

Subchapter 4.6—Mass Storage

Mass Storage Subsystems Overview

Description

A mass storage subsystem is a data storage system consisting of single or multiple storage mechanisms of same or different types. Each individual mechanism is under the direct control of the host system.

Hewlett-Packard offers two families of storage products/enclosures, the HP SMART Storage Product family and Modules and the HP High Availability Storage System Family (**Figure 4.6.1** and **Figure 4.6.2**).

Figure 4.6.1 HP High Availability Storage System Deskside Enclosure

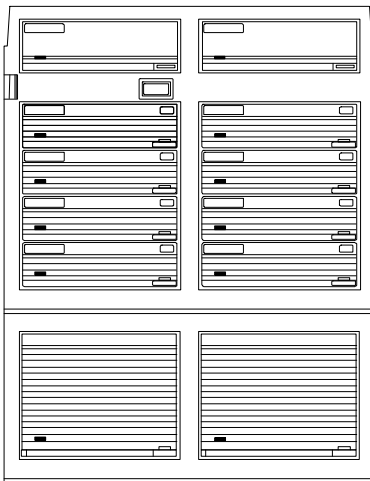
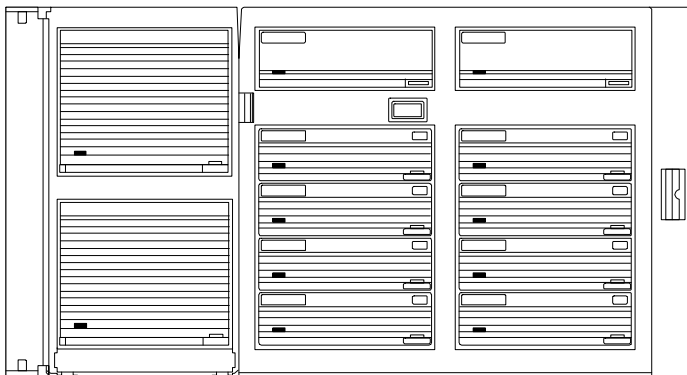


Figure 4.6.2 HP High Availability Storage System Field- and Factory-Rack Enclosure



HP's SMART Storage Modules and Enclosure

Features

The HP SMART Storage Modules and Enclosure are comprised of a series of DVD-ROM, DDS-2, DDS-3 and DDS-4 tape drives, DDS-3, DDS-4 (available 6/1/00) Autoloaders, DLT-4000, DLT-8000, and 9-, 18-GB disks. The space-efficient, 3 EIA unit high enclosure (described in **Table 4.6.1**) supports all of the above mechanisms and can house up to four half-height modules. All the technologies listed above are available as desktop versions.

Table 4.6.1 HP SMART Family of Storage

Functionality	Height Profile
Disk Drive	
SMART Storage 9 GB disk	Half Height
SMART Storage 18 GB disk	Half Height
Tape Drive	
SMART Storage DDS-2 tape drive 4 GB	Half Height
SMART Storage DDS-3 tape drive 12 GB	Half Height
SMART Storage DDS-4 tape drive 20 GB	Half Height
SMART Storage DLT 8000 40 GB	Full Height
SMART Storage DLT-4000 20 GB	Full Height
SMART Storage DDS-3 Autoloader 6×12 GB	Full Height
SMART Storage DDS-4 Autoloader 6×20 GB (available June 1, 2000)	Full Height
DVD-ROM	
SMART Storage DVD-ROM	Half Height
EIA Space Requirements	
Full Height Rack Enclosure (holds two full height modules or up to four half height modules per enclosure)	3 EIA units (tall)
High Availability Functionality	
Easy Plug	Yes
Redundant Fans	No
Redundant Power Supplies	No (1 custom)
Number of Power Cords**	4
Number of SCSI Buses**	4

* SMART Storage Desktop 2 GB SE available.

** Number of power cords and SCSI buses depends on the number of storage modules installed.

Configuration

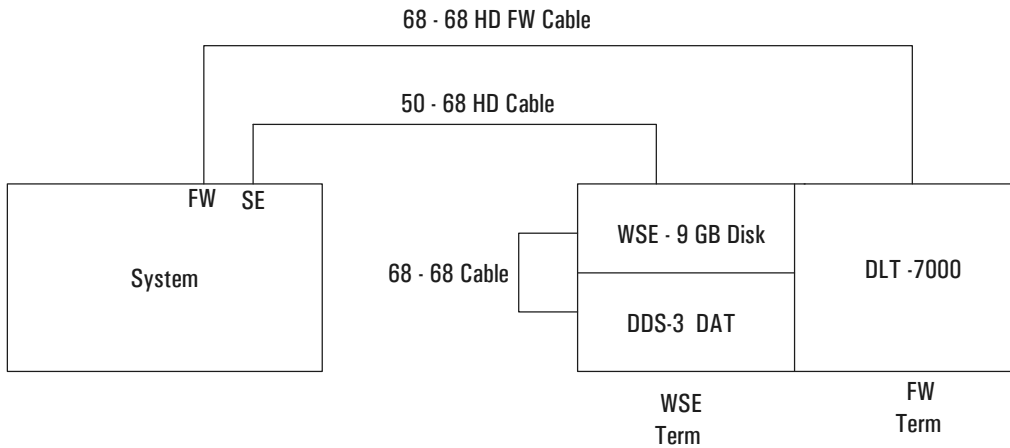
HP's SMART family of storage enclosures and modules are designed to maximize configuration flexibility and minimize the rack space required. The full-height storage rack enclosure is designed to hold up to four half-height SMART storage modules.

For configurations requiring a large number of disk devices in a single rack, the High Availability Storage Systems (A3311A, A3312A, and A3312AZ) are recommended.

Product Composition

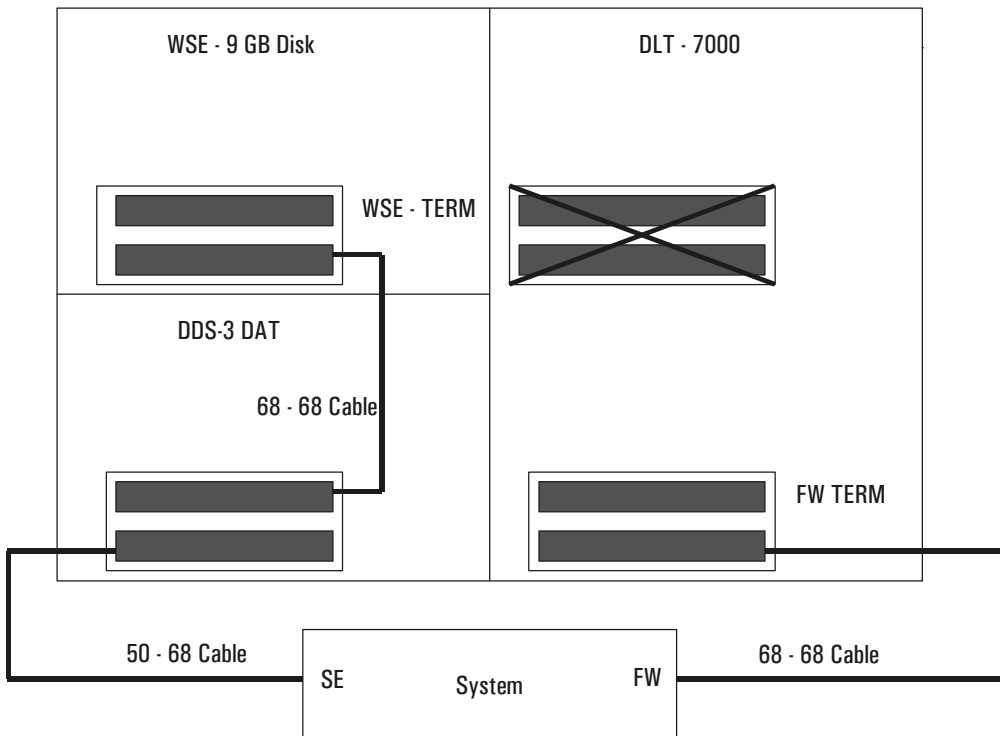
The full-height SMART storage rack enclosure is capable of securely holding up to four half-height modules with blind-mate connectors. A filler panel is provided in the event that only one module is used.

Figure 4.6.3 Sample Configuration of the Full/Half Height Enclosure



In the above example, you can see how the 3U enclosure may be configured. There is a combination of half-height and full-height devices. In addition, it is shown that there is a mixture of I/O connections. There is a fast wide, wide single ended and single ended devices. Note: If you connect WSE and SE on the same chain and chain will operate at a SE speed.

Figure 4.6.4 Cable and Termination Connections for Figure 4.6.3



Cable and I/O Information

Desktop Devices

The desktop modules contain two 50-pin or 68-pin connections. The first connection is used for the cable to connect to the system. The second connection is used for either daisy chaining the modules together or for termination.

		Pin Connections		
		System	Device	Terminator
NSE	Narrow Single Ended	50	50	50
WSE	Wide Single Ended (also referred to as Ultra SCSI)	68	68	68
WSE	SE Mode	50	68	68
FWD	Fast Wide Differential	68	68	68
FND	Fast Narrow Differential	68	50	50
LVD	Low Voltage Differential	68	68	68

Cables

Single Module	Cables	Terminator
NSE	C2908A or C2955A or C2957A	C2904A
NSE for N-Class (Prelude): VHDCI on host	C2367A or C2368A	C2904A
WSE	C2978A or C2979A	C2972A
WSE (SE mode)	C2906A or C2961A	C2972A
FWD	C2911C or C2924C	C2905A
FND	C2906A or C2961A	Included with module
LVD for N-Class (Prelude: after April 1, 1999)	C2361B or C2362B or C2363B or C2365B	C2364A
LVD for V-Class (includes in line terminator)	To be confirmed	C2364A
Daisy Chaining	Cables	Terminator
NSE	C2908A or C2955A	C2904A
WSE	C2978B or C2979B	C2972A
WSE (SE mode)	C2911C	C2972A
FWD	C2911C	C2905A
FND	C2908A or C2955A	Included with module
LVD for N-Class (Prelude: after April 1, 1999)	C2361B	
LVD for V-Class (includes in line terminator)	To be confirmed	C2364A

Rack-Ready Devices

The rack-ready modules have a single connection. The module then slides into the rack enclosure. Each bay of the rack enclosure has two 68-pin connections. The first connection is used for the cable to connect to the system. The second connection is used for either daisy chaining the modules or for termination. These are considered blindmate connectors. This means that whatever bus speed the module is operating at, it will be passed through to either the system or the next device in the daisy chain.

		Pin Connections		
		System	Device	Terminator
NSE	Narrow Single Ended	50	68	68
WSE	Wide Single Ended (also referred to as Ultra SCSI)	68	68	68
WSE	SE Mode	50	68	68
FWD	Fast Wide Differential	68	68	68
FND	Fast Narrow Differential	68	68	68
LVD	Low Voltage Differential	68	68	68

Cables

Single Module	Cables	Terminator
NSE	C2906A or C2961A	C2972A
WSE	C2978B or C2979B	C2972A
WSE (SE mode)	C2906A or C2961A	C2972A
FWD	C2911C or C2979B or C2924C	C2905A
FND	C2911C or C2961A	Included with module
LVD for N-Class (Prelude: after April 1, 1999)	C2361B or C2362B or C2363B or C2365B	
LVD for V-Class (includes in line terminator)	To be confirmed	C2364A
Daisy Chaining	Cables	Terminator
NSE	C2911C or C2978B	C2972A
WSE	C2978BA or C2979B	C2972A
WSE (SE mode)	C2911CA or C2981A	C2972A
FWD	C2911C or C2978B	C2905A
FND	C2911C or C2978B	Included with module
LVD for N-Class (Prelude: after April 1, 1999)	C2361B	
LVD for V-Class (includes in line terminator)	To be confirmed	C2364A

Full Height Enclosure

The full-height SMART storage enclosure is three EIA units (3U) tall and can mount any combination of full-height or half-height modules. You can either rack 4 half-height, 2 full-height, or 2 half-height and 1 full-height module(s). Blank filler panel(s) are provided in the event that the enclosure is not completely filled. Note: The SMART storage disk modules are available for field integration only. This enclosure is offered as a factory- or field-integrated solution.

HP's SMART storage enclosures and modules are designed for easy installation, removal and reconfiguration with blind-mate, pluggable SCSI and power connections.

Table 4.6.2 HP SMART Storage Enclosure and Modules—Factory-Racked

C4318SZ	HP's SMART Storage Factory Racked Enclosure
102	SMART Storage DDS-2 tape drive
103	SMART Storage DDS-3 tape drive
110	SMART Storage DDS-4 tape drive
104	SMART Storage DDS-3 tape autoloader
111	SMART Storage DDS-4 tape autoloader (available June 1, 2000)
106	SMART Storage DLT-4000 drive ND HP-UX
107	SMART Storage DLT-4000 NSE MPE/iX
108	SMART Storage DVD-ROM
109	SMART Storage DLT-8000 drive
001	.5-meter 68-pin HD to 68-pin HD cable
801	.9-meter 68-pin HD to 68-pin HD cable
802	2.5-meter 68-pin HD to 68-pin HD cable
803	5-meter 68-pin HD to 68-pin HD cable
811	1-meter VHDCI 68-pin to 68-pin cable
812	2.5-meter VHDCI 68-pin to 68-pin cable
813	5-meter VHDCI 68-pin to 68-pin cable
814	10-meter VHDCI 68-pin to 68-pin cable
821	1-meter 50-pin LD to 68-pin HD cable
822	2-meter 50-pin LD to 68-pin HD cable
825	1-meter 50-pin HD to 68-pin HD cable
827	2-meter 50-pin HD to 68-pin HD cable
835	WSE 68-pin SCSI terminator
836	WD 68-pin SCSI terminator
837	LVD/SE 68-pin SCSI terminator
841	5-meter VHDC 68-pin to 68-pin MM ILT
850	Y power cable (IEC 320) to power two devices from single PDU outlet
851	10-meter 68-pin HD to 68-pin HD V-Class cable

	871	2/5-meter V in-line terminator V-Class cable 68-pin HD
	873	2/3-meter V in-line terminator V-Class cable 68-pin HD
	875	5-meter 68-pin HD to 68-pin HD V-Class cable
B6191AA		Supporting Software (CD-ROMs) This software is required for mass storage subsystem compatibility with

Table 4.6.3 HP SMART Storage Enclosure and Modules—Field-Racked (Rack Ready)

C4318B		SMART Storage Full/Half height Enclosure, field-racked (3 EIA units)
C6403A		SMART Storage 9 GB LVD disk drive, field-racked
	C2978B	.5 meter 68 pin to 68 pin HD cable
	C2979B	1.5 meter 68 pin HD to 68 pin HD
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2972A	WSE 68-pin SCSI terminator
C6405A		SMART Storage 9 GB FWD disk drive, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2924C	2.5-meter 68-pin HD to 68-pin HD cable
	C2905A	FWD 68-pin SCSI terminator
C6399A		SMART Storage 18 GB LVD disk drive, field-racked
	C2978B	.5 meter 68 pin to 68 pin HD cable
	C2979B	1.5 meter 68 pin HD to 68 pin HD
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2972A	WSE 68-pin SCSI terminator
C6401A		SMART Storage 18 GB FWD disk drive, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2924C	2.5-meter 68-pin HD to 68-pin HD cable
	C2905A	FWD 68-pin SCSI terminator
C4315A		SMART Storage NSE DVD-ROM, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2972A	WSE 68-pin SCSI terminator
HP SMART Storage Tape Products: Field-Racked (Requires Rack Kit C4318B or C4317A)		
C6363A		SMART Storage NSE DDS-2 tape drive, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2972A	WSE 68-pin SCSI terminator
C6365A		SMART Storage NSE DDS-3 tape drive, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2972A	WSE 68-pin SCSI terminator
C6367A		SMART Storage NSE DDS-3 tape autoloader, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2972A	WSE 68-pin SCSI terminator
C6369A		SMART Storage LVD DDS-4 tape drive, field-racked (available 4/1/2000)
	C2978B	0.5-meter 68-pin HD to 68-pin HD cable
	C2979B	1.5-meter 68-pin HD to 68-pin HD cable

	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2924C	2.5-meter 68-pin HD to 68-pin HD cable
	C2364A	LVD 68-pin SCSI terminator
C6371A		SMART Storage LVD DDS-4 tape autoloader, field-racked (available 5/1/00)
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2979B	1.5-meter 68-pin HD to 68-pin HD cable
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2924C	2.5-meter 68-pin HD to 68-pin HD cable
	C2364A	LVD 68-pin SCSI terminator
C6379A		SMART Storage FWD DLT-8000 drive, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2924C	2.5-meter 68-pin HD to 68-pin HD cable
	C2905A	FWD 68-pin SCSI terminator
C6381A		SMART Storage NSE DLT-4000 drive for MPE/iX, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2961A	1-meter 50-pin HD to 68-pin HD cable
	C2906A	2-meter 50-pin HD to 68-pin HD cable
	C2972A	WSE 68-pin SCSI terminator
C6383A		SMART Storage FND DLT-4000 for HP-UX, field-racked
	C2978B	.5-meter 68-pin HD to 68-pin HD cable
	C2911C	.9-meter 68-pin HD to 68-pin HD cable
	C2924C	2.5-meter 68-pin HD to 68-pin HD cable
	C2905A	FWD 68-pin SCSI terminator

Table 4.6.4 HP SMART Storage Desktop Modules

C6402B		SMART Storage 9-GB 10 K LVD disk drive, Desktop
	C2978B	.5 meter 68 pin HD to 68 pin HD cable
	C2979B	1.5 meter 68 pin HD to 68 pin HD cable
	C2961A	1 meter 68 pin HD to 50 pin HD cable
	C2906A	2 meter 68 pin HD to 50 pin HD cable
	C2972A	WSE SCSI Terminator
C6404A		SMART Storage 9-GB FWD disk drive, Desktop
	C2978B	.5 meter 68-pin HD SCSI cable
	C2911C	.9-meter 68-pin HD SCSI cable
	C2924C	2.5-meter 68-pin HD SCSI cable
	C2905A	FWD Terminator
C6398B		SMART Storage 18-GB 10 K LVD disk drive, Desktop
	C2978B	.5 meter 68 pin HD to 68 pin HD cable
	C2979B	1.5 meter 68 pin HD to 68 pin HD cable
	C2961A	1 meter 68 pin HD to 50 pin HD cable
	C2906A	2 meter 68 pin HD to 50 pin HD cable
	C2972A	WSE SCSI Terminator
C6400A		SMART Storage 18-GB FWD disk drive, Desktop
	C2978B	.5 meter 68-pin HD SCSI cable
	C2911C	.9-meter 68-pin HD SCSI cable
	C2924C	2.5-meter 68-pin HD SCSI cable
	C2905A	FWD Terminator
C4314A		SMART Storage NSE DVD-ROM drive, Desktop
	C2955A	.5-meter 50-pin HD SCSI cable
	C2908A	1-meter 50-pin HD SCSI cable
	C2957A	2-meter 50-pin HD SCSI cable

	C2904A	NSE Terminator
	C2367A	1.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
	C2368A	2.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
HP SMART Storage Tape Product: Desktop		
C6362A		SMART Storage NSE DDS-2 tape drive, Desktop
	C2955A	.5-meter 50-pin HD SCSI cable
	C2908A	1-meter 50-pin HD SCSI cable
	C2957A	2-meter 50-pin HD SCSI cable
	C2904A	NSE Terminator
	C2367A	1.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
	C2368A	2.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
C6364A		SMART Storage NSE DDS-3 tape drive, Desktop
	C2955A	.5-meter 50-pin HD SCSI cable
	C2908A	1-meter 50-pin HD SCSI cable
	C2957A	2-meter 50-pin HD SCSI cable
	C2904A	NSE Terminator
	C2367A	1.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
	C2368A	2.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
C6366A		SMART Storage NSE DDS-3 tape autoloader, Desktop
	C2955A	.5-meter 50-pin HD SCSI cable
	C2908A	1-meter 50-pin HD SCSI cable
	C2957A	2-meter 50-pin HD SCSI cable
	C2904A	NSE Terminator
	C2367A	1.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
	C2368A	2.5-meter 68 pin VHDCI to 50 pin HD SCSI cable
C6368A		SMART Storage LVD DDS-4 tape drive, Desktop
	C2978B	0.5-meter 50-pin HD SCSI cable
	C2979B	1.5-meter 50-pin HD SCSI cable
	C2961A	1-meter 50-pin HD SCSI cable
	C2364A	LVD/SE 68-pin SCSI terminator
	C2906A	2.0-meter 68-pin HD to 50-pin HD SCSI cable
C6370A		SMART Storage LVD DDS-4 tape autoloader, Desktop (available 6/1/2000)
	C2978B	0.5-meter 50-pin HD SCSI cable
	C2979B	1.5-meter 50-pin HD SCSI cable
	C2961A	1-meter 50-pin HD SCSI cable
	C2364A	LVD/SE 68-pin SCSI terminator
	C2906A	2.0-meter 68-pin VHDCI to 50-pin HD SCSI cable
C6378A		SMART Storage DLT-8000 (FWD), Desktop
	C2911C	.9-meter 68-pin HD SCSI cable
	C2924C	2.5-meter 68-pin HD SCSI cable
	C2905A	FWD Terminator
C6380A		SMART Storage NSE DLT-4000 for MPE/iX, Desktop
	C2955A	.5-meter 50-pin HD SCSI cable
	C2908A	1-meter 50-pin HD SCSI cable
	C2957A	2-meter 50-pin HD SCSI cable
	C2904A	NSE Terminator
C6382A		SMART Storage FND DLT-4000 (Terminator Included), Desktop
	C2961A	1-meter 50-pin HD to 68-pin HD cable (male/male)
	C2906A	2-meter 50-pin HD to 68-pin HD cable (male/male)

HP High Availability Storage System

Description

The HP High Availability Storage System (HASS) is available in two types, desktide and rackmounts. **Table 4.6.5**, **Table 4.6.6** and **Table 4.6.7** list the available product configurations. **Table 4.6.8** lists the available upgrade options. Fibre Channel HASS solutions are available using the Fibre Channel MUX. See the Fibre Channel support section under “Features - Fibre Channel Support for High Availability Storage Systems (HASS with FC MUX)” below.

Table 4.6.5 High Availability Storage System -Desktide Storage Enclosure

Product Number	Options	Description
A3311A	001	Single SCSI Bus Configuration
	002	Redundant Hot-Pluggable Power Supply
	153	1×9.1GB WD high-performance disk module
	254	2×9.1GB FWD low profile high performance disk module
	163	1×18.2GB FWD half height high performance disk module
	801	0.9-meter 68-pin high-density/68-pin high-density cable
	802	2.5-meter 68-pin high-density/68-pin high-density cable
	803	5-meter 68-pin high-density/68-pin high-density cable
	804	10-meter 68-pin high-density/68-pin high-density
	821	1-meter 50-pin low-density/68-pin high-density cable
	822	2-meter 50-pin low-density/68-pin high-density cable
	823	1-meter 50-pin low-density female/68-pin high-density cable
	825	1-meter 50-pin high-density/68-pin high-density cable
	826	1.5-meter 50-pin high-density/68-pin high-density cable
	827	2-meter 50-pin high-density/68-pin high-density cable
	806	CA 1-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	807	CA 2.5-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	808	CA 5-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	809	CA 10-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	811	1-meter VHDCI to 68-pin high-density low-profile
	812	2.5-meter VHDCI to 68-pin high-density low-profile
	813	5-meter VHDCI to 68-pin high-density low-profile
	814	10-meter VHDCI to 68-pin high-density low-profile
	840	2.0-meter V-cable 68-pin high-density male
	841	2.0-meter V-cable VHDCI / VHDCI / 68-pin high-density male
	842	2.0-meter V-cable VHDCI / VHDCI I / L Terminator / 68-pin high-density male
	843	2.0-meter V-cable 68-pin HD / VHDCI / 68-pin high-density male
	844	2.0-meter V-cable 68-pin HD / VHDCI I / L Terminator / 68-pin high-density male
	B25	4.0-meter V-cable VHDCI / VHDCI / 68-pin high-density male
	B26	4.0-meter V-cable VHDCI / VHDCI I / L Terminator / 68-pin high-density male
	B27	4.0-meter V-cable 68-pin HD / VHDCI / 68-pin high-density male
	B28	4.0-meter V-cable 68-pin HD / VHDCI I / L Terminator / 68-pin high-density male
	851	10.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	871	2/5-meter V in-line terminator cable 68-pin HD male for V-Class
	875	5.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	851	10.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	873	2/3-meter V in-line terminator cable 68-pin HD male for V-Class
	871	2/5-meter V in-line terminator cable 68-pin HD male for V-Class
B6191AA		Supporting Software (CD-ROMs) This software is required for mass storage subsystem compatibility with HP-UX. The customer is not required to order more than one per installation site. If the storage is ordered as part of an integrated system order, B6191AA Need not be ordered because the necessary supporting software will automatically be included with the HP-UX order.

Table 4.6.6 High Availability Storage system - Field Rackable Storage Enclosure

Product Number	Options	Description
A3312A	001	Single SCSI Bus Configuration
	002	Redundant Hot-Pluggable Power Supply
	253	1×9.1GB FWD low profile high performance disk module
	254	2×9.1GB FWD low profile high performance disk module
	163	1×18.2GB FWD half height high performance disk module
	801	0.9-meter 68-pin high-density/68-pin high-density cable
	802	2.5-meter 68-pin high-density/68-pin high-density cable
	803	5-meter 68-pin high-density/68-pin high-density cable
	804	10-meter 68-pin high-density/68-pin high-density
	821	1-meter 50-pin low-density/68-pin high-density cable
	822	2-meter 50-pin low-density/68-pin high-density cable
	823	1-meter 50-pin low-density female/68-pin high-density cable
	825	1-meter 50-pin high-density/68-pin high-density cable
	826	1.5-meter 50-pin high-density/68-pin high-density cable
	827	2-meter 50-pin high-density/68-pin high-density cable
	806	CA 1-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	807	CA 2.5-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	808	CA 5-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	809	CA 10-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	811	1-meter VHDCI to 68-pin high-density low-profile
	812	2.5-meter VHDCI to 68-pin high-density low-profile
	813	5-meter VHDCI to 68-pin high-density low-profile
	814	10-meter VHDCI to 68-pin high-density low-profile
	840	2.0-meter V-cable 68-pin high-density male
	841	2.0-meter V-cable VHDCI / VHDCI / 68-pin high-density male
	842	2.0-meter V-cable VHDCI / VHDCI I / L Terminator / 68-pin high-density male
	843	2.0-meter V-cable 68-pin HD / VHDCI / 68-pin high-density male
	844	2.0-meter V-cable 68-pin HD / VHDCI I / L Terminator / 68-pin high-density male
	B25	4.0-meter V-cable VHDCI / VHDCI / 68-pin high-density male
	B26	4.0-meter V-cable VHDCI / VHDCI I / L Terminator / 68-pin high-density male
	B27	4.0-meter V-cable 68-pin HD / VHDCI / 68-pin high-density male
	B28	4.0-meter V-cable 68-pin HD / VHDCI I / L Terminator / 68-pin high-density male
	851	10.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	871	2/5-meter V in-line terminator cable 68-pin HD male for V-Class
	875	5.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	851	10.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	873	2/3-meter V in-line terminator cable 68-pin HD male for V-Class
871	2/5-meter V in-line terminator cable 68-pin HD male for V-Class	
B6191AA		Supporting Software (CD-ROMs) This software is required for mass storage subsystem compatibility with HP-UX. The customer is not required to order more than one per installation site. If the storage is ordered as part of an integrated system order, B6191AA Need not be ordered because the necessary supporting software will automatically be included with the HP-UX order.

Table 4.6.7 Factory Racked Storage Enclosure

Product Number	Options	Description
A3312AZ	001	Single SCSI Bus Configuration
	002	Redundant Hot-Pluggable Power Supply
	253	1×9.1GB FWD low profile high performance disk module
	254	2×9.1GB FWD low profile high performance disk module
	163	1×18.2 GB FWD half height high performance disk module
	422	12 GB DDS-3 tape drive module
	801	0.9-meter 68-pin high-density/68-pin high-density cable
	802	2.5-meter 68-pin high-density/68-pin high-density cable
	803	5-meter 68-pin high-density/68-pin high-density cable
	804	10-meter 68-pin high-density/68-pin high-density
	821	1-meter 50-pin low-density/68-pin high-density cable
	822	2-meter 50-pin low-density/68-pin high-density cable
	823	1-meter 50-pin low-density female/68-pin high-density cable
	825	1-meter 50-pin high-density/68-pin high-density cable
	826	1.5-meter 50-pin high-density/68-pin high-density cable
	827	2-meter 50-pin high-density/68-pin high-density cable
	806	CA 1-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	807	CA 2.5-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	808	CA 5-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	809	CA 10-meter 68-pin high-density low-profile to 68-pin high-density low-profile
	811	1-meter VHDCI to 68-pin high-density low-profile
	812	2.5-meter VHDCI to 68-pin high-density low-profile
	813	5-meter VHDCI to 68-pin high-density low-profile
	814	10-meter VHDCI to 68-pin high-density low-profile
	840	2.0-meter V-cable 68-pin high-density male
	841	2.0-meter V-cable VHDCI / VHDCI / 68-pin high-density male
	842	2.0-meter V-cable VHDCI / VHDCI I / L Terminator / 68-pin high-density male
	843	2.0-meter V-cable 68-pin HD / VHDCI / 68-pin high-density male
	844	2.0-meter V-cable 68-pin HD / VHDCI I / L Terminator / 68-pin high-density male
	B25	4.0-meter V-cable VHDCI / VHDCI / 68-pin high-density male
	B26	4.0-meter V-cable VHDCI / VHDCI I / L Terminator / 68-pin high-density male
	B27	4.0-meter V-cable 68-pin HD / VHDCI / 68-pin high-density male
	B28	4.0-meter V-cable 68-pin HD / VHDCI I / L Terminator / 68-pin high-density male
	851	10.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	871	2/5-meter V in-line terminator cable 68-pin HD male for V-Class
	875	5.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	851	10.0-meter 68-pin HD male to 68-pin HD male in-line terminator cable for V-Class
	873	2/3-meter V in-line terminator cable 68-pin HD male for V-Class
	871	2/5-meter V in-line terminator cable 68-pin HD male for V-Class
B6191AA		Supporting Software (CD-ROMs) This software is required for mass storage subsystem compatibility with HP-UX. The customer is not required to order more than one per installation site. If the storage is ordered as part of an integrated system order, B6191AA Need not be ordered because the necessary supporting software will automatically be included with the HP-UX order.

Table 4.6.8 Upgrade Kits

Product #	Description	Supported Enclosures
A5238A	9.1 GB LP Disk Drive 7200 WD	A3311A, A3312A, A3312AZ
A5239A	18.2 GB Half Height Disk Drive 7200 FWD	A3311A, A3312A, A3312AZ
A3538A	Power Supply	A3311A, A3312A, A3312AZ
A3326A	Fan	A3311A, A3312A, A3312AZ
A3328A	68 Pin Single-Ended Terminator	A3311A, A3312A, A3312AZ
B6191AA	Supporting Software (CD-ROMs) This software is required for upgrade kit compatibility with HP-UX. The customer is not required to order more than one per installation site. If the storage is ordered as part of an integrated system order, B6191AA Need not be ordered because the necessary supporting software will automatically be included with the HP-UX order.	
A5331A	Front Door for HASS Quartz Grey	A3312A, A3312AZ

Features

The HP SMART Storage Enclosure supports 9-, 18-GB disks, DVD-ROM, DLT-8000 and DLT-4000 tape drives, DDS-2, DDS-3, and DDS-4 tape drives, and DDS-3, DDS-4 (available 6/1/00) autoloaders. Both enclosure families support the 2-, 4-, 9-, and 18-GB disk drives (described in **Table 4.6.9**). The High Availability Storage System Family supports DDS-3, DDS-4 and 18 GB disk drives.

Fibre Channel Support for High Availability Storage Systems (HASS with FC MUX)

Fibre Channel connectivity is now available on the High Availability Storage System Family via support of the FC-SCSI Multiplexer (A3308A, A3511A/AZ). HASS with FC MUX offers high scalability, good performance, and high flexibility.

Since the FC-SCSI Multiplexer can be configured with up to four F/W cards for connectivity, users can easily scale to 4X the original capacity per connection to the host. In addition, long-wave (A4839A) and short-wave (A3724A) hubs are also supported for campus wide availability.

Configuration guide:

- Only F/W disks are supported behind the FC-SCSI Multiplexer.
- Follow SCSI guidelines for connecting HASS behind the MUX's SCSI ports, keep in mind the trade-off between capacity and performance.
- For additional information, refer to <http://eps.hp.com> for design and ordering information.

Note: *Fibre Channel support for HASS is available on 10.20 for D, K, T-600 and 11.0 for D, K, T-600, V-Class.*

To order HASS with FC MUX, refer to sample order menus in the Design Guide at <http://eps.rose.hp.com>. Full factory integration (including racking and cabling) for HASS with FC MUX is available only for configurations described in the Design Guide. You MUST order A5147A (Enterprise Storage Integration Product) for full factory integration.

Capacity

The deskside and rackmount enclosures in the High Availability Storage System Family have eight (8) slots for storage mechanisms. Low-profile devices (1 inch high) require 1 slot, while half-height devices (1.6 inches high) require 2 slots, therefore a maximum of eight low-profile devices or a maximum of four half-height devices can be inserted. The enclosure can accept a mixture of low-profile and half-height mechanisms.

High Availability Functionality

The High Availability Storage System enclosures offer state of the art high availability features; hot plug modules, redundant power and redundant cooling.

Table 4.6.9 HP High Availability Storage System Family Summary

Functionality	HP High Availability Storage System Family	
	Deskside	Rackmount
Number of 3.5 inch mechanisms	8 LP ¹ 4 HH ¹	8 LP ¹ 4 HH ¹
Disk Drive Support		
9 GB	Yes	Yes
18.2 GB	Yes	Yes
Enclosures per rack		
1.1-meter rack	N/A	3
1.6-meter rack	N/A	5
2-meter rack	N/A	6
High Availability Functionality		
Hot Plug	Yes	Yes
Redundant Fans	Yes	Yes
Redundant Power Supplies	Optional	Optional
Number of power cords	2 with 2nd PS	2 with 2nd PS
Number of SCSI Buses	2	2

¹ LP - Low-Profile, 1 inch high mechanisms HH - Half-Height, 1.6 inch high mechanisms

² As supply lasts

Hot Plug

The High Availability Storage System has hot pluggable components. The 3.5-inch fast/wide disk drives, power supplies and fans are all hot pluggable. Unlike a disk array, hot plug events of fast/wide disk modules can only be executed after the system has been alerted to the fact that such an event is about to occur. **Table 4.6.10** summarizes the recommended guidelines for the when hot plug events can occur.

Table 4.6.10 Hot Plug Events

Components	State of System
Fans	Anytime, fan slots should never be left empty.
Power Supply	Anytime, assuming redundant power supply installed.
Fast/Wide Disks	After the manual procedure has been executed.

Manual hot plug is limited in the scope, type of the mechanisms supported, and also in the specific type of application environments. Manual hot plug is supported with the following caveats:

- FWD Disk Drives Only
- Mirroring Environments Only
 - Single System Mirroring Environments
 - SwitchOver Mirroring Environments
 - ServiceGuard Mirroring Environment, with no simultaneous disk sharing
- A manual procedure must be followed by the customer to split the mirrors, before the CE can replace the failed disk.

Hot plug functionality is currently **NOT** supported for the following:

- Single-ended Disks
- Tapes
- Mirroring in all MC/LockManager environments (including OPS).

Redundant Power

A second power supply can be ordered for the High Availability Storage System. When 2 power supplies are installed, the two power supplies share the workload. If one of the power supplies fails, the other power supply will take over the load for the entire enclosure. Each power supply has its own independent power cord. It is not necessary to have two power supplies installed in the enclosure. However, HP recommends the second power supply be ordered for maximum high availability.

Redundant Fans

The enclosure comes standard with two fans. Although, a single fan can maintain cooling, it is strongly recommended that the defective fan be replaced as soon as possible to maintain the reliability of the enclosure. Even if one of the fans is defective, both fans must remain installed to maintain the air flow characteristics of the enclosure. Mechanism slots and power supply slots may be empty without affecting the air flow characteristics.

Powerfail Protection

A UPS is required for powerfail protection for the current HP 6000 Mass Storage Enclosure Family and the HP High Availability Storage System. The 3.0-kVA UPS is recommended for use with the HP High Availability Storage System.

Cables and Terminators

The cables must be explicitly ordered for both family of enclosures. With the HP 6000 SCSI Mass Storage Family, the cables must be ordered separately. In the case of the High Availability Storage System, the cable may be ordered via an option.

The terminator is assumed to be included with the SCSI interface cards, except with the single-ended (SE) terminator for the High Availability Storage System. The connector on the High Availability Storage System is a 68-pin connector regardless if the SCSI bus is configured as single-ended or fast/wide. This requires a unique 68-pin single-ended terminator, not the standard 50-pin single-ended terminator shipped with the SE SCSI card. As a result, the 68-pin single-ended terminator is shipped with the High Availability Storage System if a single-ended cable option is ordered, that is options 821, 822, 823, 825, 826 or 827.

*Please refer to **Subchapter 4.12** for more details on cables.*

Factory-Racking Considerations

When racking the HP High Availability Storage System into a 1.1-meter, 1.6-meter, or 2.0-meter cabinet, consider the following caveats when constructing the order.

- Only the 1.1-meter and 1.6-meter cabinets are available in factory racked configurations.
- The enclosure is 6 EIA units high.
- If the desire is to have the enclosures racked into cabinets at the factory, order product number A3312AZ. To order an enclosure to be field racked, select product number A3312A.
- The maximum number of A3312AZ's that can be factory racked in a 1.6-meter rack (A1884A, A1897A) is 4. (The minimum is 0, of course.) A fifth enclosure will fit. With five enclosures, a second PDU is required.
- A second power distribution unit is recommended, but it can not be installed at the factory. The second power distribution unit must be installed at the customer site.

Consult the integrated cabinets paragraphs of this section.

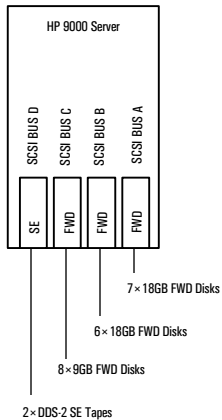
Configuration

Step 1: Determine the required number and type of storage mechanisms. For example 13×18GB WD Disks, 8×4GB WD Disks, 2 DDS-3 Tapes.

Step 2: Divide the mechanisms into three groups as follows: FWD disks, SE disks, SE tapes. Further divide each group into the number of mechanisms that will be placed on a single SCSI bus.

- SCSI Bus A 7 × 18GB WD Disks
- SCSI Bus B 6 × 18GB WE Disks
- SCSI Bus C 8 × 4GB WD Disks

Figure 4.6.5

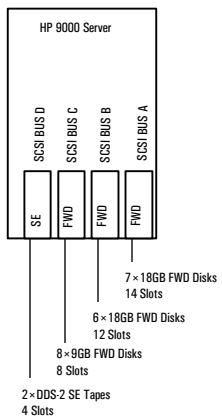


Step 3: For each group, determine the number of enclosure slots required using the following point system:

Descriptions	Number of Slots
2 GB WD LP Disk Drive	1
9.1 GB WD LP Disk Drive	1
18.2 GB WD HH Disk Drive	2

- SCSI Bus A 7 × 2 = 14 slots
- SCSI Bus B 6 × 2 = 12 slots
- SCSI Bus C 8 × 1 = 8 slots
- SCSI Bus D 2 × 2 = 4 slots

Figure 4.6.6

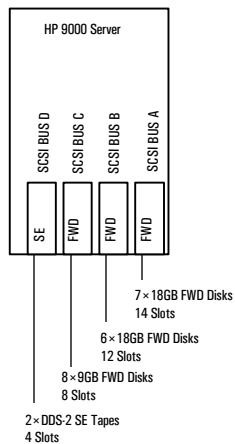


Step 4: Divide the total number of slots for each group by 8 (the total number of available slots in a High Availability Storage System) and remember the remainder.

SCSI Bus A 14 slots / 8 = 1 R 6
 SCSI Bus B 12 slots / 8 = 1 R 4
 SCSI Bus C 8 slots/8 = 1 R 0
 SCSI Bus D 4 slots/8 = 0 R 4

Step 5: The number of enclosures required can now be determined. If the remainder is greater than 4, round the number up. If the remainder is less than or equal to 4, then use .5. Now add them up and round up. Refer to **Figure 4.6.7**.

Figure 4.6.7



SCSI Bus A 14 slots / 8 = 1 R 6 == > 2.0 enclosures
 SCSI Bus B 12 slots / 8 = 1 R 4 == > 1.5 enclosures
 SCSI Bus C 8 slots/8 = 1 R 0 == > 1.0 enclosure
 SCSI Bus D 4 slots/8 = 0 R 4 == > 0.5 enclosures
Total 5.0 enclosures

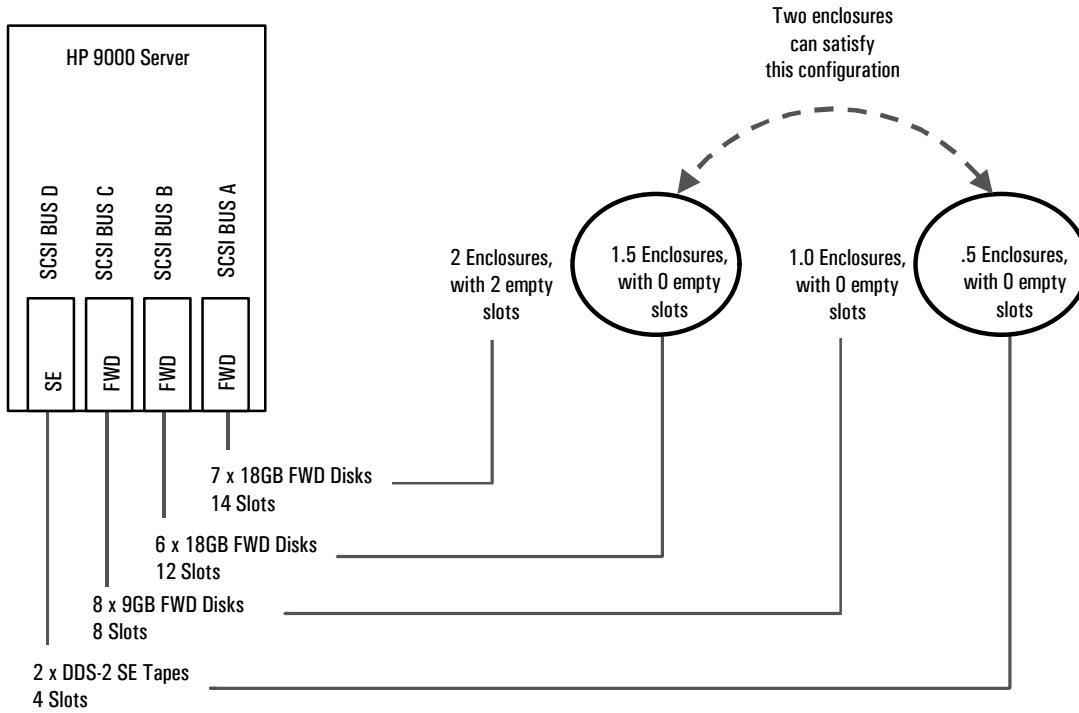
Step 6: Select the type of enclosures desired: deskside, field racked or factory racked.

A deskside and a factory-racked example will be used for illustrative purposes from this point on.

- Deskside Example: A3311A
- Factory Racked Example: A3312AZ

Step 7: Determine if the enclosures are to be configured as single bus or dual bus. Go back to step 4 and note the number of half enclosures. These can be configured with dual buses. This technique is designed to minimize the number of enclosures. If “doubling” up an enclosure is undesirable for the particular customer environment, just order additional enclosures. Refer to **Figure 4.6.8**.

Figure 4.6.8



Deskside Example:

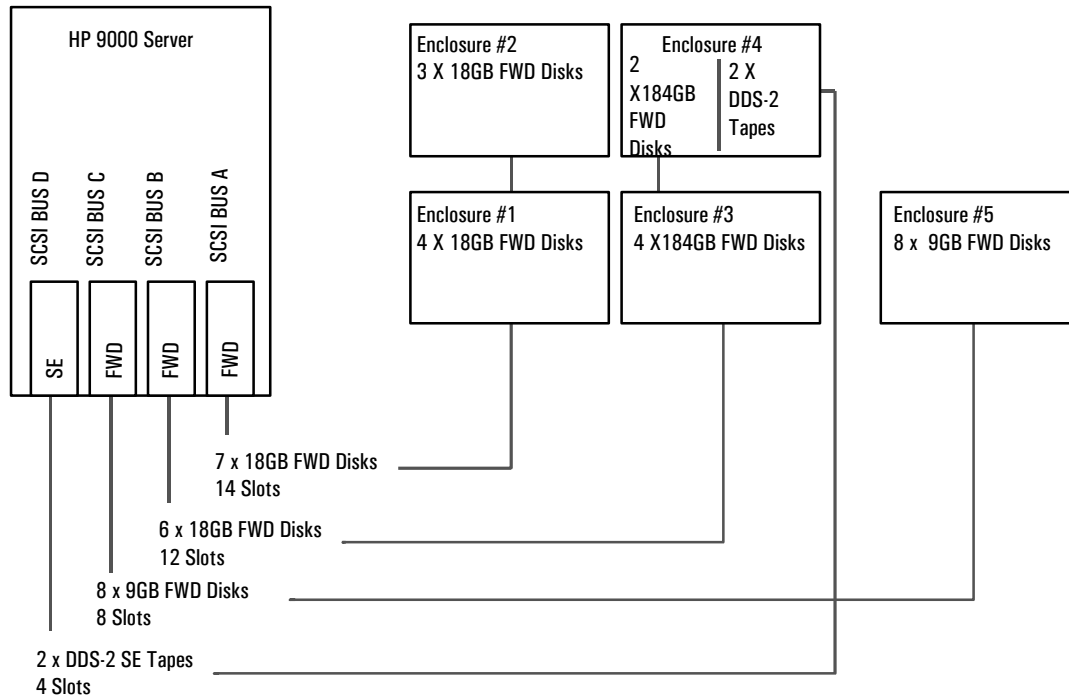
SCSI Bus A	Enclosure Number 1	A3311A Opt 001
	Enclosure Number 2	A3311A Opt 001
SCSI Bus B and D	Enclosure Number 3	A3311A Opt 001
	Enclosure Number 4	A3311A
SCSI Bus C	Enclosure Number 5	A3311A Opt 001

Factory Racked Example:

SCSI Bus A	Enclosure Number 1	A3312AZ Opt 001
	Enclosure Number 2	A3312AZ Opt 001
SCSI Bus B and D	Enclosure Number 3	A3312AZ Opt 001
	Enclosure Number 4	A3312AZ
SCSI Bus C	Enclosure Number 5	A3312AZ Opt 001

Step 8: Load the enclosures with the desired mechanisms. Refer to **Figure 4.6.9**.

Figure 4.6.9



Deskside Example:

SCSI Bus A	Enclosure Number 1	A3311A	Opt 001 4 x Opt 145	Single Bus 4 x 9GB FWD Disks
	Enclosure Number 2	A3311A	Opt 001 3 x Opt 145	Single Bus 3 x 9GB FWD Disks
SCSI Bus B and D	Enclosure Number 3	A3311A	Opt 001 4 x Opt 145	Single Bus 4 x 9GB FWD Disks
	Enclosure Number 4	A3311A	2 x Opt 145	2 x 9GB FWD Disks
SCSI Bus C	Enclosure Number 5	A3311A	Opt 001 4 x Opt 124	Single Bus 4 x (Two 2 GB Disks)

Factory Racked Example:

SCSI Bus A	Enclosure Number 1	A3312AZ	Opt 001 4 x Opt 145	Single Bus 4 x 9GB FWD Disks
	Enclosure Number 2	A3312AZ	Opt 001 3 x Opt 145	Single Bus 3 x 9GB FWD Disks
SCSI Bus B and D	Enclosure Number 3	A3312AZ	Opt 001 4 x Opt 145	Single Bus 4 x 9GB FWD Disks
	Enclosure Number 4	A3312AZ	2 x Opt 145	2 x 9GB FWD Disks
SCSI Bus C	Enclosure Number 5	A3312AZ	Opt 001 4 x Opt 124	Single Bus 4 x (Two 2 GB Disks)

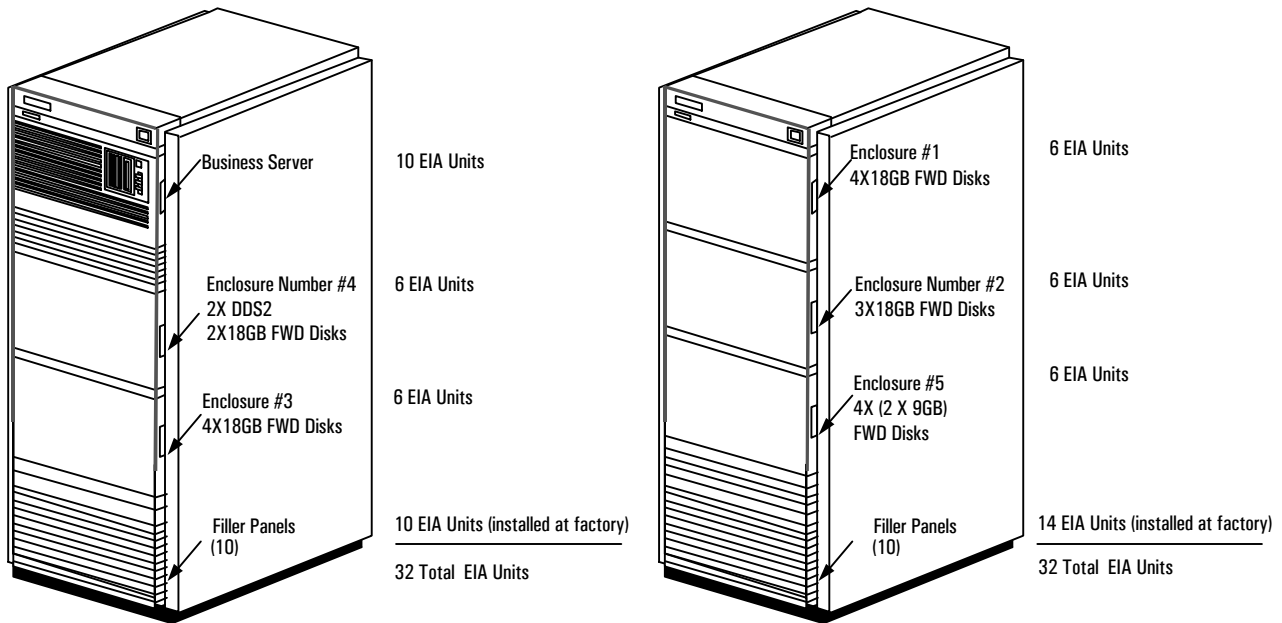
Step 9: For desktside configurations, go to Step 10.

Determine the number of 19-inch racks required. Currently, five enclosures can be placed in a single 19-inch rack. With five enclosures, two PDUs are required. (See section on racking options for more details.) This number is less if a UPS is required.

Factory Racked Example:

1×1.6-meter 19 inch rack is required for 5 enclosures (A1897A) Since a maximize of 4 enclosures can be factory racked, the example will assume, two 1.6-meter racks are to be ordered. For illustrative purposes, lets assume the SPU is also to be installed in one of the racks. Since distance is more limited with single-ended SCSI, than with fast/wide differential SCSI, enclosures 3 and 4 should be installed in the same cabinet as the SPU.

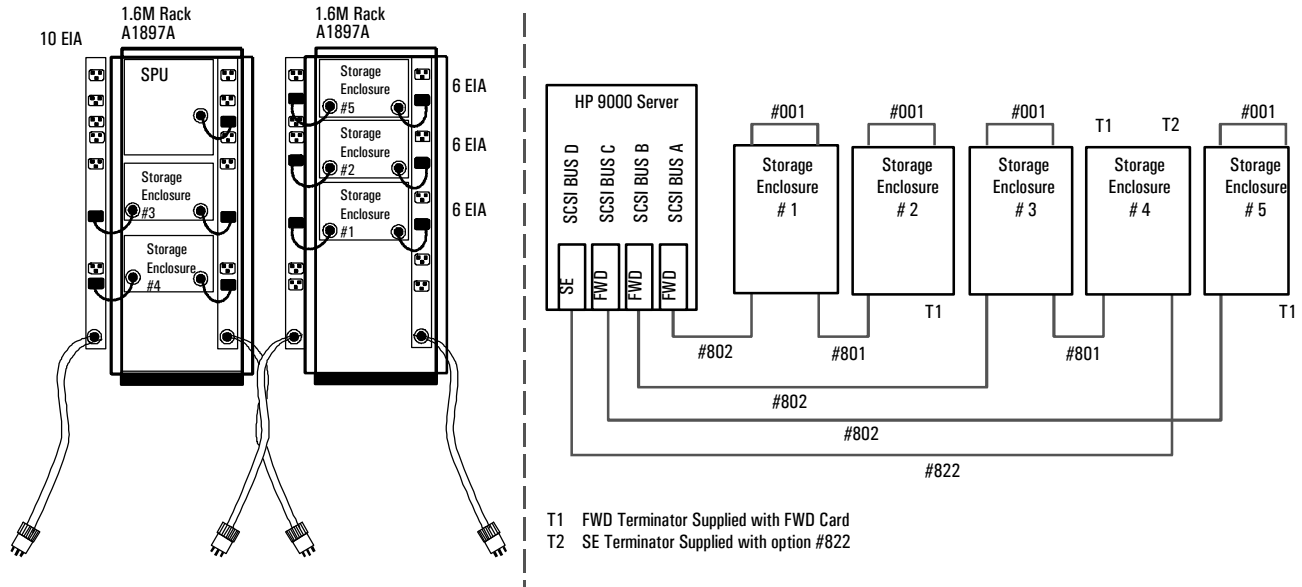
Figure 4.6.10



Step 10: Determine the required cables. The following diagrams show the cable options for the example selected.

The cable included with the 28655A card is the K2296, which is the cable to connect HP 6000 SCSI Enclosure Family, but is not the proper cable for connecting the HP High Availability Storage System. If both an HP 6000 SCSI Enclosure and an HP High Availability Storage System are to be connected to the 28655A, the most straight-forward configuration is to have the HP 6000 SCSI Enclosure directly connected to the SPU and daisy-chain the HP High Availability Storage System. This is not mandatory, however, just ensure the correct cables are ordered so the enclosures can be connected in the desired order.

Figure 4.6.11



Deskside Example:

SCSI Bus A	Enclosure Number 1	A3311A	Opt 001	Single Bus
			Opt 802	2.5-meter Cable
SCSI Bus B and D	Enclosure Number 2	A3311A	4 × Opt 163	4 × 9GB FWD Disks
			Opt 001	Single Bus
			Opt 801	0.9-meter Cable
SCSI Bus C	Enclosure Number 3	A3311A	3 × Opt 163	3 × 9GB FWD Disks
			Opt 001	Single Bus
			Opt 802	2.5-meter Cable
			4 × Opt 163	4 × 9GB FWD Disks
SCSI Bus A	Enclosure Number 4	A3311A	Opt 801	0.9-meter Cable
			Opt 822	2.0-meter Cable (SE)
			2 × Opt 163	2 × 4GB FWD Disks
			Opt 001	Single Bus
SCSI Bus A	Enclosure Number 5	A3311A	Opt 802	2.5-meter Cable

Factory Racked Example:				
SCSI Bus A	Enclosure Number 1	A3312AZ	4×Opt 148 Opt 001 Opt 802 4×Opt 163	4×(Two 2 GB Disks) Single Bus 2.5-meter Cable 4×9GB FWD Disks
	Enclosure Number 2	A3312AZ	Opt 001 Opt 801 3×Opt 163	Single Bus 0.9-meter Cable 3×9GB FWD Disks
SCSI Bus B and D	Enclosure Number 3	A3312AZ	Opt 001 Opt 802 4×Opt 163	Single Bus 2.5-meter Cable 4×9GB FWD Disks
	Enclosure Number 4	A3312AZ	Opt 801 Opt 822 2×Opt 163	0.9-meter Cable 2.0-meter Cable (SE) 2×9GB FWD Disks
SCSI Bus C	Enclosure Number 5	A3312AZ	Opt 001 Opt 802 4×Opt 148	Single Bus 2.5-meter Cable 4×(Two 2 GB Disks)

Step 11: Is redundant power required?

A second power supply can be added to the enclosure by ordering option 002.

Deskside Example:				
SCSI Bus A	Enclosure Number 1	A3311A	Opt 001 Opt 002 Opt 802 4×Opt 163	Single Bus Second Power Supply 2.5-meter Cable 4×9GB FWD Disks
	Enclosure Number 2	A3311A	Opt 001 Opt 002 3×Opt 163	Single Bus Second Power Supply 3×9GB FWD Disks
SCSI Bus B and D	Enclosure Number 3	A3311A	Opt 001 Opt 002 4×Opt 163	Single Bus Second Power Supply 4×9GB FWD Disks
	Enclosure Number 4	A3311A	Opt 002 2×Opt 163	Second Power Supply 2×9GB FWD Disks
SCSI Bus C	Enclosure Number 5	A3311A	Opt 001 Opt 002 4×Opt 148	Single Bus Second Power Supply 4×(Two 2-GB Disks)
Factory Racked Example:				
SCSI Bus A	Enclosure Number 1	A3312AZ	Opt 001 Opt 002 4×Opt 163	Single Bus Second Power Supply 4×9GB FWD Disks
	Enclosure Number 2	A3312AZ	Opt 001 Opt 002 3×Opt 163	Single Bus Second Power Supply 3×9GB FWD Disks
SCSI Bus B and D	Enclosure Number 3	A3312AZ	Opt 001 Opt 002 4×Opt 163	Single Bus Second Power Supply 4×9GB FWD Disks
	Enclosure Number 4	A3312AZ	Opt 002 2×Opt 163	Second Power Supply 2×9GB FWD Disks
SCSI Bus C	Enclosure Number 5	A3312AZ	Opt 001 Opt 002 4×Opt 148	Single Bus Second Power Supply 4×(Two 2-GB Disks)