a trained HP support representative.

Caution   *Only a trained HP representative may shut-down and power-off a disk array. Shutting down and powering off a disk array should not be done by customers except in an emergency.*

When planning for your planned power outage, please contact your HP customer engineer to schedule a customer visit.

Recovering from a power outage to the disk array

If a power outage to the array occurs, the disk array will maintain its state and recover when power is restored. The array cache is backed up by batteries that will maintain its state for a minimum of 48 hours. This length of time will provide coverage for most outages. In cases where the outage will extend beyond 48 hours, the batteries can be replaced by an HP CE which will extend the time, if necessary. You must notify HP support if your power outage is expected to extend beyond the backup time.

Manual restart of the disk array after power is restored

Caution   *Before restoring power to the disk array, HP recommends that an electrician check the input power to ensure it is stable and clean.*

You may call a trained HP representative or you may use the following procedure yourself to recover the disk array from a power failure:

1. Move the ENABLE/DISABLE switch to the ENABLE position. Move the PWR ON/OFF switch to the PWR ON position. (Figure 10 on page 59, item 11/12)

2. The following LED power sequence will occur:

   The BS-ON (Figure 10 on page 59, item 9) will turn amber and the PS ON LED (Figure 10 on page 59, item 10) will turn green.

   The CHANNEL LED (Figure 10 on page 59, item 7) will light green for every adapter installed.

   The MESSAGE LED (Figure 10 on page 59, item 3) may turn amber, if your disk array is not configured for automatic maintenance notification, signifying a SIM was generated (because the disk array went down unexpectedly).

   Finally, the READY LED (Figure 10 on page 59, item 1) will light green signifying the system is ready. Powering on the disk array may take up to 10 minutes, depending on the number of disks installed in the disk array. Power-on is complete only when the READY LED turns green.

3. Move the ENABLE/DISABLE switch to the DISABLE position.

Automatic power on restart

Caution   *As with all sophisticated electronic equipment, unstable power conditions during a restart can induce problems. HP recommends automatic power on restart only when power to the disk array is conditioned to ensure it is stable, such as by using a UPS. If your site does not have a UPS, HP recommends the disk array be configured for manual restart by keeping the ENABLE/DISABLE switch in the DISABLE position and using the manual restart procedure when power has been restored and verified.*

The disk array will automatically restart and return to service when power is restored. To enable this feature, place the ENABLE/DISABLE switch in the ENABLE position and the PWR ON/OFF switch in the PWR ON position. (Figure 10 on page 59, item 11/12). When power is restored, your disk array will restart and the following LED power sequence will occur:

The BS-ON (Figure 10 on page 59, item 9) will turn amber and the PS ON LED (Figure 10 on page 59, item 10) will turn green.

The CHANNEL LED (Figure 10 on page 59, item 7) will light green for every adapter installed.

The MESSAGE LED (Figure 10 on page 59, item 3) may turn amber, if your disk array is not configured for automatic maintenance notification, signifying a SIM was generated (because the disk array went down unexpectedly).

Finally, the READY LED (Figure 10 on page 59, item 1) will light green when the system is ready, which may take up to 10 minutes, depending on the number of disks installed in the disk array.

Specifications

Some of the XP1024 disk array specifications are listed in this section. Refer to the HP Disk Array XP1024 Site Prep Guide on the XP1024 web site at on the following main web site and access the appropriate product for a complete set of XP1024 specifications:

http://www.hp.com

Temperature

Table 12. Temperature Specifications

Temperature Specifications (Degrees F = 1.8 x Degrees C + 32)	
Nonoperating/storage Temperature Range	$-10°$ to $+43°$ C
Operating Temperature	$+16°$ to $+32°$ C
Recommended Operating Temperature Range	$+21°$ to $+24°$ C
Shipping and storage temperature	$-25°$ to $60°$ C
Temperature Shock Immunity—Maximum rate of change	$10°$ C per hour
Over-Temperature shutdown	Shutdown at $60°$ C

Table 13. Humidity Specifications

Humidity Specifications	
Nonoperating/storage Humidity Range	5% to 95 % RH
Non-operating humidity range	8% to 90%
Operating Humidity Range at $22°$ C	20% to 80 % RH
Recommended Operating Humidity Range at $22°$ C	50% to 55 % RH
Procedure for recovery from moisture condensation	None

Table 14. Mechanical Vibration Specification

Mechanical Vibration Specifications	
Maximum Operating Acceleration	0.05 G at a frequency range of 10 to 300 Hz

AC line voltage requirements for the HP Disk Array XP1024 (DKC)

Table 15 (page 73) lists the basic AC power requirements for a 40-amp, single-phase XP1024 DKC.

Table 15. 40-Amp, 50 or 60 Hz, Single-Phase DKC Operation

Parameter	Nominal Rated Voltage (Vac)				
	200	208*	220	230	240
Rated line current per power cord (Arms)	8.0	7.7	7.2	7.0	6.6
Number of power cords	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2
Recommended circuit breakers	40 A	40A	40A	40A	40A

* 60 Hz only.

Table 16 (page 73) lists the basic AC power requirements for a 30-amp, single-phase, XP1024 DKC.

Table 16. 30-Amp, 50 or 60 Hz, Single-Phase DKC Operation

Parameter	Nominal Rated Voltage (Vac)				
	200	208*	220	230	240
Rated line current per power cord (Arms)	4.0	3.9	3.6	3.5	3.3
Number of power cords	4	4	4	4	4
Number of circuit breakers	4	4	4	4	4
Recommended circuit breakers	30 A	30 A	30 A	30 A	30 A

* 60 Hz only.

Table 17 (page 74) lists the basic AC power requirements for a 30-amp, three-phase XP1024 DKC.

Table 17. 30-Amp, 50 or 60 Hz, Three-Phase DKC Operation

Parameter	Nominal Rated Voltage (Vac)							
	200	208[1]	220	230	240	380	400	415
Rated line current per power cord (Arms)	5.2	5.0	4.7	4.6	4.3	2.7	2.6	2.5
Number of power cords	2	2	2	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2	2	2	2
Recommended circuit breakers	30 A	30 A	30 A	30 A	30 A	30 A	30 A	30 A

* 60 Hz only.

AC line voltage requirements for the HP Disk Array XP1024 (DKU)

Table 18 (page 75) lists the basic AC power requirements for a 50-amp, single-phase, XP1024 DKU.

Table 18. 50-Amp, 50 or 60 Hz, Single-Phase DKU Operation

Parameter	Nominal Rated Voltage (Vac)				
	200	208*	220	230	240
Rated line current per power cord (Arms)	22.3	21.6	20.3	19.4	18.6
Number of power cords	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2
Recommended circuit breakers	50 A	50 A	50 A	50 A	50 A

* 60 Hz only.

Table 19 (page 75) lists the basic AC power requirements for a 30-amp, single-phase XP1024 DKU.

Table 19. 30-Amp, 50 or 60 Hz, Single-Phase DKU Operation

Parameter	Nominal Rated Voltage (Vac)				
	200	208*	220	230	240
Rated line current per power cord (Arms)	13.5	13.0	12.3	11.7	11.2
Number of power cords	4	4	4	4	4
Number of circuit breakers	4	4	4	4	4
Recommended circuit breakers	30 A	30 A	30 A	30 A	30 A

* 60 Hz only.

Table 20 (page 76) lists the basic AC power requirements for a 60-amp, three-phase XP1024 R1 DKU.

Table 20. 60-Amp, 50 or 60 Hz, three-phase R1 DKU operation

Parameter	Nominal Rated Voltage (Vac)							
	200	208[1]	220	230	240	380	400	415
Rated line current per power cord (Arms)	19.0	18.2	17.2	16.6	15.7	10.7	10.2	9.8
Number of power cords	2	2	2	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2	2	2	2
Recommended circuit breakers	60 A	60 A	60 A	60 A	60 A	30 A min[2]	30 A min[2]	30 A min[2]

1. 60 Hz only.
2. 30-amp breakers are adequate at 380, 400, and 415 Vac, because the current drawn at these voltages is considerably less than at the lower voltages.

Table 21 (page 76) lists the basic AC power requirements for 60-amp, three-phase, R2, L1, and L2 XP1024 DKUs. Unlike the first DKU (R1), DKUs R2, L1, and L2 do not provide AC power to the DKC.

Table 21. 60-Amp, 50 or 60 Hz, three-phase, R2, L1, and L2 DKU operation

Parameter	Nominal Rated Voltage (Vac)							
	200	208[1]	220	230	240	380	400	415
Rated line current per power cord (Arms)	19.0	18.2	17.2	16.6	15.7	10.7	10.2	9.8
Number of power cords	2	2	2	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2	2	2	2
Recommended circuit breakers	60 A	60 A	60 A	60 A	60 A	30 A min[2]	30 A min[2]	30 A min[2]

1. 60 Hz only.
2. 30-amp breakers are adequate at 380, 400, and 415 Vac, because the current drawn at these voltages is considerably less than at the lower voltages.

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Table 22 (page 77) lists the basic AC power requirements for a 30-amp, three-phase XP1024 DKU.

Table 22. 30-Amp, 50 or 60 Hz, three-phase DKU operation

Parameter	Nominal Rated Voltage (Vac)							
	200	208*	220	230	240	380	400	415
Rated line current per power cord (Arms)	15.0	14.4	13.6	13.0	12.5	8.8	8.4	8.1
Number of power cords	2	2	2	2	2	2	2	2
Number of circuit breakers	2	2	2	2	2	2	2	2
Recommended circuit breakers	30 A	30 A	30 A	30 A	30 A	30 A	30 A	30 A

* 60 Hz only.

If you intend to use HP Disk Array XP512 DKUs with your HP XP1024 Disk Array, see the *HP StorageWorks Disk Array XP512 Site Preparation Guide* for power requirements information for these DKUs.

4

Optional software products

Several optional HP software packages are available to increase your data accessibility and enable continuous access to user data on the disk array. This chapter describes how these optional software applications can help you run your disk array system.

Before installing the optional software packages, refer to the package's manual to verify equipment requirements.

XP array management

HP StorageWorks Command View XP

Command View XP provides a common management platform for the XP family of disk arrays. The Command View management station enables you to manage multiple XP arrays, even globally distributed arrays, from one console. Command View XP provides:

- A web-browser-based GUI or command line interface
- Three levels of security

    User authentication and authorization

    Host IP authentication and authorization

    Secure socket layer support for encrypted connection between the XP array and host

- Visual representation of host and storage resources
- Graphical representation of status, storage allocations, and health of XP array subcomponents
- Common user interface from which all XP management applications launch
- Event level integration into the leading network and system management solutions, such as OpenView Network Node Manager, CA Unicenter TNG, Tivoli and BMC Patrol

Storage management and LUN security

HP StorageWorks LUN Configuration and Security Manager XP

LUN Configuration Manager allows you to create, define, and configure LUNs on your disk array. LUN Configuration Manager comes with three applications that are executed from StorageWorks Command View XP.

LUN Configuration Manager enables:

- LUN creation and port assignment
- consolidation of LUNs (up to 36 LUNs can be combined)
- creation of small size LUNs to accommodate data place in cache

Security Manager establishes security at the LUN level, allowing you to enable secure multiple server connectivity to the disk array. Secure Manager XP enables the disk array to hide LUNs assigned to one server from other servers.

Remote and local data replication

Continuous Access XP, Continuous Access Extension XP, and Business Copy XP are valuable tools for creating copies of data for testing, backup, and disaster recovery.

HP StorageWorks Continuous Access XP

Continuous Access allows you to make ongoing synchronous copies of disk array data to a remote site 27 miles (43 kilometers) away.

HP StorageWorks Continuous Access Extension XP

Continuous Access Extension XP is similar to Continuous Access XP, but operating in asynchronous mode. This can produce increased performance in remote copying. Copy operations are sequenced-stamped to ensure they are executed and sorted correctly at the remote disk array.

You must purchase Continuous Access Extension as an upgrade if you are currently using the Continuous Access XP in synchronous mode, but would prefer to use asynchronous mode.

HP StorageWorks Business Copy XP

Business Copy allows you to make up to nine ongoing copies of data. These copies are maintained on the local disk array. Use Business Copy for non-production activities such as backup, batching, and system testing.

Failover and load balancing

HP StorageWorks Auto Path XP

Using Auto Path XP, you can enable Windows NT server I/O path failover and load balancing control for dual path connections. You can configure up to eight multiple paths per LUN that will provide automatic and transparent failover in the event of path failure. You can also enable dynamic, multi-path load balancing to prevent overloaded I/O operations.

HP StorageWorks Secure Path

HP StorageWorks Secure Path is a family of high availability multi-pathing software products providing continuous data access from the disk array to host servers running Windows Server 2003, Windows 2000, Windows NT, Linux, Sun Solaris, Novell NetWare, IBM AIX, and HP-UX.

Redundant hardware, advanced RAID technology and Secure Path's automated failover capability enhance fault tolerance and availability. Secure Path effectively eliminates controllers, disk drives, interconnect hardware and host bus adapters as single points of failure. Secure Path:

- Ensures increased business efficiency by maintaining high availability of business critical data and by simplifying the task of path management.

- Monitors path status, and in the case of a path failure, automatically re-routes data to an alternate path.

- Allows easy path management from a single application with graphical displays and task automation.

Performance management

HP StorageWorks Cache LUN XP

Cache LUN XP enables you to reserve disk array cache memory for storing high-use data, greatly increasing access speed to that data.

HP StorageWorks Auto LUN XP

Auto LUN XP provides monitoring and disk usage analysis for your disk array based on user thresholds. Auto LUN develops a plan to migrate impacted data volumes to lower usage LUNs, using the data acquired during monitoring. You can perform the migration manually or automatically.

HP StorageWorks Performance Advisor XP

HP StorageWorks Performance Advisor XP is an Internet application used to monitor real-time performance of the HP StorageWorks XP family of disk array products. Using a simple, browser-based interface, you can quickly customize performance data collection and set performance alarms. Performance Advisor provides real-time and historical data on:

- LDEV I/Os
- front-end and back-end port utilization
- internal bus utilization
- cache usage

You can easily integrate with VantagePoint's DSI log and user PerfView to view your performance metrics.

HP StorageWorks Application Policy Manager XP

HP StorageWorks Application Policy Manager XP is a performance allocation and management tool for XP disk arrays. It lets you allocate storage performance resources to hosts by means of policies you define.

It ensures that critical business processes have all the XP disk array performance they need to meet business objectives. You can ensure that processes such as backups and data warehouse loads get the array bandwidth necessary to meet deadlines. Application Policy Manager enables sophisticated service provider solutions based on distinct levels of service.

Application Policy Manager has a rich feature set for flexible policy definition, scheduling, monitoring, and analysis.

Network management products

HP OpenView SPI for XP Disk Arrays

HP OpenView SPI for XP Disk Arrays establishes an agent that monitors XP disk arrays, provides a correlation of events on the disk arrays, and then forwards those events to the OpenView Operations management console.

HP OpenView SPI for HP storage devices

The OpenView SPI solutions enable integration of the XP disk array infrastructure into the OpenView Operations and OpenView Service Navigator, providing you with the ability to integrate storage into your service level agreements. These solutions perform the following functions:

- Intercept and filter over 1,000 events from the XP disk array
- Show associations and dependencies existing between XP components
- Isolate root causes of failures and predict results
- Enable management of globally distributed XP disk arrays from the OpenView management console

Mainframe solutions

HP StorageWorks Resource Manager XP

HP StorageWorks Resource Manager XP allows you to share data stored on the disk array with mainframe systems and open system servers. This can reduce and optimize your storage maintenance and management overhead.

HP StorageWorks Resource Manager XP allows an XP array to connect to a mainframe system via an ESCON link.

HP StorageWorks Data Exchange XP

Data Exchange XP provides high-speed bidirectional data sharing between mainframe systems and open systems. File translations are provided through a file conversion utility.

Together, these products can free your network of host-to-host data conversion traffic.

5

Troubleshooting

This chapter explains the monitoring and reporting capabilities and the flow of troubleshooting used on the HP StorageWorks Disk Array family of disk arrays.

Monitoring and reporting

The disk array generates service information messages (SIMs) to identify normal operations, service requirements, and failures. SIMs can be generated on the disk array by the CHIP (Client Host Interface Processor) and ACP (Array Control Processor) microprocessors and by the internal service processor (SVP). Your HP service representative will use the SIMs to monitor and troubleshoot your disk array.

Troubleshooting flow diagram

When the system encounters trouble, it will report the trouble to the HP Storage Technology Center.

If a failure occurs in the disk array, it is detected and reported to the system log, the SIM log, and the HP Storage Technology Center. Figure 12 is a flow diagram that explains the progress of error detection and reporting.

1. A failure is detected in your disk array.

2. The failure is reported to the system.

3. The system stores the failure information in the system log.

   The generated SIMs are stored on your disk array's SVP for use by HP personnel and logged on the remote console PC as remote SIMs (R-SIMs). The Continuous Track remote maintenance software tool also reports SIMs to the HP Storage Technology Center. When a SIM is generated, the amber message LED on your disk array control panel turns on if the disk array is not configured to automatically phone the HP Storage Technology Center. In this case, call HP to determine the reason for the message.

   SIMs are classified according to severity: service, moderate, serious, or acute. Service-level and moderate-level SIMs do not require immediate attention and are addressed during routine maintenance. These failures are often corrected before the failure actually occurs.

   Serious-level and acute-level SIMs are reported to the HP Storage Technology Center immediately to ensure that the problem is addressed as soon as possible. Your HP service representative will configure your modem during installation.

4. The Continuous Track remote maintenance tool reports the SIMs to the HP Storage Technology Center through a dedicated dial up connection.

   The HP Storage Technology Center then takes action to correct the failure.
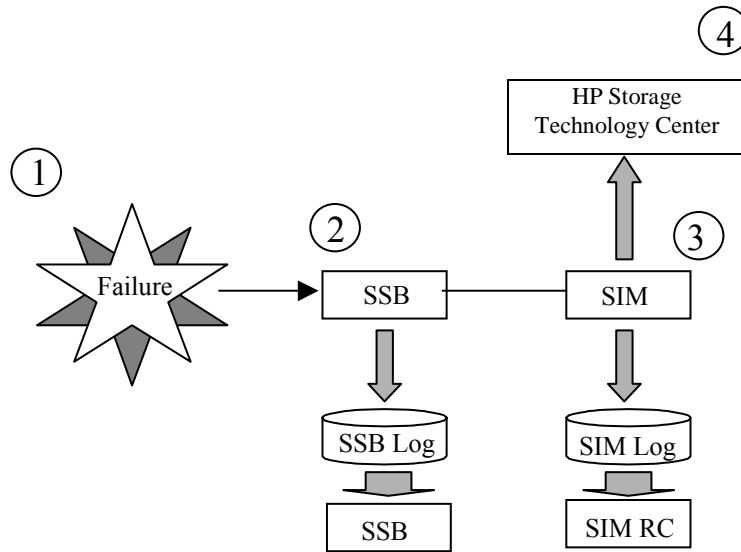
Figure 12. Error Detection and Reporting

6

Regulatory statements

The following regulatory statements apply to the HP Disk Array XP128 and XP1024.

FCC EMC Statement (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense. The end user of this product should be aware that any changes or modifications made to this equipment without the approval of Hewlett-Packard could result in the product not meeting the Class A limits, in which case the FCC could void the user's authority to operate the equipment.

Hewlett-Packard's device certification tests were conducted with HP computer systems and HP shielded cables, such as those you received with your product. Changes or modifications not expressly approved by Hewlett-Packard could void the user's authority to operate the equipment. Cables used with this device must be properly shielded to comply with the requirements of the FCC.

IEC Statement (Worldwide)

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

EMC Statement (Canada)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Spécification ATI Classe A (France)

DECLARATION D'INSTALLATION ET DE MISE EN EXPLOITATION d'un matériel de traitement de l'information (ATI), classé A en fonction des niveaux de perturbations radioélectriques émis, définis dans la norme européenne EN 55022 concernant la Compatibilité Electromagnétique.

VCCI EMC Statement (Japan)

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

BSMI EMC Statement (Taiwan)

警告使用者:
這是甲類的資訊產品,在居住的環境中使用
時,可能會造成射頻干擾,在這種情況下,使
用者會被要求採取某些適當的對策的對策

RRL EMC Statement (Korea)

사용자 안내문 : A 급 기기

이 기기는 업무용으로 전자파적합등록을 받은 기기이오니, 판매자 또는 사용자는 이 점을 주의 하시기 바라며, 만약 잘못 구입 하셨을 때에는 구입한 곳에서 비업무용으로 교환 하시기 바랍니다.

Harmonics Conformance (Japan)

高調波ガイドライン適合品

German Noise Declaration

XP128: Schalldruckpegel Lp = 56 dB(A)
XP1024: Schalldruckpegel Lp = 64 dB(A)
Am Arbeitsplatz (operator position)
Normaler Betrieb (normal operation)
Nach ISO 7779:1988 / EN 27779:1991 (Typprüfung)

Laser Safety

When equipped with native Fibre Channel adapters or iSCSI adapters, this product contains a laser internal to the Optical Link Module (OLM) contained on the 4-port Fibre Channel Adapter board and 4-port FICON board, the 8-port Fibre Channel Adapter board and 8-port FICON board, and the 4-port iSCSI board for connection to a fiber communications network.

In the USA, the OLM is certified as a Class 1 laser product conforming to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR, Subchapter J. The certification is indicated by a label on the plastic OLM housing. Outside the USA, the OLM is certified as a Class 1 laser product conforming to the requirements contained in IEC 825-1:1993 and EN 60825-1:1994, including Amendment 11:1996.

The following figure shows the Class 1 information label that appears on the plastic housing of the OLM.

> CLASS 1 LASER PRODUCT
>
> Complies with
> 21 CFR 1040.10 and 1040.11
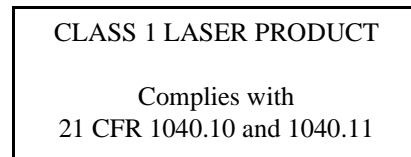
Each communications port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains internally a semiconductor laser diode in the wavelength range of 770 to 850 nanometers. In the event of a break anywhere in the fibre path, the OLM control system prevents laser emissions from exceeding Class 1 levels. Class 1 laser products are not considered hazardous.

Caution *There are no user maintenance operations, service operations, or adjustments to be performed on the Optical Link Module.*

XP128 Declaration of Conformity

Manufacturer's Name: Hewlett-Packard Company

Manufacturer's Address: 8000 Foothills Blvd.
Roseville, CA 95747
USA

declares, that the product

Product Name: hp StorageWorks disk array xp128

Model Number(s):   A7876A, A7876AR

Regulatory Model: N/A

Product Options: All

conforms to the following Product Specifications:

Safety: IEC 60950:1991 + A1, A2, A3, A4 / EN 60950:1992 + A1, A2, A3, A4, A11
GB 4943-1995
IEC 60825-1:1993 + A1 / EN 60825-1:1994 + A11, Class 1 (Laser/LED)

EMC[1]:   CISPR 22:1997 +A1 / EN 55022:1998 Class A
GB 9254-1988
CISPR 24:1997 / EN 55024:1998
IEC 61000-3-2:1995 / EN 61000-3-2:1995 + A1, A2
IEC 61000-3-3:1994 / EN 61000-3-3:1995

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive
73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.

1) The Product was tested in a typical configuration with an HP xp512 disk array and
system peripherals from several manufacturers.

Roseville, January 18, 2002   George E. Barrett, Regulatory Mgr.

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH,
Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)

XP1024 Declaration of Conformity

DECLARATION OF CONFORMITY
according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Company

Manufacturer's Address: 8000 Foothills Blvd.
                        Roseville, CA 95747
                        USA

declares, that the product

Product Name: hp StorageWorks disk array xp1024

Model Number(s):   A7906A, A7906AR, A7925A, A7925AR, A7925U

Regulatory Model: N/A

Product Options: All

conforms to the following Product Specifications:

Safety: IEC 60950:1991+A1+A2+A3+A4 / EN 60950:1992+A1+A2+A3+A4+A11
          GB 4943-1995
          IEC 60825-1:1993+A1 / EN 60825-1:1994+A11, Class 1 (Laser/LED)

EMC[1]:   CISPR 22:1997 / EN 55022:1998 Class A
          GB 9254-1988
          CISPR 24:1997 / EN 55024:1998
          IEC 61000-3-2:1995 / EN 61000-3-2:1995+A1+A2
          IEC 61000-3-3:1994 / EN 61000-3-3:1995

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive
73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.

1) The Product was tested in a typical configuration with an HP xp512 disk array and
    system peripherals from several manufacturers.

Roseville, October 8, 2002   George E. Barrett, Regulatory Mgr.

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH,
Department HQ-TRE, Herrenberger Straße 130, D-71034 Böblingen (FAX: + 49-7031-14-3143)

Glossary

ACP	Array control processor. The ACP handles the passing of data between the cache and the physical drives held in the DKUs. ACPs work in pairs, providing a total of eight SCSI buses. Each SCSI bus associated with one ACP is paired with a SCSI bus on the other ACP pair element. In the event of an ACP failure, the redundant ACP takes control. Both ACPs work together sharing the load.
AL	Arbitrated loop.
AL-PA	Arbitrated loop physical address.
allocation	The ratio of allocated storage capacity versus total capacity as a percentage. "Allocated storage" refers to those LDEVs that have paths assigned to them. The allocated storage capacity is the sum of the storage of these LDEVs. Total capacity refers to the sum of the capacity of all LDEVs on the disk array.
array group	A group of 4 or 8 physical hard disk drives (HDDs) installed in an XP disk array and assigned a common RAID level. RAID1 2d+2d array groups are made up of 4 HDDs. A RAID1 4d+4d group is two 4 HDD array groups concatenated together. RAID5 array groups are made up of 4 or 8 HDDs, depending on whether they are RAID5 3d+1p or RAID5 7d+1p, respectively. RAID6 array groups are made up of 8 HDDs (not supported by XP128 or XP1024 disk arrays).
BC	The HP StorageWorks Business Copy XP software program, which enables you to maintain up to nine internal copies of logical volumes on the disk array.
BS	Basic supply.

BTU	British thermal unit.
<Symbol font>×**C**	Degrees centigrade/Celsius.
C-Track	The HP StorageWorks Continuous Track XP software program, which detects internal hardware component problems on a disk array and automatically reports them to the HP STC.
CA	The HP StorageWorks Continuous Access XP software program, which enables you to create and maintain duplicate copies of the data stored on a local disk array.
ca	Cache.
cache	Very high speed memory that is used to speed I/O transaction time. All reads and writes to the XP array family are sent to the cache. The data is buffered there until the transfer to/from physical disks (with slower data throughput) is complete. The benefit of cache memory is that it speeds I/O throughput to the application. The larger the cache size, the greater amount of data buffering can occur and the greater throughput to the applications. XP arrays support a range of cache memory. In the event of power loss, battery power allows the contents of the cache boards to survive for up to 48 hours.
CDE	Common desktop environment.
CE	Customer engineer.
CFW	Cache fast write.
CH	Channel.
channel adapter (CHA)	The channel adapter (CHA) provides the interface between the disk array and the external host system. Occasionally this term is used synonymously with the term channel host interface processor (CHIP).
channel host interface processor (CHIP)	Synonymous with the term channel adapter (CHA).

channel processor (CHP)	The processors located on the channel adapter (CHA).
CHPID	Channel path identifier.
CKD	Count key data.
CL	Cluster.
command device	A volume on the disk array that accepts CA or BC control operations which are then executed by the disk array.
configuration file	A file that defines the pair configurations.
consistency group ID (CTGID)	The group identifier for which the disk array guarantees the sequence of asynchronous data transfer for the asynchronous CA volume group.
control unit	To organize the storage space attached to the DKC, you can group similarly configured logical devices (LDEVs) with unique control unit images (CUs). CUs are numbered sequentially. The disk array supports a certain number of CUs, depending on the disk array model. Each CU can manage multiple LDEVs. Therefore, to uniquely identify a particular LDEV requires both the CU number and the LDEV number.
CSA	Canadian Standards Association.
CU	Control unit.
CVS	Custom volume size (also called virtual LVI).
daemon	A process that runs in the background and performs a specific operation at predefined times in response to certain events.
DASD	Direct access storage device.
DCR	Dynamic cache residency.
DE	HP StorageWorks Data Exchange XP.
DFDSS	Data Facility Dataset Services.
DFSMS	Data Facility System Managed Storage.
DFW	DASD fast write.

disk adapter (DKA)	Synonymous with the term ACP.
disk control frame (DKC)	The disk control frame (DKC) refers to the array hardware that houses the channel adapters and service processor (SVP).
disk array frame (DKU)	The disk array frame (DKU) refers to the array hardware that houses the physical disks in the array.
disk recovery and restore unit (DRR)	The unit located on the ACP that is responsible for data recovery and restoration in the event of a cache failure.
disk group	The physical disk locations associated with a parity group.
disk type	The manufacturing label burned into the physical disk controller firmware. In most cases, the disk type is identical to the disk model number.
DMP	Dynamic multipathing.
dr	Drive.
DSF	Device support facilities.
DW	Duplex write.
DWL	Duplex write line.
ECKD	Extended count key data.
EFS	The IRIX standard file system.
emulation modes	The logical devices (LDEVs) associated with each RAID group can have one of the following emulation modes. These modes change the behavior of the disks and determine their size.

OPEN-3:	2.46 GB
OPEN-8:	7.38 GB
OPEN-9:	7.42 GB
OPEN-E:	13.56 GB
OPEN-K:	Not available on all XP arrays
OPEN-L:	36 GB
OPEN-M:	Not available on all XP arrays
OPEN-V:	User-defined custom size

EOF	End of field.
EPO	Emergency power-off.
EREP	Error reporting.
ESA	Enterprise Systems Architecture.
ESCON	Enterprise System Connection (the IBM trademark for optical channels).
expanded LUN	A LUN is normally associated with only a single LDEV. The LUSE feature allows a LUN to be associated with 1 to 36 LDEVs. Essentially, LUSE makes it possible for applications to access a single large pool of storage. The LUSE feature is available when the HP StorageWorks LUN Configuration Manager product is installed.
ExSA	Extended serial adapter.
failover	Disconnecting a failed portion and replacing it with another normal portion or alternative portion in order to continue functioning.
<Symbol font>×**F**	Degrees Fahrenheit.
FAL	File access library (part of the Data Exchange software).
FBA	Fixed-block architecture.
FC	Fibre Channel.
FC-AL	Fibre Channel arbitrated loop.
FCC	Federal Communications Commission.
FCP	Fibre Channel Protocol.
FCU	File conversion utility (part of the Data Exchange software).
FDR	Fast dump/restore.
fence level	A level for selecting rejection of a write I/O request from the host according to the condition of mirroring consistency.
F/M	Format/message.
ft.	Foot or feet.

FWD	Fast wide differential.
fx	The IRIX disk utility.
GB	Gigabytes.
GLM	Gigabyte link module.
HA	High availability.
HBA	Host bus adapter.
HCD	Hardware configuration definition.
HORCM_CMD	A section of the RAID Manager instance configuration file that defines the disk devices used by RAID Manager to communicate with the disk array.
HORCM_DEV	A section of the RAID Manager instance configuration file that defines the volumes of the instance.
HORCM_INST	A section of the RAID Manager instance configuration file that defines how RAID Manager groups link to remote RAID Manager instances.
HORCM_MON	A section of the RAID Manager instance configuration file that defines the instance you are configuring.
host mode	Each port can be configured with various options referred to as host modes. These modes are represented as two-digit hexadecimal numbers. The first digit, usually 0, represents different things on different arrays. The second hex digit represents the host system type. For example, the 8 in mode 08 represents an HP-UX host.
hot standby	Using two or more servers as a standby in case of a primary server failure.
HP	Hewlett-Packard Company.
H/W	Hardware.
Hz	Hertz.
ICKDSF	A DSF command used to perform media maintenance.
IDCAMS	Access method services (a component of Data Facility Product).
IML	Initial microprogram load.

in.	Inches.
I/O	Input/output (applies to an operation or device).
IOCP	Input/output configuration program
instance	An independent copy of RAID Manager. Instances are local or remote and can run on the same host.
JCL	Job control language.
KB	Kilobyte.
kcal	Kilocalorie.
kg	Kilogram.
km	Kilometer.
kVA	Kilovolt-ampere.
kW	Kilowatt.
LAN	Local area network.
lb.	Pound.
LCP	Local control port.
LD, LDEV	Logical device. An LDEV is created when a RAID group is carved into pieces according to the selected host emulation mode (that is, OPEN-3, OPEN-8, OPEN-9). The number of resulting LDEVs depends on the selected emulation mode. The term LDEV is often used synonymously with the term volume.
LED	Light emitting diode.
local disk	A local disk in the host.
local instance	The instance currently being configured or the instance to which commands are issued.
LPAR	Logical partition.
LCP	Link control processor or local control port.

LRU	Least recently used.
LU	Logical unit.
LUN	Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV, and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB.
LUSE	Logical unit size expansion.
LVI	Logical volume image.
LVM	Logical Volume Manager.
LVM mirror	A disk duplicating function provided by Logical Volume Manager (LVM) (capable of triplicating disks).
m	Meters.
MB	Megabytes.
MCU	Main control unit.
mirroring consistency	The consistency (usability) of data in a volume (for example, S-VOL).
mm	Millimeters.
MP	Microprocessor.
MPLF	Multipath Locking Facility.
MR	Magnetoresistive.
ms, msec	Milliseconds.
mutual hot standby system	Two servers that are poised to cover for each other if necessary.
MVS	Multiple Virtual Storage (including MVS/370, MVS/ESA, MVS/XA).
NHAS	Novell High Availability Server.

node	Logically speaking, an environment where instances can be executed. Physically, a processor, which is an element of a cluster system.
NVS	Nonvolatile storage.
OFC	Open Fibre Control.
OLM	Optical link module.
ORM	Online read margin.
OS	Operating system.
P/DAS	PPRC/dynamic address switching.
PA	Physical address.
parity group	A parity group is a mode of disk operation and configuration. It is synonymous with the term "array group."
partition	Dividing a specific physical disk according to the HP-UX kernel or device driver layer into two or more areas as if there are two or more physical disks.
path	Paths are created by associating a port, a target, and a LUN ID to one or more LDEVs.
PCI	Power control interface or peripheral component interconnect.
PM	HP StorageWorks Performance Manager XP software.
port	The number of supported ports on an XP disk array is dependent upon the number of supported I/O slots and the number of ports available per I/O adapter. The XP family of disk arrays supports SCSI, Fibre Channel (FC/AL), ESCON, and FICON I/O interfaces. *I/O support can vary with the selected disk array.*
	Ports are named based upon their port group and port letter. Examples of port names include CL1-A through CL1-R and CL2-A through CL2-R (letters I and O are skipped).
P-P	Point-to-point.
PPRC	Peer-to-peer remote copy.

PS	Power supply.
P-VOL	The primary or main volume that contains the data to be copied.
RS	Russellstoll®, a brand of electrical plugs and receptacles manufactured by Thomas & Betts Corporation.
RAID	Redundant array of inexpensive disks.
RAID group	See "array group."
RAID level	A RAID Level is one of the ways that disk drives are grouped together in a RAID to improve performance, data availability/reliability or both. RAID levels are defined from RAID0 to RAID6. HP StorageWorks Disk Arrays in the XP product family support RAID1, RAID5 and RAID6. Not all of these RAID levels are supported by all XP family members. Consult the owner's guide or your HP representative for the details of which RAID levels are supported by your specific XP disk array.
RAM	Random access memory.
remote instance	The instance to which the local instance communicates as configured in the HORCM_INST section of the RAID Manager instance configuration file.
RISC	Reduced instruction set computer.
RM	HP StorageWorks RAID Manager XP.
RM instance configuration file	A file that defines the link between a volume and a RAID Manager instance. This file consists of four sections: HORCM_MON, HORCM_CMD, HORCM_DEV, and HORCM_INST.
R-SIM	Remote service information message.
R/W, r/w	Read/write.
S/390	IBM System/390 architecture.
SAM	System Administration Manager.
script file	A file containing a shell script.
SCSI	Small computer system interface.
sec.	Second.

seq.	Sequential.
SGI	Silicon Graphics Incorporated.
shell script	A command sequence executed by a UNIX shell.
Sidefile	An area of cache used to store the data sequence number, record location, record length, and queued control information before transmit over the ESCON link.
SIM	Service information message.
SMI-S	Storage Management Initiative Specification.
SMIT	System Management Interface Tool.
SMS	System managed storage.
SNMP	Simple Network Management Protocol.
special files	Files that indicate physical devices and that are different from regular files in the UNIX system. The functions of the device drivers (that is, access to system peripherals) become available through these special files.
SSID	Storage subsystem identification.
STC	HP Storage Technology Center.
SVP	Service processor, which is the laptop PC that is built into the DKC. The SVP provides a direct interface into the disk array. *SVP use is reserved for HP support representatives only.*
S-VOL	Secondary or remote volume. The copy volume that receives the data from the primary volume.
takeover	The actions of a standby server that takes over processing from the previously active server.
TB	Terabyte.
TCP/IP	Transmission control protocol/Internet protocol
TID	Target ID.
TPF	Transaction processing facility.

TSO	Time-sharing option (an IBM System/370 operating system option).
UCB	Unit control block.
UL	Underwriters' Laboratories.
VDE	Verband Deutscher Elektrotechniker.
VM	Virtual machine (an IBM S/390 system control program).
VOLID	Volume ID.
volser	Volume serial number.
Volume	Synonymous with LDEV.
XRC	Extended Remote Copy.
VSE	Virtual Storage Extension (an IBM S/390 operating system).
VTOC	Volume table of contents.
XA	System/370 Extended Architecture.
XDF	Extended distance feature (for ExSA channels).
XF	IRIX extended file system.
XLV	Extended logical volume manager.

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