

HP StorageWorks

Business Copy XP user guide for the XP128/XP1024

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Business Copy XP user guide for the XP128/XP1024

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About this guide

This guide provides information about the following:

- "Overview of BC operations" on page 11"
- "Preparing for BC operations" on page 32
- "Performing BC operations" on page 36
- "BC error codes" on page 58

Intended audience

This guide is intended for customers and HP-authorized service providers experienced with the following:

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

Prerequisites

Prerequisites for using this product include:

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

Firmware versions

The recommended firmware versions provide the optimal level of support for the features provided with this product. Older firmware versions can be used; however, product features enabled with newer firmware will not appear.

Table 1 Recommended and minimum firmware versions

XP disk array	Minimum	Recommended
XP1024/XP128	21-13-02-00/00	21-14-10-00/00 or later

Related documentation

In addition to this guide, please refer to other documents for this product:

- *HP StorageWorks Command View XP user guide for XP Disk Arrays*
- *HP StorageWorks Command View XP Remote Web Console user guide for XP1024/XP128*
- *HP StorageWorks LUN Configuration and Security Manager XP user guide for the XP128/XP1024*

You can find these documents at <http://www.hp.com/support/rwc/manuals>.

Document conventions and symbols

Table 2 Document conventions

Convention	Element
Blue text: Table 1	Cross-reference links and e-mail addresses
Blue, underlined text: (http://www.hp.com)	Web site 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, and check boxes
<i>Italic text</i>	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 text</i>	<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

Telephone numbers for worldwide technical support are listed on the HP support web site:
<http://www.hp.com/support/>.

Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

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

Subscription service

HP strongly recommends that customers register online using the Subscriber's choice web site:

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

Subscribing to this service provides you with e-mail updates on the latest product enhancements, newest driver versions, and firmware documentation updates as well as instant access to numerous other product resources.

After subscribing, locate your products by selecting **Business support** and then **Storage** under Product Category.

Helpful web sites

For additional information, see the following HP web sites:

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

1 Business Copy XP (BC) for the XP128/XP1024

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 with HP StorageWorks Continuous Access XP operations to provide additional remote copies of BC volumes. BC also supports the disk array's CVS and Cache LUN XP features, ensuring that BC operations can duplicate all user data. See "[Combining BC with other data management operations](#)" on page 33 for further information on combining BC with other data management features.

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 \(P-VOLs and S-VOLs\)](#)" on page 12

- “BC software on the Command View XP management station or XP Remote Web Console” on page 13

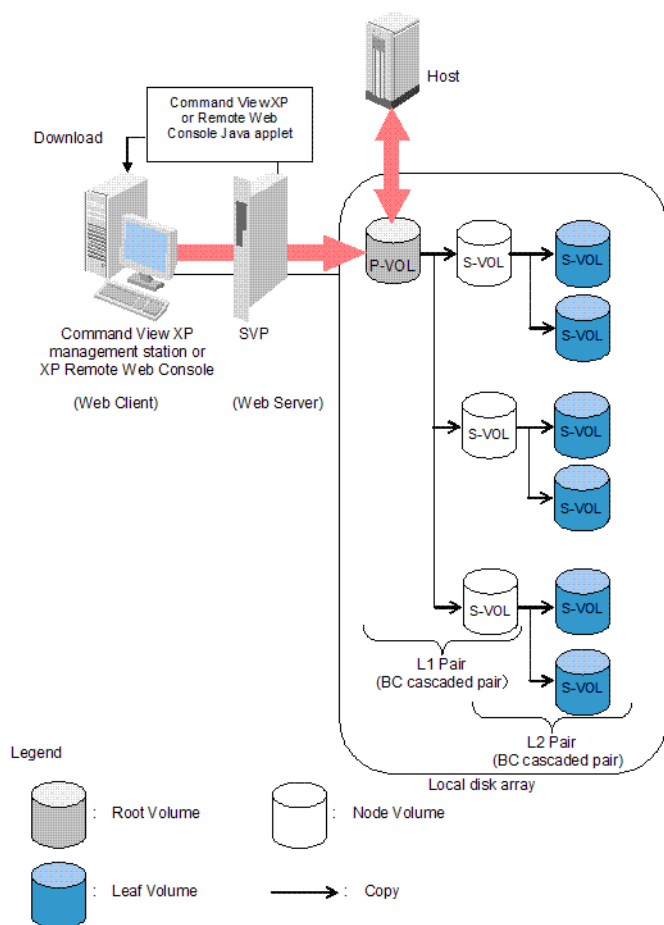


Figure 1 BC overview

Use BC from the Command View XP management station or XP Remote Web Console to copy volumes in the local disk array. 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 XP128/XP1024 disk arrays support a maximum of 8,190 BC volumes: 4,095 pairs 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 internal 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) located in the same disk array. BC P-VOLs are primary volumes containing original data. 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 (the P-VOL is accessible except during reverse resync). 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"](#) on page 16.

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.

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"](#) on page 25 for further information on the cascade function.

BC software on the Command View XP management station or XP Remote Web Console

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

BC requirements

BC operations provide disk array-internal copies of UNIX/PC server volumes (LUs) on the disk array. [Table 3](#) describes operational requirements for the use of BC.

Table 3 BC operational requirements

Parameter	Requirement
Pair objects	<p>Logical devices (LDEVs): OPEN-x (such as OPEN-3, OPEN-9, OPEN-E, or 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, or -3C).</p> <p>Volumes that form a Flex Copy XP pair cannot be specified as P-VOLs or S-VOLs.</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>The total number of BC, ShadowImage (SI390), ShadowImage - FlashCopy®, Auto LUN XP, and Flex Copy XP (or Flex Copy XP V2) volume pairs. For more information, see "Maximum number of pairs" on page 14.</p>
Maximum number of S-VOLs	4,095

Table 3 BC operational requirements (continued)

Parameter	Requirement
MU numbers of cascade pairs	L1 pairs = 0, 1, and 2 (total of 3 pairs) L2 pairs = 1 and 2 (total of 2 pairs)
Combinations of RAID levels (primary- secondary)	All combinations supported: RAID1-RAID1, RAID5-RAID5, RAID1-RAID5, and RAID5-RAID1.
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.
Physical device (PDEV) maintenance	If a PDEV requires maintenance, the status of the logical volumes associated with that PDEV is not affected. However, if PDEV maintenance requires access to a BC S-VOL, the pair must be deleted, and the Reserve attribute must be reset (unreserved).
Logical device (LDEV) maintenance	LDEV maintenance cannot be performed on LDEVs assigned to BC pairs. If LDEV maintenance requires access to a BC LDEV, the pair must be deleted, and the Reserve attribute must be reset (unreserved).
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, vary 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.
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, the BC pair status is not affected because of the RAID architecture.
Maintenance/upgrade	Under certain conditions, BC volume pairs may need to be re-established.

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

Maximum number of pairs

The number of copy pairs BC can create is the difference between total number of available resources and number of resources already used to create pairs by ShadowImage (SI390), ShadowImage - FlashCopy, Auto LUN XP, and Flex Copy XP (or Flex Copy XP V2). The maximum is 4,096 pairs. However, when a high-capacity LU is used to create pairs, the number of pairs that can be created may be less than 4,096.

This section describes how to calculate the number of resources used by ShadowImage (SI390), ShadowImage - FlashCopy, Auto LUN XP, and Flex Copy XP (or Flex Copy XP V2).

The number of pairs you can create depends on the emulation type and capacity of paired volumes. [Table 4](#) on page 15 shows the number of pairs you can create for volumes of each emulation type and capacity.

When volumes with different emulation types and capacities are paired, the number of pairs you can create is determined according to the following conditions.

- If an LU consists of one volume (when LUSE is not used):

The maximum number of pairs you can create is the largest number that meets the equation, $\Sigma(\alpha) \leq (\beta)$, where:

$\Sigma(\alpha)$ is total number of differential tables per pair

(β) is number of differential tables in the disk array

$(\beta) = 2,048$ when number of CUs is equal to or less than 4

$(\beta) = 4,096$ when number of CUs is equal to or more than 5

For example, if you create 10 pairs of OPEN-3 volumes and 20 pairs of OPEN-V (60 GB) volumes, the total number of differential tables per pair, $\Sigma(\alpha)$, is $(1 \times 10) + (7 \times 20) = 150$.

Because 150 is smaller than 2,048 (when number of CUs is equal to or less than 4) or 4,096 (when number of CUs is equal to or more than 5), it meets the equation, $\Sigma(\alpha) \leq (\beta)$, ensuring that 10 pairs of OPEN-3 volumes and 20 pairs of OPEN-V (60 GB) volumes can be created.

- If an LU consists of more than one volume (when LUSE volumes are used):

The maximum number of pairs you can create is the largest number that meets the equation, $[\Sigma(\alpha) \times (\text{number of volumes that configure a LUSE volume})]$ is less than (β) , where:

$\Sigma(\alpha)$ is total number of differential tables per pair

(β) is number of differential tables in the disk array

$(\beta) = 2,048$ when number of CUs is equal to or less than 4

$(\beta) = 4,096$ when number of CUs is equal to or more than 5

For example, if you create 10 pairs of LUSE volumes consisting of three OPEN-3 volumes and 20 pairs of LUSE volumes consisting of five OPEN-V (60 GB) volumes, $[\Sigma(\alpha) \times (\text{number of volumes that configure a LUSE volume})]$ is $(1 \times 3 \times 10) + (7 \times 5 \times 20) = 730$.

Because 730 is smaller than 2,048 (when number of CUs is equal to or less than 4) or 4,096 (when number of CUs is equal to or more than 5), it meets the equation, $[\Sigma(\alpha) \times (\text{number of volumes that configure a LUSE volume})]$ is less than (β) , ensuring that 10 pairs of OPEN-3 volumes and 20 pairs of OPEN-V (60GB) volumes can be created.

The maximum number of pairs you can create is limited to the number of volumes installed.

Table 4 Number of pairs that can be created with volumes of each emulation type and capacity

Volume		No. of differential tables per pair needed for controlling the difference between the primary and secondary volumes	No. of pairs that can be created (If the volumes of the same emulation type and capacity are used to create all the pairs)		
No.	Emulation Type		Capacity	CUs is 4 or less	CUs is 5 or more
1	OPEN-3	Does not depend on capacity	1	2,047	4,095
2	OPEN-8	Does not depend on capacity	1	2,047	4,095
3	OPEN-9	Does not depend on capacity	1	2,047	4,095
4	OPEN-E	7.2 GB or less	1	2,047	4,095
5		7.3 GB or more	2	1,024	2,048
6	OPEN-L	7.2 GB or less	1	2,047	4,095
7		7.3 GB – 14.4 GB	2	1,024	2,048
8		14.5 GB – 21.6 GB	3	682	1,365
9		21.7 GB – 28.9 GB	4	512	1,024
10		29.0 GB or more	5	409	819

Table 4 Number of pairs that can be created with volumes of each emulation type and capacity


Volume			No. of differential tables per pair needed for controlling the difference between the primary and secondary volumes	No. of pairs that can be created (If the volumes of the same emulation type and capacity are used to create all the pairs)	
No.	Emulation Type	Capacity		CUs is 4 or less	CUs is 5 or more
11	OPEN-V	9.6 GB or less	1	2,047	4,095
12		9.7 GB – 19.1 GB	2	1,024	2,048
13		19.2 GB – 28.8 GB	3	682	1,365
14		28.9 GB – 38.5 GB	4	512	1,024
15		38.6 GB– 48.1 GB	5	409	819
16		48.2 GB– 57.8 GB	6	341	682
17		57.9 GB or more	7	292	585

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). You can reserve up to 4,095 volumes in one disk array. Use the Set Reserve Attribute window (see “[Setting reserve attributes](#)” on page 43) 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](#)” on page 44) 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 \(Paircreate\)](#)” on page 45) 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.

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.

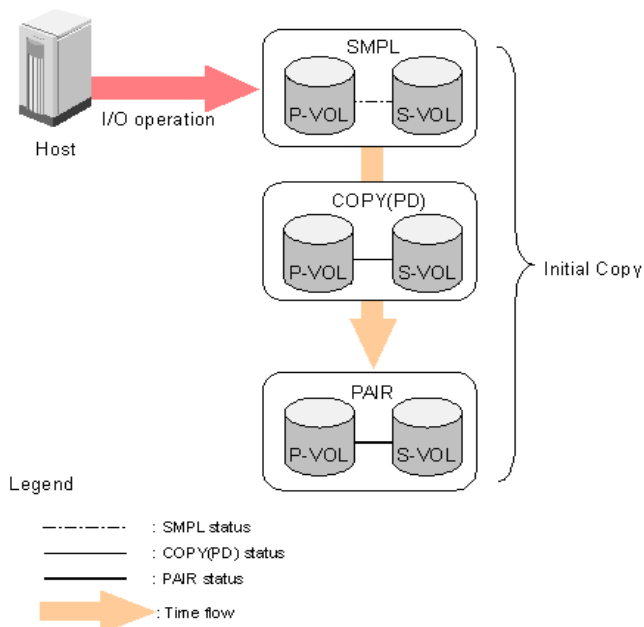


Figure 2 Adding a pair in BC

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.

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.

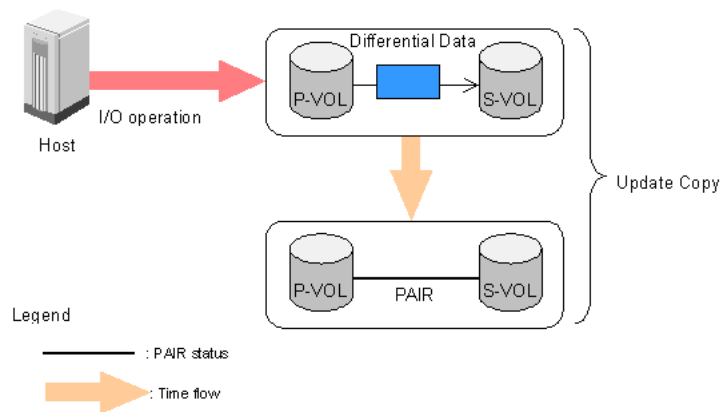


Figure 3 Update copy operation

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 \(Paircreate\)”](#) on page 45). This cascade layering scheme creates up to nine copies of one BC P-VOL. See [“Cascade function”](#) on page 25 for further information on cascade pairs and the cascade function.

Pairsplit operation

The BC split capability provides point-in-time backup of data, and facilitates real data testing by making the BC copies (S-VOLs) available for host access. The BC pairsplit operation performs all pending S-VOL updates (those issued prior to the split command and recorded in the P-VOL track map) to make the S-VOL identical to the state of the P-VOL when the split command was issued, and then provides full read/write access to the split S-VOL. You can split existing pairs as needed. You can also use the pairsplit operation to create and split pairs in one step.

Use the Pairsplit window (see [“Splitting BC pairs \(Pairsplit\)”](#) on page 48) to split existing BC pairs or to add and split new BC pairs in one step. 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 all updates to **both** volumes. The P-VOL remains fully accessible during the pairsplit operation. Pairsplit operations cannot be performed on suspended (PSUE) pairs.


- 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.
- When splitting pairs, you can also select the split type: **Quick Split** or **Steady Split**.
 - When quick split operations start, 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). The disk array performs all pending update copy operations to the S-VOL in the background. When the quick split is complete, the pair status changes to PSUS.
 - When steady split operations start, the pair status changes to COPY(SP), and the disk array performs all pending update copy operations to the S-VOL. When the Steady 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).

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.

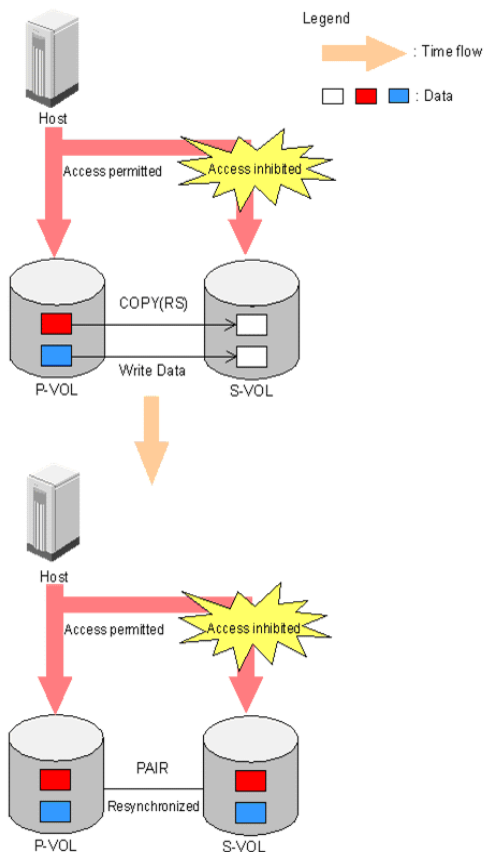


Figure 4 Normal and quick pairresync operations

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 5 lists operational requirements for the reverse pairresync operation. 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, not on suspended pairs. 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. [Table 5](#) lists operational requirements for the quick restore operation.

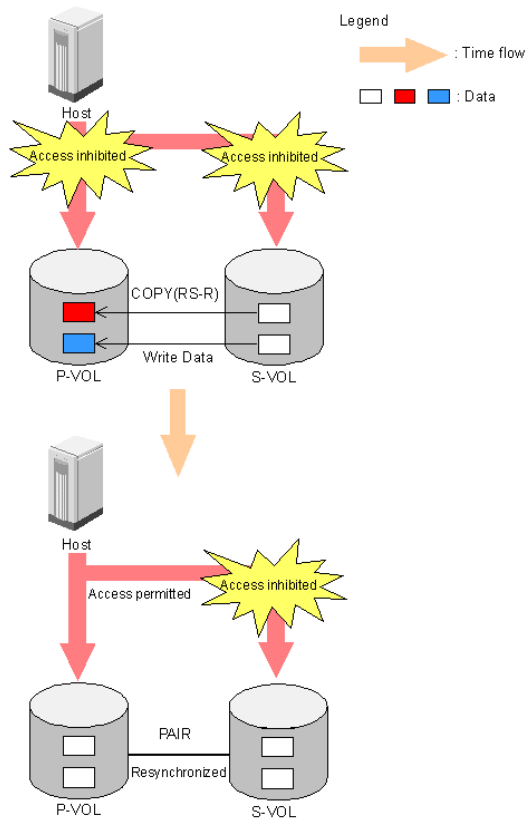


Figure 5 Reverse and quick restore pair operations

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 RAID levels 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 XP 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 XP data to be down.
 - Set the same Cache LUN XP settings (locations) for the P-VOL and S-VOL before performing the quick restore operation.


- Release the Cache LUN XP settings of the P-VOL and S-VOL before the quick restore operation, and reset the Cache LUN XP 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” on page 24 and “Setting BC options” on page 58).

Table 5 Requirements for reverse or quick restore pairresync operations

Parameter	Requirements
Pair status.	The specified pair must be in the PSUS state. If not, the reverse or quick restore pairresync command will be rejected. All other pairs sharing the same P-VOL as the specified pair must also be in the PSUS or PSUE state. If not, the reverse or quick restore pairresync command will be rejected.
Pair type	A quick restore pairresync command to a pair that consists of customized volumes and normal volumes will be rejected.
Reverse or quick restore pairresync command issued to a shared BC/Continuous Access XP volume.	If the BC and Continuous Access XP pairs share the same volume, and the BC pair is not suspended, the reverse and quick restore pairresync operations cannot be performed (the command will be rejected). During the reverse or quick restore pairresync operation, a Continuous Access XP pair cannot be created. The Continuous Access XP paircreate command will be rejected when the BC pair status is COPY(RS-R).
Effect on other pairs sharing the P-VOL.	If the reverse or quick restore pairresync operation is performed on one BC pair in a 1-to-n BC configuration (n>1), the P-VOL and the other S-VOLs are no longer synchronized. While this reverse or quick restore pairresync is in progress, you cannot perform paircreate, pairsplit, or pairresync operations for any other pair sharing the same P-VOL (pairsplit-S and pairsplit-E are allowed).
Reverse or quick restore resync ends abnormally; OR, Pairsplit-E (PSUE) is requested during reverse or quick restore resync.	<ol style="list-style-type: none"> 1. The pair status changes to PSUE. 2. The P-VOL of the PSUE pair is read- and write-enabled for all hosts; however, data on the P-VOL is not guaranteed. The S-VOL of the PSUE pair remains write-disabled (read-only); however, data on the S-VOL is not guaranteed. 3. The status of other BC pairs sharing the same P-VOL does not change.

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

 **NOTE:** When a reverse or quick restore pairresync is in progress, you cannot perform paircreate, pairsplit, or pairresync operations for any other pair that shares the same P-VOL (pairsplit-S and pairsplit-E are allowed).

Use the Pairresync window (see “Resynchronizing BC pairs (Pairresync)” on page 52) 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.

△ **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 the entire P-VOL track 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 (see "[Suspending BC pairs \(Pairsplit-E\)](#)" on page 54) 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 (see ["Deleting BC pairs \(Pairsplit-S\)"](#) on page 54) 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. See ["Deleting BC pairs \(Pairsplit-S\)"](#) on page 54 for instructions on synchronizing the volumes before deleting the pair.

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 6 BC options types and requirements

No.	Option Type	Requirement
1	Swap&Freeze	The BC quick restore operation can be performed on the disk array. If the disk array setting disables the quick restore operation, change the setting (that is, enable the quick restore operation in the disk array) before using the Swap&Freeze option. See "Swap&Freeze option" on page 24.
2	Host I/O Performance	See "Host I/O Performance option" on page 25.
3 - 32	Reserved (Currently unavailable)	—

📌 **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.

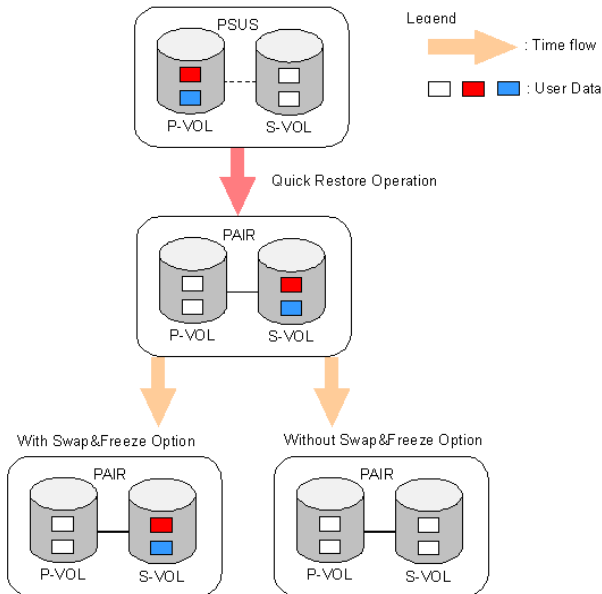


Figure 6 Quick Restore operation with or without Swap&Freeze option

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 improves host I/O responses over ShadowImage SI390/ShadowImage for z/OS (SI390 and z/OS) copying processing time. When the Host I/O Performance option is used, the disk array suppresses execution of SI390/z/OS copying processing, and consequently host I/O responses improve.

When SI390/z/OS copying processing is suppressed, the time taken for copying increases. Also, if BC pairs exist, host I/O responses might not be faster. In this case, set the Host I/O Performance option for BC 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 7](#) 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.

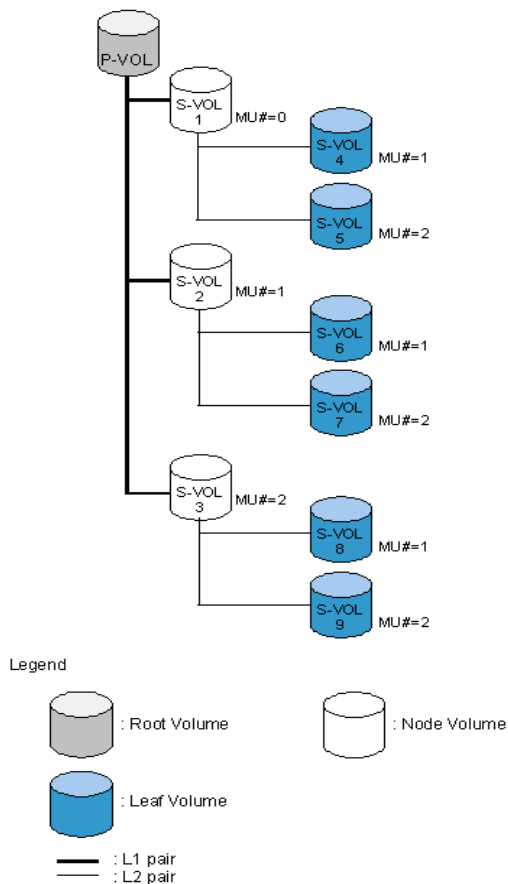


Figure 7 Cascade pairs

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 7](#) 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 8](#) 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 7 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 7 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 8 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 8 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
PSUE	OK ^{1, 2}	OK	OK	OK	OK	OK

1. MU# of L2 node pair member must be 1 or 2.
2. Not 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 9 shows the relationship between

read/write operations from host to node volume and status of L1/L2 pairs. [Table 10](#) shows the relationship between read/write operations from host to leaf volume and L2 pair status.

Table 9 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 10](#) indicates the relationship between the read/write operation from the host to the leaf volume and the L2 pair status.

Table 10 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 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. The S-VOLs will contain the same data as the P-VOLs when the pairsplit operation is complete.

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 1,024 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 XP128/XP1024*.
- BC pairs and ShadowImage (SI390) 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](#)" on page 38).

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.

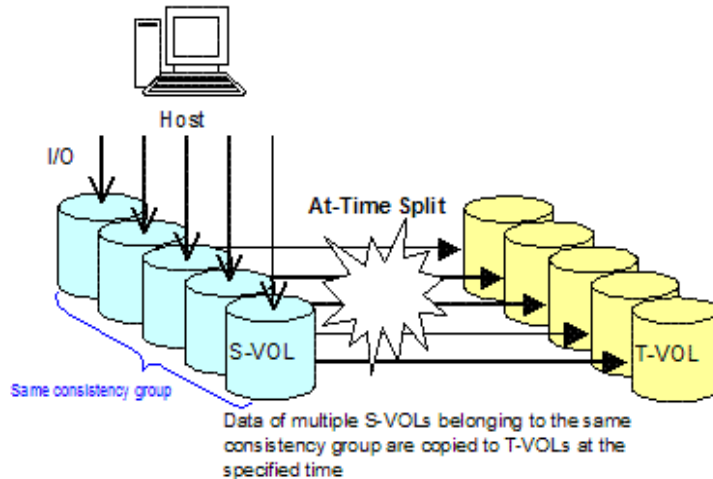


Figure 8 At-time Split Function (Specifying the Split Time)

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](#)" on page 25) 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](#)" on page 43) 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). If you use the At-Time Split function, the pairs are split with **Quick Split**.
- 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](#)" on page 38). 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.

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.

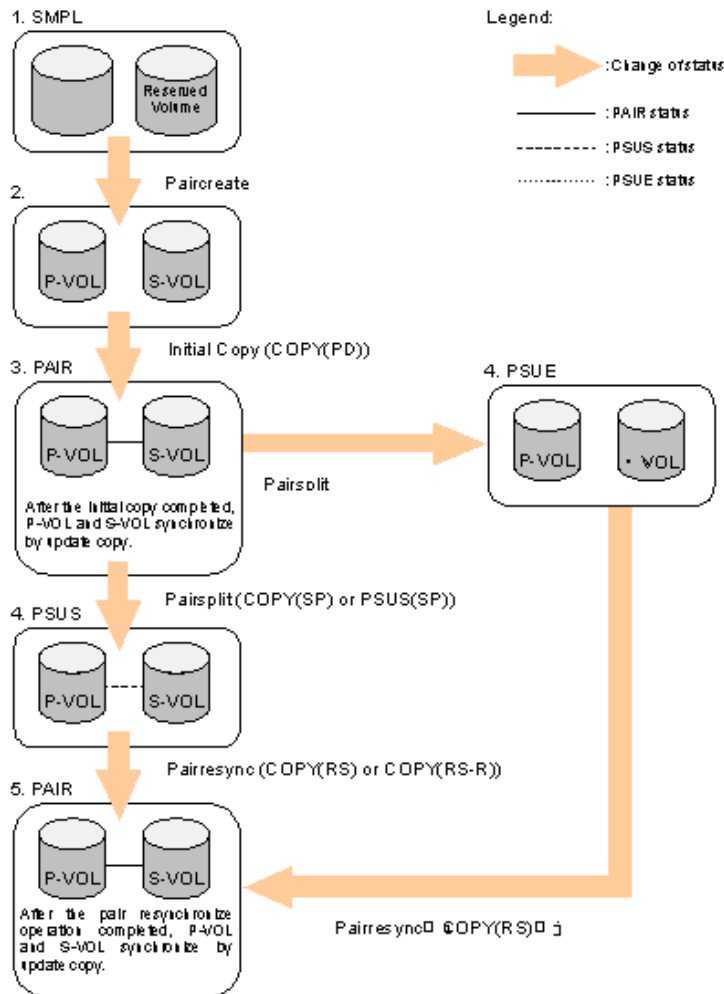


Figure 9 BC pair status transitions

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. When the pair status is PAIR, the P-VOL and S-VOL have the same data. If the P-VOL is updated after the initial copy operation, the update copy operation takes place and synchronizes the P-VOL and S-VOL.
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](#)” on page 19.
- 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 11 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.

Table 11 BC pair status conditions (continued)

Pair Status	Description	S-VOL Access
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.
- 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.

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).
- 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 XP) 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 12](#) 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 12 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 XP volumes can be assigned to BC pairs. Cache LUN XP operations can be performed on BC P-VOLs and S-VOLs.

△ **CAUTION:** See “[Pairresync operations](#)” on page 19 for important information on performing quick restore operations on Cache LUN XP volumes.

- **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](#)” on page 34 for important information on BC and Continuous Access XP shared volume configurations.
- **Auto LUN XP.** BC can be assigned to Auto LUN XP 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 XP, delete the BC volumes or unreserve the BC volumes before using them with Auto LUN XP. If you assign a BC P-VOL that is already paired with three S-VOLs to Auto LUN XP migration volumes, or assign BC volumes to Auto LUN XP volumes other than migration volumes, the command will be rejected.

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


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

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 10](#) 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

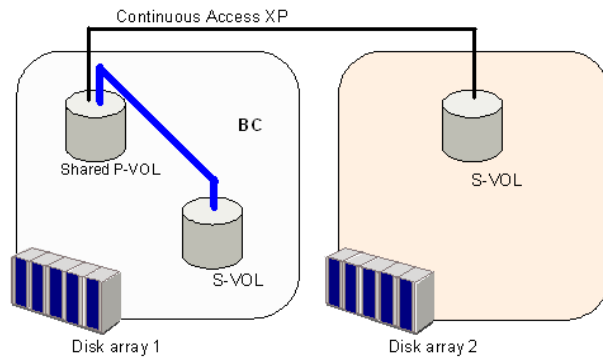


Figure 10 BC and Continuous Access XP: shared P-VOL/P-VOL

The configuration shown in [Figure 11](#) 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.

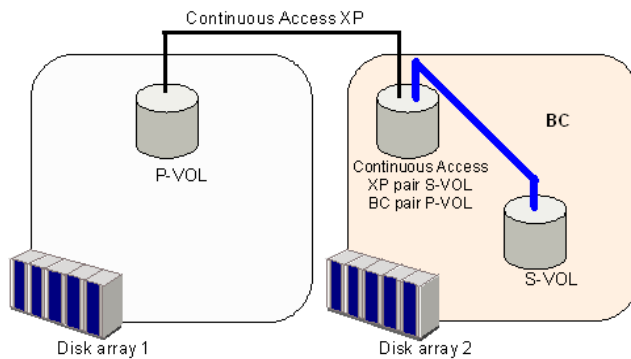


Figure 11 BC and Continuous Access XP: shared P-VOL/S-VOL

The configuration shown in [Figure 12](#) 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

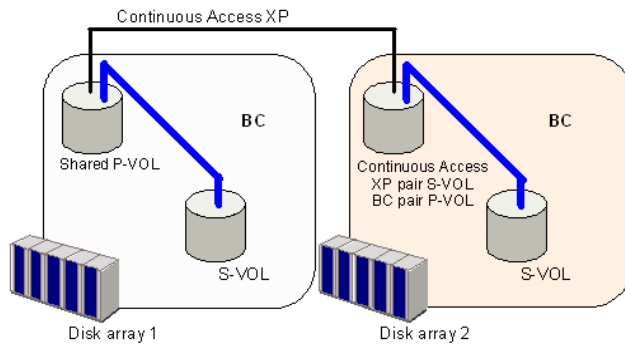


Figure 12 BC and Continuous Access XP: shared P-VOL/P-VOL and P-VOL/S-VOL

The configuration shown in [Figure 13](#) 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.

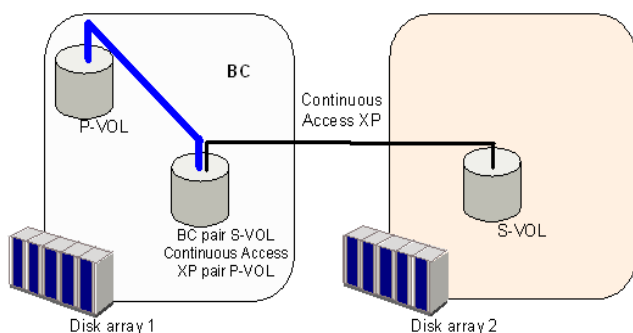


Figure 13 BC and Continuous Access XP: shared S-VOL/P-VOL

Performing BC operations

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. Click the **BC** 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.

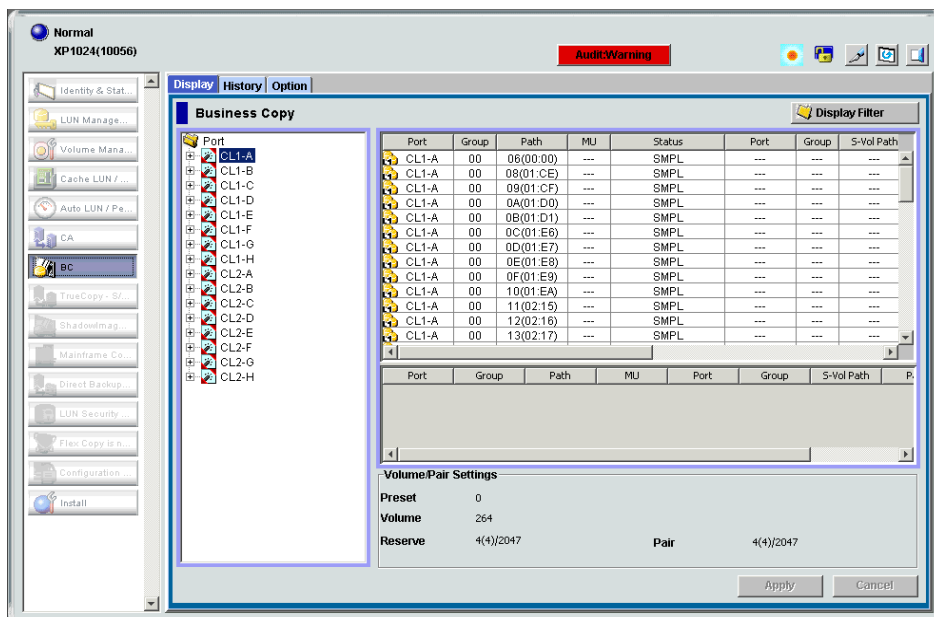


Figure 14 BC main screen

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"](#) on page 43 for instructions). You can then start adding BC pairs (see ["Creating BC pairs \(Paircreate\)"](#) on page 45 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 three tabs on the BC main screen: **Display**, **History**, and **Option**.


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 13 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** 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.
- The following icons indicate the status of a volume or pair:

Table 14 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:
 - **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.
 - **Reserve:** X(Y)/Z, where:
 X = total number of BC reserved volumes
 Y = total number of BC reserved volumes
 Z = maximum number of reserved volumes
 - **Pair:** X(Y)/Z, where:
 X = total number of BC pairs
 Y = total number of BC pairs
 Z = maximum number of pairs (BC/Auto LUN XP)

 **NOTE:** The value (Y) does not include Auto LUN XP pairs. If Auto LUN XP pairs exist, the BC paircreate operation may fail, even when (Y) is less than 4,095.


- Use the **Display Filter** button to filter volumes displayed in the Volume list.
- 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” on page 38 and Table 15).

For information about the **History** and **Option** tabs of the BC main screen, see “Viewing BC pair status and history” on page 56 and “Setting BC options” on page 58.

Volume list

The Volume list (Figure 15) 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.

Port	Group	Path	MU	Status	Port	Group	S-Vol Path	CTG
 CL1-A	00	06(00:00)	---	SMPL	---	---	---	---
 CL1-A	00	08(01:CE)	---	SMPL	---	---	---	---
 CL1-A	00	09(01:CF)	---	SMPL	---	---	---	---

SvolMode	CopyPace	Progress	Type	Capacity(MB)
---	---	---	OPEN-3	2347.03
---	---	---	OPEN-3	2347.03
---	---	---	OPEN-3	2347.03

Figure 15 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.
- **Group:** Host group of each volume.
- **Path:** CU:LDEV (control unit image:logical device ID) of each volume.
- **MU:** MU number of a BC cascade pair formed with the volume.
- **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**.
- **Port:** Port ID (cluster and channel number) of the first S-VOL of each volume. If there is no S-VOL, --- is displayed.
- **Group:** Host group of the S-VOL. If there is no S-VOL, --- is displayed.
- **S-Vol Path:** CU:LDEV (control unit image:logical device ID) of the S-VOL. If there is no S-VOL, --- is displayed.
- **CTG:** Consistency group number of the S-VOL. If no consistency group is set for the S-VOL, --- is displayed.
- **SvolMode:** Status of the S-VOL.
 - **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.

- **Progress:** 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.
- **Type:** Device emulation type (for example, OPEN-3).
- **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 15](#)):

- **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 15 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.

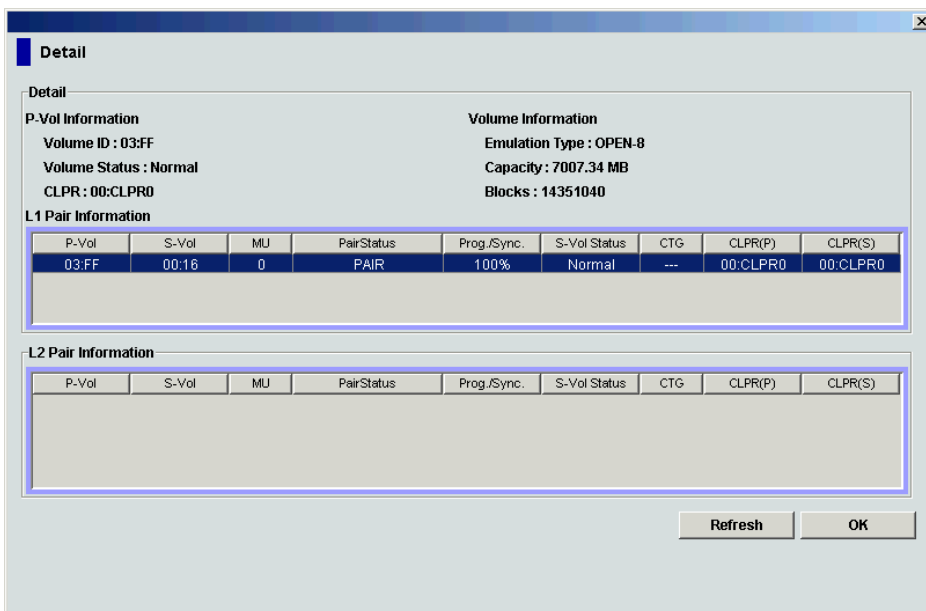


Figure 16 Detail window

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**.

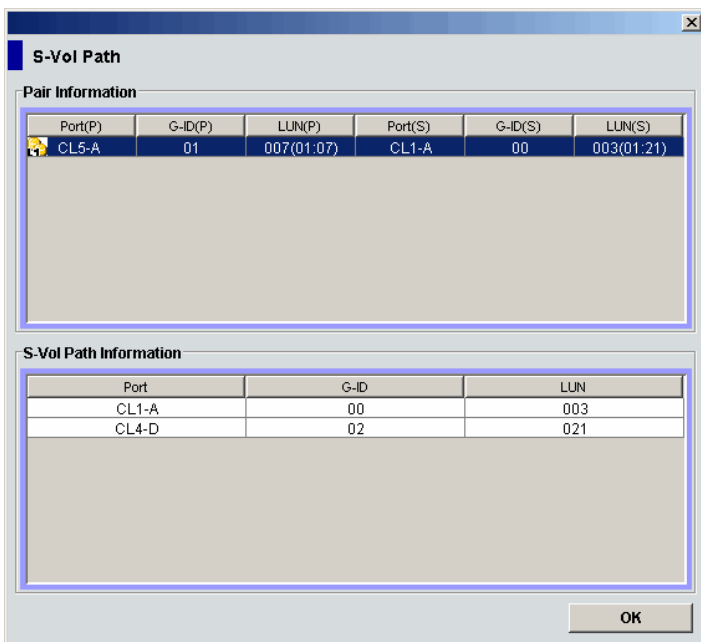



Figure 17 S-Vol Path window

 **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**.

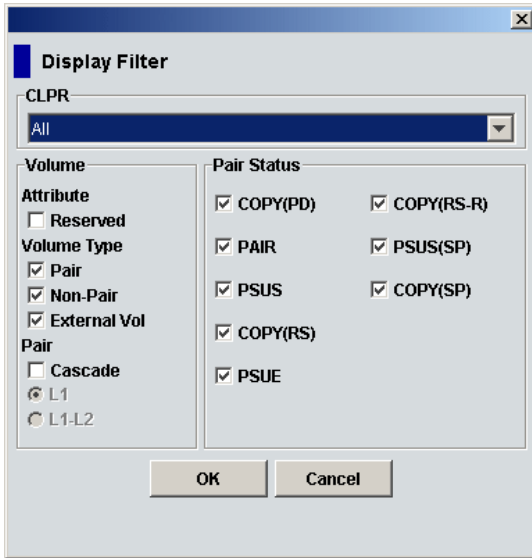



Figure 18 Display Filter window


The Display Filter window has the following features:

- The **CLPR** drop-down list displays the specified cache logical partition (CLPR).
- **Volume** box:
 - The **Reserve(d)** check box displays reserved or unreserved volumes. If you select the **Reserve(d)** check box, only reserved volumes are displayed in the Volume list. If you clear the **Reserve(d)** check box, only unreserved volumes are displayed.

 **NOTE:** If you select the Reserved check box, you cannot select any other check boxes.

 **NOTE:** Volumes specified as the S-VOL of a BC pair are automatically reserved by the disk array.

- The **Pair** check box displays paired volumes.
- The **Non-Pair** check box displays non-paired volumes.
- The **Cascade** check box filters the pairs in the Volume list by cascade level. Clicking **L1** displays L1 pairs only. Clicking **L1-L2** displays both L1 and L2 pairs.
- Use the **Pair Status** box to filter pairs displayed in the Volume list by pair status: **COPY(PD)**, **PAIR**, **PSUS**, **COPY(RS)**, **PSUE**, **COPY(RS-R)**, **PSUS(SP)**, and **COPY(SP)**. All check boxes are selected by default.
- The **OK** button applies the settings, and closes the Display Filter window.
- The **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.

Port	Group	Path	MU	Port	Group	S-Vol Path	Pace	Code

Figure 19 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:** 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:** CU:LDEV (control unit image:logical device ID) of each volume.
- **MU:** MU number of a BC cascade pair member volume.
- **Port:** Port ID (cluster and channel number) of the first S-VOL of each volume.
- **Group:** Host group of the S-VOL.

- **S-Vol Path:** CU:LDEV (control unit image:logical device ID) of the S-VOL.
- **Pace:** Copying pace for all pairs being created: **Slower**, **Medium**, and **Faster**.
- **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. For the BC error codes, see [Table 17](#) on page 58.

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**.

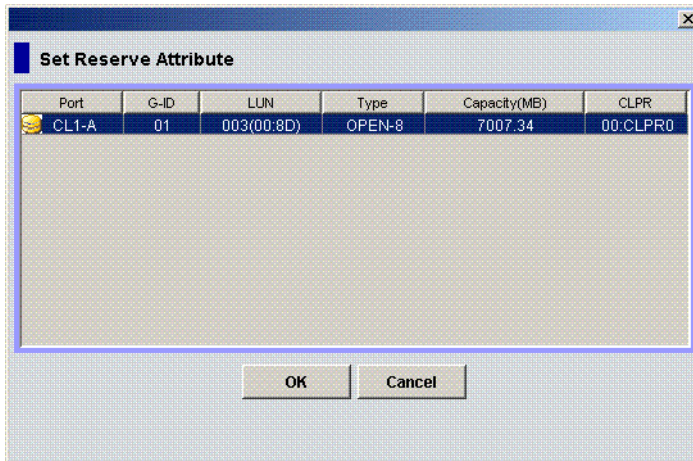


Figure 20 Set Reserve Attribute window


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).
2. From the BC main screen, select the port, host group, or LUN in the Tree View box.

3. 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**.

4. 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.
5. 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.
6. From the BC main screen, click **Apply**.
7. 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**.

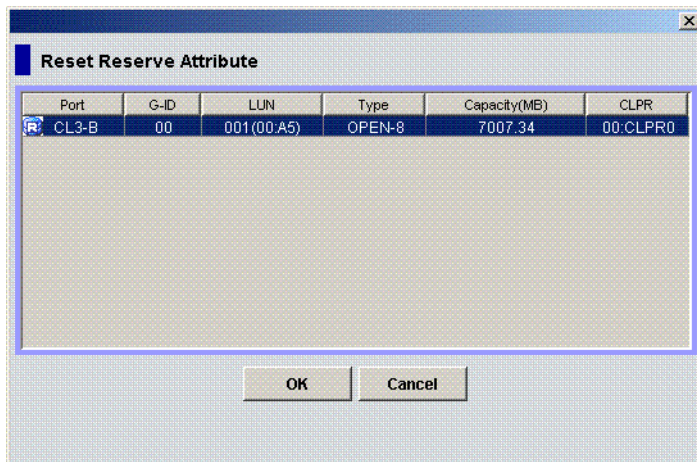


Figure 21 Reset Reserve Attribute window

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

1. Ensure that the volumes you want to unreserve are no longer assigned to BC pairs as S-VOLs. See ["Suspending BC pairs \(Pairsplit-E\)"](#) on page 54 for instructions on deleting BC pairs.
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**.

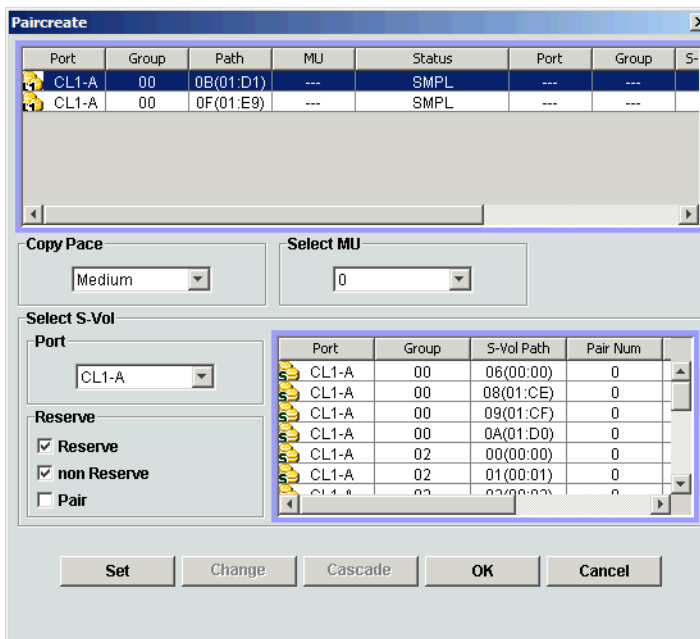


Figure 22 Paircreate window

The Paircreate pane consists of the following components:

- "Paircreate Volume List" on page 45
- "Copy Pace list" on page 46
- "Select MU list" on page 46
- "Select S-Vol box" on page 46
- "Buttons" on page 46
- "Creating L1 pairs" on page 47
- "Creating L2 pairs" on page 48

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.
- **Group:** Host group ID of the P-VOL.

- **Path:** CU:LDEV of the P-VOL.
- **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:** Host group ID of the S-VOL.
- **S-Vol Path:** CU:LDEV of the S-VOL.
- **Type:** Emulation type of the P-VOL and S-VOL.
- **Capacity(MB):** Volume capacity displayed in megabytes (MB).


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 holds Paircreate settings, and you specify a different copy pace for new pairs in the Paircreate pane, the copy pace for the existing paircreate settings displayed in the Preset List are also changed. The latest copy pace specified in the Paircreate pane 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


The **Select S-Vol** box filters S-VOLs displayed in the S-VOL list. Use the **Port** list and **Reserved** check boxes to display available S-VOLs by port and reserve attribute. Use the **Reserved** box to select pairs that can be set as L2 pairs when the **Pair** check box is selected.

- Use the **Previous** button to return 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.
- Use the **Next** button to 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.
- The S-VOL List displays the following information related to S-VOLs:
 - **Port:** Port ID (cluster and channel number) of the S-VOL
 - **Group:** Host group ID of the S-VOL.
 - **S-Vol Path:** 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 pane to the Preset List on the BC main pane.

 **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 pane and closes the Paircreate pane.

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 \(Pairsplit\)](#)” on page 48).

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](#)” on page 50). 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**.

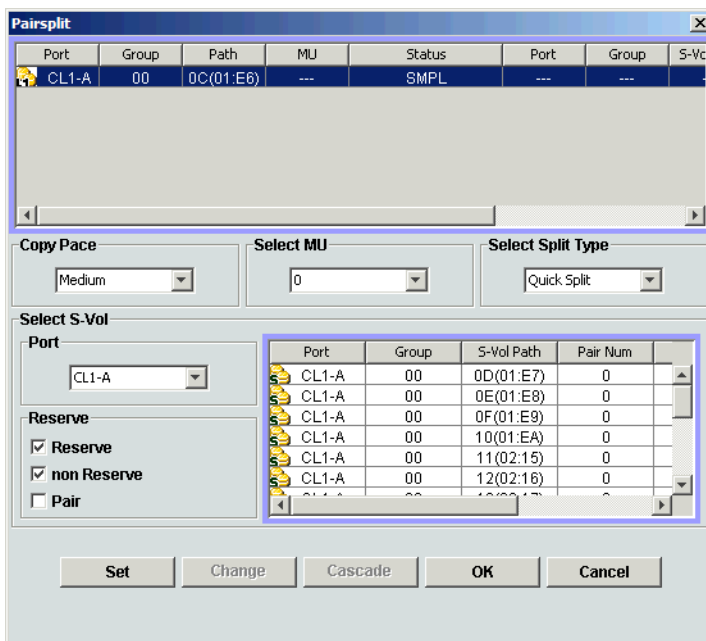


Figure 23 Pairsplit window

The Pairsplit window consists of the following components:

- “[Pairsplit Volume List](#)” on page 49
- “[Window options](#)” on page 49
- “[Select S-Vol box](#)” on page 49
- “[Buttons](#)” on page 50
- “[Splitting pairs](#)” on page 50

- “Creating and splitting pairs” on page 50

Pairsplit Volume List

This list in the upper half of the Pairsplit pane 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:** Host group ID of the P-VOL
- **Path:** CU:LDEV of the P-VOL
- **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:** Host group ID of the S-VOL
- **S-Vol Path:** CU:LDEV of the S-VOL
- **Type:** Emulation type of the P-VOL and S-VOL
- **Capacity(MB):** Volume capacity displayed in megabytes (MB)


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. Use the **Port** list and **Reserved** check boxes to display available S-VOLs by port and reserve attribute. Also use the **Reserved** box to select the pairs that can be set as L2 pairs when the **Pair** check box is selected.

- Use the **Previous** button to return 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.
- Use the **Next** button to 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.
- The S-VOL List displays the following information related to S-VOLs:
 - **Port:** Port ID (cluster and channel number) of the S-VOL
 - **Group:** Host group ID of the S-VOL
 - **S-Vol Path:** 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 pane to the Preset List on the BC main pane.

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


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

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**.

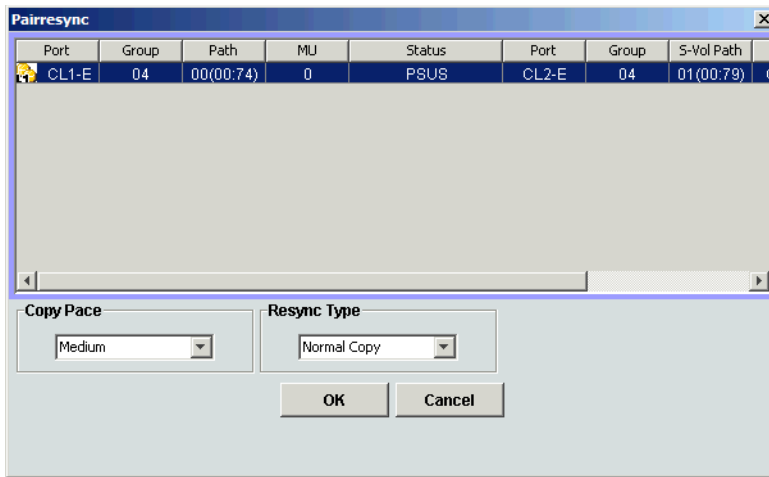


Figure 24 Pairresync window

The Pairresync pane consists of the following components.


Pairresync Volume List

The Volume List located on the upper side of the Pairresync pane 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:** Host group ID of the P-VOL
- **Path:** CU:LDEV of the P-VOL
- **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:** Host group ID of the S-VOL
- **S-Vol Path:** CU:LDEV of the S-VOL
- **Type:** Emulation type of the P-VOL and S-VOL
- **Capacity(MB):** Volume capacity displayed in megabytes (MB)

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 select the **Apply** button on the BC main pane to start the pairresync operation for the specified pairs.


- The **Cancel** button cancels operations set in the Pairresync pane and closes the Pairsplit pane.
- To remove any volumes from the Pairresync Volume List, right-click the selected volumes, and select **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 XP 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 XP 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 XP data to be down.
 - Set the same Cache LUN XP settings (locations) for the P-VOL and S-VOL before performing the quick restore operation.
 - Release the Cache LUN XP settings of the P-VOL and S-VOL before the quick restore operation, and reset the Cache LUN XP 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-VOL is varied 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**.

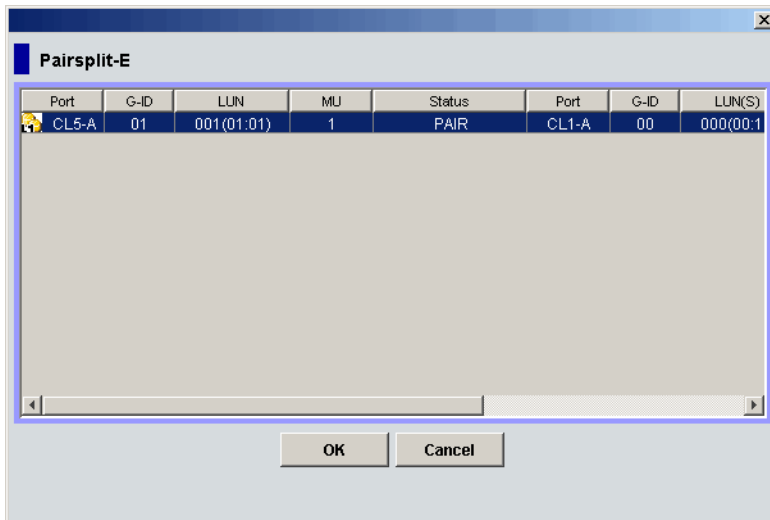


Figure 25 Pairsplit-E window

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**.

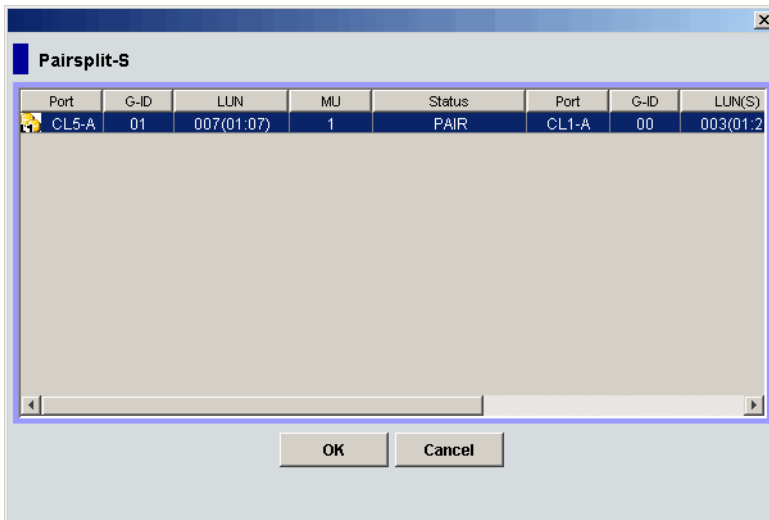




Figure 26 Pairsplit-S window

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.

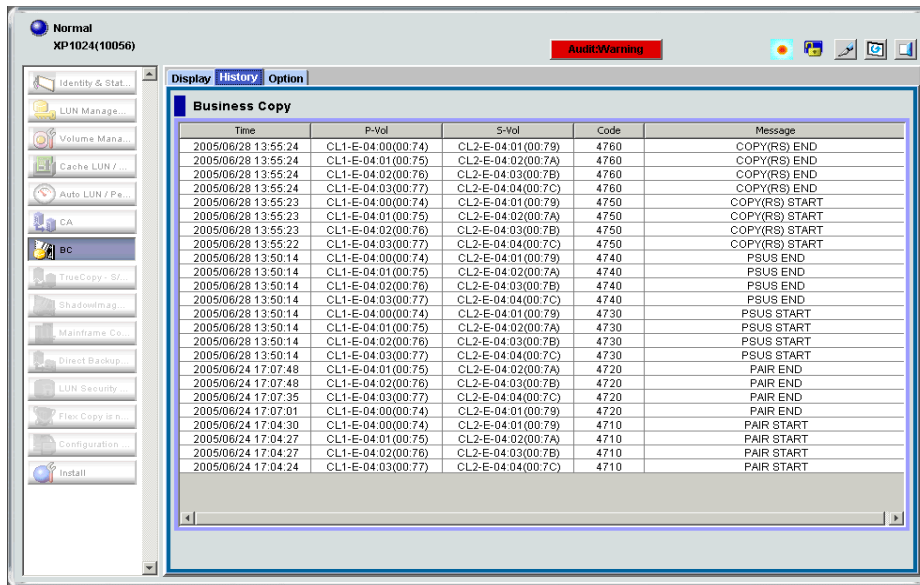


Figure 27 History pane

The **BC 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 16](#)). 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 BC History pane will not display information about the operation.

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

- BC pairs
- ShadowImage for z/OS pairs
- Compatible Mirroring for Hitachi® FlashCopy® 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 16 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).

Table 16 BC pair activity codes, messages, and descriptions (continued)

Code	Message	Description
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.

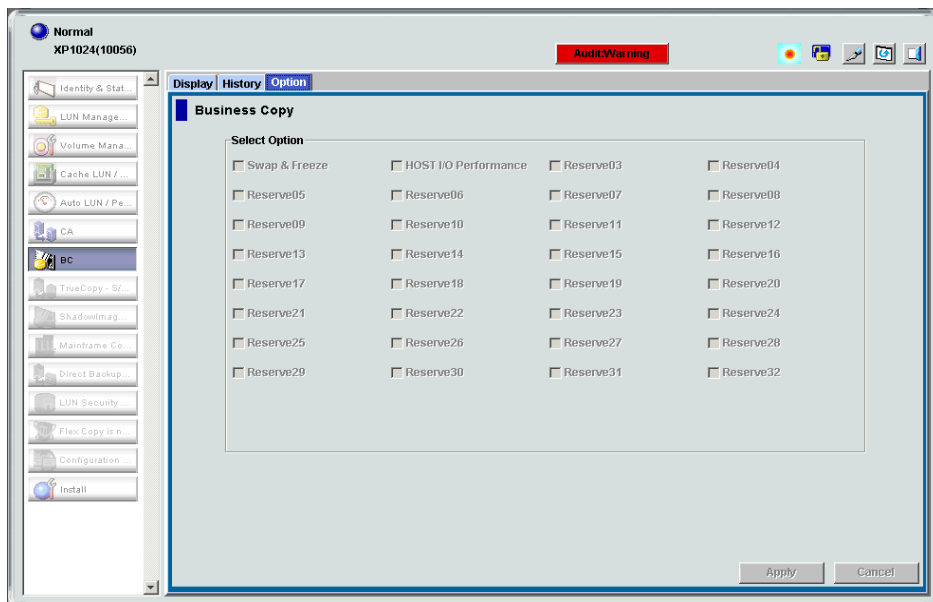


Figure 28 Option screen

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

NOTE: More options will be supported in the future. See “BC options” on page 24 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 17 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.

Error Code	Description	Corrective Action
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.
0818	The Pairsync 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.

Error Code	Description	Corrective Action
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.
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.

Error Code	Description	Corrective Action
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.
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 Auto LUN XP.	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 Auto LUN XP.	Confirm a matching condition.

Error Code	Description	Corrective Action
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.
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 Auto LUN XP.	Check the volume, or cancel the reserve volume of HIHSM.
1085	P-VOL was used for reserve volume of Auto LUN XP.	Check the P-VOL, or cancel the reserve volume of HIHSM.
1086	S-VOL was used for reserve volume of Auto LUN XP.	Check the S-VOL, or cancel the reserve volume of HIHSM.
1087	P-VOL is used as source volume for Auto LUN XP.	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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