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# Hitachi Freedom Storage™
# Lightning 9900™
# FlashAccess (DCR) User's Guide

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# Preface

This user's guide provides instructions for installing and using the FlashAccess feature (also referred to as DCR or Dynamic Cache Residence) on the 9900 Remote Console PC. Please read this manual carefully to understand how to use these products, and maintain a copy that is accessible from your Remote Console PC for reference purposes.

This user's guide assumes that:

- the user has a background in data processing and understands direct-access storage device subsystems and their basic functions,
- the user is familiar with the Hitachi Freedom Storage™ 9900 array subsystem,
- the user is familiar with the Hitachi Freedom Storage™ 9900 Remote Console, and
- the user is familiar with the Windows 95®, Windows 98®, Windows NT® or Windows 2000® operating systems.

For further information on the Hitachi Freedom 9900 subsystem, please refer to the *Hitachi Freedom Storage™ 9900 User and Reference Guide* (MK-90RD008). For further information on the Hitachi Freedom 9900 Remote Console, please refer to the *Hitachi Freedom Storage™ 9900 Remote Console User's Guide* (MK-90RD003). You may also contact your Hitachi Data Systems account team or refer to the Hitachi Data Systems worldwide web site (http://www.hds.com) for additional information on the 9900 subsystem and its features and functions.

***Note:*** In this document the term "9900" refers to the entire Hitachi Freedom Storage™ Lightning 9900™ subsystem family, unless otherwise noted.

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# Chapter 1 Overview of FlashAccess (DCR)

## 1.1 General Parameters for FlashAccess

The FlashAccess feature of the 9900 subsystem, also called Dynamic Cache Residence (DCR), allows you to store specific data in cache memory. FlashAccess increases the data access speed for the cache-resident data by enabling read and write I/Os to be performed at host data transfer speeds.

The FlashAccess cache areas (called cache extents) have the following parameters:

- They are dynamic and can be added and deleted at any time.
- The 9900 supports a maximum of 1024 addressable cache extents per LDEV, and up to 1,024 cache extents per subsystem.
- FlashAccess operations support both open volumes (OPEN-3/8/9/K/E/L/M) and mainframe volumes (3380-E/J/K, and 3390-1/2/3/3R/9). FlashAccess also supports the use of LUSE and CVS (Virtual LVI/LUN) volumes. Using FlashAccess in conjunction with Virtual LVI/LUN will achieve better performance improvements than when either of these options is used individually. ***Note:*** OPEN-L and OPEN-M are applicable for Windows 2000 only, and are not supported for CVS operations.
- For mainframe volumes, each FlashAccess cache area must be defined on contiguous tracks, with a minimum size one cache slot (or track) and a maximum size of one LVI/LU. The 9900 supports a maximum of 16 addressable cache extents per LDEV, and up to 1,024 cache extents per subsystem.
- If a user needs an entire mainframe or open-system volume in DCR, using a small CVS volume will use less cache. (Refer to the *Hitachi Freedom Storage™ 9900 Virtual LVI/LUN User's Guide* for more information on Custom Volume Size.)
- For open systems, DCR cache extents must be defined in Logical Blocks using Logical Block Addresses (LBAs), with a minimum size of 96 LBAs. However, it is most likely that users will assign the entire open system volume for DCR.
- If the remaining cache memory is less than 256 MB, DCR is not available.
- The user has the option of pre-staging the data to the resident area. If pre-staging is not used, then the data will be loaded into the DCR extents when the first 'miss' occurs. If pre-staging is used, it may affect performance for a short time while reading the data into DCR cache. Pre-staging should not be performed during peak activity.
- All write I/Os to DCR data are duplex writes, guaranteeing full data integrity. The DCR data remains fixed in cache until the user manually deletes it. Deletion of DCR extents will de-stage any write data to the affected volume(s).
- It is possible to expand the amount of DCR cache without canceling the existing DCR settings. Please call the Hitachi Data Systems Technical Support center for assistance.

FlashAccess also allows the user to pre-stage the data onto the resident area before the host accesses it. ***Caution:*** If the subsystem cache becomes overloaded during pre-staging, there may be degradation in performance, or the SIM (reference code = 4821a0) may be reported to end the pre-staging process abnormally. Pre-staging requests should be done during a normal load. Pre-staging requests will not be accepted during pre-staging execution.

Table 1.1 illustrates the SIMs that may be reported by the SVP during the pre-staging process.

**Table 1.1 Pre-Staging SIMs**

| Error | Reference Code: 22 | Reference Code: 23 | Reference Code: 13 | SIM: 28 | Level | Host Report | Remarks |
|---|---|---|---|---|---|---|---|
| Pre-staging abnormal end | 48 | 21 | xx *Note 1* | FE | Service | No | xx indicates abnormal end of pre-staging |

**Note 1:** Reference codes xx (abnormal end of prestaging) are as follows:

-x10: No DCR program product
-x20: Subsystem busy
-x40: Staging time over
-x50: Cache blockade
-x60: LDEV blockade
-x70: Staging failure
-x80: Power Supply off
-xa0: Cache overloaded

***Caution:*** The user may want to increase total subsystem cache capacity when using FlashAccess to avoid data access performance degradation for non-FlashAccess data. FlashAccess is only available on 9900 subsystems configured with at least 512 MB of cache. The Hitachi Data Systems representative configures the maximum allowable FlashAccess area when the cache is installed.

***Note:*** The DCR program recognizes logical blocks in 96 block increments. For example, if you enter a starting LBA as 1 and an ending LBA as less than 96, the DCR program will automatically change the beginning LBA to 00 and the ending LBA to 95. Table 1.2 shows the LBA blocks for open systems.

**Table 1.2 Logical Block Addresses for Open Systems**

| Starting LBA | Ending LBA | Starting LBA | Ending LBA | Notes |
|---|---|---|---|---|
| 0 | 95 | 192000 | 192095 | |
| 96 | 191 | 288000 | 288095 | |
| 192 | 287 | 384000 | 384095 | |
| 288 | 383 | 480000 | 480095 | |
| 384 | 479 | 576000 | 576095 | |
| 480 | 575 | 672000 | 672095 | |
| 576 | 671 | 768000 | 768095 | |
| 672 | 767 | 864000 | 864095 | |
| 768 | 863 | 960000 | 960095 | |
| 864 | 959 | 1920000 | 1920095 | |
| 960 | 1055 | 2880000 | 2880095 | |
| 1920 | 2015 | 3661824 | 3661919 | OPEN-K maximum LBA |
| 2880 | 2975 | 3840000 | 3840095 | |
| 3840 | 3935 | 4800000 | 4800095 | |
| 4800 | 4895 | 4806624 | 4806719 | OPEN-3 maximum LBA |
| 5760 | 5855 | 4806720 | 4806815 | |
| 6720 | 6815 | 5760000 | 5760095 | |
| 7680 | 7775 | 6720000 | 6720095 | |
| 8640 | 8735 | 7680000 | 7680095 | |
| 9600 | 9695 | 8640000 | 8640095 | |
| 19200 | 19295 | 9600000 | 9600095 | |
| 29900 | 28895 | 10560000 | 10560095 | |
| 38400 | 38495 | 11520000 | 11520095 | |
| 48000 | 48095 | 12480000 | 12480095 | |
| 57600 | 57695 | 13440000 | 13440095 | |
| 67200 | 67295 | 14350944 | 14351039 | OPEN-8 maximum LBA |
| 71904 | 71999 | 14422944 | 14423039 | OPEN-9 maximum LBA |
| 72000 | 72095 | 28452864 | 28452959 | OPEN-E maximum LBA |
| 76800 | 76895 | 71192064 | 71192159 | OPEN-L maximum LBA (*note1) |
| 86400 | 86495 | 92158464 | 92158559 | OPEN-M maximum LBA (*note1) |
| 96000 | 96095 | | | |

***Note 1***: OPEN-L and OPEN-M are applicable for Windows 2000 only.

## 1.2 Selecting the FlashAccess Mode

### 1.2.1 Priority Mode

In priority mode (normal mode) the DCR extents are used to hold read data for specific extents on volumes. Write data is write duplexed in normal cache and de-staged to disk using standard algorithms. Because there is no duplexed write data in the cache reserved for DCR, all priority mode DCR extents are 100% utilized by user read type data. The main advantage of DCR priority mode is that read data is transferred at electronic speed.

In open systems, one slot is 48KB, which requires 3 cache segments (16KB/segment). For example, 16 slots for open systems require 768KB of reserved cache. For S/390®, one slot is either 48KB or 56KB. This requires either 3 or 4 cache segments (16KB/segment). 16 slot images for S/390® requires either 768KB of reserved cache (for a 3380 type device) or 1MB of reserved cache (for a 3390 type device).

***Note:*** Even though a slot (track) for S/390® is 56KB (3390 type LDEV), because cache is divided into 16KB segments it will require 4 segments.

- In **Priority Mode**, the total capacity of cache required is as follows:
  - Standard cache + DCR cache + Additional cache
- In **Bind Mode**, the total capacity of cache required is as follows:
  - Standard cache + DCR cache
- When you install the FlashAccess feature using priority mode, the amount of additional cache required depends on the number of cache extents. If you are installing 512 or fewer cache extents, you must install 512 MB of additional cache. If you are installing between 513 and 1024 cache extents, you must install 1024 MB of additional cache.

### 1.2.2 Bind Mode

In bind mode the DCR extents are used to hold read and write data for specific extent(s) on volume(s). Any data written to the DCR bind area is not de-staged to the disk. To ensure data integrity, write data must be duplexed in the DCR area, which consumes a significant amount of the DCR cache.

For RAID-5 the amount of DCR cache required is 3 times the space required for the user data. In RAID-5 open systems, one slot is 48KB, which requires 9 cache segments (16KB/segment). 16 slots for open systems require 2.25MB of reserved cache. In RAID-5 S/390 systems, one slot is either 48KB or 56KB, which requires either 9 or 12 cache segments (16KB/segment). 16 slot images for S/390® requires 2.25MB(3380 type device) or 3MB(3390 type device) of reserved cache. ***Note:*** Even though a slot (track) for S/390® is 56KB(3390 type LDEV), because cache is divided into 16KB segments, it will require 4 segments.

For RAID-1 the amount of DCR cache required is 2 times the user data. For RAID-1 open systems, one slot is 48KB, which requires 6 cache segments (16KB/segment). 16 slots for open systems require 1.5MB of reserved cache. For RAID-1 S/390®, one slot is either 48KB or 56KB, which requires either 6 or 8 cache segments (16KB/segment). 16 slot images for S/390® requires 1.5MB(3380 type device) or 2MB(3390 type device) of reserved cache.

If a RAID-5 volume area is changed from priority mode to bind mode and no cache is added, then only 33% of the user data will fit in the area previously assigned for priority mode. If a RAID-1 volume area is changed from priority mode to bind mode and no cache is added, then only 50% of the user data will fit in the area previously assigned for priority mode.

The primary advantage of bind mode is that all targeted read and write data is transferred at electronic speed. In addition, the accessibility of read data is the same as DCR priority mode, write operations do not have to wait for available cache segments, and there will be no backend contention caused by de-staging data.

DCR bind data that has write attributes is normally not de-staged. However, this data will be de-staged during certain types of maintenance operations, (e.g. cache upgrades), if the subsystem is powered off, or when volumes are deleted from DCR bind mode.

# Chapter 2 Preparing for FlashAccess Operations

## 2.1 Enabling FlashAccess on the Remote Console PC

The 9900 Remote Console options can only be enabled by Remote Console PC users with administrator access privileges. To enable FlashAccess, you will need the Remote DCR and/or the Remote Open DCR license keys (passwords).

*Important*: If you install FlashAccess using a temporary license key, the expiration of that key will have the following effects:

- No new configuration settings may be performed.
- The configuration settings that were made before the temporary license key expired remain in effect and cannot be deleted.

An emergency license key is used in situations where the temporary key is set to expire in the near future and the user cannot get the permanent key in time because of special circumstances (e.g. a licensed server has crashed or there are problems with the communication infrastructure). An emergency key may also be used when a user who does not intend to purchase the program product needs to undo a configuration change that was made during the lifetime of the temporary license key. An emergency key is effective for 10 days.

This section describes the following tasks:

- Enabling FlashAccess (see section 2.1.1).
- Disabling FlashAccess (see section 2.1.2).

Once an option is enabled, modify access to that option is then available to administrators and to users with custom access privileges for that option. Users without either administrator access or custom access privileges for a particular option have view (read-only) access to that option.

The RMCMAIN Option Product panel (see Figure 2.1) and the DKCMAIN Option Product panel (see Figure 2.2) display the RMCMAIN and DKCMAIN options and their current installation status (**Install** or **Not install**).

To access the RMCMAIN Option Product panel, select the **Option…** button on the Remote Console Main panel.

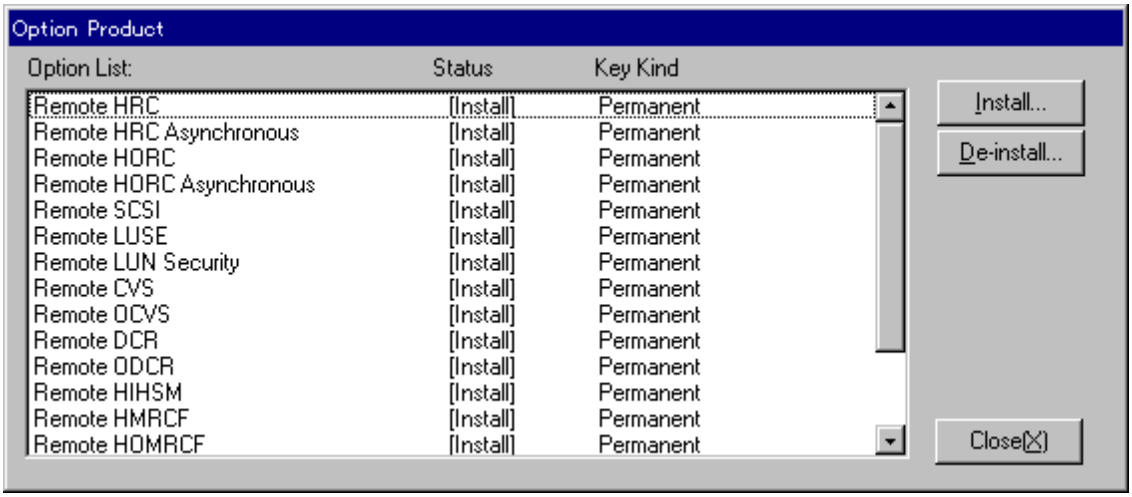


**Figure 2.1 RMCMAIN Option Product Panel**

The RMCMAIN Option Product panel has the following features:

- The **Option List** displays the available RMCMAIN options.
- The **Status** list shows the current status of each option (**Install** or **Not Install**).
- The **Key Kind** list shows the license type (**Temporary**, **Permanent**, or **Emergency**) (see section 2.2).
- The **Install…** button opens the Input Key Code panel (see Figure 2.3), which will prompt you for a password to complete the installation process. The **De-install…** button allows you to deinstall the selected option.
- The **Close** button closes the Option Product panel.

To access the DKCMAIN Option Product panel, select the **Controller…** button on the Remote Console Main panel, select the first subsystem on which you want to enable the option on the Connection Control panel (see Figure 2.5), and then select the **Install…** button.

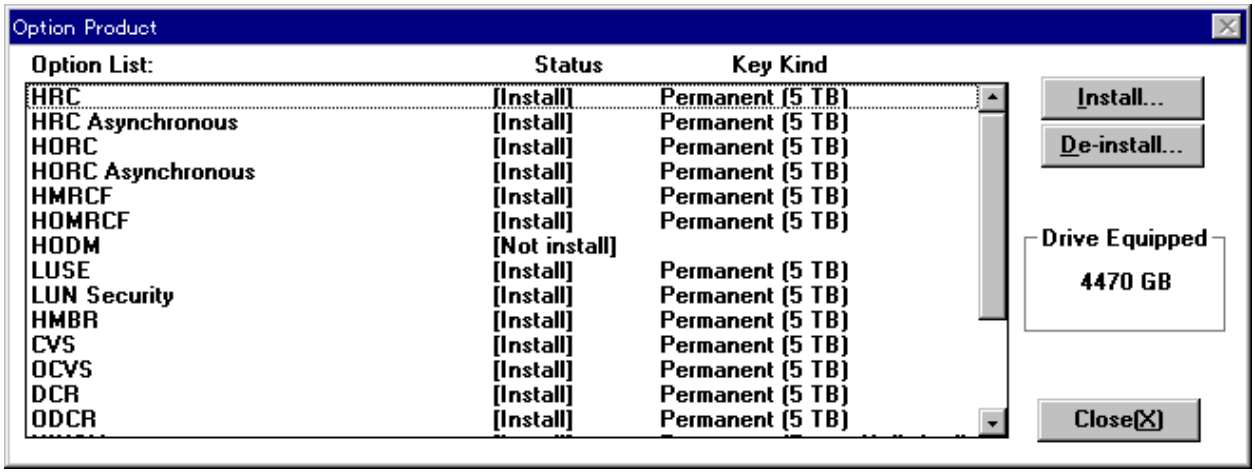


**Figure 2.2 DKCMAIN Option Product Panel**

The DKCMAIN Option Product panel has the following features:

- The **Option List** displays the available DKCMAIN options.
- The **Status** list shows the current status of each option (**Install** or **Not Install**).
- The **Key Kind** list displays the license type (**Temporary**, **Permanent**, or **Emergency**) and the maximum capacity of the PDEVs (physical devices) that the user is licensed to use. (*Note*: If **[Free]** is displayed in the **Key Kind** list, this indicates that the capacity can be up to the amount shown in **Drive Equipped** box.)
- The **Install**… button allows you to install the selected option.
- The **De-install**… button deinstalls the selected option.
- The **Drive Equipped** box shows the maximum capacity of the current subsystem.
- The **Close** button closes the Option Product panel.

### 2.1.1 Enabling FlashAccess

1. Log in as administrator.
2. On the Remote Console Main panel, select **Option…** to open the RMCMAIN Option Product panel (refer to Figure 2.1). This panel shows the current installation status of the RMCMAIN options.
3. To enable FlashAccess, select either **DCR** or **ODCR**, and then select the **Install…** button.
4. The Input Key Code panel (see Figure 2.3) opens. Enter the license key (password) in the **Key Code** text box, and then select **OK**.
5. If the password is approved, the Program Product Confirmation panel (see Figure 2.4) opens. This panel shows the program product model name (e.g., **Remote DCR**), type of key (e.g., **Permanent**), effective term (e.g., **Free**). After confirming the content of the Program Product Confirmation panel, select **Install**.
6. When this process is complete, the RMCMAIN Option Product panel reopens and the displayed status of the selected option changes from **Not install** to **Install**.
7. Select **Close** to return to the Remote Console Main panel.
8. On the Remote Console Main panel, select **Controller…** to open the Connection Control panel (see Figure 2.5).
9. On the Connection Control panel, select the first subsystem on which you want to enable these options, and then select the **Install…** button to open the DKCMAIN Option Product panel (refer to Figure 2.2).
10. Select the either **DCR** or **ODCR**, and then select the **Install…** button.
11. The Input Key Code panel (see Figure 2.3) opens. Enter the license key (password) in the **Key Code** text box, and then select **OK**.
12. If the password is approved, the Program Product Confirmation panel (refer to Figure 2.4) reopens. This panel shows the program product model name (e.g., **DCR**), key kind (e.g., **Permanent**), and effective term (e.g., **Free**).
13. To enable FlashAccess on another 9900 subsystem, repeat steps 8 through 12.
14. When you are finished enabling options on the 9900 subsystems, select **Close** to return to the Remote Console Main panel.

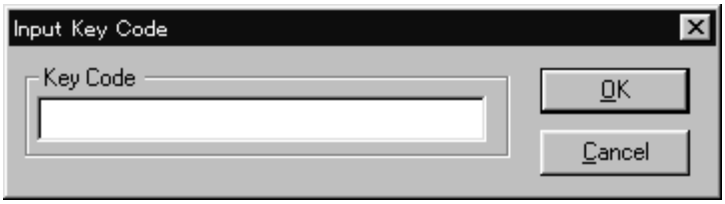


**Figure 2.3 Input Key Code Panel**

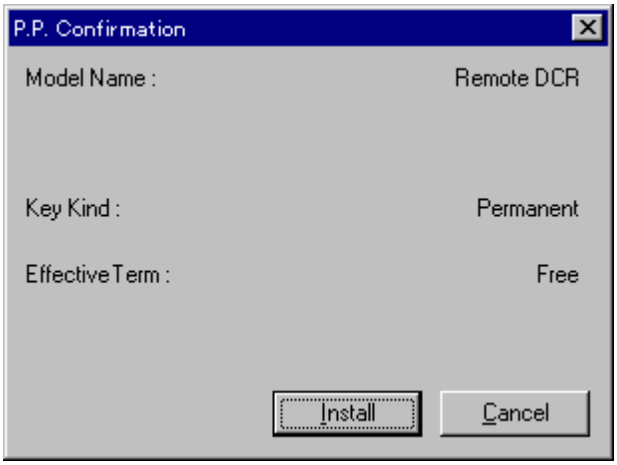


**Figure 2.4 Program Product Confirmation Panel**

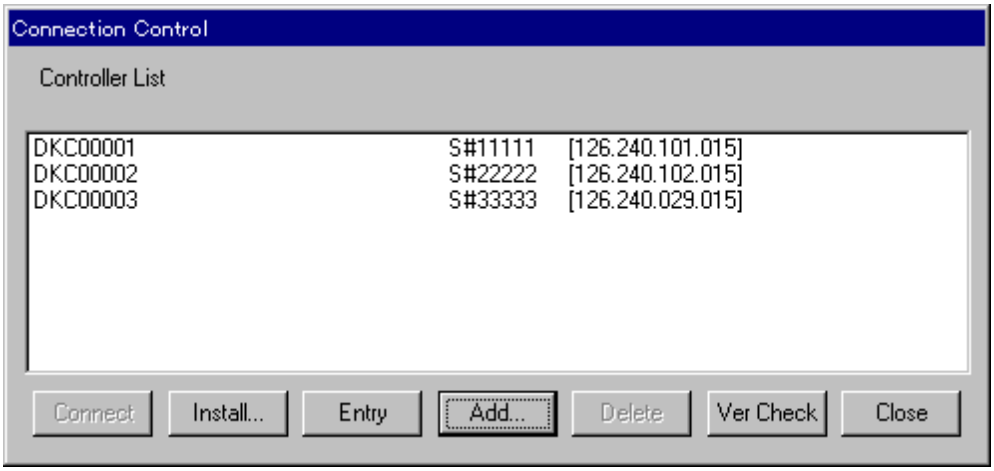


**Figure 2.5 Connection Control Panel**

### 2.1.2 Disabling FlashAccess

To disable FlashAccess on the Remote Console PC:

1. Log in as administrator.
2. On the Remote Console Main panel, select **Option…** to open the RMCMAIN Option Product panel (refer to Figure 2.1).
3. Select the DCR, then select **Deinstall…**.
4. The displayed status of the selected option changes from **Install** to **Not install**, and the option is no longer installed on the Remote Console PC.

To disable Flash Access on the SVP:

1. Log in as administrator.
2. On the Remote Console Main panel, select **Controller…** to open the Connection Control panel (refer to Figure 2.5).
3. On the Connection Control panel, select the subsystem on which you want to disable an option, and then select the **Install…** to open the DKCMAIN Option Product panel (refer to Figure 2.2).
4. Select the DCR, and then select **De-install…**. The displayed status of the selected option changes from **Install** to **Not install**.
5. Select **Close** to exit the DKCMAIN Option Product panel. You are returned to the Connection Control panel.
6. To disable FlashAccess on another 9900 subsystem, repeat steps 3 through 5. If you are finished, select **Close** to return to the Remote Console Main panel.

## 2.2 Connecting to a Subsystem

The Connection Control panel (refer to Figure 2.5) displays the registered 9900 subsystems and allows you to connect to a 9900 subsystem. To access the connect function, open the Connection Control panel by selecting the **Connect…** button on the Remote Console Main panel. The connect function is available to all users.

***Note:*** A 9900 controller can only connect to one Remote Console PC at a time.

To connect to a 9900 controller:

1. On the Remote Console Main panel, select **Connect…** to open the Connection Control panel (refer to Figure 2.5).
2. Select the desired controller in the **Controller List** box. Select the **Connect** button.
3. When the Remote Console PC connects to the selected controller, the Option Select panel opens to provide access to the installed 9900 Remote Console options.
4. To disconnect from the connected controller, exit the Option Select panel by selecting the **Close** button.

## 2.3 Launching FlashAccess

The Option Select panel (see Figure 2.6) opens automatically when the 9900 Remote Console connects to a selected controller, and provides access to the installed 9900 Remote Console features.


**Figure 2.6 Option Select Panel**

To launch FlashAccess, select **DCR**. You may also use the **Execute** menu, which displays the installed options and allows you to select and start FlashAccess. (The option buttons and the **Execute** menu commands perform exactly the same functions.)

To exit the Option Select panel, select the **File** menu, then select **Close**. The Remote Console PC automatically disconnects from the connected controller, and you are returned to the Remote Console Main panel.

# Chapter 3 FlashAccess Panel Descriptions

## 3.1 DCR Change Panel

The DCR Change panel (see Figure 3.1) allows you to select the desired CU and LDEV for DCR operations, and provides access to the DCR Detail panel (see Figure 3.2 and Figure 3.3). The DCR Change panel opens at the beginning of DCR operations, and you are returned to the DCR Change panel at the end of DCR operations so you can view and confirm your requested changes before they are implemented.

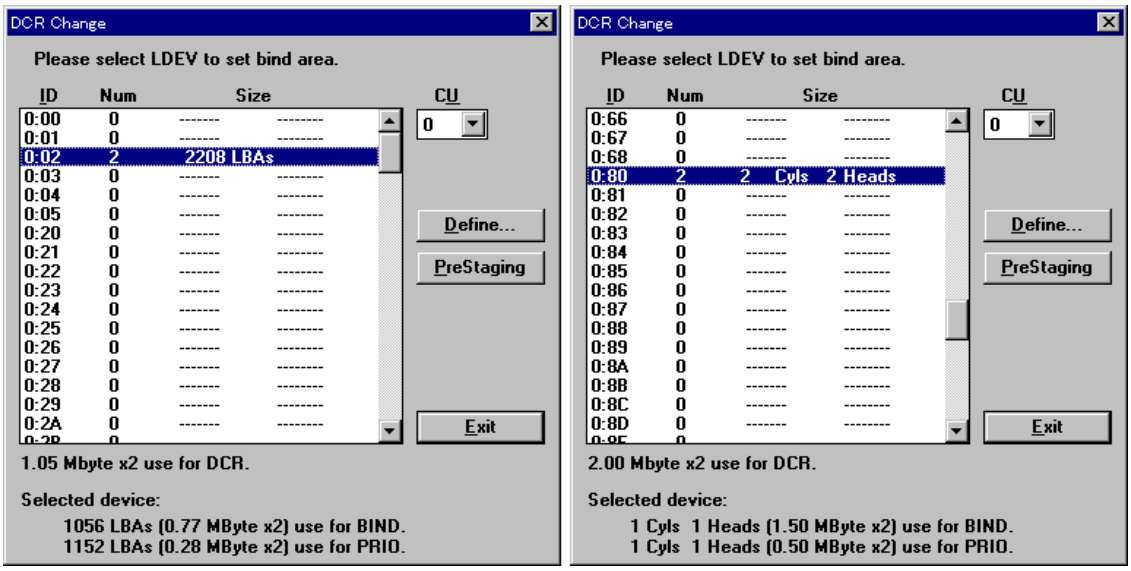


**Figure 3.1 DCR Change Panel (left: open systems, right: S/390®)**

The DCR Change panel has the following features:

- The **LDEV** list box displays the existing DCR configuration of each LDEV in the selected CU:

  **-ID** indicates the LDEV ID.

  **-Num** indicates the number of FlashAccess cache extents.

  **-Size** indicates either the number of Logical Blocks or the number of cylinders and heads for each LDEV. The total amount of reserved FlashAccess cache for the selected LDEV is displayed below the **LDEV** list box.

- The **CU** selection box allows you to select the desired CU. The information in the **LDEV ID** list is updated each time you select a different CU.

- The **Define…** button opens the DCR Detail panel for the selected LDEV (see Figure 3.2 and Figure 3.3).

- The **PreStaging** button begins the Pre-staging processing.

- The **Exit** button exits DCR and returns you to the Option Select panel (refer to Figure 2.6). DCR changes are not implemented until after you select **Exit** on the DCR Change panel.

## 3.2 DCR Detail (Logical Device) Panel

The DCR Detail panel (see Figure 3.2 and Figure 3.3) displays the DCR configuration of the selected LDEV, allows you to delete data from FlashAccess cache, and provides access to the DCR Define panel (see Figure 3.4 and Figure 3.5). To open the DCR Detail panel, select the desired LDEV on the DCR Change panel, and select **Define ….**

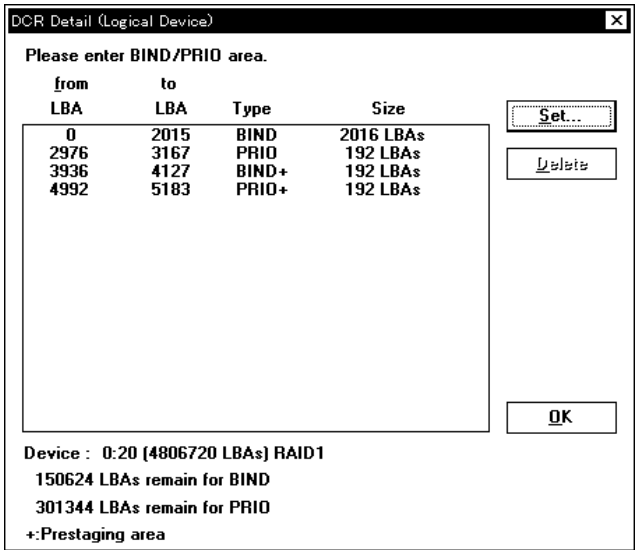


**Figure 3.2 DCR Detail (Logical Device) Panel (Open Systems)**

The DCR Detail (Logical Device) panel for open systems has the following features:

- Each FlashAccess data extent is displayed by starting logical block address (**from LBA**), ending logical block address (**to LBA**), cache mode type (**Bind** or **Prio**), and **Size**. *Note:* A plus sign (+) next to the cache mode indicators (**Bind** or **Prio**) indicates that the data is in the FlashAccess pre-staging area.
- The **Device** listing (under the cache area list box) displays the selected LDEV by CU, LDEV ID, total number of LBA, RAID type. Beneath the **Device** listing, the remaining number of logical block addresses for priority mode (**PRIO**) and for bind mode (**BIND**) are displayed.
- The **Set…** button opens the DCR Define panel (see Figure 3.4), to allow you to define a new data extent for FlashAccess cache.
- The **Delete** button removes the selected data extent from the list box and updates the LDEV information below the list box.
- The **Cancel** button cancels your requested DCR changes and returns you to the DCR Change panel.
- The **OK** button saves your requested changes and returns you to the DCR Change panel, which is updated to show your requested changes.

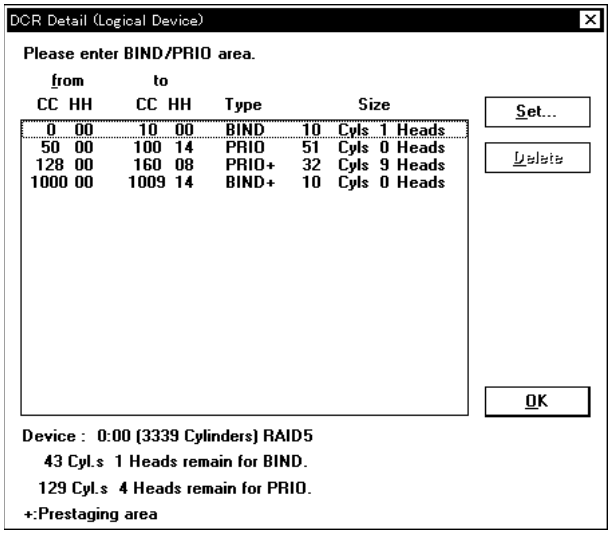


**Figure 3.3 DCR Detail (Logical Device) Panel (S/390®)**

The DCR Detail (Logical Device) Panel for mainframe systems is similar to the panel for open systems, except that the starting and ending of each cache extent and the size are displayed by cylinder and head (**CC** and **HH**) instead of LBA.

## 3.3 DCR Define Panel

The DCR Define panel (see Figure 3.4 and Figure 3.5) allows you to define a new data extent to be placed in FlashAccess cache. To open the DCR Define panel, select **Set…** on the DCR Detail panel.

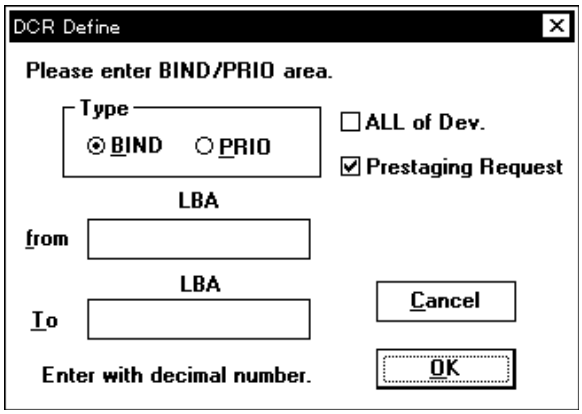


**Figure 3.4 DCR Define Panel (Open Systems)**

The DCR Define panel has the following features:

- The **Type** box allows you to select the cache mode for the new FlashAccess cache area: bind mode (**BIND**) or priority mode (**PRIO**).
- The **from LBA** entry field allows you to enter the starting logical block address for the data extent to be placed in FlashAccess cache.
- The **To LBA** entry field allows you to enter the ending logical block address for the data extent to be placed in FlashAccess cache.
- The **ALL of Dev**. box allows you to select all of the logical blocks for the specified device.
- The **Prestaging Request** box allows you to pre-stage the data into the cache.
- The **Cancel** button discards any data entered on this panel and returns you to the DCR Detail panel.
- The **OK** button saves the specified new FlashAccess data extent and returns you to the DCR Detail panel, which is updated to show your requested changes.

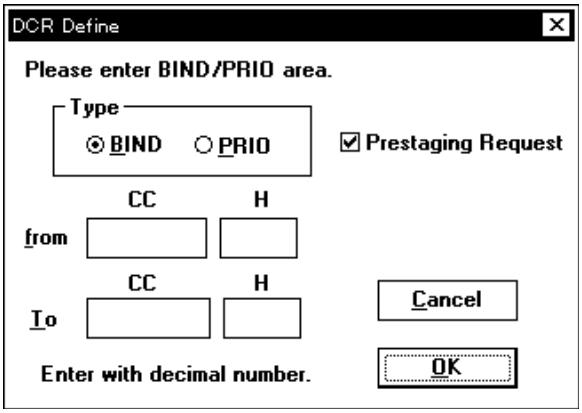


**Figure 3.5 DCR Define Panel (S/390®)**

The DCR Define panel for S/390® is similar to the panel for open systems, except that the **from CC** and **H** and the **To CC** and **H** entry fields allow you to define the cache extent by cylinder and head number rather than by LBA.

# Chapter 4 FlashAccess Operations

## 4.1 Performing FlashAccess Operations

FlashAccess operations on the 9900 Remote Console PC enable you to change the DCR configuration of the 9900 subsystem, by allowing you to place data into and remove data from FlashAccess cache. FlashAccess operations include:

- Placing data in FlashAccess cache (see section 4.2), and
- Removing data from FlashAccess cache (see section 4.3).

To start DCR operations for a specific 9900 subsystem:

1. Log in to the 9900 RMCMAIN software, and make sure that the **Remote DCR** option is installed. If not, install the remote DCR option as described in section 2.1.
2. Connect to the desired 9900 subsystem (see section 2.2). The Option Select panel opens (refer to Figure 2.6).
3. On the Option Select panel, select **DCR**. The Remote Console PC now loads the subsystem DCR configuration information. This process may take several minutes.

## 4.2 Placing Data in FlashAccess Cache

Figure 4.1 shows the sequence of screens that occurs when you place data in FlashAccess cache. The requested DCR operation does not occur until you select **Exit** on the DCR Change panel (refer to Figure 3.1) at the very end of the procedure.

To place data in FlashAccess cache:

1. On the DCR Change panel (refer to Figure 3.1), select the appropriate **CU**, then select the desired LDEV. Select **Define…** to open the DCR Detail (Logical Device) panel (refer to Figure 3.2 and Figure 3.3).
2. The DCR Detail (Logical Device) panel displays the current DCR configuration of the selected LDEV and the number of remaining logical block addresses (LBAs) or cylinders which can be placed in bind-mode and priority-mode cache.
3. Select **Set…** to open the DCR Define panel (refer to Figure 3.4 and Figure 3.5).
4. On the DCR Define panel select the desired FlashAccess cache mode (**BIND** or **PRIO**), and enter the following address information:
   a) For open-systems volumes: enter the starting LBA in the **from LBA** field, and enter the ending logical block address in the **to LBA** field. If you want to select the entire device instead of specifying starting and ending LBA, select the **ALL of Dev**. check box.

      ***Note:*** The DCR program recognizes logical blocks in 96 block increments. For example, if you enter a starting LBA as 1 and an ending LBA as less than 96, the DCR program will automatically change the beginning LBA to 00 and the ending LBA to 95. Refer to

Table 1.2 for LBA block increments.

b) For S/390® volumes: enter the starting cylinder number in the **from CC** field and enter the starting head number in the **from H** field. Enter the ending cylinder number in the **To CC** field and the ending head number in the **to H** field. Select **OK** to continue.

5. If you want to pre-stage the data into cache, select the **Prestaging Request** check box.
6. Select **OK** to continue. The DCR Detail (Logical Device) panel reopens and now displays the requested DCR configuration of the selected LDEV. ***Note:*** a plus sign (**+**) next to the cache mode (**BIND** or **PRIO**) indicates that the data is being pre-staged into cache.
7. If the information displayed in the DCR Detail (Logical Device) panel is not correct, or if you want to cancel any of you requested changes, select the incorrect DCR setting, select **Delete**, and repeat steps 4 through 6 to re-enter the information. If the information is correct, select **OK** to continue.
8. The DCR Change panel reopens and now displays the requested DCR configuration for the selected LDEV. To create FlashAccess cache extents for another volume, repeat steps 1 through 5.
9. When you are finished making DCR changes, select **Exit** to implement the requested DCR change(s) and return to the Option Select panel (refer to Figure 2.6)

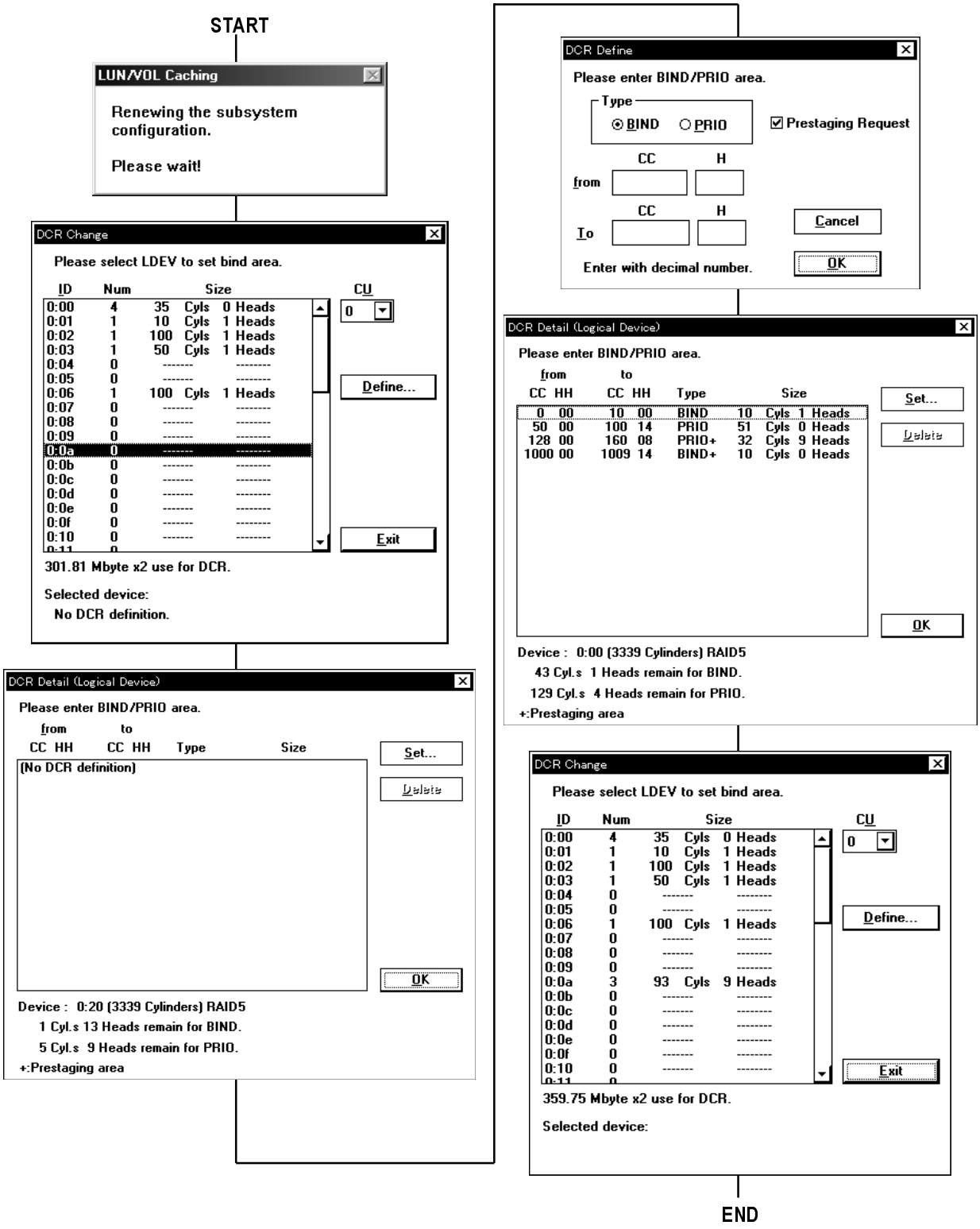


**Figure 4.1 Placing Data in FlashAccess Cache**

## 4.3 Removing Data from FlashAccess Cache

Figure 4.2 shows the sequence of events that occur when you remove data from FlashAccess cache. The requested DCR operation does not occur until you select **Exit** on the DCR Change panel at the very end of the procedure.

To remove data from FlashAccess cache (refer to Figure 4.2):

1. On the DCR Change panel (refer to Figure 3.1), select the appropriate **CU**, select the desired LDEV, and select **Define…**. The DCR Detail (Logical Device) panel now opens.
2. On the DCR Detail (Logical Device) panel (refer to Figure 3.2 and Figure 3.3), select the FlashAccess cache area(s) to be removed, and select **Delete**. If you make a mistake, select **Cancel** to restore the panel to its original configuration.
3. When the information displayed on the DCR Detail (Logical Device) panel is correct, select **OK** to continue.
4. The DCR Change panel now displays the requested DCR configuration of the selected LDEV. To remove data from FlashAccess cache for another volume, repeat steps 1 through 3. If you need to cancel any of your requested changes, select the **Define…** button to return to the DCR Detail (Logical Device) panel (refer to Figure 3.2 and Figure 3.3).
5. When you are finished making DCR changes, select the **Exit** button on the DCR Change panel to implement the requested DCR change(s). You are returned to the Option Select panel (refer to Figure 2.6).

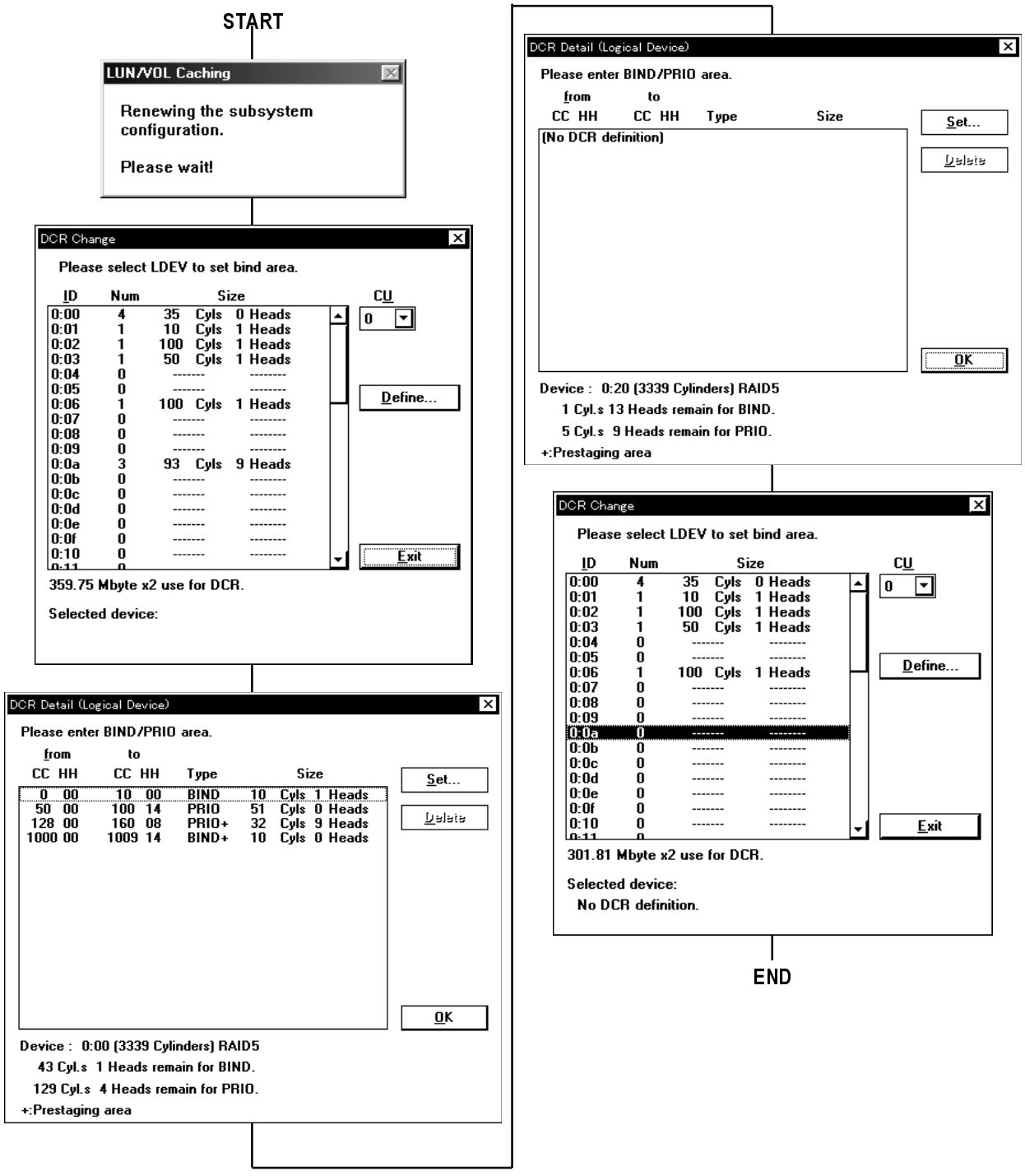


**Figure 4.2 Removing Data from FlashAccess Cache**

# Chapter 5 Troubleshooting

## 5.1 Troubleshooting

The Hitachi Freedom Storage™ 9900 subsystem provides continuous data availability and is not expected to fail in any way that would interrupt access to user data. For troubleshooting information on the 9900 subsystem, please refer to the *Hitachi Freedom Storage™ 9900 User and Reference Guide* (MK-90RD008). For further information on the Hitachi Freedom 9900 Remote Console, please refer to the *Hitachi Freedom Storage™ 9900 Remote Console User's Guide* (MK-90RD003) or *Hitachi Freedom Storage™ 9900 Remote Console Error Codes* (MK-90RD029).

The user is responsible for the operation and normal maintenance of the Remote Console PC. Here are some guidelines for troubleshooting the Remote Console PC:

- **Check the cabling and the LAN.** Make sure that both the computer and LAN cabling are firmly attached, and that the LAN is operating properly.
- **Reboot the PC**. Close any programs that are not responding. If necessary, reboot the PC and restart the Remote Console program. (If possible, first close all open programs before rebooting.) ***WARNING:*** The R-SIMs reported by the 9900 subsystems cannot be logged on the Remote Console PC when the PC is powered off. Reconnect to the same disk controller and verify the status of the data.
- **Check for any Error Codes.** Table 5.1 describes some general error conditions, along with the recommended resolution for each item. If you are unable to resolve an error condition, please call the Hitachi Data Systems Technical Support Center (see section 5.2).

**Table 5.1 Troubleshooting**

| Error Condition | Recommended Action |
|---|---|
| Error message displayed during RMCMAIN installation. | If the error message **Setup file error for Windows x.xx (ee = y)** appears, make sure the correct version of Windows is installed. If **ee = 2** is displayed, make sure the installation diskette is not write-protected and is inserted in the floppy disk drive properly. Restart the setup program.<br>If the error message **File I/O Error** appears, make sure the installation diskette is not write-protected and is inserted in the floppy disk drive properly, and restart the setup program.<br>If the error message **Resource Error (Err=xxxx)** or **Internal Error (Err=xxxx)** appears, reboot the Remote Console PC, and restart the setup program. |
| RMCMAIN will not add or connect with a subsystem. | Make sure that the S/N is correct. If not, delete the subsystem, and then add the subsystem again using the correct S/N. If RMCMAIN still cannot connect, check the settings on the Windows network control panel, and use PING to test the LAN connection. If RMCMAIN still cannot connect, exit RMCMAIN, restart the PC, start RMCMAIN, and try again. If RMCMAIN still cannot connect, reinstall the RMCMAIN software. If the problem persists, call the Hitachi Data Systems Support Center. |
| The Remote Console PC experiences an error. | Exit RMCMAIN, close all other applications, and then restart the PC. If the problem persists, make sure the PC's operating system and LAN hardware and software are properly configured, and reinstall the RMCMAIN software. The user is responsible for maintaining the Remote Console PC. |
| Any problem with a 9900 subsystem. | Open the R-SIM panel, and sort the R-SIMs by name to view the R-SIMs by subsystem. If there are any serious- or acute-level R-SIMs, call the Hitachi Data Systems Support Center. |

## 5.2 Contacting the Hitachi Data Systems Technical Support Center

If you need to call the Hitachi Data Systems Technical Support Center, be sure to provide as much information about the problem as possible, including the circumstances surrounding the error or failure, the exact content of any messages displayed on the Remote Console PC, and the severity levels and reference codes of the R-SIMs on the R-SIM panel.

The worldwide Hitachi Data Systems Technical Support Centers are:

- Hitachi Data Systems North America/Latin America
  San Diego, California, USA
  1-800-348-4357
- Hitachi Data Systems Europe
  Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
  North Ryde, Australia
  011-61-2-9325-3300

# Appendix: Glossary, Acronyms, and Abbreviations

| | |
|---|---|
| Cache extents | Areas used for FlashAccess (also known as Dynamic Cache Residency) |
| CU | control unit |
| Custom access | A feature, which allows a non-administrator to be, assigned update access to one or more of the restricted Remote Console functions. |
| CV | custom-sized volume, also called customized volume |
| CVS | custom volume size (also called Virtual LVI or Virtual LUN). This function divides a logical volume into two or more smaller volumes, called custom-sized volumes. |
| DASD | direct access storage device |
| DCR | dynamic cache residency (also called FlashAccess) |
| DKCMAIN | disk controller main |
| ESCON® | Enterprise System Connection |
| FD | floppy disk |
| FD Copy | floppy disk copy. This function downloads the 9900 Remote Console configuration information onto a floppy diskette or a hard disk drive, and is generally used for troubleshooting purposes. |
| FlashAccess | dynamic cache residency, or DCR. |
| GB | gigabyte(s) |
| HIHSM | Hitachi Internal Hierarchical Storage Manager |
| HMBR | Hitachi Multiplatform Backup/Restore |
| HMRCF | Hitachi Multi-RAID Coupling Feature (also called ShadowImage) |
| HODM | Hitachi Online Data Migration |
| HORC | Hitachi Remote Copy (open). |
| HOMRCF | Hitachi Open Multi-RAID Coupling Feature (also called ShadowImage) |
| HRC | Hitachi Remote Copy – Synchronous. This feature must be installed before you can install either HORC or HRCA. |
| HRCA | Hitachi Remote Copy – Asynchronous |
| kB | kilobyte(s) |
| LAN | local-area network |
| LBA | logical block address |
| LDEV | logical device |
| LU | logical unit |
| LUN | logical unit number |
| LUN Manager | remote console software option, also called Remote SCSI. This option must be installed before you can install either LUSE or LUN Security. |
| LUSE | Logical Unit Size Expansion |
| LVI | logical volume image (also called device emulation) |

| | |
|---|---|
| MB | megabyte(s) |
| MIB | message information block |
| Parity group | a set of hard disk drives that have the same capacity and are treated as one group. A parity group contains both user data and parity information, which allows the user data to be accessed in the event that one or more of the drives within the group are not available. |
| Remote SCSI | A Remote Console software option, also called LUN Manager |
| RMC | Remote Console PC |
| RMCMAIN | Remote console main |
| R-SIM | remote service information message (generated by the 9900 when it detects an error or service requirement). |
| SCSI | small computer system interface |
| ShadowImage | Hitachi Multi-RAID Coupling Feature (HMRCF) and/or Hitachi Open Multi-RAID Coupling Feature (HOMRCF) |
| SIM | service information message (generated by a disk controller when it detects an error or service requirement). |
| SNMP | simple network management protocol (part of the TCP/IP protocol suite) |
| SSID | storage subsystem ID. The 9900 is configured with one SSID for each 64 devices, and up to four SSIDs for each CU image. |
| SVP | Service processor (PC component of the 9900) |
| TCP/IP | transmission control protocol/internet protocol |
| TID | target ID |
| Trap | An SNMP agent initiates trap operations when R-SIMs occur, in order to send the R-SIMs to the SNMP manager (see Figure 4.1). An SNMP agent can be configured to deliver traps to more than one SNMP manager. |
| UCB | unit control block |
| VLUN | Virtual LUN (also called custom volume size, CVS) |
| VLVI | Virtual LVI (also called custom volume size, CVS) |
| Volser | volume serial number (mainframe volume identifier, not related to the LDEV ID) |
| WWN | World Wide Name, which is a unique identifier for a particular open-system host, consisting of a 64-bit physical address (the IEEE 48-bit format with 12-bit extension and 4-bit prefix). |
| WWN Group | A WWN group gives every host in the specified WWN group access to a specified LU or group of LUs. This is part of the LUN Security feature. |

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