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Hitachi Freedom Storage™ Lightning 9900™ V Series Lightning 9900™ and 7700E

Cache Manager User's Guide

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Document Revision Level

Revision	Date	Description
MK-91RD045-0	October 2001	Initial release
MK-91RD045-1	April 2002	Revision 1, supersedes and replaces revision 0

Source Document Revision Level

The following source document(s) were used to produce this document:

- TW-91RD064 (Technical Writing ECN)

Preface

This user's guide provides instructions for installing and using the Cache Manager feature on the Hitachi Freedom Storage™ Lightning 9900™ V series, Lightning 9900 and 7700E subsystems. Please read this manual carefully to understand how to use these products, and maintain a copy that is accessible from your subsystem for reference purposes.

This user's guide assumes that:

- the user has a background in data processing and understands direct-access storage device subsystems and their basic functions,
- the user is familiar with the Hitachi Freedom Storage™ array subsystem.

For further information on the Hitachi Freedom 9900 V series subsystem, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100).

For further information on the Hitachi Freedom 9900 subsystem, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ User and Reference Guide* (MK-90RD008).

For further information on the Hitachi Freedom 7700E subsystem, please refer to the *Hitachi Freedom Storage™ 7000E User and Reference Guide* (BO-98DD845).

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Thank you!

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Chapter 1 Overview of Cache Manager

1.1 General Parameters for Cache Manager

The Cache Manager function for the 7700E, 9900, and 9900V is similar to the FlashAccess function, in that it allows you to store specific data in cache memory. However, where FlashAccess 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 the Remote Console PC, 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.

Figure 1.1 illustrates some of the differences between FlashAccess and Cache Manager.

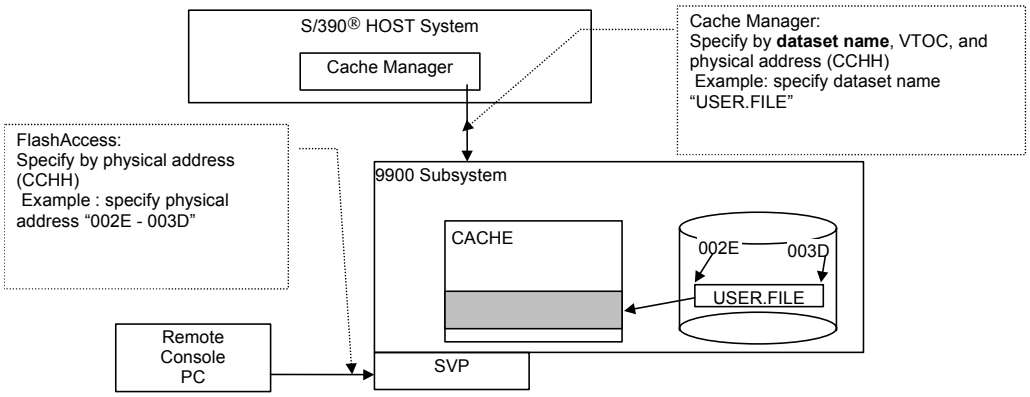

Figure 1.1 Specifying Cache by Dataset Name, VTOC and CCHH

Warning: Do not perform either the ShadowImage quick restore operation or the Hitachi CruiseControl™ migration operation on a Cache Manager volume. These operations swap the internal locations of the source and target volumes. For more information, please see the following volumes:

For the 9900V: *Hitachi Freedom Storage™ Lightning 9900™ V Series ShadowImage User's Guide* (MK-92RD110), *Hitachi Freedom Storage™ Lightning 9900™ V Series ShadowImage S/390 User's Guide* (MK-92RD109) and *Hitachi Freedom Storage™ Lightning 9900™ V Series Hitachi CruiseControl™ User's Guide* (MK-92RD106).

For the 9900: *Hitachi Freedom Storage™ Lightning 9900™ ShadowImage User's Guide* (MK-90RD031), *Hitachi Freedom Storage™ Lightning 9900™ ShadowImage S/390® User's Guide* (MK-90RD0112) and *Hitachi Freedom Storage™ Lightning 9900™ Hitachi CruiseControl™ User's Guide* (MK-91RD054).

For the 9900: *Hitachi Freedom Storage™ 7700E ShadowImage HOMRCF User's Guide* (BO-98DD861) and *Hitachi Freedom Storage™ 7700E ShadowImage HMRCF User's Guide* (BO-98DD855). ***Note***: CruiseControl is not applicable to the 7700E.

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

- They are dynamic and can only be added and deleted online.
- Cache Manager supports mainframe volumes only (3380®-E/J/K, and 3390®-1/2/3/3R/9).
- The maximum size of a cache area is one logical volume.
- The maximum number of resident extents for the 7700E is 16 per logical volume, and 1024 per subsystem. The maximum number of resident extents for the 9900 and 9900V is 1024 per logical volume, and 1024 per subsystem.
- Data defined by a continuous CCHH area will be considered as one extent. A **BIND** mode area and a **PRIO** (priority) mode area are considered different extents (see section 1.2 for more information on **BIND** and **PRIO** mode). The number of datasets and the number of resident extents will not necessarily match (e.g. if a dataset consists of noncontiguous extents).
- If a user needs an entire mainframe volume in Cache Manager, using a smaller Virtual LVI volume will use less cache. For more information on Virtual LVI, please refer to the following documents:
  - For the 9900V: *Hitachi Freedom Storage™ Lightning 9900™ V Series LUN Expansion/Virtual LVI/LUN User's Guide* (MK-92RD104).
  - For the 9900: *Hitachi Freedom Storage™ Lightning 9900™ Virtual LVI/LUN User's Guide* (MK-90RD005).
  - For the 7700E: Hitachi Freedom Storage™ 7700E Virtual LVI/LUN User's Guide (BO-98DD874).
- 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 volume(s).
- It is possible to expand the amount of cache without canceling the existing settings. Please call the Hitachi Data Systems Technical Support Center for assistance.

- Batch and TSO commands are both supported. TSO commands support the **HELP** function, but not the **BIND** or **DSMODE** commands.
- Defragmentation will reallocate the datasets. If you want to defragment a disk, 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 area(s).
- You can reset areas that were set with Cache Manager by using FlashAccess, and vice versa. The commands are accepted in the order in which they were received.
- ***Warning***: Do not attempt to simultaneously access the FlashAccess or Cache Manager functions from more than one source, or the commands may interfere with each other.

User data can be removed from cache, but with the cache extent information maintained in the disk controller in the following cases:

- By using the **SETCACHE** command (provided by the IDCAMS utilities of MVS/ESA) with the **REINITIALIZE** parameter,
- If there is an offline microcode change,
- If there is a cache memory failure (partial or module down) during maintenance.

Cache extent information is deleted in the following cases:

- Using the **BIND** command with the **DISABLE** parameter,
- By using the **SETCACHE** command (provided by IDCAMS utilities of MVS/ESA) with the **SYSTEM OFF** or **DEVICE OFF** parameter.

1.2 Cache Manager Modes

1.2.1 Priority Mode

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

Note: Even though a slot (track) for S/390® is 56 kB (3390 type LDEV), because cache is divided into 16 kB segments it will require 4 segments. A 3380 slot (track) is 48 kB, so three 16 kB segments will be sufficient.

- In **Priority Mode**, the total capacity of cache required is as follows:
  - Standard cache + FlashAccess cache + Additional cache

1.2.2 Bind Mode

- In **Bind Mode**, the total capacity of cache required is as follows:
  - Standard cache + FlashAccess cache

In bind mode the cache extents are used to hold read and write data for specific extent(s) on volume(s). 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.

For RAID-5 the amount of cache required is 3 times the space required for the user data. In RAID-5 S/390® systems, one slot is either 48 kB or 56 kB, which requires either 3 or 4 cache segments (16 kB/segment). 16 slot images for S/390® requires 2.25 MB (3380 type device) or 3 MB (3390 type device) of reserved cache. ***Note:*** Even though a slot (track) for S/390® is 56 kB, because cache is divided into 16 kB segments, it will require 4 segments. S/380® slots are 46 kB, so 3 segments are sufficient.

For RAID-1 the amount of cache required is 2 times the user data. For RAID-1 S/390®, one slot is either 48 kB or 56 kB, which requires either 9 or 12 cache segments (16 kB/segment). 16 slot images requires either 1.5 MB (3380®) or 2 MB (3390®) of reserved cache.

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

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

Bind data that has write attributes is normally not de-staged. However, this data will be de-staged in the following cases:

- During certain types of maintenance operations (e.g. cache upgrades),
- If the subsystem is powered off,
- When volumes are deleted from cache bind mode.

Chapter 2 Preparing for Cache Manager Operations

2.1 Installation Procedures

Before you install Cache Manager, you must install FlashAccess on each subsystem, make sure that the system option is set to **81** (to support the bound heads counter) and verify that the microcode version supports Cache Manager. The Hitachi Data Systems representative will install the additional cache memory module and set the amount of cache memory.

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 2.1 illustrates a JCL of a sample 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 2.1 Installation Procedure

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 2.2 illustrates the registration process using TSO commands:

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

Figure 2.2 Registering HRUDCRT and HRUDCRX

2.2 Launching Cache Manager

2.2.1 Launching HRUDCRX

1. Call the HRUDCRX program. The line count must be from 20 to 99, and the default value is 60. See Figure 2.3 for an example.
2. Use the DD statement to define the volume type (either 7700E, 9900, or 9900V). 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.

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**

Figure 2.3 is an example of launching HRUDCRUX.

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

Figure 2.3 Launching HRUDCRUX

Figure 2.4 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
//RAIDPARM  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 2.4 BIND Command

2.2.2 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.

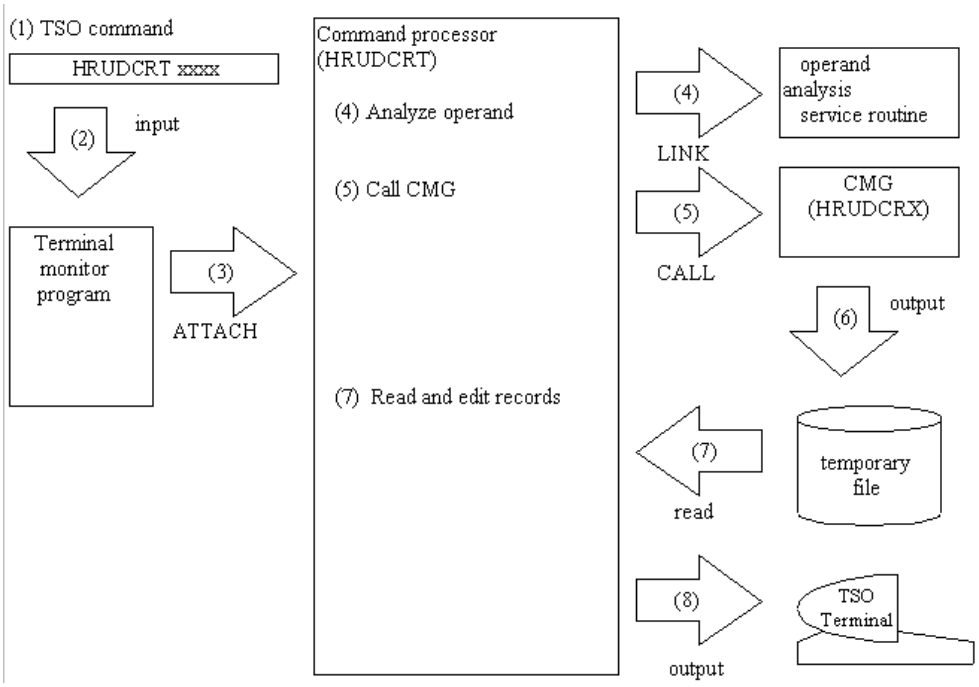

Figure 2.5 Interface Between Command Processor and Operand Analyze Routine

2.3 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 (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.

Chapter 3 Cache Manager Functions

3.1 HRUDCRX Commands

HRUDCRX supports the following commands:

- **BIND** either places data into cache or releases it from cache (see section 3.1.1).
- **COUNTS** displays the cache volume or dataset statistics. This command can also reset the counters if necessary (see section 3.1.2).
- **STATUS** displays the cache status information (see section 3.1.3).
- **DSMODE** either defines the tracks for dataset statistics or releases that definition (see section 3.1.4).
- HRUDCRX commands can also be combined (see section 3.1.5).

3.1.1 BIND Commands

Figure 3.1 illustrates **BIND** command parameters.

- **ENABLE** will place data into a specified area of cache.
- **DISABLE** will release 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**, dataset name (9900 and 9900V only), **CCHH** or **SYSTEMDS** (either physical VTOC, INDEX VTOC, or VVDS).
- **DKU**|**FREESPACE** is used if you want to release tracks from cache (**DISABLE**). The **DKU** command releases all tracks on a particular volume. **FREESPACE** releases all eccentric areas on a volume.
- **PRIO** is used to specify tracks to be bound into priority mode (**ENABLE**). If you don't specify **PRIO**, **BIND** mode is the default.

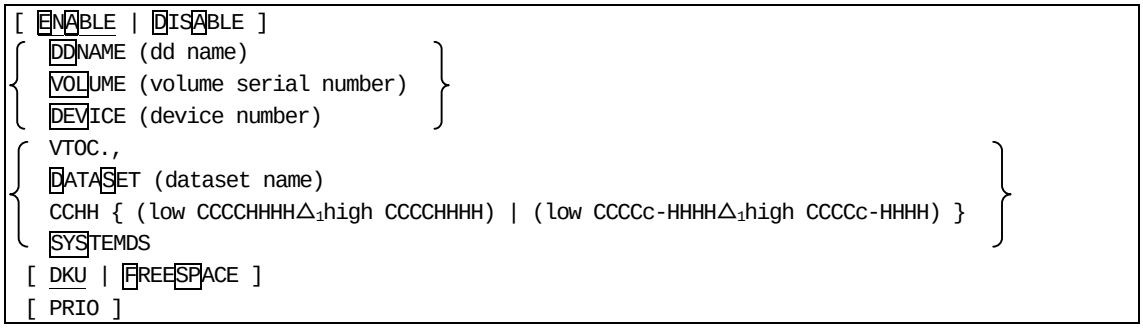

Figure 3.1 BIND Command Parameters

Figure 3.2 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)    //
```

Figure 3.2 BIND/ENABLE Command

(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 subsystem.
(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 subsystem. **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 subsystem. **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 subsystem. **SYSTEMDS** defines the residence area by VTOC area, VTOCIX area, and VVDS area.
(11) End of command.
(12) End of job.

Figure 3.3 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)    //
```

Figure 3.3 BIND/DISABLE Command

(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 subsystem.
(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 cache subsystem. **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 subsystem. **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 subsystem. **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 subsystem. **FREESPACE** releases resident extents with no dataset.
(12) End of command.
(13) End of job.

3.1.2 COUNTS Commands

The **COUNTS** command allows you to get statistics on cache memory usage and status information. ***Note***: Dataset information is available on the 9900 and 9900V only. Be sure to reset the counter before accessing cache statistic information.

Warning: If other applications are using the cache statistics information, resetting the counter will interfere with those operations.

The **COUNTS** command will display either volume or dataset statistics.

Figure 3.4 illustrates **COUNTS** command parameters.

- You can specify the target data by **DDNAME** (using volume, unit and disp number), **VOLUME** (volume serial number), or **DEVICE** (device number).
- **REPORT** is a command to print cache statistics information.
- **NO REPORT** is a command to not print cache statistics information.
- **RESET** will reset the counter to zero.
- **NO RESET** will leave the counter unchanged.
- **DKU** specifies a target range as a particular volume.
- **DKC** specifies a target range in the same subsystem ID (SSID). You need to specify RAIDPARM in the DD statement.
- **DSEXTENT** specifies that dataset statistics information will be included (9900 and 9900V only). ***Note***: If you use **DSEXTENT**, don't use the **RESET** parameter.
- **NOEXTENT** specifies that volume statistics information will be included.

Figure 3.4 COUNTS Command Parameters

Figure 3.5 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 subsystem.

```
(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,
        //              UNIT=SYSDA,DISP=SHR
(5)     //SYSIN     DD *
(6)           COUNTS VOLUME(CSVOL1) -
                  DKU -
                  REPORT -
                  RESET
(7)           COUNTS VOLUME(CSVOL1) -
                  DKC -
                  REPORT -
                  NORESET
(8)     /*
(9)     //
```

Figure 3.5 COUNTS Command for Volume Statistics

(1) Start of job. Execute HRUDCRX.
(2) Spool the message dataset.
(3) Define a dataset to store the device number.
(4) Define a dataset to store the control statements.
(5) Edit and print out volume statistics. **VOLUME** defines the volume serial number of the cache subsystem (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.
(6) Edit and print out the volume statistics information counter. **VOLUME** defines a volume serial number in the cache subsystem. **DKC** specifies all volumes with the same subsystem 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.
(7) End of command.
(8) End of job.

Figure 3.6 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'
               READ                    WRITE                         DFW
I/O COUNTERS   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 INFORMATIONS
  DESTAGE HEADS                              16        DFW OVERFLOW I/O COUNTERS   0
  SEQUENTIAL ACCESS MODE LOAD HEADS           0        WITHOUT SEQUENTIAL MODE LOAD HEADS   1
```

Figure 3.6 Volume Statistics Report

Figure 3.7 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 subsystem 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)     //
```

Figure 3.7 COUNTS Command for Dataset Statistics

(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 subsystem. **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 subsystem. **DKC** specifies all volumes with the same subsystem 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 3.8 is an example of dataset statistics. (Dataset statistics are available for the 9900 and 9900V only).

```
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 3.8 Dataset Statistics Report

3.1.3 STATUS Commands

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.

Figure 3.9 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 subsystem ID).
- **EXTENT** specifies that cache extent information will be printed.
- **NOEXTENT** 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**.

Figure 3.9 STATUS Command Parameters

Figure 3.10 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

    DCR CONFIGURATION        REMANING AREA       2294967295
                             USED AREA           2000000000
                             DCR AVAILABLE       4294967295
                             USED AREA COUNT           1024
```

Figure 3.10 Cache Memory STATUS Report

Figure 3.11 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 3.11 Cache Extent Status Report

Figure 3.12 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)     //
```

Figure 3.12 Volume STATUS Command

(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 subsystem. **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 subsystem. **DKC** specifies all volumes with the same subsystem ID (SSID). This is necessary to define the RAIDPARM DD statement. **EXTENT** defines the cache extent as all volumes that belong to same subsystem ID (SSID).
(8) End of command.
(9) End of job.

Figure 3.13 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 subsystem 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)     /*
        //
```

Figure 3.13 Dataset STATUS command

(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 subsystem. **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 subsystem. **DKC** specifies all volumes with the same subsystem ID (SSID). This is necessary to define the RAIDPARM DD statement. **DSEXTENT** processes specified dataset statistics information for all volumes with the same subsystem ID (SSID).
(8) End of command.
(9) End of job.

Figure 3.14 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 3.14 Dataset STATUS Report

Figure 3.15 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'
                                CACHE                     NVS              PINNED DATA
    STATUS                      ENABLED                   ENABLED                NONE

    DCR CONFIGURATION REMAINING AREA           2294967295
                            USED AREA          2000000000
                            DCR AVAILABLE      4294967295
                          USED AREA COUNT            1020
```

Figure 3.15 Volume STATUS Command

3.1.4 DSMODE Commands (9900 and 9900V Only)

Figure 3.16 illustrates **DSMODE** command parameters. The **DSMODE** command is available on the 9900 and 9900V only.

- **ENABLE** will set dataset statistics information for the specified area, defined either by **VTOC** or **DATASET**.
- **DISABLE** will release dataset statistics information, defined either by **VTOC**, **DATASET**, **DKU** (all tracks on a particular volume), or **ECCENTRICAREA**. If you specify **DKU** or **ECCENTRICAREA**, don't 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).

Figure 3.16 DSMODE Command Parameters

Figure 3.17 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 -
                  DDANMAE(VOL1) -
                  VTOC
(8)           DSMODE ENABLE -
                  VOLUME(CSVOL2) -
                  DATASET('USER.FILE')
(9)     /*
(10)    //
```

Figure 3.17 DSMODE Command For Statistics By Extent and Track

(1) Start of job.
(2) Execute HRUDCRX.
(3) Spool the message dataset.
(4) Define the volume serial number of 'CSAVOL1' in the cache subsystem.
(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 subsystem. **DATASET** specifies the residence area by dataset area.
(10) End of command.
(11) End of job.

Figure 3.18 illustrates a **DSMODE** command. Cache Manager releases dataset statistics information for the specified extent(s) or volume(s).

```
(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 -
                  DDANMAE(VOL1) -
                  VTOC
(8)           DSMODE DISABLE -
                  DDNAME(VOL2) -
                  DATASET('USER.FILE')
(9)           DSMODE DISABLE -
                  VOLUME(CSVOL3) -
                  DKU
(10)          DSMODE DISABLE -
                  VOLUME(CSVOL4) -
                  ECCENTRICAREA
(11)    /*
(12)    //
```

Figure 3.18 DSMODE Command Releasing Dataset Statistics Information

(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 subsystem.
(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 subsystem. **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 subsystem. **ECCENTRICAREA** is a parameter to release only eccentric areas (area(s) that don't belong to any datasets).
(11) End of command.
(12) End of job.

3.1.5 Combined Commands

Figure 3.19 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)    //
```

Figure 3.19 Combined Volume Commands

(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 subsystem.
(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 3.20 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)    //
```

Figure 3.20 Combined Dataset Commands

(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 subsystem.
(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.

3.2 HRUDCRT Commands

HRUDCRT supports the following commands:

- **COUNTS** displays cache volume or dataset statistics. This command can also reset the counters if necessary (see section 3.2.1).
- **STATUS** displays cache status information (see section 3.2.2).
- **HELP** displays definitions of terms that appear on screen (see section 3.2.3).

3.2.1 COUNTS Commands

Figure 3.21 illustrates HRUDCRT **COUNTS** command parameters.

- **VOLUME** specifies a process target by volume serial number.
- **DKU|DKC** specifies a target range. **DKU** means you specify by a particular volume parameter, and **DKC** means you specify all volumes in the same subsystem ID. You must also define the RAIDPARM DD statement.
- **DSEXTENT|NOEXTENT** specifies whether you want statistics by dataset or volume. ***Note***: If you specify by **DSEXTENT**(9900 and 9900V only), don't use the **RESET** parameter.
- **REPORT|NOREPORT** specifies whether or not you want a printed report.
- **RESET|NORESET** 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 3.21 HRUDCRT COUNTS Command Parameters

Figure 3.22 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 INFORMATIONS
   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 3.22 HRUDCRT Volume COUNTS Command

Figure 3.23 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 *****           2147483647   2147483647  EQUAL     1
  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 3.23 HRUDCRT Dataset COUNTS Command

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

3.2.2 STATUS Commands

Figure 3.24 illustrates HRUDCRT **STATUS** command parameters.

- **VOLUME** allows you to specify a process target by volume serial number.
- **DKU|DKC** allows you to specify a target range. **DKU** specifies the target range by a particular volume parameter, and **DKC** specifies the target range as all volumes in the same subsystem ID. You must also define the RAIDPARM DD statement.
- **EXTENT** specifies that cache extent information will be printed.
- **NOEXTENT** specifies that cache extent information will not be printed.
- **DSEXTENT** (9900 and 9900V only) specifies that dataset statistics information will be printed. If this is combined with a **DKC** command, you must also define the RAIDPARM DD statement.

```
HRUDCRT  STATUS,  VOLUME (volume serial number)
[ DKU | DKC ]
[ E X T E N T  | N O E X T E N T  | D S E X T E N T  ]
```

Figure 3.24 HRUDCRT STATUS Command Parameters

Figure 3.25 is an illustration of a HRUDCRT device **STATUS** command.

```
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 3.25 HRUDCRT Device STATUS Command

Figure 3.26 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 3.26 HRUDCRT Residence STATUS Command

Figure 3.27 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 3.27 HRUDCRT Dataset STATUS Command

3.2.3 HELP Commands

Figure 3.28 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 INFORMATIONS.
))NOEXTENT - NOT DISPLAYS EXTENTS INFORMATIONS.
))DSEXTENT - DISPLAYS EXTENTS AND DSMODE EXTENTS INFORMATIONS.
))RESET    - RESET COUNTER INFORMATION OF CACHE SUBSYSTEMS TO ZERO.
))NOREST   - KEEP COUNTER INFORMATION OF CACHE SUBSYSTEMS.
))REPORT   - DISPLAY COUNTER INFORMATION OF CACHE SUBSYSTEMS SPECIFIED.
))NOREPORT - NOT DISPLAY COUNTER INFORMATION OF CACHE SUBSYSTEMS
              SPECIFIED.
```

Figure 3.28 HRUDCRT HELP File

Chapter 4 Return Codes, Output Messages, and Error Codes

4.1 Return Codes

HRUDCRX has the following return codes:

- **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:

- **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.

4.2 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: **JSEnnnI-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.

4.3 Error Codes

Table 4.1 Error Codes

Error Number	Error Message	Recommended Action
JSE001I-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.
JSE002I-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.)
JSE003I-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.)
JSE004I-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.)
JSE005I-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.)
JSE006I-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.)
JSE007I-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.)

Error Number	Error Message	Recommended Action
JSE008I-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.)
JSE009I-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.)
JSE010I-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.)
JSE101I-E	OPERAND 'operand' IS INCONSISTENT	The set of operands is inconsistent. This operand can not be used with the other specified operand. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Correct the error and execute the command again.
JSE102I-E	'operand' SPECIFIED BUT REQUIRED OPERAND MISSING	The specified operand requires another operand. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Correct the error and execute the command again.
JSE103I-E	INVALID COMMAND NAME 'command name'	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. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Correct the error and execute the command again.
JSE104I-E	INVALID KEYWORD VALUE 'keyword value'	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. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Correct the error and execute the command again.
JSE105I-E	INVALID KEYWORD 'keyword value'	The specified keyword is not defined for this command. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Correct the error and execute the command again.
JSE106I-E	INVALID CCHH PARAMETER	The CCHH value is invalid because of one or more of the following reasons: (1) The number of characters is not eight or ten. (2) There is at least one invalid character. (3) The HH value exceeds the value of the last track number in a cylinder. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Correct the error and execute the command again.
JSE107I-E	LOWER LIMIT IS GREATER THAN UPPER LIMIT	The upper value specified by CCHH parameter exceeds the maximum address of a volume. (S) Terminate the command process, but the next process continues. (Return code is 8.) (P) Correct the upper CCHH value and execute the command again.

Error Number	Error Message	Recommended Action
JSE2011E	SPECIFIED CCHH LIMIT EXCEEDS VOLUME CAPACITY	The upper value specified by CCHH parameter exceeds the maximum address of a volume. (S) Terminate the command process, but the next process goes on (return code is 8.) (P) Correct the cchh value and execute the command again.
JSE202I-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 subsystem. 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.
JSE203I-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.
JSE204I-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.
JSE205I-S	CACHE ACCESS IS DISABLED	This utility tried to execute a BIND or DSMODE command, but the cache subsystem 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.
JSE206I-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 subsystem 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.
JSE207I-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 subsystem. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) If there is an error message on another subsystem, investigate and correct the cause of the messages, then execute the command again.
JSE208I-E	'volume serial number' IS NOT ONLINE	The volume specified by the VOLUME parameter is either not online, or not mounted in the cache subsystem. (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.
JSE209I-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 DKC software/DCR.

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 subsystem with DKC software/DCR.
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 subsystem. The cache subsystem may have a malfunction. (S) HRUDCRX terminates abnormally. (Return code is 12.) (P) Call customer engineer and ask to investigate the disk subsystem.
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 subsystem. (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. The maximum number of extents for 7700E is 16 per volume or 1024 per subsystem. For 9900 and 9900V the maximum is 1024 per volume or 1024 per subsystem. (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.
JSE234I-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.
JSE235I-S	EXTENT MODE OVER ON BOUND TO CACHE SUBSYSTEM	The number of dataset statistics extents exceeds the maximum, which is 64 per subsystem (9900 and 9900V). (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.

Error Number	Error Message	Recommended Action
JSE301I-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.
JSE302I-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.
JSE303I-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.
JSE304I-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.
JSE306I-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 message(s) 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.
JSE307I-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.
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.)

Error Number	Error Message	Recommended Action
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 subsystem. (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 subsystem. (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 subsystem 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 problem(s), 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 subsystem 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 subsystem 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.
JSE511I-W	'disk drive unit number' IS NOT FOUND	The disk drive unit number specified by the dataset in RAIDPARM 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.)
JSE800I-I	command name ACCEPT	The specified STATUS or COUNTS command has been accepted normally.
JSE801I-I	END OF command name	The specified STATUS or COUNTS command has been completed normally.
JSE802I-E	MISSING KEYWORD, mandatory keyword	The mandatory keyword [STATUS, COUNTS, or VOLUME] is not specified.
JSE803I-I	OPERAND IGNORED, operand name	An unnecessary operand is specified, but the process ignored the operand and continues.

Error Number	Error Message	Recommended Action
JSE810I-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.
JSE811I-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.
JSE812I-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.

Chapter 5 Troubleshooting

5.1 Troubleshooting

The Hitachi Freedom Storage™ subsystem provides continuous data availability and is not expected to fail in any way that would interrupt access to user data. For troubleshooting information, please refer to the following documents:

9900V: *Hitachi Freedom Storage™ Lightning 9900™ V Series User and Reference Guide* (MK-92RD100). For further information 9900V Remote Console, please refer to the *Hitachi Freedom Storage™ Lightning 9900™ V Series Remote Console User's Guide* (MK-92RD101) or *Hitachi Freedom Storage™ Lightning 9900™ Remote Console Error Codes* (MK-92RD132).

9900: *Hitachi Freedom Storage™ 9900 User and Reference Guide* (MK-90RD008). For further information on the 9900 Remote Console, please refer to the *Hitachi Freedom Storage™ 9900 Remote Console User's Guide* (MK-90RD003) or *Hitachi Freedom Storage™ 9900 Remote Console Error Codes* (MK-90RD029).

7700E: *Hitachi Freedom Storage™ 7700E User and Reference Guide* (BO-98DD845). For further information on the 7700E Remote Console, please refer to the *Hitachi Freedom Storage™ 7700E Remote Console User's Guide* (BO-98DD880) or *Hitachi Freedom Storage™ 7700E Remote Console Error Codes* (BO-98DD892).

5.2 Contacting the Hitachi Data Systems Technical Support Center

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

The worldwide Hitachi Data Systems Technical Support Centers are:

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

Appendix A Glossary, Acronyms, and Abbreviations

ADDR	address
bound heads	read and write counts from cache
cache extents	areas used for FlashAccess or Cache Manager
cache status: cache off error	cache failed to stop
cache status: disabled	cache is offline
cache status: disconnected	cache is disabled for maintenance
cache status: enabled	status is normal
cache status: cache error	cache error has occurred, cache function has been stopped.
cache status: initializing	cache status is being changed to "enabled"
CC	concurrent copy
CCW	channel command word
CH	channel
CHP	channel path
CPPL	command processor parameter list
CU	control unit
DASD	direct access storage device
destaged heads	number of tracks written to cache asynchronously
DFSMS	Data Facility Storage Management Subsystem
DFW	device first write
DKCMAIN	disk controller main
DS	DEVSERV
DSF	device support facilities
ERP	error recovery procedure
ESA	Enterprise Systems Architecture
ESCON®	Enterprise System Connection
extent count	number of cache or dataset extents
Extent Relation: ALL	The range of extent for dataset statistics information is equal to the extent managed by VTOC. Object dataset is one extent.
Extent Relation: ALL-	The range of extent for statistics dataset is smaller than the extent that suits for dataset. Object dataset has one extent.
Extent Relation: ALL+	The extent range for statistics dataset is larger than extent that suits for dataset. Object dataset has one extent.
Extent Relation: PART	The range of extent for statistics dataset is equal to the extent which suits for dataset. Object dataset has plural extents.
Extent Relation: PART+	The range of extent for statistics dataset is larger than extent that suits for dataset. Object dataset has plural extent.
Extent Relation: PART-	The range of extent for statistics dataset is smaller than extent that suits for dataset. Object dataset has plural extent.
Extent Status: EQUAL	The number of extents of dataset, which is managed by VTOC, are same number of the extents which dataset statistics information is set to.
Extent Status: EQUAL-	The number of extents of dataset, which is managed by VTOC, are the fewer number of extents which dataset statistics information is set to.

Extent Status: LONG	The range of extents, which dataset statistics information is set to, includes the extents which dataset does not exist.
Extent Status: SHORT	The range of extents, which dataset statistics information is set to, does not reach the extents where dataset exists.
FlashAccess	dynamic cache residency
GB	gigabyte(s)
HCD	hardware configuration definition
HMBR	Hitachi Multiplatform Backup/Restore
HPAV	Hitachi Parallel Access Volume
HRX	Hitachi RapidXchange
HXRC	Hitachi Extended Remote Copy
ID	identification
IOCP	input/output configuration program
IPL	initial program load
JCL	job control language
kB	kilobyte(s)
LCU	logical control unit
LDEV	logical device
LU	logical unit
LUN	logical unit number
LVI	logical volume image (also called device emulation)
max	maximum
MB	megabyte(s)
MIH	missing interrupt handler
MIN	minimum, minutes
MVS	multiple virtual storage
NVS	non-volatile storage
NVS: destaging	write pending is being destaged to disk
NVS: disabled	NVS cache is offline, and DFW function is stopped.
NVS: disconnected	NVS is offline due to maintenance
NVS: enabled	NVS is normal status
NVS: NVS error	Non-volatile storage cache memory error has occurred, and DFW function has been stopped
NVS: NVS off error	non-volatile storage function failed to stop
PPL	parameter list
parity group	a set of hard disk drives that have the same capacity and are treated as one group
PPRC	Peer-to-Peer Remote Copy
PTF	program temporary fix

RMCMAIN	remote console main software
rnd	random
R-SIM	remote service information message (error message displayed on the Remote Console PC).
S/390®	System/390®
SCI	state-change-interrupt
SCP	state-change-pending
sec	seconds
seq	sequential
SIM	service information message
SI390	ShadowImage - S/390®
SMS	Storage Management Subsystem
S/N	serial number (also abbreviated as s#)
SSB	sense byte
SSCH	start subchannel
SSID	storage subsystem identification
SVP	service processor (PC component of the subsystem)
TC390	Hitachi TrueCopy - S/390®
TC390A	Hitachi TrueCopy - S/390® Asynchronous
TID	target ID
UA	unit address
UCB	unit control block
V	version
VLVI	virtual LVI
VM	virtual machine
vol	volume
VOLSER	volume serial number
VSE	virtual storage extended
VTOC	volume table of contents
WLM	workload manager
XRC	extended remote copy