EVA
Disk Placement
(includes expansion cabinet)

(public distribution authorized)

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2   Document History

Version	Date	Comments
2-5-2	5-Sep-07	added document history section
2-6	28-Sep-07	added section 3-1
2-7	19-Jan-08	updated copyright, changed Enclosure Address information on EVA5000 and EVA8000/8100
2-8	20-May-08	added EVA4400, rearranged Miscellaneous Notes Section so the Drive Count Requirements do not appear to only apply to the 5000/8x00
2-9	3-Jun-09	added EVA6400 and EVA8400, modified section 3
3-0	5-Aug-09	corrected section 3-2-2, changed document format, changed array drawings
3-1	2-Sep-09	added all controllers in section 3-1, rearranged loops on EVA6000/6100, EVA6400 and EVA8400 drawings, added sections 3-5 and 3-6

3   Introduction

With increasing demand for more storage, new connectivity options (such as iSCSI) being adopted, and HP StorageWorks Division's commitment to protecting customer's investments with feature/functionality improvements to the EVA storage solutions, many customers see the value of expanding capacity on their currently deployed EVA storage array.

To assure a successful upgrade experience, this guide documents the requirements of disk placement in all current EVA arrays.

3.1   Controller Models

EVA Model	Controller Model
EVA3000	HSV100 or HSV101 (VCS 4.x)
EVA4000	HSV200
EVA4100	HSV200-B
EVA4400	HSV300
EVA5000	HSV110 or HSV111 (VCS 4.x)
EVA6000	HSV200 or HSV200-A
EVA6100	HSV200-B
EVA6400	HSV400
EVA8000	HSV210 or HSV210-A
EVA8100	HSV210-B
EVA8400	HSV450

3.2   Drive Count Requirements

3.2.1   EVA3000, EVA5000, EVA4000/4100, EVA6000/6100, EVA8000/8100

- The minimum number of drives per shelf is 4.
- **Caution:** While a shelf with only 1 to 3 drives will pass its diagnostic tests, this is not a supported configuration.
- The minimum number of drives per array is 8.
- **Never** install a drive shelf without any drives.

3.2.2   EVA4400, EVA6400, EVA8400

- The minimum number of drives per array is 8, except solid state disks.
- The minimum number of solid state drives per array is 6 and the maximum is 8.

3.3 Drive Placement Restrictions

3.3.1 EVA5000

- **Caution:** Failure to observe the disk drive bay restrictions may cause the storage system to become inoperative until all the slots are empty.
- **Never** use Bay 13 or 14 in drive enclosures with the ID of 17 or 20. The AL-PAs of these bays conflict with the AL-PAs of the controllers. Use of these slots is not supported.
- As a guide, do not install any drives in Bays 13 or 14 in enclosures 15 through 20.

3.3.2 EVA8000/8100

- **Caution:** Failure to observe the disk drive bay restrictions may cause the storage system to become inoperative until all the slots are empty.
- **Never** use Bays 12, 13 or 14 in drive enclosures with the ID of 17 or 20. Some of the AL-PAs of these bays conflict with the AL-PAs of the controllers and others conflict with the new 4GB backend loop switches. Use of these slots is not supported.
- As a guide, do not install any drives in Bays 12, 13 or 14 in enclosures 16, 17 and 19, 20. This will keep both loops equally balanced.

3.4 Expansion Cabinet Requirements

3.4.1 EVA5000

- Cables in the main EVA rack can be either copper fiber channel or optical fiber channel.
- Cables crossing between racks must be optical fiber channel.
- An EVA without loop switches and daisy chained cables can have intermixed copper fiber channel and optical fiber channel; i.e. optical fiber channel from controller to 1st enclosure and copper fiber channel from 1st enclosure to second enclosure etc.
- **Caution:** For proper copper fiber channel cable support the IO modules have to be at Rev E or higher.

3.4.2 EVA8000/8100

- Cables in the main EVA rack can be either copper fiber channel or optical fiber channel.
- Cables crossing between racks must be optical fiber channel.
- An EVA without loop switches and daisy chained cables can have intermixed copper fiber channel and optical fiber channel; i.e. optical fiber channel from controller to 1st enclosure and copper fiber channel from 1st enclosure to second enclosure etc.
- **Caution:** For proper copper fiber channel cable support the IO modules have to be at Rev E or higher.

3.4.3 EVA8400

- Cables in the main EVA rack can be either copper fiber channel or optical fiber channel.
- Cables crossing between racks must be optical fiber channel.

3.5   Drive Enclosure Requirements

3.5.1   EVA3000, EVA4000/4100

- The minimum number of enclosures is 1.
- The maximum number of enclosures is 4.
- **Recommendation** is to have an enclosure count divisible by 2.

3.5.2   EVA4400, EVA6000/6100

- The minimum number of enclosures is 1.
- The maximum number of enclosures is 8.
- **Recommendation** is to have an enclosure count divisible by 2.

3.5.3   EVA5000, EVA6400, EVA8000/8100

- The minimum number of enclosures is 2.
- The maximum number of enclosures is 18.
- **Recommendation** is to have an enclosure count divisible by 2.

3.5.4   EVA8400

- The minimum number of enclosures is 3.
- The maximum number of enclosures is 27.
- **Recommendation** is to have an enclosure count divisible by 3.

3.6   Backend Loops

3.6.1   EVA3000, EVA4000/4100, EVA4400, EVA6000/6100

- These arrays have 1 backend loop.

3.6.2   EVA5000, EVA6400, EVA8000/8100

- These arrays have 2 backend loops.

3.6.3   EVA8400

- This array has 3 backend loops.

4   Drive Placement

The following symbols and colors are used to identify EVA backend loops and drive placement.

Δ   - Available drive locations for loop 1.

◇   - Available drive locations for loop 2.

∞   - Available drive locations for loop 3.

X   - No drives are allowed in these locations for this configuration.

4.1   EVA3000

There are no drive placement restrictions.

		Drive Bay Number															Physical Shelf Count
		1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Enclosure Address	5	Controller A															
		Controller B															
	4	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#4	
	3	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#3	
	2	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#2	
	1	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#1	
Δ		4	4	4	4	4	4	4	4	4	4	4	4	4	4		
Total		4	4	4	4	4	4	4	4	4	4	4	4	4	4	56	

4.2   EVA4000/4100

There are no drive placement restrictions.

Enclosure Address		Drive Bay Number														Physical Shelf Count	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	5	Controller A															
		Controller B															
	4	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#4	
	3	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#3	
	2	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#2	
	1	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#1	

Δ	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
Total	4	4	4	4	4	4	4	4	4	4	4	4	4	4	56

4.3   EVA4400

There are no drive placement restrictions.

Enclosure Address	Enclosure addresses are automatically assigned by the controllers.	Drive Bay Number												Physical Shelf Count
		1	2	3	4	5	6	7	8	9	10	11	12	
		Controller 2 (B)						Controller 1 (A)						
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#8
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#7
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#6
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#5
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#4
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#3
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#2
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#1

Δ	24	24	24	24	
Total	24	24	24	24	96

4.4 EVA5000 with 2GB loop switches

Caution: Failure to observe the disk drive bay restrictions may cause the storage system to become inoperative until all the slots are empty.

Never use Bay 13 or 14 in drive enclosures with the ID of 17 or 20. The AL-PAs of these bays conflict with the AL-PAs of the controllers. Use of these slots is not supported.

- As a guide, do not install any drives in Bays 13 or 14 in enclosures 15 through 20.

Enclosure Address	Drive Bay Number														Physical Shelf Count
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
20	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	X	X	#18
19	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	X	X	#17
18	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	X	X	#16
17	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	X	X	#15
16	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	X	X	#14
15	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	X	X	#13
13 or 14	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#12
12 or 13	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#11
11 or 12	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#10
10 or 11	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#9
9 or 10	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#8
8 or 9	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#7
7	Controller A														
	Controller B														
6	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#6
5	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#5
4	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#4
3	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#3
2	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#2
1	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#1
◇	9	9	9	9	9	9	9	9	9	9	9	9	6	6	
Δ	9	9	9	9	9	9	9	9	9	9	9	9	6	6	
Total	18	18	18	18	18	18	18	18	18	18	18	18	12	12	240

4.5   EVA6000/6100

There are no drive placement restrictions.

		Drive Bay Number															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14		
Enclosure Address	10	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#8	Physical Shelf Count
	9	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#7	
	8	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#6	
	6	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#5	
	5	Controller A															
		Controller B															
	4	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#4	
	3	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#3	
	2	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#2	
	1	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#1	
	Δ	8	8	8	8	8	8	8	8	8	8	8	8	8	8		
	Total	8	8	8	8	8	8	8	8	8	8	8	8	8	8	112	

Note: The controller pair must use the #5 enclosure address.

- Enclosure address #7 must never be used on an EVA6000/6100.

4.6   EVA6400

There are no drive placement restrictions.

Enclosure Address	Enclosure addresses are automatically assigned by the controllers.	Drive Bay Number												Physical Shelf Count
		1	2	3	4	5	6	7	8	9	10	11	12	
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#18
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#17
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#16
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#15
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#14
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#13
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#12
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#11
		Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#10
		Controller A												
		Controller B												
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#9
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#8
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#7
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#6
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#5
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#4
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#3
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#2
		◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#1

Δ	27	27	27	27
◊	27	27	27	27
Total	54	54	54	54	216

4.7 EVA8000/8100 with 2GB or 4GB loop switches

Caution: Failure to observe the disk drive bay restrictions may cause the storage system to become inoperative until all the slots are empty.

Never use Bays 12, 13 or 14 in drive enclosures with the ID of 17 or 20. Some of the AL-PAs of these bays conflict with the AL-PAs of the controllers and others conflict with the new 4GB backend loop switches. Use of these slots is not supported.

- As a guide, do not install any drives in Bays 12, 13 or 14 in enclosures 16, 17 and 19, 20. This will keep both loops equally balanced.

Enclosure Address	Drive Bay Number														Physical Shelf Count
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
20	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	X	X	X	#18
19	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	X	X	X	#17
18	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#16
17	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	X	X	X	#15
16	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	X	X	X	#14
15	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#13
13 or 14	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#12
12 or 13	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#11
11 or 12	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#10
10 or 11	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#9
9 or 10	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#8
8 or 9	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	◊	#7
7	Controller A														
	Controller B														
6	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#6
5	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#5
4	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#4
3	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#3
2	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#2
1	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#1
◊	9	9	9	9	9	9	9	9	9	9	9	7	7	7	
Δ	9	9	9	9	9	9	9	9	9	9	9	7	7	7	
Total	18	18	18	18	18	18	18	18	18	18	18	14	14	14	240

4.8 EVA8400

There are no drive placement restrictions.

Drive Bay Number												Physical Shelf Count
1	2	3	4	5	6	7	8	9	10	11	12	
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#27
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#26
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#25
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#24
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#23
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#22
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#21
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#20
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#19
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#18
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#17
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#16
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#15
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#14
Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	Δ	#13
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#12
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#11
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#10
Controller A												
Controller B												
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#9
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#8
◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	◇	#7
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#6
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#5
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#4
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#3
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#2
∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	#1

Enclosure Address — Enclosure addresses are automatically assigned by the controllers.

Δ	27	27	27	27
◇	27	27	27	27
∞	27	27	27	27
Total	81	81	81	81	324