

Hitachi Virtual Storage Platform Hitachi Volume Shredder User Guide

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Preface

This document describes and provides instructions for using the Hitachi Volume Shredder secure erase software for the Hitachi Virtual Storage Platform (VSP) storage system.

Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

This preface includes the following information:

- [Intended audience](#)
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Intended audience

This document is intended for system administrators, Hitachi Data Systems representatives, and authorized service providers who install, configure, and operate the Virtual Storage Platform.

Readers of this document should be familiar with the following:

- Data processing and RAID storage systems and their basic functions.
- The Virtual Storage Platform storage system and the *Hitachi Virtual Storage Platform User and Reference Guide*.
- The Storage Navigator software for the Virtual Storage Platform and the *Hitachi Storage Navigator User Guide*.
- Data protection and security practices in enterprise storage environments, including data retention, archival, and shredding.

Product version

This document revision applies to Hitachi VSP microcode 70-05-0x or later.

Document revision level

Revision	Date	Description
MK-90RD7035-00	October 2010	Initial release
MK-90RD7035-01	December 2010	Supersedes and replaces MK-90RD7035-00
MK-90RD7035-02	March 2011	Supersedes and replaces MK-90RD7035-01
MK-90RD7035-03	November 2011	Supersedes and replaces MK-90RD7035-02
MK-90RD7035-04	March 2012	Supersedes and replaces MK-90RD7035-03
MK-90RD7035-05	November 2012	Supersedes and replaces MK-90RD7035-04
MK-90RD7035-06	January 2013	Supersedes and replaces MK-90RD7035-05

Changes in this revision

- Changed section title "Example of Volume Shredding" to "How Volume Shredding Works."
- Added guidelines on required time and conditions for volume shredding.
- Added new section detailing shredding time by drive type: [Shredding times on page 1-4](#)
- Added new section: [Data security practices and Volume Shredder on page 1-2](#)
- Added new section: [Calculating number of overwrite passes for FMDs on page 2-4](#)
- Added new section: [Example of shredding data on FMDs on page 2-4](#)
- Corrected the formulas for calculating number of overwrite passes and deleting data ([Calculating number of overwrite passes for flash drives on page 2-3](#), [Calculating number of overwrite passes for FMDs on page 2-4](#), [Example of shredding data on flash drives on page 2-3](#).)

Referenced documents

Hitachi Virtual Storage Platform documents:

- *Hitachi Storage Navigator User Guide*, MK-90RD7027
- *Hitachi Storage Navigator Messages*, MK-90RD7028
- *Hitachi Virtual Storage Platform User and Reference Guide*, MK-90RD7042

Document organization

The following table provides an overview of the contents and organization of this document. Click the chapter title in the left column to go to that chapter. The first page of each chapter provides links to the sections in that chapter.

Chapter	Description
Chapter 1, Overview of Hitachi Volume Shredder	Provides an overview of Hitachi Volume Shredder.
Chapter 2, Volume Shredder operations	Describes the workflow for shredding volumes and provides instructions for shredding operations, including blocking volumes, calculating shredding settings, shredding volumes, stopping shredding operations, and viewing shredding results.
Chapter A, Volume Shredder GUI reference	Describes the Storage Navigator windows and dialog boxes for Volume Shredder.

Document conventions

This document uses the following terminology conventions:





Convention	Description
Hitachi Virtual Storage Platform (VSP)	Refers to all models of the VSP, unless otherwise noted.

This document uses the following typographic conventions:

Convention	Description
Bold	Indicates the following: <ul style="list-style-type: none">• Text in a window or dialog box, such as menus, menu options, buttons, and labels. Example: On the Add Pair dialog box, click OK.• Text appearing on screen or entered by the user. Example: The -split option.• The name of a directory, folder, or file. Example: The horcm.conf file.
<i>Italic</i>	Indicates a variable, which is a placeholder for actual text provided by the user or system. Used for variables in regular text. Example: copy <i>source-file target-file</i>

Convention	Description
Monospace	Indicates text that is displayed on screen or entered by the user. Example: # <code>pairdisplay -g oradb</code>
< > angle brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Used for variables in monospace text. Example: # <code>pairdisplay -g <group></code>
[] square brackets	Indicates optional values. Example: [a b] indicates that you can choose a, b, or nothing.
{ } braces	Indicates required or expected values. Example: { a b } indicates that you must choose either a or b.
vertical bar	Indicates that you have a choice between two or more options or arguments. Examples: [a b] indicates that you can choose a, b, or nothing. { a b } indicates that you must choose either a or b.

The following table lists note icons that might appear in this document.

Icon	Meaning	Description
	Tip	Provides information, guidelines, or suggestions for performing tasks more effectively.
	Note	Calls attention to additional information.
	Caution	Warns that failure to take or avoid a specified action can result in adverse conditions or consequences (for example, loss of access to data).
	WARNING	Warns that failure to take or avoid a specified action can result in severe conditions or consequences (for example, loss of data).

Convention for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 KB	1,000 (10 ³) bytes
1 MB	1,000 KB or 1,000 ² bytes
1 GB	1,000 MB or 1,000 ³ bytes
1 TB	1,000 GB or 1,000 ⁴ bytes
1 PB	1,000 TB or 1,000 ⁵ bytes
1 EB	1,000 PB or 1,000 ⁶ bytes

Logical storage capacity values (for example, logical device capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
1 KB	1,024 (2^{10}) bytes
1 MB	1,024 KB or $1,024^2$ bytes
1 GB	1,024 MB or $1,024^3$ bytes
1 TB	1,024 GB or $1,024^4$ bytes
1 PB	1,024 TB or $1,024^5$ bytes
1 EB	1,024 PB or $1,024^6$ bytes

Accessing product documentation

The Hitachi Virtual Storage Platform user documentation is available on the Hitachi Data Systems Portal: <https://portal.hds.com>. Please check this site for the most current documentation, including important updates that may have been made after the release of the product.

Getting help

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to the Hitachi Data Systems Portal for contact information: <https://portal.hds.com>

Comments

Please send us your comments on this document: doc.comments@hds.com. Include the document title and number, including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Data Systems.

Thank you!

Overview of Hitachi Volume Shredder

This chapter provides an overview of Volume Shredder operations on the Hitachi Virtual Storage Platform storage system.

- [Data security practices and Volume Shredder](#)
- [Supported volume types](#)
- [Volume Shredder operations](#)
- [Shredding times](#)

Data security practices and Volume Shredder

The Volume Shredder software on Storage Navigator enables you to securely erase data on volumes in the Hitachi Virtual Storage Platform storage system by overwriting existing data to prevent restoration of the erased data. For example, when the user of a volume changes, you may want to purge the data stored by the previous user before giving access to the new user. This method of erasing data by overwriting it with dummy data is referred to as *shredding*.

Because of the way data is written on the drives, overwriting data once or twice might not be enough to ensure that the data cannot be restored. The best practice is to overwrite data at least three times with dummy data. Volume Shredder allows you to specify the number of times the data is overwritten, enabling you to ensure compliance with applicable requirements (for example, DoD5220.22-M).

Supported volume types

You can use Volume Shredder to shred both open-systems and mainframe volumes, including logical devices (LDEVs) and custom volumes (CVs) of all emulation types. External volumes and Dynamic Provisioning virtual volumes* can also be shredded.

*When a shredding operation is performed on an unused virtual volume for Dynamic Provisioning, no dummy data is written to the volume.

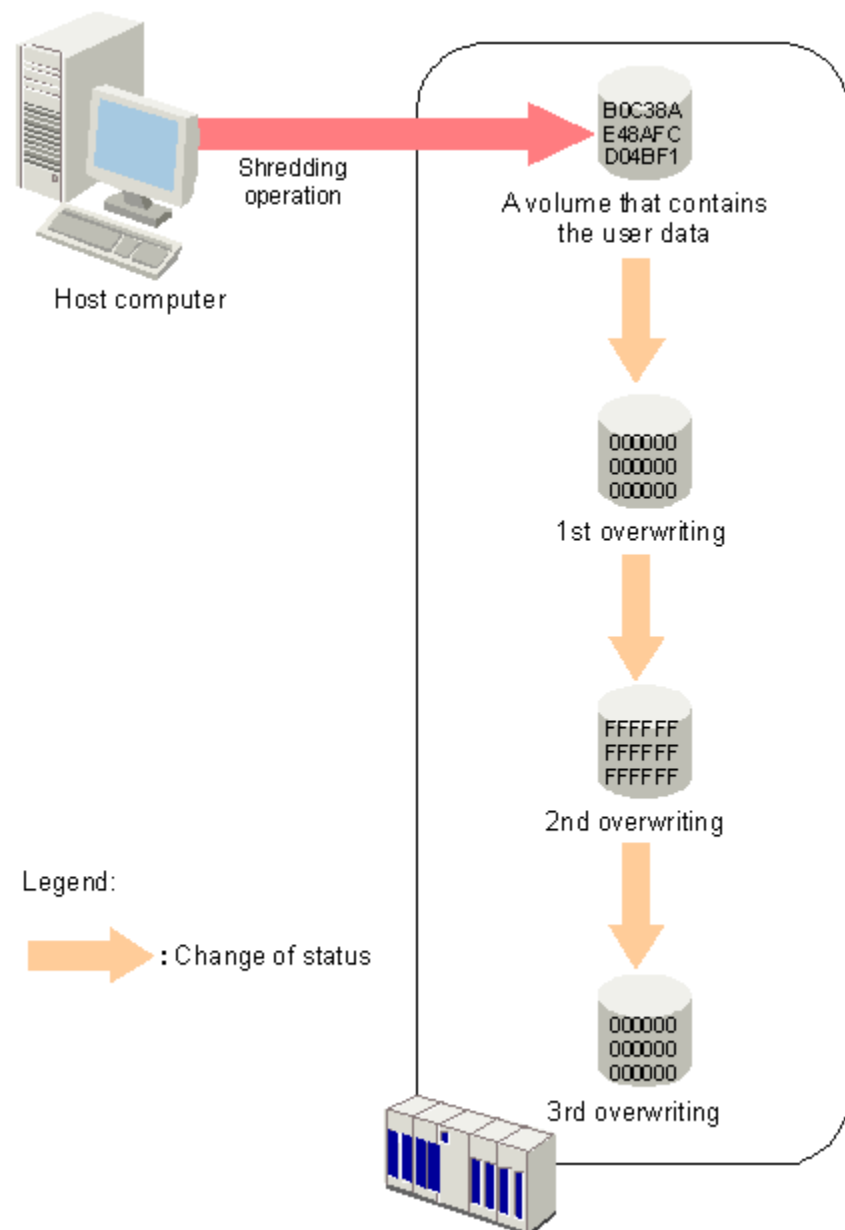
You cannot use Volume Shredder to shred the following types of volumes:

- Pool volumes
- Virtual volumes for Copy-on-Write Snapshot
- Virtual volumes for Thin Image
- Journal volumes
- Volumes that do not have a status of Blocked
- Volumes that are not write-enabled (access attribute is not read/write)

Volume Shredder operations

The following figure shows user data that is being overwritten three times (default value for number of overwrites). Volume Shredder overwrites data using the following dummy data values:

- The first overwrite is 00.
- The second overwrite is FF.
- The third overwrite is 00.



You can configure Volume Shredder to overwrite data from three to eight times, and each time the system overwrites the data you can configure the dummy data to be any hexadecimal number from 0 to FFFF.

After the system finishes overwriting data, you can view the results in the user interface, or, if configured, you can open the compressed results files.

We recommend that you execute the shredding function at times of day when the host I/O load is lowest. If the number of LDEVs to be shredded is large, shredding operations might affect host I/O operations. Use the following formula to determine the standard required time for a shredding operation:

$$(\text{time required for shredding}) = (\text{time required for one dummy data write (standard required time)}) \times (\text{number of times dummy data is written (n)})$$

Shredding times

The following tables show the standard required times for shredding without host I/O, listed by drive type. The same standard times also apply to shredding encrypted drives. The standard required time in each table assumes the use of RAID5 (7D + 1P) configuration, which requires the longest time of all RAID levels, and OPEN-V volumes.

For DKxxx-JxxxSS/KxxxSS/HxxxSS disk drives:

Rotation per minute	Number of ECCs	Standard required time
10 Krpm, 15 Krpm	1	35 minutes
	32	70 minutes
	64	135 minutes
	128	300 minutes
7.2 Krpm	1	57 minutes
	32	110 minutes
	64	220 minutes
	128	490 minutes
Hard disk drive capacity is assumed to be 100 GB.		

For DKxxx-HxxxAT disk drives:

Number of ECCs	Standard required time
1	18 hours
40	40 hours
80	80 hours
Hard disk drive capacity is assumed to be 2 TB.	

For flash drives (SSDs):

Number of ECCs	Standard required time
1, 2, 4	70 minutes
Flash drive capacity is assumed to be 200 GB.	

For FMDs:

Number of ECCs	Standard required time
1, 2, 4	20 minutes
FMD capacity is assumed to be 100 GB.	

The standard required time depends on the following:

- RAID level of the ECC
- Number of drives that make up the ECC
- LDEV emulation type defined for the ECC

The following table lists the differences in the standard required times for the RAID levels as compared to RAID5 (7D+1P).

RAID level	Difference in standard required time
RAID1 (2D + 2D)	-30% to -50% (faster)
RAID5 (3D + 1P)	
RAID6 (6D + 2P)	-10% to -30% (faster)
RAID6 (14D + 2P)	+5% to + 25% (slower)

When host I/Os are performed, the required shredding time is at least six times that of when no host I/Os are performed. If a DKxxx-HxxxAT hard disk drive is used for the ECC when creating a parity group on an encrypted hard disk drive, the time required for shredding that parity group is the maximum time listed.

If the volumes to be shredded belong to drives of mixed types or mixed configurations, the longest required times associated with the drive type or drive configuration apply to all volumes. Thus, mixed types and configurations take more time for the volumes to become available for use than when the drive type and drive configuration are the same. When you add drives or change drive configurations, you should arrange the drives into those with the same standard required times, and then add drives starting with those volume types requiring the least shredding time.

Fibre-channel connectivity is required for both mainframe and open-systems volumes.

Volume Shredder operations

This chapter describes and provides instructions for performing Hitachi Volume Shredder operations:

- [Volume Shredder workflow](#)
- [Blocking volumes](#)
- [Calculating number of overwrite passes for flash drives](#)
- [Calculating number of overwrite passes for FMDs](#)
- [Shredding a volume](#)
- [Stopping a shredding operation](#)
- [Viewing shredding results in Storage Navigator](#)
- [Viewing shredding results in the compressed files](#)
- [Volume Shredder status messages](#)

Volume Shredder workflow

The following workflow shows the tasks to be performed when shredding volumes:

1. Change the status of the volumes to **Blocked**.
See [Blocking volumes on page 2-2](#).
2. Calculate the required number of overwrite passes for each shredding operations. This applies only when you are shredding volumes on flash drives and FMDs.
 - See [Calculating number of overwrite passes for flash drives on page 2-3](#).
 - See [Calculating number of overwrite passes for FMDs on page 2-4](#).
3. Perform the volume shredding operations.
See [Shredding a volume on page 2-5](#).
4. If necessary, you can stop a shredding operation that is in process.
See [Stopping a shredding operation on page 2-7](#).
5. View the results of the shredding operations.
 - See [Viewing shredding results in Storage Navigator on page 2-8](#).
 - See [Viewing shredding results in the compressed files on page 2-9](#).

Blocking volumes

Before you can shred a volume, you must change the status of the volume to Blocked.



Note: When a volume has a status of Blocked, hosts cannot write to the volume.

1. Open the Storage Navigator main window.
2. Click **Storage System** in **Explorer**.
3. Select the volume (resource) in the **Storage System** folder.
The **LDEVs** tab appears when you select a parity group in **Parity Group** or when you select an LDEV in **Logical Device**.
4. Check the volume status in the **Status** column. If a status other than **Block** is displayed, the volume is not blocked. Continue to the next step.
If **Block** is displayed, the volume is already blocked. You can now calculate the number of overwrite passes (for flash drives and FMDs only) and then shred the volume.
5. Select the volume, and then click **Block LDEVs**.
6. When the confirmation message appears, click **Apply** to block the selected LDEVs.

If the volumes to be shredded are on flash drives or FMDs, you must now calculate the required number of overwrite passes before you can shred the volumes:

- [Calculating number of overwrite passes for flash drives on page 2-3](#)

- o [Calculating number of overwrite passes for FMDs on page 2-4](#)

If the volumes to be shredded are on hard disk drives, you can now shred the volumes: [Shredding a volume on page 2-5](#)

Calculating number of overwrite passes for flash drives

Because of the way space is allocated in flash drives, the dummy data that is used to overwrite the volume must exceed the capacity of the target volume. Therefore, before you shred a volume on flash drives, you need to calculate the number of times the system must overwrite the volume with dummy data.

1. Select an LDEV in **Logical Device** and write down its capacity and the amount of data in the RAID configuration (found on the **LDEVs** tab).

Examples of amounts of data in a RAID configuration:

n of RAID5(nxD + 1P)

n of RAID6(nxD + 2P)

2. Use the following formula to calculate the number of times to overwrite the data (N):

$$N = (\text{User-capacity-for-Data} \times 2) / \text{Capacity-of-target-volume}$$

When the capacity of the flash drive is 72 GB, 72 GB x n

Example: The capacity of the flash drive is 72 GB, the RAID configuration is 3D+1P, and the LDEV capacity is 100 GB.

$$[(72 \times 3) \times 2] / 100 = 4.32 = \text{five times}$$

Round up the value (4.32) to the nearest whole number. You need to overwrite the data five times.

Example of shredding data on flash drives

In this sample configuration, the flash drive capacity is 200 GB, the RAID configuration is 3D+1P, and the LDEV capacity is 220 GB.

1. Calculate the number of shredding operations.

$$[(200 \times 3) \times 2] / 220 = 5.45 = \text{six times}$$

Round up the value (5.45) to the nearest whole number. You need to overwrite the data six times.

2. Define the shredding settings.

Refer to [Shredding a volume on page 2-5](#), enter the dummy data **00** in the text box and add a row to the **Data Pattern (User Setting)** list (add rows for performing the shredding operation six times).

3. Erase the volume data.

Refer to [Shredding a volume on page 2-5](#) and execute the shredding operation.

4. Repeat steps 2 and 3 using the dummy data **FF**.

5. Repeat steps 2 and 3 using the dummy data **00**.

Calculating number of overwrite passes for FMDs

Because of the way space is allocated in FMDs, the dummy data that is used to overwrite the volume must exceed the capacity of the target volume. Therefore, before you shred a volume on FMDs, you need to calculate the number of times the system must overwrite the volume with dummy data.

1. Select an LDEV in **Logical Device** and write down its capacity and the amount of data in the RAID configuration (found on the **LDEVs** tab).

Examples amounts of data in a RAID configuration:

n of RAID5(nxD + 1P)

n of RAID6(nxD + 2P)

2. Use the following formula to calculate the number of times to overwrite the data (N):

$$N = (\text{User-capacity-for-Data} \times 2) / \text{Capacity-of-target-volume}$$

When the capacity of the FMD is 1,600 GB, 1,600GB x n

Example: The capacity of the FMD is 1,600 GB, the RAID configuration is 3D+1P, and the LDEV capacity is 880 GB.

$$[(1,600 \times 3) \times 2] / 880 = 10.9 = 11 \text{ times}$$

Round up the value (10.9) to the nearest whole number. You need to overwrite the data 11 times.

You can write dummy data up to eight times in one shredding operation. To write dummy data nine or more times, perform the shredding operation for the volume as many times as required.

Example of shredding data on FMDs

This example assumes that the capacity of the FMD is 1,600 GB, the RAID configuration is 3D+1P, and the LDEV capacity is 880 GB.

1. Calculate the number of times to overwrite the data:

$$[(1,600 \times 3) \times 2] / 880 = 10.9 = 11 \text{ times}$$

Round up the value (10.9) to the nearest whole number. You need to overwrite the data 11 times.

2. Define the shredding settings.

Refer to [Shredding a volume on page 2-5](#), select **Data Pattern (User Setting)** list and **Random Data**, then click **Add** eight times.

3. Erase the volume data.

Refer to [Shredding a volume on page 2-5](#) for procedures on erasing the volume data.

4. Repeat steps 2 and 3, three more times, clicking **Add** three times.

Shredding a volume

Configure data overwrite patterns and the number of overwrite passes in the **Shredding Parameters** window. By default the number of overwrite passes is three; but you can change this number from three to up to eight times. The system keeps user-specified settings while the **Shred LDEVs** window is open.

1. Open the Storage Navigator main window.
2. Select the resource from the **Parity Group** or an LDEV in **LDEVs**. The **LDEVs** tab appears.
3. Select the volume you want to overwrite, and then click **Shred LDEVs**.

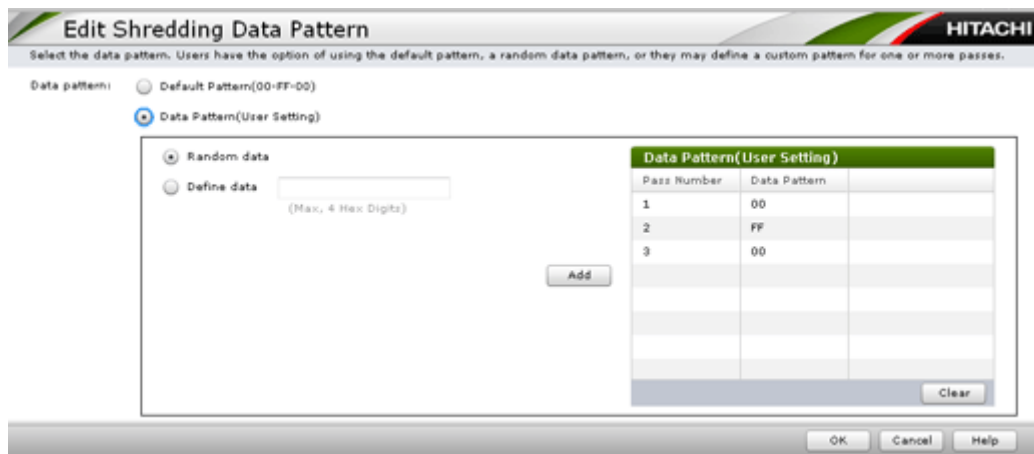
LDEV ID	LDEV Name	Parity Group ID	Pool Name(ID)	Emulation Type	Capacity	Provisioning Type	Data Output
0000:00		P61-2	-	OPEN-V	0.04 GB	Basic	YES

Pass Number	Data Pattern
1	00
2	FF
3	00

4. Click **Edit Data Pattern**.
The **Edit Shredding Data Pattern** window opens.
5. To use the default value, click the **Default Pattern (00-FF-00)** radio button, and click **OK**. To specify custom settings, click the **Data Pattern (User Setting)** radio button and continue to the next step.



Caution: For FMDs, make sure you select Random Data as the specified Data Pattern.



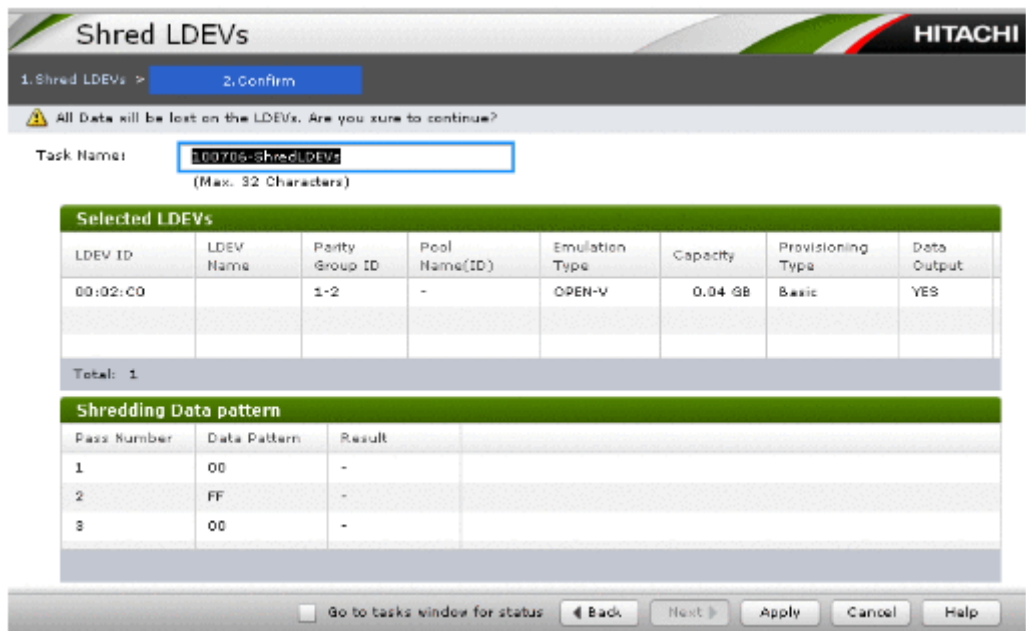
6. To use the random data setting, select the **Random Data** radio button, and click **Add**. Random numbers are added in the **Data Pattern (User Setting)** table. To close the **Edit Shredding Data Pattern** window, click **OK**.
7. Specify the data pattern and then click OK. Click the **Define Data** radio button, and then enter a number that you want to use as dummy data in the text box, and click **Add**. You can enter a hexadecimal number of up to four digits (0 to FFFF). The number is added in the **Data Pattern (User Setting)** table.

If you make a mistake, click **Clear** and reenter the desired numbers.



Caution: You should enter three or more numbers to use as dummy data. If you overwrite data with less than three numbers, some or all data might be recoverable.

8. Click **Shred LDEVs**.
The **Shred LDEVs** window appears.
9. To save the results of the volume shredding process as a file, click **Set Data Output**. If not, click **Cancel Data Output**.
Note: You can save results for up to three volumes.
10. Click **Finish** in the **Shred LDEV** window.
11. Review the settings, name the task, and then click **Apply** to start.
When the volume is shredded, the volume status changes to **Normal**.



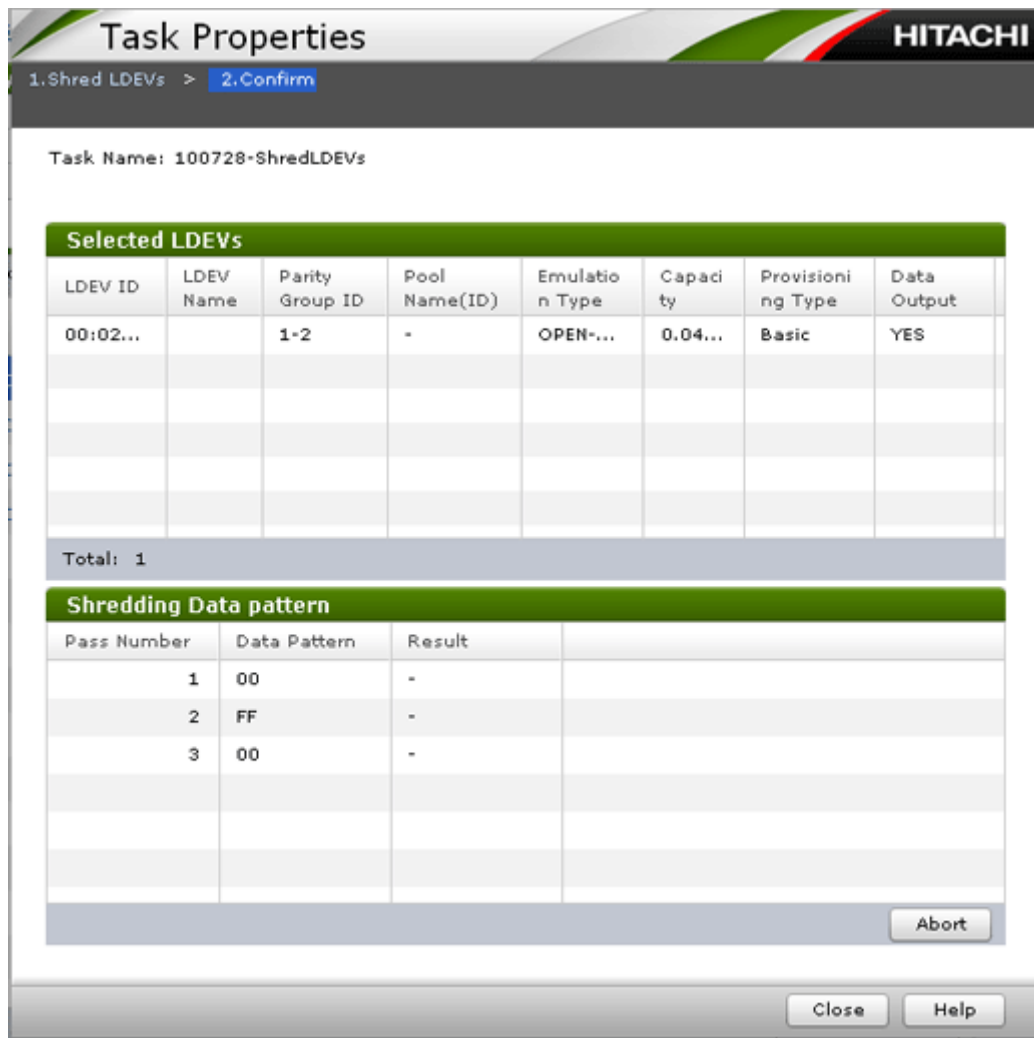
Stopping a shredding operation

You can stop the volume shredding process.



Caution: If you stop the shredding process, you cannot restart the process. Data integrity of the volume is not guaranteed.

1. Open the Storage Navigator main window.
2. Select **Storage System** in **Explorer**.
3. Select **Tasks**.
A list of tasks appears.
4. In the list, click the task you want to stop.
The **Task Properties** dialog box opens.
5. Click **Abort** in the **Shredding Data pattern** field.

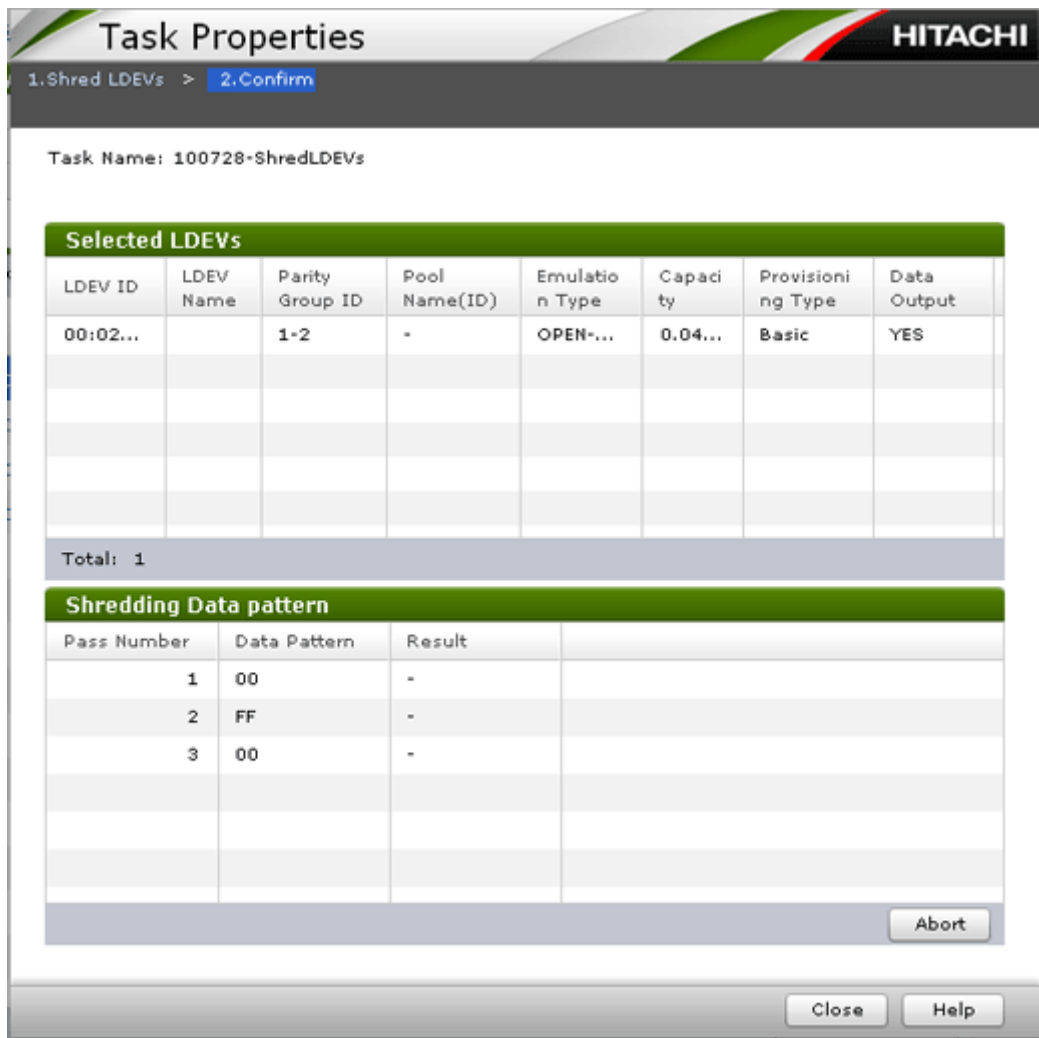


6. Verify the displayed settings and click **Yes**.The shredding process stops.
7. Click **Close** in the **Task Properties** dialog box.

Viewing shredding results in Storage Navigator

After a volume is shredded, you can check the results of the process in Storage Navigator.

1. Open the Storage Navigator main window.
2. Select **Storage System** in **Explorer**.
3. Select **Tasks**.
A list of tasks appears.
4. In the list, click the task name.
The **Task Properties** dialog box opens.



- Confirm the **Result** in the **Shredding Data pattern** table.
Check the contents to verify whether all the overwriting operations have ended normally.
If an overwriting pass ends abnormally, shredding is not successful. If shredding fails, try to shred the volume again. If shredding fails again, contact Hitachi Data Systems Support Center to resolve the error.
If power to the system stops during the shredding process, the **Shredding operation canceled** or **Shredding operation Failed** message appears.
- Click **Close** in the **Task Properties** dialog box.

Viewing shredding results in the compressed files

In the **Selected LDEVs** table on the **Shred LDEVs** window, if the **Data Output** column is set to **YES**, the result of shredding a volume can be saved as files on the Storage Navigator computer. Use this file to check the results of shredding a volume.

When you open the compressed file, you see binary and text files that contain shredding results:

- The name of the binary file indicates LDKC, CU, and LDEV numbers of the shredded volumes, and the number of times the system wrote dummy data to the volumes. For example, if a binary file is named 00-01 11 03.bin, the LDKC number is 00, the CU number is 01, and the LDEV number is 11. The filename also indicates that the system wrote dummy data to that volume three times. A binary file contains the first 512 bytes of data of a shredded volume (LDEV).
- The file name of a text file appears as follows:

shred_finish-time-of-shredding-operation.txt

The compressed file is saved with the time zone setting of the SVP. If the compressed file is decompressed on the Storage Navigator computer, the time stamp of the decompressed file appears with the time zone setting of the Storage Navigator computer. The time stamp of the decompressed file might be different from the actual finish time of the shredding operation.

The text file contains the following summary information:

- Results of the shredding operation (see [Volume Shredder status messages on page 2-10](#))
 - Contents of the dummy data
 - Shredded volumes
 - Start and finish time of the shredding operation
1. On the menu bar, select **Reports > Shredding Report >** and **Download Latest Report** or **Download Other Reports**.
Select **Download Latest Report** to download the latest result file.
Select **Download Other Reports** to download the past ten times result files.
The message that the preparation for download is completed appears.
 2. Click **OK**.
 3. Specify the folder in which to download the file.
 4. Click **Save**.

Compression files are downloaded.

Volume Shredder status messages

The following table lists and describes the Volume Shredder status messages that are displayed in the shredding results.

Status	Description
—	The shredding operation was not performed.
Shredding operation Normal.	The shredding operation was successful.
Writing.	The shredding operation is in process.

Status	Description
Shredding operation not executed.	The shredding operation did not occur as specified.
Shredding operation canceled.	The shredding operation was canceled, or power to the system was interrupted.
Shredding operation Failed.	The shredding operation was not successful, or power to the system was interrupted.
Shredding data transfer error.	The system could not write the shredding results to a file.
Shredding data verify error.	An error was detected in the file containing the shredding results.
No-data assigned.	When you shred an unused Dynamic Provisioning virtual volume, no dummy data is written to the volume. In this case the status of the shredding operation in the shredding results file is No-data assigned .



Volume Shredder GUI reference

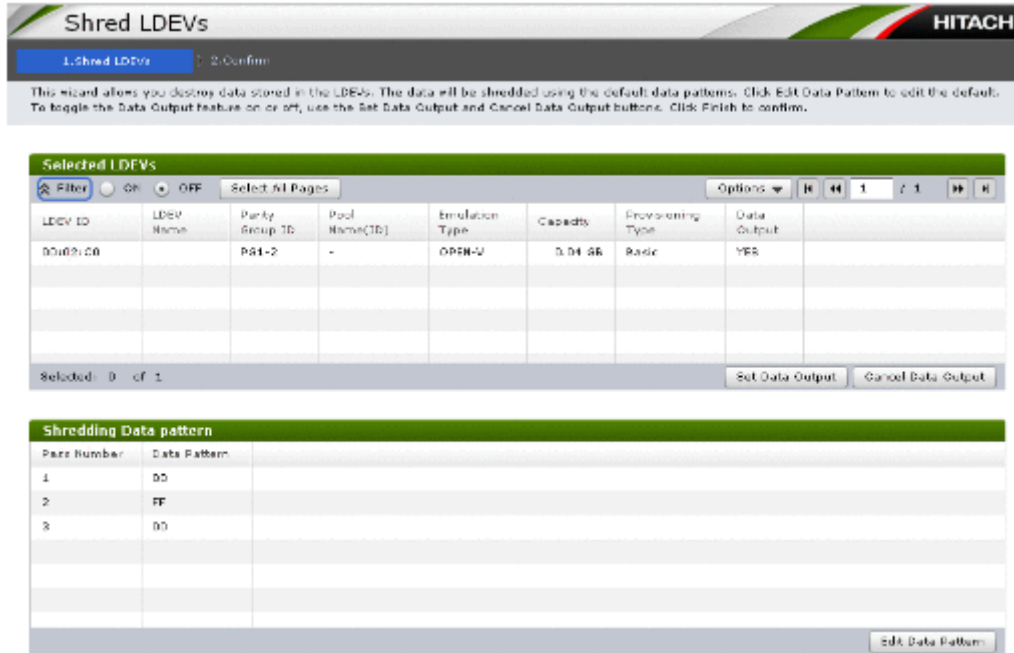
This appendix describes the Storage Navigator windows for Volume Shredder.

- [Shred LDEVs wizard](#)
- [Edit Shredding Data Pattern window](#)

Shred LDEVs wizard

Shred LDEVs window

Use the **Shred LDEVs** window to select the volumes (LDEVs) to be shredded, configure the shredding operations (number of overwrite passes, data patterns), and enable/disable the output of shredding results to files.



Selected LDEVs table on the Shred LDEVs window

Item	Description
LDEV ID	ID of the selected LDEV. The ID is a combination of the logical disk controller (LDKC) number, control unit (CU) number, and LDEV number. Free indicates free space.
LDEV Name	Name of the selected LDEV.
Parity Group ID	Parity group number (for example, 1-1) of the selected LDEV. <ul style="list-style-type: none"> A parity group number starting with E (for example, E1-1) indicates that the parity group contains one or more external volumes. A parity group number starting with V (for example, V1-1) indicates that the parity group contains one or more Copy-on-Write Snapshot virtual volumes. A parity group number starting with X (for example, X1-1) indicates that the parity group contains one or more Dynamic Provisioning virtual volumes.
Pool Name(ID)	Pool volume (pool-VOL) name and ID.
Emulation Type	Emulation type of the selected LDEV.
Capacity	Capacity of the selected LDEV. To change the capacity unit, select Option > Capacity Unit .

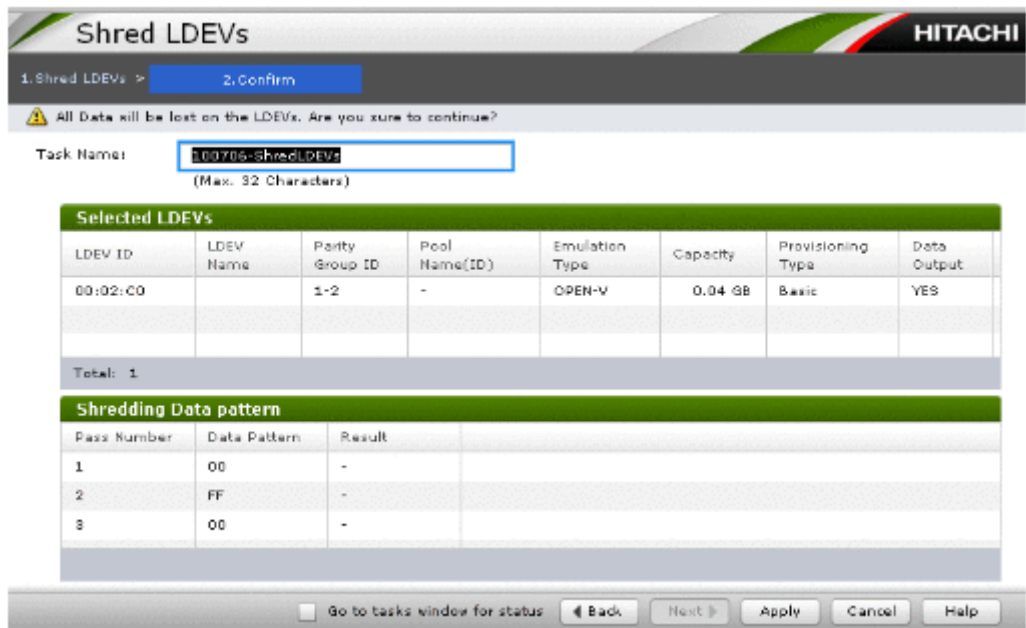
Item	Description
Provisioning Type	Provisioning type of the selected LDEV: <ul style="list-style-type: none"> • Basic: Internal volume • External: External volume • DP: Virtual volume of Dynamic Provisioning
Data Output	Indicates whether the results of the shredding operation will be saved in a file. Results can be saved for up to three volumes.
Set Data Output	Click to save the shredding results, and then click Yes to save the results or No to discard the results.
Cancel Data Output	Click to cancel the output of results for the selected LDEV.

Shredding Data Pattern table on the Shred LDEVs window

Item	Description
Pass Number	Order of the overwrite pass.
Data Pattern	Dummy data pattern for the overwrite pass.
Edit Data Pattern	Click to open the Edit Shredding Data Pattern dialog box, which allows you to change the data pattern setting.

Confirm window

Use the **Confirm** window to review the information for the volume shredding operations and start the shredding task. When you are ready to start the specified volume shredding operations, enter a unique name for the shredding task, and then click **Apply** to start the shredding operations.



Selected LDEVs table on the Confirm window

Item	Description
LDEV ID	ID of the LDEV to be shredded. The ID is a combination of the logical disk controller (LDKC) number, control unit (CU) number, and LDEV number. Free indicates free space.
LDEV Name	Name of the LDEV to be shredded.
Parity Group ID	Parity group number (for example, 1-1) of the LDEV to be shredded. <ul style="list-style-type: none"> • A parity group number starting with E (for example, E1-1) indicates that the parity group contains one or more external volumes. • A parity group number starting with V (for example, V1-1) indicates that the parity group contains one or more Copy-on-Write Snapshot virtual volumes. • A parity group number starting with X (for example, X1-1) indicates that the parity group contains one or more Dynamic Provisioning virtual volumes.
Pool Name(ID)	Pool volume (pool-VOL) name and ID.
Emulation Type	Emulation type of the LDEV to be shredded.
Capacity	Capacity of the LDEV to be shredded. To change the capacity unit, select Option > Capacity Unit .
Provisioning Type	Provisioning type of the LDEV to be shredded: <ul style="list-style-type: none"> • Basic: Internal volume • External: External volume • DP: Virtual volume of Dynamic Provisioning
Data Output	Indicates whether the results of the shredding operation will be saved in a file. Results can be saved for up to three volumes.
Set Data Output	Click to save the shredding results for the selected LDEV, and then click Yes to save the results or No to discard the results.
Cancel Data Output	Click to cancel the output of results for the selected LDEV.

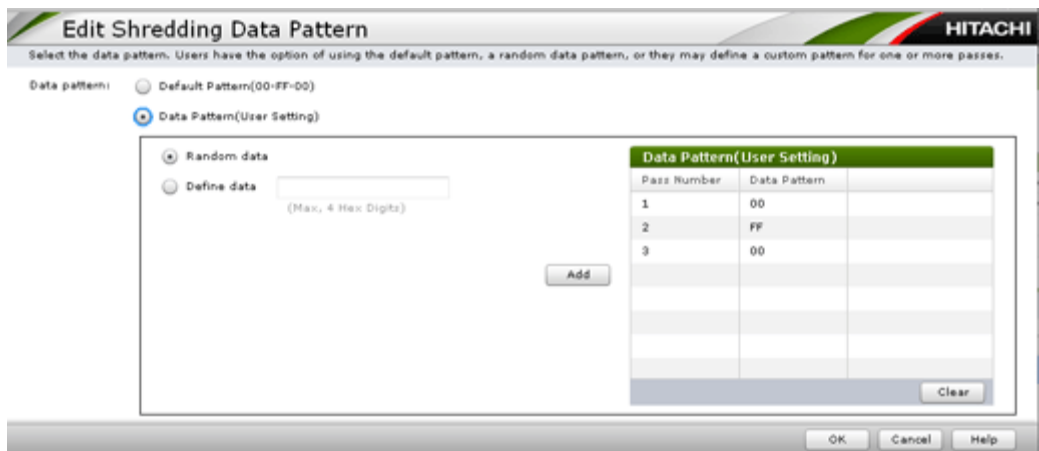
Shredding Data Pattern table on the Confirm window

Item	Description
Pass Number	Order of the overwrite pass.
Data Pattern	Dummy data pattern for the overwrite pass.

Item	Description
Result	<p>Results of the shredding operations:</p> <ul style="list-style-type: none"> • -: The system did not overwrite the volume. • Shredding operation Normal: The system successfully overwrote the volume. • Writing: The system is overwriting the volume now. • Shredding operation not executed: The system did not overwrite the volume as configured. • Shredding operation canceled: The system or user cancelled the overwrite request. • Shredding operation Failed: The overwrite process ended unsuccessfully. • Shredding data transfer error: The results could not be written to a file. • Shredding data verify error: An error was detected while verifying the file containing the result. • No-data assigned: The Dynamic Provisioning virtual volume was unused; no dummy data was written to the volume.

Edit Shredding Data Pattern window

Use the **Edit Shredding Data Pattern** window to configure the volume shredding settings, including number of overwrite passes and dummy data patterns.



Item	Description
Data Pattern	<p>Type of data pattern: default data pattern or custom.</p> <ul style="list-style-type: none"> • Default Pattern(00-FF-00): Three passes with the following dummy data patterns: "00" for the first pass, "FF" for the second pass, and "00" for the third pass. • Data Pattern(User Setting): Select to define the number of passes and the data pattern for each pass.
Random Data	Volume Shredder selects a 4-digit hexadecimal number at random to be used as the dummy data pattern for the pass.

Item	Description
Define Data	Enter a hexadecimal number (from 0 to FFFF) to be used as the dummy data for the user-defined pass.
Add	Adds the user-defined data pattern to the Data Pattern(User Setting) table. This button is available only when you select Data Pattern(User Setting) for the Data pattern type.

Data Pattern (User Setting) table on the Edit Shredding Data Pattern window

Item	Description
Pass Number	Order of the overwrite pass.
Data Pattern	Dummy data pattern for the overwrite pass.
Clear	Clears the values (other than 00) in the bottom row of the Data Pattern(User Setting) table.



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