

HP StorageWorks

Business Copy XP user guide

for the XP12000/XP10000/SVS200

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About this guide

This guide provides information about:

- using Business Copy XP operations
- preparing Business Copy XP operations
- starting Business Copy XP operations
- performing Business Copy XP operations
- understanding Business Copy XP operation error codes

Intended audience

This guide is intended for customers and HP-authorized service providers with knowledge of:

- Disk array hardware and software
- Data processing and RAID storage subsystems and their basic functions and utilities

Prerequisites

Prerequisites for using this product include:

- Installation of the HP StorageWorks disk array(s)
- Installation of the license key for this product

Related documentation

The following documents provide related information:

- *HP StorageWorks Command View XP user guide for XP Disk Arrays*
- *HP StorageWorks XP Remote Web Console user guide for XP12000/XP10000*
- *HP StorageWorks Snapshot XP user guide*
- *HP StorageWorks LUN Configuration and Security Manager XP user guide for the XP12000/XP10000*
- *HP StorageWorks LUN Security XP Extension user guide*
- *HP StorageWorks RAID Manager XP user guide*
- *Hitachi ShadowImage for z/OS user guide*
- *HP StorageWorks External Storage XP user guide*
- *HP StorageWorks Performance Control XP user guide*
- *HP StorageWorks Flex Copy XP user guide*

You can find these documents from the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Storage Software** and then select your product.

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Blue text: Table 1	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	website addresses
Bold text	<ul style="list-style-type: none">• Keys that are pressed• Text typed into a GUI element, such as a box• GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
<i>Italic</i> text	Text emphasis
Monospace text	<ul style="list-style-type: none">• File and directory names• System output• Code• Commands, their arguments, and argument values
<i>Monospace, italic</i> text	<ul style="list-style-type: none">• Code variables• Command variables
Monospace, bold text	Emphasized monospace text

 **CAUTION:**

Indicates that failure to follow directions could result in damage to equipment or data.

 **IMPORTANT:**

Provides clarifying information or specific instructions.

 **NOTE:**

Provides additional information.

 **TIP:**

Provides helpful hints and shortcuts.

HP technical support

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level

- Detailed questions

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/e-updates>

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

HP websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- http://www.hp.com/service_locator
- <http://www.hp.com/support/manuals>

Documentation feedback

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To make comments and suggestions about product documentation, please send a message to storagedocs.feedback@hp.com. All submissions become the property of HP.

1 Business Copy XP (BC) for the Array

HP StorageWorks Business Copy XP (BC) maintains internal copies of user data on disk arrays for purposes such as data backup or duplication. Duplicate volumes are created on the same disk array as the primary volume at hardware speeds. BC is used for UNIX and PC server data, and can provide up to nine duplicates of one primary volume.

This chapter provides instructions for performing BC operations using Command View XP or XP Remote Web Console.



NOTE:

See the *HP StorageWorks Command View XP Advanced Edition Device Manager Web Client user guide* for instructions on accessing Business Copy from Command View XP Advanced Edition.

BC operations are nondisruptive and allow the primary (main) volume of each volume pair to remain online to all hosts for read and write I/O operations.

After establishing operations, BC operations continue unattended to provide asynchronous internal data backup. Usability is further enhanced through a resynchronization capability that reduces data duplication requirements and backup time, thereby increasing user productivity. BC also supports reverse resynchronization.

You can perform BC operations in conjunction with HP StorageWorks Continuous Access XP operations to provide additional remote copies of BC volumes. BC also supports the disk array's custom volume size (CVS) and Cache LUN features, ensuring that BC operations can duplicate all user data. See [Combining BC with other data management operations](#) for further information on combining BC with other data management features.

You can also perform BC operations with External Storage XP operations to create pairs with external volumes.

Overview of BC operations

BC is a storage-based hardware solution for duplicating logical volumes that reduces backup time and provides point-in-time backup. BC primary volumes (P-VOLs) contain original data; BC secondary volumes (S-VOLs) contain duplicate data. You can use the BC cascaded volume function to make up to nine copies of each P-VOL. Because each S-VOL is paired with its P-VOL independently, each S-VOL can be maintained as an independent copy set that can be split, resynchronized, and deleted separately from other S-VOLs assigned to the same P-VOL.

BC components

BC operations on the Command View XP management station or XP Remote Web Console involve primary and secondary volumes in the disk array. [Figure 1](#) shows a typical BC configuration. BC system components are:

- BC volume pairs (P-VOLs and S-VOLs)
- BC software on the Command View XP management station

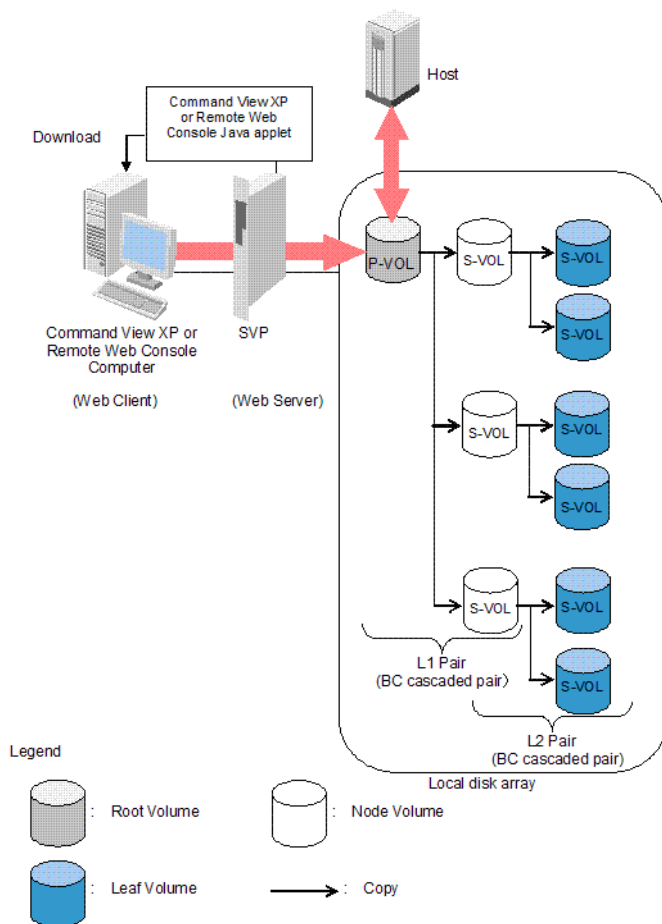


Figure 1 BC overview

Use BC from the Command View XP management station or XP Remote Web Console to make local copies of volumes. The volume that has original data is called a P-VOL (primary volume), and a volume to which data is copied is called an S-VOL (secondary volume). Pairs of P-VOLs and S-VOLs made by BC are called BC pairs. You can specify an S-VOL as a P-VOL to make another two BC pairs. As a result, you can use BC to make a total of nine S-VOLs. Use the cascade style to make BC pairs by specifying S-VOLs as P-VOLs. In cascade style, pairs in the first cascade layer are called L1 pairs and pairs in the second cascade layer are called L2 pairs.

BC volume pairs (P-VOLs and S-VOLs)

Disk arrays contain and manage original and copied BC data. The XP1024/XP128 disk arrays support a maximum of 8,190 BC volumes: 4,095 pairs and the RAID Manager command device. The XP12000 disk array supports a maximum of 16,382 BC volumes (8,191 pairs: (8,191 P-VOLs and 8,191 S-VOLs) and the RAID Manager command device. When BC pairs include size-expanded LUs, the maximum number of pairs decreases. When pairs include more than one S-VOL, the maximum number of P-VOLs decreases.

BC performs copy operations for logical volume pairs that you establish. Each BC pair consists of one primary volume (P-VOL) and up to three secondary volumes (S-VOLs). These volumes can be located in the XP disk array or in external storage attached to the XP disk array. BC S-VOLs are secondary or mirrored volumes containing backup data. Each S-VOL must be paired with only one P-VOL. During BC operations, P-VOLs remain available to all hosts for read and write I/O operations (except during reverse resync and quick restore). S-VOLs become available for host access only after the pair is split.

When a BC volume pair is created, data on the P-VOL is copied to the S-VOL to synchronize the volumes. During this initial copy operation and after the pair is synchronized, all write operations to the S-VOL are prohibited. To access an S-VOL, you can "split" the pair to make the S-VOL accessible. While a BC pair is split, the disk array keeps track of all changes to the P-VOL and S-VOL. When you "resync" the pair, the

differential data in the P-VOL (due to P-VOL and S-VOL updates) is copied to the S-VOL, so the S-VOL is again identical to the P-VOL. For reverse resync, the differential data in the S-VOL (due to P-VOL and S-VOL updates) is copied to the P-VOL, so the P-VOL is now identical to the S-VOL.

 **NOTE:**

BC S-VOLs are updated asynchronously. For a volume pair with PAIR status, the P-VOL and S-VOL may not be identical. For further information on BC update copy operations, see [Paircreate operation](#).

BC P-VOLs or S-VOLs should not be concentrated in the same RAID group. To disperse workloads of RAID groups, each RAID group should have both P-VOLs and S-VOLs evenly distributed. BC pairs for which BC operations are performed simultaneously should be in different RAID groups. If BC pairs are concentrated in only a few RAID groups, host I/O performance may be degraded.

If the disk array is overloaded, increase cache, disk adapters, and/or RAID groups. Consider assigning BC S-VOLs in newly installed RAID groups. If you continue BC operations with an overloaded disk array, host I/O performance may be degraded.

Copy Threshold option

If BC performs copy operations when the disk array workload is heavy, host server I/O performance might be degraded. To minimize this performance degradation, enable **Copy Threshold**, which temporarily stops all BC copy operations when the disk array has a heavy workload. Copy operations that are stopped by the Copy Threshold option resume when the disk array workload is lighter.

This option is different from the **Host I/O Performance** option ([Host I/O Performance option](#)), because it is effective only when the disk array workload is heavy.

 **NOTE:**

Contact your HP support account representative for more information about the Copy Threshold option.

In addition to BC operations, Copy Threshold temporarily stops copy operations for the following applications when the disk array workload is heavy:

- Auto LUN XP
- ShadowImage for z/OS
- Hitachi FlashCopy Mirroring
- Hitachi FlashCopy Mirroring Version 2
- Snapshot XP
- Flex Copy XP

Cascade pairs

The BC cascade function adds a second layer of pairs onto the first layer of original BC pairs. Use these two layers of pairs (L1 and L2) to create and maintain up to nine copies of one original BC primary volume (P-VOL). See [Cascade function](#) for further information on the cascade function.

BC software on the Command View XP management station

When installed on the Command View XP management station, the BC software displays BC information and performs BC operations. The Command View XP management station can be attached to multiple disk arrays. The Command View XP management station acquires status from and issues commands to BC P-VOLs and S-VOLs.

BC requirements for the array

BC operations provide local copies of UNIX/PC server volumes (LUs) on the disk array. The following table describes the operational requirements for BC.

Table 2 BC operational requirements for the array

Parameter	Requirement
Pair objects	<p>Logical devices (LDEVs): OPEN-x (such as OPEN-3, OPEN-9, OPEN-E, and OPEN-V), including CVS and LUSE volumes. Devices must be installed and configured. The P-VOL and S-VOL must be the same type (for example, OPEN-3 to OPEN-3 is allowed, OPEN-3 to OPEN-9 is not allowed).</p> <p>A custom size P-VOL must be paired with S-VOLs of the same type and capacity. A LUSE P-VOL must be paired with S-VOLs of the same size and structure. For example, if a LUSE P-VOL is connected to volumes of 1GB, 2GB, and 3GB in this order, you must specify the LUSE volume that has exactly the same size and connection order as the S-VOL.</p> <p>BC does not support multiplatform devices (for example, 3390-3A, -3B, -3C). For information about using Snapshot XP pair volumes as Business Copy XP volumes, please refer to <i>Snapshot XP User's Guide</i>.</p> <p>Snapshot XP pairs, virtual volumes, and pool volumes cannot be specified as P-VOLs or S-VOLs.</p> <p>Journal volumes for HP StorageWorks Continuous Access XP Journal cannot be specified as P-VOLs or S-VOLs.</p> <p>Volumes that form a Flex Copy XP pair cannot be specified as P-VOLs. A Flex Copy XP P-VOL can be specified as a Business Copy XP S-VOL under certain conditions. Refer to the <i>HP StorageWorks Flex Copy XP user guide</i> for more information.</p> <p>BC operations can be performed with External Storage XP operations to create pairs that use the external volumes as BC S-VOLs (or mirroring volumes) under the same conditions applied to the volumes in the local disk array. Refer to the <i>HP StorageWorks External Storage XP user guide</i> for more information.</p>
Number of copies	<p>Maximum of three copies (S-VOLs) per primary volume (P-VOL). Maximum of one P-VOL per S-VOL (P-VOLs cannot share an S-VOL).</p> <p>An additional six copies can be created by using the BC cascade function.</p>
Maximum number of pairs ¹	<p>A maximum of 8,192 pairs (8,192 P-VOLs and 8,192 S-VOLs) can be created per disk array.</p> <p>NOTE:</p> <p>The maximum number of pairs equals the total number of BC, Snapshot XP, ShadowImage for z/OS, Hitachi FlashCopy Mirroring, Hitachi FlashCopy Mirroring Version 2, Auto LUN XP, and Flex Copy XP volume pairs.</p> <p>When you use RAID Manager, the command device reduces the maximum number of BC pairs to 8,191 (8,191 P-VOLs and 8,191 S-VOLs) when configuring pairs in a ratio of 1 S-VOL to 1 P-VOL.</p> <p>If some BC pairs contain LUSE volumes, or if an application other than BC is used, the maximum number of BC pairs might be less than 8,192 (or 8,191).</p> <p>Refer to Maximum number of pairs for the array Maximum number of pairs for the array" on page 15 for information about calculating the maximum number of BC pairs.</p>
Maximum number of S-VOLs	8,192 (8,191 if RAID Manager is used).
MU (mirror unit) numbers of cascade pairs	<p>L1 pairs = 0, 1, and 2 (a total of 3 pairs)</p> <p>L2 pairs = 1 and 2 (a total of 2 pairs)</p>
Combinations of RAID levels (primary-secondary)	All combinations supported: RAID1-RAID1, RAID5-RAID5, RAID6-RAID6, RAID1-RAID5, RAID1-RAID6, RAID5-RAID1, RAID5-RAID6, RAID6-RAID1, RAID6-RAID5.
Dynamic sparing and automatic correction copy	If a failure occurs requiring the disk array to utilize dynamic sparing or automatic correction copy, the status of the paired volumes associated with the failed physical device is not affected.

Parameter	Requirement
Physical device (PDEV) maintenance	Maintenance of a PDEV that is not used by BC does not affect BC operations or the status of BC pairs. If a PDEV contains LDEVs used by BC, you can maintain that PDEV independently of the BC operations and pair status.
Logical device (LDEV) maintenance	If the status of a BC pair is COPY(PD), PAIR, PSUS, PSUS(SP), COPY(SP), COPY(RS), or COPY(RS-R), maintenance for the LDEVs used by that pair is restricted. Maintenance is also restricted for LDEVs with the Reserve attribute. To maintain these LDEVs, suspend or delete the BC pair, or reset (unreserve) the Reserve attribute.
Cache maintenance	If disk array cache maintenance is performed during a period of high I/O usage, one or more BC pairs may be suspended. Reduce the I/O load before cache maintenance.
Point-in-time backup	For pairs in PAIR status, host I/Os are copied to S-VOLs asynchronously. To synchronize a pair and access the S-VOL as soon as possible, take the P-VOL offline and split the pair before using the S-VOL. If the P-VOL cannot be taken offline, a P.I.T. backup still occurs if a pairsplit is issued. When all data on the P-VOL (up to the pairsplit time) is copied to the S-VOL, the pair is split and the S-VOL becomes available for use (R/W). The operation may take longer to complete if high write activity from the host to the P-VOL is occurring. A P.I.T. backup can also be performed by issuing a pairsplit to P-VOLs in the SMPL (simplex) state (in this case the pairsplit operation simultaneously creates and splits new BC pairs.).
Failures	When a failure of any kind prevents a BC copy operation from completing, the disk array suspends the pair. If an LDEV failure occurs, the disk array suspends the pair. If a PDEV failure occurs, BC pair status is not affected because of the RAID architecture, but copy pace may be degraded.
Maintenance/upgrade	Under certain conditions, BC volume pairs may need to be re-established.

¹Maximum number of pairs per disk array depends on installed firmware version.

Maximum number of pairs for the array

When you create BC pairs, resources called *differential tables* are required. The number of differential tables available in one disk array depends on the array's amount of shared memory for differential tables.

- You can use 13,652 differential tables if no additional shared memory for differential tables is installed.
- You can use 30,718 differential tables if additional shared memory for differential tables is installed.

NOTE:

Contact your HP account support representative for more information about adding additional shared memory.

NOTE:

The maximum number of pairs you can create is 8,192, no matter how much shared memory for differential tables is available. If a command device is installed in order to use RAID Manager, the maximum number of pairs is 8,191 (when configuring pairs of 1 P-VOL: 1 S-VOL ratio).

To calculate the maximum number of BC pairs, you must calculate how many differential tables are required to create BC pairs, and compare the result with the number of differential tables in the disk array.

The following applications also use differential tables:

- ShadowImage for z/OS
- Hitachi FlashCopy Mirroring

- Hitachi FlashCopy Mirroring version 2
- Flex Copy XP
- Auto LUN XP
- Snapshot XP

For more information, refer to the following documents:

- For ShadowImage for z/OS, Hitachi FlashCopy Mirroring, and Hitachi FlashCopy Mirroring Version 2, see the *Hitachi ShadowImage for z/OS user guide*.
- For Flex Copy XP, see “Calculating the maximum number of Flex Copy XP copy pairs”.
- For Auto LUN XP, see “Calculating the number of Auto LUN XP concurrent migration plans”.
- For Snapshot XP, see the *HP StorageWorks Snapshot XP user guide*.

If BC is used in the same disk array as any of these applications, the number of available differential tables for BC pairs is the number of differential tables in the disk array minus the number of differential tables used by other applications.

If only BC uses differential tables, the following section describes how to calculate the number of differential tables required for one BC pair, and the conditions you need to consider when calculating the number of BC pairs that you can create.

 **NOTE:**

You can use RAID Manager's **inqraid** command to query the number of differential tables required when you create BC pairs. You can also use this command to query the number of unused differential tables in the disk array. For more information about the **inqraid** command, see the *HP StorageWorks RAID Manager XP user guide*.

Calculating the number of differential tables for one BC pair

When you create a BC pair, the number of required differential tables changes according to the emulation type of the volumes. Use the equations in [Table 3](#) to calculate the total number of differential tables per pair.

Table 3 Total number of differential tables per pair

Emulation type	Equation
OPEN-3	Total number of differential tables per pair = $[(X \div 48) + (Y \times 15)] \div Z$ <ul style="list-style-type: none"> (X): Volume capacity (KB) ^{1, 2} (Y): Number of control cylinders associated with the emulation type (see Table 4) (Z): Number of slots that can be managed by a differential table (61,312)
OPEN-8	
OPEN-9	
OPEN-E	
OPEN-L	<p>NOTE:</p> <p>Round the result of the calculation up to the nearest whole number.</p> <p>For example, if the volume's emulation type is OPEN-3, and it is not a custom volume, the volume capacity (X) is the default volume size, 2,403,360 KB, and total number of differential tables is calculated as follows:</p> $[(2,403,360 \div 48) + (8 \times 15)] \div 61,312 = 0.81860$ <p>When you round to the nearest whole number, the result is 1. Therefore, the total number of differential tables for a pair is 1 when the emulation type is OPEN-3.</p>
OPEN-V	<p>Total number of differential tables per pair = $(X \div 256) \div (Z)$</p> <ul style="list-style-type: none"> (X): Volume capacity (KB)² (Z): Number of slots that can be managed by a differential table (61,312) <p>NOTE:</p> <p>Round the result of the calculation up to the nearest whole number.</p> <p>For example, if the volume capacity (X) is the maximum OPEN-V volume capacity of 3,019,898,880 KB, the total number of differential tables is calculated as follows:</p> $(3,019,898,880 \div 256) \div 61,312 = 192.40084$ <p>When you round up to the nearest whole number, the result is 193. Therefore, the total number of differential tables for a pair is 193 when the emulation type is OPEN-V.</p>

¹If the selected volume is a CVS (custom volume size) volume, use the capacity of the custom volume instead of the default volume capacity for the emulation type. Since the OPEN-L emulation type does not support custom volume operations, you must use the default volume capacity of OPEN-L for X.

²1 KB equals 1024 bytes.

Table 4 Number of control cylinders according to emulation types

Emulation type	Number of control cylinders
OPEN-3	8 (5,760 KB)
OPEN-8	27 (19,440 KB)
OPEN-9	
OPEN-E	19 (13,680 KB)
OPEN-L	7 (5,040 KB)
OPEN-V	0 (0 KB)

[Table 5](#) shows the relationship between emulation type, capacity, and differential tables. [Table 6](#) shows the number of differential tables used in OPEN-V.

Table 5 Relationship between emulation type, capacity, and differential tables

Emulation type	Capacity ¹	Differential tables per pair
OPEN-3	Does not depend on capacity	1
OPEN-9	Up to 2.7GB	1
	Up to 5.5GB	2
	Up to 6.8GB	3
OPEN-E	Up to 2.7GB	1
	Up to 5.5GB	2
	Up to 8.4GB	3
	Up to 11.2GB	4
	Up to 13.5GB	5
OPEN-L	33.9GB	13
OPEN-V	See Table 6	

¹ 1 GB = 1024³ Bytes

Table 6 Number of differential tables used in OPEN-V

Capacity ¹	Differential tables	Capacity ¹	Differential tables	Capacity ¹	Differential tables
Up to 14.9GB	1	Up to 493.9GB	33	Up to 972.9GB	65
Up to 29.9GB	2	Up to 508.9GB	34	Up to 987.9GB	66
Up to 44.9GB	3	Up to 523.9GB	35	Up to 1,002.8GB	67
Up to 59.8GB	4	Up to 538.8GB	36	Up to 1,017.8GB	68
Up to 74.8GB	5	Up to 553.8GB	37	Up to 1,032.8GB	69
Up to 89.8GB	6	Up to 568.8GB	38	Up to 1,047.8GB	70
Up to 104.7GB	7	Up to 583.7GB	39	Up to 1,062.7GB	71
Up to 119.7GB	8	Up to 598.7GB	40	Up to 1,077.7GB	72
Up to 134.7GB	9	Up to 613.7GB	41	Up to 1,092.7GB	73
Up to 149.6GB	10	Up to 628.7GB	42	Up to 1,107.6GB	74
Up to 164.6GB	11	Up to 643.6GB	43	Up to 1,122.6GB	75
Up to 179.6GB	12	Up to 658.6GB	44	Up to 1,137.6GB	76
Up to 194.5GB	13	Up to 673.5GB	45	Up to 1,152.5GB	77
Up to 209.5GB	14	Up to 688.6GB	46	Up to 1,167.6GB	78
Up to 224.5GB	15	Up to 703.5GB	47	Up to 1,182.5GB	79
Up to 239.4GB	16	Up to 718.4GB	48	Up to 1,197.4GB	80
Up to 254.4GB	17	Up to 733.4GB	49	Up to 1,212.4GB	81
Up to 269.4GB	18	Up to 748.4GB	50	Up to 1,227.4GB	82
Up to 284.3GB	19	Up to 763.4GB	51	Up to 1,242.5GB	83
Up to 299.3GB	20	Up to 778.3GB	52	Up to 1,257.3GB	84
Up to 314.3GB	21	Up to 793.3GB	53	Up to 1,272.3GB	85
Up to 329.3GB	22	Up to 803.3GB	54	Up to 1,287.3GB	86

Capacity ¹	Differen- tial tables	Capacity ¹	Differen- tial tables	Capacity ¹	Differen- tial tables
Up to 344.2GB	23	Up to 823.2GB	55	Up to 1,302.2GB	87
Up to 359.2GB	24	Up to 838.2GB	56	Up to 1,317.2GB	88
Up to 374.2GB	25	Up to 853.2GB	57	Up to 1,332.2GB	89
Up to 389.1GB	26	Up to 868.1GB	58	Up to 1,347.1GB	90
Up to 404.1GB	27	Up to 883.1GB	59	Up to 1,362.1GB	91
Up to 419.1GB	28	Up to 898.1GB	60	Up to 1,377.1GB	92
Up to 434.0GB	29	Up to 913.0GB	61	Up to 1,392.0GB	93
Up to 449.0GB	30	Up to 928.0GB	62	Up to 1,407.0GB	94
Up to 464.0GB	31	Up to 943.0GB	63	Up to 1,422.0GB	95
Up to 478.9GB	32	Up to 957.9GB	64	Up to 1,436.9GB	96
Up to 1,451.9GB	97	Up to 1,945.9GB	130	Up to 2,439.9GB	163
Up to 1,466.9GB	98	Up to 1,960.9GB	131	Up to 2,454.8GB	164
Up to 1,481.8GB	99	Up to 1,975.8GB	132	Up to 2,469.8GB	165
Up to 1,496.8GB	100	Up to 1,990.8GB	133	Up to 2,484.8GB	166
Up to 1,511.8GB	101	Up to 2,005.8GB	134	Up to 2,499.7GB	167
Up to 1,526.8GB	102	Up to 2,020.7GB	135	Up to 2,514.7GB	168
Up to 1,541.7GB	103	Up to 2,035.7GB	136	Up to 2,529.7GB	169
Up to 1,556.7GB	104	Up to 2,050.7GB	137	Up to 2,544.6GB	170
Up to 1,571.7GB	105	Up to 2,065.6GB	138	Up to 2,559.6GB	171
Up to 1,586.6GB	106	Up to 2,080.7GB	139	Up to 2,574.6GB	172
Up to 1,601.6GB	107	Up to 2,095.6GB	140	Up to 2,589.5GB	173
Up to 1,616.6GB	108	Up to 2,110.5GB	141	Up to 2,604.5GB	174
Up to 1,631.5GB	109	Up to 2,125.5GB	142	Up to 2,619.5GB	175
Up to 1,646.5GB	110	Up to 2,140.5GB	143	Up to 2,634.4GB	176
Up to 1,661.5GB	111	Up to 2,155.4GB	144	Up to 2,649.4GB	177
Up to 1,676.4GB	112	Up to 2,170.4GB	145	Up to 2,664.4GB	178
Up to 1,691.4GB	113	Up to 2,185.4GB	146	Up to 2,679.3GB	179
Up to 1,706.4GB	114	Up to 2,200.4GB	147	Up to 2,694.3GB	180
Up to 1,721.4GB	115	Up to 2,215.3GB	148	Up to 2,709.3GB	181
Up to 1,736.3GB	116	Up to 2,230.3GB	149	Up to 2,724.3GB	182
Up to 1,751.3GB	117	Up to 2,245.3GB	150	Up to 2,739.2GB	183
Up to 1,766.3GB	118	Up to 2,260.2GB	151	Up to 2,754.2GB	184
Up to 1,781.2GB	119	Up to 2,275.2GB	152	Up to 2,769.2GB	185
Up to 1,796.2GB	120	Up to 2,290.2GB	153	Up to 2,784.1GB	186
Up to 1,811.2GB	121	Up to 2,305.1GB	154	Up to 2,799.1GB	187
Up to 1,826.1GB	122	Up to 2,320.1GB	155	Up to 2,814.1GB	188
Up to 1,841.1GB	123	Up to 2,335.1GB	156	Up to 2,829.0GB	189

Capacity ¹	Differ- tial tables	Capacity ¹	Differ- tial tables	Capacity ¹	Differ- tial tables
Up to 1,856.1GB	124	Up to 2,350.0GB	157	Up to 2,844.0GB	190
Up to 1,871.0GB	125	Up to 2,365.0GB	158	Up to 2,859.0GB	191
Up to 1,886.0GB	126	Up to 2,380.0GB	159	Up to 2,873.9GB	192
Up to 1,901.0GB	127	Up to 2,394.9GB	160	Up to 2,880.0GB	193
Up to 1,915.9GB	128	Up to 2,409.9GB	161		
Up to 1,930.9GB	129	Up to 2,424.9GB	162		

¹ 1 GB = 1024³ Bytes

If you intend to create pairs with volumes of different emulation types, the maximum number of pairs you can create depends on the following conditions.

 **NOTE:**

For more information about calculating total number of differential tables per pair, see [Table 3](#).

Calculating the number of BC pairs if LUSE is not used

Use the following equation to calculate whether the desired number of BC pairs can be created:

$\Sigma\{(a) \times (\text{number of BC Pairs})\} \leq (B)$, where:

- (a) is the required number of differential tables per pair (see [Table 3](#)).
- (number of BC pairs) is the number of BC pairs you want to create.
- (B) is number of differential tables in the disk array.
 - (B) = 13,652 when additional shared memory for differential tables is not installed.
 - (B) = 30,718 when additional shared memory for differential tables is installed.

For example, if you create 10 pairs of OPEN-3 volumes and 20 pairs of OPEN-V volumes in a disk array that does not have additional shared memory for differential tables, use the following equation:

$$1 \times 10 + 193 \times 20 = 3870 \leq 13,652$$

Since 3,870 is less than 13,652, 10 pairs of OPEN-3 volumes and 20 pairs of OPEN-V volumes can be created.

 **NOTE:**

When the emulation type is OPEN-3, and the capacity of the volume is 2,403,360 KB, the number of differential tables required for a pair is 1. When the emulation type is OPEN-V, and the capacity of the volume is 3,019,898,880 KB, the number of differential tables required for a pair is 193.

Calculating the number of BC pairs if LUSE is used

Use the following equation to calculate whether the desired number of BC pairs can be created:

$\Sigma[\Sigma\{(a) \times (\text{number of volumes that form LUSE volumes})\} \times (\text{number of BC pairs})] \leq (B)$, where:

- (a) is the required number of differential tables for each volume that forms the LUSE volume.

When you use LUSE volumes to create a BC pair, every volume that forms the LUSE volume uses the differential tables as a pair. For example, if you create a BC pair by using LUSE volumes that are created by combining two OPEN-V volumes, you need differential tables for two OPEN-V pairs.

- (B) is number of differential tables in the disk array.
 - (B) = 13,652 when additional shared memory for differential tables is not installed.

- (B) = 30,718 when additional shared memory for differential tables is installed.

For example, if you create 10 pairs of LUSE volumes consisting of three OPEN-3 volumes, use the following equation:

$$(1 \times 3) \times 10 = 30 \leq 13,652$$

Since 30 is less than 13,652, 10 pairs of LUSE volumes consisting of three OPEN-3 volumes can be created.



NOTE:

When the emulation type is OPEN-3, and the capacity of the volume is 2,403,360 KB, the number of differential tables required for a pair is 1.

BC operations

Set reserve attribute operation

This operation reserves a volume so it can be used as a BC S-VOL. Reserved volumes can only be used as BC S-VOLs. The disk array rejects all write operations to reserved volumes (unless in split (PSUS) status or PSUS(SP)). You can reserve up to 4,095 volumes in one disk array. Use the Set Reserve Attribute window (see [Setting reserve attributes](#)) to reserve volumes for use as BC S-VOLs.

A volume might be reserved for BC to ensure that a server does not mount it before BC can use it in a pair. BC cannot use a volume as an S-VOL if it is being used by a server.



NOTE:

BC leaf volumes (L2 cascade pair) also function as S-VOLs and must be reserved prior to being assigned to an L2 cascade pair.

Reset reserve attribute operation

This operation unreserves a volume so it can be mounted and accessed by all hosts. After you reset the reserve attribute, the disk array accepts all subsequent I/O operations to the volume. Use the Reset Reserve Attribute window (see [Resetting reserve attributes](#)) to unreserve volumes.

Paircreate operation

This operation establishes the new BC pairs. The volume that will be the P-VOL must be in the SMPL (simplex) state, and the volume that will be the S-VOL must be in the SMPL state before being added to a BC pair.



NOTE:

You can reserve the S-VOL before creating a pair, but you can also create a pair with an unreserved S-VOL. Use the Paircreate window (see [Creating BC pairs \(Paircreate\)](#)) to create new BC volume pairs.

Initial copy operation

This operation occurs when you create a new volume pair (see [Figure 2](#)). The BC initial copy operation copies all data on the P-VOL to the associated S-VOL. The P-VOL remains available to all hosts for read and write I/Os throughout the initial copy operation. After the initial copy is complete, the update copy operation duplicates write operations performed on the P-VOL during the initial copy operation at the S-VOL.

Before the initial copy operation, the status of a pair is SMPL. The status of the pair is COPY(PD) (PD = pending) while the initial copy operation is in progress. The status changes to PAIR when the initial copy is complete. Write operations performed on the P-VOL during the initial copy operation are duplicated at the S-VOL by update copy operations after the initial copy is complete.

CAUTION:

Even if a copy operation is completed without any host I/O, the data in the P-VOL and S-VOL may not be identical. Whether the P-VOL and the S-VOL have the same data depends on the condition of the disk array. To make the P-VOL and S-VOL data the same, split the pair and make the pair status PSUS.

NOTE:

When creating pairs, you can select the pace for the initial copy operation: slower, medium, and faster. The slower pace minimizes the impact of BC operations on disk array I/O performance, while the faster pace completes the initial copy operation as quickly as possible.

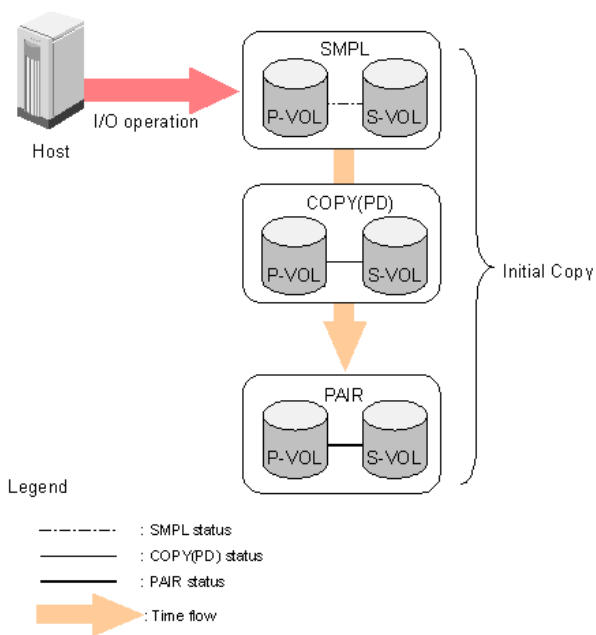


Figure 2 Adding a pair in BC

Update copy operation

This operation updates the S-VOL of a BC pair after the initial copy operation is complete. Since a P-VOL remains available to all hosts for read and write I/Os during the initial copy operation, the P-VOL might be updated during the operation. Therefore, when the status of the pair changes to PAIR after the initial copy operation is complete, the update copy operation takes place and the P-VOL's differential data is copied to the S-VOL. Update copy operations take place only for duplex pairs (status = PAIR). As write I/Os are performed on a duplex P-VOL, the disk array stores a map of the P-VOL's differential data, and performs update copy operations periodically based on the amount of differential data present on the P-VOL and the elapsed time between update copy operations. [Figure 3](#) illustrates an update copy operation in a BC pair with only one S-VOL.

△ CAUTION:

Even if a copy operation is completed without any host I/O, the data in the P-VOL and S-VOL may not be identical. Whether the P-VOL and the S-VOL have the same data depends on the condition of the disk array. To make the P-VOL and S-VOL data the same, split the pair and make the pair status PSUS.

NOTE:

- Update copy operations are not performed for pairs with the following status: COPY(PD) (*pending duplex*), COPY(SP) (*steady split pending*), PSUS(SP) (*quick split pending*), PSUS (*split*), COPY(RS) (*resync*), COPY(RS-R) (*resync-reverse*), and PSUE (*suspended*).
- Update copy operations do not occur every time a host issues a write I/O operation to the P-VOL of a BC pair. BC update copy operations are performed asynchronously according to the differential bitmap, which is stored in shared memory.
- If shared memory is lost (for example, offline micro exchange or volatile PS on), the differential bitmap is also lost. In this case, the disk array treats the entire BC P-VOL (S-VOL for COPY(RS) pairs) as difference data and recopies all data to the S-VOL (P-VOL for COPY(RS) pairs) to ensure proper pair resynchronization. For pairs with COPY(SP) or PSUS(SP) status, the disk array changes the status to PSUE due to the loss of the differential bitmap, also ensuring proper resynchronization of these pairs. If shared memory is lost, allow extra time for BC operations.

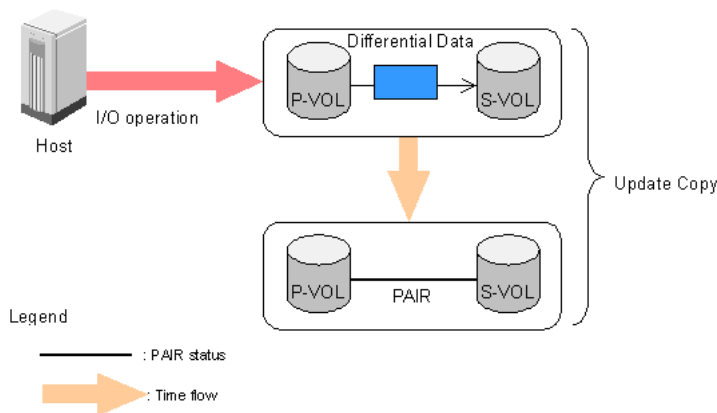


Figure 3 Update copy operation

Cascade function

This function creates a second layer of BC volume pairs (L2) underneath the first layer of BC pairs (L1). Cascade pairs are created by clicking **Cascade** instead of **Set** in the Paircreate window (see [Creating BC pairs \(Paircreate\)](#)). This cascade layering scheme creates up to nine copies of one BC P-VOL. See [Cascade function](#) for further information on cascade pairs and the cascade function.

Pairsplit operation

The BC split capability, by making the BC copies (S-VOLs) available for host access, provides a point-in-time copy that can be used for data backup or to provide real data for test purposes. The BC pairsplit operation copies all P-VOL data or differential data to the S-VOL to make the S-VOL identical to the P-VOL. If there are a lot of host I/Os for the P-VOL, it might take longer to synchronize the P-VOL and S-VOL.

Use the Pairsplit window to split existing BC pairs or to add and split new BC pairs in one step. When you split an existing pair, only the differential data is copied to the S-VOL. When you create and split a

new pair, all P-VOL data is copied to the S-VOL. When the split operation is complete, the pair status changes to PSUS, and you have full read/write access to the split S-VOL (even though it is still reserved).

While the pair is split, the disk array establishes a track map for the split P-VOL **and** S-VOL, and records a list of the changed tracks for **both** volumes. The P-VOL remains fully accessible during the pairsplit operation, and the accessibility of the S-VOL depends on the split type (see [Split type](#)). Pairsplit operations cannot be performed on suspended (PSUE, COPY(RS), or COPY(RS-R)) pairs.

Copy pace

When splitting pairs, you can select the pace for the pending update copy operation: **Slower**, **Medium**, and **Faster**. The slower pace minimizes the impact of BC operations on disk array I/O performance, while the faster pace splits the pairs as quickly as possible.

Split type

When splitting pairs, you can select the split type: **Quick Split** or **Steady Split**.

- When you specify **Quick Split**, the pair status changes to PSUS(SP), and the S-VOL is available immediately for read and write I/Os (even though it is still reserved). All P-VOL data or differential data is copied to the S-VOL in the background.
- When you specify **Steady Split**, the pair status changes to COPY(SP), and all P-VOL data or differential data is copied to the S-VOL. When the operation is complete, the pair status changes to PSUS, and you have full read/write access to the split S-VOL (even though it is still reserved). If you want to finish the copy operation quickly in order to access the S-VOL, take the P-VOL offline before performing the operation.



NOTE:

Refer to the Table 7 for information about read/write operations from host servers to P-VOLS and S-VOLS of BC pairs during a pairsplit operation.

Pairresync operations

To change the status of the pairs from PSUS to PAIR, or from PSUE to PAIR, you must resynchronize the pairs. BC can perform the following types of pairresync operations according to the speed and direction of the resynchronization:

- Normal Copy
- Quick Resync
- Reverse Copy
- Quick Restore

Use the Pairresync pane to resynchronize split and suspended BC pairs. When the pairresync operation starts, the pair status changes to COPY(RS) or COPY(RS-R). When the pairresync is complete, the pair status changes to PAIR. The local disk array resumes BC update copy operations after the pair status changes to PAIR. The P-VOL remains fully accessible during a normal pairresync operation, but is inaccessible to all hosts during a reverse or quick restore pairresync operation. This ensures that data on the P-VOL is identical to data on the S-VOL when the reverse or quick restore pairresync operation completes.



NOTE:

You can use BC to perform normal or quick pairresync operations on split and suspended pairs, but you can perform reverse or quick restore pairresync operations only on split pairs.

Forward pairresync operation

A forward pairresync operation resynchronizes pairs by copying data on P-VOLs to S-VOLs. The following are the types of forward pairresync operations:

- **Normal.** This operation (see Figure 4) resynchronizes the S-VOL with the P-VOL. The copy direction for a normal pairresync operation is P-VOL to S-VOL. The pair status during a normal resync operation is COPY(RS), and the P-VOL remains accessible to all hosts for read and write operations during a normal pairresync.
- **Quick.** This operation speeds up the normal pairresync operation without copying the P-VOL data to the S-VOL. The P-VOL and S-VOL are resynchronized when update copy operations are performed for duplex pairs (status = PAIR). The pair status during a quick pairresync operation is PSUS(SP) until the differential map is copied, and the P-VOL remains accessible to all hosts for read and write operations. The S-VOL becomes inaccessible to all hosts during a quick pairresync operation.

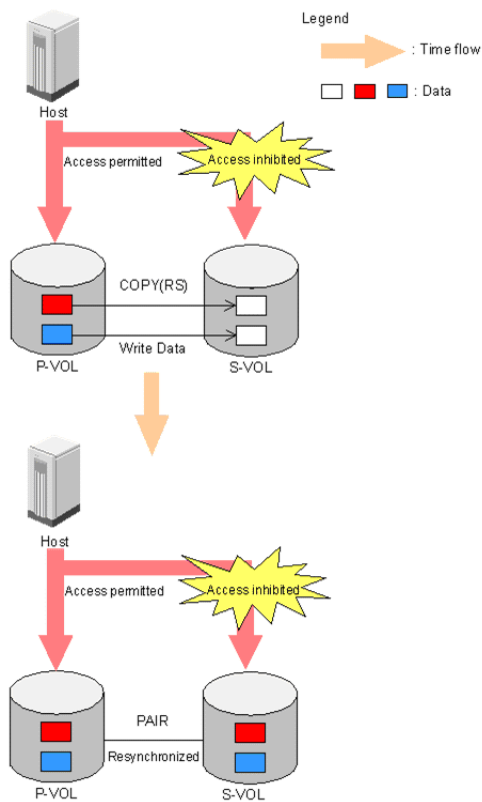


Figure 4 Normal and quick pairresync operations

△ CAUTION:

Even if a copy operation is completed without any host I/O, the data in the P-VOL and S-VOL may not be identical. Whether the P-VOL and the S-VOL have the same data depends on the condition of the disk array. To make the P-VOL and S-VOL data the same, split the pair and make the pair status PSUS.

Backward pairresync operation

A backward pairresync operation resynchronizes pairs by copying data on S-VOLs to P-VOLs. The following are the types of backward pairresync operations:

- **Reverse.** This operation (see [Figure 5](#)) synchronizes the P-VOL with the S-VOL. The copy direction for a reverse pairresync operation is S-VOL to P-VOL. [Table 7](#) shows the requirements for reverse and quick restore pairresync operations. If you perform these operations on pairs that do not meet the requirements, the reverse copy or quick restore command is rejected. The pair status during a reverse resync operation is COPY(RS-R), and the P-VOL and S-VOL become inaccessible to all hosts for write operations during a reverse pairresync operation. When the reverse pairresync is complete, the P-VOL becomes accessible. The reverse pairresync operation can only be performed on split pairs (PSUS status), not on suspended pairs (PSUE status). The reverse pairresync operation cannot be performed on L2 cascade pairs.

 **NOTE:**

The P-VOL remains read-enabled during the reverse pairresync operation only to enable the host to recognize the volume. Data on the P-VOL is not guaranteed until the reverse pairresync operation is complete and the status changes to PAIR.

-
- **Quick Restore.** This operation ([Figure 5](#)) speeds up reverse resync by changing the volume map in the disk array to swap the contents of the P-VOL and S-VOL without copying the S-VOL data to the P-VOL. The P-VOL and S-VOL are resynchronized when update copy operations are performed for pairs in PAIR status. The pair status during a quick restore operation is COPY(RS-R) until the volume map change is complete. The P-VOL and S-VOL become inaccessible to all hosts for write operations during a quick restore operation. Quick restore cannot be performed on L2 cascade pairs or on suspended pairs (PSUE status). [Table 7](#) shows the requirements for reverse and quick restore pairresync operations. If you perform these operations on pairs that do not meet the requirements, the reverse copy or quick restore command is rejected.

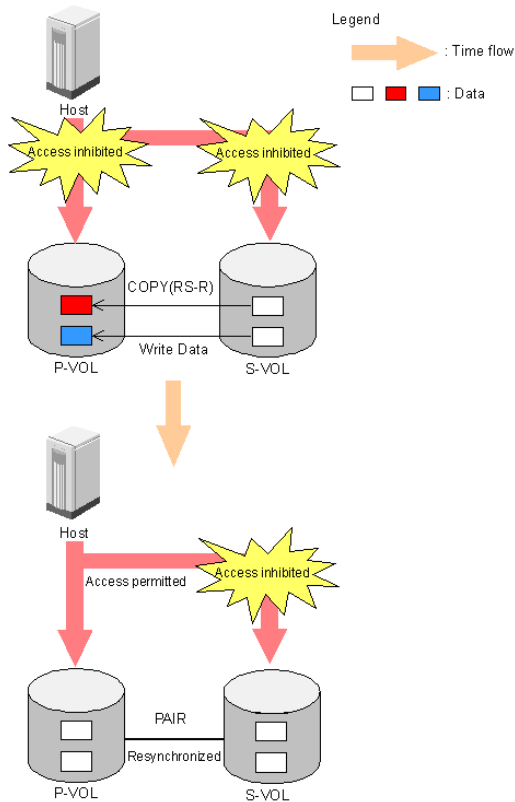


Figure 5 Reverse and quick restore pair operations

NOTE:

The P-VOL remains read-enabled during the quick restore operation only to enable the host to recognize the volume. Data on the P-VOL is not guaranteed until the quick restore operation is complete and the status changes to PAIR.

NOTE:

When a quick restore operation is in progress, the array management user interface may display old configuration information. To update the information in the user interface, wait for the quick restore operation to finish, and click **Refresh**.

CAUTION:

During a quick restore operation, the **RAID levels**, **HDD types**, and **Cache LUN** settings of the P-VOL and S-VOL are exchanged. For example, if the P-VOL has a RAID-1 level and the S-VOL has a RAID-5 level, the quick restore operation changes the P-VOL to RAID-5 and the S-VOL to RAID-1.

To avoid any performance impact due to the quick restore operation

1. Ensure that the P-VOL and S-VOL have the same RAID level and HDD type before performing the quick restore operation. To restore the original volume designations after a quick restore, stop host I/Os to the pair, split the pair, perform the quick restore operation for that pair again, and restart host I/Os to the pair.

2. Because Cache LUN settings are exchanged during a quick restore operation, you must perform one of the following operations. If you do not, the change of location of cache residence areas may cause I/O performance to the Cache LUN data to be down.
 - Set the same Cache LUN settings (locations) for the P-VOL and S-VOL before performing the quick restore operation.
 - Release the Cache LUN settings of the P-VOL and S-VOL before the quick restore operation, and reset the Cache LUN settings of the P-VOL and S-VOL after the pair changes to PAIR status as a result of the quick restore operation.

△ CAUTION:

If you do not want the P-VOL and S-VOL to be resynchronized after the quick restore operation, set the Swap&Freeze option before performing the quick restore operation (see [Swap&Freeze option](#)).

Table 7 shows the requirements for reverse and quick restore pairresync operations. If you perform these operations on pairs that do not fulfill the requirements, the reverse copy or quick restore command is rejected.

Table 7 Requirements for reverse or quick restore pairresync operations

Parameter	Requirements
Pair status	The specified pair must be in the PSUS state. All other pairs sharing the same P-VOL as the specified pair must also be in the PSUS or PSUE state.
Pair type	Whether you can execute a quick restore command for a pair consisting of customized and normal volumes depends on the volume's emulation type.
Shared BC/Continuous Access XP volume	If BC and Continuous Access XP pairs share the same volume, and the Continuous Access XP pair is not suspended, you cannot perform reverse and quick restore pairresync operations.
Shared BC/Continuous Access XP Journal volume	If the BC and Continuous Access XP Journal pairs share the same volume, and the Continuous Access XP Journal pair is not suspended, you cannot perform the reverse and quick restore pairresync operations.

📋 NOTE:

A Continuous Access XP Journal P-VOL means a Continuous Access XP Journal primary data volume. A Continuous Access XP Journal S-VOL means a Continuous Access XP Journal secondary data volume.

△ CAUTION:

If a reverse or quick restore resync operation ends abnormally, or a Pairsplit-E (PSUE) is requested during a reverse or quick restore resync operation, the status of other BC pairs sharing the same P-VOL does not change.

📋 NOTE:

When a reverse or quick restore pairresync operation is in progress, you cannot perform paircreate, pairsplit, or pairresync operations for any other pairs sharing the same P-VOL (pairsplit-S and pairsplit-E are allowed).

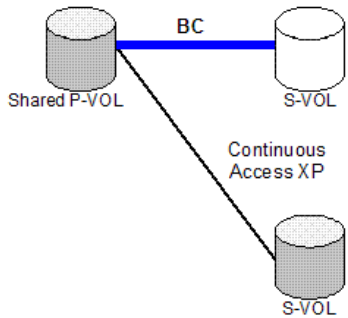


Figure 6 BC P-VOL forming pair with Continuous Access XP S-VOL and external S-VOL, respectively

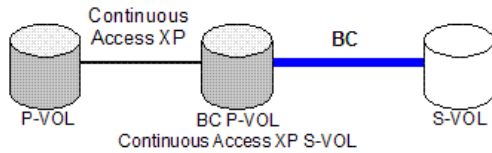


Figure 7 BC P-VOL forming pair with external S-VOL and shared as Continuous Access XP S-VOL

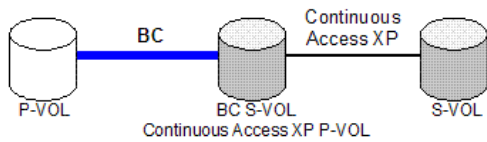


Figure 8 BC S-VOL forming pair with external P-VOL and shared as Continuous Access XP P-VOL

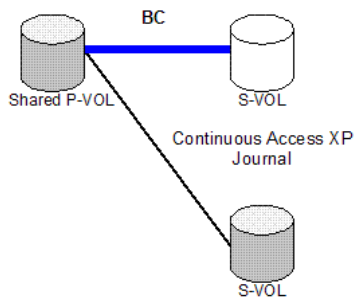


Figure 9 BC P-VOL forming pair with CA XP Jou. S-VOL and Ext. S-VOL, respectively

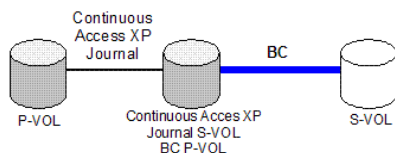


Figure 10 BC P-VOL forming pair with external S-VOL and shared as Continuous Access XP Journal S-VOL

Use the Pairresync window to resynchronize split and suspended BC pairs. When the pairresync operation starts, the pair status changes to COPY(RS) or COPY(RS-R). When the pairresync is complete, the pair

status changes to PAIR. The disk array resumes BC update copy operations after the pair status changes to PAIR. The P-VOL remains fully accessible during a normal pairresync operation, but becomes inaccessible to all hosts during a reverse or quick restore pairresync operation. This ensures that data on the P-VOL is identical to data on the S-VOL when the reverse or quick restore pairresync operation completes.

Pair status and time required for pairresync

The pairresync operation can be performed on a split pair or suspended pair. This section describes the relationship between the pair status and the time required for pairresync operations.

- Pairresync for split pair. When a normal/quick pairresync operation is performed on a split pair (status = PSUS), the disk array copies all flagged tracks from the P-VOL to the S-VOL. When a reverse or quick restore pairresync operation is performed on a split pair, the disk array copies all flagged tracks from the S-VOL to the P-VOL. This ensures that the P-VOL and S-VOL are properly resynchronized in the desired direction, and greatly reduces the time needed to resynchronize the pair.
- Pairresync for suspended pair. When a normal/quick pairresync operation is performed on a suspended pair (status = PSUE), the disk array copies all data on the P-VOL to the S-VOL, because all P-VOL tracks were flagged as difference data when the pair was suspended. Reverse and quick restore pairresync operations cannot be performed on suspended pairs. The normal pairresync operation for suspended pairs is equivalent to and takes as long as the BC initial copy operation.

If you perform the quick pairresync operation on the suspended pairs, the update copy operation will be performed and all the data will be copied to the S-VOL. In this case, the update copy operation may take much more time than the initial copy operation.

△ CAUTION:

When resynchronizing pairs, you can select the pace for the pairresync operation: slower, medium, or faster. The slower pace minimizes the impact of BC operations on subsystem I/O performance. The faster pace resynchronizes the pairs as quickly as possible, but it may affect the disk array's I/O performance.

Pairsplit-E operation (suspend)

This operation suspends the BC copy operations to the S-VOL of the pair. You can suspend a BC pair at any time. When a BC pair is suspended (status = PSUE), the disk array stops performing BC copy operations to the S-VOL, continues accepting write I/O operations to the P-VOL, and marks all P-VOL tracks as difference data. When a pairresync operation is performed on a suspended pair, the entire P-VOL is copied to the S-VOL. While the pairresync operation for a split BC pair can be very fast, the pairresync operation for a suspended pair takes as long as the initial copy operation. The reverse and quick restore pairresync operations cannot be performed on suspended pairs.

The disk array automatically suspends a BC pair when it cannot keep the pair mirrored for any reason. When the disk array suspends a pair, sense information is generated to notify the host. The disk array automatically suspends a pair under the following conditions:

- When the volume pair has been suspended (PSUE) or deleted (SMPL) from an open system host using the RAID Manager command line interface.
- When the disk array detects an error condition related to an initial copy operation. When a volume pair with COPY(PD) status is suspended (PSUE), the disk array aborts the initial copy operation, changes the status of the P-VOL and S-VOL to SMPL, accepts all subsequent write I/Os to the S-VOL, and does not keep track of updates.
- When the disk array detects an error condition related to an update copy operation.
- When the P-VOL and/or S-VOL track map in shared memory is lost (for example, due to offline microprogram exchange). This applies to COPY(SP) and PSUS(SP) pairs only. For PAIR, PSUS, COPY(RS), or COPY(RS-R) pairs, the pair is not suspended, but the entire P-VOL (S-VOL for reverse or quick restore pairresync) is marked as difference data.

Use the Pairsplit-E window to suspend BC pairs. When a pair is suspended, the status changes to PSUE. When the pairresync operation starts, the pair status changes to COPY(RS). The P-VOL remains fully accessible while suspended and during the pairresync operation.

Pairsplit-S operation (delete)

This operation stops BC copy operations to the S-VOL of the pair and changes the pair status of both volumes to SMPL. The volumes are not deleted. A BC pair can be deleted at any time except during the quick pairsplit operation (or any status except SMPL status and PSUS(SP) status). After you delete a BC pair, the S-VOL is still not available for write operations until the reserve attribute is reset.

Use the Pairsplit-S window to delete BC pairs. When a BC pair is deleted, pending update copy operations for the pair are discarded, and the status of the P-VOL and S-VOL is changed to SMPL.

△ CAUTION:

The S-VOL of a duplex pair (PAIR status) may not be identical to its P-VOL due to the asynchronous BC update copy operations.

BC options

Use the BC options to extend standard BC operations such as the paircreate and pairresync operations. The following table lists the options that are currently available.

Table 8 BC options types and requirements

Option type	Features	Requirement
Swap&Freeze	Suppresses the update copy. See Swap&Freeze option .	You must change disk array setting to enable the quick restore operation.
Host I/O Performance	Suppresses the BC copy operations. See Host I/O Performance option .	—

NOTE:

The number of available option types depends on the disk array's settings.

Swap&Freeze option

This option allows the S-VOLs of a BC pair to remain unchanged after the quick restore operation. If the quick restore operation is performed on a BC pair with the Swap&Freeze option, update copy operations are suppressed for pairs in PAIR status after the quick restore operation. If the quick restore operation is performed without the Swap&Freeze option, the P-VOL and S-VOL are resynchronized when update copy operations are performed for pairs in PAIR status.

The following figure shows the state of the S-VOL after the quick restore operation with or without the Swap&Freeze option.

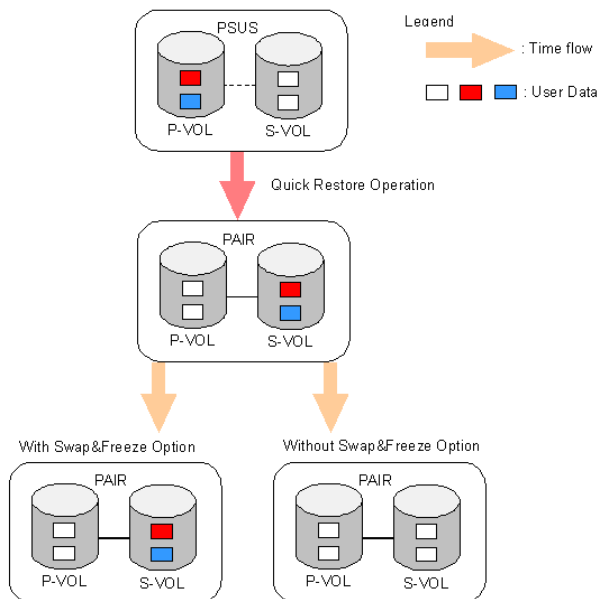


Figure 11 Quick Restore operation with or without Swap&Freeze option

The Quick Restore pairresync operation on a pair with status of PSUS exchanges data in the pair's P-VOL and S-VOL. If you use the Swap&Freeze option when performing the Quick Restore pairresync operation, the update copy operation will not take place after the Quick Restore pairresync operation is complete. Therefore, data on the P-VOL and S-VOL is kept exchanged. If you do not use the Swap&Freeze option when performing the Quick Restore pairresync operation, the update copy operation will take place after the Quick Restore pairresync operation is complete, and data on the P-VOL overwrites data on the S-VOL.

Host I/O Performance option

This option prioritizes host I/O responses over BC copy processing time. When you use the Host I/O Performance option, the disk array suppresses execution of BC copy processing, and consequently host I/O responses improve.

When BC copy processing is suppressed, the time taken for copying increases. Also, if ShadowImage for z/OS pairs exist, host I/O responses might not be faster. In this case, set the Host I/O Performance option for ShadowImage for z/OS as well.

Cascade function

This function creates a second layer of volume pairs underneath the first layer of BC pairs. Pairs created in the first and second layer are called cascaded pairs. Figure 12 illustrates cascaded BC volume pairs. The first cascade layer (L1) is the original BC pair, consisting of one P-VOL (root volume) and up to three S-VOLs (node volumes). In the second cascade layer (L2), the S-VOLs of the original BC pair function as the P-VOLs of the L2 pairs, and each L2 P-VOL can have up to two S-VOLs (leaf volumes). This layering scheme can create up to nine copies of one BC primary volume (P-VOL).

Every volume can have up to three Mirror Unit (MU) numbers associated with it. The MU number designates a pair for which the volume is a member. The MU number is not the number of the pair, but the number of the volume. A pair is made up of two volumes of which each pair member could have the same or different MU numbers.

- MU=0 is the number of a volume for its first pair.
- MU=1 is the number of the same volume for its next pair.
- MU=2 is the number of the same volume for its third pair.
- The MU number of an S-VOL is always MU=0.

For Level 1 (L1) pairs, the root volume could have MU=0, MU=1, and MU=2. For L1 pairs, the associated S-VOLs all have MU=0 because this is the first pair of which they are a member.

For the Level 2 (L2) pairs, the L1 S-VOLs are now all acting as L2 P-VOLs. Because they are already a member of one pair, the next MU number for each of them is MU=1 for their first L2 pair and MU=2 for their second L2 pair. For the S-VOLs associated with each of these pairs, the MU number is once again MU=0 because this is the first pair of which they are a member.

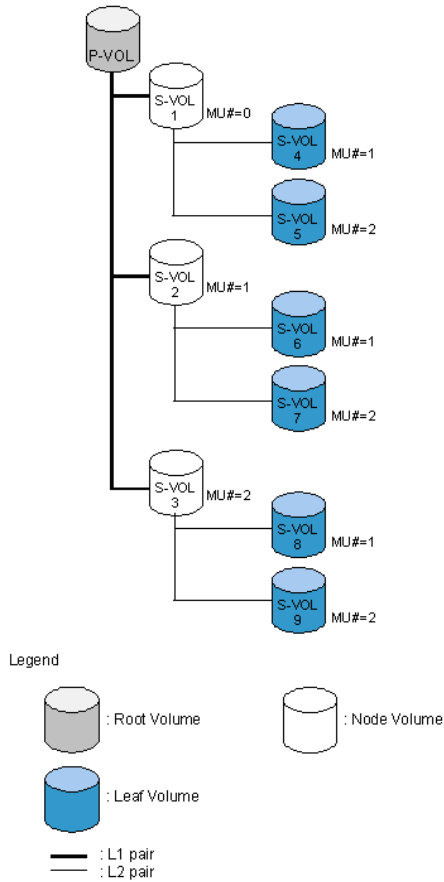


Figure 12 Cascade pairs

When L1 and L2 cascade pairs are created, the P-VOLs and S-VOLs of the cascade pairs are classified using the following terms (as shown in the previous figure):

- The **root volume** is the P-VOL of the L1 pair, which is the original BC pair. You can add up to three S-VOLs (node volumes) to a root volume.
- The **node volume** is the S-VOL (reserved) of an L1 pair and the P-VOL of an L2 pair. You can add up to two S-VOLs (leaf volumes) to a node volume.
- The **leaf volume** is the S-VOL (reserved) of an L2 cascade pair.

Table 9 shows the relationship between L1 pair status and availability of BC pair operations on the associated L2 pairs. To split an L2 pair, you must first split the L1 pair (L1 status = PSUS). The reverse and quick restore pairresync operations cannot be used for L2 pairs. Table 10 shows the relationship between L2 pair status and availability of pair operations on the associated L1 pairs. (CMD RJT = command rejected.) If you delete an L1 pair containing an L2 pair, the L2 pair becomes the L1 pair.

**NOTE:**

- Combining L1 and L2 pairs with Continuous Access XP volumes is allowed; however, Continuous Access XP considers node and leaf volumes as secondary volumes (S-VOLs).
- When a P-VOL is paired with more than one S-VOL, the disk array assumes there are the same number of virtual P-VOLs. For example, when a P-VOL is paired with three S-VOLs, there is only one real P-VOL, but the disk array assumes there are three virtual P-VOLs. A Virtual P-VOL is called an MU (Mirror Unit).
- “MU#” in Figure 12 means MU number, which identifies each MU. MU#=1 under S-VOL1 means the MU number of the P-VOL that is paired with the S-VOL1 is 1.

Table 9 Relationship between L1 pair status and L2 pair operations

L1 Pair Status	L2 Pair Operations					
	Paircreate	Pairsplit	Pairresync	Reverse/ Quick Restore	Pairsplit-E	Pairsplit-S
COPY(PD)	OK	NO (CMD RJT)	OK	NO (CMD RJT)	OK	OK
PAIR	OK	NO (CMD RJT)	OK	NO (CMD RJT)	OK	OK
COPY(SP)	OK	NO (CMD RJT)	OK	NO (CMD RJT)	OK	OK
PSUS(SP)	OK	NO (CMD RJT)	OK	NO (CMD RJT)	OK	OK
PSUS	OK	OK	OK	NO (CMD RJT)	OK	OK
COPY(RS)	OK	NO (CMD RJT)	OK	NO (CMD RJT)	OK	OK
COPY(RS-R)	OK	NO (CMD RJT)	OK	NO (CMD RJT)	OK	OK
PSUE	OK	NO (CMD RJT)	OK	NO (CMD RJT)	OK	OK

Table 10 shows the relationship between the L2 pair status and availability of pair operations on the associated L1 pairs. (CMD RJT = command rejected.) If you delete an L1 pair containing an L2 pair, the L2 pair becomes the L1 pair.

Table 10 Relationship between L2 pair status and L1 pair operations

L2 Pair Status	L1 Pair Operations					
	Paircreate	Pairsplit	Pairresync	Reverse/Quick Restore	Pairsplit-E	Pairsplit-S
COPY(PD)	OK ^{1, 2}	OK	OK	OK	OK	OK
PAIR	OK ^{1, 2}	OK	OK	OK	OK	OK
COPY(SP)	NO ² (CMD RJT)	NO ² (CMD RJT)	NO (CMD RJT)	NO (CMD RJT)	OK	OK
PSUS(SP)	NO ² (CMD RJT)	NO ² (CMD RJT)	NO (CMD RJT)	NO (CMD RJT)	OK	OK
PSUS	OK ^{1, 2}	OK	OK	OK	OK	OK
COPY(RS)	OK ^{1, 2}	OK	OK	OK	OK	OK
COPY(RS-R)	NO ² (CMD RJT)	NO ² (CMD RJT)	—	—	—	—
PSUE	OK ^{1, 2}	OK	OK	OK	OK	OK

¹MU# of L2 node pair member must be 1 or 2.
²Not displayed by the array management interface.

The read/write operation to each volume (root, node, or leaf) from the host is enabled or disabled depending on the status of L1/L2 pairs. The read/write operation from the host can always be performed to the root volume regardless of the status of L1/L2 pairs. Table 11 shows the relationship between read/write operations from host to node volume and status of L1/L2 pairs. Table 12 shows the relationship between read/write operations from host to leaf volume and L2 pair status.

Table 11 Read/write operation (host to the node volume) and L1/L2 pair status

L1 Pair Status	L2 Pair Status					
	COPY(PD)	PAIR	COPY(SP)	PSUS(SP)/PSUS	COPY(RS)	PSUE
COPY(PD)	Read Only	Read Only	Read Only	Read Only	Read Only	Read Only
PAIR	Read Only	Read Only	Read Only	Read Only	Read Only	Read Only
COPY(SP)	Read Only	Read Only	Read Only	Read Only	Read Only	Read Only
PSUS(SP)/PSUS	Read/ Write	Read/ Write	Read/ Write	Read/ Write	Read/ Write	Read/ Write
COPY(RS)	Read Only	Read Only	Read Only	Read Only	Read Only	Read Only
COPY(RS-R)	Read Only	Read Only	Read Only	Read Only	Read Only	Read Only
PSUE	Read Only	Read Only	Read Only	Read Only	Read Only	Read Only

Table 12 indicates the relationship between the read/write operation from the host to the leaf volume and the L2 pair status.

Table 12 Read/write operation (host to the leaf volume) and L2 pair status

COPY	L2 Pair Status				
	PAIR	COPY(SP)	PSUS(SP)/ PSUS	COPY(RS)	PSUE
Read Only	Read Only	Read Only	Read/Write	Read Only	Read Only

At-Time Split function

In the past, a BC pair group split each LUN pair in the group at a slightly different time. If the application data spanned multiple LUNs in the group, there was the chance of data corruption unless the application was stopped before the split. With the At-Time Split function, LUN pairs are split at the same time within the group, which keeps data consistent without having to stop the application.

At this time, the At-Time Split operation is performed using RAID Manager on the UNIX/PC server host. You can use Command View XP or XP Remote Web Console to perform BC pair operations for At-Time Split pairs created by RAID Manager. However, the At-Time Split option in Command View XP or XP Remote Web Console is disabled.

A BC consistency group (CTG) is a user-defined set of BC volume pairs used for the At-Time Split function. This function creates S-VOLs of all P-VOLs in the same consistency group when the pairsplit command is executed.

BC consistency groups and the At-Time Split function have the following restrictions:

- You can configure up to 128 consistency groups in a disk array, including BC consistency groups.
- A number (0–127) is assigned to each consistency group. You can specify a consistency group number when you create BC pairs. If you do not specify a number, the disk array assigns a number automatically.
- You can define up to 4,096 BC pairs in a consistency group. However, for LUSE volumes containing n LDEVs, you should count as n volumes. For more information about LUSE volumes, see the *HP StorageWorks LUN Configuration and Security Manager XP user guide for the XP12000/XP10000*.
- BC pairs and ShadowImage pairs cannot co-exist in the same consistency group.
- To configure BC consistency groups, use the RAID Manager software. However, to confirm the BC consistency group numbers, use BC (see [Volume list](#)).

When the At-Time Split function is enabled, data in all P-VOLs in the same consistency group is copied to the corresponding S-VOLs when the disk array receives the pairsplit request from the host server. The following figure shows an overview of the At-Time Split function.

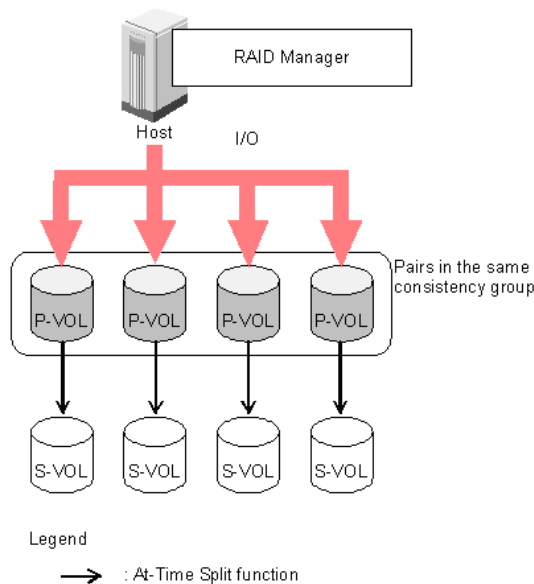


Figure 13 Overview of At-Time Split function

Enabling the At-Time Split function using RAID Manager

1. Create BC At-Time Split pairs as follows:
 - a. Define a consistency group for BC pairs. You cannot define L1 and L2 cascade pairs (see [Cascade function](#)) sharing the same node volume in a consistency group. If you specify such pairs in the same consistency group, the paircreate command will be rejected.
 - b. Specify the At-Time Split option.
 - c. Execute the paircreate command.
2. Execute the pairsplit command on the new BC At-Time Split pairs.

The At-Time Split option is enabled, and data in all P-VOLs in the same consistency group is copied to the corresponding S-VOLs when the disk array receives the pairsplit request.

NOTE:

- You can perform BC pair operations (see [Performing BC operations](#)) from the Command View XP management station or XP Remote Web Console on the BC At-Time Split pairs created by RAID Manager; however, the At-Time Split option is disabled (the pairsplit operation does not ensure creating S VOLS of the P-VOLs in the same consistency groups).
- When the RAID Manager pairsplit operation ends abnormally, all BC pairs in the same consistency group are suspended (status = PSUE).
- When the host server is down or has failed, a consistency group with no BC pairs can be defined. If you execute the paircreate command with the At-Time Split option (-m) under these conditions, the paircreate command might be rejected. In this case, first find a consistency group number that is not used by any pairs on the BC main screen by sorting the **CTG** column (see [Volume list](#)). Next, specify the consistency group number explicitly, and execute the paircreate command with the At-Time Split option using RAID Manager on the host server.
- Do not mix pairs created with the At-Time Split option and pairs not created with the At-Time Split option in the same group defined in the RAID Manager configuration file. If you mix these two types of pairs, the pairsplit operation might terminate abnormally, or the S-VOLs of the P-VOLs in the same consistency group might not be created correctly when the pairsplit request is received.
- If you use the At-Time Split function to split a pair, you can select **Quick Split** or **Steady Split**.

NOTE:

After the pairsplit, response time of the first I/O to each logical unit (LU) can be up to approximately five seconds in the worst case. This worst case should be in a one-to-three BC pair situation and 36 LDEV LUSE configuration.

Pair status

The BC remote console software displays the pair status of all BC volumes (LUs) on the specified port of the connected disk array. The following figure shows the BC pair status transitions and the relationship between pair status and BC operations.

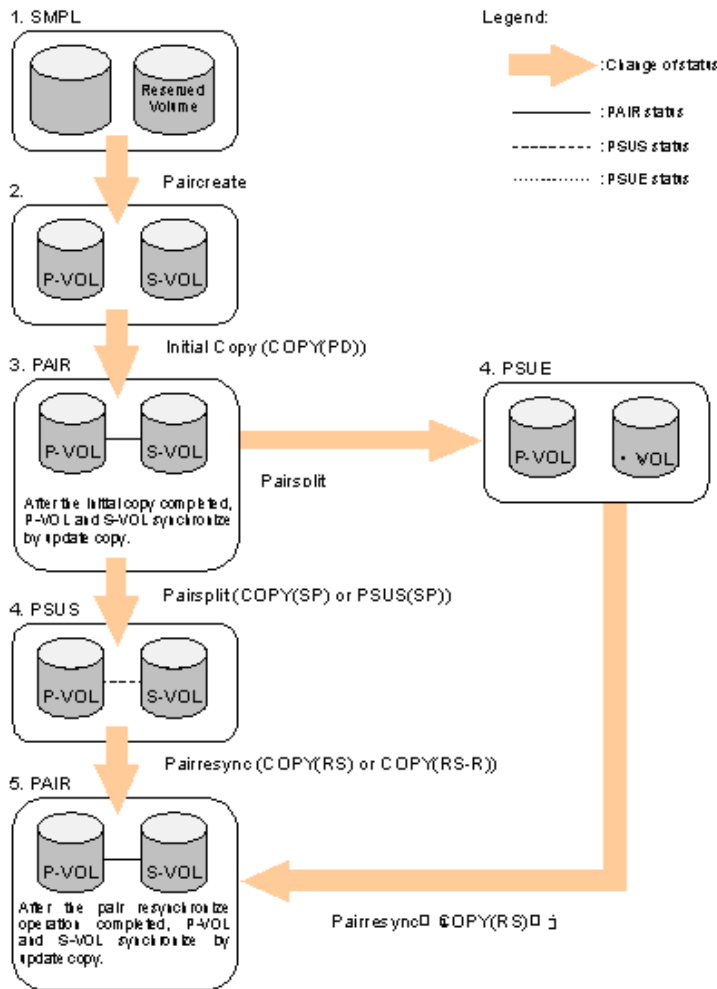


Figure 14 BC pair status transitions

The following describes BC pair status conditions:

1. If a volume is not assigned to a BC pair, its status is SMPL.
2. Select the SMPL volumes for the P-VOL and S-VOL to create a BC pair. When you create a BC pair, the initial copy operation starts. During the initial copy operation, the status of the P-VOL and S-VOL changes to COPY(PD).
3. When the initial copy operation is complete, the pair status becomes PAIR, and the differential data between the P-VOL and the S-VOL is copied by the update copy operation.

4. The following are the types of pair status (PSUS and PSUE) when the pair is not synchronized:
 - When you split a pair (pairsplit), the pair status changes to COPY(SP) or PSUS(SP) for quick pairsplit. During the pairsplit process, the pair status becomes COPY(SP). If you specify Quick Split pairsplit, the pair status becomes PSUS(SP) during the process. When the pairsplit operation is complete, the pair status changes to PSUS and you can access the split S-VOL. The update copy operation is not performed on pairs with status of PSUS.
 - If the disk array cannot maintain PAIR status for any reason or if you suspend the pair (pairsplit-E), the pair status changes to PSUE.

**NOTE:**

- When you specify reverse or quick restore mode for a pairresync operation, the pair status changes to COPY(RS-R) (data is copied in the reverse direction from the S-VOL to the P-VOL). For more information about pairresync operation settings, see [Pairresync operations](#).
 - When you delete a pair (pairsplit-S), the pair status changes to SMPL. You cannot delete a pair with status of PSUS(SP).
-
5. When you start a pairresync operation, the pair status changes to COPY(RS) or COPY(RS-R). When the pairresync operation is complete, the pair status changes to PAIR.

Table 13 BC pair status conditions

Pair Status	Description	S-VOL Access
SMPL	The volume is not assigned to a BC pair. The disk array accepts read and write I/Os for all SMPL volumes that are not reserved.	N/A (there is no S-VOL yet).
COPY(PD)	The initial copy operation is in progress. The disk array continues to accept read and write operations for the P-VOL, but stops accepting write operations for the S-VOL. No update copy operations are performed.	Read only.
PAIR	The initial copy operation is complete, and the disk array performs asynchronous update copy operations from the P-VOL to the S-VOL as needed. The P-VOL and S-VOL of a duplex pair (PAIR status) may not be identical. The disk array rejects all write I/Os for S-VOLs with status PAIR.	Read only.
COPY(SP)	The status becomes COPY(SP) when the steady split mode is selected for the pairsplit operation. All P-VOL updates prior to the pairsplit command are copied to the S-VOL. When these updates are complete, the split S-VOL is identical to the state of the P-VOL when the split started. The disk array rejects all write I/Os for COPY(SP) S-VOLs.	Read only.
PSUS(SP)	The status becomes PSUS(SP) when the quick split mode is selected for the pairsplit operation. Only the P-VOL differential data is copied to the S-VOL in the background. The disk array accepts writes for PSUS(SP) S-VOLs. PSUS(SP) pairs cannot be deleted.	Read and write. The S-VOL can be mounted.
PSUS	The disk array stops update copy operations for PSUS (split) pairs, and starts accepting write I/Os for PSUS S-VOLs. The disk array keeps track of all updates to the split P-VOL and S-VOL, so the pair can be resynchronized quickly.	Read and write. The S-VOL can be mounted.
COPY(RS)	The disk array does not accept write I/Os for COPY(RS) S-VOLs. When a split pair is resynchronized in normal mode, the disk array copies only the P-VOL differential data to the S-VOL. When a PSUE (suspended) pair is resynchronized, the disk array copies the entire P-VOL to the S-VOL. No update copy operations are performed during the pairresync operation.	Read only.
COPY(RS-R)	The disk array does not accept write I/Os for COPY(RS-R) S-VOLs. When a split pair is resynchronized in reverse or quick restore mode, the disk array copies only the S-VOL differential data to the P-VOL. No update copy operations are performed during the reverse or quick restore pairresync operation.	Read only.
PSUE	The disk array continues accepting read and write I/Os for a PSUE (suspended) P-VOL, but does not perform update copy operations for a PSUE S-VOL. The disk array marks the entire P-VOL track map as difference data, so the entire P-VOL is copied to the S-VOL when the PSUE pair is resumed. Use the pairresync command to resume a PSUE pair.	Read only.

Cautions on switching off the power supply

To switch off the power supply of the disk array during BC operations, make sure to:

- Complete copying for the BC pair in COPY(SP) or PSUS(SP) status first to change the pair status from COPY(SP) or PSUS(SP) to PSUS, and then switch off the power supply. If shared memory is volatilized when you switch on the power supply again, the pair in COPY(SP) or PSUS(SP) status changes to PSUE.

 **NOTE:**

If the shared memory is volatilized when you switch on the power supply again, the pair in the COPY(SP) or PSUS(SP) status changes to PSUE.

 **NOTE:**

If the status of only a part of the pairs in the same consistency group is changed, the processing of At-Time Split function may not resume when you switch on the power supply, and the status of some pairs may remain unchanged.

- Establish a timetable for BC copying operations. If shared memory is volatilized when you switch on the power supply again, the following conditions occur:
 - If the BC pair was in COPY(PD) or COPY(SP) status, data already copied becomes target data to be copied after the power supply is switched back on. Even if there is no host I/O, the data consistency rate does not reach 100% when the BC pair status changes to PAIR. When the BC pair status changes to PAIR, target data is copied to the secondary volume.
 - If the BC pair was in PAIR status, data already copied becomes target data to be copied after the power supply is switched back on. In this case, the data consistency rate is 0%, and target data is copied to the S-VOL.
 - If the BC pair was in PSUS status, the entire volume becomes differential data. In this case, the data consistency rate is 0%, and the entire volume is copied to the secondary volume when you perform the pairresync operation.

Cautions on using the XP10000

The XP10000 has a fewer processors than the XP12000. Therefore, BC copy processing sometimes takes a long time and host I/O performance may degrade. Consider the following:

- Copy processing

When you use BC on the XP10000, copy processing time (such as pair creation, pair split, and pair resynchronization) might take longer compared to when you use BC on the XP12000. Copy processing time changes according to the number of pairs, and sometimes the XP10000 requires two to eight times the copy processing time compared to the XP12000.

- Host I/O performance

Since BC copy processing uses processors, host I/O performance might degrade during copy processing. The number of processors in the XP10000 is small, therefore, when you use the XP10000, the impact of copy processing on host I/O performance is larger than when you use the XP12000. To mitigate host I/O performance degradation, reduce the copy pace or use the Host I/O Performance option.

For more information about specifying the copy pace, see [Copy Pace list](#). For more information about the Host I/O Performance option, see [Host I/O Performance option](#).

Preparing for BC operations

System requirements

BC operations involve the disk array containing the primary and secondary volumes and the licensed BC feature enabled on the Command View XP management station or XP Remote Web Console. System requirements for BC are:

- Disk array hardware, microcode, and software required for BC operations must be installed and enabled.

- Command View XP management station (user-supplied Windows-based PC) or XP Remote Web Console.
- BC license key installed.

Preparing for BC operations

To ensure that you and your disk arrays are ready for BC operations, perform the following tasks:

- BC operations affect I/O performance of the disk array because of copy operations to the S-VOLs. If you have not already done so, consider the relative importance of the disk array's I/O performance and the BC backup copies. For example, assigning three S-VOLs to each P-VOL takes more resources than assigning one or two. You can also use the copy pace option to control the impact of BC initial copy operations. Using a slower copy pace minimizes the impact of BC operations on I/O performance, while a faster copy pace produces copies more quickly, but may affect I/O performance.
- If you are using more than one disk array data management feature (such as BC, Continuous Access XP, or Cache LUN) at the same time in the same disk array, contact your HP account support representative to ensure that your disk array is optimized for your configuration of concurrent operations. Each disk array feature can affect disk array performance and/or operation of other features. For example, BC and Continuous Access XP operations both involve initial copy and update copy operations to secondary/remote volumes in addition to host I/O workload.
- Identify the volumes (LUs) you will use for BC operations. For each volume, write down the full SCSI path (port, target ID (TID), and LUN), whether the volume will be a P-VOL or S-VOL, and the other volumes in its pair (see [Table 14](#) for a sample). LUN Manager displays this information. Volumes that will be P-VOLs remain fully accessible to all hosts throughout normal BC operations, but volumes that will be S-VOLs must be unmounted before being reserved for BC operations.

Table 14 Identifying the volumes for BC operations

CU	Port	TID: LUN	L1 P-VOL	Assoc. L1 S-VOLs	L1 S-VOL	Assoc. L1 P-VOL	L2 P-VOL	Assoc. L2 S-VOLs	L2 S-VOL	Assoc. L2 P-VOL
0	1A	0:00	Yes	1B-0:00, 2A-0:00, 2B-0:00	No	—	No	—	No	—
0	1A	0:01	Yes	1B-0:01, 2A-0:01, 2B-0:01	No	—	No	—	No	—
etc.										
0	1B	0:00	No	—	Yes	1A-0:00	Yes	3A-0:00, 3A-0:01	No	—
0	1B	0:01	No	—	Yes	1A-0:01	Yes	3B-0:00, 3B-0:01	No	—
etc.										
0	2A	0:00	No	—	Yes	1A-0:00	Yes	4A-0:00, 3B-0:01	No	—
0	2A	0:01	No	—	Yes	1A-0:01	Yes	4B-0:00, 3B-0:01	No	—
etc.										
0	3A	0:00	No	—	No	—	No	—	Yes	1B-0:00
0	3A	0:01	No	—	No	—	No	—	Yes	1B-0:00

Combining BC with other data management operations

BC supports concurrent operations with the following data management functions:

- **LU Size Expansion (LUSE).** LUSE volumes can be assigned to BC pairs if the P-VOL and S-VOL have the same LU type and number of LDEVs (same size). If you must perform LUSE operations on an existing BC P-VOL or S-VOL, delete the pair first to return the volume to SMPL status.
- **CVS.** CVS volumes can be assigned to BC pairs if the S-VOL has the same capacity as the P-VOL. If you must perform CVS operations on an existing BC P-VOL or S-VOL, delete the pair first to return the volume to SMPL status.
- **LUN Security.** LUN Security operations do not affect BC operations. Volumes under secure ports and/or assigned to World Wide Name (WWN) groups and/or LUN groups can also be assigned to BC pairs. Volumes assigned to BC pairs can also be assigned to secure ports, WWN groups, and/or LUN groups for LUN Security.

 **NOTE:**

BC S-VOLs cannot be accessed by any host except when the pair is split.

-
- **Cache LUN.** Cache LUN volumes can be assigned to BC pairs. Cache LUN operations can be performed on BC P-VOLs and S-VOLs.

 **CAUTION:**

See [Pairresync operations](#) for important information on performing quick restore operations on Cache LUN volumes.

-
- **Continuous Access XP Journal.** Continuous Access XP Journal volumes can be assigned to BC pairs, and BC volumes can be assigned to Continuous Access XP Journal pairs.
 - **Continuous Access XP.** Continuous Access XP volumes can be assigned to BC pairs, and BC volumes can be assigned to Continuous Access XP pairs. See [Combining BC and Continuous Access XP operations](#) for important information on BC and Continuous Access XP shared volume configurations.
 - **Auto LUN.** BC can be assigned to Auto LUN migration volumes. However, if the BC P-VOL is already paired with three S-VOLs, delete the BC pairs before migrating the volumes. Also, to assign BC volumes to destination migration volumes or reserve BC volumes for Auto LUN, delete the BC volumes or unreserve the BC volumes before using them with Auto LUN. If you assign a BC P-VOL that is already paired with three S-VOLs to Auto LUN migration volumes, or assign BC volumes to Auto LUN volumes other than migration volumes, the command will be rejected.

If you split the BC pair assigned to Auto LUN migration volumes, migration of those volumes will be canceled.

 **NOTE:**

You cannot use Auto LUN migration, destination, and reserved volumes for BC pair operations (the command will be rejected). To use Auto LUN volumes for BC pair operations, use Auto LUN to release the volumes.

-
- **LUN Security XP Extension.**
 - **External Storage XP.** BC operations can be performed with External Storage XP operations to create pairs with the external volumes.

Combining BC and Continuous Access XP Journal operations

Continuous Access XP Journal volumes can be assigned to BC pairs, and BC volumes can be assigned to Continuous Access XP Journal pairs.

BC and Continuous Access XP Journal can function together in the same Local disk array to provide both internal and remote backup for your important data.

NOTE:

- A primary volume (P-VOL) of Continuous Access XP Journal means a primary data volume of Continuous Access XP Journal. A secondary volume (S-VOL) of Continuous Access XP Journal means a secondary data volume of Continuous Access XP Journal.
- Combining BC L1 and L2 pairs with Continuous Access XP Journal volumes is allowed. Continuous Access XP Journal considers node and leaf volumes as secondary volumes (S-VOLs).

The configuration shown in [Figure 15](#) is an example of a volume that functions as both a Continuous Access XP Journal P-VOL and a BC P-VOL. This configuration allows you to:

- Use BC to provide on-site backup copies of Continuous Access XP Journal P-VOLs
- Use Continuous Access XP Journal to provide remote backup copies of BC P-VOLs

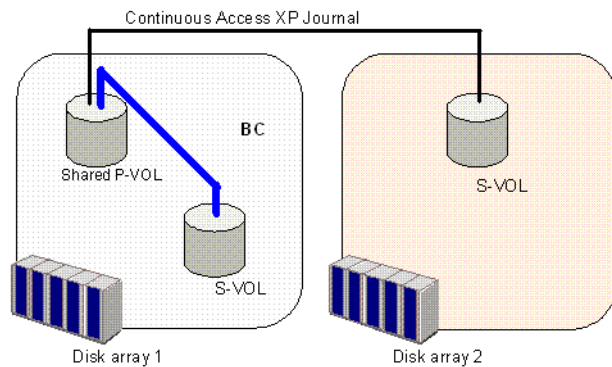


Figure 15 BC and Continuous Access XP Journal: Shared P-VOL and P-VOL

CAUTION:

When you share a BC P-VOL with a Continuous Access XP Journal S-VOL as shown in [Figure 16](#), the write operation to the Continuous Access XP Journal P-VOL takes time. Especially, when the BC pair is in the PSUS(SP) status, the write operation to the Continuous Access XP Journal P-VOL may take extra time due to the time for copying to the BC pair. In addition, if the journal volume size is small, the Continuous Access XP Journal pair may be suspended and fail due to a shortage of the capacity of its journal volume.

The configuration shown in [Figure 16](#) is an example of a volume that functions as both a Continuous Access XP Journal S-VOL and a BC P-VOL. This configuration allows you to use BC to provide remote copies of Continuous Access XP Journal S-VOLs.

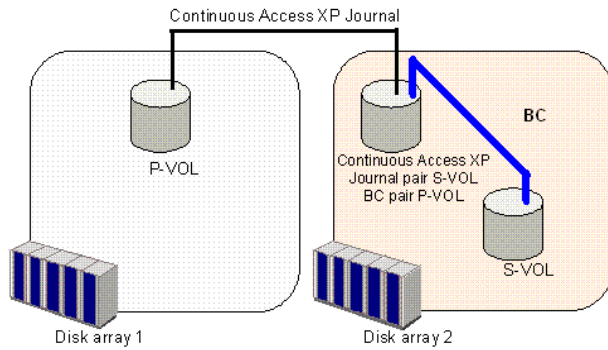


Figure 16 BC and Continuous Access XP Journal: Shared P-VOL and S-VOL

Figure 17 is an example of a volume that functions as both a Continuous Access XP Journal P-VOL and a BC P-VOL, while the S-VOL of the same Continuous Access XP Journal pair also functions as the P-VOL of another BC pair. This configuration allows you to:

- Use BC to provide on-site backup copies of Continuous Access XP Journal P-VOLs and S-VOLs
- Use Continuous Access XP Journal to provide remote backup of BC P-VOLs

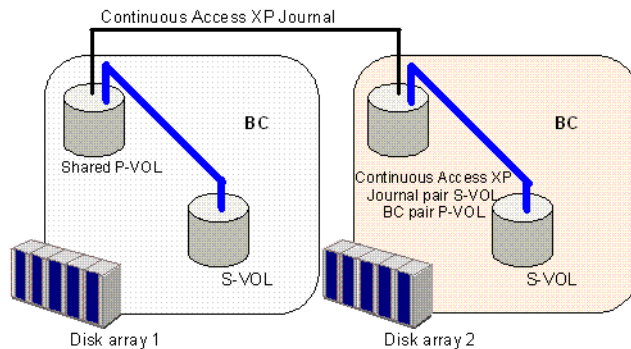


Figure 17 BC and Continuous Access XP Journal: Shared P-VOL and P-VOL and P-VOL and S-VOL

NOTE:

In the configuration shown in Figure 17, you cannot perform the Business Copy XP and Continuous Access XP Journal copy operations at the same time. In Figure 17, first you need to create and split the Business Copy XP pair, then create the Continuous Access XP Journal pair. If you want to resynchronize the Business Copy XP pair, suspend the Continuous Access XP Journal pair beforehand. Note that you cannot change the Continuous Access XP Journal pair status while the Business Copy XP pair is in PSUS(SP) status.

NOTE:

Usually Continuous Access XP and Continuous Access XP Journal can share volumes with BC. However, in some cases, you cannot create BC pairs using volumes shared with Continuous Access XP and Continuous Access XP Journal. For more information about combining BC, Continuous Access XP, and Continuous Access XP Journal, see Figure 22 and Figure 23.

Combining BC and Continuous Access XP operations

BC and Continuous Access XP can function together in the same disk array to provide both internal and remote backup for important data.

NOTE:

- BC is recommended for intra-disk array copy operations. If BC is not installed, use Continuous Access XP (synchronous only) to copy within the same local disk array. This Continuous Access XP configuration requires at least one external ESCON® cable loop (minimum of two is recommended).
- Combining BC L1 and L2 pairs with Continuous Access XP volumes is allowed. Continuous Access XP considers node and leaf volumes secondary volumes (S-VOLs).

NOTE:

Reverse resync and quick restore operations cannot be performed on BC/Continuous Access XP shared volume pairs.

The configuration shown in [Figure 18](#) is an example of a volume functioning as both a Continuous Access XP P-VOL and BC P-VOL. With this configuration, you can perform the following:

- Use BC to provide on-site backup copies of Continuous Access XP P-VOLs
- Use Continuous Access XP to provide remote backup copies of BC P-VOLs

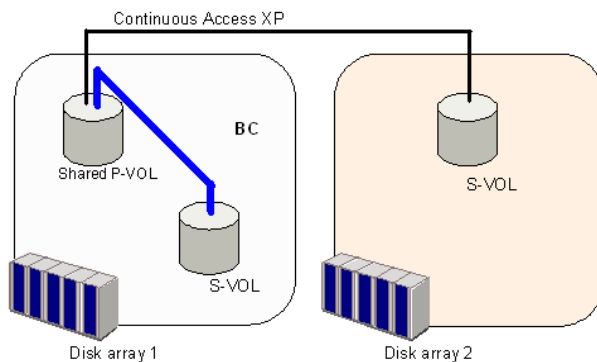


Figure 18 BC and Continuous Access XP: shared P-VOL/P-VOL

The configuration shown in [Figure 19](#) is an example of a volume functioning as both a Continuous Access XP S-VOL and BC P-VOL. With this configuration, you can use BC to provide remote copies of Continuous Access XP S-VOLs.

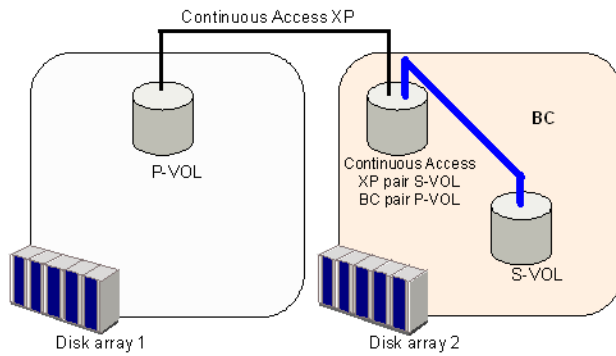


Figure 19 BC and Continuous Access XP: shared P-VOL/S-VOL

△ CAUTION:

When you share a BC P-VOL with a Continuous Access XP S-VOL as shown in [Figure 19](#), the write operation to the Continuous Access XP P-VOL takes time. Especially, when the BC pair is in the PSUS(SP) status, the write operation to the Continuous Access XP P-VOL may take extra time due to the time for copying to the BC pair. In addition, in the case of Continuous Access XP Asynchronous, the Continuous Access XP pair may be suspended and fail due to a shortage of capacity in its side file.

The configuration shown in [Figure 20](#) is an example of a volume functioning as both a Continuous Access XP P-VOL and BC P-VOL, while the S-VOL of the same Continuous Access XP pair is also functioning as the P-VOL of another BC pair. With this configuration, you can perform the following:

- Use BC to provide on-site backup copies of Continuous Access XP P-VOLs and S-VOLs
- Use Continuous Access XP to provide remote backup of BC P-VOLs

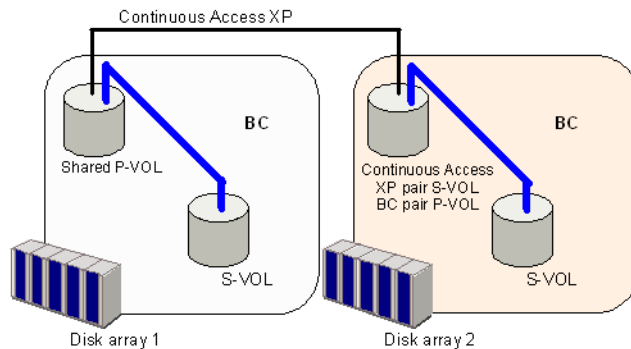


Figure 20 BC and Continuous Access XP: shared P-VOL/P-VOL and P-VOL/S-VOL

The configuration shown in [Figure 21](#) is an example of a volume functioning as both a BC S-VOL and Continuous Access XP P-VOL. With this configuration, you can use Continuous Access XP to provide asynchronous remote copy.

📝 NOTE:

This configuration does not allow BC and Continuous Access XP to copy at the same time. Create the BC pair first, and then split the pair before creating the Continuous Access XP pair. You must suspend the Continuous Access XP pair to resync the BC pair. The Continuous Access XP pair status cannot be changed when the BC pair is in PSUS(SP) status.

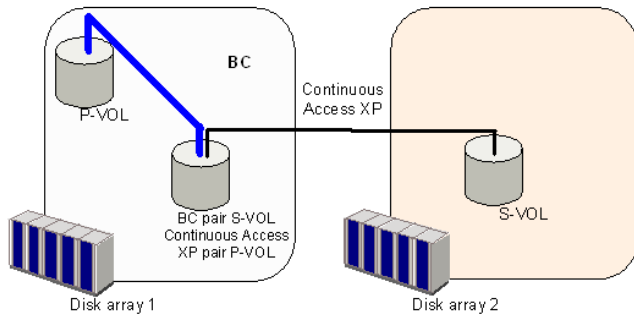


Figure 21 BC and Continuous Access XP: shared S-VOL/P-VOL

Usually Continuous Access XP and Continuous Access XP Journal can share volumes with BC. However, in some cases, you cannot create BC pairs using volumes shared with Continuous Access XP and Continuous Access XP Journal. Figure 22 and Figure 23 show examples of when you cannot create BC pairs using volumes shared with Continuous Access XP and Continuous Access XP Journal.

NOTE:

A Continuous Access XP Journal primary volume (P-VOL) means a Continuous Access XP Journal primary data volume. A Continuous Access XP Journal secondary volume (S-VOL) means a Continuous Access XP Journal secondary data volume.

Figure 22 is an example of a volume functioning as both a Continuous Access XP Journal S-VOL and a Continuous Access XP P-VOL. In this configuration, you cannot use this volume as the P-VOL of a BC pair.

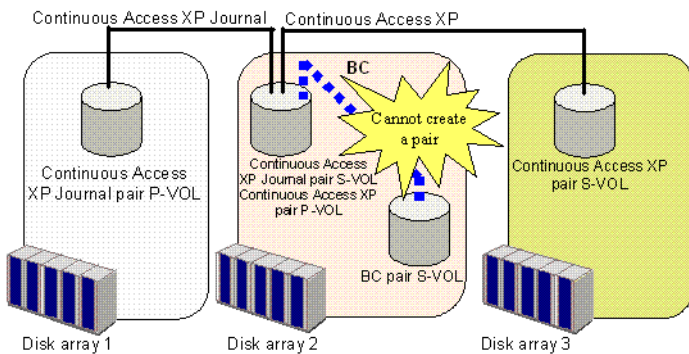


Figure 22 BC, Continuous Access XP Journal, and Continuous Access XP: Shared S-VOL/P-VOL/S-VOL

Figure 23 is an example of a volume functioning as both a Continuous Access XP S-VOL and a Continuous Access XP Journal P-VOL. In this configuration, you cannot use this volume as the P-VOL of a BC pair.

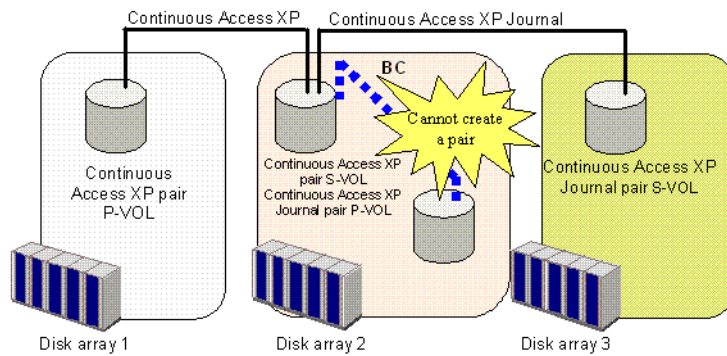


Figure 23 BC, Continuous Access XP, and Continuous Access XP Journal: Shared S-VOL/P-VOL/S-VOL

Combining BC with LUN Security XP Extension

BC can create pairs using volumes for which LUN Security XP Extension sets the access attribute. However, you cannot create a BC pair specifying a volume with the S-VOL Disable attribute as an S-VOL.

Table 15 shows whether you can specify the volume with access attribute as a P-VOL or S-VOL of a BC pair.

Table 15 Access attribute and availability as a BC pair volume

Access attribute	Availability as a BC pair volume	
	P-VOL	S-VOL
Read/Write	OK	OK
Read Only	OK	NO
Protect	OK	NO
S-VOL Disable	OK	NO

Table 16 shows whether you can perform BC operations on the volume with the S-VOL Disable attribute.

Table 16 Availability of BC operations on volumes with the S-VOL Disable attribute

BC operations	Availability of BC operations	
	P-VOL	S-VOL
Paircreate	OK	NO
Pairsplit	OK	NO
Paircreate and Pairsplit ¹	OK	NO
Forward Pairresync	OK	NO
Backward Pairresync	NO	NO
Suspend	OK	NO
Delete	OK	OK

¹Paircreate and Pairsplit means you simultaneously create and split BC pairs.

Copying access attributes

If you create a BC pair using volumes that LUN Security XP Extension has set to VMA (Volume Management Area), you can copy information about the access attribute in the P-VOL's VMA to the S-VOL.

Table 17 VMA setting and availability of Paircreate operation

P-VOL	S-VOL	
	Volume without VMA	Volume with VMA
Volume without VMA	OK	NO
Volume with VMA	NO	OK

NOTE:

You can specify a volume with VMA as a reserve volume.

Figure 24 shows the process of copying of access attribute when you create a pair using volumes with VMA.

NOTE:

When you use volumes with VMA to create a BC pair, both the P-VOL and S-VOL must have VMA.

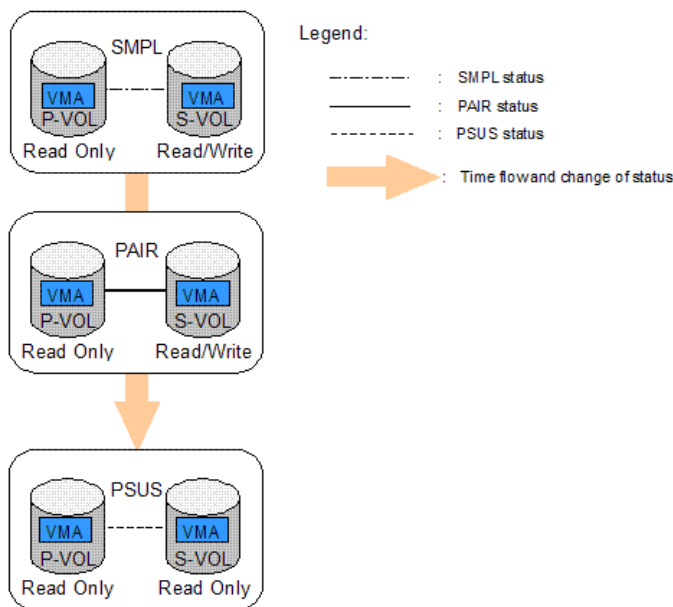


Figure 24 Copying access attribute

In Figure 24, if both the P-VOL and S-VOL have VMA, the P-VOL's VMA is copied to the S-VOL. In Figure 24, the S-VOL's access attribute is Read/Write when the pair status is SMPL. After the P-VOL's VMA is copied to the S-VOL, the S-VOL's access attribute is Read Only, which is same as the P-VOL's access attribute. When the pair status is PAIR, copied access attribute information is not effective, so the S-VOL's access attribute is still Read/Write. To make the copied access attribute information effective, split the pair and make the pair status PSUS. When the pair status is PSUS, the S-VOL's access attribute changes to Read Only. For more information about pair status and operations related to the access attribute, see Table 18.

△ **CAUTION:**

Because the S-VOL's access attribute is changed after copying the P-VOL's access attribute, be careful about access attributes of volumes to be specified as BC pairs. For example, if the P-VOL's access attribute is S-VOL Disable, the S-VOL's access attribute is also S-VOL Disable after copying the access attribute. You cannot perform Pairresync operations on the S-VOL that has the S-VOL Disable access attribute. You must change the access attribute to something other than S-VOL Disable. For more information about changing the access attribute, see the *HP StorageWorks LUN Security XP Extension user guide*.

You can set VMA, which is required to copy the access attribute, only when the volume's emulation type is OPEN-V. [Table 18](#) shows whether you can create pairs according to the VMA setting.

Whether you can use LUN Security XP Extension to change or reference the access attribute for BC pair volumes depends on the pair status. [Table 18](#) shows the availability of LUN Security XP Extension operations according to the pair status.

Table 18 Pair status and availability of LUN Security XP Extension operations

Volume	Pair status	LUN Security XP Extension	
		OK	OK
P-VOL	COPY (PD)	OK	OK
	PAIR	OK	OK
	COPY (SP)	OK	OK
	PSUS (SP)	OK	OK
	PSUS	OK	OK
	COPY (RS)	OK	OK
	COPY (RS-R)	No	OK ¹
	PSUE	OK	OK
S-VOL	SMPL	OK	OK ²
	COPY (PD)	No	OK ^{1, 2}
	PAIR	No	OK ^{1, 2}
	COPY (SP)	No	OK ¹
	PSUS (SP)	OK	OK
	PSUS	OK	OK
	COPY (RS)	No	OK ^{1, 2}
	COPY (RS-R)	No	OK ^{1, 2}
	PSUE	No	OK ^{1, 2}
Reserve volume	-	OK	OK

¹If the VMA copy is not completed, referred information might not be the same as the P-VOL's information.

²When the S-VOL's mode is "noread", you can refer to the access attribute only when the pair status is COPY(SP), PSUS, or PSUS(SP). For more information about the "noread" mode, see the *HP StorageWorks RAID Manager XP user guide*.

License capacity of LUN Security XP Extension

To create BC pairs using volumes with VMA, you need the license capacity of LUN Security XP Extension for both P-VOLs and S-VOLs. This is because the S-VOLs have the same access as the P-VOLs when the access attribute copy is complete. For more information about copying access attributes, see [Figure 24](#).

You can also copy access attributes of cascaded pairs. [Figure 25](#) shows the required license capacity of LUN Security XP Extension when you create cascaded pairs using volumes with VMAs and access attributes.

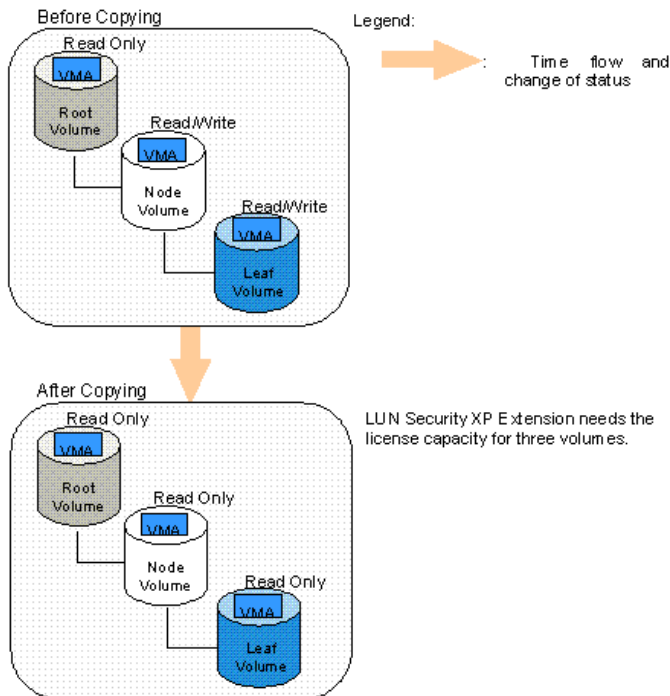


Figure 25 Required license capacity for LUN Security XP Extension when using cascade function


In [Figure 25](#), VMAs are set to cascaded pairs' volumes. Before copying, the root volume's access attribute is Read Only, the node and leaf's access attribute is Read/Write. When copy operations, such as update copy or pairresync, are performed on these cascaded pairs, the root volume's access attribute is copied to the node and leaf volumes. Therefore, to set the access attribute for volumes used in cascade pairs, LUN Security XP Extension needs license capacity for the root volume and the node and leaf volumes. If you set the access attribute to the root, node, or leaf volume, LUN Security XP Extension requires license capacity for the root, node, and leaf volumes.

NOTE:

If LUN Security XP Extension's license capacity is insufficient, you might not be able to create BC pairs. For more information about LUN Security XP Extension's license capacity, see the *HP StorageWorks LUN Security XP Extension user guide*.

Starting BC

After you enable the BC feature on the Command View XP management station or XP Remote Web Console and prepare for BC operations, you are ready to start BC.

1. Launch Command View XP or XP Remote Web Console.
2. Click the **Business Copy** button . The BC main screen shows the name of the connected disk array, currently selected port, and all volumes (LUs) installed under the current port.

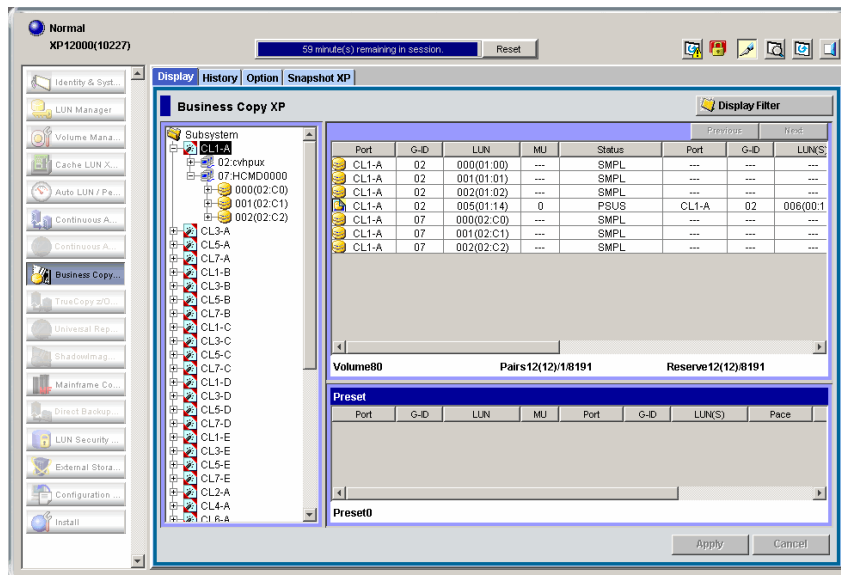


Figure 26 BC main screen

You can now perform BC operations. You first need to reserve the volumes you plan to use as BC S-VOLs (see [Setting reserve attributes](#) for instructions). You can then start adding BC pairs (see [Creating BC pairs \(Paircreate\)](#) for instructions).

BC main screen

The BC main screen displays BC volume and pair information for the selected port of the connected disk array and performs all BC operations. To open the BC main screen, click the **BC** button. There are four tabs on the BC main screen: **Display**, **History**, **Options**, and **Snapshot XP**.



NOTE:

The Snapshot XP tab appears only when Snapshot XP is installed. Although the BC main screen displays information about BC and Snapshot XP pairs, this section only explains BC pair items. For more information about Snapshot XP pair items, see the *HP StorageWorks Snapshot XP user guide*.

The Display pane of the BC main screen has the following features:

- Use the **Tree View** box on the left side to select the port, host group, or defined P-VOL (pair).

The following icons appear in the tree:

Table 19 BC tree icons

Icon	Meaning
	Port
	Host group
	LUN
	Root

 **NOTE:**

You can filter volumes or volume pairs displayed in the Volume list on the upper-right side of the **Display** tab by selecting a port, host group, or volume (P-VOL). To display all volumes and pairs, select **Port (Subsystem)** at the top of the Tree View box.






- The **Volume list** on the upper-right of the Display pane shows all available volumes on the port, host group, or P-VOL selected in the Tree View box. You can sort volumes by port, group, path, MU#, status, port (S-VOL), group (S-VOL), S-VOL path, copy pace, copy progress, volume emulation type, and capacity. You can also filter volumes by reserve attribute, pair condition, and pair status in the Display Filter window. To open the Display Filter window, click **Display Filter**, or select the **Display Filter** command from the shortcut menu.

 **NOTE:**

The maximum number of volumes that can be displayed in the Volume List at one time is 1,024. If the number of volumes defined in the disk array exceeds this limit, use the **Previous** and **Next** buttons on the upper right of the Volume list to turn the pages of the Volume list to see the entire list.

- The following icons indicate the status of a volume or pair:

Table 20 Status icons for BC

Icon	LDEV status
	L1 pair
	L2 pair
	S-VOL (node volume: Secondary , Leaf volume: Leaf)
	Reserved volume
	An error occurred during operations. This error icon is displayed in the Preset Volume list.

- The **Preset Volume list**, below the Volume list, displays the content of the operations (volume/pair information) that have been set or specified, but are not yet applied to the disk array.
- The **Volume/Pair Settings** box on the lower-right side displays:

 **NOTE:**

The Volume/Pair Settings information is displayed above and below the Preset Volume list.

- **Preset:** Number of operations (volume/pair information) that have not been performed in the disk array. The Preset Volume list, located below the Volume list, displays preset operations. Click **Apply** to perform the specified operations displayed in the Preset Volume list.
- **Volume:** Total number of volumes defined in the disk array.
- **Pairs:** W(X)/Y/Z, where:
 - W = total number of BC pairs
 - X = total number of BC and ShadowImage for z/OS pairs
 - Y = total number of Snapshot XP pairs
 - Z = maximum number of pairs that can be created in one array (BC/Snapshot XP/ShadowImage for z/OS /Auto LUN XP/Flex Copy/Hitachi FlashCopy Mirroring/Hitachi FlashCopy Mirroring Version 2)

 **NOTE:**

The value (X) does not include Auto LUN XP, Flex Copy, Snapshot XP, Hitachi FlashCopy Mirroring, or Hitachi FlashCopy Mirroring Version 2 pairs. If these pairs exist, BC paircreate operations may fail, even when (X) is less than 8,191.

- **Reserve:** X(Y)/Z, where:

X = total number of BC reserved volumes

Y = total number of BC and ShadowImage for z/OS reserved volumes

Z = maximum number of reserved volumes that can be created in one array (BC/ShadowImage for z/OS /Auto LUN XP/Flex Copy)

 **NOTE:**

The value (Y) does not include Auto LUN XP, Flex Copy, Snapshot XP, Hitachi FlashCopy Mirroring, or Hitachi FlashCopy Mirroring Version 2 pairs. If these pairs exist, the BC paircreate operation may fail even when (Y) is less than 8,191.

- Use the **Display Filter** button to filter volumes displayed in the Volume list.
- The **Previous** button returns to the previous page of the Volume list. This button is available only when the number of volumes defined in the disk array exceeds 1,024, which is the maximum number of volumes that can be displayed on one page. The button is unavailable if the total number of defined volumes is less than 1,024.
- The **Next** button displays the next page of the Volume list. This button is available only when the number of volumes defined in the disk array exceeds 1,024, which is the maximum number of volumes that can be displayed on one page. The button is unavailable if the total number of defined volumes is less than 1,024.
- The **Apply** button performs BC operations displayed in the Preset Volume list in the disk array. If the specified operations complete successfully, the Preset Volume list is cleared. If an error occurs during an operation, the failed operation remains in the Preset Volume list. To display the error code and message for the failed operation, select the **Detail** command.
- The **Cancel** button cancels all operations specified on the **Display** tab.

To perform BC operations for volumes, select one or more volumes in the Volume list, right-click, and select the command (see [Volume list](#) and [Table 21](#)).

For information about the **Snapshot XP** tab, see the *HP StorageWorks Snapshot XP user guide*.

Volume list

The Volume list ([Figure 27](#)) displays volume/pair information based on filter options selected in the Tree View box (along the left side of the screen).

 **NOTE:**

You can select up to 512 volumes/pairs in the Volume list.

 **NOTE:**

The maximum number of volumes displayed in the Volume List is 1,024. If the number of volumes defined in the disk array exceeds this limit, use the **Previous** and **Next** buttons on the upper right of the Volume list to turn the pages of the Volume list to see the entire list.



Port	G-ID	LUN	MU	Status	Port	G-ID	LUN(S)
 CL1-A	00	002(00:50)	---	SMPL	---	---	---
 CL1-A	00	005(01:25)	0	PSUS	CL1-A	00	004(01:25)
CTG	SvolMode	CopyPace	Prog./Sync.	Type	Capacity(MB)	CLPR(P)	CLPR(S)
---	---	---	---	OPEN-8	7007.34	00:CLPR0	---
---	W	---	0%	OPEN-8	7007.34	00:CLPR0	00:CLPR0

Figure 27 Volume list

The Volume list contains all installed volumes (LUs) on the selected port and displays the following information for each volume:

- **Port:** Port ID (cluster and channel number) of each volume. If L2 pairs exist, a different icon displays. To display detailed information on L2 pairs, double-click the corresponding S-VOL in the Volume list.
- **G-ID:** Host group of each volume.
- **LUN:** CU:LDEV (control unit image:logical device ID) of each volume.

 **NOTE:**

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **MU:** MU number of a BC cascade pair formed with the volume. For more information about what appears if you select Snapshot XP pairs, see the *HP StorageWorks Snapshot XP user guide*.
- **Status:** BC pair status of the volume pair: **SMPL**, **COPY(PD)**, **PAIR**, **PSUS**, **COPY(RS)**, **PSUE**, **COPY(SP)**, **COPY(RS-R)**, **PSUS(SP)**, **SMPL (PD)**, **Secondary**, and **Leaf**. For more information about the Snapshot XP pair status, see the *HP StorageWorks Snapshot XP user guide*.
- **Port:** Port ID (cluster and channel number) of the first S-VOL of each volume. If there is no S-VOL, --- is displayed.
- **G-ID:** Host group of the S-VOL. If there is no S-VOL, --- is displayed.
- **LUN(S):** CU:LDEV (control unit image:logical device ID) of the S-VOL. If there is no S-VOL, --- is displayed.

 **NOTE:**

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **CTG:** Consistency group number of the S-VOL. If no consistency group is set for the S-VOL, --- is displayed. For more information about the Snapshot XP pair status, see the *HP StorageWorks Snapshot XP user guide*.
- **SvolMode:** Status of the S-VOL. For more information about the Snapshot XP pair status, see the *HP StorageWorks Snapshot XP user guide*.
 - **S-VOL Write:** When the S-VOL status is **COPY(SP)**, **PSUS(SP)**, or **PSUS** and the host writes to the S-VOL, **W** is displayed.
 - **Hide Mode:** When the S-VOL is set to hide mode, **N** is displayed.
- **CopyPace:** Copy pace (**Slower**, **Medium**, or **Faster**) for the pair being created. For more information about the Snapshot XP pair status, see the *HP StorageWorks Snapshot XP user guide*.
- **Prog/Sync:** If the volume pair is in **COPY** status, the copy progress (%) is displayed (for example, **0%** or **45%**). If there is no S-VOL, --- is displayed. For more information about the Snapshot XP pair status, see the *HP StorageWorks Snapshot XP user guide*.
- **Type:** Device emulation type (for example, OPEN-3). When you create a BC pair, the number of required differential tables changes according to the emulation type of the volumes. For more information, see [Calculating the number of differential tables for one BC pair](#).
- **Capacity(MB):** Storage capacity of the volume in MB.
- **CLPR(P):** The cache logical partition of the P-VOL is displayed.
- **CLPR(S):** the cache logical partition of the S-VOL is displayed.

You can perform BC operations for volumes in the Volume list by using the following shortcut menu commands (see also [Table 21](#)):

- **Detail:** Displays pair status for selected volumes/pairs.
- **Paircreate:** Creates or adds new BC pairs.
- **Pairsplit:** Splits BC pairs.
- **Pairresync:** Resynchronizes BC pairs.
- **Pairsplit-E:** Suspends BC pairs.
- **Pairsplit-S:** Deletes BC pairs.
- **Change Reserve:** Sets and resets the BC reserve attribute.
- **S-Vol Path:** Displays the S-VOL's port, group, and path (LUN) of the selected pair.
- **Display Filter:** Filters volumes displayed in the Volume list. Clicking **Display Filter** is another method of accessing this command.

Table 21 BC operations shortcut menu commands

Operation	Pair status								
	SMPL	COPY (PD)	PAIR	COPY (SP)	PSUS (SP)	PSUS	COPY (RS)	COPY (RS-R)	PSUE
Detail	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Paircreate	Yes	No	No	No	No	No	No	No	No
Pairsplit	Yes	Yes	Yes	No	No	No	No	No	No
Pairresync	No	No	No	No	Yes	Yes	No	No	Yes
Pairsplit-E	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Pairsplit-S	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Change Reserve	Yes	No	No	No	No	No	No	No	No
S-Vol Path	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Detail window

This window displays information for the selected volume or pair. To open the Detail window, select a pair or volume in the Volume list, right-click, and select **Detail**. If the P-VOL of the selected pair has two or more S-VOLs sharing the same P-VOL, the Detail window displays all S-VOLs.

NOTE:

If you select the **Detail** command when selecting a Snapshot XP pair, the displayed **Detail** window is different than when you select a BC pair. For more information, see the *HP StorageWorks Snapshot XP user guide*.

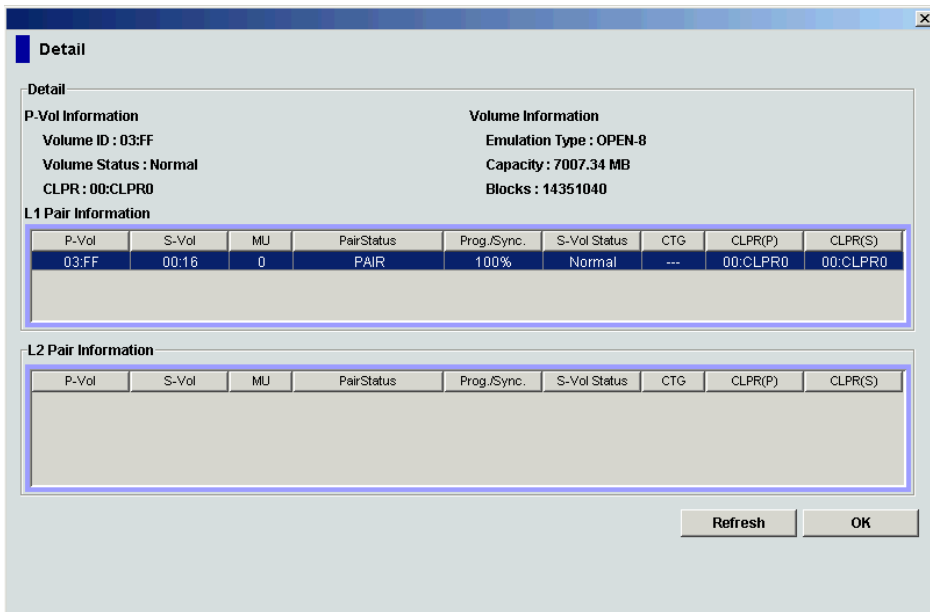


Figure 28 Detail window

S-Vol Path window

This window displays information on the selected pair (all paths defined for the S-VOL). To open the S-Vol Path window, select one or more pairs in the Volume list, right-click, and select **S-Vol Path**.

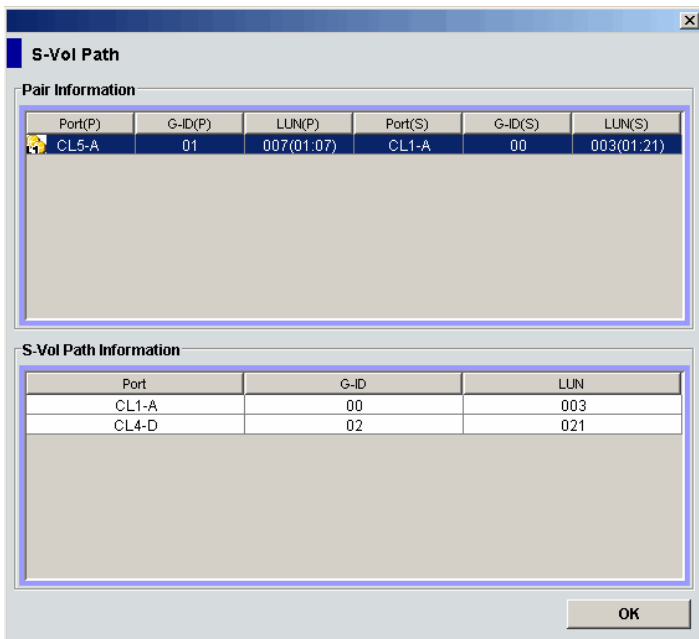


Figure 29 S-Vol Path window



NOTE:

The **S-Vol Path** command is not available when selecting SMPL volumes.

Display Filter window

This window filters volumes displayed in the Volume list by reserve attribute, pair condition, and pair status. To open the Display Filter window, click **Display Filter** on the BC main screen, or select any pair or volume in the Volume list, right-click, and select **Display Filter**.

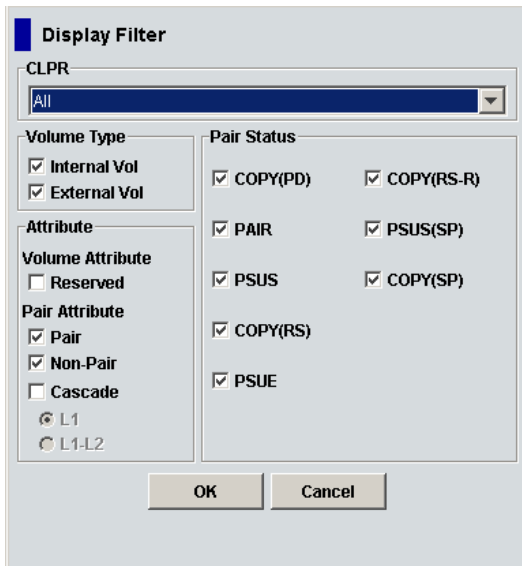


Figure 30 Display Filter window (BC tab selected)

The Display Filter window (**BC** tab selected) has the following features:

- **CLPR:** Displays the specified cache logical partition (CLPR).
- **Volume Type:**
 - **Internal Vol:** Displays or hides internal volumes.
 - **External Vol:** Displays or hides external volumes.

 **NOTE:**

Both check boxes are selected by default.

- **Attribute:**
 - **Reserve(d):** Displays reserved or unreserved volumes. If you select the **Reserve(d)** check box, only reserved volumes appear in the Volume list. If you clear the **Reserve(d)** check box, only unreserved volumes appear.

 **NOTE:**

If you select the **Reserve(d)** check box, you cannot select any other check boxes.

 **NOTE:**

The disk array automatically reserves volumes specified as a BC pair S-VOL.

- **Pair:** Displays paired volumes.
- **Non-Pair:** Displays non-paired volumes.
- **External Vol:** Displays external volumes.
- **Cascade:** Filters pairs in the Volume list by cascade level. Selecting **L1** displays only L1 pairs. Selecting **L1-L2** displays L1 and L2 pairs.

- **Pair Status:**
 - **BC:** Displays or hides BC pairs.
 - **Snapshot XP:** Displays or hides Snapshot XP pairs.

 **NOTE:**

If a check box is not selected, all check boxes in each tab are grayed out.

- **BC:** Check boxes for the pair statuses are available only when you select the **Pair** check box in the **Attribute** box. If you select the check boxes, you can display pairs in those statuses. You must also select the **BC** check box in the **Pair Status** tab to use these check boxes.
 - **Snapshot XP:** This tab is for Snapshot XP pairs, and only appears if Snapshot XP is installed. For more information, see the *HP StorageWorks Snapshot XP user guide*.
 - **OK** button: Applies the settings, and closes the Display Filter window.
 - **Cancel** button: Resets the settings, and closes the Display Filter window.
-

 **NOTE:**

Filter settings are only effective within the current BC session. If you switch to another program feature (such as LUN Manager or Continuous Access XP) or click a button on the toolbar, the settings are reset.

Preset Volume list

The Preset Volume list is located below the Volume list, and lists the specified operations (volume/pair information) that have not been performed in the disk array.


Preset							
Port	G-ID	LUN	MU	Port	G-ID	LUN(S)	Pace
 CL5-A	01	007(01:07)	0	CL1-A	00	004(01:22)	Medium

Figure 31 Preset Volume list

Use the Preset Volume list to hold multiple settings of the same operation only. You cannot display different types of operations (for example, pairsplit and pairresync) in the Preset Volume list at the same time. You can also cancel the operations in the Preset Volume list.

The Preset Volume list displays the following information of specified operations:

- **Port:** Port ID (cluster and channel number) of each volume. If L2 pairs exist, a different icon displays.
- **Group (G-ID):** Host group of each volume.
- **CLPR (P):** The cache logical partition (CLPR) of the P-VOL.
- **CLPR (S):** The cache logical partition (CLPR) of the S-VOL.
- **Path (LUN):** CU:LDEV (control unit image:logical device ID) of each volume.

 **NOTE:**

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **MU:** MU number of a BC cascade pair member volume. For more information about what appears if you select Snapshot XP pairs, see the *HP StorageWorks Snapshot XP user guide*.
- **Port:** Port ID (cluster and channel number) of the first S-VOL of each volume.
- **Group (G-ID):** Host group of the S-VOL.
- **S-Vol Path (LUNS):** CU:LDEV (control unit image:logical device ID) of the S-VOL.



NOTE:

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **Pace:** Copy pace for all pairs being created: **Slower**, **Medium**, and **Faster**. For more information about what appears if you select Snapshot XP pairs, see the *HP StorageWorks Snapshot XP user guide*.
- **Code:** If the specified option in the Preset Volume list is performed by clicking **Apply**, but the operation fails, the reason code is displayed.

To perform the specified operations, click **Apply** on the BC main screen. When all operations are performed successfully, the Preset Volume list is cleared. However, failed operations remain in the Preset Volume list. You can also cancel one or all operations by using the following shortcut menu commands:

- **Delete:** Cancels the selected operation only. To display the **Delete** command, select a volume or pair, and right-click.
- **Delete All:** Cancels all operations displayed in the Preset Volume list. To display the **All Delete** command, deselect any volume or pair, and right-click.
- **Detail:** Displays the Error window, which lists error code and message for the failed operation.

Performing BC operations

Setting reserve attributes

Use the Set Reserve Attribute window to set the reserve attribute for volumes selected on the BC main screen. To open the Set Reserve Attribute window, select one or more unreserved SMPL volumes in the Volume list on the BC main screen, right-click, and click **Change Reserve**.

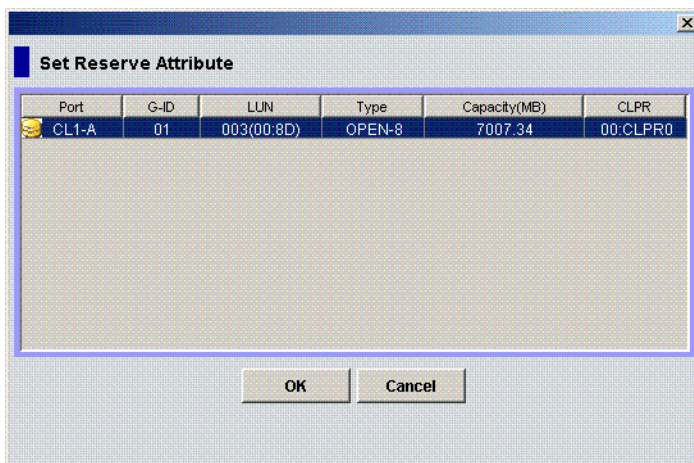


Figure 32 Set Reserve Attribute window

The Set Reserve Attribute window displays unreserved volumes selected on the BC main screen. Clicking **OK** sets the reserve attribute for unreserved volumes.

The setting is displayed in the Preset Volume list on the BC main screen. The **Cancel** button closes the Set Reserve Attribute window without reflecting the settings. To apply the settings to the disk array, click **Apply** on the BC main screen.

Reserving one or more volumes for use as BC S-VOLs

1. Unmount the volumes you want to reserve. The disk array rejects all write I/Os to reserved volumes (except when in PSUS status).

- From the BC main screen, select the port, host group, or LUN in the Tree View box.
- Display reserved SMPL volumes in the **Volume List**.

 **NOTE:**

To display unreserved SMPL volumes in the Volume List, open the Display Filter window, clear the **Reserved** and **Pair** check boxes, select the **Non-Pair** check box, and click **OK**.

- Select the volumes, right-click, and select **Change Reserve**. The Set Reserve Attribute window appears. If the **Change Reserve** command is not enabled, you selected paired volumes. Select only unreserved and unpaired volumes.
- From the Set Reserve Attribute window, select the volumes you want to reserve, and click **OK**. The setting is reflected in the Preset Volume list on the BC main screen.
- From the BC main screen, click **Apply**.
- Verify that the settings are reflected in the disk array. To check the attribute, click **Display Filter**.

 **NOTE:**

You can check whether the attribute setting is updated on the Display Filter window. To open the Display Filter window, click **Display Filter**.

Resetting reserve attributes

Use the Reset Reserve Attribute window to reset the reserve attribute for the volume selected on the BC main screen. To open the Reset Reserve Attribute window, select one or more reserved SMPL volumes in the Volume list on the BC main screen, right-click, and click **Change Reserve**.

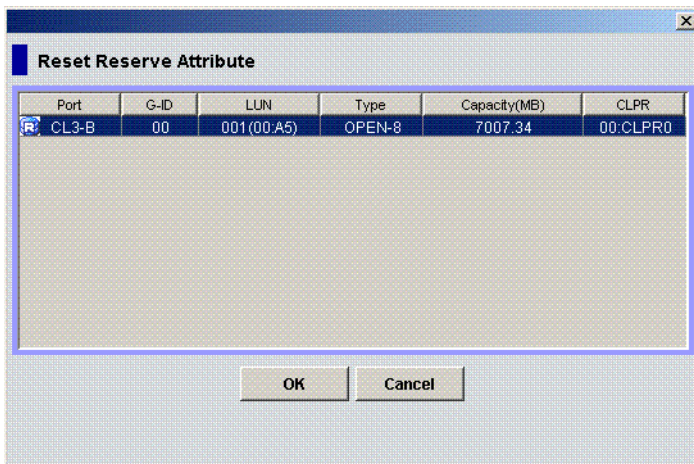


Figure 33 Reset Reserve Attribute window

The Reset Reserve Attribute window displays the reserved volumes selected on the BC main screen. Clicking **OK** resets the reserve attribute for reserved volumes.

The settings are displayed in the Preset Volume list on the BC main screen. The **Cancel** button closes the Reset Reserve Attribute window without reflecting the settings. To apply the settings to the disk array, click **Apply** on the BC main screen.

Unreserving one or more volumes

- Ensure that the volumes you want to unreserve are no longer assigned to BC pairs as S-VOLs.

2. In the BC main screen, select the port, host group, or LUN in the Tree View box.
3. To display reserved SMPL volumes in the Volume list, open the Display Filter window, select the **Reserve(d)** check box, and click **OK**.
4. Select the volumes, right-click, and select **Change Reserve**. The Reset Reserve Attribute window appears. If the **Change Reserve** command is not enabled, you selected paired volumes. Select only reserved and unpaired volumes.
5. In the Reset Reserve Attribute window, select the volume you want to unreserve, and click **OK**.
The setting is reflected in the Preset Volume list on the BC main screen.
6. In the BC main screen, click **Apply**.
7. Verify that the settings are reflected in the disk array. To check the attribute, click **Display Filter**.

Creating BC pairs (Paircreate)

△ CAUTION:

The BC paircreate operation overwrites all existing data on the S-VOLs. You are responsible for backing up data on the S-VOLs before creating BC pairs.

The Paircreate window displays P-VOL and S-VOL information for the pairs being created (added). Use the Paircreate window to select the S-VOLs for each P-VOL, set the copy pace for all pairs being created, and start the paircreate operations. To open the Paircreate window, select one or more SMPL volumes or PSUS pairs in the Volume list on the BC main screen, right-click the selected volumes, and select **Paircreate**.

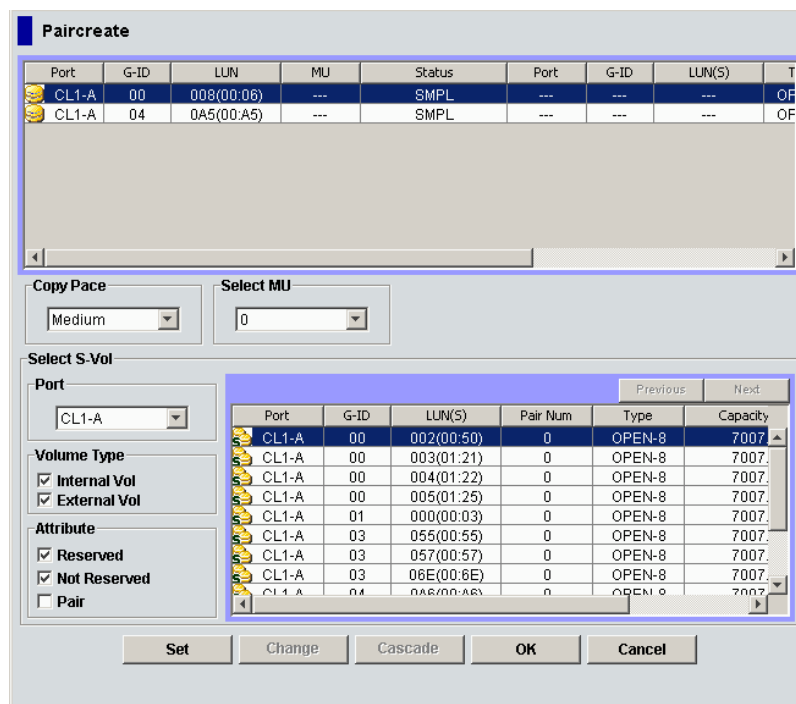


Figure 34 Paircreate window

The Paircreate window consists of the following components:

- Paircreate Volume List
- Copy Pace list
- Select MU list

- Select S-Vol box
- Buttons
- Creating L1 pairs

Paircreate Volume List

The Volume List in the upper half of the Paircreate window displays the following information about the P-VOL and S-VOL used for creating a pair:

NOTE:

The S-VOL for each P-VOL is displayed only after being selected (using **Set** or **Change**).

-
- **Port:** Port ID (cluster and channel number) of the P-VOL.
 - **G-ID:** Host group ID of the P-VOL.
 - **LUN:** CU:LDEV of the P-VOL.

NOTE:

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

-
- **MU:** MU number of the P-VOL.
 - **Status:** Status of the P-VOL.
 - **Port:** Port ID (cluster and channel number) of the first S-VOL of each volume pair.
 - **G-ID:** Host group ID of the S-VOL.
 - **SvolMode (LUN(S)):** CU:LDEV of the S-VOL.

NOTE:

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

-
- **Type:** Emulation type of the P-VOL and S-VOL.
 - **Capacity (MB):** Volume capacity displayed in megabytes (MB).
 - **CLPR(P):** Cache logical partition of the P-VOL.
 - **CLPR(S):** Cache logical partition of the S-VOL.

Copy Pace list

Use the **Copy Pace** list to select the copy pace for all pairs being created: **Slower**, **Medium**, and **Faster**.

NOTE:

When the Preset List already contains Paircreate settings, and you specify a different copy pace for new pairs in the Paircreate window, the copy pace for existing paircreate settings in the Preset List are also changed. The latest copy pace specified in the Paircreate window is in effect before the settings are reflected to the disk array.

Select MU list

Use the **Select MU** list to select the MU number for each pair being created: **0**, **1**, and **2** for L1 pairs, and **1** and **2** for L2 pairs.

 **NOTE:**

You can select an MU number for a cascade pair. You cannot select the same MU number for different cascade pairs of the same P-VOL (root or node volume).

Select S-Vol box

This box filters S-VOLs displayed in the S-VOL list.

- **Port** list: Displays available S-VOLs by port.
- **Volume Type:**
 - **Internal Vol:** Select available S-VOLs that are internal volumes.
 - **External Vol:** Select available S-VOLs that are external volumes.

 **NOTE:**

You can select external volumes only when External Storage XP is available.

- **Attribute:** Select available S-VOLs that are reserved when the **Reserved** check box is selected, or that are unreserved when the **Not Reserved** check box is selected. You can also select the pairs that can be set as L2 pairs when the **Pair** check box is selected.

 **NOTE:**

The number of secondary volumes that can be displayed in the S-VOL List at one time is limited to 1,024. If the number of volumes defined in the disk array exceeds this limit, use the **Previous** and **Next** buttons on the upper right of the S-VOL List to turn the pages of the S-VOL List and see the entire list.

- **Previous:** Returns to the previous page of the S-VOL List. This button is selectable only when the number of volumes defined in the disk array exceeds 1,024, which is the maximum number of volumes that can be displayed on one page. The button is unavailable if the total number of volumes defined in the disk array is less than 1,024 volumes.
- **Next:** Turn to the next page of the S-VOL List. This button is selectable only when the number of volumes defined in the disk array exceeds 1,024, which is the maximum number of volumes that can be displayed on one page. The button is unavailable if the total number of volumes defined in the disk array is less than 1,024 volumes.
- S-VOL List: Displays the following information related to S-VOLs:
 - **Port:** Port ID (cluster and channel number) of the S-VOL.
 - **Group (G-ID):** Host group ID of the S-VOL.
 - **S-Vol Path (LUN):** CU:LDEV of the S-VOL.
 - **Pair Num:** Number of pairs.
 - **Type:** Emulation type of the S-VOL.
 - **Capacity (MB):** Capacity of the S-VOL in megabytes (MB).
 - **CLPR:** The cache logical partition (CLPR) of the S-VOL.

Buttons

- **Set:** Adds the selected S-VOL and P-VOL to the Paircreate Volume List as an L1 pair.
- **Change:** Replaces the existing S-VOL of the selected L1 pair (meaning the S-VOL of the pair after completing the operation selected in the Paircreate Volume List) with the selected S-VOL.
- **Cascade:** Adds the selected S-VOL and P-VOL (node volume) to the Paircreate Volume List as a L2 pair. To use the **Cascade** button, select one of the listed L1 pairs.
- **OK:** Adds the operation (setting) to create a new pair using the P-VOL and S-VOL selected in the Paircreate window to the Preset List on the BC main screen.

 **NOTE:**

To apply the new pair operation setting displayed in the Preset List to the disk array, click **Apply** on the BC main screen.

- **Cancel:** Cancels the operations set in the Paircreate window and closes the Paircreate window.

To remove any volumes from the Paircreate Volume List or S-VOL List, select the volumes, right-click the selected volumes, and select **Delete**.

Creating L1 pairs

To create new BC pairs and split them immediately so you can access the S-VOLs as soon as possible, use the pairsplit operation instead of the paircreate operation (see [Splitting BC pairs \(Pairsplit\)](#)).

1. Ensure that the S-VOLs are unmounted.
2. In the BC main screen, select the port, host group, or P-VOL in the Tree View box to filter the volumes displayed in the Volume list.
3. Select the P-VOLs for the new pairs, right-click the selected P-VOLs, and select **Paircreate**. The Paircreate window appears.

 **NOTE:**

Do not select reserved volumes.

4. Set the initial copy pace for all pairs being created: **Slower**, **Medium**, or **Faster**.
5. Verify that the Paircreate window displays the P-VOLs. To remove any volumes from the list, select the volumes, right-click the volumes, and select **Delete**.
6. Select the S-VOLs for each P-VOL as follows:
 - a. Select the P-VOL in the Paircreate window.
 - b. In the **Select MU** list, select the MU number for the L1 pair being created: **0**, **1**, or **2**.
 - c. Select the port in the **Port** list, select the **Reserved** check box to display reserved volumes, and select the S-VOL.

 **NOTE:**

You can select an unreserved volume as the S-VOL. When you create the pair, the disk array changes the reserve attribute to "reserved" automatically.

- d. Click **Set** to create (add) the S-VOL to the selected P-VOL. The S-VOL is displayed next to the selected P-VOL.
 - e. To add a second and third S-VOL to the same P-VOL, repeat step 6b — step 6d. Each pair to be created is displayed separately in the list of pairs in the Paircreate window.
7. Repeat step 6 until all pairs are displayed. Click **Change** to replace an S-VOL, click **Set** to add an S-VOL, and use the **Delete** command to remove pairs.
 8. When the Paircreate window displays the new pairs, click **OK** to reflect all pairs (settings) in the list to the Preset Volume list on the BC main screen.
 9. From the BC main screen, click **Apply** to create the pairs.

When the initial copy operations start, the BC main screen shows new pairs with COPY(PD) status and progress (%) of the initial copy operations.

10. Click **Refresh** () to monitor the progress of the initial copy operations.

△ **CAUTION:**

The L2 paircreate operation overwrites all existing data on the L2 S-VOLs. You are responsible for backing up the data on the S-VOLs before creating BC pairs.

Creating L2 pairs

1. Ensure that the L2 S-VOLs are unmounted.
2. In the BC main screen, select the L1 pairs to which you want to add the L2 pairs, right-click the selected L1 pairs, and select **Paircreate**. The Paircreate window appears.
3. In the Paircreate window, select the L1 node volume, select the MU number (**1** or **2**) in the **Select MU** list, and select the S-VOL for the new L2 pair (MU=0 was already used as the L1 S-VOL).
4. Click **Cascade** to add the L2 pair to the list of pairs.
5. Repeat until all L2 pairs are displayed. Click **Change** to replace an S-VOL, click **Cascade** to add an S-VOL, and use the **Delete** command to remove pairs.
6. When the Paircreate window displays all new pairs, click **OK** to reflect all pairs (settings) in the list to the Preset Volume list on the BC main screen.
7. In the BC main screen, click **Apply** to create the pairs.
When the initial copy operations start, the BC main screen shows new pairs with COPY(PD) status and progress (%) of the initial copy operations.
8. Click **Refresh** () to monitor the progress of the initial copy operations.

Splitting BC pairs (Pairsplit)

The Pairsplit window displays volume and pair information for volumes and/or pairs selected on the BC main screen. Use the Pairsplit window to split existing BC pairs, or simultaneously create and split new BC pairs (see [Creating and splitting pairs](#)). To open the Pairsplit window, select volumes or pairs in the Volume list on the BC main screen, right-click the selected volumes or pairs, and click **Pairsplit**.

Figure 35 Pairsplit window

The Pairsplit window consists of the following components:

- [Pairsplit Volume List](#)
- [Window options](#)
- [Select S-Vol box](#)
- [Buttons](#)
- [Splitting pairs](#)
- [Creating and splitting pairs](#)

Pairsplit Volume List

This list in the upper half of the Pairsplit window displays the following information about the P-VOL and S-VOL of the pair you want to split:

- **Port:** Port ID (cluster and channel number) of the P-VOL
- **Group (G-ID):** Host group ID of the P-VOL
- **(Path) LUN:** CU:LDEV of the P-VOL

 **NOTE:**

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **MU:** MU number of the P-VOL
 - **Status:** Status of the P-VOL
 - **Port:** Port ID (cluster and channel number) of the first S-VOL of each volume pair
 - **Group (G-ID):** Host group ID of the S-VOL
 - **SvolMode (LUN(S)):** CU:LDEV of the S-VOL
-

 **NOTE:**

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **Type:** Emulation type of the P-VOL and S-VOL
- **Capacity (MB):** Volume capacity displayed in megabytes (MB)
- **CLPR(P):** Cache logical partition of the P-VOL
- **CLPR(S):** Cache logical partition of the S-VOL

Window options

Copy Pace list

Use this list to select the copy pace (**Slower**, **Medium**, or **Faster**) for all pairs you are splitting. The **Set** button applies the same copy pace to all pairs you are splitting.

Select MU list

Use this list to select the MU number for each pair being created: **0**, **1**, and **2** for L1 pairs, and **1** and **2** for L2 pairs.

 **NOTE:**

You can select an MU number for a cascade pair. You cannot select the same MU number for different cascade pairs of the same P-VOL (root or node volume).

Select Split Type list

Use this list to select the pairsplit type: **Quick Split** or **Steady Split**.

Select S-Vol box

This box filters S-VOLs displayed in the S-VOL list.

- **Port:** Display available S-VOLs by port.
 - **Volume Type:**
 - **Internal Vol:** Select available S-VOLs that are internal volumes.
 - **External Vol:** Select available S-VOLs that are external volumes.
-

 **NOTE:**

You can only select external volumes when External Storage XP is available.

- **Attribute:** Select available S-VOLs that are reserved when the **Reserved** check box is selected, or that are unreserved when the **Not Reserved** check box is selected. You can also select pairs that can be set as L2 pairs when the **Pair** check box is selected.

 **NOTE:**

The number of secondary volumes that can be displayed in the S-VOL List at one time is limited to 1,024. If the number of volumes defined in the disk array exceeds this limit, use the **Previous** and **Next** buttons on the upper right of the S-VOL List to turn the pages of the S-VOL List and see the entire list.

- **Previous** button: Returns to the previous page of the S-VOL List. This button is selectable only when the number of volumes defined in the disk array exceeds 1,024, which is the maximum number of volumes that can be displayed on one page. The button is unavailable if the total number of volumes defined in the disk array is less than 1,024.
- **Next** button: Turns to the next page of the S-VOL List. This button is selectable only when the number of volumes defined in the disk array exceeds 1,024, which is the maximum number of volumes that can be displayed on one page. The button is unavailable if the total number of volumes defined in the disk array is less than 1,024.
- The S-VOL List displays the following information related to S-VOLs:
 - **Port**: Port ID (cluster and channel number) of the S-VOL
 - **Group (G-ID)**: Host group ID of the S-VOL
 - **S-Vol Path (LUN)**: CU:LDEV of the S-VOL
 - **Pair Num**: Number of pairs
 - **Type**: Emulation type of the S-VOL
 - **Capacity (MB)**: Capacity of the S-VOL in megabytes (MB)
 - **CLPR**: The cache logical partition (CLPR) of the S-VOL

Buttons

- **Set**: Adds the selected S-VOL and P-VOL to the Pairsplit Volume List as an L1 pair.
- **Change**: Replaces the existing S-VOL of the selected L1 pair (that is, the S-VOL of the pair after completing the operation selected in the Pairsplit Volume List) with the selected S-VOL.
- **Cascade**: Adds the selected S-VOL and P-VOL (node volume) to the Pairsplit Volume List as an L2 pair. To use the **Cascade** button, select one of the listed L1 pairs.
- **OK**: Adds the operation (setting) to split a pair composed of the P-VOL and S-VOL selected in the Pairsplit window to the Preset List on the BC main screen.

 **NOTE:**

To apply the new setting displayed in the Preset List to the disk array, click **Apply** on the BC main screen.

- **Cancel**: Cancels operations set in the Pairsplit window and closes the Pairsplit window.

To remove any volumes from the Pairsplit Volume List or the S-VOL List, select the volumes, right-click the selected volumes, and select **Delete**.

Splitting pairs

1. If you want the split S-VOLs to be identical to the P-VOLs, stop all write operations to the P-VOLs before splitting the pairs. This ensures there are no updates to the P-VOLs while the pairsplit operations are synchronizing the S-VOLs to the P-VOLs.

 **CAUTION:**

The P-VOL and S-VOL are synchronized only when the pair status changes from COPY(SP) or PSUS(SP) to PSUS. Due to the BC asynchronous update copy operations, this status transition can take several minutes.

2. In the BC main screen, select the port, host group, or P-VOL in the Tree View box to filter the volumes displayed in the Volume list.
3. Select the pairs you want to split, right-click the selected P-VOLs, and select **Pairsplit**. The Pairsplit window appears. You cannot split a suspended (PSUE) pair.
4. In the Pairsplit window, set the copy pace (**Slower**, **Medium**, or **Faster**) for all pairs being split. If you change the setting, the latest setting is applied to all pairs
5. Set the split type (**Quick Split** or **Steady Split**) for each pair being split. The split type is set for all pairs being split. If you change the setting, the latest setting is applied to all pairs.
6. When the Pairsplit window displays the pairs you want, click **OK** to add all pairs to the Preset Volume list on the BC main pane. Use the **Delete** command to remove any pairs from the list.
7. In the BC main screen, click **Apply** to split the pairs.

When the pairsplit operations start, the BC main screen shows new pairs with COPY(SP) or PSUS(SP) status and progress (%) of the update copy operations. The PSUS status is displayed right away if there were no pending update copy operations

8. Click **Refresh** () to monitor the progress of the pairsplit operations.

Creating and splitting pairs

Use the pairsplit operation to simultaneously create and split new BC pairs. In this case, the pairsplit operation changes the pair status from SMPL to COPY(SP) or PSUS(SP), copies all data on the P-VOL to the S-VOL, and changes the pair status to PSUS.

1. If you want the split S-VOLs to be identical to the P-VOLs, stop all write operations to the P-VOLs before creating and splitting the pairs. This ensures there are no updates to the P-VOLs while the pairsplit operations are synchronizing the S-VOLs to the P-VOLs.

△ CAUTION:

The P-VOL and S-VOL are synchronized only when the pair status changes from COPY(SP) or PSUS(SP) to PSUS. Due to the BC asynchronous update copy operations, this status transition can take several minutes.

2. In the BC main screen, select the port, host group, or P-VOL in the Tree View box to filter the volumes displayed in the Volume list.
3. Select the volumes that will be the P-VOLs of the new pairs to be created and split, right-click the selected P-VOLs, and select **Pairsplit**. The Pairsplit window appears.
4. Set the copy pace (**Slower**, **Medium**, or **Faster**) and split type (**Quick** or **Steady**) for all pairs being created and split.
5. Specify the S-VOLs as follows:
 - a. Select the P-VOL.
 - b. In the **Select MU** list, select the MU number (**0**, **1**, or **2**) for the L1 pair to be created.
 - c. Select the port in the **Port** list, display either reserved or unreserved volumes, and click the S-VOL.
 - d. Click **Set** to add the S-VOL to the selected P-VOL. The S-VOL is now displayed next to the selected P-VOL.
 - e. To add another S-VOL to the same P-VOL, repeat step 5c — step 5d. Each pair to be created and split is displayed separately in the list of pairs.
6. Repeat step 5 until the L1 pairs are displayed. Click **Change** to replace S-VOLs, click **Set** to add L1 S-VOLs, and use the **Delete** command to remove pairs.
7. To create and split L2 cascade pairs, add the L2 S-VOLs to the L1 pairs as follows:
 - a. Select the L1 pair from the list of pairs to be created and split.

- b. Ensure that the L1 pairs are split (status = PSUS).
 - c. In the **Select MU** list, select the MU number (**1** or **2**) for the L2 pair to be created.
 - d. From the Pairsplit Volume List, select the volume to assign as the S-VOL for the L2 pair.
 - e. Click **Cascade** to add the L2 S-VOL to the selected L1 pair. The new L2 pair is now displayed.
 - f. To add another L2 S-VOL to the same L1 pair, repeat step 7b — step 7e. Each L2 pair to be created and split is displayed separately in the list of pairs.
8. Repeat step 7 until the pairs are displayed. Click **Change** to replace S-VOLs, click **Cascade** to add L2 S-VOLs, and use the **Delete** command to remove pairs.
 9. When the Pairsplit window displays the L1 and L2 pairs, click **OK** to reflect the settings to the Preset Volume list on the BC main screen.
 10. In the BC main screen, click **Apply** to create and split the pairs.
When the pairsplit operations start, the BC main screen shows new pairs with COPY(SP) or PSUS(SP) status.
 11. Click **Refresh** () to monitor the progress of the pairsplit operations.

Resynchronizing BC pairs (Pairresync)

The Pairresync window displays pair information for pairs selected on the BC main screen. Use the Pairresync window to resynchronize pairs. To open the Pairresync window, select one or more PSUS or PSUE pairs in the Volume list on the BC main screen, right-click the selected pair, and select **Pairresync**.

Figure 36 Pairresync window

The Pairresync window consists of the following components.

Pairresync Volume List

The Volume List located on the upper side of the Pairresync window displays the following information about the P-VOL and S-VOL of the pair you want to resynchronize:

- **Port:** Port ID (cluster and channel number) of the P-VOL
- **Group (G-ID):** Host group ID of the P-VOL
- **(Path) LUN:** CU:LDEV of the P-VOL

NOTE:

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **MU:** MU number of the P-VOL
- **Status:** Status of the P-VOL
- **Port:** Port ID (cluster and channel number) of the first S-VOL of each volume pair
- **Group (G-ID):** Host group ID of the S-VOL
- **SvolMode (LUN(S)):** CU:LDEV of the S-VOL

NOTE:

An LDEV number ending with # (for example, **00:01#**) indicates the LDEV is an external volume.

- **Type:** Emulation type of the P-VOL and S-VOL
- **Capacity (MB):** Volume capacity displayed in megabytes (MB)
- **CLPR(P):** Cache logical partition of the P-VOL

- **CLPR(S)**: Cache logical partition of the S-VOL

Window options

- Use the Resync Type list to select the pairresync type for pairs being resynchronized (**Normal Copy, Quick Resync, Reverse Copy, or Quick Restore**).
- Use the Copy Pace list to select the copy pace (**Slower, Medium, or Faster**) for all pairs being resynchronized.
- The **OK** button adds the operation setting displayed in the Pairresync Volume List for resynchronizing the specified pairs to the Preset List on the BC main screen.

NOTE:

You must click **Apply** on the BC main pane to start the pairresync operation for the specified pairs.

- The **Cancel** button cancels operations set in the Pairresync window and closes the Pairsplit window.
- To remove any volumes from the Pairresync Volume List, right-click the selected volumes, and click **Delete**.

Resynchronizing one or more BC pairs

1. Unmount the split (PSUS) S-VOLs before starting the pairresync operations. When the pairresync operation starts, the disk array stops accepting write I/Os to the S-VOL.
2. In the BC main screen, select the port, host group, or P-VOL in the Tree View box to filter the volumes displayed in the Volume list.
3. In the BC main screen, select the pairs to resync, right-click the selected pairs, and select **Pairresync**. The Pairresync window appears.
4. In the Pairresync window, select the pairs, and set the copy pace (**Slower, Medium, or Faster**) and resync type (**Normal Copy, Quick Resync, Reverse Copy, or Quick Restore**) for each pair. Reverse and quick restore pairresync cannot be performed on suspended pairs (PSUE) or L2 cascade pairs.

NOTE:

When a quick restore operation is in progress, the array management user interface may display old configuration information. To update the information in the user interface, wait for the quick restore operation to finish, and click **Refresh**.

CAUTION:

Ensure that the correct resync direction (normal/quick, or reverse/quick restore) is selected.

△ **CAUTION:**

During the quick restore operation, the RAID levels, HDD types, and Cache LUN settings are swapped. To avoid performance impact due to quick restore operations:

- Ensure that the P-VOL and S-VOL have the same RAID level and HDD type before performing the quick restore operation. To restore the original RAID levels after quick restore, stop host I/Os to the pair, split the pair, perform the quick restore operation for that pair again, and restart host I/Os to the pair.
- Because the Cache LUN settings are exchanged during a quick restore operation, you must perform one of the following operations. If you do not, the change of location of the cache residence areas may cause I/O performance to the Cache LUN data to be down.
 - Set the same Cache LUN settings (locations) for the P-VOL and S-VOL before performing the quick restore operation.
 - Release the Cache LUN settings of the P-VOL and S-VOL before the quick restore operation, and reset the Cache LUN settings of the P-VOL and S-VOL after the pair changes to PAIR status as a result of the quick restore operation.

If you do not want to resynchronize the P-VOL and S-VOL after the quick restore operation, set the Swap&Freeze option before performing the quick restore operation.

-
5. Click **OK**. Repeat step 4 — step 5 until the Preset Volume list on the BC main screen displays the pairs (settings).

 **NOTE:**

Ensure that the S-VOLs are taken offline before starting pairresync operations.

-
6. In the BC main screen, click **Apply** to resync the specified pairs.
The BC main screen displays the results of the pairresync operations (that is, the pair status changed to COPY(RS), COPY(RS-R), or PAIR).
7. Click **Refresh** () to monitor the progress of the pairresync operations.

Suspending BC pairs (Pairsplit-E)

The Pairsplit-E window displays pair information for pairs selected on the BC main screen. Use the Pairsplit-E window to suspend pairs. To open the Pairsplit-E window, select one or more pairs (except SMPL and PSUE pairs) in the Volume list on the BC main screen, right-click the selected pairs, and click **Pairsplit-E**.

Figure 37 Pairsplit-E window

The Pairsplit-E window lists pairs selected on the BC main screen and shows pair status and copy pace for each pair. The **OK** button suspends the selected pairs. The **Cancel** button closes the Pairsplit-E window and returns to the BC main screen.

Suspending one or more BC pairs

1. In the BC main screen, click the port, host group, or P-VOL in the Tree View box to filter the volumes displayed in the Volume list.
2. Select the pairs to suspend (or the volumes whose pairs you want to suspend), right-click the selected pairs, and click **Pairsplit-E**. The Pairsplit-E window appears.
3. In the Pairsplit-E window, select the pairs to suspend, and click **OK** to reflect the settings to the Preset Volume list on the BC main screen.

To remove the pairs from the list, right-click while selecting the pairs, and select **Delete**.

4. Repeat step 2 — step 3 to suspend additional pairs in the list.
5. In the BC main screen, click **Apply** to suspend the specified pairs.
The BC main screen now displays the results of the pairsplit-E operations (that is, pair status changed to PSUE).
6. Click **Refresh** () to display the latest information.

Deleting BC pairs (Pairsplit-S)

The Pairsplit-S window displays pair information for pairs selected on the BC main screen. Use the Pairsplit-S window to delete pairs. To open the Pairsplit-S window, select one or more pairs (except SMPL and PSUS(SP) pairs) in the Volume list on the BC main screen, right-click the selected pairs, and select **Pairsplit-S**.

Figure 38 Pairsplit-S window

The Pairsplit-S window lists pairs selected on the BC main screen and shows pair status and copy pace for each pair. The **OK** button deletes selected pairs. The **Cancel** button closes the Pairsplit-S window and returns to the BC main screen.

Deleting one or more BC pairs

1. To synchronize the P-VOL and S-VOL before deleting the pair:
 - a. Wait until all write I/Os to the P-VOL are complete, and take the P-VOL offline to prevent the P-VOL from being updated during or after the pairsplit-S operation.
 - b. After the P-VOL is offline, suspend the pair to copy all pending updates to the S-VOL.
 - c. When the pair status changes to PSUE, the P-VOL and S-VOL are synchronized.
2. In the BC main screen, select the port, host group, or P-VOL in the Tree View box to filter the volumes displayed in the Volume list.
3. Select the pairs to delete (or the volumes whose pairs you want to delete), right-click the selected pairs or volumes, and select **Pairsplit-S**. The Pairsplit-S window appears.

NOTE:

Pairs with PSUS(SP) status cannot be deleted. To remove pairs from the list, right-click while selecting the pairs, and select **Delete**.

4. In the Pairsplit-S window, select the pairs to delete, and click **OK** to reflect the settings to the Preset Volume list on the BC main screen.
5. In the BC main screen, click **Apply** to delete the specified pairs or volumes.
The BC main screen now displays the results of the pairsplit-S operations.
6. Click **Refresh** () to display the latest information.

Viewing BC pair status and history

The History pane displays current BC pair status information and BC pair history information for the selected port. To open the History pane, click the **History** tab on the BC main screen.

Figure 39 History pane



NOTE:

If Snapshot XP is installed, the lower area of the pane lists the operation history of Snapshot XP pairs. For more information, see the *HP StorageWorks Snapshot XP user guide*.

The upper area of the History pane lists the operation history of BC pairs. The upper area of the History pane displays the following information:

- BC pair activity listed by date and time, LU information (port, host group ID, LUN) and volume ID (CU:LDEV) of the P-VOL and S-VOL, and BC code and message (see [Table 22](#)). The **Time** button sorts the list by date and time. The **P-Vol** and **S-Vol** buttons sort the list by **P-VOL** or **S-VOL**. The **Code** button sorts the list by code number. The **Message** button sorts by message type.



NOTE:

The maximum number of records that can be listed in the History pane is 16,384.

- The **Refresh** button () updates all information in the History pane.

If you perform an operation on a pair before the copy operation starts, the History pane will not display information about the operation.

You may need to wait for a while until the History pane displays operation history if the total number of the following pairs is 500 or more:

- BC pairs
- Snapshot XP pairs
- ShadowImage for z/OS pairs
- Hitachi® FlashCopy® Mirroring pairs
- Auto LUN XP pairs
- Flex Copy XP pairs

Even if the total number of pairs is less than 500, displaying operation history may take time when some of the pairs include LUSE volumes.

Table 22 BC pair activity codes, messages, and descriptions

Code	Message	Description
4710 - 471F	PAIR START	BC initial copy operation started.
4720 - 472F	PAIR END	BC initial copy operation ended, and pair status changed to PAIR.
4730 - 473F	PSUS START	BC pairsplit operation started, and pair status changed to COPY(SP) or PSUS(SP).
4740 - 474F	PSUS END	BC pairsplit operation ended, and pair status changed to PSUS.
4750 - 475F	COPY(RS) START COPY(RS-R) START	BC pairresync operation started, and pair status changed to COPY(RS) or COPY(RS-R).
4760 - 476F	COPY(RS) END COPY(RS-R) END	BC pairresync operation ended, and pair status changed to PAIR.
4780 - 478F	SMPL	BC pairsplit-S operation was performed, and pair status changed to SMPL.
4790 - 479F	PSUE	BC pairsplit-E operation was performed, and pair status changed to PSUE.
47A0 - 47AF	COPY WARNING END	Copy ended with a warning.
47B0 - 47BF	COPY ABNORMAL END(PVOL BLOCKADE)	Copy ended abnormally due to P-VOL blockade.
47C0 - 47CF	COPY ABNORMAL END(SVOL BLOCKADE)	Copy ended abnormally due to S-VOL blockade.
47D0 - 47DF	COPY ABNORMAL END	Copy ended abnormally (reason other than above).
47E7	COMPULSION PAIR SUSPEND	A pair was suspended compulsorily.
47E9	SI SM INITIALIZATION START	Initialization of BC extension table was started (SM = shared memory).
47EA	SI SM INITIALIZATION END	Initialization of BC extension table was completed (SM = shared memory).
47EB	SI SM INITIALIZATION FAILED	Initialization of BC extension table failed (SM = shared memory).
7FF1 - 02	COPY ABNORMAL END (MULTIPLE PAIRS)	Multiple copies ended abnormally. This reference code is reported at a five-minute interval (one report per five minutes). If a pair ended abnormally, the pair status changed to PSUE.
FFFF	Reference Code unknown	The reference code is unknown.

Setting BC options

You can set the BC options by selecting and/or clearing the option check boxes on the Option screen. To display the Option screen, click the **Option** tab on the BC main screen.

Figure 40 Option screen

The **Select Option** box displays check boxes for the BC options.

**NOTE:**

More options will be supported in the future. See [BC options](#) for further information.

The **Apply** button applies the option settings in the **Select Option** box.

Setting a BC option (Swap&Freeze option)

1. In the BC main screen, click **Option** to display the **Select Option** box.
Select the option check box. If you do not want to set any option, clear all check boxes in the **Select Option** box.
2. Click **Apply**. You can now perform a BC operation with the specified option.

BC error codes

BC displays error messages when error conditions occur during BC operations. The BC Error window displays the BC error code and message. To display the Error window, select the failed volume in the Preset Volume list on the BC main screen (**Display** tab), right-click, and select **Detail**. The following table describes the BC error codes and provides instructions for resolving each error condition.

Table 23 BC error codes

Error Code	Description	Corrective Action
0401	A locking time-out was detected during an internal processing.	A retry may result in a normal termination. Retry about five seconds later.
0402	A command (Paircreate, Pairsplit, or Reserve Volume) could not be completed because it was not in the SMPL status internally.	A retry may result in a normal termination. Retry about five seconds later.
0801	The BC feature could not be used.	Ensure that the disk array has the correct microcode level for BC, the disk array has BC installed and enabled, and the Command View XP management station or XP Remote Web Console has BC installed and enabled.
080B	The request could not be accepted.	Retry about one minute later.
0810	The specified command cannot be accepted in this status. (The command was rejected.)	Check the pair status, and ensure that the pair status is correct for the command.
0811	The specified command is treated as an NOP.	The specified command is treated as an NOP. (NOP means the command can end without errors, but executes nothing.)
0812	The new pair could not be created because a path group is set.	Disconnect from host, or cancel Continuous Access XP path. On the Continuous Access XP main screen, confirm the specified S-VOL is simplex, specify the Delete Pair by Force option, and retry the operation.
0813	The Pairsplit command was issued to a pair in the PSUS status.	The Pairsplit command cannot be issued because the pair is already in PSUS status.
0814	The Paircreate command was issued to the pair in the PAIR status.	The Paircreate command cannot be issued because the pair is already in PAIR status.
0817	A Reserve volume cannot be set because a path group is set.	Disconnect volume to be reserved from host, or delete Continuous Access XP path.

Error Code	Description	Corrective Action
0818	The Pairresync or Pairsplit-E command cannot be issued because a path group is set.	Unmount the S-VOL (offline from the host), or delete Continuous Access XP path.
081F	Command Reject. P-VOL is used from HOST or by CA.	Disconnect from host, or cancel Continuous Access XP path.
0830	A pair cannot be created because the track format is different.	Ensure that the emulation type of the P-VOL and S-VOL is the same.
0831	A pair cannot be created because a number of slots is different.	Ensure that the capacity of the P-VOL and S-VOL is the same.
0834	The emulation type of the specified P-VOL is not supported by BC.	Ensure that BC supports the emulation type of the P-VOL.
0835	The emulation type of the specified S-VOL is not supported by BC.	Ensure that BC supports the emulation type of the S-VOL.
0836	The pair cannot be created.	The emulation type of the P-VOL and S-VOL is not the same.
0840	Logical contradiction.	Call HP technical support for assistance.
0841	Logical contradiction.	Call HP technical support for assistance.
0842	Logical contradiction.	Call HP technical support for assistance.
0848	Logical contradiction.	Call HP technical support for assistance.
0849	Logical contradiction.	Call HP technical support for assistance.
084A	Logical contradiction.	Call HP technical support for assistance.
084B	Logical contradiction.	Call HP technical support for assistance.
0852	Command Reject. P-VOL and S-VOL are used from HOST or by CA.	Disconnect from the host, or cancel Continuous Access XP path.
0880-08FF	Logical contradiction.	Call HP technical support for assistance.
0C70	A P-VOL is not installed.	Volumes that are not installed cannot be processed.
0C71	The P-VOL cannot be used.	Call HP technical support to make the P-VOL status normal.
0C72	The P-VOL is being formatted.	Wait until formatting the P-VOL completes.
0C80	The S-VOL is not installed.	Volumes that are not installed cannot be processed.
0C81	The S-VOL cannot be used.	Call HP technical support to make the P-VOL status normal.
0C82	The S-VOL is being formatted.	Wait until formatting the S-VOL completes.
0C90	The volume to be Reserved is not installed.	Volumes that are not installed cannot be processed.
0C91	The volume to be Reserved cannot be used.	Call HP technical support to make the volume status normal.
0C92	The volume to be Reserved is being formatted.	Wait until formatting the volume completes.
1001	Logical contradiction.	Call HP technical support for assistance.
1002	Logical contradiction.	Call HP technical support for assistance.
1003	Logical contradiction.	Call HP technical support for assistance.

Error Code	Description	Corrective Action
1004	Logical contradiction.	Call HP technical support for assistance.
1005	Logical contradiction.	Call HP technical support for assistance.
1007	Logical contradiction.	Call HP technical support for assistance.
1009	The number of BC pairs exceeded the maximum.	Delete some of the pairs.
1010	Logical contradiction.	Call HP technical support for assistance.
1011	The number of the volume specified to be a Reserve volume has already been used for a Reserve volume.	Change the volume number for specifying a Reserve volume.
1012	The number of the volume specified to be a Reserve volume has already been used for a primary BC volume.	Change the volume number for specifying a Reserve volume.
1013	The number of the volume specified to be a Reserve volume has already been used for a hierarchical control primary volume.	Change the volume number for specifying a Reserve volume.
1014	The number of the volume specified to be a Reserve volume has already been used for a hierarchical control destination volume.	Change the volume number for specifying a Reserve volume.
1015	The volume specified to be a Reserve volume is not set as a Reserve volume.	Check volume status.
1016	The volume can appropriately be allocated as an S-VOL does not exist among Reserve volumes.	Delete any Reserve volume that can be allocated as an S-VOL.
1017	A Reserve volume cannot be set because the max. number of Reserve volumes was exceeded.	Delete any Reserve volumes.
101E	The Reserve volume itself does not exist in the system.	Set one or more Reserve volumes.
1026	It is impossible to make a pair any more because the volume that was specified as P-VOL is root volume already.	Delete some of the pairs of root volume.
1027	It is impossible to make a pair any more because the volume that was specified as P-VOL is node volume already.	Delete some of the pairs of node volume.
1028	It is impossible to make a pair because the volume that was specified as P-VOL is leaf volume already.	Confirm a pair condition.
1029	It is impossible to make a pair because the volume that was specified as S-VOL is leaf volume already.	Confirm a pair condition.
102E	P-VOL is used as source volume for HIHSM.	Confirm a matching condition.
102F	P-VOL is used as destination volume for HIHSM.	Confirm a matching condition.
1030	The specified P-VOL number does not exist.	Retry after refreshing the screen.
1031	The specified P-VOL has been set as a Reserve volume.	Check pair status.
1032	No more pairs can be created for the specified P-VOL.	Delete any pairs formed by the P-VOL.

Error Code	Description	Corrective Action
1033	The specified P-VOL is not really a P-VOL.	Check pair status.
1037	The specified P-VOL has been set as a BC S-VOL.	Check pair status.
103A	The Pairresync command was issued to a device in the SMPL status.	Check pair status.
103B	It is impossible to make a pair because volume that was specified as S-VOL is root volume already.	Confirm a pair condition.
103C	It is impossible to make a pair because volume that was specified as S-VOL is node volume already.	Confirm a pair condition.
103D	It is impossible for L2 pair to require a split because L1 pair is not in the split condition.	After making L1 pair a split condition, re-execute.
103E	A new pair was created with a P-VOL forming the CA cooperation pattern.	Place the BC pair in SMPL status, or place the Continuous Access XP pair that uses the BC S-VOL as a P-VOL in SMPL status.
103F	A pair status cannot be changed to form the CA cooperation pattern.	Place the Continuous Access XP pair that uses the BC S-VOL as a P-VOL in PSUE or SMPL status.
1040	The specified S-VOL does not exist.	Set one or more Reserve volumes.
1042	S-VOL is used as destination volume for HIHSM.	Confirm a matching condition.
1043	The specified S-VOL number has already been used as that of an S-VOL.	Check pair status.
1044	The specified S-VOL is not a BC S-VOL.	Check pair status.
1046	The specified secondary volume is being used as a CA P-VOL.	Delete the Continuous Access XP pair.
1047	The specified secondary volume is being used as a CA S-VOL.	Delete the Continuous Access XP pair.
104A	The specified secondary volume is being used as a BC P-VOL.	Check the pair status.
104B	S-VOL is used as source volume for HIHSM.	Confirm a matching condition.
104E	The volume specified as a Reserve volume is being used as a CA P-VOL.	Delete the Continuous Access XP pair.
104F	The volume specified as a Reserve volume is being used as a CA S-VOL.	Delete the Continuous Access XP pair.
1050	The specified P-VOL and S-VOL are not a BC pair.	Check the pair status.
1051	The volume numbers of the specified P-VOL and S-VOL are the same.	Retry after refreshing the screen.
1053	Request could not be accepted	Confirm a matching condition.
1054	Request could not be accepted	Confirm a matching condition.
1058	S-VOL is node volume whose L2 status is SP-Pend.	Confirm a matching condition.
1070	The status mode specification (status modec) in the Status Check command is incorrect.	Call HP technical support for assistance.

Error Code	Description	Corrective Action
1071	The status classification (statusindc) in the Status Check command is incorrect.	Call HP technical support for assistance.
1072	The CU number specified by the Status Check command (volume status) does not exist.	Call HP technical support for assistance.
1084	Volume was used for reserve volume of HIHSM.	Check the volume, or cancel the reserve volume of HIHSM.
1085	P-VOL was used for reserve volume of HIHSM.	Check the P-VOL, or cancel the reserve volume of HIHSM.
1086	S-VOL was used for reserve volume of HIHSM.	Check the S-VOL, or cancel the reserve volume of HIHSM.
1087	P-VOL is used as source volume for HIHSM.	Confirm a matching condition.
1095	Request could not be accepted because status of pair who shared with P-VOL was Reverse-copy.	Confirm a matching condition.
1096	Request could not be accepted because L1 pair status was Reverse-copy.	Confirm a matching condition.
1097	Request could not be accepted because L2 pair status was Reverse-copy.	Confirm a matching condition.
1098	Reverse-Copy could not be accepted because pair status was not Split.	Confirm a matching condition.
1099	Reverse-copy to L2 pair could not be accepted because status of pair who shared with P-VOL was neither Split nor Suspend.	Confirm a matching condition.
109A	Reverse-copy could not be accepted because P-VOL was shared with CA P-VOL whose status was not Suspend.	Confirm a matching condition.
109B	Reverse-copy could not be accepted because P-VOL was shared with CA S-VOL whose status was not Suspend.	Confirm a matching condition.
109C	Reverse-copy could not be accepted because S-VOL was shared with CA P-VOL.	Confirm a matching condition.

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