



**Hitachi Freedom Storage™  
Thunder 9500™ V Series**

**Synchronous TrueCopy 9500V User's Guide**



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## Changes in this Revision

- Added a note to sections 1.1 and 2.5 stating that Windows® 2000 dynamic disks are not supported

## Referenced Documents

- *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Graphical User Interface (GUI) (MK-92DF605)*
- *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Command Line Interface (CLI) (MK-92DF603)*
- *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*



# Preface

The *Hitachi Freedom Storage™ Thunder 9500™ V Series TrueCopy 9500V User's Guide* describes and provides instructions for performing ShadowImage 9500V operations on the Thunder 9500V array subsystem using Hitachi Synchronous TrueCopy 9500V software. It also provides Synchronous TrueCopy 9500V configuration information.

**Note:** This product is not supported by the following subsystems: 9531V, 9532V, and 9533V.

This user's guide assumes the following:

- The user has a background in data processing and understands RAID storage subsystems and their basic functions.
- The user is familiar with the Hitachi Freedom Storage™ Thunder 9500™ V Series array subsystem.
- The user has read and understands the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.
- The user is familiar with the Windows 98, Windows NT, and/or the Windows 2000 operating system.

**Note:** The term "9500V" refers to the entire Hitachi 9500V subsystem family, unless otherwise noted. Please refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series User and Reference Guide (MK-92DF601)* for further information on the 9500V disk array subsystems, or contact your Hitachi Data Systems account team.

**Note:** The use of Synchronous TrueCopy 9500V software, and all other Hitachi Data Systems products is governed by the terms of your license agreement(s) with Hitachi Data Systems.

## Terminology

Please note the following:

- The term DF600 refers to the Thunder 9500™ V Series subsystem.

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**Thank you!**



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# Chapter 1 Overview of Hitachi Data Systems Copy Solutions

## 1.1 Synchronous TrueCopy 9500V

The Hitachi Data Systems Synchronous TrueCopy 9500V features enable you to maintain remote copies of all user data on the Thunder 9500V storage subsystem for data backup or duplication. The duplicated volumes are created between subsystems that are connected with a fibre channel interface. Synchronous TrueCopy 9500V is used for UNIX<sup>®</sup>-based and PC server data, and can provide one duplicate for each primary volume.

Synchronous TrueCopy 9500V operations are non-disruptive and allow the primary (main) volume of each volume pair to remain online to all hosts for both read and write I/O operations. Once established, Synchronous TrueCopy 9500V operations continue unattended to provide synchronous remote data backup. Usability is further enhanced through a resynchronization capability that reduces data duplication requirements and backup time, thereby increasing user productivity.

**Note:** Windows<sup>®</sup> 2000 dynamic disks are not supported.

## 1.2 ShadowImage 9500V

The Hitachi Data Systems ShadowImage 9500V features enable you to maintain subsystem-internal copies of all user data on the Thunder 9500V storage subsystem for purposes such as data backup or duplication. The duplicated volumes are created within the same Thunder 9500V subsystem as the primary volume. ShadowImage 9500V is used for UNIX<sup>®</sup>-based and PC server data, and can provide one duplicate for each primary volume.

ShadowImage 9500V operations are non-disruptive and allow the primary (main) volume of each volume pair to remain online to all hosts for both read and write I/O operations. Once established, ShadowImage 9500V 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.

**Note:**

- If a ShadowImage 9500V pair suspended-error (PSUE) occurs, the cause is usually due to hardware failure (or when the user forcibly suspends the pair). To recover from a suspended status, the hardware error and designated data must be recovered. To accomplish this task, contact Hitachi Data Systems Customer Support.

To prepare for resolving a PSUE error, ensure that the user (system engineer) monitors the CCI system log. Verify that the PSUE error is not caused by user operation before contacting Hitachi Data System Customer Support.

- ShadowImage 9500V operations can be performed from the UNIX<sup>®</sup> and/or PC-server host using the Hitachi Data Systems Command Control Interface (CCI) software. For information and instructions on using CCI to perform ShadowImage 9500V operations, please refer to the manual the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide* (MK-92DF609).



# Chapter 2 Overview of Operations

## 2.1 Overview of Synchronous TrueCopy 9500V Operations

The Synchronous TrueCopy 9500V feature synchronizes the data of LUs in subsystems that are connected by a Fibre Channel interface. Using Synchronous TrueCopy 9500V, the data received from the server is written into subsystems on local and remote sides simultaneously. The data of subsystems on local and remote sides are always synchronized. When the resynchronization is executed, you can save time by transferring the differential data only to the subsystem on the remote side. Since Synchronous TrueCopy 9500V also has a fail-over function (for example, a failure occurs on the local side), you can immediately switch the server that is in the normal condition.

To Synchronous TrueCopy 9500V, the Hitachi Command Control Interface (CCI) and the Resource Manager 9500V are required. The Hitachi Command Control Interface (CCI) enables you to execute and control operations (for example, a copy operation). The Resource Manager 9500V program enables you to set the path. Additionally, a Web browser is required for maintenance of the path.

The LED device traces, and the analyzing tool enables you to reference the path, the LU status, and the failure information of the subsystem. You can also reference this information easily by concurrently using the Web browser.

## 2.2 Overview of ShadowImage 9500V Operations

Hitachi Data Systems ShadowImage 9500V is a storage-based hardware solution for duplicating logical volumes which reduce backup time and provide point-in-time backup. The ShadowImage 9500V primary volumes (P-VOLs) contain the original data; the ShadowImage 9500V secondary volume(s) (S-VOLs) contain the duplicate data. Since each P-VOL is paired with its S-VOL independently, each volume can be maintained as an independent copy set that can be split (pairsplit), resynchronized (pairresync), and released (pairsplit -S) separately.

ShadowImage 9500V operations are performed from the UNIX<sup>®</sup> and/or PC-server host using the Hitachi Data Systems Command Control Interface (CCI) software. ShadowImage 9500V commands are issued from Command Control Interface (CCI) through command devices in the Thunder 9500V subsystem. These command devices can be specified or released by the user by using the Resource Manager 9500V.

**Note:** To avoid a path failure:

- When you turn on the subsystem where a path has already been set, turn on the remote subsystem first, and then turn on the local subsystem after the remote subsystem is READY.

When you turn off the subsystem where a path has already been set, turn off the local subsystem first, then turn off the remote subsystem.

- You will receive an error/blockage if the remote subsystem is not available. Once you remove the blockage by either turning on the remote subsystem or making the paths available the two subsystems should recover. Use the 9500V web interface to manually re-establish the two paths. If the path blockage is not recovered when the subsystem is READY, contact Hitachi Customer Support.
- Do not change the microprogram when the subsystem power is on during the execution of a Synchronous TrueCopy 9500Vcopy operation.
- When the local subsystem is directly connected with the remote subsystem paired with the local subsystem, the setting of the Fibre transfer rate must not be modified while the subsystem power is on. If the setting of the Fibre transfer rate is modified, a path blockage will occur.

## 2.3 Synchronous TrueCopy 9500V Components

To operate Synchronous TrueCopy 9500V in primary and secondary volumes in the 9500V subsystem, the Resource Manager 9500V and the Command Control Interface (CCI) are used. Figure 2.1 shows a typical Synchronous TrueCopy 9500V configuration. Synchronous TrueCopy 9500V system components include the following:

- Synchronous TrueCopy 9500V volume pairs (P-VOLs and S-VOLs) (see section 2.3.1)
- Resource Manager 9500V (see section 2.3.2)
- Hitachi Command Control Interface (CCI) on the UNIX® and/or PC-server host (refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*)

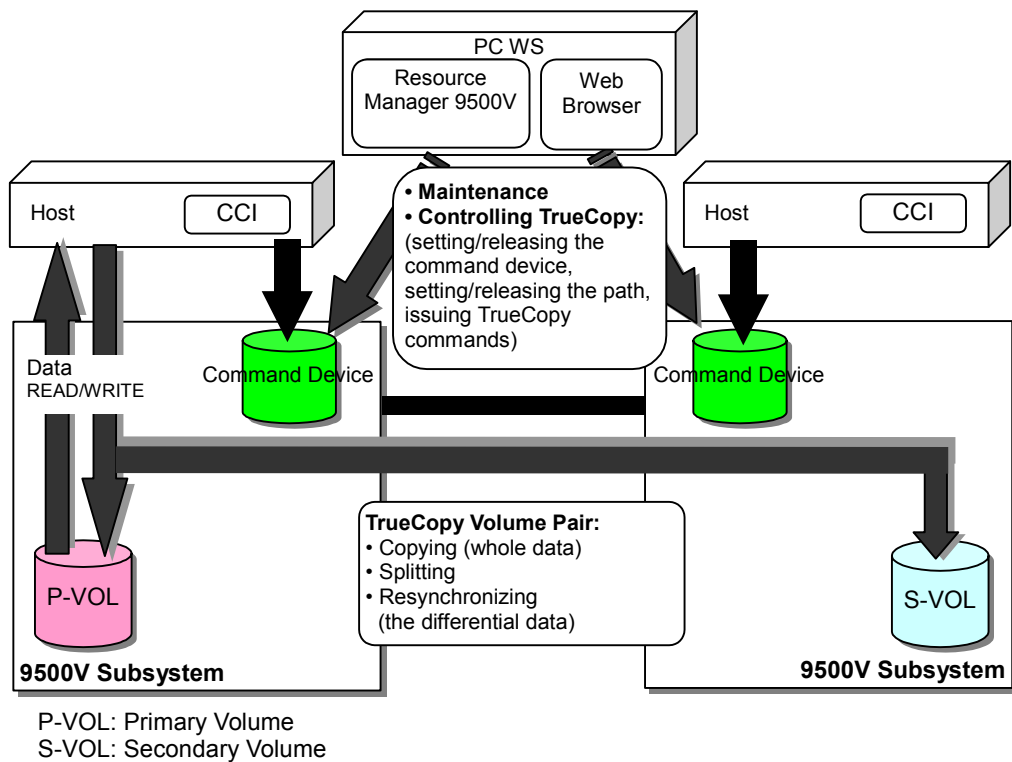


Figure 2.1 Synchronous TrueCopy 9500V Components

### 2.3.1 Synchronous TrueCopy 9500V Volume Pairs (P-VOLs and S-VOLs)

Synchronous TrueCopy performs remote copy operations for logical volume pairs established by the user. Each Synchronous TrueCopy pair consists of one primary volume (P-VOL) and one secondary volume (S-VOLs), which are located in the 9500V subsystems that are connected by a Fibre Channel interface. The Synchronous TrueCopy P-VOLs are primary volumes that contain original data. The Synchronous TrueCopy S-VOLs are secondary or mirrored volumes that contain backup data. Synchronous TrueCopy supports a maximum of 31 pairs.

During Synchronous TrueCopy operations, the P-VOLs remain available to all hosts for read and write I/O operations. An exception to this includes when "data" is specified in the fence level and the LU is impossible to access (for example, an LU blockage). The S-VOLs become available for write operations from the hosts only after the pair has been split.

Depending on how the pair is split, the S-Vol is available for both read and write I/O.

When a Synchronous TrueCopy volume pair is created, the 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. If you need to access an S-VOL, you can "split" the pair to make the S-VOL accessible. The P-VOL is accessible except when "data" is specified in the fence level and the LU is impossible to access (for example, an LU blockage). While a Synchronous TrueCopy pair is split, the 9500V subsystem 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 that 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; the P-VOL is now identical to the S-VOL.

### 2.3.2 Resource Manager 9500V

The Resource Manager 9500V program displays path information. Setting the path, a route for copying, enables you to perform Synchronous TrueCopy 9500V operations.

The Resource Manager 9500V can set a Synchronous TrueCopy 9500V environment by connecting the PC, which is installed with the subsystem, through a LAN. This operation enables the command device to be specified or released.

## 2.4 ShadowImage 9500V Components

ShadowImage 9500V operations involve the primary and secondary volumes in the Thunder 9500V subsystem, the Resource Manager 9500V, and the Hitachi Data Systems Command Control Interface (CCI). Figure 2.2 shows a typical ShadowImage 9500V configuration. The ShadowImage 9500V system components include:

- ShadowImage 9500V volume pairs (P-VOLs and S-VOLs) (see section 2.4.1)
- Resource Manager 9500V (see section 2.4.2)
- Hitachi Data Systems Command Control Interface (CCI) on the UNIX® and/or PC-server host. Refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*

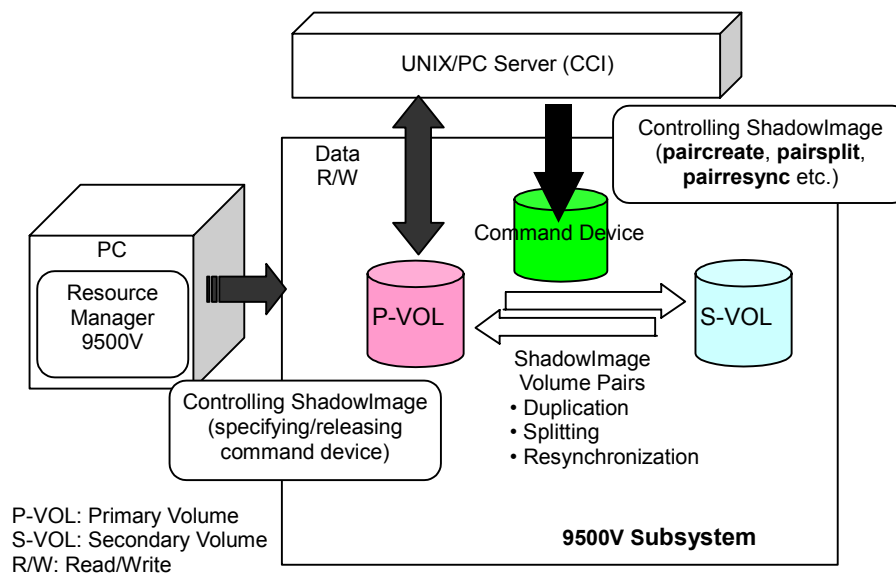


Figure 2.2 ShadowImage 9500V Components

## 2.4.1 ShadowImage 9500V Volume Pairs (P-VOLs and S-VOLs)

The Thunder 9500V subsystem contains and manages both the original and copied ShadowImage 9500V data. ShadowImage 9500V supports a maximum of 31 pairs.

ShadowImage 9500V performs internal copy operations for logical volume pairs established by the user. Each ShadowImage 9500V pair consists of one primary volume (P-VOL) and one secondary volume (S-VOL) which are located in the same Thunder 9500V subsystem. The ShadowImage 9500V P-VOLs are the primary volumes which contain the original data. The ShadowImage 9500V S-VOLs are the secondary or mirrored volumes which contain the backup data. *During ShadowImage 9500V operations, the P-VOLs remain available to all hosts for read and write I/O operations (except during reverse resync).* The S-VOLs become available for host access only after the pair has been split.

When a ShadowImage 9500V volume pair is created, the 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. If you need to access an S-VOL, you must first “split” the pair to make the S-VOL accessible (the P-VOL is accessible except during reverse resync). While a ShadowImage 9500V pair is split, the Thunder 9500V subsystem 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 updates) is copied to the S-VOL so that the S-VOL is again identical to the P-VOL. For reverse resync, the differential data in the S-VOL (due to S-VOL updates) is copied to the P-VOL so that the P-VOL is now identical to the S-VOL.

**Note:** For performance reasons, ShadowImage 9500V P-VOLs and S-VOL pairs should not be set in the same RAID group. ShadowImage 9500V pairs for which ShadowImage 9500V operations are performed simultaneously should be on different controllers. If ShadowImage pairs are concentrated in the same controller, the host I/O performance may be negatively impacted.

## 2.4.2 Resource Manager 9500V

The Resource Manager 9500V displays ShadowImage 9500V pair information. The ShadowImage environment is configured using the Resource Manager 9500V software installed on an Intel-based PC with LAN connectivity to the Thunder 9500V subsystem.

The Resource Manager 9500V enables the command device(s) to be specified or released and displays the status of ShadowImage 9500V volumes.

## 2.5 Synchronous TrueCopy 9500V and ShadowImage 9500V Requirements

ShadowImage 9500V operations provide subsystem-internal copies of UNIX®/PC server volumes (LUs) on the Thunder 9500V subsystem. Synchronous TrueCopy operations provide remote copies of UNIX®/PC server volumes (LUs) on the Thunder 9500V subsystem.

Table 2.1 lists and describes the operational requirements for Synchronous TrueCopy 9500V and ShadowImage 9500V.

**Note:** Windows® 2000 dynamic disks are not supported.

**Table 2.1 Synchronous TrueCopy 9500V and Shadow Image 9500V Requirements**

Parameter	Synchronous TrueCopy Requirement	ShadowImage Requirement
User interface	The following software products are necessary: Hitachi Command Control Interface (CCI): used for issuing commands to create and split Synchronous TrueCopy 9500V and ShadowImage 9500V pairs. Resource Manager 9500V: used for specifying and releasing command devices. Also used for specifying the path and referencing the status of the path on Synchronous TrueCopy 9500 V and ShadowImage 9500V.	
Controller configuration	Configuration of dual controller is required.	
Max number of command devices	Two command devices per 9500V subsystem. The command devices must be set on both the local and remote subsystems.	Two command devices per 9500V subsystem.
Unit of pair management	LUs are the target of Synchronous TrueCopy 9500V and ShadowImage 9500V pairs, and are managed per logical unit.	
Pair structure	One copy (S-VOL) per P-VOL.	
Supported RAID level	Only RAID 5 (2D+1P~15D+1P).	RAID 0, RAID 1, RAID 5, RAID 1+0 (However, using a P-VOL and S-VOL with the same redundant RAID level is recommended.)
Combination of RAID levels	For example, P-VOL type which is RAID 5 (4D+1P) can be combined only with S-VOL type RAID 5 (4D+1P). P-VOL type      S-VOL type RAID 5 (4D+1P)   RAID 5 (4D+1P)   => available RAID 5 (4D+1P)   RAID 1+0 (4D+4P) => not available RAID 1+0 (2D+2P)RAID 1+0 (2D+2P) => not available RAID 5 (4D+1P)   RAID 0 (4D)      => not available RAID 5 (4D+1P)   RAID 5 (3D+1P)   => not available RAID 5 (4D+1P)   RAID 1+0 (2D+2P) => not available RAID 5 (4D+1P)   RAID 0 (5D)      => not available RAID 1+0 (2D+2P) RAID 1+0 (5D+5P) => not available	All combinations supported. However, the number of data disks must be the same. P-VOL type      S-VOL type RAID 5 (4D+1P)   RAID 5 (4D+1P)   => available RAID 5 (4D+1P)   RAID 1+0 (4D+4P) => available RAID 1+0 (2D+2P) RAID 1+0 (2D+2P) => available RAID 5 (4D+1P)   RAID 0 (4D)      => available RAID 5 (4D+1P)   RAID 5 (3D+1P)   => not available RAID 5 (4D+1P)   RAID 1+0 (2D+2P) => not available RAID 5 (4D+1P)   RAID 0 (5D)      => not available RAID 1+0 (2D+2P) RAID 1+0 (5D+5P) => not available
Number of paths (for 1 pair)	Two paths per 1 pair must be set. (One path is specified per 1 controller. Since it requires a dual controller configuration, total of 2 paths are specified.)	—
Size of LU	The LU size must always be P-VOL = S-VOL. Please set the value larger than or equal to 65,538 blocks (1 block = 512 bytes) (33 MB) for the LU size of the command device.	
Server access restrictions while copying	Read-only while copying (P-VOL and S-VOL)	

**Table 2.1 Synchronous TrueCopy 9500V and ShadowImage 9500V Requirements (continued)**

Parameter	Synchronous TrueCopy Requirement	ShadowImage Requirement
Allocation of P-VOL and S-VOL	S-VOL is allocated in the remote subsystem which is connected to the local subsystem in which P-VOL is included with Fibre Channel Interface.	The P-VOL and S-VOL can only be allocated in the same controller.
Initial copy	When receiving the paircreate command, the entire copy is executed in the direction of P-VOL to S-VOL.	
Split	When receiving the pairsplit command, splitting P-VOL and S-VOL is executed. Splitting is completed immediately (few ms to 10ms).	
Differential management	When the P-VOL and S-VOL is in split status (PSUS), write operations received individually will be managed as differential data of P-VOL and S-VOL.	
Resynchronization	When receiving the pairresync command, the differential copy is executed in the direction of P-VOL to S-VOL or S-VOL to P-VOL.	
S-VOL data creation	<p>The S-VOL data on cache is created during the write operation.</p> <ol style="list-style-type: none"> <li>1. Receiving the write command from the host.</li> <li>2. Creates the P-VOL data.</li> <li>3. Creates the S-VOL data.</li> <li>4. Reports "GOOD" to host.</li> </ol>	
Concurrent use of Dual ID Succession	Cannot use Dual ID Succession concurrently.	
Concurrent use of LUN Size Expansion	A Unified LU cannot be set to S-VOL or P-VOL.	Available.
Concurrent use of LU FlashAccess	The LU specified for FlashAccess (LU cache residence) cannot be set to S-VOL or P-VOL.	
Concurrent use of SNMP Agent	Available.	
Concurrent use of LUN SANTinel	Available.	
Concurrent use of Password Protection	Available.	
Concurrent use of LUN Management	Available.	
Key	Unlock the Synchronous TrueCopy 9500V and ShadowImage 9500V function.	Unlock the ShadowImage 9500V function.
Concurrent use of ShadowImage 9500V and Synchronous TrueCopy 9500V	Synchronous TrueCopy 9500V and ShadowImage 9500V can be used concurrently. For details, see section 2.12.	
Data share	Data share mode is must be enabled.	Data share mode is recommended.
Failures	When a failure of the copy operation from P-VOL to S-VOL occurs, Synchronous TrueCopy 9500V and ShadowImage 9500V will suspend the pair (PSUE). If a LU failure occurs, Synchronous TrueCopy 9500V and ShadowImage 9500V suspend the pair. If a drive failure occurs, the Synchronous TrueCopy 9500V and ShadowImage 9500V pair status is not affected because of the RAID architecture.	
Restriction for formatting the volumes	Do not execute Synchronous TrueCopy 9500V and ShadowImage 9500V operations while formatting the volume. Formatting takes priority and the Synchronous TrueCopy 9500V and ShadowImage 9500V operations will be suspended.	

## 2.6 Command Operations

Command operations can be performed from the UNIX®/PC server host using Hitachi Command Control Interface (CCI) software. For further information on using the Hitachi Command Control Interface, please refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

### 2.6.1 Paircreate Operation for Synchronous TrueCopy

The paircreate operation establishes the new specified pair(s). The volumes, which will be the P-VOL and S-VOL, must be in the SMPL (simplex) state before being added to a pair.

#### 2.6.1.1 Initial Copy Operation

The initial copy operation takes place when you create a new pair (see Figure 2.3). The 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. Write operations performed on the P-VOL during the initial copy operation will always be duplicated to the S-VOL. The pair status changes to COPY when the initial copy is complete.

When creating pairs, you can select the pace for the initial copy operation(s): slower, medium, and faster. The pace is divided on a scale of 1 to 15. The default value is 3. However, you must set the maximum value of 15. For details, see section 4.1.

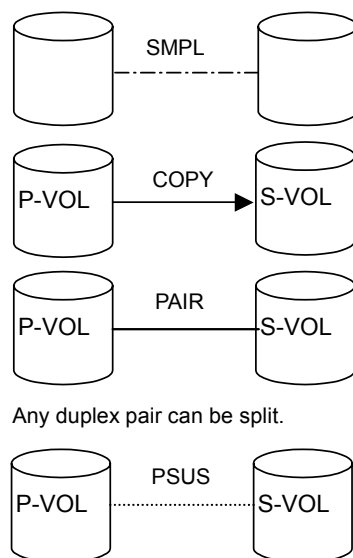


Figure 2.3 Adding a Synchronous TrueCopy Pair

## 2.6.2 Pairsplit Operation for Synchronous TrueCopy 9500V

The pairsplit operation suspends 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; it 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.

When the split operation is complete, the pair status changes to PSUS, and you have full read/write access to the split S-VOL. While the pair is split, the 9500V 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. For details on the pairsplit operation, see section 4.2.

## 2.6.3 Pairresync Operations for Synchronous TrueCopy 9500V (Normal, Swap)

The pairresync operation resynchronizes the split pairs (PSUS) or the suspended pairs (PSUE). When the pairresync operation starts, the pair status changes to COPY. The pair status changes to PAIR when the pairresync operation completes.

Synchronous TrueCopy allows you to perform two types of pairresync operations:

- **Normal.** The normal pairresync operation (see Figure 2.4) 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. The S-VOL becomes inaccessible to all hosts for write operation, and the P-VOL remains accessible to all hosts for both read and write operations during a normal pairresync. The normal pairresync operation can be executed for pairs with PSUS and PSUE status.
- **Swap.** The pairresync (-swaps/-swapp) operation (see Figure 2.5) swaps the P-VOL for the S-VOL. The copy direction for a pairresync operation is S-VOL to P-VOL. The pair status during a pairresync (-swaps/-swapp) operation is COPY, and the S-VOL becomes inaccessible to all hosts for write operations during a pairresync (-swaps/-swapp) operation. The P-VOL remains accessible for both read and write operations, and the write operation on P-VOL will always be reflected to S-VOL.

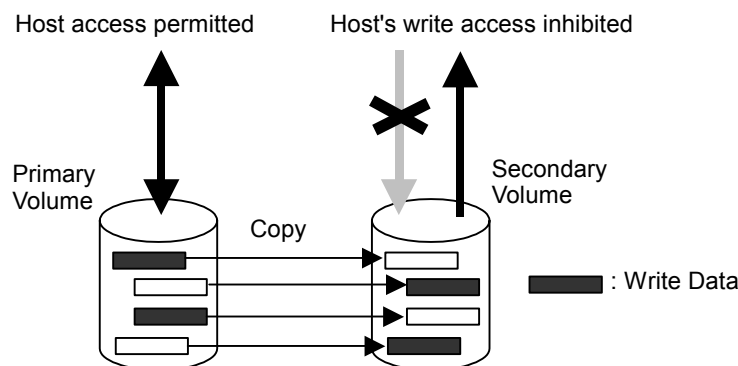
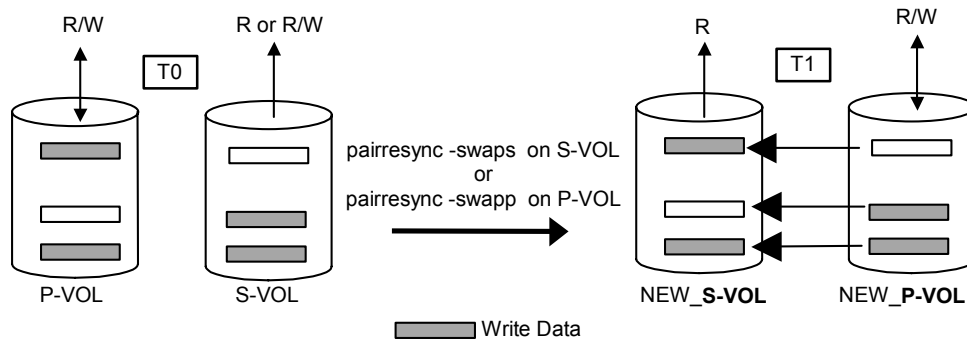


Figure 2.4 Normal Pairresync Operation



**Figure 2.5 Swap Operation**

Synchronous TrueCopy 9500V allows you to perform pairresync operations on split and suspended pairs.

- **Pairresync for split pair.** When pairresync operation is performed on a split pair (status = PSUS), the subsystem merges the S-VOL track map into the P-VOL track map and then copies all flagged data from the P-VOL to the S-VOL.
- **Pairresync for suspended pair.** When a pairresync operation is performed on a suspended pair (status = PSUE), the subsystem copies all data on the P-VOL to the S-VOL, since all P-VOL data were flagged as differential data when the pair was suspended. The pairresync operation takes as long as the Synchronous TrueCopy initial copy operation. For details on the pairresync operation, see section 4.3.

## 2.6.4 Pairsplit –R Operation for Synchronous TrueCopy 9500V

The Synchronous TrueCopy 9500V pairsplit -R operation suspends the Synchronous TrueCopy 9500V copy operations to the S-VOL of the pair. A Synchronous TrueCopy 9500V pair can be suspended by the user at any time.

The 9500V subsystem will automatically suspend a Synchronous TrueCopy 9500V pair when it cannot keep the pair mirrored for any reason. When the 9500V suspends a pair, a file is output to system log or event log to notify the host. The 9500V will automatically suspend a pair under the following conditions:

- When the Synchronous TrueCopy 9500V volume pair has been suspended or deleted from the UNIX®/PC server host using the Hitachi Command Control Interface (CCI),
- When the 9500V detects an error condition related to a copy operation. When a volume pair with COPY status is suspended, the 9500V aborts the copy operation, changes the status of the P-VOL and S-VOL to PSUE, and accepts all subsequent Read/Write I/Os to the P-VOL. An exception to this includes when “data” is specified in the fence level and the LU is impossible to access (for example, an LU blockage).

## 2.6.5 PairSplit -S Operation for Synchronous TrueCopy

The **pairsplit -S** operation stops the copy operations to the S-VOL of the pair and releases the volume in paired status. A pair can be released by the user at any time except during the pairsplit operation (i.e., any status except SMPL). Volume status changes to SMPL for both.

## 2.6.6 Paircreate Operation for ShadowImage 9500V

The **paircreate** operation establishes the newly specified pair(s). The volumes that will become the P-VOL and S-VOL must be in the SMPL (simplex) state before being joined as a pair.

### 2.6.6.1 Initial Copy Operation

The initial copy operation takes place when you create a new pair (see Figure 2.6). The 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. Write operations performed on the P-VOL during the initial copy operation will always be duplicated to the S-VOL. The status of the pair is COPY(PD) (PD = pending) while the initial copy operation is in progress. The pair status changes to PAIR when the initial copy is complete.

When creating pairs, you can select the pace for the initial copy operation(s): slow, medium, and fast. The pace is divided on the scale of 1 to 15. The default value is 3. However, you must set the maximum value of 15.

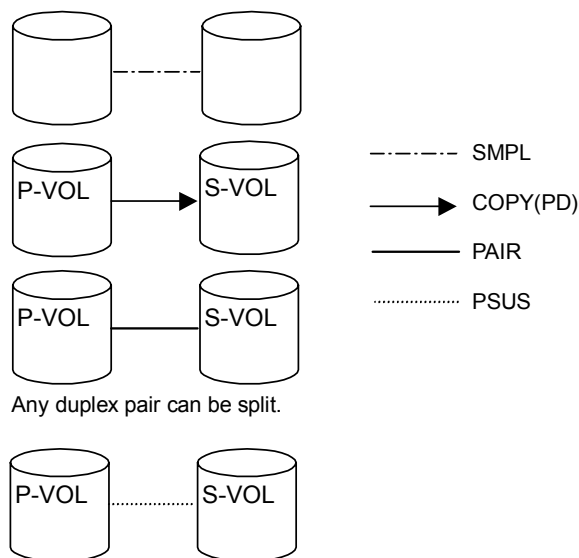


Figure 2.6 Adding a ShadowImage 9500V Pair

## 2.6.7 Pairresync Operations for ShadowImage 9500V (Normal, Reverse)

The pairresync operation resynchronizes the split pairs (PSUS) or the suspended pairs (PSUE). When the pairresync operation starts, the pair status changes to COPY(RS) or COPY(RS-R). The pair status changes to PAIR when the pairresync operation completes.

ShadowImage 9500V allows you to perform two types of pairresync operations:

- **Normal.** The normal pairresync operation (see Figure 2.7) 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). The S-VOL becomes inaccessible to all hosts for write operation, and the P-VOL remains accessible to all hosts for both read and write operations during a normal pairresync. The normal pairresync operation can be executed for pairs with the status PSUS and PSUE.
- **Reverse.** The reverse pairresync (pairresync -restore) operation (see Figure 2.8) synchronizes the P-VOL with the S-VOL. The copy direction for a reverse pairresync operation is S-VOL to P-VOL. The pair status during a reverse resync operation is COPY(RS-R), and the S-VOL becomes inaccessible to all hosts for write operations during a reverse pairresync operation. The P-VOL remains accessible for both read and write operations, and the write operation on P-VOL will always be reflected to S-VOL (see Figure 2.9).

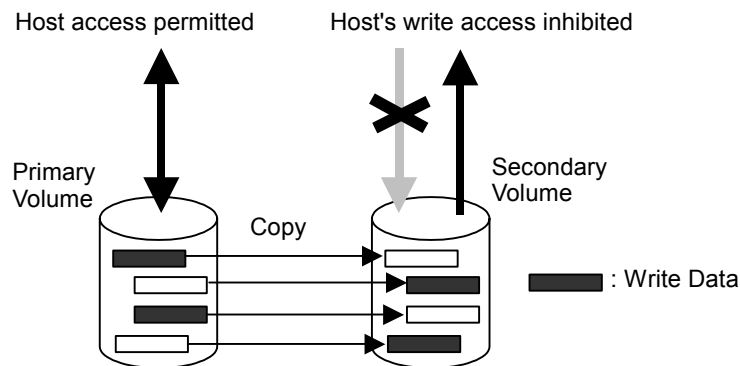


Figure 2.7 Normal Pairresync Operation on a ShadowImage 9500V

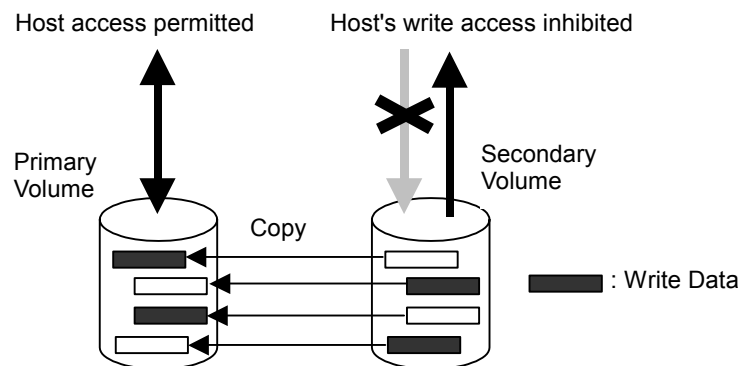
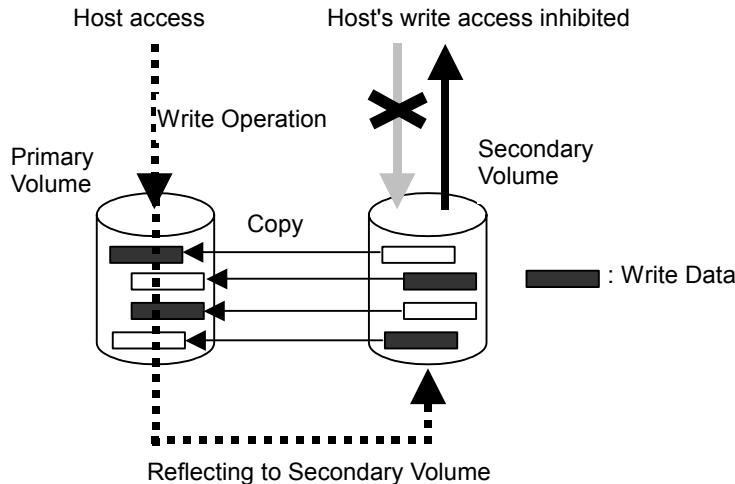


Figure 2.8 Reverse Pairresync Operation (pairresync -restore) on ShadowImage 9500V



**Figure 2.9 Reflecting Write Data to S-VOL during Reverse Pairresync Operation (pairresync -restore) on ShadowImage 9500V**

ShadowImage 9500V allows you to perform pairresync operations on split and suspended pairs.

- **Pairresync for split pair.** When a pairresync operation is performed on a split pair (status = PSUS), the subsystem merges the S-VOL track map into the P-VOL track map and then copies all flagged data from the P-VOL to the S-VOL. When a reverse pairresync operation is performed on a split pair, the subsystem merges the P-VOL track map into the S-VOL track map and then 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 also greatly reduces the time needed to resynchronize the pair.
- **Pairresync for suspended pair.** When a pairresync operation is performed on a suspended pair (status = PSUE), the subsystem copies all data on the P-VOL to the S-VOL, since all P-VOL tracks were flagged as difference data when the pair was suspended. The pairresync operation takes as long as the ShadowImage initial copy operation.

For details on pairresync operation, see section 4.7.

## 2.6.8 Pairsplit -S Operation for ShadowImage 9500V

The ShadowImage 9500V **pairsplit-S** operation stops the ShadowImage 9500V copy operations to the S-VOL of the pair and releases the volume in paired status. The user can release a ShadowImage 9500V pair at any time except during the **pairsplit** operation (i.e., any status except SMPL). The status of both ShadowImage 9500V volumes changes to SMPL.

## 2.7 Pair Status

### 2.7.1 Synchronous TrueCopy 9500V Pair Status

Synchronous TrueCopy 9500V displays the pair status of all Synchronous TrueCopy volumes (LUs). Figure 2.10 illustrates the Synchronous TrueCopy 9500V pair status transitions and the relationship between the pair status and the Synchronous TrueCopy 9500V operations.

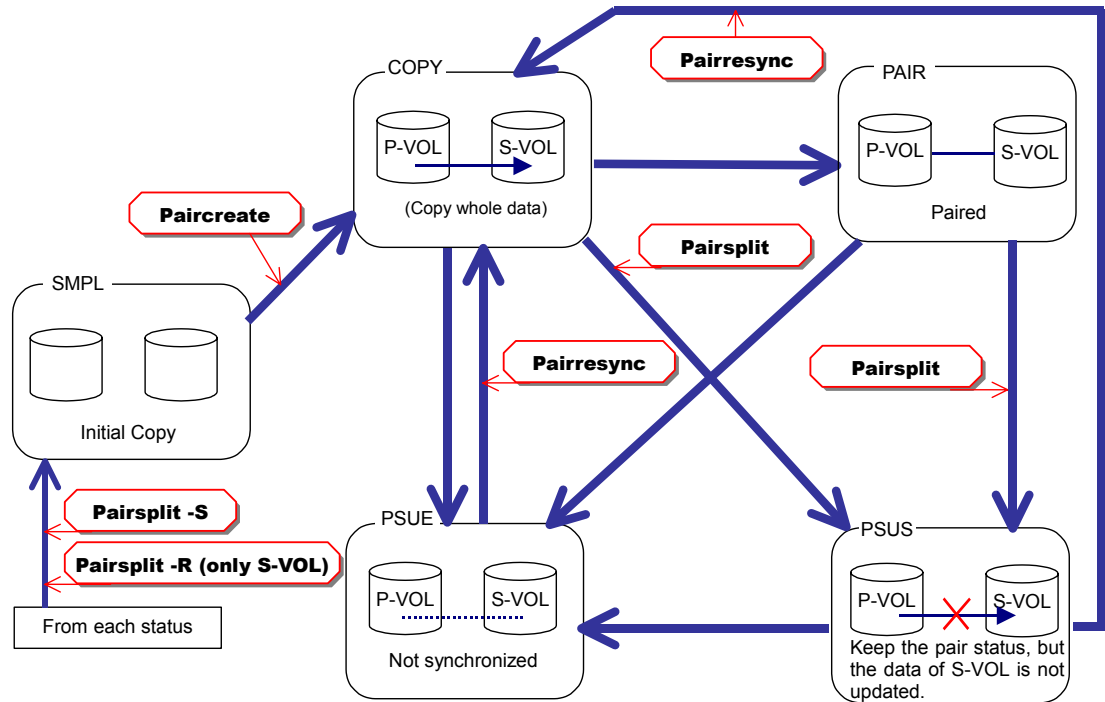


Figure 2.10 Synchronous TrueCopy 9500V Pair Status Transitions

Table 2.2 lists and describes the Synchronous TrueCopy 9500V pair status conditions. If a volume is not assigned to a Synchronous TrueCopy 9500V pair, its status is SMPL. When you create a Synchronous TrueCopy 9500V pair, the status of the P-VOL and S-VOL changes to COPY. When the copy operation is complete, the pair status becomes PAIR. If the 9500V cannot maintain PAIR status for any reason, or if you suspend the pair (pairsplit -E), the pair status changes to PSUE. When the pairsplit operation is complete, the pair status changes to PSUS to enable you to access the split S-VOL. When you start a pairresync operation, the pair status changes to COPY. When the pairresync operation is complete, the pair status changes to PAIR. When you release a pair (pairsplit -S or -R), the pair status changes to SMPL.

**Table 2.2 Synchronous TrueCopy 9500V Pair Status Conditions**

Pair Status	Description	P-VOL Access	S-VOL Access
SMPL	The volume is not assigned to the pair. The subsystem accepts read and write operations for all SMPL volumes.	Read: Available Write: Available	Read: Available Write: Available
COPY	The copy operation is in progress. The subsystem continues to accept read and write operations for P-VOL and the read operation for S-VOL. The subsystem, however, rejects the write operation for S-VOL.	Read: Available Write: Available	Read: Available Mount operation is disabled Write: Not available
PAIR	The copy operation is complete. P-VOL and S-VOL are still paired. The subsystem accepts the read and write operation for P-VOL and the operation for S-VOL. The subsystem, however, rejects the write operation for S-VOL.	Read: Available Write: Available	Read: Available Mount operation is disabled Write: Not available
PSUS (SSUS)	The copy operation is suspended. The subsystem starts accepting write operations for P-VOL and S-VOL. When the pair is resynchronized, the subsystem executes the differential data copying from P-VOL to S-VOL.	Read: Available Write: Available	Read: Available Write: Available
PSUE	A failure occurred and the copy operation is suspended forcibly. The subsystem continues accepting read and write I/Os for a PSUE (suspended) P-VOL, except when "data" is specified in the fence level* and the LU is impossible to access (for example, the LU blockage). The subsystem accepts the read operation for S-VOL, but rejects the write operation. When the pair is resynchronized, the subsystem executes copying whole data of LU or the differential data from P-VOL to S-VOL.	Read: Available/ Not available Write: Available/ Not Available	Read: Available Write: Not available

## 2.7.2 ShadowImage 9500V Pair Status

The ShadowImage 9500V displays the pair status of all ShadowImage volumes (LUs). Figure 2.11 illustrates the ShadowImage 9500V pair status transitions and the relationship between the pair status and the ShadowImage 9500V operations.

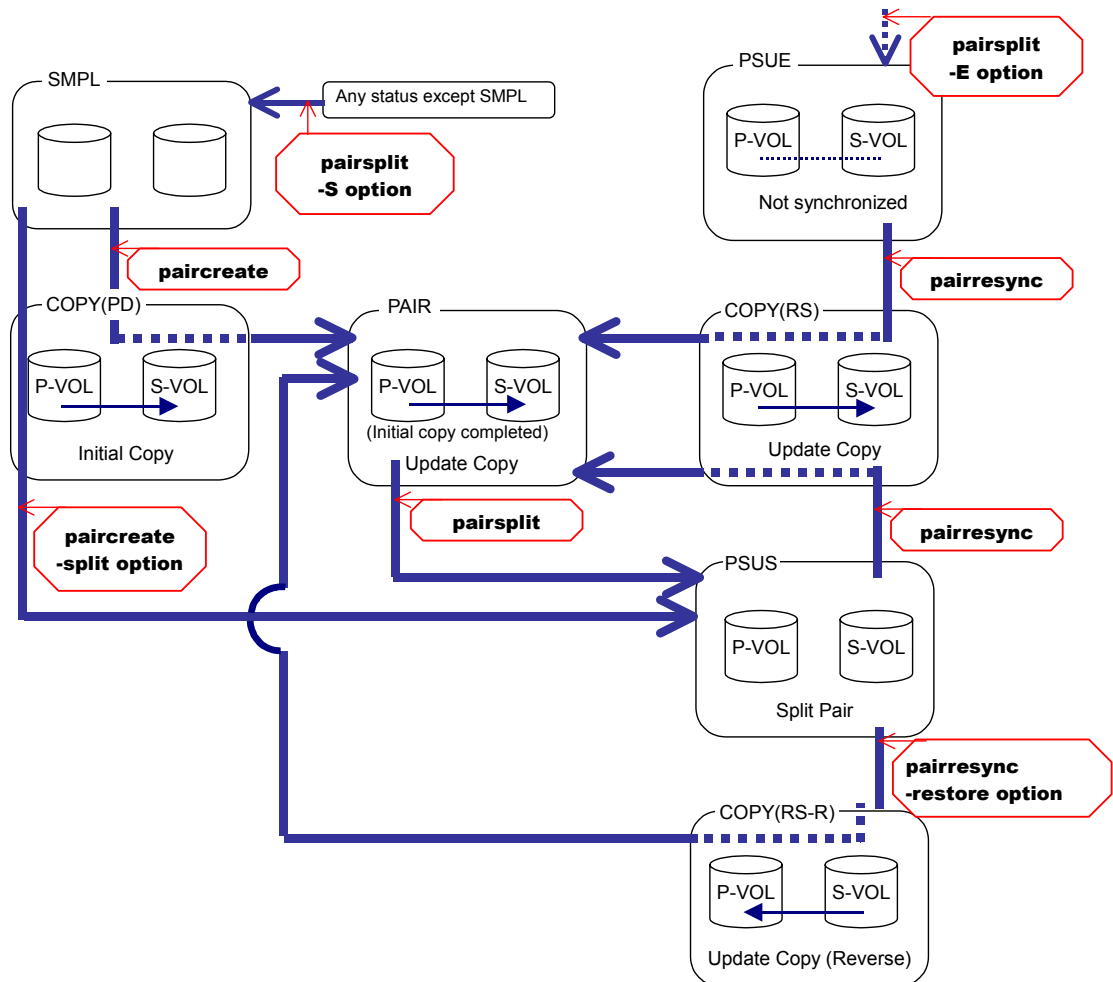


Figure 2.11 ShadowImage 9500V Pair Status Transitions

Table 2.3 lists and describes the ShadowImage 9500V pair status conditions. If a volume is not assigned to a ShadowImage 9500V pair, its status is SMPL. When you create a ShadowImage 9500V pair, the status of the P-VOL and S-VOL changes to COPY(PD). When the initial copy operation is complete, the pair status becomes PAIR. If the 9500V cannot maintain PAIR status for any reason, or if you suspend the pair (pairsplit -E), the pair status changes to PSUE. When you split a pair (pairsplit), the pair status changes to COPY(SP). When the pairsplit operation is complete, the pair status changes to PSUS to enable you to access the split S-VOL. When you start a pairresync operation, the pair status changes to COPY(RS). When you specify reverse mode for a pairresync operation (pairresync -restore), the pair status changes to COPY(RS-R) (data is copied in the reverse direction from the S-VOL to the P-VOL). When the pairresync operation is complete, the pair status changes to PAIR. When you release a pair (pairsplit -S), the pair status changes to SMPL.

**Table 2.3 ShadowImage Pair Status**

Pair Status	Description	S-VOL Access
SMPL	The volume is not assigned to a ShadowImage 9500V pair. The 9500V accepts read and write I/Os for all SMPL volumes.	N/A (There is no S-VOL yet )
COPY(PD)	The initial copy operation is in progress. The 9500V continues to accept read and write operations for the P-VOL but does not accept write operations for the S-VOL.	Read only
PAIR	The initial copy operation is complete, and the 9500V starts copying the write operation taken to the P-VOL data onto the S-VOL. The P-VOL and S-VOL of a duplex pair (PAIR status) is identical. The 9500V rejects all write I/Os for S-VOLs with the status PAIR.	Read only
PSUS	The 9500V starts accepting write I/Os for PSUS S-VOLs. The 9500V keeps track of all updates to the split P-VOL and S-VOL, so that the pair can be resynchronized quickly.	Read and write The S-VOL can be mounted.
COPY(RS)	The 9500V does not accept write I/Os for COPY(RS) S-VOLs. When a split pair is resynchronized in normal mode, the 9500V copies only the P-VOL differential data to the S-VOL. When a PSUE (suspended) pair is resynchronized, the 9500V copies the entire P-VOL to the S-VOL.	Read only
COPY(RS-R)	The 9500V does not accept write I/Os for COPY(RS-R) S-VOLs. When a split pair is resynchronized in reverse mode, the 9500V copies only the S-VOL differential data to the P-VOL.	Read only
PSUE	The 9500V continues accepting read and write I/Os for a PSUE (suspended) P-VOL (however, if the status transits from COPY(RS-R), all access to P-VOL is disabled). The 9500V marks the entire P-VOL track map as difference data, so that 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 (If the status transits from COPY(RS-R), all access to S-VOL is disabled.)

For details on pairdisplay operation, see section Chapter 4.

## 2.8 Synchronous TrueCopy 9500V Operations

Synchronous TrueCopy operations for setting the path can be performed from the host with the Resource Manager 9500V. For more detailed information on the Resource Manager 9500V, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Graphical User Interface (GUI)* (MK-92DF605).

Paircreate can be performed from the host using RAID Manager (CCI). For further information on using the Hitachi Command Control Interface, please refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide* (MK-92DF609).

### 2.8.1 Setting the Path

#### 2.8.1.1 Path

Synchronous TrueCopy 9500V operations can be performed between the subsystems that are connected by a Fibre Channel Interface. A route called a "path" connects the port from the local subsystem that executes the volume replication to the port on the remote subsystem.

The local and remote ports of the subsystem are specified using the Resource Manager 9500V. Only one path can be specified per controller. Since the subsystem requires a dual controller, two paths must be set.

#### 2.8.1.2 Alternative Path

Two paths must be set to avoid stopping (suspending) the copy operation due to a single point malfunction in the path. A single path for each controller on the local and remote subsystem must be set and a duplex path for each pair is allocated.

To avoid malfunction, the path can be automatically switched from the main path to the alternative path from the local subsystem.

In Figure 2.12, if the path-1 is blocked while copying with path-1, the path can be automatically switched from the path-1 to path-2.

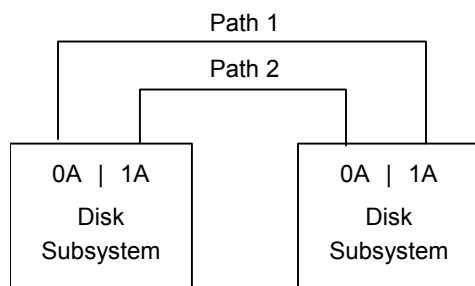


Figure 2.12 Switching the Paths

### 2.8.1.3 Confirming the Path Condition

Synchronous TrueCopy 9500V supports a function that periodically issues commands between the subsystems and monitors the path status. When a path status is blocked due to path malfunction, its status will be reported from the LED or from the Web interface (no status is reported for temporary command error). The user can also confirm the path status any time by using the Web interface.

### 2.8.2 Port Connection and Topology

The subsystem supports direct or switch connection only. Hub connection is not supported. Like the Switch-Hub subsystem, a connection via Hub is not supported even if the connection is FL-Port of Fabric (switch).

For topology, please refer to Table 2.4.

**Table 2.4 Supported Topology**

#	Port Connection	Topology		Local	Remote
1	Direct	Point to Point		Not available	Not available
2		Loop		Available	Available
3	HUB	Loop		Not available	Not available
4	Switch	Point to Point	F-Port	Available	Available
5		Loop	FL-Port	Available	Available

## 2.9 Cascade Connection

Synchronous TrueCopy 9500V can cascade two LUs for P-VOL connected with the ShadowImage 9500V on the local side and the remote side as shown in the following figure. Synchronous TrueCopy 9500V does not always need ShadowImage 9500V.

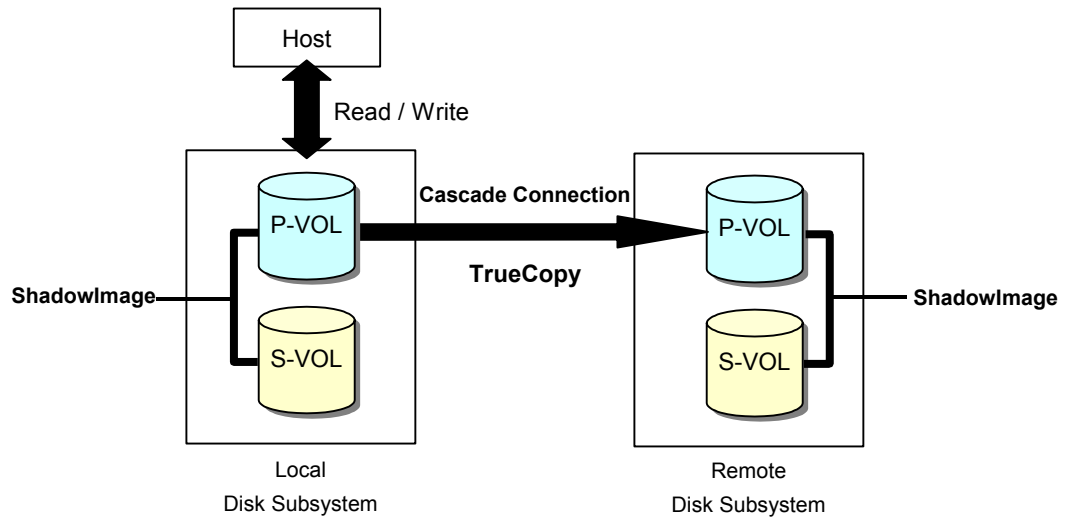


Figure 2.13 Cascade Connection

### 2.9.1 Cascade Restrictions

ShadowImage 9500V S-VOL and Synchronous TrueCopy 9500V cannot be cascaded.

If by using Synchronous TrueCopy 9500V, the S-VOL of the ShadowImage 9500V pair is cascaded, and the data of the P-VOL on ShadowImage 9500V is written into S-VOL on ShadowImage 9500V according to the dual writing or the differential copying, the data must be written simultaneously into S-VOL on the Synchronous TrueCopy 9500V to keep equality of LUs on the local side and the remote side. Synchronous TrueCopy 9500V does not support this feature.

However, if by using Synchronous TrueCopy 9500V, the P-VOL on ShadowImage 9500V is cascaded, there is a possibility that the data of P-VOL on the local side does not equal the data of P-VOL on the remote side due to the reverse-resync being executed using ShadowImage 9500V. As the countermeasure against this matter, the restriction that enables the reverse-resync using ShadowImage 9500V to be executed in the PSUS status only is provided on Synchronous TrueCopy 9500V (See section 2.9.2).

## 2.9.2 Pair Status Restrictions

When the reverse-resync using ShadowImage 9500V is executed, Synchronous TrueCopy 9500V must be in the PSUS status. If the reverse-resync using ShadowImage 9500V is executed in the COPY status or PAIR status of Synchronous TrueCopy 9500V, the data in the LUs for P-VOL that are cascaded using Synchronous TrueCopy 9500V on the local side and the remote side cannot be assured of equality.

The details of the pair status restrictions are described below.

**Table 2.5 LU Shared with P-VOL on ShadowImage 9500V and P-VOL on Synchronous TrueCopy 9500V**

		ShadowImage 9500V P-VOL					
		PAIR	COPY	COPY (Reverse resync)	PSUS	PSUE	PSUE (Reverse resync)
TrueCopy 9500V P-VOL	PAIR	Possible Read/Write available	Possible Read/Write available	Impossible	Possible Read/Write available	Possible Read/Write available	Impossible
	COPY	Possible Read/Write available	Possible Read/Write available	Impossible	Possible Read/Write available	Possible Read/Write available	Impossible
	PSUS	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write unavailable
	PSUE (Read/Write available)	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write unavailable
	PSUE (Read available)	Possible Read only	Possible Read only	Impossible	Possible Read only	Possible Read only	Impossible

**Note:** PSUE in this table excludes a condition in which access of an LU is not possible (for example, LU blockage).

**Table 2.6 One LU used for P-VOL on ShadowImage 9500V and S-VOL on Synchronous TrueCopy 9500V**

		ShadowImage 9500V P-VOL					
		PAIR	COPY	COPY (Reverse resync)	PSUS	PSUE	PSUE (Reverse resync)
TrueCopy 9500V S-VOL	PAIR	Possible Read only	Possible Read only	Impossible	Possible Read only	Possible Read only	Impossible
	COPY	Possible Read only	Possible Read only	Impossible	Possible Read only	Possible Read only	Impossible
	PSUS	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write available	Possible Read/Write unavailable
	PSUE (Read available)	Possible Read only	Possible Read only	Impossible	Possible Read only	Possible Read only	Impossible

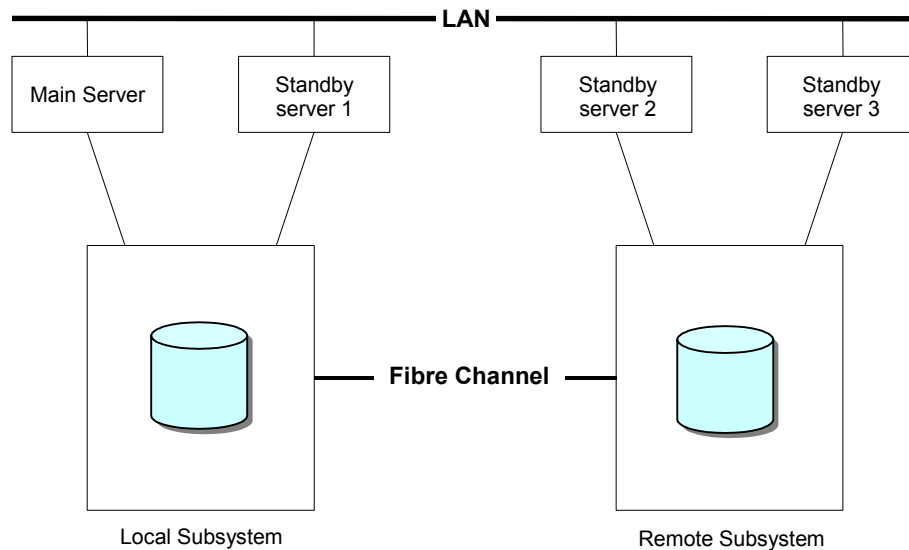
**Note:** PSUE in this table excludes a condition in which access of an LU is not possible (for example, LU blockage).

## 2.10 Synchronous TrueCopy 9500V Operation

### 2.10.1 Failover and Fence Level

When an application is used, such as a database, which has a data and writing log, and it is able to execute the I/O operation using the alternative host although a failure occurs during the writing operation, it is possible to perform the failover from the local side to the remote side.

Refer to the following configuration.



**Figure 2.14 Configuration for Performing Failover**

In this example, “data” is selected for the fence level, and “PAIR” is selected for the pair status. If the write operation into the S-VOL cannot be executed, an error occurs during the write operation into the P-VOL. Therefore the mirror-consistency between the P-VOL and the S-VOL is kept. The fence level is a feature that controls the host command (write) response after the status of the P-VOL changes into PSUE.

The responses to the host, after the status transitions to PSUE, are shown below.

**Table 2.7 Response to the Host After the Status Transitions to PSUE**

Fence Level	Write to P-VOL
data	Check Response
never	Good Response

## 2.10.2 Swapping From the Local Main Server to the Local Standby Server

If the status changes to PSUE because a blockage occurs in both paths between the local side and the remote side, or the subsystem on the remote side is down, a read/write I/O from the main server error occurs. In this case, the main server on the local side is changed over to the standby server, and the takeover operation (horctakeover) is performed in accordance with the Hitachi Command Control Interface (CCI) command.

On the local side, P-VOL-Takeover is performed, and the subsystem cuts off the P-VOL. Subsequently, P-VOL can read and write the data and the standby server 1 on the local side can be used as a main server.

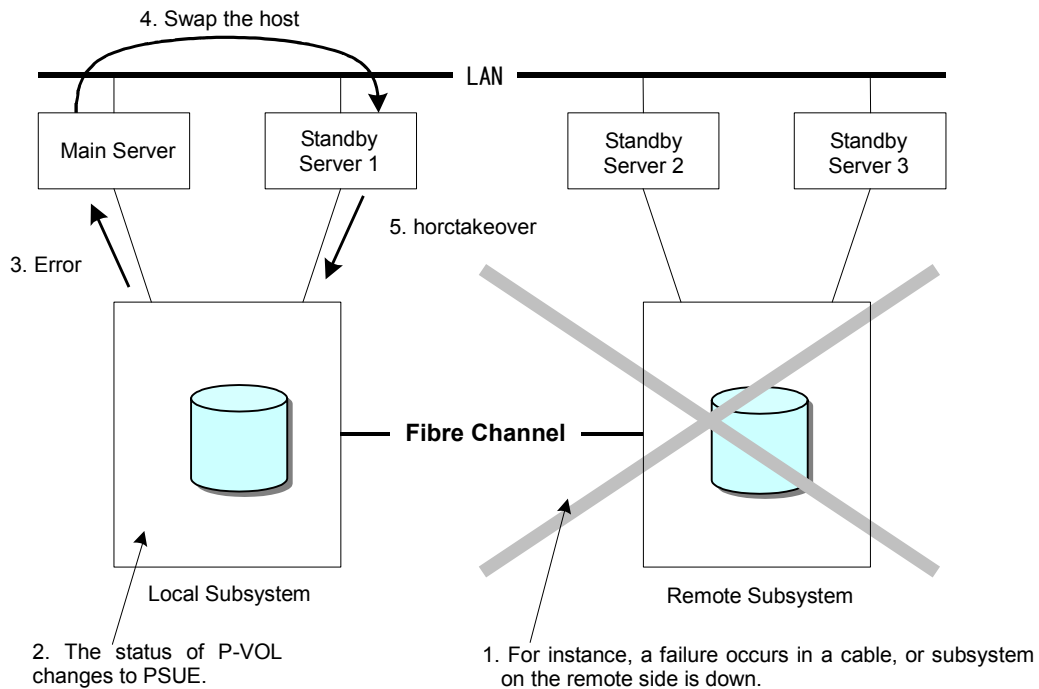


Figure 2.15 Movement when the Main Server is Changed for the Standby Server on the Local Side

### 2.10.3 Swapping the Local Server for the Remote Server

If both the main server and the standby server on the local side break down, or the subsystem on the local side goes down, the server on the remote side is used as the host (instead of the server on the local side).

The standby server 2 on the remote side performs the takeover operation (horctakeover) in accordance with the Hitachi Command Control Interface (CCI) command. If the subsystem on the local side can be used, SWAP-Takeover is performed, and the role of the subsystem is changed over between the primary side and the secondary side. (The local side is assigned to the secondary side, and the remote side is assigned to the primary side.)

- Split a pair of P-VOL and S-VOL.
- Execute SWAP resynchronization (pairresync-swaps).

If the subsystem on the local side cannot be used, S-VOL-Takeover is performed, the status of S-VOL changes to PSUS (SSWS), and S-VOL can read and write.

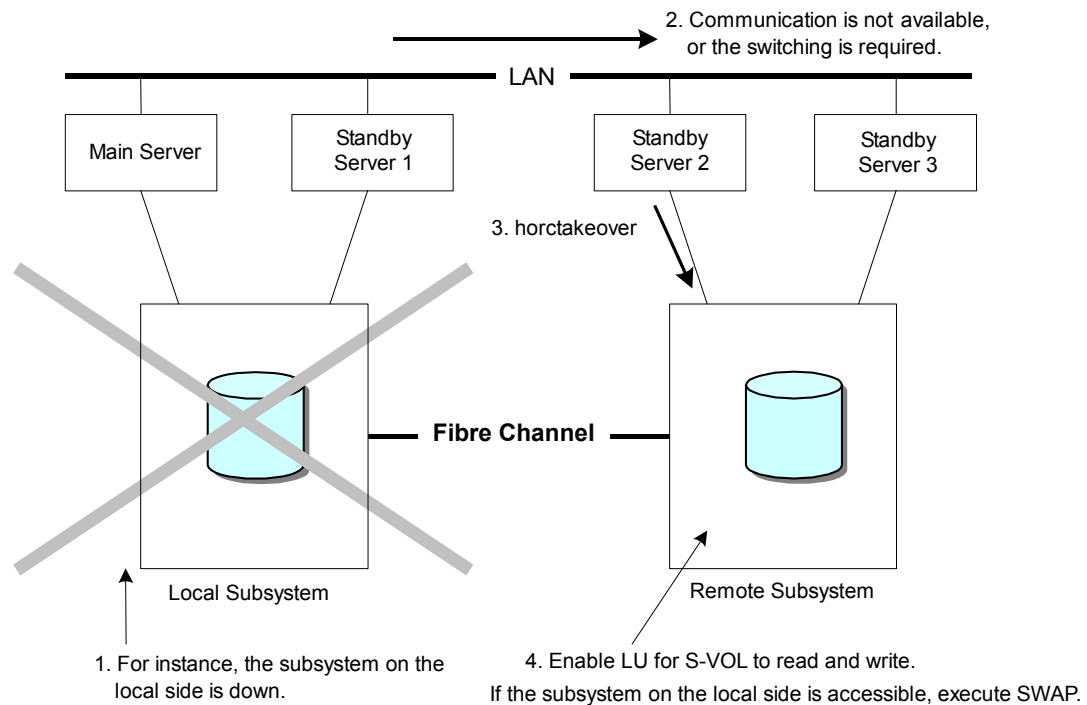


Figure 2.16 Movement when the Host is Changed from the Local Side to the Remote Side

## 2.11 Operation When the Fence Level is “never”

The file systems for UNIX® and Windows® NT/2000 do not have the writing log (or the journal file). Even though “data” is set for the fence level, the file sometimes does not correspond to the directory. Therefore, “never” is set for the fence level.

In this case, the data of S-VOL is used after “fsck” and “chkdsk” are executed. The data, however, is not guaranteed completely. Therefore, we recommend a configuration which saves the complete data in the P-VOL or the S-VOL that is cascaded by using ShadowImage 9500V on the remote side.

## 2.12 Concurrent Use of Synchronous TrueCopy 9500V and ShadowImage 9500V

By using Synchronous TrueCopy 9500V and ShadowImage 9500V concurrently, the LU in the subsystem that the Synchronous TrueCopy 9500V function used is duplicated. Even when the Synchronous TrueCopy 9500V function is in progress, the host I/O operation to the volume is guaranteed.

### 2.12.1 System Configuration for Backup Use

By using Synchronous TrueCopy 9500V, you can back up the LU in the subsystem. To save data when a failure occurs during a copy operation, it is recommended that you connect the primary LU and the secondary LU by using ShadowImage 9500V on the remote side (Ordinary Split).

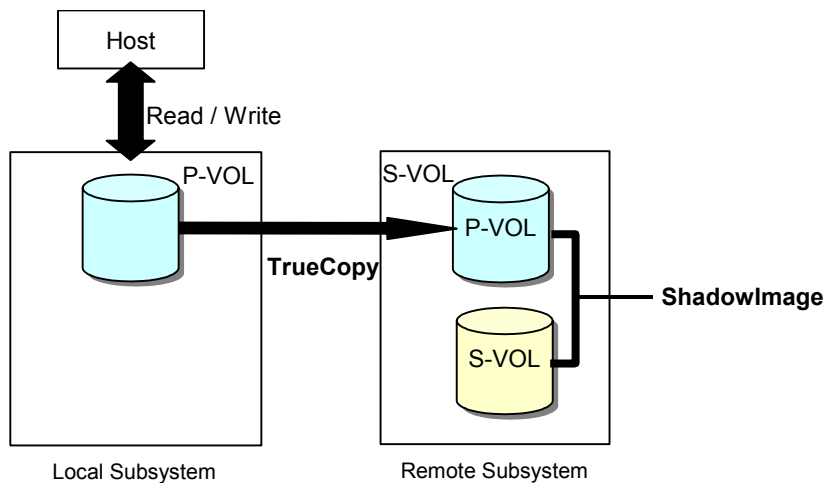


Figure 2.17 System Configuration for Backup Use

The following two operations are available:

- **Completely Full-time Pair** (Attaching importance to the recovery time)
- **Ordinary Split** (Attaching importance to the performance)

### 2.12.1.1 Completely Full-time Pair (Attaching importance to the recovery time)

This can be used for the failover and the backup operation. "Completely Full-time Pair" also can be used for the data move, but it is recommended that you use "Ordinary Split" for the data move.

- a) Characteristics of the system include:
  - When the primary LU and the secondary LU are cascaded by using ShadowImage 9500V, split a pair of ShadowImage 9500Vs. When splitting this pair, the data is saved in the secondary LU on ShadowImage 9500V.
  - Although the subsystem on the local side is in the hang-up condition, because "data" is being set for the fence level and the application (for example, the database that has logs) is being used, the data can be completely recovered. (Merit)
  - When data is written from the host to the subsystem on the local side, the performance deteriorates because the data is simultaneously written from the host to the LUs on the local side and the remote side. (Demerit)
- b) Status restrictions include:
  - Completely Full-time Pair: Synchronous TrueCopy 9500V is used under the Full-time PAIR condition.

### 2.12.1.2 Ordinary Split (Attaching importance to the performance)

This can be used for the backup and the data move operation. "Ordinary Split" cannot be used for failover.

- a) Characteristics of the system include:
  - Execute resynchronization when the host I/O is performed infrequently. When the resynchronization is complete, stop the processing for the application temporarily and split a pair. The data is saved when a pair is split.
  - If the primary LU is cascaded with the secondary LU using ShadowImage 9500V on the remote side, the data is saved in the secondary LU on ShadowImage 9500V by resynchronization using Synchronous TrueCopy 9500V after splitting a pair of ShadowImage 9500V.
  - When Synchronous TrueCopy 9500V is in the PSUS status, the host accesses the subsystem on the local side only. Therefore, the host I/O is quicker than a "Completely Full-time Pair". (Merit)
  - When splitting a pair after resynchronization, data is saved on the remote side; therefore, the data that is changed during the period from when a Synchronous TrueCopy 9500V pair is split until a failure occurs is not saved. (Demerit)
- b) Status restrictions include:
  - Completely Full-time Pair: Synchronous TrueCopy 9500V is used under the Full-time PAIR condition.

## 2.12.2 System Configuration for Data Move

To configure the system for Data Move, set the LU on the local side to Synchronous TrueCopy 9500V P-VOL and set the remote LU to Synchronous TrueCopy 9500V S-VOL as shown in Figure 2.18.

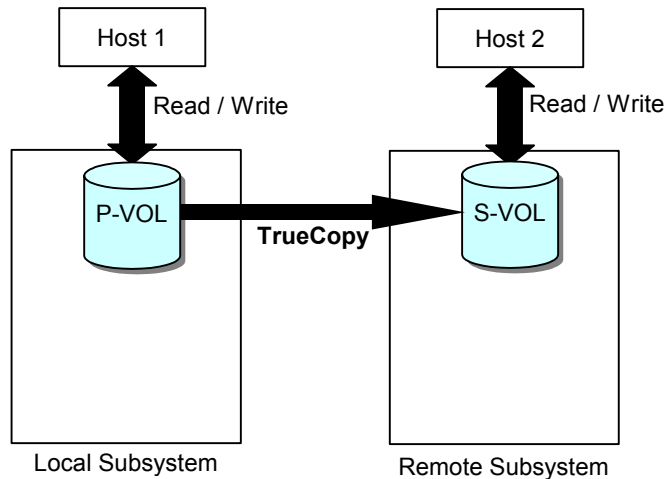


Figure 2.18 System Configuration for Data Use

The operation for the “Ordinary Split” condition is described as follows.

### 2.12.2.1 Ordinary Split

By using Synchronous TrueCopy 9500V, you can transfer the data of the LU in the subsystem on the local side to the remote side, then use the data on the remote side.

- a) Characteristics of the system include:
  - Execute resynchronization when the host I/O is performed infrequently. When the resynchronization is complete, stop the processing for the application temporarily and split a pair.
  - On the remote side, process the data by using the host on the remote side.
  - When Synchronous TrueCopy 9500V is in the PSUS status, each host on the local side and the remote side can access the subsystem on their side only.
- b) Status restrictions include:
  - Synchronous TrueCopy 9500V is used under the ordinary PSUS condition.

# Chapter 3 Preparing for Synchronous TrueCopy 9500V Operations

The following preparation is required for Synchronous TrueCopy 9500V operations:

- Installing and Uninstalling Synchronous TrueCopy 9500V (see section 3.1)
- Setting the Command Device (see section 3.2)
- Setting the Target ID (see section 3.3)
- Setting the Host Group Option (see section 3.4)
- Setting the Path (see section 3.5)
- Defining the Configuration Definition File (see section 3.6)
- Setting the Environment Variable (see section 3.7)

## 3.1 Installing and Uninstalling Synchronous TrueCopy 9500V

Since Synchronous TrueCopy 9500V is an extra-cost option, Synchronous TrueCopy 9500V cannot usually be selected (locked) when first using the 9500V. To make Synchronous TrueCopy 9500V available, you must install the Synchronous TrueCopy 9500V and make its function selectable (unlock). The installation of Synchronous TrueCopy 9500V also unlocks ShadowImage and enables its availability.

Synchronous TrueCopy 9500V can be installed from the Resource Manager 9500V. This section describes the installation/uninstallation procedures using the Resource Manager 9500V via the Graphical User Interface (GUI).

For procedures performed by using the Command Line Interface (CLI) of Disk Array management program, see Appendix B.

**Note:** Before installing/uninstalling Synchronous TrueCopy 9500V, verify that the array unit to be operated is in normal state. If a failure such as a controller blockage has occurred, installation/uninstallation cannot be performed.

### 3.1.1 Installing Synchronous TrueCopy 9500V

To install Synchronous TrueCopy 9500V, the key code is provided with the optional feature is supplied. The following describes the installation procedure.

To install Synchronous TrueCopy 9500V:

1. Start the Resource Manager 9500V, and change the operation mode to **Management Mode** (administrator mode).
2. Register the subsystem (array unit) in which Synchronous TrueCopy 9500V is to be installed, then connect to the subsystem.

The Array System Viewer panel is displayed, and the connected subsystem is displayed.

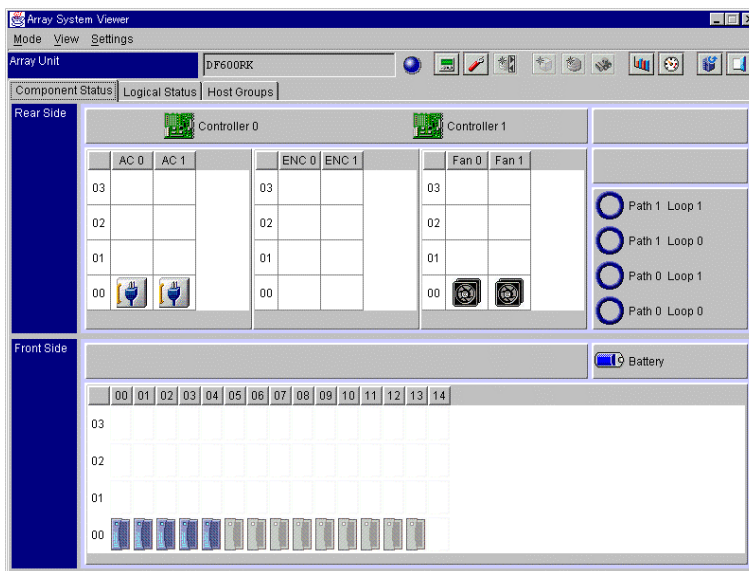

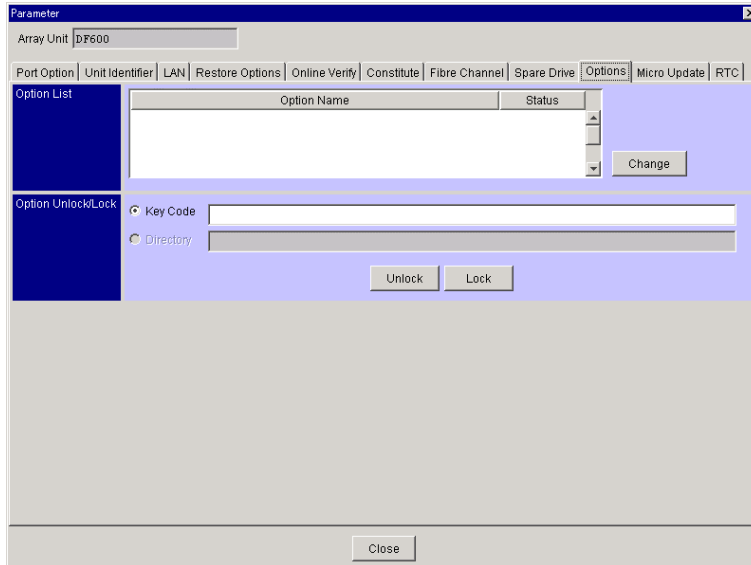


Figure 3.1 Array System Viewer Panel (Component Status Page)

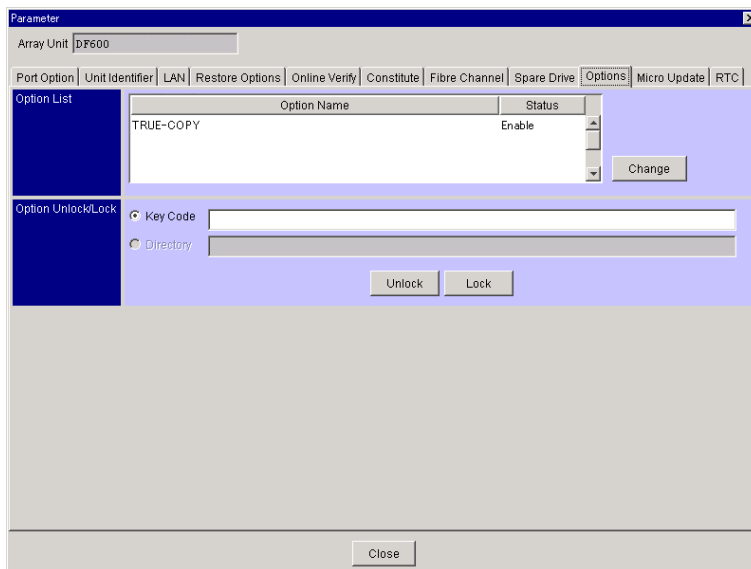
3. From the **Settings** menu, select **Configuration Settings**. Alternatively, from the tool bar, select the **Configuration Settings**  button. The Parameter panel is displayed.

4. On the Parameter panel, select the **Options** tab. The **Options** page is displayed in front.



**Figure 3.2 Parameter Panel (Locked)**

5. Enter the key code. Select the **Unlock** button.
6. A message appears, asking you to confirm that you want to unlock Synchronous TrueCopy 9500V. Select the **OK** button.



**Figure 3.3 Parameter Panel (Unlocked)**

The Synchronous TrueCopy 9500V installation is now complete. To perform other operations, connect to the subsystem again and open the Array System Viewer panel.

### 3.1.2 Uninstalling Synchronous TrueCopy 9500V

To uninstall Synchronous TrueCopy 9500V, the key code provided with the optional feature is required. Once uninstalled, Synchronous TrueCopy 9500V cannot be used (locked) until it is again unlocked using the key code.


**Note:** The following conditions must be satisfied in order to uninstall Synchronous TrueCopy 9500V.

- All Synchronous TrueCopy 9500V and ShadowImage 9500V pairs must be released (that is, the status of all LUs are SMPL). If ShadowImage 9500V is unlocked, ShadowImage 9500V pairs do not need to be released.
- The path settings must be released.

To uninstall Synchronous TrueCopy 9500V:

1. Start the Resource Manager 9500V, and change the operation mode to **Management Mode** (administrator mode).
2. Register the subsystem (array unit) in which the Synchronous TrueCopy 9500V is to be uninstalled, and then connect to the subsystem.

The Array System Viewer panel (see Figure 3.1) opens displaying the connected subsystem.

3. From the **Settings** menu, select **Configuration Settings**. Alternatively, from the tool bar, select the **Configuration Settings**  button.

The Parameter panel is displayed.

4. On the Parameter panel, select the **Options** tab.

The **Options** page (see Figure 3.3) is displayed in front.

5. Enter the key code. Select the **Lock** button.
6. A message appears, asking you to confirm that you want to lock Synchronous TrueCopy 9500V. Select the **OK** button.

Synchronous TrueCopy 9500V is now uninstalled. To perform other operations, connect to the subsystem again and open the Array System Viewer panel.

### 3.1.3 Enabling or Disabling Synchronous TrueCopy 9500V

Synchronous TrueCopy 9500V can be set to “enable” or “disable” when it is installed.


**Note:** The following conditions must be satisfied in order to disable Synchronous TrueCopy 9500V.

- All Synchronous TrueCopy 9500V and ShadowImage 9500V pairs must be released (that is, the status of all LUs are SMPL). If ShadowImage 9500V is unlocked, ShadowImage 9500V pairs do not need to be released.
- The path settings must be released.

The following steps describe the enabling/disabling procedure.

1. Start the Resource Manager 9500V, and change the operation mode to **Management Mode** (administrator mode).
2. Register the subsystem (array unit) in which the Synchronous TrueCopy 9500V is to be changed, and then connect to the subsystem.

The Array System Viewer panel (see Figure 3.1) opens displaying the connected subsystem.

3. From the **Settings** menu, select **Configuration Settings**. Alternatively, from the tool bar, select the **Configuration Settings**  button.

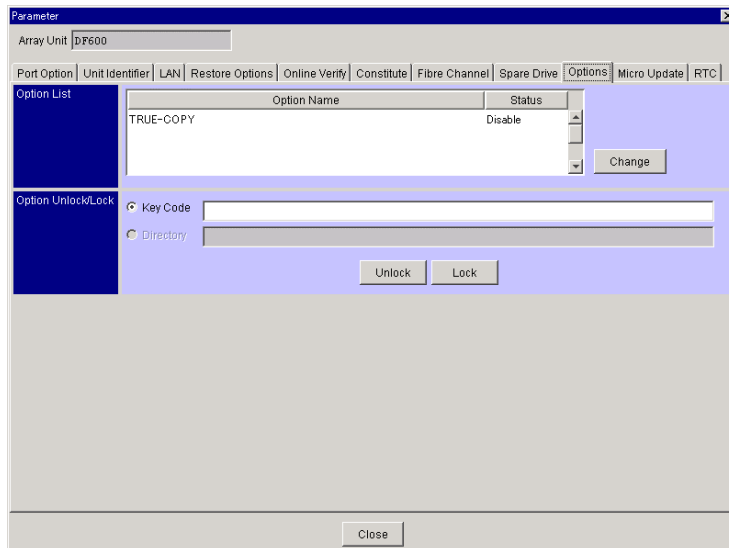
The Parameter panel is displayed.

4. On the Parameter panel, select the **Options** tab.

The **Options** page (see Figure 3.3) is displayed in front.

5. From **Option Name**, select **TRUE-COPY**, then select the **Change** button.

6. A message appears, asking you to confirm that you want to change the status (enable or disable). Select the **OK** button.



**Figure 3.4 Parameter Panel (Disabled)**

Enabling or disabling Synchronous TrueCopy 9500V is now complete. To perform other operations, connect to the subsystem again and open the Array System Viewer panel.

## 3.2 Setting the Command Device


The command device is a user-selected, dedicated logical volume on the 9500V subsystem which functions as the interface to the CCI software. The Synchronous TrueCopy 9500V and ShadowImage 9500V commands are issued by the CCI (HORCM) to the 9500V through command device.

In order to accept read and write commands that are executed by the 9500V subsystem and return read requests to the UNIX<sup>®</sup>/PC host, the command device must be designated. The command device must be defined in the HORCM\_CMD section of the configuration definition file for the CCI instance on the attached host. Two command devices can be designated for the 9500V subsystem. You can designate command devices using Resource Manager 9500V.

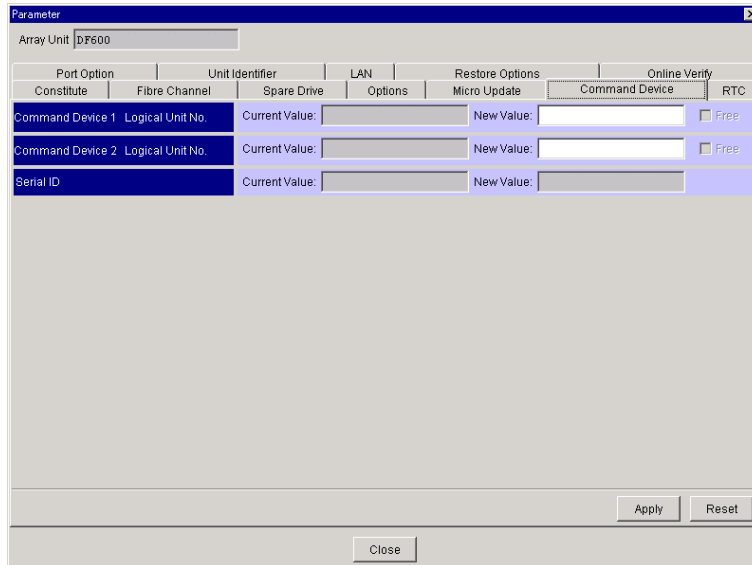
**Note:**

- LUs set for command devices must be recognized by the host.
- For Synchronous TrueCopy 9500V, the command devices must be designated on both the remote and local subsystems.

To designate command device(s):

1. Start the Resource Manager 9500V, and change the operation mode to **Management Mode** (administrator mode).
2. Connect to the subsystem. The Array System Viewer panel (Figure 3.1) opens displaying the connected subsystem.
3. From the **Settings** menu, select **Configuration Settings**. Alternatively, from the tool bar, select the **Configuration Settings**  button. The Parameter panel is displayed.

- On the Parameter panel, select the **Command Device** tab. The Command Device page is displayed in front.



**Figure 3.5 Parameter Panel (Command Device Page)**

- In the **Command Device 1 - Logical Unit No. - New Value**, enter the LU number of the command device.
- If you want to set one more command device, in the **Command Device 2 - Logical Unit No.**, enter the LU number.

**Note:** To use the alternate command device function, or to avoid data loss and subsystem downtime, designate two command devices. For details on the alternate command device function, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

- To change an already set command device**, select the LU number of the command device you want to change, and then change the LU number.
- To release an already set command device**, select the LU number of the command device you want to release. The **Free** check box activates. Select the check box on.
- Select the **Apply** button, and then select the **Close** button.  
The Parameter panel closes and you will return to the Array System Viewer panel.

Designating the command device is now complete. Leave the Array System Viewer panel open, and go on to the next section (setting the target ID).

### 3.3 Setting the Target ID (LU Mapping)

The following is the procedure for specifying the target ID. The target ID is specified using Resource Manager 9500V.

#### 3.3.1 Specifying Mapping Mode

1. On the Array System Viewer panel, select the **Host Groups** tab. The **Host Groups** page is displayed in front.
2. Double-clicking **Controller 0** or **Controller 1**, select **Port A** or **Port B**.
3. On the **Settings** menu, pointing the **Mapping Mode** and then select the **Enable**.

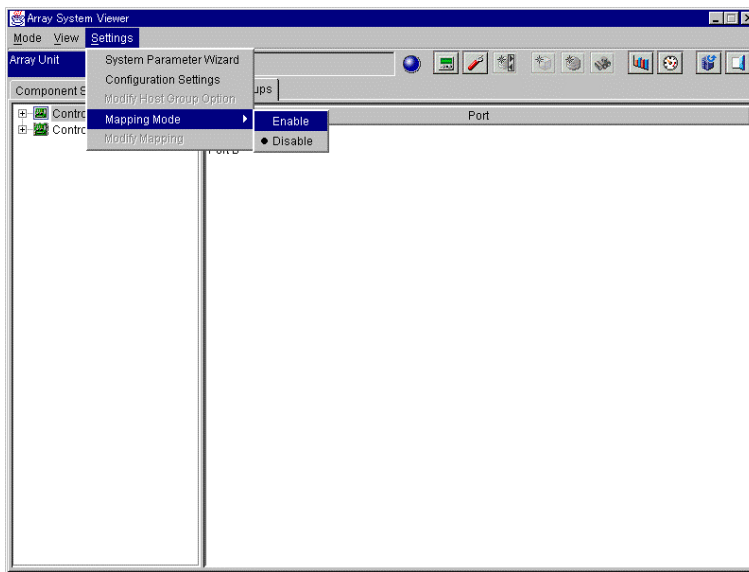


Figure 3.6 Array System Viewer Panel (Host Groups Page)

4. A confirmation message appears. Click the **OK** button.

### 3.3.2 Setting Mapping Information

1. Click **Port A** or **Port B**, plus signs next to **000:G000**, and select **000:G000**.
2. Select **Logical Unit**. On the **Settings** menu, select **Modify Mapping**.  
The Mapping Property panel is displayed.

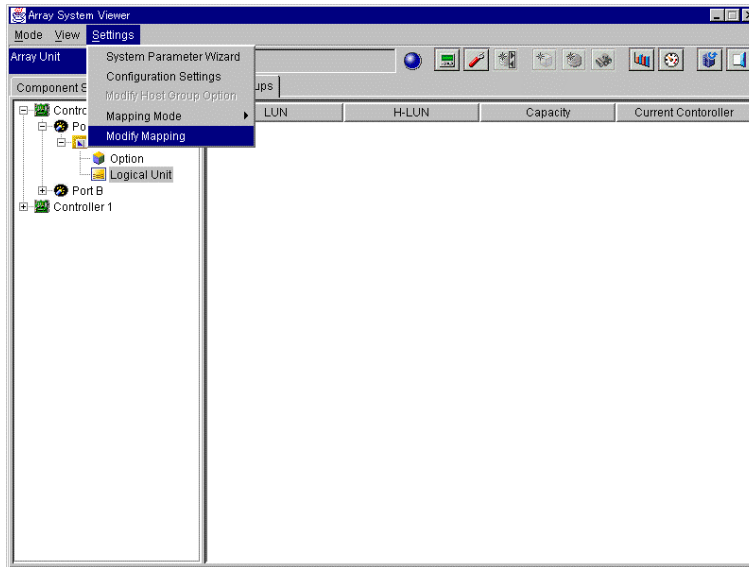

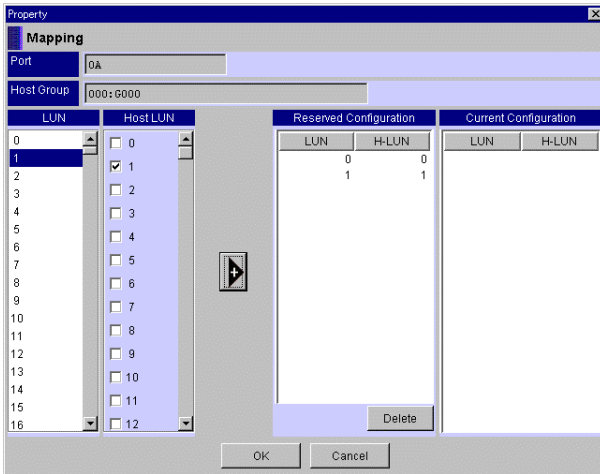


Figure 3.7 Setting Mapping Information

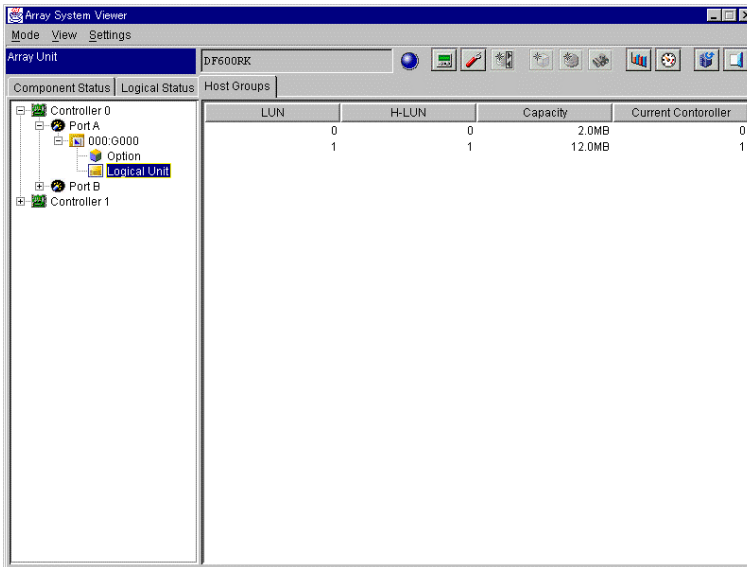
3. On the Mapping Property panel, relate the LU number between the subsystem and the host. Select the following items:
  - For **LUN**, select the LU number of the subsystem.
  - For **Host LUN**, select the LU number that the host can recognize.Note that specification may differ depending on the system configuration.

4. Select the  button. The specification you just made will be added to the **Reserved Configuration**. Click the **OK** button.



**Figure 3.8 Mapping Property Panel**

5. A confirmation message appears. Click the **OK** button. The set mapping information is updated and the following window is displayed.



Setting the target ID is now complete.

### 3.4 Setting the Host Group Option

When MC/Service Guard is used on HP server, set the host group option.

1. Start the Resource Manager 9500V program and switch to **Management Mode**.
2. Register the array unit in which you will set host group option. A Unit screen for the connected array unit will be displayed. (Refer to Figure 3.1)
3. Click the **Host Groups** tab, and select **Option** on 000:G00.
4. From the **Settings** menu, select the **Modify Host Group Option**.

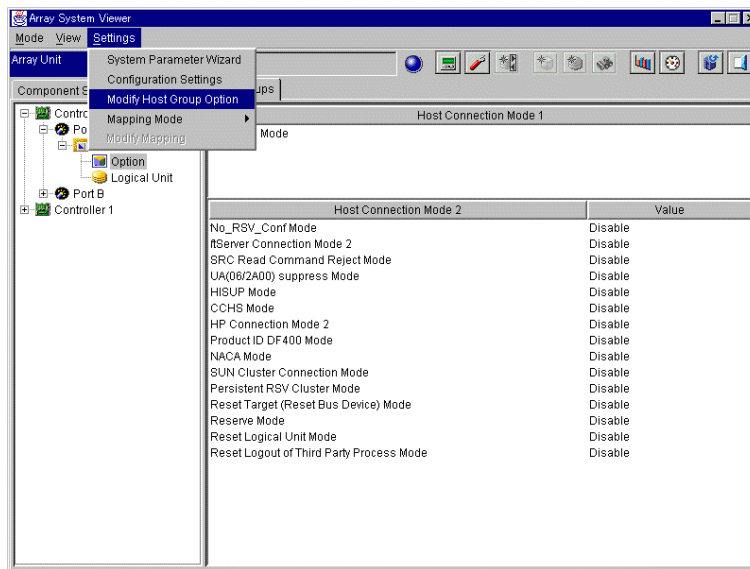


Figure 3.9 Setting the Host Group Option

5. Click the check box of the **SRC Read Command Reject Mode** enable option for the **Host Connection Mode 2** setting item. Then click the **OK** button.

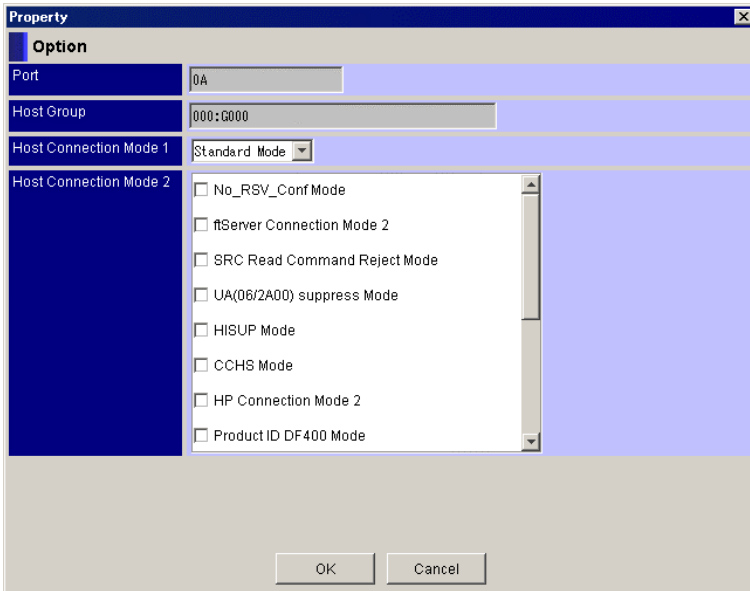
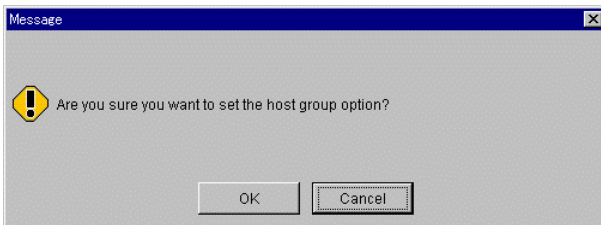
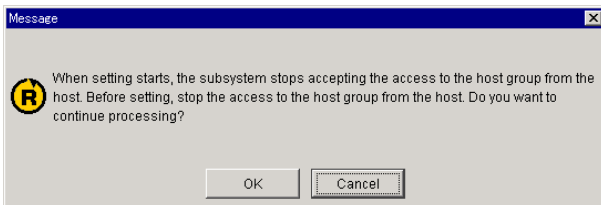


Figure 3.10 Selecting the Host Connection Mode

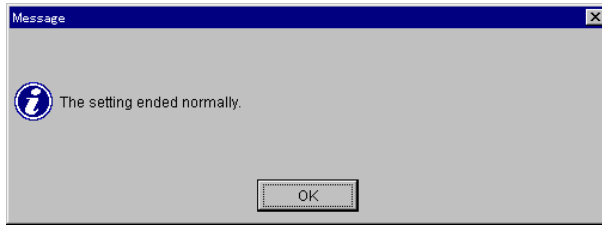
6. A message appears, click the **OK** button.



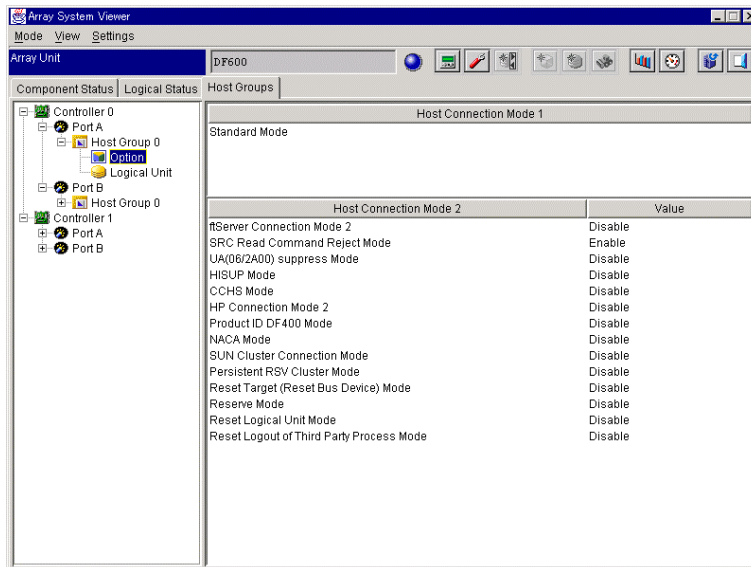
7. A message appears, click the **OK** button.



8. A message appears, confirming that host group option setting ended normally. Click the OK button.



The setting contents are displayed.




### 3.5 Setting the Path

The path on Synchronous TrueCopy 9500V is specified using Resource Manager 9500V.

Only single path for each controller-0 and controller-1 must be specified, so a total of two paths should be specified. Path-0 is connected to the port of the controller-0 on the local subsystem, then Path-1 is connected to the port of the controller-1 on the local subsystem.

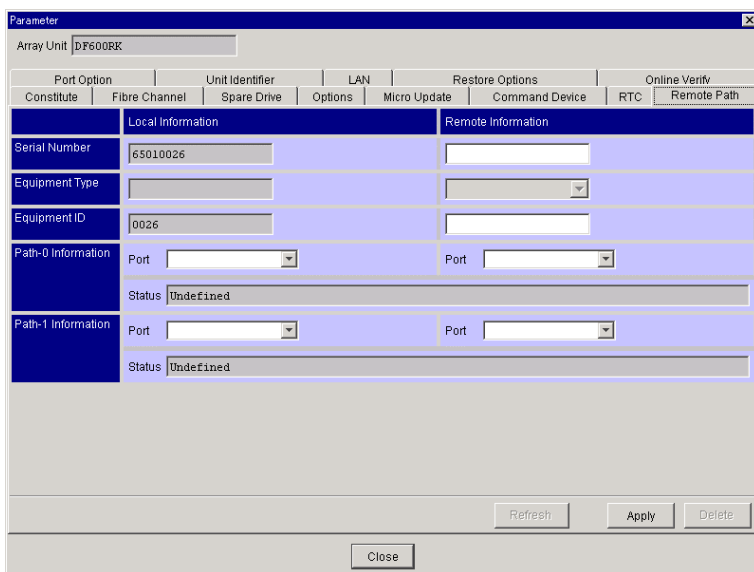
**If you want to change the already set path information**, specify new path information again after releasing the previously set path information. Once path information is set, the previously set path information cannot be changed.

The following is the procedure for specifying the path on Synchronous TrueCopy 9500V.

1. Resource Manager 9500V and change the operation mode to **Management Mode** (administrator mode).
2. Connect to the subsystem. The Array System Viewer panel (Figure 3.1) opens displaying the connected subsystem.
3. From the **Settings** menu, select **Configuration Settings**. Alternatively, from the tool bar, select the **Configuration Settings**  button. The Parameter panel is displayed.
4. On the Parameter panel, select the **Remote Path** tab. The Remote Path page is displayed in front.

On this page, **Serial Number**, **Equipment Type**, and **Equipment ID** are displayed. If the command device is not defined, **Path information** displays **undefined**.

**Note:** The Remote Path tab is displayed only when the Synchronous TrueCopy 9500V facility is enabled.



The screenshot shows a window titled "Parameter" with a close button in the top right corner. The "Array Unit" is set to "DF600RK". The window has a menu bar with options: Port Option, Unit Identifier, LAN, Restore Options, and Online Verif. Below the menu bar is a sub-menu bar with options: Constitute, Fibre Channel, Spare Drive, Options, Micro Update, Command Device, RTC, and Remote Path. The main area is divided into two columns: "Local Information" and "Remote Information".

	Local Information	Remote Information
Serial Number	65010026	
Equipment Type		
Equipment ID	0026	
Path-0 Information	Port [dropdown] Status Undefined	Port [dropdown]
Path-1 Information	Port [dropdown] Status Undefined	Port [dropdown]

At the bottom of the window are buttons for "Refresh", "Apply", "Delete", and "Close".

Figure 3.11 System Parameter (Remote Path page 1)

5. On the Remote Path page, select the following items:

**Local information:**

- For **Path-0 information** and **Path-1 information**, select the port in the pull-down menu referred to Table 3.1. The port to be selected differs according to Equipment Type.

**Remote information:**

- For **Serial Number**, specify the eight digits numbers in decimal notation.
- For **Equipment Type**
- For the **Equipment ID**, specify the same **Serial Number** that is used for setting the command device.
- For **Path-0 information** and **Path-1 information**, select the port in the pull-down menu referred to the Table 3.1. The port to be selected differs according to Equipment Type.

**Table 3.1 Selection Items by Equipment Type**

	Equipment Type of Local Device		Equipment Type of Remote Device	
<b>Path-0 Port</b>	0A 0B		0A 0B 1A 1B	
<b>Path-1 Port</b>	1A 1B		0A 0B 1A 1B	

6. Select the **Apply** button.

When the Setting ended normally, a panel is displayed. Select the **OK** button. The Remote Path page on which path is specified is displayed.

The functions of the buttons displayed on this page are as follows:

- **Refresh** button gets the latest information in that time, and displays its condition again.
- **Apply** button is not selectable in this condition.
- **Delete** button deletes the specified path information.

Table 3.2 lists the status strings displayed on the **Path Status** field in each status.

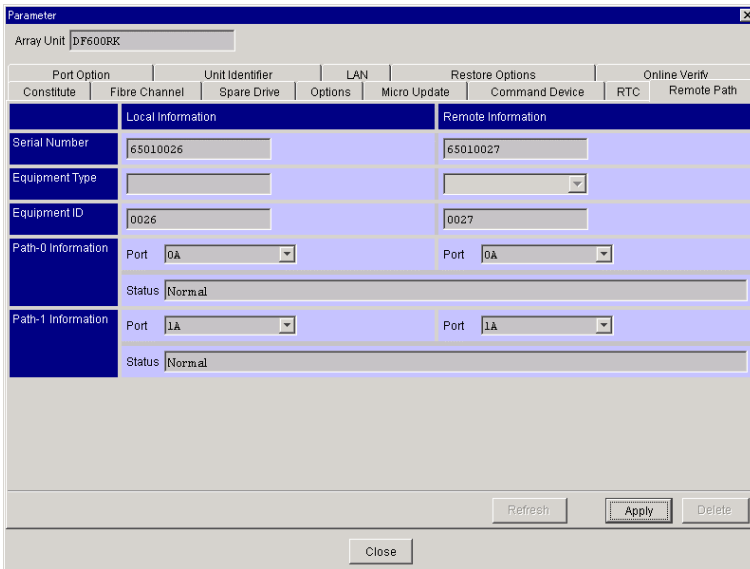


Figure 3.12 System Parameter (Remote Path page 2)

Table 3.2 Status strings Displayed on the Path Status Field

No.	Status	Status string
1	Undefined	Undefined
2	Normal	Normal
3	Detached	Detached
4	Diagnosing	Diagnosing

### 3.6 Defining the Configuration Definition File

The configuration definition file describes the system configuration in order to make CCI operational. The configuration definition file is a text file created and/or edited using any standard text editor, and can be defined from the PC where the CCI software is installed. This sample configuration definition file (HORCM\_CONF), is included with the CCI software, and this file should be used as the basis for creating your configuration definition file(s). The system administrator should copy the sample file, set the necessary parameters in the copied file, and place the copied file in the proper directory. For details on configuration definition file, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

The configuration definition file can be automatically created using the mkconf command tool. However, the parameters, such as poll(10ms) must be set manually (see step 4 below). For details on the mkconf command tool, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

The following describes an example for manually defining the configuration definition file, when the system configuration with two instances within the same server (Windows® NT/2000).

1. On the host where CCI is installed, verify that the CCI is not running. If the CCI software is still running, shut down the CCI software using the horcmshutdown command. For details on horcmshutdown, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.
2. In the command prompt, make two copies of the sample file (horcm.conf).

**Example:**

```
c:\HORCM\etc> copy \HORCM\etc\horcm.conf \WINNT\horcm0.conf  
c:\HORCM\etc> copy \HORCM\etc\horcm.conf \WINNT\horcm1.conf
```

3. Open horcm0.conf using the text editor.
4. In the **HORCM\_MON** section, set the necessary parameters.

**Important:** A value more than or equal to 6000 must be set for poll(10ms). Please refer to *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)* for details on calculating the poll(10ms) value. Specifying the value incorrectly may cause a conflict in the internal process, which suspends the process temporary and stops the internal process of the subsystem. For more details on configuration parameters, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

- In the **HORCM\_CMD** section, specify the physical drive (command device) on the subsystem.

```

horcm0.conf - Notepad
File Edit Search Help
HORCH_MON
#ip_address      service      poll(10ms)    timeout(10ms)
XXXXXXXXX        5000         12000         3000

HORCH_CMD
#dev_name        dev_name      dev_name
\\.\PHYSICALDRIVE1

HORCH_DEV
#dev_group       dev_name      port#          TargetID      LU#          MU#
UG01             oradb1        CL1-A         1             1            MU#

HORCH_INST
#dev_group       ip_address    service
UG01             XXXXXXXXX    5001

```

Figure 3.13 Horcm0.conf Example

- Save the configuration definition file and use the `horcmstart` command to start the CCI software. For details on `horcmstart`, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide* (MK-92DF609).
- Execute the `raidsan` command and make sure you write down the target ID displayed in the execution result. For details on the `raidsan` command, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide* (MK-92DF609).
- Shut down the CCI software and then open the configuration definition file again.
- In the **HORCH\_DEV** section, set the necessary parameters. For the target ID, set the ID of the `raidsan` result you wrote down.
- In the **HORCH\_INST** section, set the necessary parameters, and then save (overwrite) the file.
- Repeat step 3 to 10 for the `horcm1.conf` file (Figure 3.14).

```

horcm1.conf - Notepad
File Edit Search Help
HORCH_MON
#ip_address      service      poll(10ms)    timeout(10ms)
XXXXXXXXX        5001         12000         3000

HORCH_CMD
#dev_name        dev_name      dev_name
\\.\PHYSICALDRIVE1

HORCH_DEV
#dev_group       dev_name      port#          TargetID      LU#          MU#
UG01             oradb1        CL1-A         1             2            MU#

HORCH_INST
#dev_group       ip_address    service
UG01             XXXXXXXXX    5000

```

Figure 3.14 Horcm1.conf Example

12. Enter the following in the command prompt to verify the connection between CCI and the subsystem.

**Example:**

```
C:\>cd horcm\etc

C:\horcm\etc>echo hd1-3 | .inqraid
Harddisk 1 -> [ST] CL1-A Ser = 174 LDEV= 0 [HITACHI ] [DF600F-CM ]
Harddisk 2 -> [ST] CL1-A Ser = 174 LDEV= 1 [HITACHI ] [DF600F ]
                HORC = SMPL HOMRCF[MU#0 = NONE MU#1 = NONE MU#2 = NONE]
                RAID5[Group 1-0] SSID = 0x0000
Harddisk 3 -> [ST] CL1-A Ser = 174 LDEV= 2 [HITACHI ] [DF600F ]
                HORC = SMPL HOMRCF[MU#0 = NONE MU#1 = NONE MU#2 = NONE]
                RAID5[Group 2-0] SSID = 0x0000

C:\horcm\etc>
```

For details on configuration definition file, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 3.7 Setting the Environment Variable

### 3.7.1 Setting the Environment Variable (Synchronous TrueCopy 9500V)

To perform Synchronous TrueCopy 9500V operations, you must set the environment variable for the execution environment. The following describes an example supposing the system configuration with two instances within the same server (Windows® NT/2000).

1. Set the environment variable for each instance. Enter the following from the command prompt.

**Example:**

```
C:\HORCM\etc>set HORCMINST=0
```

2. Execute the horcmstart script, and then execute the pairdisplay command to verify the configuration.

**Example:**

```
C:\HORCM\etc>horcmstart 0 1
starting HORCM inst 0
HORCM inst 0 starts successfully.
starting HORCM inst 1
HORCM inst 1 starts successfully.

C:\HORCM\etc>pairdisplay -g VG01
group  PairVOL(L/R)  (Port#,TID,LU),Seq#,LDEV#.P/S,Status, Fence, Seq#,P-LDEV# M
VG01  oradb1(L)      (CL1-A , 1, 1) 174  1..SMPL  ---- -,-----,-----  -
VG01  oradb1(R)      (CL1-B , 1, 2) 175  2..SMPL  ---- -,-----,-----  -
```

Preparing for Synchronous TrueCopy 9500V operation is now complete.

### 3.7.2 Setting the Environment Variable (ShadowImage 9500V)

To perform ShadowImage 9500V operations, you must set the environment variable for the execution environment. The following describes an example supposing the system configuration with two instances within the same server (Windows® NT/2000).

1. Set the environment variable for each instance. Enter the following from the command prompt.

**Example:**

```
C:\HORCM\etc>set HORCMINST=0
```

2. To use ShadowImage 9500V, you must set the environment variable shown below.

**Example:**

```
C:\HORCM\etc>set HORCC_MRCF=1
```

3. Execute the horcmstart script, and then execute the pairedisplay command to verify the configuration.

**Example:**

```
C:\HORCM\etc>horcmstart 0 1
starting HORCM inst 0
HORCM inst 0 starts successfully.
starting HORCM inst 1
HORCM inst 1 starts successfully.

C:\HORCM\etc>pairedisplay -g VG01
group  PairVOL(L/R)  (Port#,TID,LU-M),Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01   oradb1(L)     (CL1-A , 1, 1-0) 174  1..SMPL  ----,-----  ---- -
VG01   oradb1(R)     (CL1-A , 1, 2-0) 174  2..SMPL  ----,-----  ---- -
```

Preparing for ShadowImage 9500V operation is now complete.



## Chapter 4 Performing Command Operations

This chapter provides examples of commands using the Windows® NT/2000 systems and shows icons of the pairs (indicating ShadowImage 9500V pair status) displayed in the Resource Manager 9500V.

To execute commands from the host where CCI is installed, display the command prompt.

### 4.1 Creating Synchronous TrueCopy 9500V Pairs (paircreate)

To create Synchronous TrueCopy 9500V pairs:

1. In this example, the group name in the configuration definition file is vg01. Execute the pairdisplay command to verify that the status of the Synchronous TrueCopy 9500V volume is SMPL.

```
c:\horcm\etc>pairdisplay -g vg01
Group  PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S,Status,Fence, Seq#,P-LDEV# M
vg01   oradb1(L)   (CL1-A , 1, 1) 174   1..SMPL  ----  -----,-----  ----  -
vg01   oradb1(R)   (CL1-B , 1, 2) 175   2..SMPL  ----  -----,-----  ----  -
```

Figure 4.1 Paircreate Command Example

2. Execute the paircreate command. When executing the command, always use the -c option with the value 15 to specify the copying pace. Then, execute the pairevtwait command to verify that the status of each volume is PAIR.

**Example:**

```
c:\horcm\etc>paircreate -g vg01 -vl -c 15
c:\horcm\etc>pairevtwait -g vg01 -s pair -t 300 10
pairevtwait : Wait status done.
```

3. Execute the pairdisplay command to verify the pair status and the configuration.

**Example:**

```
c:\horcm\etc>pairdisplay -g vg01
Group  PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S,Status,Fence, Seq#,P-LDEV# M
vg01   oradb1(L)   (CL1-A , 1, 1) 174   1..P-VOL COPY Never , 175   2   -
vg01   oradb1(R)   (CL1-B , 1, 2) 175   2..S-VOL COPY Never ,-----  1   -
```

The Synchronous TrueCopy 9500V pair is created. For details on the paircreate command and its options, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 4.2 Splitting Synchronous TrueCopy 9500V Pairs (pairsplit)

To split Synchronous TrueCopy 9500V pairs:

1. In this example, the group name in the configuration definition file is vg01. Execute the pairsplit command to split the Synchronous TrueCopy 9500V pair in the PAIR status.

```
c:\horcm\etc>pairsplit -g vg01
```

**Figure 4.2 Pairsplit Command Example**

2. Execute the pairdisplay command to verify the pair status and the configuration.

**Example:**

```
c:\horcm\etc>pairdisplay -g vg01
Group  PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S,Status,Fence, Seq#,P-LDEV# M
vg01   oradb1(L)   (CL1-A , 1, 1) 174   1..P-VOL PSUS Never , 175   2   -
vg01   oradb1(R)   (CL1-B , 1, 2) 175   2..S-VOL PSUS Never ,----- 1   -
```

The Synchronous TrueCopy 9500V pair is split. For details on the pairsplit command and its options, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

### 4.3 Resynchronizing Synchronous TrueCopy 9500V Pairs (pairresync)

To resynchronize Synchronous TrueCopy 9500V pairs:

1. In this example, the group name in the configuration definition file is vg01. Execute the pairresync command to resynchronize the Synchronous TrueCopy 9500V pair. When executing the command, always use the -c option with the value 15 to specify the copying pace. Execute the pairevtwait command to verify that the status of each volume is PAIR.

```
c:\horcm\etc>pairresync -g vg01 -c 15
c:\horcm\etc>pairevtwait -g vg01 -s pair -t 300 10
pairevtwait : Wait status done.
```

**Figure 4.3 Pairresync Command Example**

2. Execute the pairdisplay command to verify the pair status and the configuration.

**Example:**

```
c:\horcm\etc>pairdisplay -g vg01
Group   PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S,Status,Fence, Seq#,P-LDEV# M
vg01   oradb1(L)   (CL1-A , 1, 1) 174   1..P-VOL PAIR NEVER , 174   2   -
vg01   oradb1(R)   (CL1-B , 2, 2) 175   2..S-VOL PAIR NEVER , 1     ---- -
```

The Synchronous TrueCopy 9500V pair is resynchronized. For details on pairresync command and its options, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 4.4 Suspending Synchronous TrueCopy 9500V Pairs (pairsplit -R)

To suspend Synchronous TrueCopy 9500V pairs:

1. In this example, the group name in the configuration definition file is vg01. Execute the pairdisplay command to verify that the pair to be suspended is in PAIR status.

**Example:**

```
c:\horcm\etc>pairdisplay -g vg01
Group  PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S,Status,Fence, Seq#,P-LDEV# M
vg01   oradb1(L)   (CL1-A , 1, 1) 174   1..P-VOL PAIR NEVER , 175   2   -
vg01   oradb1(R)   (CL1-B , 1, 2) 175   2..S-VOL PAIR NEVER , ----- 1   -
```

2. Execute the pairsplit (pairsplit -R) command to split the Synchronous TrueCopy 9500V pair.

```
c:\horcm\etc>pairsplit -g vg01 -R
```

**Figure 4.4 Pairsplit -R Command Example**

3. Execute the pairdisplay command to verify that the pair status changed to SMPL.

```
c:\horcm\etc>pairdisplay -g vg01
Group  PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S,Status,Fence, Seq#,P-LDEV# M
vg01   oradb1(L)   (CL1-A , 1, 1) 174   1..P-VOL PSUE NEVER , 175   2   -
vg01   oradb1(R)   (CL1-B , 1, 2) 175   2..SMPL  ----  ----- , ----- 1   -
```

The Synchronous TrueCopy 9500V pair is split. For details on the pairsplit command and the -R option, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 4.5 Releasing Synchronous TrueCopy 9500V Pairs (pairsplit -S)

To split Synchronous TrueCopy 9500V pairs:

1. Execute the pairsplit (pairsplit -S) command to release the Synchronous TrueCopy 9500V pair.

```
c:\horcm\etc>pairsplit -g vg01 -S
```

**Figure 4.5 Pairsplit -S Command Example**

2. Execute the pairdisplay command to verify that the pair status changed to SMPL.

**Example:**

```
c:\horcm\etc>pairdisplay -g vg01
Group  PairVol(L/R) (Port#,TID,LU),Seq#,LDEV#.P/S,Status,Fence, Seq#,P-LDEV# M
vg01   oradbl(L)   (CL1-A , 1, 1) 174  1..SMPL  ----  -----  ----  -
vg01   oradbl(R)   (CL1-B , 1, 2) 175  2..SMPL  ----  -----  ----  -
```

The Synchronous TrueCopy 9500V pair is released. For details on the pairsplit command and the -S option, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 4.6 Creating ShadowImage 9500V Pairs (paircreate)

To create ShadowImage 9500V pairs:

1. In this example, the group name in the configuration definition file is VG01. Execute the pairdisplay command to verify that the status of the ShadowImage 9500V volume is SMPL.

```
C:\HORCM\etc>pairdisplay -g VG01
Group PairVol(L/R) (Port#,TID,LU-M),Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01 oradb1(L) (CL1-A ,1, 1-0) 174 1..SMPL ----,----- ---- -
VG01 oradb1(R) (CL1-A ,1, 2-0) 174 2..SMPL ----,----- ---- -
```

**Figure 4.6 Paircreate Command Example**

2. Execute the paircreate command. When executing the command, always use the -c option with the value 15 to specify the copying pace. Then, execute the pairevtwait command to verify that the status of each volume is PAIR.

**Example:**

```
C:\HORCM\etc>paircreate -g VG01 -vl -c 15
C:\HORCM\etc>pairevtwait -g VG01 -s pair -t 300 10
pairevtwait : Wait status done.
```

3. Execute the pairdisplay command to verify the pair status and the configuration.

**Example:**

```
C:\HORCM\etc>pairdisplay -g VG01
Group PairVol(L/R) (Port#,TID,LU-M),Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01 oradb1(L) (CL1-A ,1, 1-0) 174 1..P-VOL PAIR, 174 2 -
VG01 oradb1(R) (CL1-A ,1, 2-0) 174 2..S-VOL PAIR,----- 1 -
```

The ShadowImage 9500V pair is created. For details on the paircreate command and its options, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 4.7 Resynchronizing ShadowImage 9500V Pairs (pairresync)

To resynchronize ShadowImage 9500V pairs:

1. In this example, the group name in the configuration definition file is VG01. Execute the pairresync command to resynchronize the ShadowImage 9500V pair. When executing the command, always use the -c option with the value 15 to specify the copying pace. Execute the pairevtwait command to verify that the status of each volume is PAIR.

```
C:\HORCM\etc>pairresync -g VG01 -c 15
C:\HORCM\etc>pairevtwait -g VG01 -s pair -t 300 10
pairevtwait : Wait status done.
```

**Figure 4.7 Pairresync Command Example**

2. Execute the pairdisplay command to verify the pair status and the configuration.

**Example:**

```
C:\HORCM\etc>pairdisplay -g VG01
Group PairVol(L/R) (Port#,TID,LU-M),Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01 ora0b1(L) (CL1-A ,1, 1-0) 174 1..P-VOL PAIR, 174 2 -
VG01 ora0b1(R) (CL1-A ,1, 2-0) 174 2..S-VOL PAIR,----- 1 -
```

The ShadowImage 9500V pair is resynchronized. For details on the pairresync command and its options, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Synchronous TrueCopy 9500V User's Guide Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 4.8 Releasing ShadowImage 9500V Pairs (pairsplit -S)

To release the ShadowImage 9500V pair and change the status to SMPL:

1. In this example, the group name in the configuration definition file is VG01. Execute the pairdisplay command to verify that the status of the ShadowImage 9500V pair is PAIR.

**Example:**

```
C:\HORCM\etc>pairdisplay -g VG01
Group PairVol(L/R) (Port#,TID,LU-M),Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01 oradb1(L) (CL1-A ,1, 1-0) 174 1..P-VOL PAIR, 174 2 -
VG01 oradb1(R) (CL1-A ,1, 2-0) 174 2..S-VOL PAIR,----- 1 -
```

2. Execute the pairsplit (pairsplit -S) command to release the ShadowImage 9500V pair.

```
C:\HORCM\etc>pairsplit -g VG01 -S
```

**Figure 4.8 Pairsplit -S Command Example**

3. Execute the pairdisplay command to verify that the pair status changed to SMPL.

**Example:**





```
C:\HORCM\etc>pairdisplay -g VG01
Group PairVol(L/R) (Port#,TID,LU-M),Seq#,LDEV#.P/S,Status, Seq#,P-LDEV# M
VG01 oradb1(L) (CL1-A ,1, 1-0) 174 1..SMPL ----,----- 2 -
VG01 oradb1(R) (CL1-A ,1, 2-0) 174 2..SMPL ----,----- 1 -
```

The ShadowImage 9500V pair is released. For details on the pairsplit command and the -S option, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

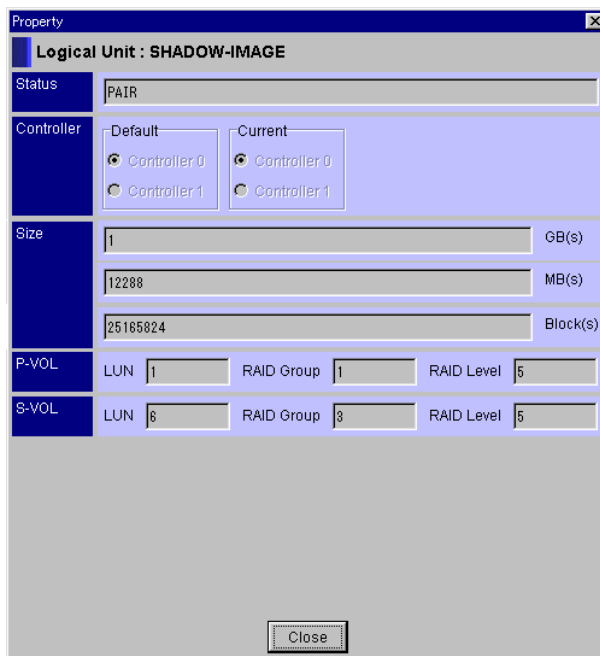
## 4.9 Confirming the Status of ShadowImage 9500V Pairs

The status of the logical units set in the command device can be verified in the Resource Manager 9500V. Icons are used to display status in the **Logical Status** page of the Array System Viewer panel.

**Table 4.1** Icons for Pair Status

Icons	Paired Status	Meaning
 yellow	PAIR	Indicates the paired volume
 light yellow	COPY	Indicates a paired status, but initial copy or resync operation is not complete.
 yellow and blue	PSUS	In paired status, but updates to the S-VOL data are suspended due to user-requested pairsplit.
 red	PSUE	In paired status, but updates to the S-VOL data are suspended forcibly or due to an error condition.

You can confirm the properties of the coupled logical unit by double clicking the icon. The Property panel will be displayed.



**Figure 4.9** Property Panel

## 4.10 Confirming the Status of Paths

The status of paths can be verified in the Resource Manager 9500V.

Path status is displayed in the **Component Status** page of the Array System Viewer Panel.

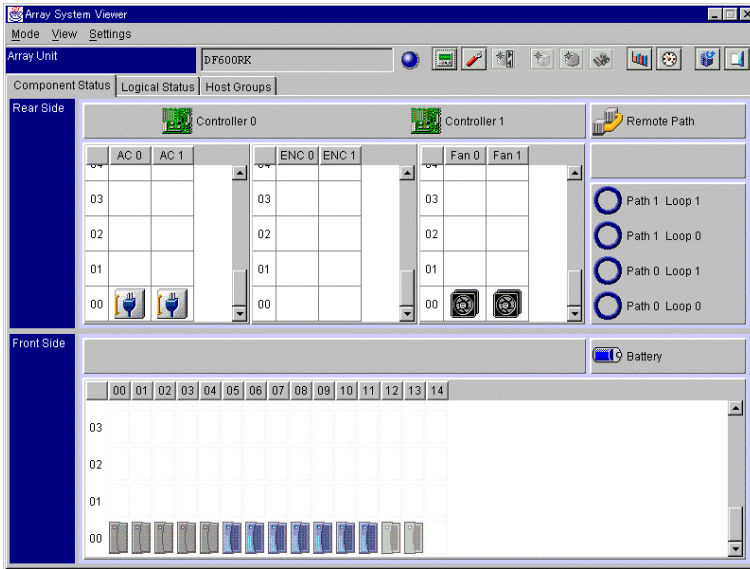



Figure 4.10 Array System Viewer Panel (Component Status Page)

You can confirm the properties of the path settings by double clicking the **Remote Path**  icon. The Property panel will be displayed.

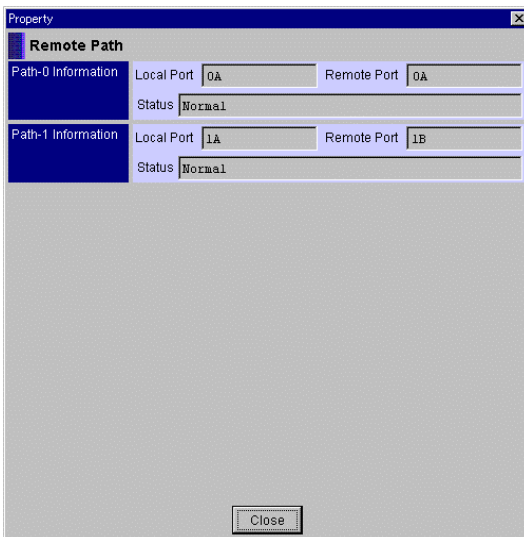


Figure 4.11 Property Panel of Remote Path

## 4.11 Troubleshooting

If a hardware error occurs while you are operating Synchronous TrueCopy 9500V or ShadowImage 9500V, both of the following are necessary:

- A CCI user intervention
- Assistance from a Hitachi Customer Service representative

For example, when formatting is needed to resolve an LU error and that LU is used for Synchronous TrueCopy 9500V or ShadowImage 9500V, the pair must be released by the user (CCI operation by the user) before the LU can be formatted. Therefore, contact Hitachi personnel because maintenance requires the user to issue CCI commands. Note that the Hitachi personnel can only remove errors which result from hardware. An operation such as recovering a Synchronous TrueCopy 9500V or ShadowImage 9500V pair status (for example, resynchronizing) must be done by the user.

If you have a problem with Synchronous TrueCopy 9500V or ShadowImage 9500V operation, refer to the Troubleshooting section in the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*. Synchronous TrueCopy 9500V and/or ShadowImage 9500V error messages and procedures for recovering the PSUE errors are described in detail.



# Chapter 5 Basic Specification and Function Comparison

## 5.1 Synchronous Remote Copy (Synchronous TrueCopy 9500V Basic)

The synchronous remote copy function (Synchronous TrueCopy 9500V) synchronizes the data of logical units (LUs) in subsystems connected with Fibre Channel interface. Using Synchronous TrueCopy 9500V, data received from the host is written into subsystems on the local side and the remote side simultaneously. Thus, the data of the subsystems on the local side and the remote side are always synchronized. When the resynchronization is executed, you can save time by transferring only differential data to the subsystem on the remote side.

Synchronous TrueCopy 9500V provides a failover function. When a failure occurs on the local side, you can immediately switch the local host to the remote host. You can execute the fail-over function using a manual switching method that executes the script from the host on the remote side manually, or an automatic switching method that executes the script automatically, according to the High Availability (HA) configuration.

To use Synchronous TrueCopy 9500V, you must install Synchronous TrueCopy 9500V on the local side and the remote side respectively. You also need the Resource Manager 9500V program (to set the path for copying data) and the Command Control Interface (CCI) program to control the execution of operation (for example, the activation of a copy operation). The Web browser is required for path maintenance.

Use the LED device, traces, and the analyzing tool to trace the path and reference the path, the LU status, and the failure information of the subsystem. You can also reference this information easily by concurrently using the Web browser.

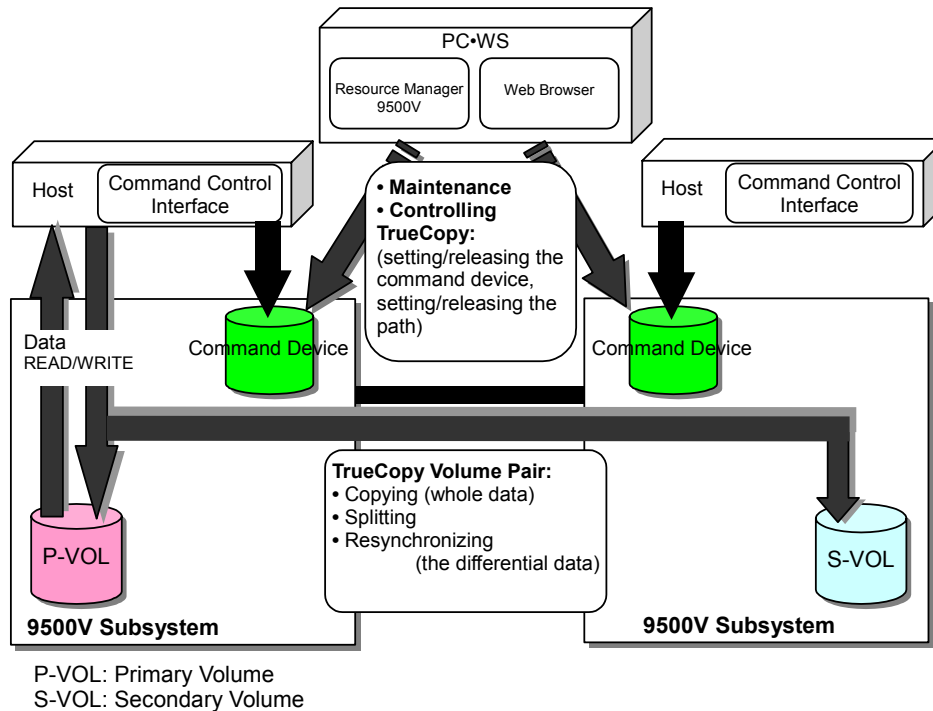


Figure 5.1 Overview of Synchronous TrueCopy 9500V

## 5.2 Support Platform

The supported platforms are shown in Table 5.1.

**Table 5.1 Support Platform List**

No.	Platform	OS REV	Disaster Recovery		Backup Use	Data Migration Use
			High Availability Configuration (Automatically Switching)	Manual Switching		
1	SUN	Solaris 2.6	Supported: Veritas Cluster Server	Supported	Supported	Supported
		Solaris 8	Not supported: Sun Cluster			
2	PC Server (Microsoft)	Windows NT 4.0	Not supported: MSCS	Supported	Supported	Supported
		Windows 2000				
3	HP	HP-UX 11x	Case-by-case: MC/Service Guard ( <b>Note 1</b> )	Supported	Supported	Supported
4	IBM	AIX 4.3.3	Supported: HACMP	Supported	Supported	Supported
		AIX 5.1.0				
5	Compaq	Tru64 UNIX 5.1	Not supported: Trucluster	Supported	Supported	Supported
6	—	Red Hat Linux 7.0	—	Supported	Supported	Supported
7	SGI	IRIX 6.5x	—	Supported	Supported	Supported

**Note 1:** MC/Service Guard needs to evaluate with “5-node configuration”. We will treat as individual if required.

### 5.3 Basic and External Specifications

The following table lists and describes the basic and the external specifications (restrictions) of Synchronous TrueCopy 9500V.

**Table 5.2 Basic and External Specifications (Continued on next page)**

Item	9500V Specifications (Synchronous TrueCopy 9500V)	9900 Specifications (HORC)
User Interface and Basic Specifications		
User Interface	Resource Manager 9500V, Web, CCI	Remote Console, CCI
Basic Specification	<p><b><u>CCI (host):</u></b></p> <ul style="list-style-type: none"> <li>- Takeover function (switching P-LU and S-LU)</li> <li>- Pair create (new copy)</li> <li>- Pair splitting and deleting (releasing the pair, suspending copy)</li> <li>- Pair resynchronization (copy)</li> <li>- Event wait (serial automatic execution control for multiple copy)</li> <li>- Pair status display, configuration confirmation</li> <li>- Referencing failure information (log, error messages)</li> <li>- Copy progress display</li> </ul> <p><b><u>Resource Manager 9500V:</u></b></p> <ul style="list-style-type: none"> <li>- Setting the path and the command device</li> <li>- Referencing path status</li> </ul> <p><b><u>Web:</u></b></p> <ul style="list-style-type: none"> <li>- Referencing path status</li> <li>- Referencing pair status</li> <li>- Referencing the failure information of the subsystem</li> </ul> <p><b><u>Disk Subsystem:</u></b></p> <ul style="list-style-type: none"> <li>- Confirming the failure position using LED</li> <li>- Confirming the failure position using traces (analyzing tool required)</li> <li>- Path check function (function for detecting the path malfunction)</li> </ul>	<p><b><u>CCI (host):</u></b></p> <ul style="list-style-type: none"> <li>- Takeover function (switching P-LU and S-LU)</li> <li>- Pair create (new copy)</li> <li>- Pair splitting and deleting (releasing the pair, suspending copy)</li> <li>- Pair resynchronization (copy)</li> <li>- Event wait (serial automatic execution control for multiple copy)</li> <li>- Pair status display, configuration confirmation</li> <li>- Referencing failure information (log, error messages)</li> <li>- Copy progress display</li> </ul> <p><b><u>Remote Console</u></b></p> <ul style="list-style-type: none"> <li>- Setting the path, and referencing path status</li> <li>- Referencing failure on the host information</li> <li>- Pair create</li> </ul> <p><b><u>Disk Subsystem:</u></b></p> <ul style="list-style-type: none"> <li>- Referencing failure on RAID information</li> <li>- Path check function (function for detecting the path malfunction)</li> </ul>

**Table 5.2 Basic and External Specifications (continued)**

Item	9500V Specifications (Synchronous TrueCopy 9500V)	9900 Specifications (HORC)
External Specifications		
Copy movement	Copies the whole LU, and the differential data	Copies the whole LU, and the differential data
Dual writing during PAIR status	Only synchronization is supported.	Synchronization and asynchronization are supported.
Restrictions for copy destination	9500V (Installation of Synchronous TrueCopy 9500V is necessary.)	9900 only (Installation of HORC is necessary.)
Number of subsystems for copy destination	1	4
Maximum number of LUs for creating pairs	31 pairs	4,095 pairs
Number of command device	2LUs *1 Device is used in common with ShadowImage 9500V.	No restriction
Maximum number of pairs for 1 LU	Supports only 1:1	Supports only 1:1
Target LU	RAID 5 (2D+1P to 15D+1P)	[RAID 1-RAID 1], [RAID 5-RAID 5], [RAID 1-RAID 5], [RAID 5-RAID 1]
Number of paths (for 1 pair)	2 paths (1 path/controller, 2 paths for the dual-controller configuration) are required.	Specifying 2 paths or more (alternative path specifying) is required.
LU size	P-LU = S-LU	P-LU = S-LU
Host access restrictions while copying	The read and write operations for S-VOL are not available under the PAIR status and the COPY status. (Volume cannot be mounted.) The read and write operations for P-VOL are always available.	Read and write operations for S-VOL are not available under the PAIR status and the COPY status. Read and write operations for P-VOL are always available.
Movement mode of the port	Fibre only. Mixing initiator and target mode.	Fibre only. Each port of the initiator and the target is on the separate controllers. Mixing initiator and target is impossible.
Path switching when the path failure occurred	Available. Path switching is executed by the subsystem.	Available. Path switching is executed by the subsystem.
Path switching when the controller blockage occurred.	Available. Path switching is executed by the subsystem.	Available. Path switching is executed by the subsystem.
Method for specifying the path	Specified by the remote subsystem serial number, the remote and local port number.	Specified by the subsystem serial number, the controller number, the port number, and the LU number.
Cascade connection	Only with P-VOL of ShadowImage 9500V.	Only with HOMRCF. It is possible to cascade the volume pair up to two layers.
Concurrent use of Dual ID Succession	Cannot use Dual ID Succession concurrently.	None of the relevant function
Setting copy priority function	Available (e.g. specifying priority with host I/O)	Available

**Table 5.2 Basic and External Specifications (continued)**

Item	9500V Specifications (Synchronous TrueCopy 9500V)	9900 Specifications (HORC)
Copy progress display function	Available	Available
Controller configuration	Since the path is dual, Dual-controller configuration is required.	Using the multiple-controller is premised.
LU format	Cannot format the LU of the pair of Synchronous TrueCopy 9500V.	Cannot format the LU of the pair of HORC.
LUN Concatenation	Cannot expand the LU of the pair of Synchronous TrueCopy 9500V. Cannot specify an expanded LU as a Synchronous TrueCopy 9500V pair.	Cannot expand the LU of the pair of HORC. Can specify an expanded LU as a HORC pair.
Deleting RG*2/LU	Cannot delete the RG/LU that are the target pair of Synchronous TrueCopy 9500V.	Cannot delete the RG/LU that are the target pair of HORC.
License	Including the ShadowImage 9500V feature.	Issuing the license key.

\*1: For details on command devices, see the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*. Command device is shared between several hosts. However, this does not mean the data is shared. Command devices must not be used by ordinary applications. Set the command device with caution. For details on setting the command device, see the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

\*2: RG means the RAID groups.

## 5.4 Synchronous TrueCopy 9500V Pair Status Transitions

Figure 5.2 illustrates the Synchronous TrueCopy 9500V pair status transitions. (The status is same as HORC.)

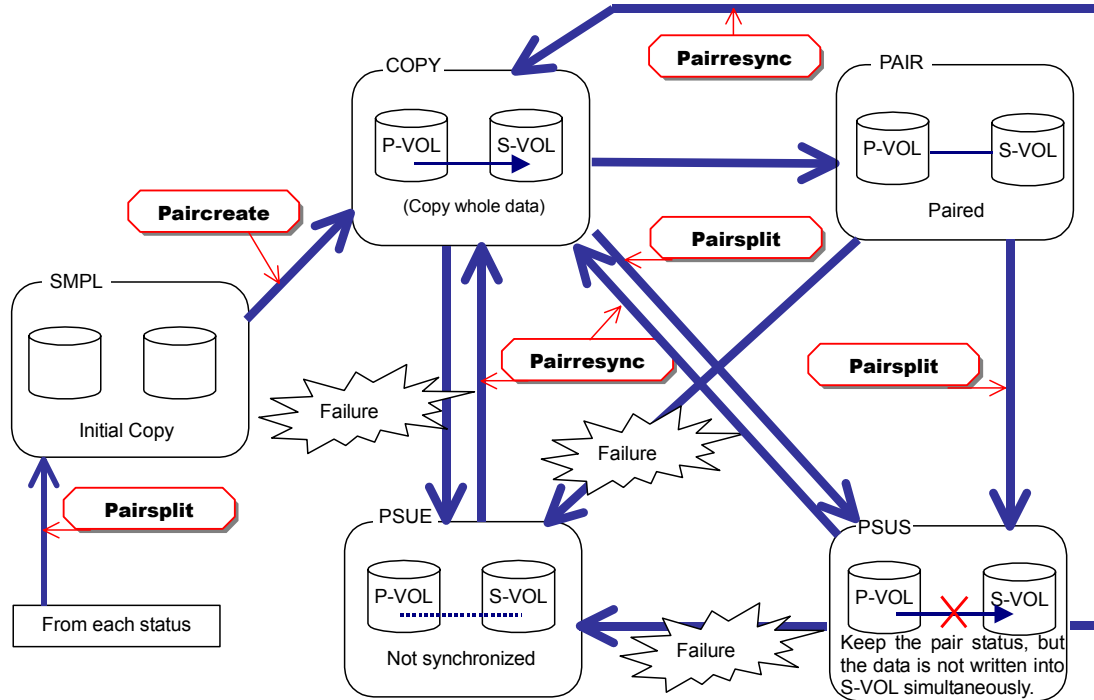


Figure 5.2 Synchronous TrueCopy 9500V Pair Status Transitions

Table 5.3 Synchronous TrueCopy 9500V Pair Status Conditions

Pair Status	Description
SMPL	Two volumes are not paired. The subsystem accepts the read and the write I/Os for all SMPL volumes.
COPY	The copy operation is in progress. The subsystem continues to accept the read and the write operations for P-VOL, but rejects the read and the write operation for S-VOL. (Volume cannot be mounted.)
PAIR	The copy operation is complete. P-VOL and S-VOL are still paired. The subsystem accepts the read and the write operations for P-VOL, and the read operation for S-VOL. The subsystem, however, rejects the read and the write operations for S-VOL. (Volume cannot be mounted.)
PSUS (SSUS)	The copy operation is suspended. A pair is kept, but the data cannot be written into S-VOL. The subsystem starts accepting write I/O operations for P-VOL, and can specify the read and write I/Os for S-VOL by option. When the pair is resynchronized and the status is COPY, the subsystem executes copying the differential data from P-VOL to S-VOL.
PSUE	A failure occurred and the copy operation is suspended forcibly. The volumes are not synchronous. The subsystem accepts the read and write I/Os for a PSUE (suspended) P-VOL, excluding the case that occurs under the condition of "data" specified in the fence level*, and the access impossible of LU, e.g. the LU blockage. The subsystem accepts the read operation for S-VOL, but rejects the write operation. When the pair is resynchronized and the status is COPY, the subsystem executes copying whole data of LU or the differential data from P-VOL to S-VOL.

\*Note: The fence level is a feature that controls the host command (write) response after the status of the P-VOL changing into PSUE.

## 5.5 Overview of Command Control Interface (CCI)

Like ShadowImage 9500V, Synchronous TrueCopy 9500V uses commands and options of CCI in order to create pairs, obtain information, and execute copy operation. For more information, see the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

The following table shows the supported commands. (Commands are same as HORC.)

**Table 5.4 Overview of CCI Commands**

#	Item	Commands	Meaning
1	Starting CCI	horcmstart	Starts CCI
2	Terminating CCI	horcmshutdown	Terminates CCI
3	Create pairs	paircreate	Creates a new pair and the P-LU and S-LU is specified. Copying is executed in the direction of P-LU to S-LU.
4	Split or delete pair	pairsplit	Splits or deletes the pair. For Synchronous TrueCopy 9500V, the pair becomes in a split status during the copy operation. Pair splitting and pair releasing are performed for both P-LU and S-LU.
5	Resynchronize pair	pairresync	Resynchronizes the pair. The differential data copying is performed between an already created pairs.
6	Event wait (status wait)	pairevwait	Checks the status of creating a pair and waits the completion of resynchronization. This command can also be used for specifying logical pairs per group. Example: Copy process (2) is executed after the copy process (1) (pairresync(1)) completes. : pairresync(1) pairevwait pairresync(2) :
7	Confirming the pair status and the configuration	pairmon	Displays the status transition
8	Reporting the volume attribute	pairvolchk	Reports the volume attribute
9	Displaying the connection configuration	raidscan	Displays the connection configuration
10	Monitoring the statistical information	raidar	Monitors the statistical information
11	Confirming the connection between the host and the subsystem	raidqry	Confirms the connection between the host and the subsystem
12	Changing and displaying the CCI and the command trace control parameter	horcctl	Changes and displays the CCI and the command trace control parameter
13	Confirming the connection of the device file	inqraid	Confirms the connection of the device file
14	Switching P-LU and S-LU	horctakeover	HA linkage function

## 5.6 Host Connection

### Access to a Command Device

When a pair is created, the following conditions are necessary:

- It is possible to access from one host to both command devices of 9500V on the local side and the remote side.
- It is possible to access from two hosts to each 9500V on the local side and the remote side, and two hosts are connected with LAN.

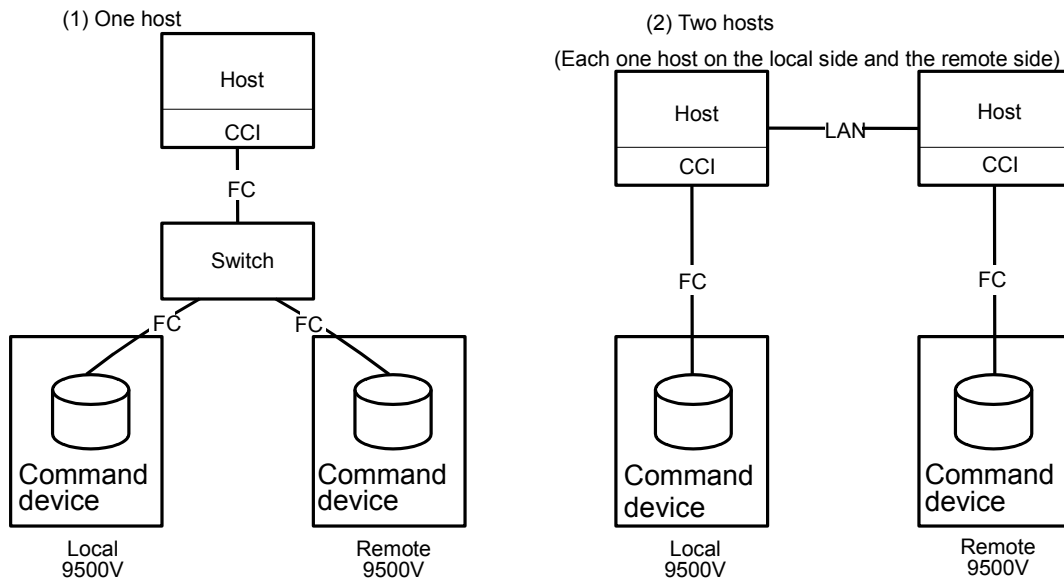


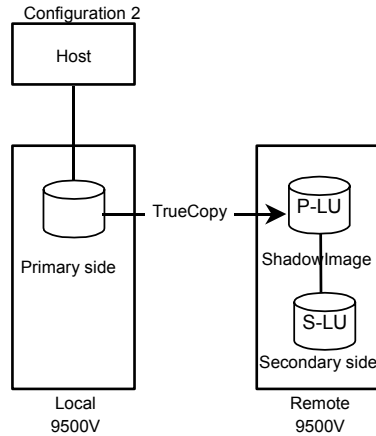
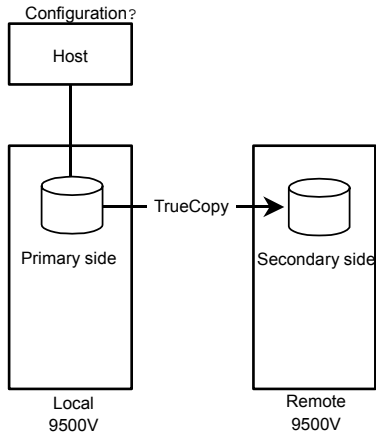
Figure 5.3 Examples of the Host Connection

**Note:** When a pair is created on Synchronous TrueCopy 9500V, it is necessary to connect two hosts with a LAN for communicating between CCIs on the host associated with the local 9500V and on the host associated with the remote 9500V. When there are two hosts, one host activates both CCIs on the local side and on the remote side; it is not necessary to connect two hosts to the LAN.

## 5.7 Cascade Connection

Because Synchronous TrueCopy 9500V accepts the write operation during a copy operation, you can build a system without the cascade connection with ShadowImage 9500V. However, you can create a system with ShadowImage 9500V. Some examples of the structure are shown in this section.

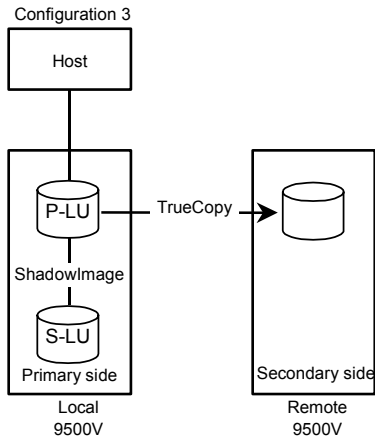
### Examples of the Cascade Structure



**The purpose of using cascade with ShadowImage is:**

- To back up the data on the remote side.
- To manage the generation on the remote side.

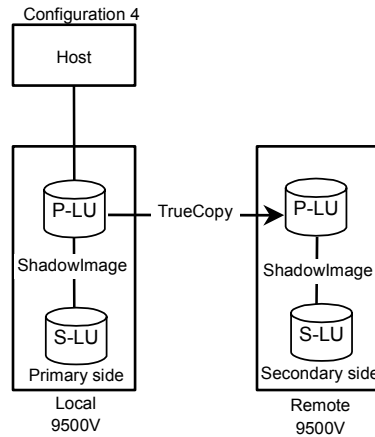
**Note:** When reverse-resync is executed on ShadowImage, the pair of TrueCopy must be split.



**The purpose of using cascade with ShadowImage is:**

- The same as the former ShadowImage operation on the local side. (Backup).

**Note:** When reverse-resync is executed on ShadowImage, the pair of TrueCopy must be split.



**The purpose of using cascade with ShadowImage is:**

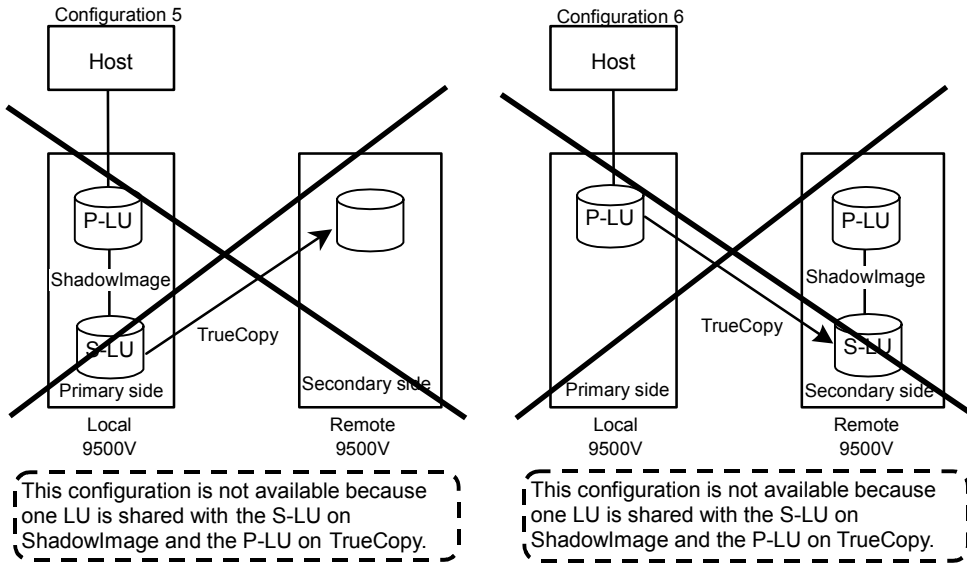
- To back up the data and manage the generation on the remote side
- The same as the former ShadowImage operation on the local side

**Note:** When reverse-resync is executed on ShadowImage, the pair of TrueCopy must be split.

Figure 5.4 Examples of the Cascade Structure

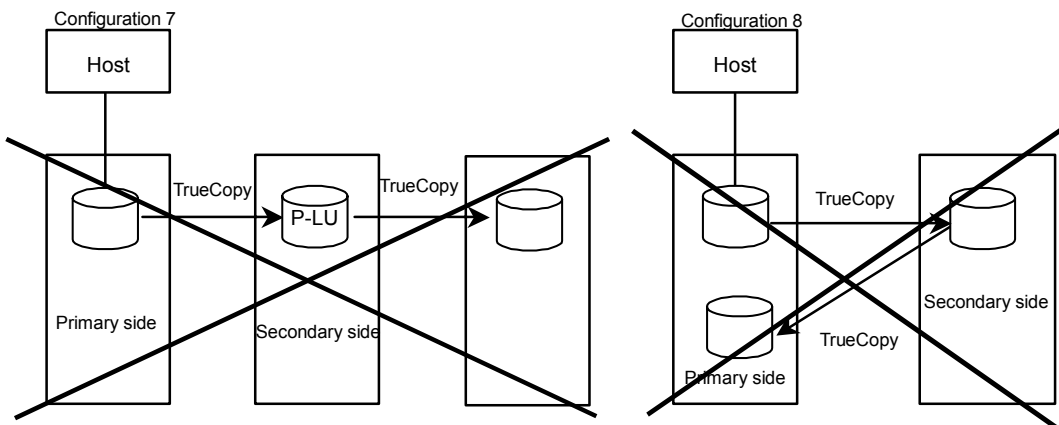
**Restrictions**

After executing the dual writing of ShadowImage 9500V, the data is not reflected as the data after executing the dual writing of Synchronous TrueCopy 9500V. The LU cannot be shared with the S-LU of ShadowImage 9500V and P-LU of Synchronous TrueCopy 9500V.



**Figure 5.5 Restrictions in Cascade Connection-1**

A Cascade connection with Synchronous TrueCopy 9500Vs is not available.



**Figure 5.6 Restrictions in Cascade Connection-2**

When P-VOL of ShadowImage 9500V connects the LU of Synchronous TrueCopy 9500V and the reverseresync operation is executed on ShadowImage 9500V, a pair of Synchronous TrueCopy 9500V must be split (PSUS). (See Configuration 2, 3 and 4 in Figure 5.4 Examples of the Cascade Structure.)



# Chapter 6 Synchronous TrueCopy 9500V System Configuration

Connections between 9500V and 9500V are available.

For the connection between 9500Vs, only a direct connection and the Fibre connection via a switch are allowed. A connection via Hub is not available. The connection via a switch supports both F-Port (Point-to-Point) and FL-Port (Loop).

The setting of two paths for entire 9500V, i.e. one path per one controller, is necessary. For restrictions of path settings, see Section 6.2.

## 6.1 Connection between 9500Vs

Some examples of the structure are shown in this section.

### 6.1.1 Direct Connection

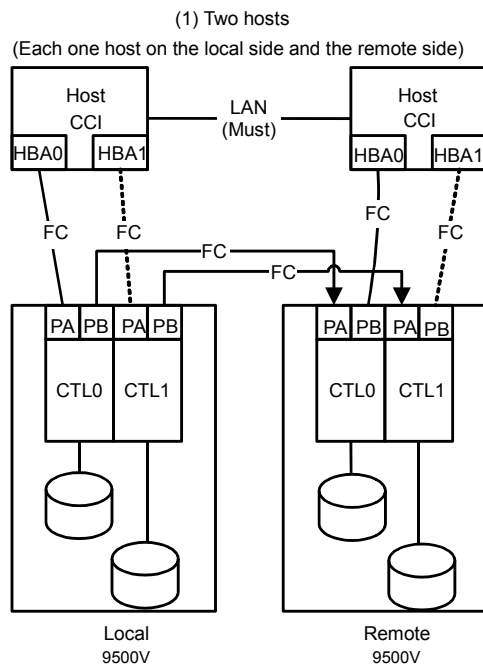
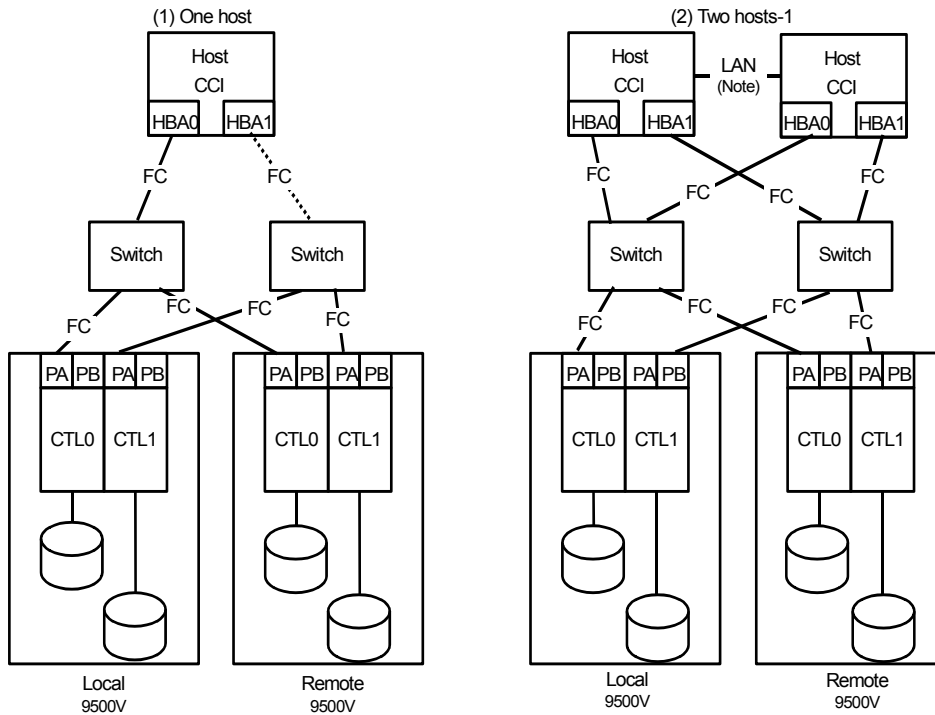


Figure 6.1 Examples of a Direct Connection

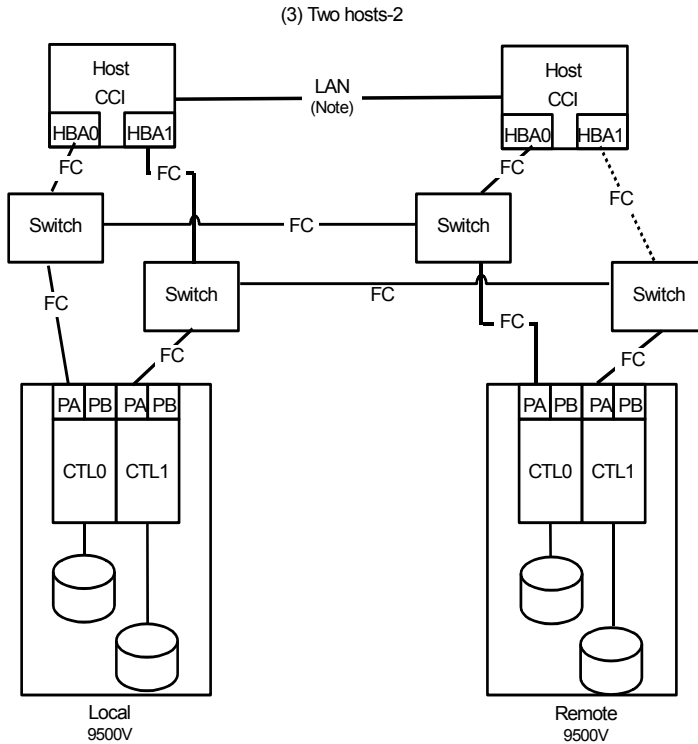
Between a host and 9500V, only one path is acceptable. If a configuration has two paths as illustrated in Figure 6.1, a path can be switched when a failure in a path or the controller blockage occurs.

## 6.1.2 Switch Connection



**Figure 6.2** Example of Switch Connection-1

**Note:** When a pair is created on Synchronous TrueCopy 9500V, it is necessary to connect two hosts with the LAN for communicating between CCIs on the host associated with the local 9500V and on the host associated with the remote 9500V. If there are two hosts, one host activates both CCIs on the local side and on the remote side; it is not necessary to connect two hosts with LAN.



**Figure 6.3 Example of Switch Connection-2**

**Note:** When a pair is created on Synchronous TrueCopy 9500V, it is necessary to connect two hosts with the LAN for communicating between CCIs on the host associated with the local 9500V and on the host associated with the remote 9500V. If there are two hosts, one host activates both CCIs on the local side and on the remote side; it is not necessary to connect two hosts with LAN.

Between a host and 9500V, only one path is acceptable. If a configuration has two paths as illustrated in Figure 6.3, a path can be switched when a failure in a path or the controller blockage occurs.

The 9500V must be connected with a switch as follows.

**Table 6.1 Connections Between 9500V and a Switch**

		Switch	
		For 2 Gbps	Only for 1 Gbps
Mode of 9500V	2 Gbps Mode	<p>From the viewpoint of the performance, one path/controller between 9500V and a switch is acceptable, as illustrated in Figure 6.2 and Figure 6.3.</p> <p>The same port is available for the host I/O and for copying data of Synchronous TrueCopy 9500V.</p>	Not available
	1 Gbps Mode	<p>From the viewpoint of the performance, a port between 9500V and a switch has to be provided for the host I/O and for a copying respectively. If the ports are not provided respectively, the performance deteriorates.</p> <p>For Figure 6.2 and Figure 6.3, two paths/controller between 9500V and a switch, or a switch per a port for the host I/O and for copying Synchronous TrueCopy 9500V respectively have to be provided.</p>	See the left column.

### 6.1.3 One-Path-Connection Between 9500Vs

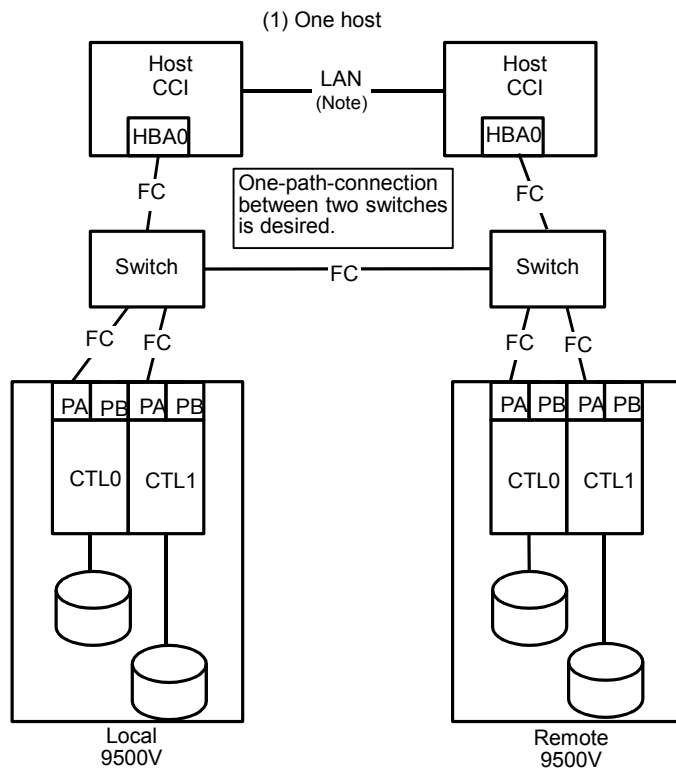


Figure 6.4 Example of a One-Path-Connection

**Note:** When a pair is created on Synchronous TrueCopy 9500V, it is necessary to connect two hosts with the LAN for communicating between CCIs on the host associated with the local 9500V and on the host associated with the remote 9500V. If there are two hosts, one host activates both CCIs on the local side and on the remote side; it is not necessary to connect two hosts with LAN.

However, if a failure occurs in a switch or a path, a path cannot be switched. Therefore, this configuration is not recommended.

## 6.2 Restriction of Path Setting

Set one path for one controller, two paths total.

Figure 6.5 shows the combinations of a controller and a port. As illustrated in the following figure, the combination of two CTL0s, or two CTL1s on the local and the remote side, i.e. Combination 1, and the combination of CTL0 and CTL1 on the both sides, i.e. Combination 2, are available.

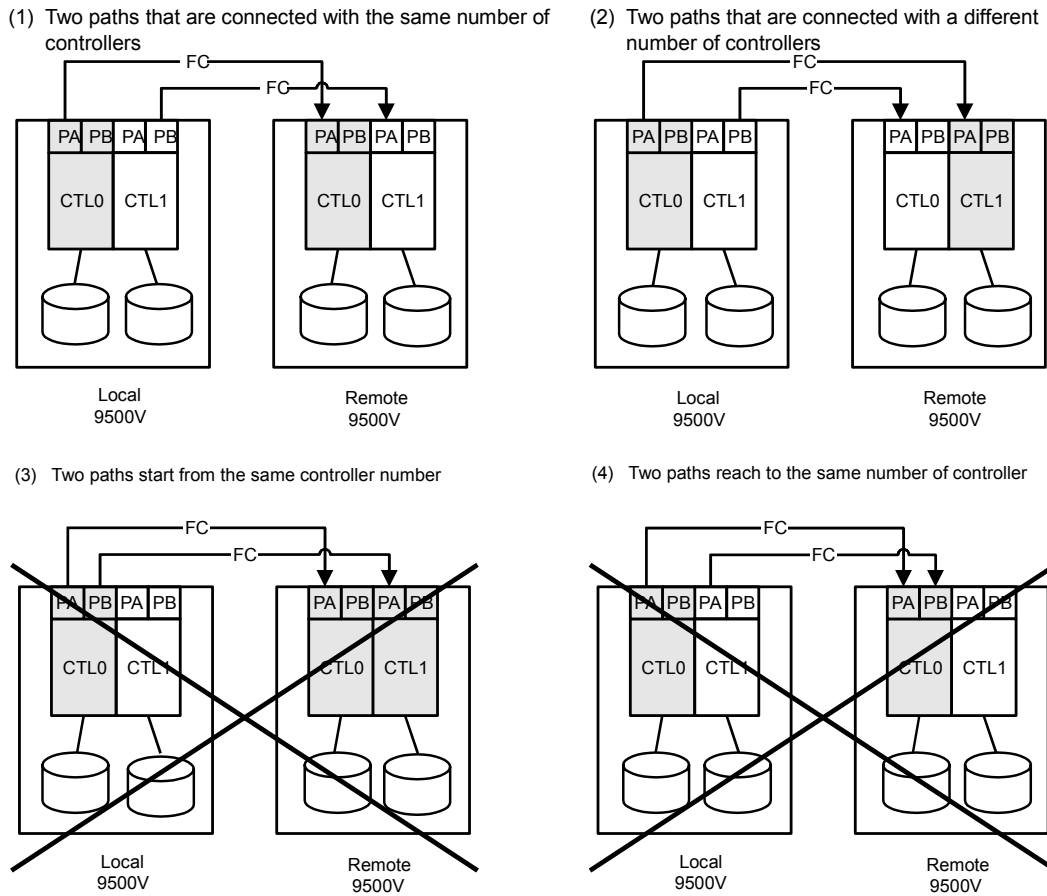


Figure 6.5 Combinations of a Controller and a Port

### 6.3 Combination

Details of restrictions are included in this section.

#### 6.3.1 Restrictions for the Controller Associated with the LU on Each Path

When the LUs on the local side and the remote side are paired, it is necessary to connect the same number of the controllers on the local side and the remote side. Therefore, (1) in Figure 6.6 is recommended.

In (2) in Figure 6.6, because the copy I/O of Synchronous TrueCopy 9500V between CTL0 and CTL1 on the remote side has to be executed, the performance deteriorates.

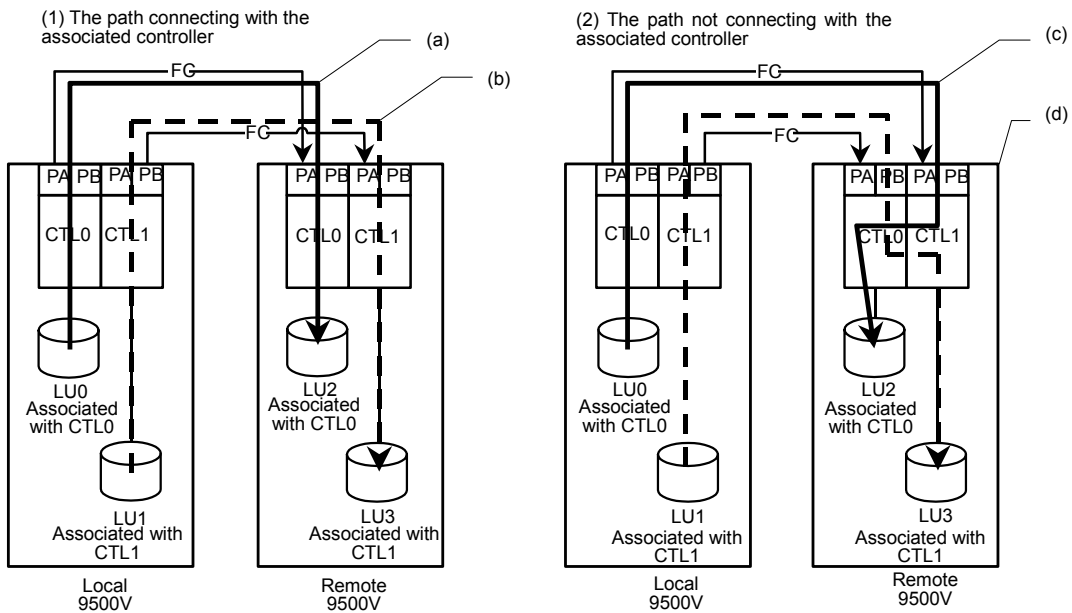


Figure 6.6 Examples of Path Connection



# Chapter 7 Extender

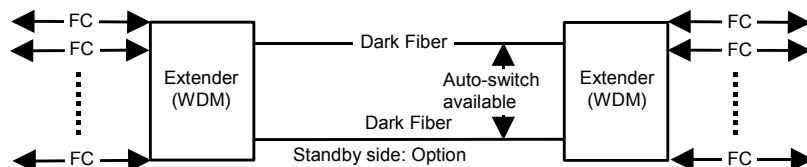
## 7.1 Extender for Wavelength Division Multiplexing (WDM)

### 7.1.1 Overview

This section explains an extender to support Wavelength Division Multiplexing (WDM).

The different wavelength lights do not interfere each other. By using this characteristic, WDM is the optical communications technology for increasing information transmission amounts dramatically. The number of the wavelength is in accordance with multiplexing several different wavelength optical signals on a dark fiber. Multiplexing several channels of the optical signal is called WDM; multiplexing several dozen channels of the optical signal is called Dense WDM (DWDM).

The overview of WDM is illustrated in Figure 7.1.



- By converting several wavelengths of the optical signal, such as Fibre Channel, it is possible to transmit the data via one dark fiber.
- By duplicating the dark fiber using the function of an extender for WDM, it is possible to automatically switch to dark fiber on the stand-by side when a failure occurs.

Figure 7.1 Overview of WDM

An example of the configuration (HA configuration) is shown below.

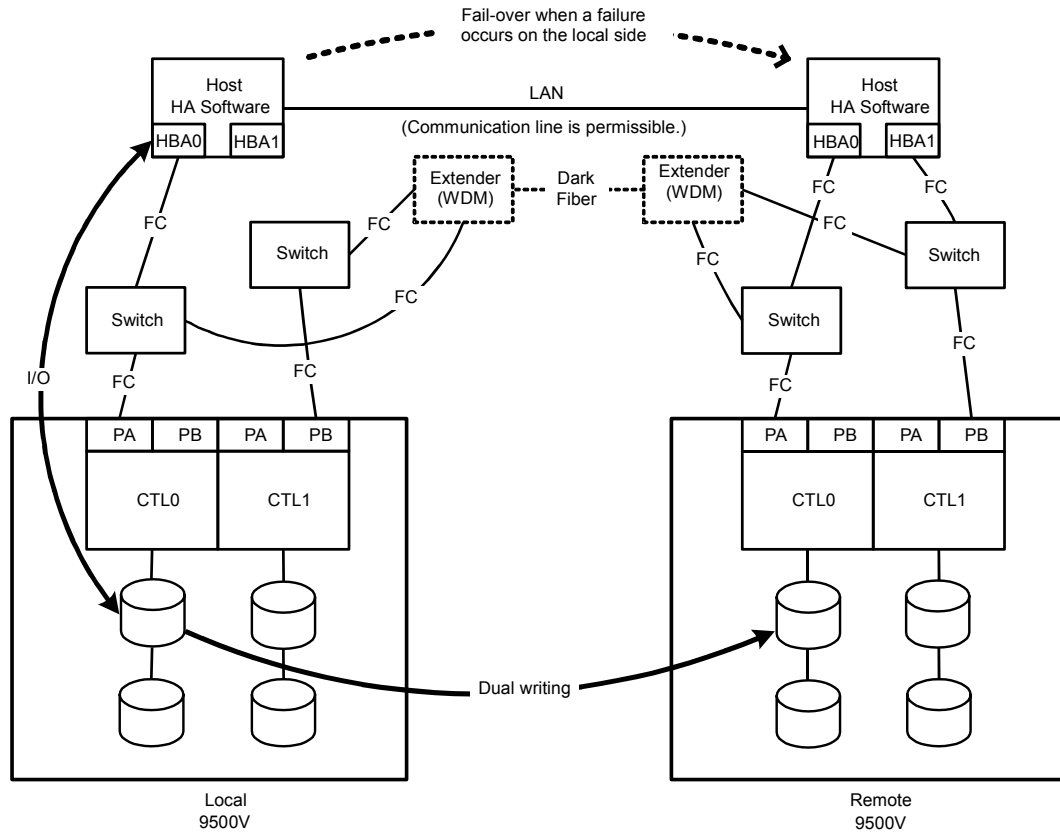


Figure 7.2 Example of HA Configuration

Presently, the communication enterprises offer the dark fiber. Therefore, the combination of the dark fiber and an extender for WDM makes the long-distance transmission possible at 1 Gbps, which is the same speed of the fibre channel. (There are small numbers of dark fibers for 2 Gbps fibre channel.)

If the distance will extend, the response time will increase. (The measure of the response time is approximately 5 ms for 100 km.) For more detail, contact a carrier.

Dark fiber is optical fiber that does not work but it is laid. Optical fibers are generally laid from several dozen fibers to several hundred. Only needed fibers are activated; others are left as dark fiber.

## 7.1.2 Communication Line (Dark Fiber) when using WDM

When WDM is used, the response time will extend. This deterioration of response time has to be covered with increasing BB-Credit (the number of buffer) of fibre channel and the transmission volume, without waiting for the response. Therefore, a switch is required.

If the 9500V is connected directly to an extender for WDM without a switch, BB-Credit is 4 or 8. If they are connected with a switch (Brocade), BB-Credits are 16. It can hold up to 10 km, on the standard scale. BB-Credit can be increased up to 60; it can hold up to 100 km by adding Extended Fabrics to a switch.

For short distances (within several dozen kilometers), both signals of IN and OUT can be transmitted via one dark fiber.

For long distances (more than several dozen kilometers), an optical amplifier is required to amplify the wavelength between two extenders to prevent the attenuation through a fiber. Therefore, dark fibers are required to prepare for IN and OUT respectively.

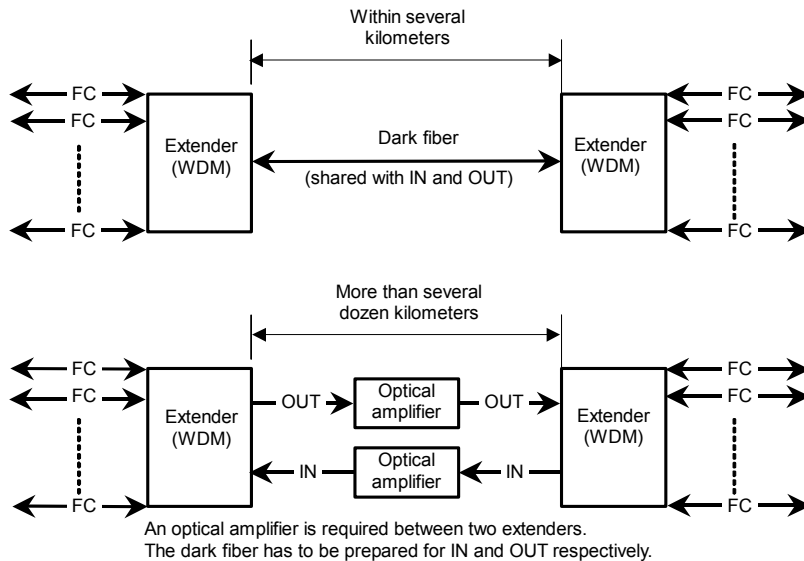
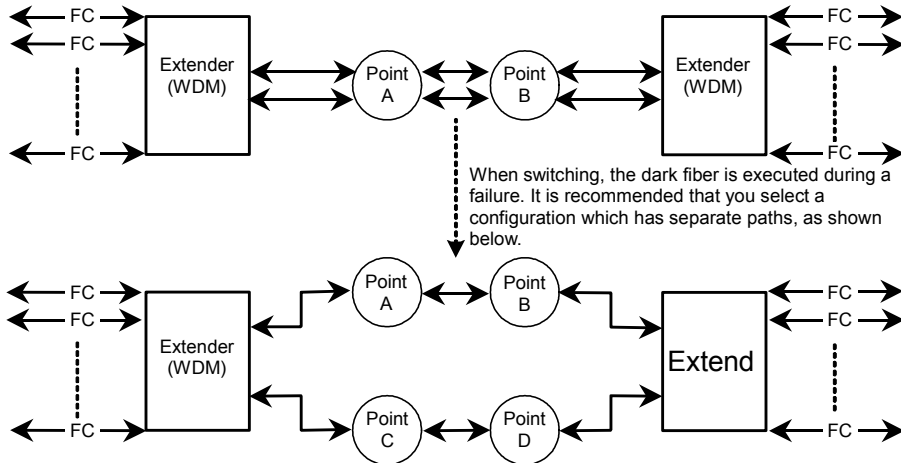


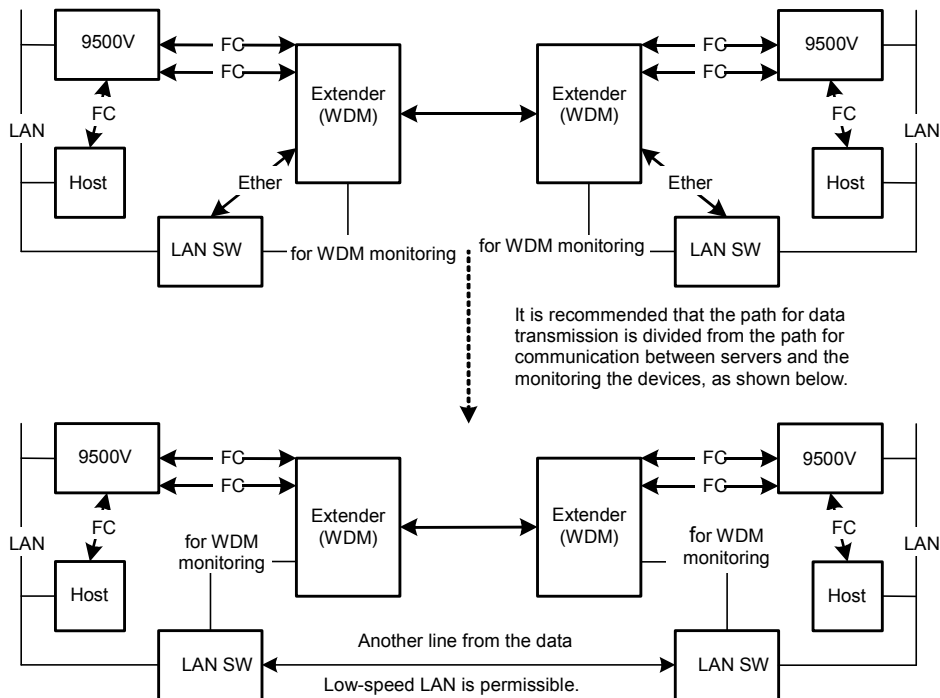
Figure 7.3 Dark Fiber with WDM

If switching is executed when a failure in the dark fiber occurs, the dark fiber in other path has to be selected. If the fiber in the same path is selected, several failures may occur in several dark fibers simultaneously because optical fibers are laid from several dozen fibers to several hundred, as mentioned previously.



**Figure 7.4 A Failure in the Dark Fiber**

WDM function can be multiplexed not only in Fibre Channel but also in Gbps Ethernet in one dark fiber. While monitoring an extender for WDM or 9500V by using LAN, if a failure occurs in the dark fiber, you cannot confirm the condition of each device. We recommend that you secure another line for monitoring in addition to the line for the data transmission.



**Figure 7.5 Line for Monitoring**

### 7.1.3 Maintenance and Operation

If the connection with WDM is used in the customer's environment, a test period is required before the actual operation. The sufficient investigation for the connection to meet the customer's environment is necessary.

9500V and a switch that is the product of Hitachi OEM are maintained with Hitachi's responsibility. Because an extender for WDM and the communication line of the dark fiber between two WDMs are not the Hitachi's product, the maintenance is up to a user. If the switch is not a product of Hitachi OEM, the user is responsible for maintenance. A consensus about a partial charge for the maintenance and operation is negotiated between the user and Hitachi Customer Service.



# Chapter 8 Example of System Operation

## 8.1 Disaster Recovery

If both the host and the disks (9500V) on the local side are destroyed by a disaster condition (for example, an earthquake), data recovery and continuing operation are executed by the stand-by host and the disks on the remote side.

### 8.1.1 Automatic Switching by High Availability (HA) Software

By installing the High Availability (HA) Software on both the local side and the remote side, when a failure occurs in the host or in the subsystem, although the input and output operation from the host on the local side cannot be executed, operation will continue by automatically switching over to the stand-by host on the remote side. A configuration is shown below.

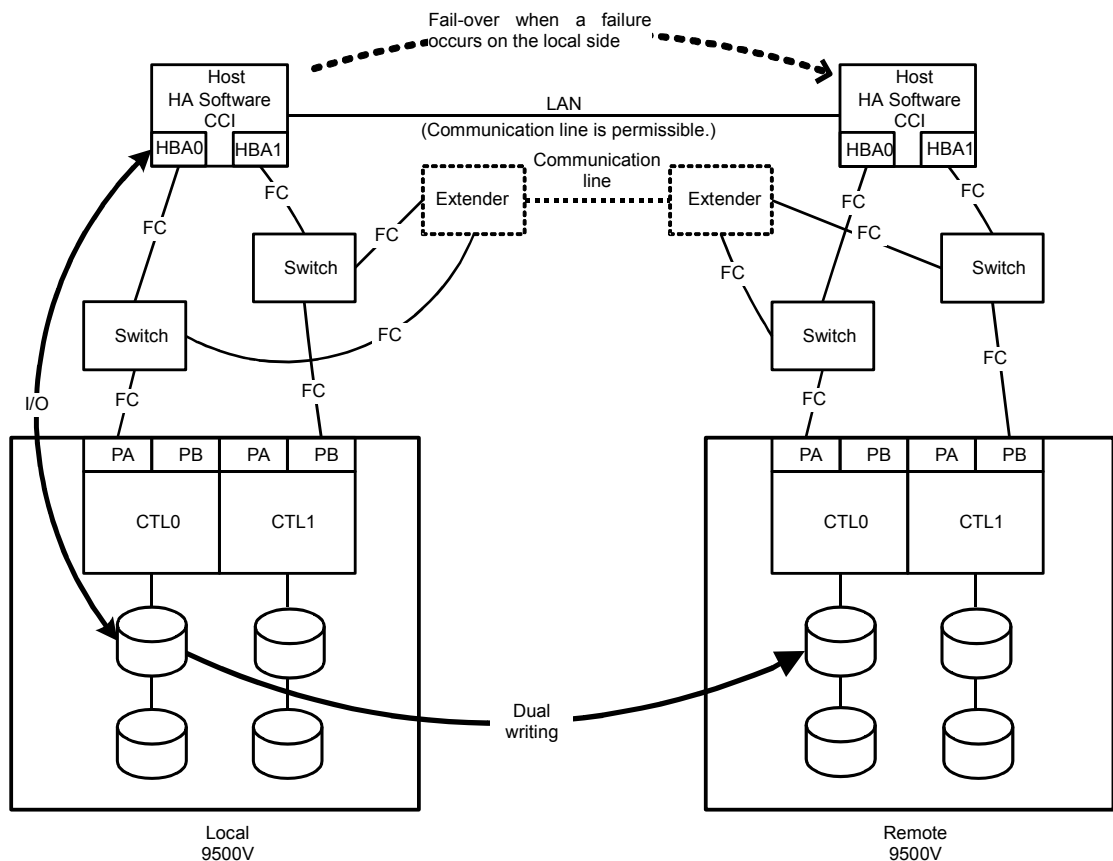


Figure 8.1 Configuration for Failover

When a failure occurs on the local side, a host is switched into the stand-by host on the remote side (fail-over) by HA software. Automatically executing the script of the recovery process in the stand-by host on the remote side enables the host on the remote side to continue the operation.

**Note:** Several minutes are needed for the switching process.

Recovery processes for the database and file system are as follows:

1. Database

- Issuing the take-over command of CCI from the stand-by host makes the stand-by host possible to access the disk on the remote side.
- By using REDO log, the data of the database is recovered.

2. File system

- Issuing the take-over command of CCI from the stand-by host on the remote side makes the stand-by host possible to access the disk on the remote side.
- For UNIX, the file of fsck and Windows is recovered by executing 'chkdsk'.

For details of the system recovery by take-over, see the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 8.1.2 Manual Switching

As mentioned in this section, if the host on the local side can access 9500Vs on both the local side and the remote side via the Fibre Channel, the stand-by host on the remote side can be OFF. If the host on the local side can access the disks on both the local side and the remote side, it is not necessary to connect with the host on the local side and the stand-by host on the remote side with LAN.

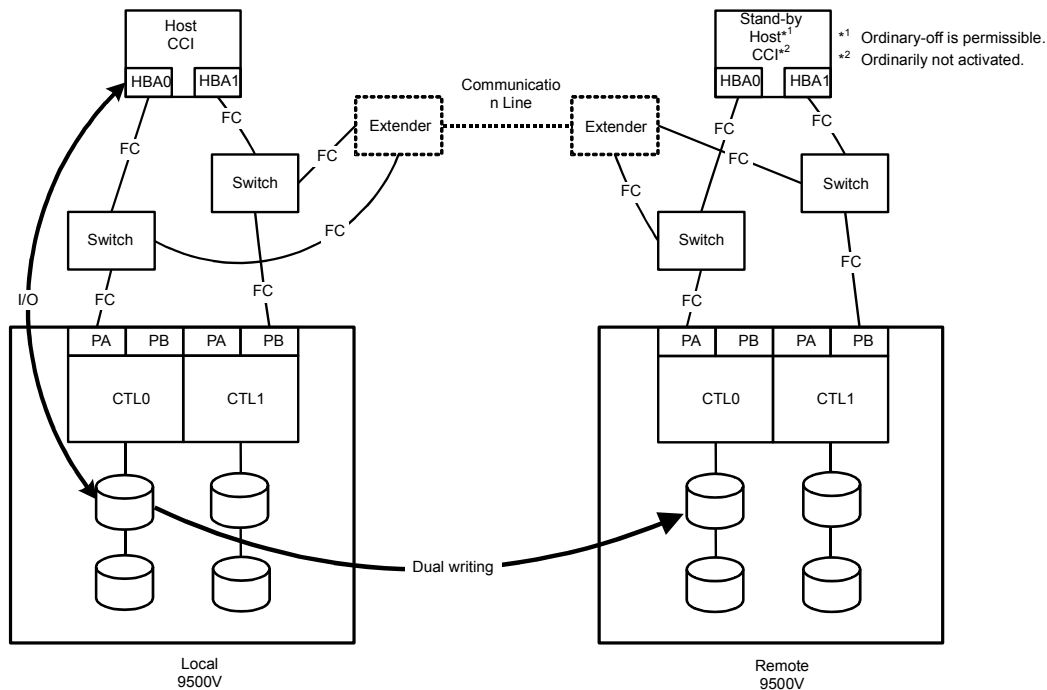


Figure 8.2 Disaster Recovery

### The process of manual switching:

When a failure occurs on the local side, executing the script for the recovery process enables continuous operation by the stand-by host.

The recovery processes for the database and the file system are as follows:

1. Database
  - Issuing the take-over command of CCI from the stand-by host on the remote side makes the stand-by host possible to access the disk on the remote side.
  - By using REDO log, the data of the database is recovered.
2. File system
  - Issuing the take-over command of CCI from the stand-by host on the remote side makes the stand-by host possible to access the disk on the remote side.
  - For UNIX, the file of fsck and Windows is recovered by executing 'chkdsk'.

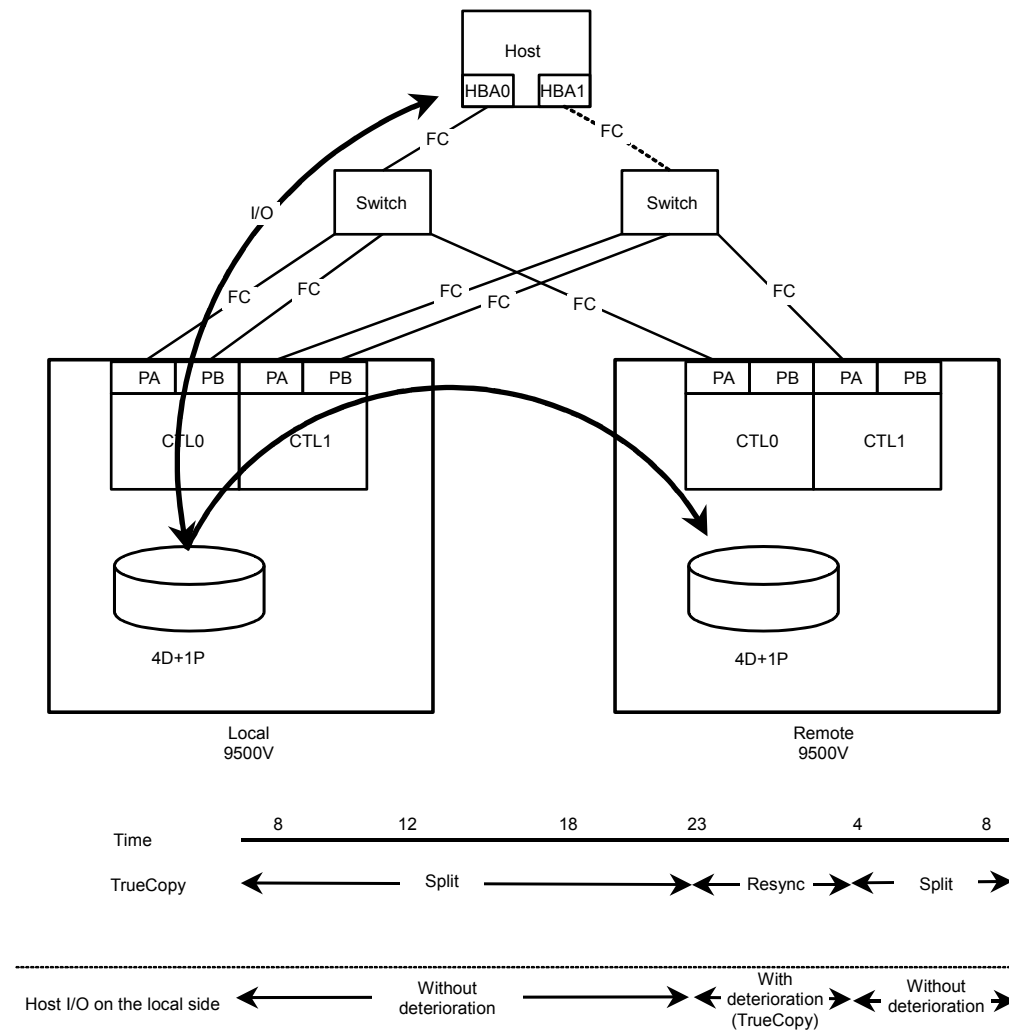
For details of the system recovery by take-over, see the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

## 8.2 Backup Use

### 8.2.1 9500V Synchronous TrueCopy 9500V Ordinary Split Operation

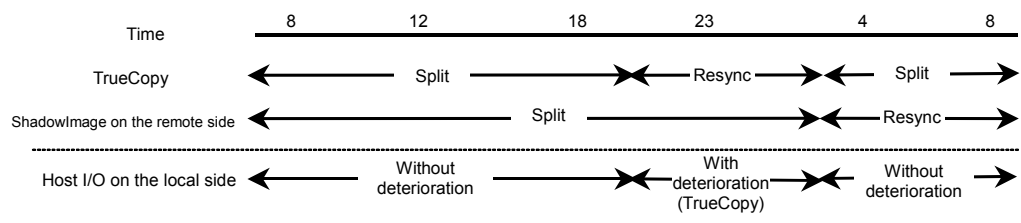
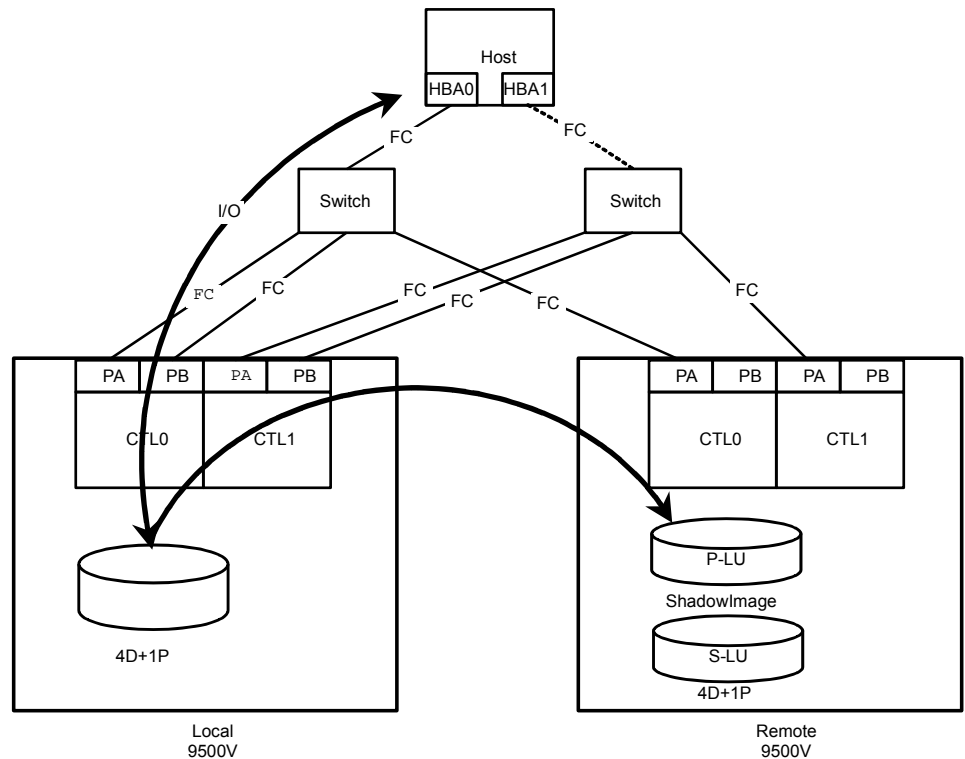
When the host I/O is lightly executed (for example, at night) resync is executed. After resync, I/O operation of the database on the local side is stopped and the pair is split.

**Note:** When a copy operation on ShadowImage 9500V and Synchronous TrueCopy 9500V is performed, the copy prior mode is recommended.



**Figure 8.3 9500V Synchronous TrueCopy 9500V Ordinary Split Operation-1**

If the LUs are cascaded via ShadowImage 9500V on the remote side and resync of Synchronous TrueCopy 9500V is executed after LUs on ShadowImage 9500V split, the data is saved in the secondary side of ShadowImage 9500V even though a failure occurs during the resync of Synchronous TrueCopy 9500V.



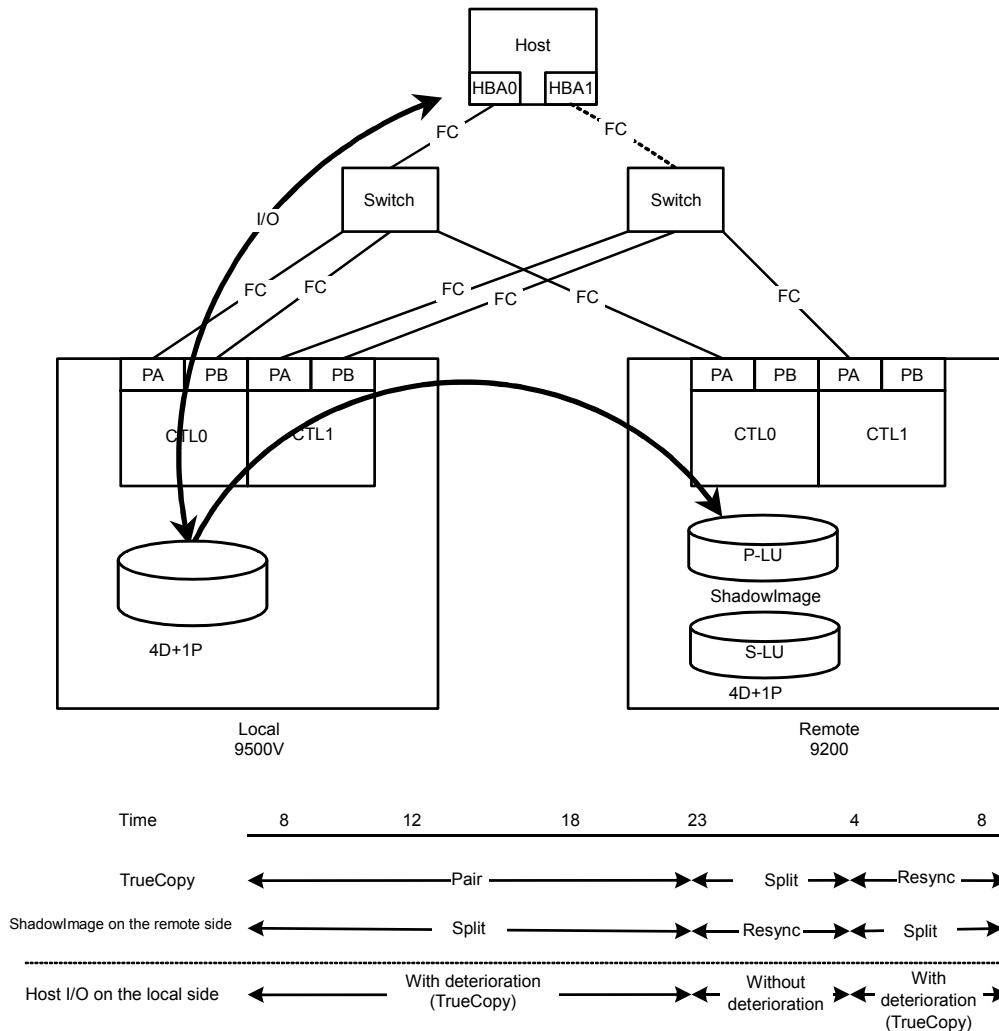
**Figure 8.4 9500V Synchronous TrueCopy 9500V Ordinary Split Operation-2**

During the split status of Synchronous TrueCopy 9500V, the host I/O performance does not deteriorate because the host does not write to the remote side. Since the data when Synchronous TrueCopy 9500V is split after resync is not saved, the data from when a pair of Synchronous TrueCopy 9500V is split to when a failure occurs is not saved. Therefore, we recommended this operation to the user who attaches importance to the host I/O performance.

## 8.2.2 9500V Synchronous TrueCopy 9500V Ordinary Pair Operation

If you want to backup the data and a pair of Synchronous TrueCopy 9500Vs is split, the backup data at the time remains on the remote side. By cascading LUs with ShadowImage 9500V on the remote side, the data when a pair of ShadowImage 9500Vs are split is saved on the secondary side of ShadowImage 9500V.

**Note:** When a copy operation on ShadowImage 9500V and Synchronous TrueCopy 9500V is performed, the copy prior mode is recommended.



**Figure 8.5 Synchronous TrueCopy 9500V Ordinary Pair Operation**

The performance of the write operation from the host during the pair status deteriorates because the subsystem gives a “finish” response to the host after writing to the subsystem on the remote side. Therefore, we recommend this operation to the user who attaches importance to data recovery when failure occurs.

## 8.3 Data Migration Use

### 8.3.1 9500V Synchronous TrueCopy 9500V Ordinarily Split Operation

If you want to use the data on the local side from the remote side and the pair of Synchronous TrueCopy 9500Vs is split directly after the resync operation is performed, the data of the local side at this point in time remains on the remote side.

**Note:** The copy operations are performed in the copy prior mode.

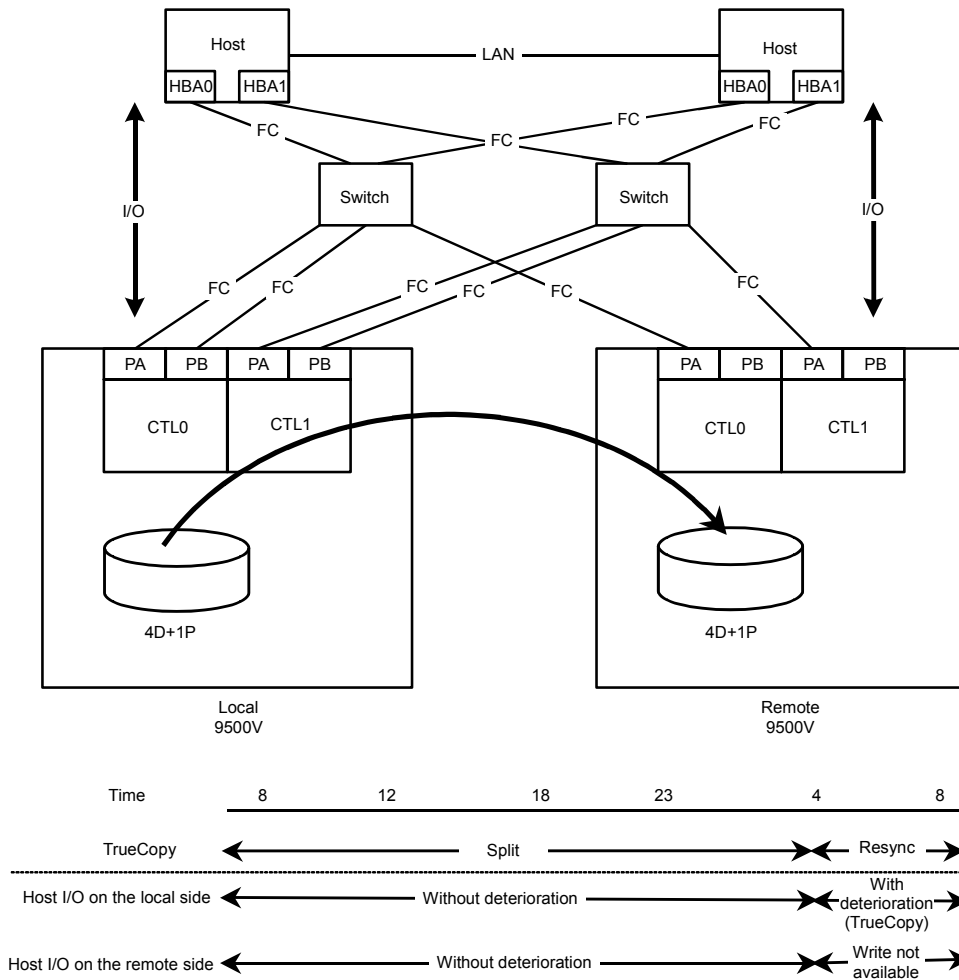


Figure 8.6 Data Migration Use



# Chapter 9 Restrictions

## 9.1 Host Timeout

It is recommended that you set more than 60 seconds for the I/O timeout from the host to the 9500V.

## 9.2 For VxVM+Synchronous TrueCopy 9500V Configuration

- **Volumes to be recognized by the same host**

If you have set the P-VOL and the S-VOL to be recognized by the same host, the VxVM will not operate properly. Set only the P-VOL of ShadowImage 9500V to be recognized by the host.

- **Displaying the command device**

The host operates as if another disk is attached to the subsystem (“DF+another disk”) since Synchronous TrueCopy 9500V attaches characters “-CM” at the end of “PRODUCT\_ID” of the command device. Therefore, command devices are displayed in the following format.

**Messages displayed when booting the system (example):**

a) **Without Synchronous TrueCopy 9500V:**

```
NOTICE:vxvm:vxdump:added disk array D60000D0
```

b) **With Synchronous TrueCopy 9500V:**

```
NOTICE:vxvm:vxdump:added disk array D60000D0
NOTICE:vxvm:vxdump:added disk array JBOD_DISKS
```

**Output displayed when executing the “vadmpadm listctlr all” command (example):**

a) **Without Synchronous TrueCopy 9500V:**

CTLR-NAME	ENCLR-TYPE	STATE	ENCLR-NAME	
C0	SEAGATE	ENABLED	seagate0	←Internal hard disk
C3	HITACHI	ENABLED	hitachi1	
C4	HITACHI	ENABLED	hitachi1	

b) **With Synchronous TrueCopy 9500V:**

CTLR-NAME	ENCLR-TYPE	STATE	ENCLR-NAME	
C0	SEAGATE	ENABLED	seagate0	
C3	HITACHI	ENABLED	hitachi1	
C4	HITACHI	ENABLED	hitachi1	
C3	JBOD	ENABLED	jbod0	
C4	JBOD	ENABLED	jobd0	

### 9.3 For AIX+Synchronous TrueCopy 9500V Configuration

- Volumes to be recognized by the same host

If you have set both the P-VOL and the S-VOL to be recognized by the same host, AIX will not operate properly. Set only the P-VOL to be recognized by the host.

### 9.4 Hitachi Path Manager (HPM) for Windows 2000 plus RAID Manager (Synchronous TrueCopy 9500V and ShadowImage 9500V)

Do not use HPM (for Windows 2000) and RAID Manager (Synchronous TrueCopy 9500V and ShadowImage 9500V) at the same time.

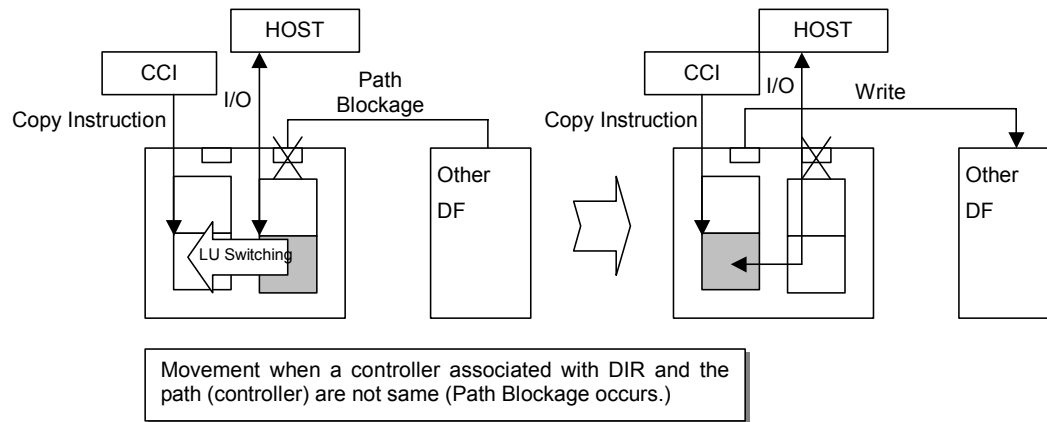
### 9.5 Restrictions for the Case with One Host

There are the following restrictions for each OS.

Table 9.1 The Restrictions for each OS

No.	OS	Restrictions
1	Windows NT, 2000	The target LU for Synchronous TrueCopy 9500V has to recognize and release a drive with "mount" and "unmount" command of RAID Manager instead of your specifying the drive letter. Cannot use "mountvol" command of Windows 2000 because the data is not output when releasing. (For more detail, see the <i>Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)</i> . Cannot combine with a path switching software.
2	HP-UX	Available. Cannot mount at the same time. Can combine with a path switching software (PV-Link).
3	Sun	Available. Cannot mount at the same time. Cannot combine with a path switching software because of the restrictions of Section 9.2.
4	AIX	Not available because of the restrictions of Section 9.3.

## 9.6 Conflict With the Command for Format, Synchronize Cache, and Verify



**Figure 9.1** Movement when the Controller to be Associated with DIR and the Path are Not the Same

When both paths are operating under normal conditions, there is no problem. If a path blockage occurs in one path, however, Synchronous TrueCopy 9500V is restricted as follows:

- While Format or Synchronize Cache command is executed for the LU that does not work under Synchronous TrueCopy 9500V, the copy operation of Synchronous TrueCopy 9500V sometimes stops. The copy operation restarts when the Format or Synchronize Cache operation is completed. It sometimes takes considerable time to execute the Format and Synchronize Cache command.
- While the Verify command is executed for an LU that does not work under Synchronous TrueCopy 9500V, the copy operation of Synchronous TrueCopy 9500V sometimes stops. The copy operation restarts when the Verify operation is completed. Since the Verify command is issued continuously to check a disk when you execute the logical format for the disk by using Windows NT/2000, the Synchronous TrueCopy 9500V copy operation suspends until the logical format is completed.

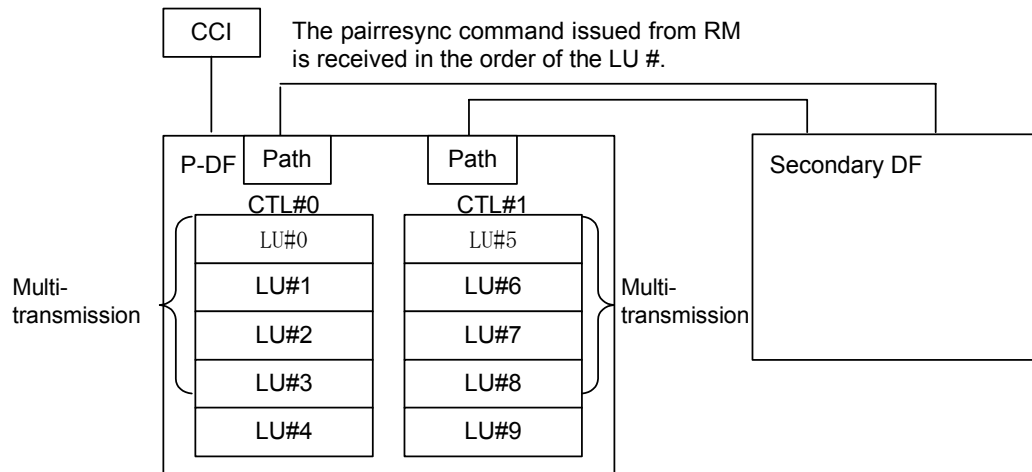
For example, Format, Synchronize Cache, and Verify commands are issued when the following operations are executed:

- Formatting LU by using the Resource Manager 9500V program (Format command issue)
- The logical format of a disk from Windows NT/2000 (Verify command continuous issue)

Therefore, during the copy operation of Synchronous TrueCopy 9500V, issuing the Format, Synchronize Cache, and Verify commands is not permitted.

## 9.7 Changing the Order of Copy Execution when Receiving Multiple Requests from CCI

The commands issued from CCI are generally executed in the order they were received in LUs. However, when receiving more than five commands per controller, the execution order changes.



**Figure 9.2** Order of Copy

The LU#s 0, 1, 2, 3, 5, 6, 7, 8 begins multi-transmission and starts the copy operation almost at the same time. LU#4 starts copying when one of the LUs (0 to 3) completes the operation. LU#9 starts copying when one of the LUs (5 to 8) completes the operation.

A single controller provides a data-transmission-area-resource for four pairs multi-transmission. If the controller receives more than that of a command request, the recent request will be processed later.

## Chapter 10 Notes on System Configuration

- **Pre-design a procedure for recovering data in the event of malfunction**

To cascade in Synchronous TrueCopy 9500V and ShadowImage 9500V, the P-VOL and S-VOL synchronization may become corrupt due to a hardware malfunction. Even when the user has a hardware maintenance contract (including free warranty period) with Hitachi, recovering Synchronous TrueCopy 9500V and ShadowImage 9500V status (such as resynchronization) is beyond the maintenance personnel's task. The maintenance personnel's tasks include removing the cause of malfunction and recovering the hardware only. Therefore, the procedure for recovering Synchronous TrueCopy 9500V and ShadowImage 9500V status must be specified by the user when designing the system.

- **Applying Synchronous TrueCopy 9500V and ShadowImage 9500V to an existing system**

When newly applying Synchronous TrueCopy 9500V and ShadowImage 9500V to an existing system, follow the description described in Chapter 6 and design the configuration.



## Appendix A Acronyms and Glossary

CTL	Controller
CLI	Command Line Interface
Dark Fiber	The dark fiber is the optical fiber that does not work but it is laid. The optical fibers are generally laid by several dozen fibers to several hundred. Only fibers to be needed are activated and others are left as the dark fiber.
Differential data	The data to be updated from the suspended status of the pair volume to the primary volume.
Differential data control	To control the differential data constantly.
Differential data copy	To copy the updated data to the secondary volume. The data is updated from the differential data control status (the pair volume is under the suspended status) to the primary volume.
Disaster recovery	To recover the data and to keep an operation going when a critical failure.
Disc array device	Disc array subsystem. The disc array subsystem is referred to as "Disc array device" or "Disc subsystem" in this manual.
Dual copy	To write the data into P-Vol and S-Vol simultaneously with one requirement of Write.
Entire copy	To copy all data in the primary volume to the secondary volume for conforming the data of both volumes completely.
Extender	A converter that changes a signal to other signal. When the data is transmitted to a distance, an extender is used for changing a signal for Fibre Channel to a signal for a dark fiber or an Ethernet (IP).
Fail-over	To take over a process or a data with an alternative host when a failure occurs in a host. By using the High Availability software, an automatically switching the hosts is possible.
Fibre channel	Input/output channel using Fibre cable.
GUI	Graphical User Interface
High Availability (HA) Software	Software that automatically switches a host to a stand-by host (fail-over) during a failure of a host and disks. High Availability software is installed in more than one host respectively.
I/O	input/output
LAN	Local Area Network
LDEV	Logical Device
LU	Logical unit in a device that is connected with Fibre.
LUN	Logical Unit Number. The number of the unit that is connected with Fibre.

PC	Personal Computer
P-VOL	Primary volume, the volume on the primary side of the pair volume. The primary volume controls the pair status, and the status reflects on the secondary volume.
Pair status	The status of the logical volume that is paired.
Paired volume	Primary and secondary volume that are paired in a disk array device.
PSUE	Pair Suspended-Error
PSUS	Pair Suspended-Split
RAID	Redundant Array of Independent Disks
Resynchronization (TrueCopy 9500V/ ShadowImage 9500V)	To copy the differential data to the secondary volume for conforming the data of both the primary and secondary volumes. When the resynchronization is completed, the status changes to the pair status.
SMPL	Simplex
Status transition	To change the pair status of the pair volume.
Suspended status	The status when the update operation is suspended with keeping the pair status. Under this status, the differential data control for the updated data is performed in the primary volume.
S-VOL	Secondary volume, the volume on the secondary side of the pair volume. The primary volume controls the pair status, and the status reflects on the secondary volume.
TID	Target ID
Truck size	Truck size (sector/truck) that is fixed per the volume type.
Volume copy	To copy all data of P-VOL into S-VOL.
WDM	Wavelength Division Multiplexing Generally, WDM is to multiplex the optical signal of several channels and DWDM (Dence WDM) is to multiplex the optical signal of several dozen channels.

## Appendix B Operations Using CLI

This section describes the following operation procedure for Synchronous TrueCopy 9500V using the CLI of the Resource Manager 9500V program. The following sections are included:

- Installing Synchronous TrueCopy 9500V
- Uninstalling Synchronous TrueCopy 9500V
- Enabling or Disabling Synchronous TrueCopy 9500V
- Setting the Command Device
- Setting the Target ID
- Setting the Path
- Confirming the Status of the Pairs

For details on the Resource Manager 9500V program, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Resource Manager 9500V User's Guide Command Line Interface (CLI) (MK-92DF603)*.

### B.1 Installing Synchronous TrueCopy 9500V

Since Synchronous TrueCopy 9500V is an extra-cost option, Synchronous TrueCopy 9500V cannot usually be selected (locked) before it can be used. To make Synchronous TrueCopy 9500V available, you must install Synchronous TrueCopy 9500V and set its function selectable (unlock).

**Note:** Before installing/uninstalling Synchronous TrueCopy 9500V, verify that the array unit to be operated is in normal state. If a failure such as a controller blockage has occurred, installation/uninstallation cannot be performed.

To install Synchronous TrueCopy 9500V, the key code provided with the optional feature is required. The following describes the installation procedure.

To install Synchronous TrueCopy 9500V:

1. From the command prompt, register the subsystem (array unit) in which Synchronous TrueCopy 9500V is to be installed, and then connect to the subsystem.
2. Execute the **auopt** command to unlock Synchronous TrueCopy 9500V. The example is shown below.

**Example:**

```
% auopt -unit subsystem-name -lock off -keycode manual-attached-keycode
Password: manager-password
Option was opened.
%
```

3. Execute the **auopt** command to confirm that Synchronous TrueCopy 9500V has been unlocked. The example is shown below.

**Example:**

```
% auopt -unit subsystem-name -refer
Password: manager-password
Option name      Status
TRUE-COPY       Enable
%
```

Synchronous TrueCopy 9500V is installed and the status is “Enable”. Installation of Synchronous TrueCopy 9500V is now complete.

## B.2 Uninstalling Synchronous TrueCopy 9500V

To uninstall Synchronous TrueCopy 9500V, the key code provided with the optional feature is required. Once uninstalled, Synchronous TrueCopy 9500V cannot be used (locked) until it is again unlocked using the key code.

**Note:** The following conditions must be satisfied in order to uninstall Synchronous TrueCopy 9500V:

- All Synchronous TrueCopy 9500V and ShadowImage 9500V pairs must be released (the status of all LUs are SMPL). If ShadowImage 9500V is unlocked, ShadowImage 9500V pairs do not need to be released.
- The path settings must be released.

The following describes the uninstallation procedure.

To uninstall Synchronous TrueCopy 9500V:

1. From the command prompt, register the subsystem (array unit) in which the Synchronous TrueCopy 9500V is to be uninstalled, and then connect to the subsystem.
2. Execute the **auopt** command to lock Synchronous TrueCopy 9500V. The example is shown below.

**Example:**

```
% auopt -unit subsystem-name -lock on -keycode manual-attached-keycode
Password: manager-password
Option was closed.
%
```

3. Execute the **auopt** command to confirm that Synchronous TrueCopy 9500V has been locked. The example is shown below.

**Example:**

```
% auopt -unit subsystem-name -refer
Password: manager-password
DMEC002015: No information displayed.
%
```

Uninstalling Synchronous TrueCopy 9500V is now complete.

### B.3 Enabling or Disabling Synchronous TrueCopy 9500V

Synchronous TrueCopy 9500V can be set to enable or disable the usage when it is installed.

**Note:** The following conditions must be satisfied in order to disable Synchronous TrueCopy 9500V:

- All Synchronous TrueCopy 9500V and ShadowImage 9500V pairs must be released (the status of all LUs are SMPL). If ShadowImage 9500V is unlocked, ShadowImage 9500V pairs do not need to be released.
- The path settings must be released.

The following describes the enabling/disabling procedure.

1. From the command prompt, register the subsystem (array unit) in which the status of the feature is to be changed, and then connect to the subsystem.
2. Execute the **auopt** command to change the status (enable or disable).  
The following is an example of changing the status from enable to disable. If you want to change the status from disable to enable, enter **enable** after the **-st** option.

**Example:**

```
% auopt -unit subsystem-name -option TRUE-COPY -st disable
Password: manager-password
Option modification completed successfully.
%
```

3. Execute the **auopt** command to confirm whether the status has been changed. The example is shown below.

**Example:**

```
% auopt -unit subsystem-name -refer
Password: manager-password
Option name      Status
TRUE-COPY       Disable
%
```

Enabling or disabling Synchronous TrueCopy 9500V is now complete.

## B.4 Setting the Command Device

The command device is a user-selected, dedicated logical volume on the 9500V subsystem that functions as the interface to the CCI software. The Synchronous TrueCopy 9500V commands are issued by the CCI (HORCM) to the 9500V command device.

In order to accept read and write commands that are executed by the 9500V subsystem and return read requests to the UNIX®/PC host, the command device must be designated. The command device must be defined in the HORCM\_CMD section of the configuration definition file for the CCI instance on the attached host. Two command devices can be designated for the 9500V subsystem. You can designate command devices using the Resource Manager 9500V program.

**Note:** LUs set for command devices must be recognized by the host.

To designate command device(s):

1. From the command prompt, register the subsystem (array unit) to which you want to create the command device. Connect to the subsystem.
2. Execute the `aucmddev` command to create a command device.

The following is an example of specifying LU 2 for command device 1.

**Example:**

```
% aucmddev -unit subsystem-name -set -dev 1 2
Password: manager-password
%
```

3. Execute the `aucmddev` command to verify that the command device has been created. The following shows the example.

**Note:** To set the alternate command device function or to avoid data loss and subsystem downtime, designate two command devices. For details on alternate command device function, refer to the *Hitachi Freedom Storage™ Thunder 9500™ V Series Command Control Interface (CCI) User and Reference Guide (MK-92DF609)*.

**Example:**

```
% aucmddev -unit subsystem-name -refer
Password: manager-password
Command Device  LUN
1                2
%
```

4. **To release an already set command device**, specify as follows.  
The following is an example of releasing command device 1.

**Example:**

```
% aucmddev -unit subsystem-name -rm -dev 1
Password: manager-password
%
```

5. **To change an already set command device**, release the already set command device first, then change the LU number. The following is an example of specifying LU 3 for command device 1.

**Example:**

```
% aucmddev -unit subsystem-name -set -dev 1 3
Password: manager-password
%
```

## B.5 Setting the Target ID

The following is the procedure for specifying the target ID. The target ID is specified using the Resource Manager 9500V program.

1. From the command prompt, register the subsystem (array unit) to which you want to set the target ID, and then connect to the subsystem.
2. Execute the **auhgmap** command to set the target ID. The following is the example of setting LU 0 in the subsystem to be recognized as 6 by the host. The port is connected via host group 0 of port 0A on controller 0.

### **Example:**

```
% auhgmap -unit subsystem-name -MappingMode on
Password: manager-password
Are you sure you want to set the mapping mode? (y/n [n]): y
when setting starts, the subsystem stops accepting the access to the controller from
the host.
Before setting, stop the access to the controller from the host.
Do you want to continue processing? (y/n [n]): y
The mapping mode has been set successfully.
%

% auhgmap -unit subsystem-name -add 0 A 0 6 0
Password: manager-password
The mapping information has been set successfully.
%
```

3. Execute the **auhgmap** command to verify that the target ID has been set.

### **Example:**

```
% auhgmap -unit subsystem-name -refer
Password: manager-password
Mapping mode = ON
Port  Group  H-LUN   LUN
   0A      0       6       0
%
```

## B.6 Setting the Path

To specify, release, and reference path status, use the CLI. The procedure is as follows:

1. From the command prompt, register the subsystem (array unit) in which you want to set the system parameter, then connect to the subsystem.
2. The following is an example of referencing the path status where path information is not yet specified.

### Example:

```
% aurmtpath -unit subsystem-name -refer
Password: manager-password
Local Information
  Serial Number : 65010012
  Equipment ID  : 0012

Remote Information
  Serial Number :
  Equipment ID  :

Path  Local  Remote  Status
  0    --    --    undefined
  1    --    --    undefined
%
```

3. Execute the **aurmtpath** command to set the path.

The following is an example:

- **path-0** for 0A and **path-1** for 1A port on the local subsystem
- **path-0** for 0A port
- **path-1** for 1B port on the remote subsystem with serial Number **65012326**, equipment ID **2326**

### Example:

```
% aurmtpath -unit subsystem-name -set -remote 65012326 2326 -path0 0A 0A -path1 1A 1B
Password: manager-password
%
```

4. Execute the `aurmtpath` command to confirm whether the path has been set.

**Example:**

```
% aurmtpath -unit subsystem-name -refer
Password: manager-password
Local Information
  Serial Number : 65010012
  Equipment ID  : 0012

Remote Information
  Serial Number : 65012326
  Equipment ID  : 2326

Path  Local  Remote  Status
  0    0A    0A     normal
  1    1A    1B     normal
%
```

5. To release a previously set command device, specify as follows.

The following is an example of releasing the previously set path information.

**Example:**

```
% aurmtpath -unit subsystem-name -rm
Password: manager-password
%
```

## B.7 Confirming the Status of ShadowImage 9500V Pairs

You can display the ShadowImage 9500V paired logical units using CLI. The following steps describe this procedure.

1. From the command prompt, register the subsystem (array unit) to which you want to display the status of paired logical volumes. Connect to the subsystem.
2. Execute the `aumrcfluc` command to display the pair status.

**Example:**

```
% aumrcfluc -unit subsystem-name
Password: manager-password
  RAID      RAID      Capacity
LU  Group   Level   [block]   D-CTL  C-CTL  Status
2/ 3  0/1      5 / 5    100000000  0      0      PAIR
7/ 8  2/3      1 / 1    100000000  1      1      PAIR
%
```

The pair status is displayed.