



# Hitachi Cache Manager User's Guide

Hitachi Virtual Storage Platform  
Hitachi Universal Storage Platform V/VM  
Hitachi TagmaStore<sup>®</sup> Universal Storage Platform  
Hitachi TagmaStore<sup>®</sup> Network Storage Controller

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# Preface

This document describes and provides instructions for using the Hitachi Cache Manager software for the Hitachi RAID storage systems. Hitachi Cache Manager enables the user to perform Hitachi Cache Residency Manager operations from the mainframe host.

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](#)
- [Product Version](#)
- [Document Revision Level](#)
- [Changes in this Revision](#)
- [Referenced Documents](#)
- [Document Conventions](#)
- [Convention for Storage Capacity Values](#)
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## Intended Audience

This document is intended for system administrators, Hitachi Data Systems representatives, and authorized service providers who are involved in installing, configuring, and operating the Hitachi RAID storage systems.

Readers of this document should be familiar with the following:

- Data processing and RAID storage systems and their basic functions.
- The Hitachi RAID storage systems and the *User and Reference Guide* for the storage system.
- The operating system hosting the Hitachi Cache Manager software.

## Product Version

This document revision applies to Cache Manager version 01-07-00 or later.

## Document Revision Level

Revision	Date	Description
MK-96RD646-P	February 2007	Preliminary Release
MK-96RD646-00	May 2007	Initial Release, supersedes and replaces MK-96RD646-P. This revision also supersedes and replaces MK-91RD045-07.
MK-96RD646-01	September 2007	Revision 1, supersedes and replaces MK-96RD646-00
MK-96RD646-02	January 2008	Revision 2, supersedes and replaces MK-96RD646-01
MK-96RD646-03	August 2013	Revision 3, supersedes and replaces MK-96RD646-02

## Changes in this Revision

- Added support for the Hitachi Virtual Storage Platform, including new system option mode 940 for the VSP.

## Referenced Documents

Hitachi Virtual Storage Platform:

- *User and Reference Guide*, MK-90RD7042
- *ShadowImage for Mainframe User Guide*, MK-90RD7023
- *Performance Guide*, MK-90RD7020
- *Provisioning Guide for Mainframe Systems*, MK-90RD7021

Hitachi Universal Storage Platform V/VM:

- *User and Reference Guide*, MK-96RD635
- *ShadowImage for z/OS User's Guide*, MK-96RD619
- *Performance Manager User's Guide*, MK-96RD617
- *Virtual LVI/LUN and Volume Shredder User's Guide*, MK-96RD630

Hitachi TagmaStore Universal Storage Platform and Network Storage Controller:

- *Universal Storage Platform User and Reference Guide*, MK-94RD231
- *Network Storage Controller User and Reference Guide*, MK-95RD279
- *ShadowImage for z/OS User's Guide*, MK-94RD212
- *Performance Manager User's Guide*, MK-94RD218
- *LUN Expansion and Virtual LVI/LUN User's Guide*, MK-94RD205

# Document Conventions

This document uses the following typographic conventions:

Typographic Convention	Description
<b>Bold</b>	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels. Example: Click <b>OK</b> .
<i>Italic</i>	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: copy <i>source-file target-file</i> <b>Note:</b> Angled brackets (< >) are also used to indicate variables.
screen/code	Indicates text that is displayed on screen or entered by the user. Example: # <code>pairdisplay -g oradb</code>
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: # <code>pairdisplay -g &lt;group&gt;</code> <b>Note:</b> Italic font is also used to indicate variables.
[ ] 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.
underline	Indicates the default value. Example: [ <u>a</u>   b ]

This document uses the following icons to draw attention to information:

Icon	Meaning	Description
	Note	Calls attention to important and/or additional information.
	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Warns the user of adverse conditions and/or consequences (for example, disruptive operations).
	WARNING	Warns the user of severe conditions and/or consequences (for example, destructive operations).

## 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 user documentation for the Hitachi RAID storage systems is available on the Hitachi Data Systems Portal: <https://portal.hds.com>. 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](mailto: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.

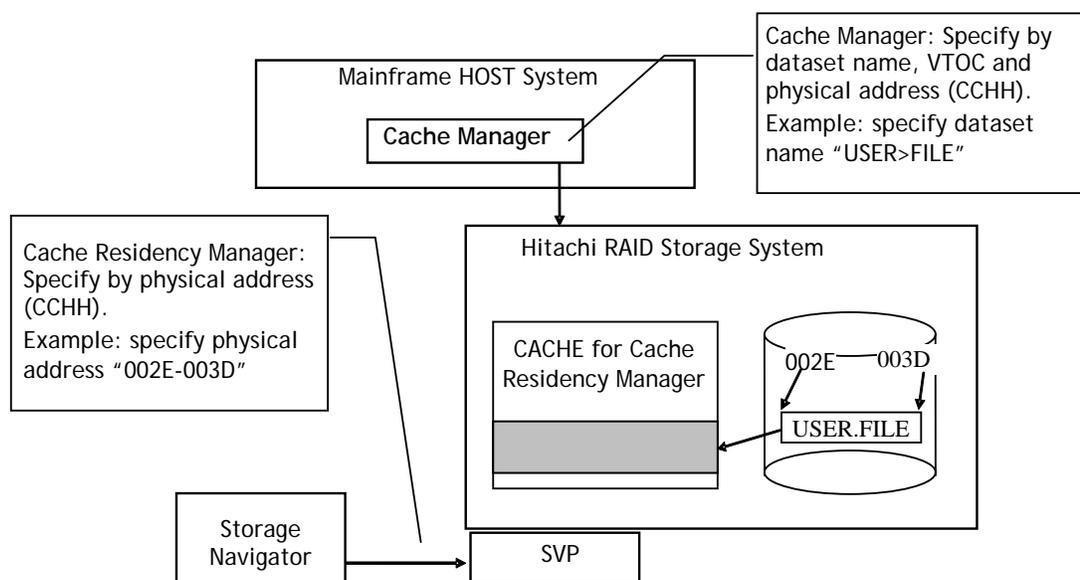
**Thank you!**

## Overview of Hitachi Cache Manager

Cache Manager enables users to perform Hitachi Cache Residency Manager operations on Hitachi RAID storage systems by issuing commands from the mainframe host console. Cache Residency Manager enables users to store specific data in cache memory to make the data available to hosts at front-end access speeds.

For more information about Cache Residency Manager, please see the *Hitachi Cache Residency Manager User Guide* for the storage system.

Figure 1-1 illustrates some of the differences between Cache Residency Manager and Cache Manager.



**Figure 1-1 Specifying Cache by Dataset Name, VTOC and CCHH**



# About Cache Manager Operations

This chapter provides the Cache Manager specifications and describes Priority mode and Bind mode.

- [Cache Manager Operations](#)
- [Methods to Specify Cache Data](#)
- [Overview of Priority and Bind Mode](#)

## Cache Manager Operations

This section provides important information about Cache Manager operations.

- If you need an entire mainframe volume in Cache Manager, using a smaller Virtual LVI volume uses less cache. For details, see the Virtual LVI/LUN user document for the storage system (for example, *Hitachi VSP Provisioning Guide for Mainframe Systems*, MK-92RD7021).
- All write I/Os to cache are duplex writes, guaranteeing full data integrity. The data remains fixed in cache until the user manually deletes it. Deletion of extents will de-stage any write data to the affected volumes.
- It is possible to expand the amount of cache without canceling the existing settings. Call the Hitachi Data Systems Support Center for assistance.
- Defragmentation will reallocate the datasets. If you want to defragment a drive, first release the datasets and then reassign them to cache when you are finished.
- If a **BIND** command to assign discontinuous plural extents to cache as one dataset terminates abnormally, Cache Manager will automatically release the resident area. If an error occurs in the process of releasing the resident area, Cache Manager will display the remaining extents that should be released. If this occurs, manually release the remaining extents then re-execute the **BIND** command.
- If a **BIND** command to release data from cache terminates abnormally, correct the errors and re-execute the command for the remaining areas.
- You can reset areas that were set with Cache Manager by using Cache Residency Manager, and vice versa. The commands are accepted in the order in which they are received.
- **Warning:** Do not simultaneously access the Cache Residency Manager or Cache Manager functions from more than one source. If this happens, the commands may interfere with each other.

## Cache Extents

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

- Cache extents are dynamic and can only be added and deleted online.
- Data defined by a continuous CCHH area is considered as one extent. A **BIND** mode area and a **PRIO** (priority) mode area are considered different extents (see [Overview of Priority Mode and Bind Mode](#)). The number of datasets and the number of resident extents will not necessarily match (for example, when a dataset consists of noncontiguous extents).
- The maximum number of extents is limited:
  - Virtual Storage Platform, Universal Storage Platform V
    - Maximum: 4096 extents per logical volume
    - Maximum: 16384 extents for the storage system
  - Universal Storage Platform/Network Storage Controller
    - Maximum: 4096 extents per logical volume
    - Maximum: 4096 extents for the storage system

User data can be removed from cache, and the cache extent information is either maintained in the disk controller or deleted:

- Cache extent information is maintained in the following cases:
  - When using the **SETCACHE** command (provided by the IDCAMS utilities) with the **REINITIALIZE** parameter.
  - When there is an offline microcode change.
  - When there is a cache memory failure (partial or module down) during maintenance.
- Cache extent information is deleted in the following cases:
  - When using the **BIND** command with the **DISABLE** parameter.
  - When using the **SETCACHE** command (provided by IDCAMS utilities) with the **SYSTEM OFF** or **DEVICE OFF** parameter.

## Methods to Specify Cache Data

### Units Used to Specify Data for Cache Storage CCH, VTOC, VTOC Index

The Cache Manager function for the RAID storage systems is similar to the Cache Residency function; it allows you to store specific data in cache memory. However, where Cache Residency only allows you to specify what data to place in cache by using the physical address (CCHH), Cache Manager allows you to specify the data to be placed into cache by CCHH, VTOC, VTOC index, VVDS (VSAM volume dataset) or the extent of the dataset area. Data to be removed from cache may be specified by dataset name, VTOC, VTOC Index, VSAM volume dataset (VVDS), or by volume. If you set the cache area from Storage Navigator, you must define the extent using CCHH.

Cache Manager also allows you to coordinate objective jobs with other functions, and to control jobs dynamically and automatically, thereby increasing efficiency and improving system performance.

# Overview of Priority Mode and Bind Mode

## Priority Mode

In **Priority Mode** (normal mode), the total capacity of cache required is:

Standard cache + cache required for Cache Manager + Additional cache

The main advantage of priority mode is that read data is transferred at host data transfer speed. In priority mode the cache 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 Cache Manager, all priority mode cache extents are 100% utilized by user read-type data.

For mainframe volumes, one slot is 66 KB. This requires 4 cache segments (16.5 KB/segment). Sixteen (16) slot images for mainframe require 1,056 KB of reserved cache.

**Note:** Even though a track for 3390 volumes is 56 KB, because cache is divided into 16.5 KB segments, it will require four segments. A 3380 slot (track) is 48 KB, so three 16 KB segments will be sufficient.

## Bind Mode

In **Bind Mode**, the total capacity of cache required is:

Standard cache + cache required for Cache Manager

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

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

**RAID-5/6.** For RAID-5 and RAID-6 array groups the amount of cache required is three times the space required for the user data. For RAID-5/6 mainframe volumes, one slot is 66 KB, which requires 12 cache segments (16.5 KB/segment). For example, 16 slot images require 3,168 KB of reserved cache.

- **Note:** Even though tracks for 3390 LVIs are 56 KB, because cache is divided into 16.5 KB segments, it will require four segments. Slots for 3380 LVIs are 46 KB, so three segments are sufficient.
- **Note:** If a RAID-5/6 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.

**RAID-1 and external storage.** For RAID-1/external array groups the amount of cache required is two times the space required for user data. For 3390 volumes, One slot is 66 KB, which requires eight cache segments (16.5 KB/segment). For example, 16 slot images require 2,112 KB of reserved cache.

- **Note:** 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, and the remaining 50% is used to save read/write data.

## Notices

**(1) Timing to load (be resident) data to cache memory.** The storage system begins to load (is resident) data from data drives to cache memory right after the BIND command is executed.

**(2) Cases when cache residence is released.** The following is the case to release residence by other than Cache Manager:

- IDCAMS utility (MVS/ESA, OS/390, zOS)  
    'SETCACHE' command -SUBSYSTEM (whole DKC) OFF  
                          -DEVICE (volume) OFF

**(3) Cases to take over the cache resident status.** In the following cases data in cache memory is disappeared, but resident status remains in the storage system. Then the storage system automatically resides data in cache memory after first miss for the track that have been specified to reside.

- IDCAMS utility (MVS/ESA, OS/390, zOS)  
    'SETCACHE' command REINITIALIZE
- Offline microcode change
- Cache Memory failure (partial down, or module down) or during maintenance of cache memory

**(4) Counter specification.** In case of counter overflow, count starts from beginning again. And a counter is reset in the following cases:

- Power Off and ON of the storage system.
- Cache off
- User designation by JCL using RESET parameter.

**(5) Restriction of resident extents.** The Cache Residency Manager function of hardware or Cache Manager has following restrictions:

- The maximum size of cache memory for Cache Residency Manager function is the capacity defined by hardware. The command to reside over the limitation will be an error.
- The Cache Residency Manager function of hardware manages as follows:
  - Continuous CCHH area is one extent.
  - BIND mode area and PRIO mode area are different extent. The BIND command to different mode area ends with JSE231I-S error.
  - The maximum number of extents: 16/volume or 1024/subsystem (DKC). The BIND command that makes to exceed the limitation ends with JSE232I-S error.
- The number of datasets and the number of resident extents does not match necessarily, if any of dataset s consists of discontinuous plural extents

**(6) Set / reset handling from Storage Navigator.** Cache Residency Manager function works with Storage Navigator besides Cache Manager from mainframe HOST system. In case of Storage Navigator, user must handle by physical address (CCHH).

The storage system accepts set/reset commands from Storage Navigator and Cache Manager orderly. Then the set area by Cache Manager may be reset by Storage Navigator and vice versa.

**Attention:** Simultaneous access to the Cache Residency Manager function from Storage Navigator and Cache Manager on multiple HOSTs might cause unexpected results, because the storage system has no exclusive access control for cache memory between Storage Navigator and Cache Manager on multiple HOSTs. To avoid unexpected results, do not access the Cache Residency Manager function in the same storage system simultaneously from Storage Navigator or Cache Manager on multiple HOST systems.

**(7) Online Volume.** The objective volume of Cache Residency Manager must be varied online.

**(8) Restriction of cache binding for external storage volume (VSP, USP, USP).** Support function of Bind command for external storage volume is different between cache mode and non-cache mode.

- In case of Cache Mode: Cache Bind function for external storage volume is same as normal volume.
- In case of Non-Cache Mode: Cache Bind function for external storage volume is only PRIO mode. BIND mode is not supported. If user specifies BIND mode, CMG report I/O error and SSB shows Format/Message: 04 (Byte 7) and error code: 75F9 (Byte 16-17).

For details about Cache Mode for external storage volume, see the *Universal Volume Manager User Guide*.

### **(8) Cache Statistic Information**

- Counter overflow for cache statistic information  
DKC restarts the count from 0 automatically after the counter reaches its maximum. Then the counters are not the same situation necessarily. The counter is four byte wide counter.

**Attention:** Reset the counters before supervising the cache statistic information by using COUNTS command. And use the cache statistic information not to exceeds the limitation of I/O counts.

- Coexistence with other applications regarding of reset counters  
COUNTS command with RESET operand makes it possible to reset hardware counters. But if other applications are supervising the cache statistic information, CMG's reset function breaks the cache statistic information for the other applications.

**Recommendation:** If other applications uses the cache statistic information, do not use the CMG's reset function, and calculate the difference values.

**(9) Reside again after defragmentation.** Defragmentation makes the re-allocation of datasets. Then if user wants to make defragmentation to the volume resided, make defragmentation after releasing the residence of the volume and reside again after defragmentation.

**(10) Clean up operation after a BIND command error.** CMG makes a clean up operation as follows, when CMG terminates abnormally in process of BIND command (reside or release residence) to the discontinuous plural extents that constitutes one dataset.

- BIND command to reside

After the abnormal termination of the BIND command to reside, CMG makes a clean up operation to release the resident area that area have been set by this job.

If an error occurred during the clean up operation, CMG terminates after displaying the remained extents that should be released the residence. In this case, remove the error factor and executes the CMG to release the remained resident area and then execute the objective command again.

- BIND command to release residence

CMG does not make a clean up operation after the abnormal termination of the BIND command to release residence. Remove the error factor and executes the command again for the remaining area.

**(11) System option modes (SOMs) of the storage system.** The SOMs are set on the SVP by the Hitachi Data Systems representative.

- System option mode **81** must be ON to have the right value for BOUND HEADS counter.
- For the VSP storage system, system option mode **940** must be ON.



# Preparing for Cache Manager Operations

This chapter provides information on installing and launching Cache Manager, including the HRUDCRX and HRUDCRT programs.

- [System Requirements](#)
- [Installing Cache Manager](#)
- [Launching Cache Manager](#)
- [Estimated Required Memory](#)

## System Requirements

Hitachi Cache Manager operations involve the data on the Hitachi RAID storage systems, the Cache Manager utility, and the licensed Cache Residency Manager feature. Table 3-1 lists the system requirements for Hitachi Cache Manager. Table 3-2 lists the Hitachi storage system microcode requirements for Hitachi Cache Manager.

**Table 3-1 Specifications of Cache Manager**

No	Item	Specification
1	Storage Systems	Hitachi Virtual Storage Platform Hitachi Universal Storage Platform V Hitachi Universal Storage Platform VM Hitachi TagmaStore Universal Storage Platform Hitachi TagmaStore Network Storage Controller
		Additional cache memory module and Hitachi Cache Residency Manager software are required.
2	Controller Emulation Types	3990-3, 6, 2105-E20, F20, 2107
	Device Emulation Types	3390-1, 2, 3, 9, L; 3380-E, J, K, 3 type Maximum number of cylinders for 3390-9 = 32,760 Convert using the following values: <ul style="list-style-type: none"> <li>▪ 3390 emulation = 66 KB/track</li> <li>▪ 3380 emulation = 66 KB/track (49.5 KB/track on 9900V)</li> </ul>
System Environment		
3	OS	MVS/ESA, OS/390 <sup>®</sup> , z/OS <sup>®</sup>
Basic Function		
4	Set or reset residence (BIND command)	Supported
5	Display volume statistical information (COUNTS command)	Supported
6	Display dataset statistical information (COUNTS command)	Supported
7	Display volume or dataset status information (STATUS command)	Supported
8	Set or reset extent for dataset statistics information (DSMODE command)	Supported
9	Setting cache memory for Cache Residency Manager	Contact the Hitachi Data Systems Support Center.
Other (Processing Type)		
10	Batch	Supported
11	TSO command	Supported

No	Item	Specification
Software/Cache Residency Manager Specification		
12	Maximum number of resident extent	VSP, USP V: <ul style="list-style-type: none"> <li>Logical Volume: ≤4096 extents</li> <li>Storage System: ≤16,384 extents</li> </ul> USP: <ul style="list-style-type: none"> <li>Logical Volume: ≤4096 extents</li> <li>Storage System: ≤4096 extents</li> </ul>
13	Maximum number of extent for dataset statistics information	VSP, USP V: <ul style="list-style-type: none"> <li>Logical Volume: ≤64 extents</li> <li>LCU: ≤64 extents</li> <li>Storage System: ≤32,640 extents</li> </ul> USP: <ul style="list-style-type: none"> <li>Logical Volume: ≤64 extents</li> <li>Storage System: ≤64 extents</li> </ul>
14	Unit to specify for cache residency	1 track
15	Minimum/maximum size of cache residency	1 track / logical volume size Maximum size depends on No.13's maximum available size of cache memory for Cache Residency Manager.
16	Additional cache memory module	Required
17	Maximum available size of cache memory for Cache Residency Manager. Maximum size depends on No.13's maximum available size of cache memory for Cache Residency Manager.	Additional cache memory size for Cache Residency Manager. Residing 256 MB area actually occupies 512 MB cache memory in RAID1 or 768 MB in RAID5/6.

**Table 3-2 Microcode Requirements for Hitachi Cache Manager**

Hitachi RAID Storage System	Required Microcode Level
Hitachi Virtual Storage Platform	FICON channel: 70-05-xx and higher
Hitachi Universal Storage Platform V/VM	ESCON channel: 60-01-xx and higher FICON channel: 60-01-xx and higher
Hitachi TagmaStore Universal Storage Platform and Network Storage Controller	ESCON channel: 50-01-xx and higher FICON channel: 50-01-xx and higher

## Prerequisites

Before you install the Cache Manager utility, the following tasks must be completed:

- Hitachi Data Systems representative: Install the additional cache memory module and set the amount of cache memory.
- Hitachi Data Systems representative: Set system option mode (SOM) **81** to ON (to support the bound heads counter).
- Hitachi Data Systems representative: For the VSP storage system, set system option mode (SOM) **940** to ON.
- User: Install Cache Residency Manager on each storage system. For details, see the *Hitachi Storage Navigator User Guide*.
- User: Verify that the microcode version supports Hitachi Cache Manager. For details, see Table 3-2.

# Installing Cache Manager

The volume serial number for installation is DCR001. The label format is standard label (SL), and there are five datasets, which are installed as follows:

1. Load the copyright notice (included but not required).
2. Load the HRUDCRX load module (dataset name J91Y1.LINKLIB) into SYS1.LINK.LIB or authorized libraries.
3. Load the HRUDCRT load module (dataset name J91Y1.CMDLIB) into SYS1.CMDLIB or authorized libraries. If you are using HRUDCRT, HRUDCRX must be installed in one of the standard libraries used as logon procedures for TSO users, such as JOBLIB, STEPLIB, or SYS1.LINKLIB.
4. Load HRUDCRT's English help (dataset name J91Y1.HELP) into SYS1.HELP.
5. Load HRUDCRT's Japanese help (dataset name J91.JP.HELP) into SYS1.JP.HELP (included but not required).

Figure 3-1 shows an example of the installation procedure.

```
//COPYJOB JOB
//STEP1 EXEC PGM=IEBCOPY
//SYSPRINT DD SYSOUT=*
//SYSUT1 DD DISP=(OLD,PASS),DSN=J91Y1.LINKLIB,UNIT=PTAPE,
// VOL=SER=DCR001,LABEL=(2,SL)
//SYSUT2 DD DISP=OLD,DSN=SYS1.LINKLIB
//SYSIN DD *
COPY INDD=((SYSUT1,R)),OUTDD=SYSUT2
//*
//STEP2 EXEC PGM=IEBCOPY
//SYSPRINT DD SYSOUT=*
//SYSUT1 DD DISP=(OLD,PASS),DSN=J91Y1.CMDLIB,UNIT=PTAPE,
// VOL=SER=DCR001,LABEL=(3,SL)
//SYSUT2 DD DISP=OLD,DSN=SYS1.CMDLIB
//SYSIN DD *
COPY INDD=((SYSUT1,R)),OUTDD=SYSUT2
//*
//STEP3 EXEC PGM=IEBCOPY
//SYSPRINT DD SYSOUT=*
//SYSUT1 DD DISP=(OLD,PASS),DSN=J91Y1.HELP,UNIT=PTAPE,
// VOL=SER=DCR001,LABEL=(4,SL)
//SYSUT2 DD DISP=OLD,DSN=SYS1.HELP
//SYSIN DD *
COPY INDD=((SYSUT1,R)),OUTDD=SYSUT2
//*
```

**Figure 3-1** Sample JCL for Installation

**Note:** DCRT is an alias of HRUDCRT. You can invoke Cache Manager in TSO by specifying either HRUDCRT or DCRT as the program name. One issue reported with using DCRT, however, is a missing file for online help. If your installation CD is missing the DCRT help file, avoid using the DCRT alias, or contact HDS for the DCRT help file.

HRUDCRX must be registered as authorized libraries, as follows:

1. Register in SYS1.PARMLIB(IKJTSOxx).
2. Add HRUDCRT and the alias DCRT as AUTHCMD NAMES.
3. Add HRUDCRX as AUTHPGM NAMES.

If you are not using IKJTSOxx:

1. Specify the authorized command and authorized program by using CSECT IKJEFTE2 or IKJEFTE8.
2. To update, assemble them, then reassemble them to link them with load module IKJTABLS in SYS1.LPALIB, then re-IPL the system.

Figure 3-2 illustrates the registration process using TSO commands:

```
AUTHCMD NAMES (                +
      DCRT   HRUDCRT            +
      :
      :
)
AUTHPGM NAMES (                +
      HRUDCRX                   +
      :
      :
)
```

**Figure 3-2 Registering HRUDCRT and HRUDCRX**

## Operating Environment

The Cache Manager program operates CACHE management functions for the Hitachi RAID storage systems under following environment.

**Table 3-3 Cache Manager Operating Environment**

Item	Contents
JOB Type	Batch Job
Program Attribution	Register as an authorized program.
Operating Condition Of program	(1) Restriction for specifying by dataset name When user specifies to reside or release residence by using dataset name, the specified dataset must exist in the volume. (2) Vary online the objective volume.
Attribution of Specified Volume	(1) Restriction for multi volume dataset CMG executes the process only for one volume. Then if the dataset is a multi volume dataset, user must specify to reside or release residence for each volume.

# Launching Cache Manager

## Launching HRUDCRX

1. Call the HRUDCRX program. The line count must be from 20 to 99, and the default value is 60. See Figure 3-3 for an example.
2. Use the DD statement to define the volume type. The operand of the statement must specify the unit and volume, and the **DISP** operand must specify **OLD**.  
*Note:* If more than one DD statement is defined, only the first one will be processed. If you need to include more than one DD statement, you must divide the job step.
3. The RAIDPARM DD statement specifies a sequential dataset to describe the device address when you use **STATUS** and **COUNTS** commands with **DKC** parameter. The DCB information of the dataset is as follows:
  - Dataset format (DSORG): SAM (PS)
  - Record format (RECFM) Fixed or Fixed Block (F or FB)
  - Record Length (LRECL) 80
  - Block Length (BLKSIZE) 80 x n
  - You can specify up to 1024 devices.
4. The format and parameter requirements of the RAIDPARM dataset is as follows:
  - RAIDUNIT (CCUU [ - CCUU] [, CCUU] [, ...] )
  - You can specify up to 1024 devices.
  - The record size is 80 bytes, but you can only use columns 1 through 71. Data in columns 72 through 80 will be ignored.
  - You may not put a space between the comma, hyphen, bracket or parameter.
  - The description must be on one line, with no comments on that line.
  - The device number may contain either 3 or 4 digits.
  - If you use a hyphen to specify device number, you must put the lesser number to the left and use the same CC value. All device numbers that are between the two numbers will be included.
5. The SYSPRINT DD statement specifies a sequential dataset to store the output messages. The record length must be 132-byte fixed-length record format.
6. The SYSIN DD statement must specify a dataset that includes HRUDCRX commands, and the record length must be 80 byte fixed-length record format of SAM or PAM. *Note:* HRUDCRX will return normal end (CC=0), even though user does not specify a command and parameter in the SYSIN DD statement.

7. If you are executing a **DSMODE** command with either an **ENABLE** or a **DISABLE** parameter, in order to log any eccentric areas (those that are not part of a dataset), you must specify **DCRLOG DD** statement. **Note:** This command will be ignored if another command or parameter is specified. The required format is as follows:
  - Dataset format (DSORG): SAM (PS)
  - Record format (**RECFM**): Variable (**V**) or Variable Length Block (**VB**)
  - Record length (**LRECL**): **130**
  - Block length (BLKSIZE): 130 x n + 4

```
// EXEC PRG=HRUDCRX, PARM='LINECNT(m)'
```

### Figure 3-3 Launching HRUDCRUX

Figure 3-4 is an example of a JCL specifying a **BIND** command:

```
//JOBNAME JOB
// EXEC PGM=HRUDCRX, PARM=..., REGION=1024K
//SYSPRINT DD SYSOUT=A
//VOL2 DD UNIT=SYSDA, VOL=SER=VSN001, DISP=OLD
//RAIDPDM DD DSN=DATASET1, UNIT=SYSDA, DISP=SHR,
// VOL=SER=ABC001, DCB=(BLKSIZE=.....)
//DCRLOG DD DSN=DATASET2, UNIT=SYSDA, DISP=SHR,
// VOL=SER=ABC002, DCB=(BLKSIZE=.....)
//SYSIN DD *
        BIND ENABLE -
            DDNAME(VOL2) -
            DATASET('USER.FILE')
/*
//
```

### Figure 3-4 BIND Command

The required format for control statements is as follows:

- Specify the control statements in the first line (columns 1 through 71).
- If a control statement is longer than one line (columns 72 and higher), you can continue the statement on the next line as follows:
  - Specify a plus sign after the last parameter if the letters of a parameter are continued to next line.
  - Specify a hyphen after the last parameter if other parameters are continued to next line.
- You cannot specify a space (empty) line between each control statement.

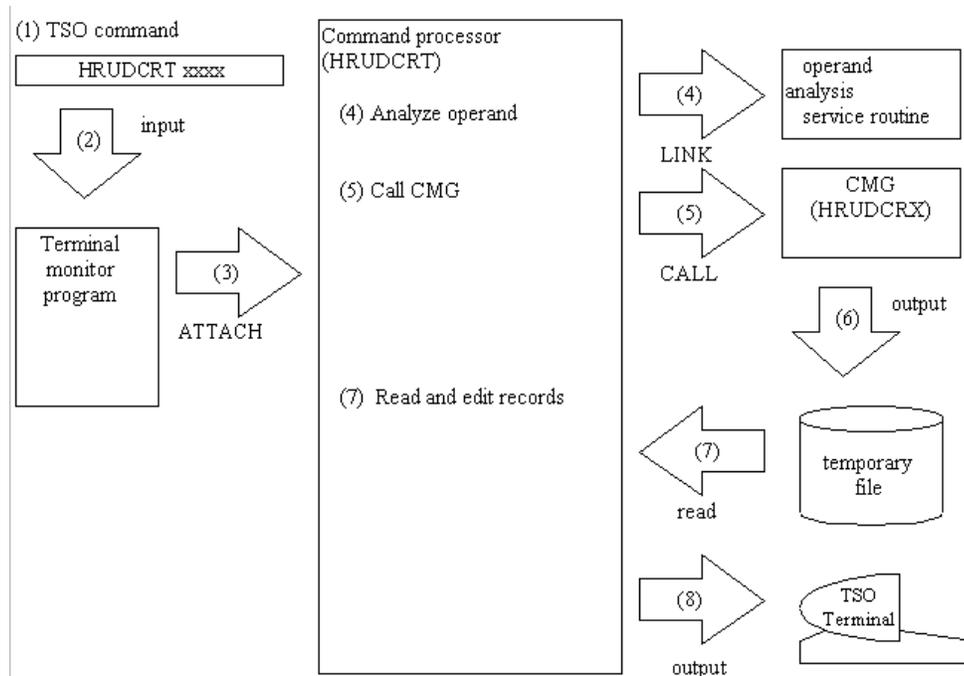
The format for comments is as follows:

- The first column must have a forward slash and an asterisk sign (/ \*).
- Comment statements can be written after a parameter.  
Example: STATUS DEV(5837) DKU /\*COMMENT\*/
- Comment statements can be written between parameters.  
Example: BIND EA DEV(5837) /\*COMMENT\*/ VTOC
- Comment statements can be written after commands.  
Example: STATUS /\*COMMENT\*/ DEV(5837) DKU
- Comment statements can be written before commands.  
Example: /\*COMMENT\*/ BIND DA DEV(5837) DKU
- Comment statements can be written after a parameter using a semicolon (;). Example: STATUS DEV(5837) DKU ;COMMENT
- Parameters can be continued to the next line using a plus sign (+).  
Example: BIND EA DEV(58+37) VTOC
- Parameters can be continued to the next line using a hyphen (-).  
Example: STATUS - DEV(5837) DKU

## Launching HRUDCRT

To launch HRUDCRT:

1. The terminal monitor program will issue an **ATTACH** macro that generates a task and activates the command processor. Register 1 will have a pointer to the command processor parameter list (CPPL).
  2. The executed command processor will analyze the operands as follows:
    - Call the CALLTSSR macro.
    - Make a parameter control list (PCL), including operand description and abbreviated value.
    - Hand the analyzed parameter list (PPL) to the operand analyze routine.
    - Set the described parameters, and return control to the command processor.
  3. The command processor (HRUDCRT) will call the Cache Manager utility by issuing a LOAD/CALL macro to activate Cache Manager (HRUDCRX). HRUDCRT then allocates a SYSIN dataset, sets the input command and operand, and allocates an output dataset (OUTDD).
- Note:** You must allocate the input dataset (RAIDPARM) before executing a HRUDCRT command.
4. The command processor will then collect and edit the Cache Manager output, then display it on screen.



**Figure 3-5 Interface Between Command Processor and Operand Analyze Routine**

## Estimating Required Memory

To calculate the required memory for HRUDCRX, start with 170 KB, which is the basic requirement. Add to that the variable requirement, which is calculated as follows:

$$(A + B + 2,112 + C * (5D + 1,024)) / 1,024 \text{ (KB)}$$

**A** is either 160 (if you are using JOB stream input) or 5 \* the block length of the SYSIN dataset.

**B** is either 242 (if you are using SYSOUT output) or 5 \* the block length of the SYSPRINT dataset.

**C** is either 1 (if you are specifying a RAIDPARM dataset) or 0.

**D** is the block length of the RAIDPARM dataset.

## Performing Cache Manager Operations

This chapter explains the commands and parameters for executing Cache Manager operations.

- [HRUDCRX Commands](#)
- [Using HRUDCRT Commands to Display Information at The Console](#)



**WARNING:** Do not perform the ShadowImage quick restore operation or Volume Migration operations on Cache Manager volumes. These operations swap the internal locations of the source and target volumes. For further information on these operations, please refer to the ShadowImage and Volume Migration documentation for the Hitachi RAID storage system.

---

# HRUDCRX Commands

HRUDCRX supports the following commands:

- [BIND](#) either places data into cache or releases it from cache.
- [COUNTS](#) displays the cache volume or dataset statistics. This command can also reset the counters if necessary.
- [STATUS](#) displays the cache status information.
- [DSMODE](#) either defines the tracks for dataset statistics or releases that definition.
- HRUDCRX commands can also be combined [using JCL](#).

## Using Bind to Place or Release Data From the Cache

Figure 4-1 illustrates **BIND** command parameters.

- **ENABLE** places data into a specified area of cache.
- **DISABLE** releases data from cache.
- You can specify the target data either by **DDNAME** (using volume, unit and disp number), **VOLUME** (volume serial number), or **DEVICE** (device number).
- You can specify the cache area by **VTOC**, **CCHH**, **DATASET**, **CCHH** or **SYSTEMDS** (either physical **VTOC**, **INDEX VTOC**, or **VVDS**). If you specify **ENABLE**, you must also specify one of these parameters.
- **DKU** (default) | **FREESPACE** is used if you want to release tracks from cache (**DISABLE**). The **DKU** command (default) releases all tracks on a particular volume. **FREESPACE** releases all eccentric areas on a volume.
- **PRIO** | **BIND** (default). **PRIO** is used to specify tracks to be bound into priority mode (**ENABLE**).

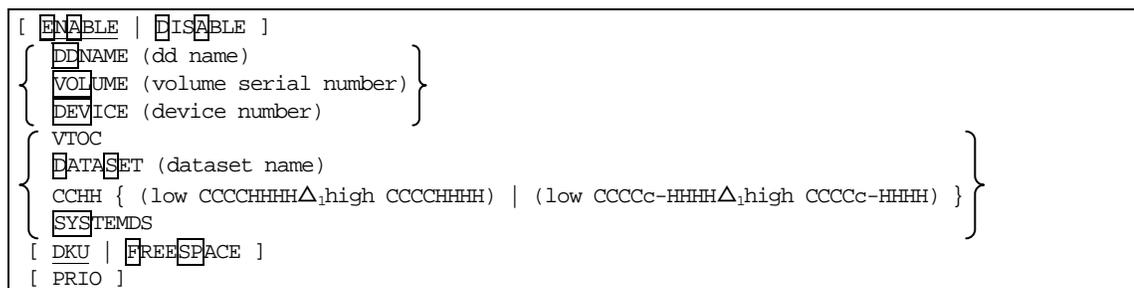


Figure 4-1 **BIND** Command Parameters

Figure 4-2 is a sample JCL of a **BIND/ENABLE** command.

```
(1) //CSUT01 JOB MSGLEVEL=...
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) { //VOL1 DD UNIT=SYSDA,VOL=SER=CSVOL1,DISP=OLD
      //VOL2 DD UNIT=SYSDA,VOL=SER=CSVOL2,DISP=OLD
(5) //SYSIN DD *
(6) BIND ENABLE DDNAME(VOL1) VTOC
(7) BIND ENABLE DDNAME(VOL2) DATASET('USER.FILE')
(8) BIND ENABLE VOLUME(CSVOL3) CCHH(00100005 00100007) PRIO
(9) BIND ENABLE DEVICE(5800) CCHH(00012-0001 00012-0007)
(10) BIND ENABLE VOLUME(CSVOL4) SYSTEMDS
(11) /*
(12) //
```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define the volume serial number of 'CSAVOL1' and 'CSVOL2' in the cache storage system.
- (5) Define a dataset in which control statements are stored.
- (6) Define an area in cache memory. **DDNAME** defines the dd name in the DD statement. **VTOC** specifies the cache residence by VTOC area.
- (7) Define an area in cache memory. **DDNAME** defines the dd name in the DD statement. **DATASET** specifies the residence area by dataset area (DSN: USER.FILE).
- (8) Define an area (three tracks) in cache memory. **VOLUME** defines a volume serial number in the cache storage system. **CCHH** specifies the resident area by absolute address (hexadecimal). **PRIO** specifies PRIORITY mode.
- (9) Define an area (in this case seven tracks) in cache memory. **DEVICE** defines the device number in the cache storage system. **CCHH** specifies the resident area by absolute address (decimal).
- (10) Define an area (VTOC area or VTOCIX area or VVDS area) in cache memory. **VOLUME** defines a volume serial number in the cache storage system. **SYSTEMDS** defines the residence area by VTOC area, VTOCIX area, and VVDS area.
- (11) End of command.
- (12) End of job.

**Figure 4-2 BIND/ENABLE Command**

Figure 4-3 is a sample JCL of a **BIND/DISABLE** command.

```
(1) //CSUT02 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) { //VOL1 DD UNIT=SYSDA,VOL=SER=CSVOL1,DISP=OLD
      //VOL2 DD UNIT=SYSDA,VOL=SER=CSVOL2,DISP=OLD
(5) //SYSIN DD *
(6) BIND DISABLE DDNAME(VOL1) VTOC
(7) BIND DISABLE DDNAME(VOL2) DATASET('USER.FILE')
(8) BIND DISABLE VOLUME(CSVOL3) DKU
(9) BIND DISABLE VOLUME(CSVOL4) CCHH(00100005 00100007)
(10) BIND DISABLE VOLUME(CSVOL4) SYSTEMDS
(11) BIND DISABLE VOLUME(CSVOL4) FREESPACE
(12) /*
(13) //
```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define the volume serial number of 'CSAVOL1' and 'CSVOL2' in the cache storage system.
- (5) Define a dataset in which control statements are stored.
- (6) Define an area to release residence in cache memory. **DDNAME** defines the dd name in the DD statement. **VTOC** specifies the cache residence to be released by VTOC area.
- (7) Define an area to release residence in cache memory. **DDNAME** defines the dd name in the DD statement. This is a required parameter to define dd name (VOL2) in DD statement (4). **DATASET** specifies the residence area to be released by dataset area (DSN: USER.FILE).
- (8) Define an area to release residence in cache memory. **VOLUME** defines a volume serial number in the storage system. **DKU** releases all resident areas in the volume serial number of 'CSVOL3'.
- (9) Define an area (three tracks) to release residence in cache memory. **VOLUME** defines a volume serial number in the cache storage system. **CCHH** specifies the resident area to be released by absolute address (hexadecimal).
- (10) Define an area (using VTOC area, VTOCIX area, and VVDS area) to release residence in cache memory. **VOLUME** defines a volume serial number in the cache storage system. **SYSTEMDS** releases the resident area (defined by VTOC, VTOCIX or VVDS).
- (11) Define an area to release residence in cache memory that has no dataset. **VOLUME** defines a volume serial number in the cache storage system. **FREESPACE** releases resident extents with no dataset.
- (12) End of command.
- (13) End of job.

**Figure 4-3 BIND/DISABLE Command**

## Using COUNTS to Display Cache Volume or Dataset Statistics

The **COUNTS** command allows you to get statistics on cache memory usage and status information. **Note:** Be sure to reset the counter before accessing cache statistic information.

**WARNING:** If other applications are using the cache statistics information, resetting the counter interferes with those operations.

The **COUNTS** command displays either volume or dataset statistics.

- You can specify the target data by **DDNAME** (using volume, unit and disp number), **VOLUME** (volume serial number), or **DEVICE** (device number).
- **REPORT** (default) is a command to print cache statistics information.
- **NO REPORT** is a command to not print cache statistics information.
- **RESET** resets the counter to zero.
- **NO RESET** (default) leaves the counter unchanged.
- **DKU** (default) specifies a target range as a particular volume.
- **DKC** specifies a target range in the same storage system ID (SSID). You need to specify RAIDPARM in the DD statement.
- **DSEXTENT** specifies that dataset statistics information will be included. **Note:** If you use **DSEXTENT**, do not use the **RESET** parameter.
- **NOEXTENT** (default) specifies that volume statistics information will be included.

```
{ DDNAME (dd name)
  VOLUME (volume serial number)
  DEVICE (device number)
  [ REPORT | NOREPORT ]
  [ RESET | NORESET ]
  [ DKU | DKC ]
  [ DSEXTENT | NOEXTENT ] }
```

Figure 4-4 COUNTS Command Parameters

Figure 4-5 is a sample JCL of a **COUNTS** command for volume statistics. Cache Manager resets the volume statistics of the current volume, then edits and prints out the volume statistics for all volumes in the storage system.

```

(1) //CSUT12 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //RAIDPARM DD DSN=input dataset name, VOL=SER=volume serial number,
(5) // UNIT=SYSDA,DISP=SHR
(6) //SYSIN DD *
      COUNTS VOLUME(CSVOL1) -
          DKU -
          REPORT -
          RESET
(7)      COUNTS VOLUME(CSVOL1) -
          DKC -
          REPORT -
          NORESET
(8) /*
(9) //

```

1. (1) Start of job. Execute HRUDCRX.
2. (2) Spool the message dataset.
3. (3) Define a dataset to store the device number.
4. (4) Define a dataset to store the control statements.
5. (5) Identifies the source of the input statements. An input statement to HRUDCRX is a command. When you code `SYSIN DD*`, you identify the statements that follow as input.
6. (6) Edit and print out volume statistics. **VOLUME** defines the volume serial number of the cache storage system (CSVOL1 in this example). **DKU** specifies the entire volume. **REPORT** edits and prints out volume statistics information. **RESET** resets the volume statistics information counter after the information is printed out.
7. (7) Edit and print out the volume statistics information counter. **VOLUME** defines a volume serial number in the cache storage system. **DKC** specifies all volumes with the same storage system ID (SSID). This is necessary to define the RAIDPARM DD statement. **REPORT** is a required parameter to edit and print out the volume statistics information counter. **NORESET** defines that the volume statistics information counter will not be reset.
8. (8) End of command.
9. (9) End of job.

**Figure 4-5 COUNTS Command for Volume Statistics**

Figure 4-6 is an example of volume statistics.

```

CACHE MANAGER UTILITY (P-9Y2R-J91Y1 01-02-07)LISTING INFORMATION 1999-11-30, 11:36:44 PAGE
0001
COUNTS VOLUME (NAS033) DKU
                                CACHE EXTENT COUNTERS REPORT
VOLSER---NAS033  DEVICE NUMBER---X' 581C'  DEVICE TYPE---3390-3 SSID---X' 0094'  DEVICE
ADDRESS-X' 1C'

I/O COUNTERS  READ          WRITE          DFW
                READS READ HITS  HIT%  WRITES  WRITE HITS  HIT%  DFWS  DFW HITS  HIT%
BASIC MODE    3210          3210  100    7        7        100   7     7        100
SEQUENTIAL MODE 49           49  100    2         1         50   2     1         50
                BOUND HEADS          0                0
INHIBIT CACHE LOADING MODE  READS/WRITES          0  TOTAL I/O COUNTERS  READS/WRITES
3268
                CACHE BYPASS MODE          READS/WRITES  0                READ HIT% 100
                VERIFY MODE          READS/WRITES  0                WRITE HIT%  0
OTHER INFORMATION
                DESTAGE HEADS          16                DFW OVERFLOW I/O COUNTERS  0
                SEQUENTIAL ACCESS MODE LOAD HEADS          0                WITHOUT SEQUENTIAL MODE LOAD HEADS
1

```

**Figure 4-6 Volume Statistics Report**

Figure 4-7 is a sample JCL of a **COUNTS** command for dataset statistics. Cache Manager edits and prints out dataset statistics information for the specified datasets, then edits and prints out dataset statistics information for all volumes with the same storage system ID (SSID).

```

(1) //CSUT22 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //RAIDPARM DD DSN=input dataset name, VOL=SER=volume serial number,
// UNIT=SYSDA,DISP=SHR
(5) //SYSIN DD *
(6) COUNTS VOLUME(CSVOL1) -
DKU -
DSEXTENT -
REPORT
(7) COUNTS VOLUME(CSVOL1) -
DKC -
DSEXTENT -
REPORT
(8) /*
(9) //

```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define a dataset to store the device number.
- (5) Define a dataset to store the control statements.
- (6) Edit statistics information and print out it. **VOLUME** defines a volume serial number in the cache storage system. **DKU** specifies the entire volume. **DSEXTENT** processes dataset statistics information of specified datasets. **REPORT** edits and prints out statistics information.
- (7) Edit and print out the statistics information counter. **VOLUME** defines a volume serial number in the cache storage system. **DKC** specifies all volumes with the same storage system ID (SSID). This is necessary to define the RAIDPARM DD statement. **DSEXTENT** processes dataset statistics information of the specified datasets. **REPORT** edits and prints out statistics information.
- (8) End of command.
- (9) End of job.

**Figure 4-7 COUNTS Command for Dataset Statistics**

Figure 4-8 is an example of dataset statistics.

```

CACHE MANAGER UTILITY (P-9Y2R-J91Y1 01-02-07) LISTING INFORMATION 2000-03-23,10:01:05 PAGE 0001
COUNTS VOL(RAID31) DKU DSEXTENT
                CACHE EXTENT COUNTERS REPORT
VOLSER----RAID31  DEVICE NUMBER----X'2001'  DEVICE TYPE----3390-3  SSID----X'0094'
DEVICE ADDRESS-- X'01'
USED DATASET COUNT----      6
  ----DATASET NAME----      I/O COUNTERS-----DSEXTENT-      ---EXTENT----
                                READS          WRITES          STATUS          COUNT
***** VTOC *****          967295          67296          EQUAL          1
SYS1.VTOCIX.RAID31          967295          967296          EQUAL          1
SYS1.VVDS.VRAID31          967295          296          EQUAL          1
USER1.AAAA.BBBB.CCCC          4967295          296          EQUAL          2
USER1.AAAA.BBBB.DDDD          294967295          67296          EQUAL-          2
*USER1.AAAA.BBBB.EEEE          95          6          EQUAL          0

```

**Figure 4-8 Dataset Statistics Report**

## Using STATUS to Display the Cache Status

The **STATUS** command displays volume or dataset status information, including the size of the cache memory, the residence area of the cache extents, and the extent of the dataset statistics information. See the glossary for status definitions.

Figure 4-9 illustrates **STATUS** command parameters.

- You can specify target data by **DDNAME**, (using volume, unit and disp number), **VOLUME** (volume serial number) or **DEVICE** (device number).
- You can specify a target data range as either **DKU** (a volume defined by DDNAME or volume) or **DKC** (all volumes in the same storage system ID). (**DKU** is the default value.)
- **EXTENT** specifies that cache extent information will be printed.
- **NOEXTENT** (default) specifies that cache extent information will not be printed.
- **DSEXTENT** specifies that extent information of dataset statistics will be printed. If this is combined with a DKC command, you must also define **RAIDPARM**.

```

{ DDNAME (dd name)
  VOLUME (volume serial number)
  DEVICE (device number)
  [ DKU | DKC ]
[ EXTENT | NOEXTENT | DSEXTENT ]

```

**Figure 4-9 STATUS Command Parameters**

Figure 4-10 is an example of a cache memory **STATUS** report.

```
** CACHE MANAGER UTILITY (P-9Y2R-J91Y1 01-02-07) ** LISTING INFORMATION 2000-03-23,
10:01:05 PAGE 0001
STATUS VOL (RAID31) DKC

                                CACHE SUBSYSTEM STATUS REPORT

DISK CONTROLLER INFORMATION
      CU-TYPE---- 3990-3      SSID---- X'0080'   DEVICE ADDRESS---- X'01'
      CACHE                               NVS                               PINNED DATA
STATUS      ENABLED                               ENABLED                               NONE

FLASH ACCESS CONFIGURATION REMAINING AREA          2097152
                               USED AREA          2097152
                               FLASH ACCESS AVAILABLE 4194304
                               USED AREA COUNT      1024
```

**Figure 4-10** Cache Memory STATUS Report

**Note:** The term “Flash Access” is another name for Cache Residency Manager.

Figure 4-11 is an example of a cache extent **STATUS** report.

```

** CACHE MANAGER UTILITY (P-9Y2R-J91Y1 01-02-07) ** LISTING INFORMATION 2000-03-23,
10:01:05 PAGE 0001
STATUS VOL(RAID31) DKU CACHE EXTENT STATUS REPORT

VOLSER--RAID31 DEVICE NUMBER---- X'2001' DEVICE TYPE----3390-3 SSID----X'0094' DEVICE
ADDRESS---- X'01'
CACHE ACCESS--ENABLED DRIVE STATUS--ENABLED DFW STATUS----- ENABLED USED AREA COUNT-- 5
----FROM---- ----TO---- ----SIZE---- ----DCR----- --EXTENT--- -DATASET NAME---
CC HH CC HH CYLS HEADS TYPE RELATION
00000-0001 00010-0001 10 1 BIND ALL USER1.AAAA.BBBB.CCCC
00050-0000 00100-0014 51 0 PRIO PART USER1.AAAA.BBBB.DDDD
00128-0000 00160-0008 32 9 BIND PART USER1.AAAA.BBBB.DDDD
01000-0000 01009-0014 10 0 PRIO ALL USER1.AAAA.BBBB.EEEE
01010-0000 01010-0014 1 0 PRIO ALL *** VTOC ****
01011-0000 01011-0014 1 0 PRIO ALL SYS1.VTOCIX.RAID31
01012-0000 01012-0014 1 0 PRIO ALL SYS1.VVDS.VRAID31
01013-0000 01013-0014 1 0 BIND ALL ***FREE SPACE ***

```

**Figure 4-11 Cache Extent STATUS Report**

Figure 4-12 is an example of a CLPR for Cache Residency Manager **STATUS** report.

```

** CACHE MANAGER UTILITY (P-9Y2R-J91Y1 01-06-03) ** LISTING INFORMATION 2005-
02-16, 10:01:05 PAGE 0001
STATUS VOL(RAID31) CLPR CACHE SUBSYSTEM STATUS REPORT

DISK CONTROLLER INFORMATION
CU-TYPE---- 3990-3 SSID---- X'0080' DEVICE ADDRESS---- X'01'
CACHE NVS
PINNED DATA
STATUS ENABLED ENABLED
NONE

CLPR NO. 32
CURRENT CLPR CONFIGURATION REMAINING AREA 2000000
USED AREA 2000000
FLASH ACCESS AVAILABLE 4000000

MAXIMUM AREA COUNT 2048
USED AREA COUNT 1024
DEVICE USED AREA COUNT 512

```

**Figure 4-12 CLPR Extent STATUS Report**

**Note:** "Flash Access" is another name for Cache Residency Manager.

Figure 4-13 is an illustration of a JCL for volume **STATUS**.

```
(1) //CSUT13 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //RAIDPARM DD DSN=input dataset name, VOL=SER=volume serial number,
// UNIT=SYSDA,DISP=SHR
(5) //SYSIN DD *
(6) STATUS VOLUME(CSVOL2) -
DKU
(7) STATUS VOLUME(CSVOL3) -
DKC -
EXTENT
(8) /*
(9) //
```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define a dataset to store the device number.
- (5) Define a dataset to store the control statements.
- (6) Edit the cache status, nonvolatile memory status and capacity information and store them in the dataset. **VOLUME** defines a volume serial number in the cache storage system. **DKU** is a required parameter to specify the entire volume of 'CSVOL2'.
- (7) Edit the cache status and extent information and store them in the dataset. **VOLUME** defines a volume serial number in the cache storage system. **DKC** specifies all volumes with the same storage system ID (SSID). This is necessary to define the RAIDPARM DD statement. **EXTENT** defines the cache extent as all volumes that belong to same storage system ID (SSID).
- (8) End of command.
- (9) End of job.

**Figure 4-13 Volume STATUS Command**

Figure 4-14 illustrates a sample JCL for a dataset **STATUS** command. Cache Manager stores, edits and prints the extent information (dataset statistics) for all volumes, including a specified volume with the same storage system ID (SSID).

```

(1) //CSUT23 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //RAIDPARM DD DSN=input dataset name, VOL=SER=volume serial number,
// UNIT=SYSDA,DISP=SHR
(5) //SYSIN DD *
(6) STATUS VOLUME(CSVOL2) -
DKU -
(7) DSEXTENT
STATUS VOLUME(CSVOL3) -
DKC -
(8) DSEXTENT
(9) /*
//

```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define a dataset to store the device number.
- (5) Define a dataset to store the control statements.
- (6) Edit the cache status, nonvolatile memory status and capacity information and store them in the dataset. **VOLUME** defines a volume serial number in the cache storage system. **DKU** is a required parameter to specify the entire volume of 'CSVOL2'. **DSEXTENT** processes dataset statistics information of specified datasets.
- (7) Edit the cache status and extent information and store them in the dataset. **VOLUME** defines a volume serial number in the cache storage system. **DKC** specifies all volumes with the same storage system ID (SSID). This is necessary to define the RAIDPARM DD statement. **DSEXTENT** processes specified dataset statistics information for all volumes with the same storage system ID (SSID).
- (8) End of command.
- (9) End of job.

**Figure 4-14 Dataset STATUS Command**

Figure 4-15 is an example of a dataset **STATUS** report.

```

** CACHE MANAGER UTILITY (P-9Y2R-J91Y1 01-02-07)**LISTING INFORMATION 2000-03-23, 10:01:05
PAGE 0001

STATUS VOL(RAID31) DKU DSEXTENT

                                CACHE EXTENT STATUS REPORT

VOLSER----RAID31 DEVICE NUMBER----X'2001' DEVICE TYPE---3390-3  SSID---- X'0094'   DEVICE
ADDRESS---- X'01'
CACHE ACCESS--ENABLED DRIVE STATUS--  ENABLED DFW STATUS-----  ENABLED USED AREA COUNT--  8
-----FROM-----  ----TO-----  ----SIZE-----  -----EXTENT-----  ----DATASET
NAME-----
    CC  HH      CC  HH      CYLS  HEADS      RELATION
00000-0001  00010-0001      10     1      ALL *USER1.AAAA.BBBB.CCCC
00050-0000  00100-0014      51     0      PART USER1.AAAA.BBBB.DDDD
00128-0000  00160-0008      32     9      PART USER1.AAAA.BBBB.DDDD
01000-0000  01009-0014      10     0      ALL *USER1.AAAA.BBBB.EEEE
01010-0000  01010-0014      1     0      ALL ***** VTOC *****
01011-0000  01011-0014      1     0      ALL SYS1.VTOCIX.RAID31
01012-0000  01012-0014      1     0      ALL SYS1.VVDS.VRAID31
01013-0000  01013-0014      1     0      ALL *** FREE SPACE ***

```

**Figure 4-15 Dataset STATUS Report**

Figure 4-16 illustrates the output of a volume **STATUS** command.

```

** CACHE MANAGER UTILITY (P-9Y2R-J91Y1 01-02-07) ** LISTING INFORMATION 000-03-23,
10:01:05 PAGE 0001

STATUS VOL(RAID31) DKC

                                CACHE SUBSYSTEM STATUS REPORT

    DISK CONTROLLER INFORMATION
          CU-TYPE---- 3990-3      SSID---- X'0080'   DEVICE ADDRESS---- X'01'
          STATUS          CACHE          NVS          PINNED DATA
                   ENABLED          ENABLED          NONE

FLASH ACCESS CONFIGURATION REMAINING AREA          2097152
                           USED AREA          2097152
                           FLASH ACCESS AVAILABLE 4194304
                           USED AREA COUNT          1024

```

**Figure 4-16 Volume STATUS Command**

**Note:** “Flash Access” is another name for Cache Residency Manager.

## Using DSMODE to Define Tracks for Dataset Statistics

Figure 4-17 illustrates **DSMODE** command parameters. The **DSMODE** command allows you to define a cache extent for dataset statistics information and then release it. Once the dataset is defined, Cache Manager can display I/O counts for each extent (refer to Figure 4-8).

- **ENABLE** sets dataset statistics information for the specified area, defined either by **VTOC** or **DATASET**.
- **DISABLE** releases dataset statistics information, defined either by **VTOC**, **DATASET**, **DKU** (all tracks on a particular volume), or **ECCENTRICAREA**. An **ECCENTRICAREA** is a cache extent that does not belong to a dataset managed by the **VTOC**.  
**Note:** If you specify **DKU** or **ECCENTRICAREA**, do not use **VTOC** or **DATASET**.
- You can specify target data by **DDNAME** (using volume, unit and disp number), **VOLUME** (volume serial number) or **DEVICE** (device number).

```
ENABLE | DISABLE ]
{
  DDNAME (dd name)
  VOLUME (volume serial number)
  DEVICE (device number)
}
[ VTOC | DATASET (dataset name) ]
[ DKU | ECCENTRICAREA ]
```

Figure 4-17 DSMODE Command Parameters

Figure 4-18 illustrates a **DSMODE** command. Cache Manager specifies dataset statistics information by the tracks of the specified extents.

```
(1) //CSUT24 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //VOL1 DD UNIT=SYSDA,VOL=SER=CSVOL1,DISP=OLD
(5) //DCRLOG DD DSN=input dataset name, VOL=SER=volume serial number,
// UNIT=SYSDA,DISP=SHR
(6) //SYSIN DD *
(7) DSMODE ENABLE -
DDNAME(VOL1) -
VTOC
(8) DSMODE ENABLE -
VOLUME(CSVOL2) -
DATASET('USER.FILE')
(9) /*
(10) //
```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define the volume serial number of 'CSAVOL1' in the cache storage system.
- (5) Define a dataset to store LOG (DCRLOG) to set or release dataset statistics information.
- (6) Define a dataset to store the device number.
- (7) Define an area (VTOC area) to set dataset statistics information.
- (8) **DDNAME** defines the dd name in the DD statement. **VTOC** specifies the cache residence by VTOC area.
- (9) Define an area (DATASET area) to set dataset statistics information. **VOLUME** defines a volume serial number in the cache storage system. **DATASET** specifies the residence area by dataset area.
- (10) End of command.
- (11) End of job.

**Figure 4-18 DSMODE Command for Statistics by Extent and Track**

Figure 4-19 illustrates a **DSMODE** command. Cache Manager releases dataset statistics information for the specified extents or volumes.

```

(1) //CSUT25 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //DCRLOG DD DSN=input dataset name, VOL=SER=volume serial number,
// UNIT=SYSDA,DISP=SHR
(5) //VOL1 DD UNIT=SYSDA,VOL=SER=CSVOL1,DISP=OLD
//VOL2 DD UNIT=SYSDA,VOL=SER=CSVOL2,DISP=OLD
(6) //SYSIN DD *
(7) DSMODE DISABLE -
DDNAME(VOL1) -
VTOC
(8) DSMODE DISABLE -
DDNAME(VOL2) -
DATASET('USER.FILE')
(9) DSMODE DISABLE -
VOLUME(CSVOL3) -
DKU
(10) DSMODE DISABLE -
VOLUME(CSVOL4) -
ECCENTRICAREA
(11) /*
(12) //

```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define a dataset to store LOG (DCRLOG) to set or release dataset statistics information.
- (5) Define the volume serial number of 'CSAVOL1, CSAVOL2' in the cache storage system.
- (6) Define a dataset to store the device number.
- (7) Define an area (VTOC area) to release dataset statistics information.
- (8) **DDNAME** defines the dd name in the DD statement. **VTOC** specifies the cache residence to be released by VTOC area. **DDNAME** defines the dd name in the DD statement. **DATASET** specifies the residence area to be released by dataset area (DSN: USER.FILE).
- (9) Define an area to release dataset statistics information. **VOLUME** defines a volume serial number in the cache storage system. **DKU** releases all statistics area in the volume serial number of 'CSVOL3'.
- (10) Define an area to release dataset statistics information. **VOLUME** is a required parameter to define a volume serial number of 'CSVOL4' in the cache storage system. **ECCENTRICAREA** is a parameter to release only eccentric areas.
- (11) End of command.
- (12) End of job.

**Figure 4-19 DSMODE Command Releasing Dataset Statistics Information**

## Using JCL Run Commands

Figure 4-20 illustrates a JCL of combined volume commands. Cache Manager edits and prints out the statistics information counter, resets the counter, then resides the VTOC of the specified volumes. Then Cache Manager edits and prints out the extent information.

```
(1) //CSUT16 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //RAIDPARM DD DSN=input dataset name, VOL=SER=volume serial number,
    //          UNIT=SYSDA,DISP=SHR
(5) { //VOL1 DD VOL=SER=CSVOL1,UNIT=SYSDA,DISP=OLD
    //VOL2 DD VOL=SER=CSVOL2,UNIT=SYSDA,DISP=OLD
(6) //SYSIN DD *
(7) COUNTS DDNAME(VOL1) DKC REPORT RESET
(8) { BIND ENABLE DDNAME(VOL1) VTOC
    { BIND ENABLE DDNAME(VOL2) VTOC
(9) STATUS DDNAME(VOL1) DKC EXTENT
(10) /*
(11) //
```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define a dataset to store the device number.
- (5) Define volume serial number in the cache storage system.
- (6) Define a dataset to store the control statements.
- (7) Edit statistics information counter and print out it and reset the counter.
- (8) Reside the physical VTOC area of 'CSVOL1' and 'CSVOL2'.
- (9) Edit and print out the extent information.
- (10) End of command.
- (11) End of job.

**Figure 4-20 Combined Volume Commands**

Figure 4-21 illustrates a JCL of combined dataset commands. Cache Manager edits and prints out the dataset statistics information counter, then sets the dataset statistics information for the VTOC of the specified volumes. Then Cache Manager edits and prints out the cache status and dataset statistics.

```

(1) //CSUT26 JOB MSGLEVEL=(1,1)
(2) //CACHE EXEC PGM=HRUDCRX,REGION=1024K
(3) //SYSPRINT DD SYSOUT=A
(4) //RAIDPARM DD DSN=input dataset name, VOL=SER=volume serial number,
// UNIT=SYSDA,DISP=SHR
(5) { //VOL1 DD VOL=SER=CSVOL1,UNIT=SYSDA,DISP=OLD
//VOL2 DD VOL=SER=CSVOL2,UNIT=SYSDA,DISP=OLD
(6) //SYSIN DD *
(7) COUNTS DDNAME(VOL1) DKC DSEXTENT REPORT NORESET
(8) { DSMODE ENABLE DDNAME(VOL1) VTOC
DSMODE ENABLE DDNAME(VOL2) VTOC
(9) STATUS DDNAME(VOL1) DKC DSEXTENT
(10) /*
) //
(11)
)

```

- (1) Start of job.
- (2) Execute HRUDCRX.
- (3) Spool the message dataset.
- (4) Define a dataset to store the device number.
- (5) Define volume serial number in the cache storage system.
- (6) Define a dataset to store the control statements.
- (7) Edit and print out dataset statistics information.
- (8) Set dataset statistics information for the physical VTOC area of 'CSVOL1' and 'CSVOL2'.
- (9) Edit and print out cache status and dataset statistics.
- (10) End of command.
- (11) End of job.

**Figure 4-21 Combined Dataset Commands**

## Using HRUDCRT Commands to Display Information at the Console

HRUDCRT supports the following commands:

- [COUNTS](#) displays cache volume or dataset statistics. This command can also reset the counters if necessary.
- [STATUS](#) displays cache status information.
- [HELP](#) displays definitions of terms that appear on screen.

### Using COUNTS to Display Cache Volume or Dataset Statistics

Figure 4-22 illustrates HRUDCRT **COUNTS** command parameters.

- **VOLUME** specifies a process target by volume serial number.
- **DKU|DKC** specifies a target range. **DKU** (default) means you specify by a particular volume parameter, and **DKC** means you specify all volumes in the same storage system ID. You must also define the **RAIDPARM DD** statement.
- **DSEXTENT|NOEXTENT** (default) specifies whether you want statistics by dataset or volume. **Note:** If you specify by **DSEXTENT**, do not use the **RESET** parameter.
- **REPORT** (default) | **NOREPORT** specifies whether or not you want a printed report.
- **RESET|NORESET** (default) specifies whether or not you want to reset the cache statistics information counter to zero.

```
HRUDCRT COUNTS, VOLUME (volume serial number)
[ DKU | DKC ]
[ DSEXTENT | NOEXTENT ]
[ REPORT | NOREPORT ]
[ RESET | NORESET ]
```

**Figure 4-22** HRUDCRT COUNTS Command Parameters

Figure 4-23 is an illustration of a HRUDCRT volume **COUNTS** command.

```

READY
HRUDCRT COUNTS VOL(RAID31) DKU
JSE800I-I COUNTS ACCEPT
JSE001I-I END OF HRUDCRX, RETURN CODE IS 00
***** CACHE SUBSYSTEM COUNTERS REPORT (01-02-07) *****
VOLSER      DEVICE NUMBER  DEVICE TYPE  SSID      DEVICE ADDRESS
-----
RAID31      X'2001'      3390-3      X'0080'   X'01'

I/O COUNTERS: BASIC MODE
READS      READ HITS    %    WRITES    WRITE HITS  %    DFW      DFW HITS    %
-----
3458      3269      94    2210      1835      83    1602      1538      96

I/O COUNTERS: SEQUENTIAL MODE
READS      READ HITS    %    WRITES    WRITE HITS  %    DFW      DFW HITS    %
-----
46879     34774      74    17964     14192     64    18219     14192     77

I/O COUNTERS: BOUND HEADS
READS      READ HITS    %    WRITES    WRITE HITS  %    DFW      DFW HITS    %
-----
1096      647

I/O COUNTERS: INHIBIT CACHE LOADING MODE
READS/WRITES      104

I/O COUNTERS: CACHE BYPASS MODE
READS/WRITES      0

I/O COUNTERS: VERIFY MODE
READS/WRITES      0

TOTAL I/O COUNTERS
READS/WRITES      72538      READ HIT%    54      WRITE HIT%    22

OTHER INFORMATION
DESTAGE HEADS      505
DFW OVERFLOW I/O COUNTERS      0
SEQUENTIAL ACCESS MODE LOAD HEADS      1215
WITHOUT SEQUENTIAL MODE LOAD HEADS      791
JSE801I-I END OF COUNTS
READY

```

**Figure 4-23 HRUDCRT Volume COUNTS Command**

Figure 4-24 is an illustration of a HRUDCRT dataset **COUNTS** command.

```

READY
HRUDCRT COUNTS VOL(RAID31) DKU DSEXTENT
JSE800I-I COUNTS ACCEPT
JSE001I-I END OF HRUDCRX, RETURN CODE IS 00
***** CACHE SUBSYSTEM COUNTERS REPORT (01-02-07) *****
VOLSER   DEVICE NUMBER   DEVICE TYPE   SSID   DEVICE ADDRESS
-----
RAID31   X'2001'           3390-3       '0080' X'01'

      USED DATASET COUNT
      -----
              6

              I/O COUNTERS           DSEXTENT EXTENT
DATASET NAME      READS      WRITES      STATUS   COUNT
-----
***** VTOC *****
SYS1.VTOCIX.RAID31  2147483647  2147483647  EQUAL    1
SYS1.VVDS.VRAID31  2147483647  2147483647  EQUAL    1
USER1.AAAA.BBBB.CCCC.DDDD.EEEE.FFFF.GGGG.HHH*
                2147483647  2147483647  EQUAL    1
USER1.AAAA.BBBB.DDDD  2147483647  2147483647  EQUAL    2
USER1.AAAA.BBBB.EEEE  2147483647  2147483647  EQUAL-   2
JSE801I-I END OF COUNTS
READY

```

**Figure 4-24** HRUDCRT Dataset COUNTS Command

**Note:** If the dataset name is over 40 characters, the data will be shown in the following line.

## Using STATUS to Display the Cache Status

Figure 4-25 illustrates HRUDCRT **STATUS** command parameters. See the glossary for further definition of the types of cache status.

- **VOLUME** allows you to specify a process target by volume serial number.
- **DKU|DKC|CLPR** allows you to specify a target range. **DKU** (default) specifies the target range by a particular volume parameter, and **DKC** specifies the target range as all volumes in the same storage system ID. You must also define the RAIDPARM DD statement. For installation of Cache Logical Partition (CLPR) function, CMG outputs CLPR information, which volume belongs to a specified.
- **EXTENT** specifies that cache extent information will be printed.
- **NOEXTENT** (default) specifies that cache extent information will not be printed.
- **DSEXTENT** specifies that dataset statistics information will be printed. If this is combined with a **DKC** command, you must also define the RAIDPARM DD statement.

Figure 4-26 is an illustration of a HRUDCRT device **STATUS** command.

```
HRUDCRT STATUS, VOLUME (volume serial number)
[ DKU | DKC | CLPR ]
[ EXTENT | NOEXTENT | DSEXTENT ]
```

**Figure 4-25 HRUDCRT STATUS Command Parameters**

```
READY
HRUDCRT STATUS VOL(RAID31) DKC
JSE800I-I STATUS ACCEPT
JSE001I-I END OF HRUDCRX, RETURN CODE IS 00
***** CACHE SUBSYSTEM STATUS REPORT (01-02-07) *****
DISK CONTROLLER INFORMATION
CU-TYPE      SSID      DEVICE ADDRESS
-----
3990-3      X'0080'      X'01'

                CACHE          NVS          PINNED DATA
-----
STATUS          ENABLED          ENABLED          NONE

DCR CONFIGURATION REMAINING AREA      734656
                   USED AREA          313920
                   DCR AVAILABLE BYTE 1048576
                   USED AREA COUNT    17
JSE801I-I END OF STATUS
READY
```

**Figure 4-26 HRUDCRT Device STATUS Command**

Figure 4-27 is an illustration of a HRUDCRT residence **STATUS** command.

```

READY
HRUDCRT STATUS VOL(RAID31) DKU
JSE800I-I STATUS ACCEPT
JSE001I-I END OF HRUDCRX, RETURN CODE IS 00
***** CACHE SUBSYSTEM STATUS REPORT (01-02-07) *****
VOLSER   DEVICE NUMBER   DEVICE TYPE   SSID   DEVICE ADDRESS
-----
RAID31   X'2001'             3390-3       X'0080'   X'01'

CACHE ACCESS   DRIVE STATUS   DFW STATUS   USED AREA COUNT
-----
          ENABLED           ENABLED           ENABLED           5

          FROM           TO           SIZE           DCR   EXTENT
          CC   HH           CC   HH           CYLS HEADS   TYPE  RELATION  DATASET NAME
-----
00000-0001 00010-0001    10    1    BIND   ALL   USER1.AAAA.BBBB.1111
00050-0000 00100-0014    51    0    PRIO   PART  USER1.AAAA.BBBB.2222
00128-0000 00160-0008    32    9    BIND   PART  USER1.AAAA.BBBB.2222
01000-0000 01009-0014    10    0    PRIO   ALL   USER1.AAAA.BBBB.CCCC.33*33
01010-0000 01010-0014    1    0    PRIO   ALL   ***** VTOC *****
01011-0000 01011-0014    1    0    PRIO   ALL   SYS1.VTOCIX.SYSC02
01012-0000 01012-0014    1    0    PRIO   ALL   SYS1.VVDS.VSYSC02
01013-0000 01013-0014    1    0    BIND   ALL   ***** FREE SPACE *****
JSE801I-I END OF STATUS
READY

```

**Figure 4-27 HRUDCRT Residence STATUS Command**

Figure 4-28 is an illustration of a HRUDCRT dataset **STATUS** command.

```

READY
HRUDCRT STATUS VOL(RAID31) DKU DSEXTENT
JSE800I-I STATUS ACCEPT
JSE001I-I END OF HRUDCRX, RETURN CODE IS 00
***** CACHE SUBSYSTEM STATUS REPORT (01-02-07) *****
VOLSER   DEVICE NUMBER   DEVICE TYPE   SSID   DEVICE ADDRESS
-----
RAID31   X'2001'             3390-3       X'0080'   X'01'

CACHE ACCESS   DRIVE STATUS   DFW STATUS   USED AREA COUNT
-----
          ENABLED           ENABLED           ENABLED           8

          FROM           TO           SIZE           EXTENT
          CC   HH           CC   HH           CYLS HEADS   RELATION  DATASET NAME
-----
00000-0001 00010-0001    10    1           ALL   USER1.AAAA.BBBB.1111
00050-0000 00100-0014    51    0           PART  USER1.AAAA.BBBB.2222
00128-0000 00160-0008    32    9           PART  USER1.AAAA.BBBB.2222
01000-0000 01009-0014    10    0           ALL   USER1.AAAA.BBBB.CCCC.33*33
01010-0000 01010-0014    1    0           ALL   ***** VTOC *****
01011-0000 01011-0014    1    0           ALL   SYS1.VTOCIX.RAID31
01012-0000 01012-0014    1    0           ALL   SYS1.VVDS.VRAID31
01013-0000 01013-0014    1    0           ALL   ***** FREE SPACE *****
JSE801I-I END OF STATUS
READY

```

**Figure 4-28 HRUDCRT Dataset STATUS Command**

Figure 4-29 is an illustration of a HRUDCRT dataset **STATUS** command.

```

READY
HRUDCRT STATUS VOL(RAID31) CLPR
JSE800I-I STATUS ACCEPT
JSE001I-I END OF HRUDCRX, RETURN CODE IS 00
***** CACHE SUBSYSTEM STATUS REPORT (01-06-03) *****
DISK CONTROLLER INFORMATION
CU-TYPE      SSID      DEVICE ADDRESS
-----      -
3990-3      X'0080'      X'01'

                CACHE                NVS                PINNED DATA
                -----                -----                -----
STATUS        ENABLED                ENABLED                NONE

CLPR NO. 32

CURRENT CLPR CONFIGURATION REMAINING AREA                2000000
                        USED AREA                2000000
                        FLASH ACCESS AVAILABLE                4000000

                        MAXIMUM AREA COUNT                2048
                        USED AREA COUNT                1024
                        DEVICE USED AREA COUNT                512

JSE801I-I END OF STATUS
READY

```

**Figure 4-29 HRUDCRT CLPR STATUS Command**

**Note:** "Flash Access" is another name for Cache Residency Manager.

## Displaying Help for HRUDCRT Commands

Figure 4-30 is an example of the HRUDCRT HELP file.

```
)F FUNCTION -
  THE HRUDCRT COMMAND DISPLAYS STATUS OF CACHE SUBSYSTEMS SPECIFIED.

)X SYNTAX -
  HRUDCRT STATUS
    VOLUME('SERIAL')
    DKC/DKU
    EXTENT/NOEXTENT

  OR

  HRUDCRT COUNTS
    VOLUME('SERIAL')
    DKC/DKU
    RESET/NORESET
    REPORT/NOREPORT

  REQUIRED - STATUS/COUNTS VOLUME
  DEFAULT - DKC NOEXTENT NORESET REPORT
  ALIAS - DCRT

)O OPERANDS-
))STATUS - DISPLAYS STATUS OF CACHE SUBSYSTEMS SPECIFIED.
))COUNTS - OPERATES COUNTER INFORMATION OF CACHE SUBSYSTEMS SPECIFIED.
))VOLUME('SERIAL') - VOLUME IN CACHE SUBSYSTEMS.
))DKC - TARGET IS DKC. (ONLY SPECIFIED VOLUME)
))DKU - TARGET IS DKU. (ALL DKC OF SPECIFIED VOLUME)
))EXTENT - DISPLAYS EXTENTS INFORMATION.
))NOEXTENT - NOT DISPLAYS EXTENTS INFORMATION.
))DSEXTENT - DISPLAYS EXTENTS AND DSMODE EXTENTS INFORMATION.
))RESET - RESET COUNTER INFORMATION OF CACHE SUBSYSTEMS TO ZERO.
))NORESET - KEEP COUNTER INFORMATION OF CACHE SUBSYSTEMS.
))REPORT - DISPLAY COUNTER INFORMATION OF CACHE SUBSYSTEMS SPECIFIED.
))NOREPORT - NOT DISPLAY COUNTER INFORMATION OF CACHE SUBSYSTEMS
  SPECIFIED.
```

**Figure 4-30** HRUDCRT HELP File

# Return Codes, Output Messages, and Error Codes

This chapter lists the return and error codes as well as the output messages.

- [Return Codes](#)
- [Output Messages](#)
- [Error Codes](#)

## Return Codes

HRUDCRX has the following return codes:

Return Code	Description
0	Indicates that all commands were successfully executed.
4	Indicates that a slight error occurred that doesn't affect the execution of the commands. The process continues, but an attention message will display.
8	Indicates that an error occurred during the command execution, and the process ended abnormally. The listed commands (if any were specified) will be executed.
12	Indicates that a serious error occurred during the command execution, and the process ended abnormally. The listed commands (if any were specified) will not be executed.
16	Indicates that the command failed to open either a SYSIN dataset or a SYSPRINT dataset. It can also indicate that a virtual storage memory for command execution was not sufficient. The specified commands were not executed.

HRUDCRT has the following return codes:

Return Code	Description
0	Indicates that all commands were successfully executed.
4	Indicates that a slight error occurred that doesn't affect the execution of the commands. The process continues, but an attention message will display.
8	Indicates that an error occurred during the command execution.
12	Indicates that a serious error occurred during the command execution.
16	Indicates that an error occurred during the HRUDCRX execution.
20	Indicates that the command failed to allocate a temporary dataset.

## Output Messages

The output message for HRUDCRX is stored in a sequential dataset. The message includes input control statements, which are printed out with each command followed by the result of the command execution. If you want to print out cache statistics information, specify **COUNTS** and then **REPORT**. If you want to print out status information, specify **STATUS** and then **REPORT**.

The output for HRUDCRT is displayed on a TSO terminal. If you want to display statistics information, specify **COUNTS** and then **REPORT**. If you want to display status information, specify **STATUS** and then **REPORT**.

Both HRUDCRX and HRUDCRT messages contain a nine-character ID statement, formatted as follows: **JSEnnnl-C**. In this example, **JSE** indicates a message, **nnn** indicates the message number, and **I-C** indicates the severity code. **(S)** indicates an action by the Cache Manager utility, and **(P)** indicates an action by the user.

The severity codes are as follows:

- **I** indicates that all commands were successfully implemented.
- **W** indicates that the process was completed, but there is an attention message.
- **E** indicates that an error occurred during the command execution, and the process ended abnormally. The listed commands (if specified) will be executed.
- **S** indicates that a serious error occurred during the command execution, and the process ended abnormally. The listed commands (if specified) were skipped.
- **U** indicates that a serious error occurred during the command execution, and the process ended abnormally. The specified commands were skipped.

## Error Codes

**Table 5-1 Error Codes**

Error Number	Error Message	Recommended Action
JSE0011-I	END OF HRUDCRX, RETURN CODE IS return code	HRUDCRX has been executed. The return code has the maximum value of return codes during the execution of HRUDCRX.
JSE0021-I	[VTOC, dataset name, FROM cchh TO cchh] ON [volume serial number or disk drive unit number] WAS BOUND TO CACHE	HRUDCRX specified cache residence by VTOC, DATASET, or CCHH. (S) Process the next command. (Return code is 0.)
JSE0031-I	VTOC, VTOCIX, VVDS ON [volume serial number or disk drive unit number] WAS BOUND TO CACHE	HRUDCRX ordered to reside [VTOC, VTOCIX, or VVDS] tracks in the volume specified by [volume serial number, or disk drive unit number]. If the VTOCIX is [*****] or the VVDS is [****], HRUDCRX did not reside those tracks to cache, because HRUDCRX could not find those tracks. (S) Process the next command. (Return code is 0.)
JSE0041-I	[VTOC, dataset name or FROM cchh TO cchh] ON [volume serial number or disk drive unit number] WAS UNBOUND FROM CACHE	HRUDCRX released residence of the tracks specified by [VTOC, DATASET, or CCHH]. (S) Process the next command. (Return code is 0.)
JSE0051-I	ALL TRACKS ON [volume serial number or disk drive unit number] WERE UNBOUND FROM CACHE	HRUDCRX released residence of all tracks in the volume specified by [volume serial number or disk drive unit number]. (S) Process the next command. (Return code is 0.)
JSE0061-I	FREE SPACE ON [volume serial number, disk drive unit number] WAS UNBOUND FROM CACHE	HRUDCRX released the remaining non-managed area of residence in the volume specified by [volume serial number, or disk drive unit number]. (S) Process the next command. (Return code is 0.)
JSE0071-I	VTOC, VTOCIX, VVDS ON [volume serial number or disk drive number] WAS UNBOUND FROM CACHE	HRUDCRX released residence of [VTOC, VTOCIX, or VVDS] tracks in the volume specified by the [volume serial number, or disk drive unit number]. If the VTOCIX is [*****] or the VVDS is [****], HRUDCRX did not release the cache residence, because HRUDCRX could not find the tracks. (S) Process the next command. (Return code is 0.)
JSE0081-I	[VTOC or dataset name] EXTENT MODE ON [volume serial number or disk drive unit number] WAS [ENABLED or DISABLED].	HRUDCRX either enabled or disabled the data statistics area for the specified [VTOC extent mode or dataset], as defined by the [volume serial number or disk drive unit number]. (S) Process the next command. (Return code is 0.)
JSE0091-I	ALL TRACKS EXTENT MODE ON [volume serial number or disk drive unit number] WERE DISABLED	HRUDCRX disabled all dataset statistics in the volume specified by [volume serial number, or disk drive unit number]. (S) Process the next command. (Return code is 0.)
JSE0101-I	FREE SPACE EXTENT MODE ON [volume serial number or disk drive unit number] WAS DISABLED	HRUDCRX released the dataset statistics of the remaining non-managed tracks in the volume specified by [volume serial number, or disk drive unit number]. (S) Process the next command. (Return code is 0.)

Error Number	Error Message	Recommended Action
JSE1011-E	OPERAND 'operand' IS INCONSISTENT	<p>The set of operands is inconsistent. This operand can not be used with the other specified operand.</p> <p>(S) Terminate the command process, but the next process continues. (Return code is 8.)</p> <p>(P) Correct the error and execute the command again.</p>
JSE1021-E	'operand' SPECIFIED BUT REQUIRED OPERAND MISSING	<p>The specified operand requires another operand.</p> <p>(S) Terminate the command process, but the next process continues. (Return code is 8.)</p> <p>(P) Correct the error and execute the command again.</p>
JSE1031-E	INVALID COMMAND NAME 'command name'	<p>The [command name or PARM information] is incorrect. If the PARM information is incorrect, the error message will indicate [PARM] in place of command name.</p> <p>(S) Terminate the command process, but the next process continues. (Return code is 8.)</p> <p>(P) Correct the error and execute the command again.</p>
JSE1041-E	INVALID KEYWORD VALUE 'keyword value'	<p>There is an error in the [dataset name, volume serial number, dd name, disk drive unit address, track address, or other]. For example, there may be too many characters, or some invalid characters.</p> <p>(S) Terminate the command process, but the next process continues. (Return code is 8.)</p> <p>(P) Correct the error and execute the command again.</p>
JSE1051-E	INVALID KEYWORD 'keyword value'	<p>The specified keyword is not defined for this command.</p> <p>(S) Terminate the command process, but the next process continues. (Return code is 8.)</p> <p>(P) Correct the error and execute the command again.</p>
JSE1061-E	INVALID CCHH PARAMETER	<p>The CCHH value is invalid because of one or more of the following reasons:</p> <ol style="list-style-type: none"> <li>1. The number of characters is not eight or ten.</li> <li>2. There is at least one invalid character.</li> <li>3. The HH value exceeds the value of the last track number in a cylinder.</li> </ol> <p>(S) Terminate the command process, but the next process continues. (Return code is 8.)</p> <p>(P) Correct the error and execute the command again.</p>
JSE1071-E	LOWER LIMIT IS GREATER THAN UPPER LIMIT	<p>The upper value specified by CCHH parameter exceeds the maximum address of a volume.</p> <p>(S) Terminate the command process, but the next process continues. (Return code is 8.)</p> <p>(P) Correct the upper CCHH value and execute the command again.</p>
JSE2011E	SPECIFIED CCHH LIMIT EXCEEDS VOLUME CAPACITY	<p>The upper value specified by CCHH parameter exceeds the maximum address of a volume.</p> <p>(S) Terminate the command process, but the next process goes on (return code is 8.)</p> <p>(P) Correct the cchh value and execute the command again.</p>

Error Number	Error Message	Recommended Action
JSE2021-E	[volume serial number or disk DRIVE UNIT NUMBER] IS NOT IN CACHE SUBSYSTEM	The volume specified by [DDNAME, VOLUME, or DEVICE] is not a volume in the cache storage system. If the volume serial number is [*****], a spool device or a dummy dataset is specified.  (S) Terminate the command process, but the next process continues. (Return code is 8.)  (P) If the volume serial number is wrong, correct it and execute the command again.
JSE2031-E	DATASET 'dataset name' DOES NOT EXIST ON [volume serial number or disk drive unit number]	Either the dataset specified by DATASET parameter was not found in the volume defined by the volume serial number or the disk drive unit address, or the extent number of the specified dataset is zero.  (S) Terminate the command process, but the next process continues. (Return code is 8.)  (P) Correct the dataset name or volume serial number and execute the command again.
JSE2041-S	NOT ENOUGH SPACE IN CACHE	This utility tried to reside the tracks specified by the BIND command, but there is not enough cache memory.  (S) HRUDCRX terminates abnormally. (Return code is 12.)  (P) After releasing unnecessary resident area, execute the command again.
JSE2051-S	CACHE ACCESS IS DISABLED	This utility tried to execute a BIND or DSMODE command, but the cache storage system is disabled because of an unspecified failure.  (S) HRUDCRX terminates abnormally. (Return code is 12.)  (P) Use the STATUS command to check and print out the cache status, then call the Hitachi Data Systems Technical Support Center.
JSE2061-S	UNABLE TO FIND ANY ONLINE VOLUME IN SUBSYSTEM	This utility could not find the specified online volume in the specified dataset. The volume has the same storage system ID as one of the following:  1. The volume specified by the VOLUME parameter or the DDNAME parameter, or 2. The DKC parameter specified by the COUNTS command or the STATUS command.  (S) HRUDCRX terminates abnormally. (Return code is 12.)  (P) Vary the objective volume online, and execute the command again.
JSE2071-S	I/O ERROR ON [volume serial number or disk drive unit number]	An input / output error happened during the I/ O operation to the cache storage system.  (S) HRUDCRX terminates abnormally. (Return code is 12.)  (P) If there is an error message on another storage system, investigate and correct the cause of the messages, then execute the command again.
JSE2081-E	'volume serial number' IS NOT ONLINE	The volume specified by the VOLUME parameter is either not online, or not mounted in the cache storage system.  (S) Terminate the command process, but the next process continues. (Return code is 8.)  (P) After varying the specified volume online, execute the command again.
JSE2091-S	COMMAND 'command name' UNABLE TO EXECUTE FOR DKC TYPE 'disk controller type'	The disk drive unit does not support the specified command function.  (S) HRUDCRX terminates abnormally. (Return code is 12.)  (P) Execute the command again to the disk drive unit that belongs to the disk controller with Cache Residency Manager installed.

Error Number	Error Message	Recommended Action
JSE210I-S	COMMAND 'command name' OPERAND 'operand' UNABLE TO EXECUTE FOR DKC TYPE 'disk controller type'	The disk drive unit does not support the specified command function. If this was a DSMODE command, all operands are checked. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Execute the command again to the disk drive unit that belongs to the disk storage system with Cache Residency Manager installed.
JSE211I-S	CMG RECEIVED UNEXPECTED RETURN VALUE (RAID TYPE) ON [volume serial number or disk drive unit number]	HRUDCRX detected an unexpected failure during the execution of the I/O request to the cache storage system. The cache storage system may have a malfunction. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Call customer engineer and ask to investigate the disk storage system.
JSE213I-S	I/O ERROR OCCURRED ON [volume serial number, disk drive unit number, sense byte]	An input / output error happened during the I/O operation to the cache storage system. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Investigate and correct the specified error, then execute the command again.
JSE215I-E	'disk drive unit number' IS NOT FOUND	The specified disk drive unit number does not exist. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Execute the command again by specifying the correct disk drive unit number.
JSE217I-E	'disk drive unit number' IS NOT MOUNTED ON SYSTEM	The volume specified by disk drive unit number is not mounted. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) After mounting the volume specified by the disk drive unit number, execute the command again.
JSE231I-S	ALREADY BOUND TO CACHE BY [BIND or PRIO] MODE	The command to reside data using PRIO mode was made to the BIND mode area, or vice versa. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Check the mode of the already resident area and correct the parameter, then execute the command again.
JSE232I-S	EXTENT OVER ON BOUND TO CACHE	The number of resident extents exceeds the limitation. Maximum number of extents is: <ul style="list-style-type: none"> <li>▪ For VSP and USP V/VM, 4096 per volume or 16384 per storage system.</li> <li>▪ For USP/NSC, 4096 per volume or 4096 per storage system.</li> </ul> (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Check the remaining number of available resident extents. If the number is too small, release the unnecessary resident extents, then execute the command again.
JSE233I-S	EXTENT MODE LIMIT IS DUPLICATED	The area specified by the DSMODE/ENABLE command has already been enabled. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Disable the area using the DSMODE/ECCENTRIC operand, then reissue the command.

Error Number	Error Message	Recommended Action
JSE2341-S	EXTENT MODE LIMIT IS A PART OF DATASET EXTENT	The area specified by the DSMODE/DISABLE command has already been enabled. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Disable the area using the DSMODE/ECCENTRIC operand, then reissue the command.
JSE2351-S	EXTENT MODE OVER ON BOUND TO CACHE SUBSYSTEM	The number of dataset statistics extents exceeds the maximum, which is 64 per storage system. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Check the remaining dataset extents. If the number is too small, release any unnecessary area. Then execute the command again.
JSE2361-S	UNABLE TO EXECUTE FOR DKC	The command was executed on a storage system that does not have Cache Residency Manager installed. (S) HRUDCRX terminates abnormally. (Return code is '8'.) (P) Install Cache Residency Manager in DKC and then execute the command again.
JSE2371-E	CLPR FUNCTION UNABLE TO EXECUTE FOR DKC KIND=xx	The command cannot be executed because the Cache Logical Partition (CLPR) function is not installed in the DKC. DKC KIND: 06 for VSP, 05 for USP V/VM, 04 for USP/NSC, 03 for 9900V (S) HRUDCRX terminates abnormally. (Return code is '8'.) (P) Install the Cache Logical Partition (CLPR) program product in DKC and then execute the command again
JSE2381-E	CLPR FUNCTION IS INVALID	The specified volume does not belong to the Cache logical Partition (CLPR). (S) HRUDCRX terminates abnormally. (Return code is '8'.) (P) Check the definition of Cache Logical Partition (CLPR) information and then execute the command again.
JSE2391-E	CATALOG ACCESS ERROR (return code, reason code, module ID) { CATALOG 'catalog name' DATASET 'dataset name' }	The error occurred on accessing to catalog. (S) HRUDCRX terminates abnormally. (Return code is '8'.) (P) Check the specified dataset name or catalog name and then execute the command again.
JSE2401-E	DATASET 'dataset name' DOES NOT EXIST IN CATALOG	The specified dataset did not exist in specified catalog. (S) HRUDCRX terminates abnormally. (Return code is '8'.) (P) Check the specified dataset name and catalog name and then execute the command again.
JSE2411-W	DATASET TYPE CAN NOT CACHE PROCESS 'dataset name'	The specified dataset is not supported under CMG environment. (S) HRUDCRX stops the command process and continues to be process in next command. (Return code is '4'.) (P) Check the specified dataset name and catalog name and then execute the command again if it needs.
JSE2421-S	MODULE (module name) NOT FOUND	Load module did not exist. (S) HRUDCRX terminates abnormally. (Return code is '12'.) (P) Check the system dataset and then execute the command again.

Error Number	Error Message	Recommended Action
JSE2431-S	UNABLE TO EXECUTE BIND COMMAND DURING PRE-STAGING	BIND command cannot execute because pre-staging is performing. (S) HRUDCRX terminates abnormally. (Return code is '12'.) (P) Confirm the end of pre-staging and then execute the command again.
JSE3011-E	DD STATEMENT 'dd name' NOT FOUND	User specified neither the DD statement that corresponds to the dd name specified by the command, nor a RAIDPARM DD statement. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Specify the necessary DD statements or correct the dd name and execute the command again.
JSE3021-E	DSORG/RECFM/BLKSIZE/LRECL OF 'dd name' IS INVALID	The output dataset of the COUNT or STATUS command lacks one or more of the following required attributes: Dataset format (DSORG): SAM (PS), Record format (RECFM): Variable length block (VB), Record length (LRECL): 100 or more, Block length (BLKSIZE): 104 or more. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Check the DCB attribute of output dataset. Then correct the invalid parameter and execute the command again.
JSE3031-S	INSUFFICIENT MAIN STORAGE, COMMAND TERMINATED	The utility could not get sufficient main storage area to execute the command. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Expand the virtual main storage area allocated to user region, and execute the command again.
JSE3041-E	DYNALLOC ERROR, RETURN CODE return code, ERROR CODE X'error code', INFO CODE X'detail code'	The following error happened during the operation of volume dynamic allocation [DYNALLOC macro process]. The return code (the contents of general register 15) is indicated in decimal form. error code: The error code of DYNALLOC macro. detail code: The detail code of DYNALLOC macro. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Examine these codes in detail and correct the error, then execute the command again.
JSE3061-E	I/O ERROR ON OUTDD (dd name)	I/O error has been detected during the output operation to the output dataset of COUNTS or STATUS command. Other error messages will have more detailed information. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Examine the other error messages.
JSE3071-E	I/O ERROR job name, step name, disk drive unit number, device type, dd name, order, error type, BBCCHHR, QSAM	I/O error has been detected during the output operation of the COUNTS or STATUS command. See "SYNADAF macro" explanation for more detail. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Examine the error message.

Error Number	Error Message	Recommended Action
JSE500I-U	INVALID RAIDPARM PARAMETER	The specified contents of the dataset in RAIDPARM DD statement has a coding rule error. (S) HRUDCRX terminates abnormally. (Return code is 16.) (P) Correct the error and execute the command again.
JSE501I-U	DEVICE NUMBER EXCEEDS LIMIT	The total number of disk drive units specified by the dataset in the RAIDPARM DD statement exceeds the maximum. (S) HRUDCRX terminates abnormally. (Return code is 16.) (P) Correct the error and execute the command again.
JSE502I-W	'disk drive unit number' IS DUPLICATED	The dataset in RAIDPARM DD statement includes a duplicated disk drive unit number. (S) Ignore the duplicated parameter, and the process continues. (Return code is 4.)
JSE503I-W	'disk drive unit number' IS NOT IN CACHE SUBSYSTEM	The disk drive unit number specified by the dataset in RAIDPARM DD statement does not exist in this cache storage system. (S) Terminate the process for this disk drive unit, but the process continues for the following disk drive units. (Return code is 4.)
JSE504I-W	'disk drive unit number' IS NOT ONLINE	The disk drive unit number specified by the dataset in RAIDPARM DD statement is either not online or not mounted in the cache storage system. (S) Terminate the process for this disk drive unit, but the process continues for the following disk drive units. (Return code is 4.)
JSE505I-W	RAIDPARM IS EMPTY	The dataset specified by RAIDPARM DD statement has no record. (S) The process continues. (Return code is 4.)
JSE506I-S	I/O ERROR ON 'disk drive unit number'	An input/output error happened during the I/ O operation to the cache storage system of the disk drive unit number specified by the dataset in RAIDPARM DD statement. (S) If you are specifying the DKC parameter by a STATUS command or a COUNTS command, terminate the process for the volume, but the process continues for the following volumes. (Return code is 12.) (P) If another system has some error messages, review them, address the problems, then execute the command again.
JSE507I-S	I/O ERROR ON 'disk drive unit number', 'sense byte'	An input/output error happened during the I/O operation to the cache storage system of the disk drive unit number specified by the dataset in RAIDPARM DD statement. (S) If you are specifying the DKC parameter by a STATUS command or a COUNTS command, terminate the process for that volume, but the process continues for the other volumes. (Return code is 12.) (P) Examine the contents of the message and correct the error, then execute the command again.
JSE510I-S	DATASET 'dataset name' EXTENT FROM CCHH TO CCHH IS [BOUND, UNBOUND or NOT CHANGE].	The utility indicates (hexadecimal) that the resident extents of the dataset specified by DATASET parameter were not processed. In case that an input/output error to the cache storage system happened during the operation, the utility prints out the status of all dataset extents. BOUND: The extents reside in cache memory. UNBOUND: The extents do not reside in cache memory. NOT CHANGE: The extents have not changed from the previous command, because the process was not executed. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Examine the contents of the message and correct the error, then execute the command again.

Error Number	Error Message	Recommended Action
JSE5111-W	'disk drive unit number' IS NOT FOUND	The disk drive unit number specified by the dataset in RAIDPARAM DD statement does not exist. (S) Terminate the process for this disk drive unit, but the process continues for the following disk drive units. (Return code is 4.)
JSE8001-I	command name ACCEPT	The specified STATUS or COUNTS command has been accepted normally.
JSE8011-I	END OF command name	The specified STATUS or COUNTS command has been completed normally.
JSE8021-E	MISSING KEYWORD, mandatory keyword	The mandatory keyword [STATUS, COUNTS, or VOLUME] is not specified.
JSE8031-I	OPERAND IGNORED, operand name	An unnecessary operand is specified, but the process ignored the operand and continues.
JSE8101-E	DYNALLOC ERROR, dd name, RETURN CODE return code, ERROR CODE X 'error code', INFO CODE X 'detail code'	The following error happened during the operation of dd name dynamic allocation. Return code: The return code of DYNALLOC macro (the contents of general register 15) is indicated in decimal form. Error code: The error code of DYNALLOC macro. Detail code: The detail code of DYNALLOC macro. (S) Terminate the command process. (P) Examine the error code and correct the error, then execute the command again.
JSE8111-E	SYSIN ALREADY USED	The utility failed to allocate, because DD name SYSIN is in use. (S) Terminate the command process. (P) After releasing the allocation of DD name SYSIN, execute the command again.
JSE8121-E	I/O ERROR, dd name, macro name	An error occurred during the file input/output operation of dd name. (S) Terminate the command process. (P) If another system has some messages, investigate the cause of the messages take countermeasures if necessary, then execute the command again.



# Troubleshooting

This chapter provides troubleshooting information for Cache Manager and instructions for calling technical support.

- [Troubleshooting](#)
- [Calling the Hitachi Data Systems Support Center](#)

## Troubleshooting

The Hitachi RAID storage systems provide continuous data availability and are not expected to fail in any way that would interrupt access to user data. For troubleshooting information, please refer to the *User and Reference Guide* for the storage system.

## Calling the Hitachi Data Systems Support Center

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>



# Acronyms and Abbreviations

CCHH	cylinder cylinder head head
CPPL	command processor parameter list
CU	control unit
DCR	Dynamic Cache Residency (another name for Cache Residency Manager)
DFW	DASD fast write
ESA	Enterprise Systems Architecture
HH	head head
IPL	initial program load
JCL	job control language
LCU	logical control unit
LVI	logical volume image (also called device emulation)
max	maximum
MVS	Multiple Virtual Storage
NSC	Hitachi TagmaStore Network Storage Controller
NVS	non-volatile storage
PPL	parameter list
SIM	service information message
SSID	storage system identification
TSO	Time Sharing Option
USP	Hitachi Universal Storage Platform
USP V	Hitachi Universal Storage Platform V
VOLSER	volume serial number
VSP	Hitachi Virtual Storage Platform
VTOC	volume table of contents





# Glossary

This glossary defines some of the special terms used in this document.

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bound heads	Read and write counts from cache.
cache extents	Areas used for Cache Residency or Cache Manager.
Cache Residency Manager	Other names for this product are Flash Access and Dynamic Cache Residency (DCR).
cache status:	
cache off error	Cache failed to stop.
disabled	Cache is offline.
disconnected	Cache is disabled for maintenance.
enabled	Status is normal.
cache error	Cache error occurred, so cache function has been stopped.
initializing	cache status is being changed to "enabled".
destaged heads	Number of tracks written to disk asynchronously.
extent count	Number of cache or dataset extents.
Extent Relation:	
ALL	The extent range for dataset statistics information is equal to the extent range managed by the VTOC. The object dataset has one extent.
ALL-	The extent range for dataset statistics information is smaller than the extent range managed by the VTOC. The object dataset has one extent.
ALL+	The extent range for dataset statistics information is larger than the extent range managed by the VTOC. The object dataset has one extent.
PART	The extent range for dataset statistics information is equal to the extent range for the dataset. The object dataset has more than one extent.
PART+	The extent range for dataset statistics information is larger than the extent range for the dataset. The object dataset has more than one extent.
PART-	The extent range for dataset statistics information is smaller than the extent range for the dataset. The object dataset has more than one extent.

Extent Relation (continued):

EQUAL	The number of dataset extents managed by the VTOC is the same as the number of datasets from which statistics are derived.
EQUAL-	The number of dataset extents managed by the VTOC is less than the number of datasets from which statistics are derived.
LONG	The number of dataset extents from which statistics are derived includes extents that do not have datasets.
SHORT	The number of dataset extents from which statistics are derived includes datasets that do not have extents.

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NVS:

destaging disabled	Write-pending data is being destaged to disk. Non-volatile storage cache is offline, and DFW function is stopped.
disconnected	Non-volatile storage is offline due to maintenance.
enabled	Non-volatile storage is normal status.
NVS error	Non-volatile storage cache memory error has occurred, and DFW function has been stopped.
NVS off error	Non-volatile storage function failed to stop.

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