

BrightStor™ CA-1® Tape Management

General Information Guide

5.2



Computer Associates®

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About This Guide

The *BrightStor CA-1 Tape Management General Information Guide* is written for individuals who are considering using BrightStor BrightStor CA-1 Tape Management to control their operating system tape library environment, and for new users who are becoming acquainted with BrightStor CA-1 and would like an overview of its features, functions, and operational characteristics.

This guide presents a general, nontechnical explanation of the controls provided by BrightStor CA-1 and their impact on data center applications that require the storage and retrieval of tape data sets. BrightStor CA-1 affects virtually every area of the data center organization, including tape library administration, systems programming, and DASD administration.

Organization

Chapter	Description
1	Provides an overview of BrightStor CA-1 features, functions, and operating characteristics.
2	Discusses BrightStor CA-1 realtime processing and control of tape data sets, and processing techniques used to maintain tape control for multivolume data sets and multi-data set volumes.
3	Describes the methodology used by BrightStor CA-1 to ensure the protection and retention of data sets.
4	Describes the BrightStor CA-1 facilities available for automating tape library maintenance functions.
5	Identifies some of the report and utility programs which can help you manage and control your tape environment.
6	Describes optional BrightStor CA-1 features which you can use.
7	Discusses criteria for evaluating a tape management system and evaluates BrightStor CA-1 based on this criteria.
Index	Provides a quick way to locate specific material.

Summary of Revisions

Each of the following Version 5.2 enhancements for BrightStor CA-1 are described in detail in the new set of documentation issued for this version.

Product Changes and Enhancements

Enhancement topics are listed in alphanumeric order. For additional information on the new BrightStor CA-1 Version 5.2 enhancements see the *BrightStor CA-1 Tape Management Release Guide*.

Summary of Revisions for Service Pack 4

BrightStor CA-1 Tape Management Version 5.2 Service Pack 4 includes both current maintenance as well as new features. The Service Pack tape is in the standard OS/390 Computer Associates format which provides the ability to only apply maintenance to an existing BrightStor CA-1 5.2 environment or to perform a full install of the product with all maintenance integrated into the install libraries.

Component Enhancements

CBRUXVNL Exit

This feature provides a new sample exit for IBM 3494 and 3494/VTS tape libraries (robots).

Data Erase Utility (CTSDEU)

Allows you to erase residual data on tape cartridges for security purposes. Because the new tape media types, such as the IBM 3590 contain servo tracks that can be damaged if a degauss is performed. This utility allows a security erase to be performed on a tape without damaging the servo tracks.

Support for Blocking the Tape Management Catalog (TMC)

Allows you to increase the number of volume and DSNB records defined to the TMC by providing support for a blocked TMC.

Tape Inquiry (TI) Display

The Tape Inquiry (TI) display allows ISPF users to perform a quick lookup of BrightStor CA-1 TMC data for cataloged data sets using the ISPF 3.4 Data Set List display. The new, easy to read display returns essential information from the BrightStor CA-1 TMC organized into groups of related fields.

Documentation

- Adobe Acrobat PDFs and IBM Books are provided for easy access and printing.
- The Systems Programmer Guide contains the "Troubleshooting" information previously found in the installation guides.
- The Master Index is no longer provided as the PDF and Book formats provided offer greater searching capabilities.

Messages

New messages have been added to support the CBRUXVNL exit and the CTSDEU utility.

Summary of Revisions for the Fifth Edition

ISPF Facility

Two replacement screens have been added to "Building New TMC Records".

Documentation

CA90s is now known as CA Common Services for z/OS and OS/390. However, the panels and some references have been retained.

Summary of Revisions for the Fourth Edition

- Common Tape System (CTS)
- Commands - New descriptions for SNAP/NOSNAP and LOG/NOLOG DISPLAY commands.
- BrightStor CA-1 Data Base Services (DBS) - Two new subtasks to this section are:
 - Tape Agent Server and I/O (AIO) - This subtask interfaces with Agent Manager subtask of CTS and TLMS allowing tape agents to protect and record the contents of tapes.
 - Tape Agent Manager (AMGR) - Describes the new AIO subtask which interfaces with BrightStor CA-1 Agents running on other platforms.
- Online Label Interface - New example on modifying TMELBLS to move user data to output label.
- Maintaining the Tape Library System
 - Adding TMC Volume Ranges or DSNB Records - New information regarding the warning message IEFTMS9.

Removed

All references to Fujitsu and MSP.

Summary of Revisions for This Edition

AIVS

Allows BrightStor CA-1 to track foreign tapes and tapes with duplicate volsers. This is done by assigning a unique external label from a range predefined to the TMC, and cataloging the file(s) to this external label. At mount time, the mount message contains both the external and internal label. At mount validation time, the difference between the internal VOL1 label and the requested volser is resolved through a new intercept.

Catalog Control

A new intercept has been introduced which allows the realtime tracking of BrightStor CA-1 controlled tape files. Whenever a catalog or uncatalog operation takes place to a tape volume, the TMC is updated. The result is that TMSCTLG no longer has to be run either in locate mode or by using IDCAMS listings.

BrightStor CA-1 now monitors tape CATLG/UNCATLG activity using an SMF exit and records the status in the TMC. Generation data set support is provided for use with ICF catalogs when a generation data set is uncataloged, or it is rolled off when a new generation is cataloged and the GDG limit has been reached.

Component Enhancements

- **TMSAUDIT** has had several new exception records created by TMSSMF83 added to the TYPE control statement.
- **TMSCLEAN** has been significantly rewritten with Version 5.2. Nearly all changes were done in the portion of the code dealing with the SCRATCHLIST process. One of the biggest changes is that TMSCLEAN simply reads the TMC looking for eligible volumes and then passes the volsers to a subroutine called TMSSCR which actually performs the scratch process.
 - The CLEAN parameter, cleaning criteria, and the SYSIN control statement to control OUTCODE tapes have been moved to a separate utility.
 - The SCRATCHLIST parameter marks expired tapes available for use and produces a flat file used to produce the Scratch and Clean Listing.
 - The function of TMSCTLG moves to TMSCLEAN if the new system option OCTLG is set to N. This option indicates if the old TMSCTLG program should be used or the new catalog processing in TMSCLEAN.
 - The UNCATA option has been changed to include a default of G (for GDG).
 - A new option SCRCAT controls if data sets currently cataloged should be allowed to go scratch.
 - The handling of foreign tapes has been changed. If a tape goes scratch and has the new FOREIGN indicator set (TMC field FLAG4 bit X'04'), that volume is put into delete status.

- Files controlled by LDATE/ddd or CATLG/ddd have their expiration dates changed even when they reside at an off-site location.
- **TMSCLNOA** is a new component which marks volumes that need to be cleaned and sent off-site. This is an optional step that can be run after TMSCLEAN and before the Advantage CA-Earl reports.
- **TMSCONVR** has been moved into the *BrightStor CA-1 Utilities and Reports Reference Guide* from the *CA-1 Conversion Guide*. This is a batch utility program which reformats any machine-readable data set into one of three possible formats. Depending on the format selected, the output record formats are TMSUPDTE control statements, TMSEXPDT Retention Data Set (RDS) control statements, or TMRECORD (TMC record) format.
- **TMSDATA** is a new component which produces sequential data sets from TMC volume records and data set name block (DSNB) records.
- **TMSINIT** has added a new option called SECWTO which controls if the WTOR to ask for the user ID/password should be issued.
- **TMSMERGE** has added three new SYSIN control statements to support merging of other BrightStor CA-1 data centers with matching volsers or foreign volumes already defined to a Version 5.2 TMC.
 - AIVS=xxxxx
 - FOREIGN=yyyyyy
 - CATALOG=NEVER/AIVS/ALWAYS
- **TMSOSCAT** has been changed to report and correct errors based on the new catalog indicator, OCATLG.

In addition to reporting on the difference between the TMC and the operating system catalogs, TMSOSCAT can be used to ensure the new TMISCAT TMC FLAG4 bit X'08' and DSNBISCA DSNB FLAG1 bit X'08' are set on for all files currently cataloged. Due to these changes, new parameters have been added to the JCL and enhancements have been made to the Catalog Control statements. New reports have replaced the TMS Report 17 used in Version 5.1.

The TMSOSCAT control statements that define report content (R=, LIST=) have been replaced with new parameters. You must revise your TMSOSCAT control statements to use the new parameters if defaults are not accepted.

- **TMSSECUR** (online security module) has added two new options, LOGSVC and AADB4, for security processing.
 - LOGSVC indicates if external security system logging is needed.
 - AADB4 indicates if an extra BrightStor CA-1 audit record should be written containing the *before* image of the volume/DSNB record being updated.
- **TMSTPNIT** has been enhanced to provide further verification message processing options.
- **TMSVMEDT** has added two additional control statements. The Volume (VOL=) and Cataloged Data Set Name (CDSN=) control statements designate specific volume or volume sets that need to be moved to an off-site location. The Vaulting with AND conditions pattern has been changed.

Database Fields

- Five new fields have been added under FLAG4 in TMMTMREC as follows:
 - TMACVOLI (ACV) reflects that the internal and external volser do not match.
 - TMDEGAU (DEG) reflects that all residual data have been erased.
 - TMISCAT (OSC) reflects the MVS catalog status of the first file on the volume.
 - TMNRS (NRS) is set to indicate this is a foreign volume.
 - TMVSR (VSR) shows that a vaulted volume is eligible to be returned from the vault if no entry for it is found in the VPD.
- Two new flag byte fields, FLAG5 and FLAG6, have been defined for future use. The size of the existing TMB1DIS (B1 Disclosure Label) and TMB1INT (B1 Integrity Label) have each been reduced from four bytes to three to provide the new flag byte fields.
- TMACTVL1 (ACTVL1) and TMACTVL2 (ACTVL2) have been created to store the internal volser if different from the external volser.
- The DSNBISCA (OSC) field has been added to TMMDSNB FLAG1.

Installation Options

An alphabetical listing of the user modifiable fields has been added to the BrightStor CA-1 options section located in the *BrightStor CA-1 Systems Programmer Guide*.

Module Changes

Modules Added

- CTSPRINT has been added to the CTS library as a supplement to TMSPRINT processing.
- TMSUX2A added a new function code for the obtain volser process to be used from TMSOCEPR and TMSOMODV.

Modules Moved/Renamed

- EDM detection has been moved and renamed CTSEDMLK or CTMEDLK.
- TMSARCTV is now a user distributed source module.
- TMSINITD is now the front-end for the CTS module CTSINITP.
- TMSINITE has been moved to CTS as CTSINITE.
- TMSMSGEX and TMSMSGLC have been moved and renamed CTSMMSGEX and CTSMMSGLC respectively.

Modules Removed

- TMSOCE42 has been removed as it is a duplicate to TMSOCE22.

MVS Systems Library

Docview format documentation for BrightStor CA-1 Version 5.2 is no longer available. It has been replaced by the MVS Systems Library, a multi-product CD-ROM documentation set in IBM BookManager format.

O/C/EOV Intercepts

- A new intercept has been added to support the AIVS feature. AIVS=xxxxxx allows a request for volume 123456 (the external volser) to be processed by DFP/Open processing even though the ACTVOL (actual internal volser) is different. It also allows a scratch subpool request to be done using a new VOL=SER=poolid specification which is satisfied by any scratch tape in the requested scratch pool.
- The existing OPEN for Output indicator is turned off at close time. This allows TMSCLEAN to bypass changing the expiration date for tapes under Catalog Control when they are still in the process of being created.

Realtime Stacking

This major new feature of BrightStor CA-1 allows users to stack multiple files on output volumes without making JCL changes, thereby increasing volume utilization. (This feature is provided in maintenance after the initial 9609 genlevel of Version 5.2.)

Scratch Subpool Changes

Support has been added to allow scratch subpool assignments to be based on retention and JCL specified by coding the pool-ID in the VOL=SER= field. The only limitation is that the pool-ID must be 6 characters in length for the JCL method to be used.

Security Features

- TMSINIT security has been improved by preventing unauthorized operators or users from activating, deactivating, reinitializing or placing BrightStor CA-1 into batch active status.
- Audit Before (AUDB4) - See System Options below
- Log Service Processing (LOGSVC) - See System Options below
- Recreate (RECRE8) - See System Options below
- WTOR in TMSINIT (SECWTO) - See System Options below

SPLIT/MERGE

These utilities are used to allow data from one TMC to be merged into another TMC. With the new duplicate volser support, when a conflict is found, the tape has a unique external volser assigned to it. At the same time, the file name can be cataloged to the external volser. When the data is read for input, it is called for by its unique external volser. The O/C/EOV intercept allows the difference in the VOL1 and the file is read.

Once the file is expired, it is required that the tape be reinitialized prior to its use for output processing. After reinitialization, the internal and external labels match.

System Options

- **ADGDG** indicates if ADSM pseudo GDGs should be treated as regular GDGs by the vaulting system.
- **AUDB4** controls processing whenever BrightStor CA-1 attempts to update a TMC record for either volume or DSNB type.
- **LOGSVC** indicates if external security logging should be performed for successful SVC I/O operations to the TMC or Audit files.
- **OCTLG** indicates if the old TMSCTLG utility should still be used (not all systems sharing the TMC have been upgraded to Version 5.2).
- **RECRE8** indicates if BrightStor CA-1 should remove or keep volumes not used during recreate processing.
- **SECWTO** controls if WTORs should be issued when TMSINIT is executed as a started task to ensure the operator attempting to reinitialize, stop, or make BrightStor CA-1 batch-active is authorized to perform the desired function.
- **SCRCAT** indicates if in addition to the expiration date, TMSCLEAN should analyze the new catalog indicator prior to selecting volumes for scratch processing.
- **UXSCR** indicates if the new scratch exit module (TMSXSCR) invoked to scratch volumes should call the optional user exit.

The DSSN (Data Set Security DDname) and XMSG (Specific Mount Message) under TMOOPT have been removed.

Troubleshooting

- A Collecting Diagnostic Data table has been added to assist the user.
- Information has been added regarding accessing the CA home page on the Internet for additional CA products and services.
- Several changes have been made to the following:
 - Accessing the Online Client Support System
 - Product Versions and Maintenance
 - Requesting Enhancements

User Exits

- All existing realtime user exits have been renamed from TMSUX1x to TMSUX2x with the following exceptions:
 - TMSUX1D is now CTSUXEDM
 - TMSUX1G is now CTSUX1G
 - TMSMSGEX is now CTSMSGEX

All clients are required to review their existing exits for applicability and assemble, and relink with the new names. This change is required because most of the BrightStor CA-1 exits must be 31-bit addressable and may have new parameter lists.

Vault Management System

- Two new parameters have been added that allow you to designate a specific volume or volume sets that need to be moved to an off-site location without regard for rules.
- An additional Vault Pattern Example has been added which shows VOL=, CDSN= and DSN= patterns.

Publications

The following documentation is supplied with BrightStor CA-1. These manuals are intended to help you learn how to use the product and serve as a reference when problems develop or when you want to expand product use.

BrightStor CA-1 Publications

Title	Description
<i>CA-ACTIVATOR</i>	Describes how to install BrightStor CA-1 using the CA-ACTIVATOR installation driver. Detailed installation considerations and data set storage requirements are supplied to ensure the installer has everything needed before starting the installation. Installation instructions are organized in a detailed, step-by-step procedure. This guide applies only to MVS.
<i>BrightStor CA-1 Installation and Maintenance Guide</i>	Describes how to install BrightStor CA-1 using SMP/E, but without the assistance of CA-ACTIVATOR. Detailed installation considerations and data set storage requirements are outlined to ensure the installer has everything needed before starting the installation. Installation instructions are organized in a detailed, step-by-step procedure.
<i>BrightStor CA-1 Systems Programmer Guide</i>	Supplies the systems programmer with the technical information needed to implement and maintain the BrightStor CA-1 system. The guide describes the functional operation of BrightStor CA-1 and provides detailed information on specific BrightStor CA-1 features, programs, macros, user exits, and TMC and Audit data set maintenance.
<i>BrightStor CA-1 Administrator and Operator Guide</i>	Provides the system administrator, tape librarian and operator with the information needed to run BrightStor CA-1 on a daily basis. The guide discusses daily batch processing, tape library maintenance, Auxiliary Disposition, tape processing, the Vault Management System (VMS), online inquiry and update, and the Common Tape System (CTS) component.
<i>BrightStor CA-1 General Information Guide</i>	Provides a system overview for anyone interested in learning about BrightStor CA-1. This overview describes the features and functions of BrightStor CA-1, such as realtime processing, tape data set retention, online inquiry and update, tape library maintenance, product and security interfaces, and scratch pool management.

Title	Description
<i>BrightStor CA-1 Utilities and Reports Reference Guide</i>	Reference for all users of BrightStor CA-1. This publication identifies each utility's purpose, JCL and parameter information, control statement specifications, and hardcopy output. The BrightStor CA-1 modules which generate reports are presented alphabetically with complete descriptions of the reports they produce. Field descriptions are included to aid in interpreting the information contained in each report.
<i>BrightStor CA-1 Message Guide</i>	Contains WTO/WTOR messages and replies, messages issued by BrightStor CA-1 utilities, and system and user abends most frequently encountered during BrightStor CA-1 operations. Each message or code is accompanied by a brief explanation and the appropriate response or recommended action.
<i>BrightStor CA-1 Release Guide</i>	(Formerly the <i>CA-1 Conversion Guide</i> .) Contains all the information you need to successfully convert to BrightStor CA-1 Version 5.2 from another tape management system or from an earlier version of BrightStor CA-1. Contains descriptions of all conversion utilities and messages issued by these utilities.

All manuals are updated as required. Instructions accompany each update package.

Related Publications

The following publications relate to BrightStor CA-1 and are available from Computer Associates:

Title	Description
CA Common Services for z/OS and OS/390 documentation	Various manuals specific to your operating system provide information on installing CA Common Services for z/OS and OS/390 with CA-ACTIVATOR, installing CA Common Services for z/OS and OS/390 without CA-ACTIVATOR, operating instructions for using and maintaining the CA Common Services for z/OS and OS/390, and messages and codes for the CA Common Services for z/OS and OS/390.
<i>CA Reference Guide</i> , CAIENF Utilities section	Provides operating instructions for the CAIENF facilities.

Other Related Publications

The following publications are not available from Computer Associates, but are referenced in the BrightStor CA-1 documentation set and are recommended reading:

IBM Publications

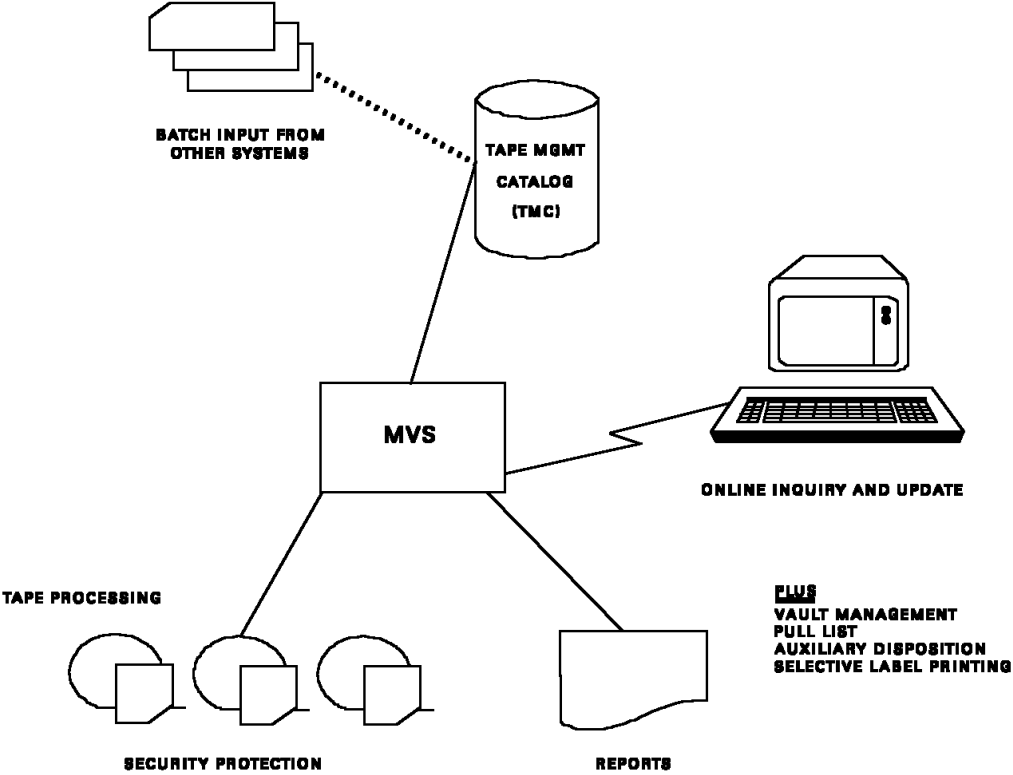
- Principles of Operation
- MVS Interactive Problem Control System (IPCS) Messages and Codes
- MVS Message Library: System Messages
- MVS SPL: Initialization and Tuning
- MVS Catalog Administration Guide
- MVS Utilities
- MVS Administration: Macro Instruction Reference
- MVS Tape Labels
- MVS Data Facility Product Version 2: Customization
- SMP/E User's Guide
- SMP/E Reference
- SMP/E Messages and Codes
- SMP/E General Information Manual
- JES3 SPL: User Modifications and JES3 Macros
- DFHSM System Programmer's Reference
- DFHSM Installation and Customization Guide
- MVS Programming Library: Debugging Handbook

Disclaimer

All sample code, JCL, and reports that are provided in this guide are intended as reference aids only. No warranty of any kind is made of the completeness or correctness of these samples for your specific installation environment. If you wish to use any of these samples at your site, be sure to adjust them to your specific site standards.

Chapter 1. BrightStor CA-1 Features

BrightStor CA-1 provides absolute protection against the inadvertent destruction of tape files. Additional capabilities enhance tape library management and allow for maximum ease of tape operation with minimal manual intervention. This diagram illustrates the conceptual structure of BrightStor CA-1.



1.1 Tape Data Set Protection

BrightStor CA-1 is uniquely designed for tape protection so that:

- External tape labels are not necessary. However, provision is made for both selective label printing and the printing of labels for all output tapes. Protection is provided without the need to externally identify tape data sets.
- Write rings do not need to be removed. The level of protection provided by BrightStor CA-1 allows a data center to leave write rings in all tapes or to modify the tape drives so that write rings are not required. This is also true for the equivalent feature on cartridge media.
- All multivolume data sets are protected as they are created. Chain pointers reference the forward and backward structure of the data set, immediately identifying all associated volumes.
- Each secondary file on a tape has its own identifying record and expiration date in the BrightStor CA-1 database, and is separately protected and reported on.
- In the event a problem occurs, an Audit data set tracks all changes to the BrightStor CA-1 database to provide restoration capability up to the instant of failure. Activity reports available from the Audit data set can provide detailed information on the tape processing trends in your installation, and resolve specific tape processing problems.
- Nonlabel tapes are controlled with the same degree of protection provided for standard label tapes, including input data set name checking, multifile control, and the chaining of multivolume data sets.
- Products external to BrightStor CA-1 can use and manage BrightStor CA-1 controlled tapes. The External Data Manager (EDM) feature allows systems such as the IBM Hierarchical Storage Manager (DFHSM) to *own* a BrightStor CA-1 controlled volume and indicate when it should be returned to scratch status. These tapes are identified on reports as EDM controlled.
- Complete security integration with external security packages (eTrust CA-ACF2, CA-Top Secret, and RACF) allows control of realtime processing, batch jobs and online interfaces.

1.1.1 Management and Control Techniques

Management and control is provided for all tape processing:

- Facilities are provided to track tapes created on non-BrightStor CA-1 systems. Tapes created and used on a DOS machine or a non-IBM CPU can be tracked using the BrightStor CA-1 Batch Update System.
- BrightStor CA-1 can manage tapes created on another BrightStor CA-1 system with a volume serial number which conflicts with a BrightStor CA-1 controlled volume. These tapes, known as duplicate tapes, are controlled through a facility known as Alternate Internal Volume Substitution or AIVS. In addition, AIVS can be used to manage foreign tapes.
- A complete Vault Management System allows you to automatically route critical tapes to and from off-site vaults or other locations as necessary. Full reporting is provided.
- Online inquiry and update features provide immediate access to the data associated with BrightStor CA-1 controlled tapes. Updates to these data fields can be made only by authorized users. The BrightStor CA-1 Interactive System Productivity Facility (BrightStor CA-1 ISPF) component presents a set of panels which can be used to interface with the system. Other components operate through standard MVS consoles, TSO terminals, JES3 consoles, CICS terminals and BrightStor CA-Roscoe terminals. BrightStor CA-1 ISPF is the recommended facility.

```

----- VOLSER INQUIRY DISPLAY ----- *** SCRATCH TAPE ***
COMMAND ==>>                                DATE: 1995/002
                                           95.002

VOLSER = 300001
DSN = CORPSTD.ARCHIVE.SEC110                DSN17= TD.ARCHIVE.SEC110
EXPDT = 1995/002 ACCT= TMS USER ACCOUNTING AREA
FLAG1 = E5 = (INT,CLO,UPD,SCR,RDS)         BATCHID= 05 = TMSCLEAN
FLAG2 = 40 = (OUT)                         HOOKID = FE =
FLAG3 = 00 =                               SMSMC = BLANKS
FLAG4 = 00 =                               EDMID =
CDATE = 1995/002 CJOB = ARCHIVE1 CTIME = 0923 CPGM = ARCHIVE1
LDATE = 1995/002 LJOB = ARCHIVE1 LTIME = 0924 LPGM = ARCHIVE1
CSTEP = STEP1 CDDNAME= OUT1 CUNIT = 0E81 LUNIT = 0E81
OUTDATE= ZEROS OUTCODE= SLOT = 00000 TRERRC = 00000
BTHDATE= 1995/002 VENDOR = BLANKS COUNT = 00012 TWERRC = 00000
DATECLN= 1994/145 USECLN = 00010 CLNCNT = 002 TRERRI = 00001
VOLSEQ = 0001 ROBTY = ROBID = 000 PRERRC = 00000
1STVOL = NEXTVOL= PREVVOL= PRERRC = 00000
NUMDSNB= 0000 1STDSNB= 0000000 LSTDSNB= 0000000 PWERRC = 00000
LABEL = SL DEN = 6250 TRTCH = 9TRK PRERRI = 00001
RECFM = FB LRECL = 000144 BLKSIZE= 000144 PWERRI = 00001
AUDATE = 1995/002 AUTIME = 0946 BLKCNT = 0000000082
AUCODE = 00 AUFLAG1= 00 CPUID = XE76 USERID = CORPUR1

```

BrightStor CA-1 ISPF Volume Record Display

1.1.2 Reporting

Many standard reports are supplied using Advantage CA-Earl or BrightStor CA-1 utilities. These include:

- Inventory lists by volume serial number, data set name or creating job name.
- Forecasts of tapes to become scratch.
- A report listing all tapes sent to customers, affiliate vendors, off-site vaults, and so forth.
- A list of scratch tapes with cleaning information.
- An operating system Catalog-to-Tape Management Catalog (TMC) correspondence report.
- A list of inactive tape volumes.

In addition, the Advantage CA-Earl interface allows you to select data to be reported, design the output, and generally produce any kind of report you need, such as a list of all tapes which had I/O errors during the past 48 hours.

1.1.3 Optional Features

Optional features in BrightStor CA-1 provide other management and control techniques:

- Paperwork does not have to accompany jobs that have special processing needs or postprocessing requirements. The Auxiliary Disposition feature communicates these special processing requirements directly to your system console(s).
- By using the BrightStor CA-1 prestaging facility, input tapes required by scheduled jobs can be pulled in advance to reduce delays in mounting tapes and increase overall throughput.
- BrightStor CA-1 interfaces with a wide variety of other software packages, such as security, DASD management, and media analysis.

1.2 Installation and Implementation

Installation of BrightStor CA-1 is a straightforward process. Modifications are *not* necessary to the standard operating system data management modules.

SMP/E for MVS can be used to install BrightStor CA-1, and the CA-ACTIVATOR facility can be used to drive the installation for MVS systems. CA-ACTIVATOR is automatically shipped with the BrightStor CA-1 product tape and relevant documentation.

Implementation techniques depend on your current method of tape control and may vary considerably, based on the information initially available to BrightStor CA-1. The process, however, does not require changes to standard system JCL for the specification of expiration dates or retention periods.

BrightStor CA-1 is designed to be as flexible as possible to fit the needs of different data processing environments. The installation of BrightStor CA-1 covers decisions on a number of options. Most of these options have defaults which suit the majority of installations.

Chapter 2. Realtime Processing

BrightStor CA-1 gains control at every tape OPEN, CLOSE and End-of-Volume (EOV). All necessary information associated with the tape volume is captured at these times and immediately stored in the Tape Management Catalog (TMC) for all tapes defined to BrightStor CA-1. Validity checking is performed at OPEN and EOV by checking tape status in the TMC prior to allowing any processing by the program requesting tape I/O.

The TMC contains a single record called a Volume record for each volume assigned to BrightStor CA-1 control. To track the allocation of secondary data sets, the TMC uses Data Set Name Block (DSNB) records.

Control of tape data sets by BrightStor CA-1 includes both input and output for Standard Label (SL), ANSI Label (AL) Nonlabel (NL), Nonstandard Label (NSL), and Bypass Label Processing (BLP). Control is also maintained for files which span more than one physical volume (multivolume data sets) and for tape volumes which contain more than one physical file (multi-data set volumes).

This chapter identifies considerations for using existing production JCL under BrightStor CA-1 and considerations for the tape library organization.

2.1 JCL Considerations

JCL changes are not normally required when BrightStor CA-1 is installed; however, it is important to examine the conventions utilized by BrightStor CA-1. BrightStor CA-1 is concerned with the five DD statement parameters discussed below.

- **DSN** - The same data set name is required when reading a tape data set that was used when the data set was created. This applies to NL and BLP tape data sets and SL data sets. BrightStor CA-1 compares the data set name specified in the JCL to the data set name stored in the TMC record during input processing.

Any inequality causes the job to abend. For ease of BrightStor CA-1 implementation, when the data set name in the TMC is set to HEXZEROS (the default), the actual data set name is stored in the TMC during the initial OPEN for input processing.

- **VOL=SER** - For SL tapes, this parameter is handled in the standard manner. For NL or BLP tapes, the operator is asked to reply the volume serial number through a WTOR issued by BrightStor CA-1. The operator's reply is compared to the volume serial number specified in JCL. If the comparison is equal, processing continues. If the comparison is unequal, the NL tape is demounted and a mount is issued for the volume specified in the JCL. If no volume serial number is specified (that is, nonspecific output), BrightStor CA-1 uses the volume serial number supplied by the operator to access the TMC. In addition, the volume serial number is passed to the operating system in such a way that the actual volume serial number (as replied by the operator) appears on the SYSMMSG listing even for NL nonspecific output.

Since the external reel number for NL tapes is supplied to BrightStor CA-1 through an operator reply, NL nonspecific output tapes can be successfully cataloged. (The operating system without BrightStor CA-1 generates a pseudo volume serial number for NL nonspecific output tapes, rendering MVS cataloging meaningless.)

- **DISP** - BrightStor CA-1 allows the recreation of a data set on the same volume if the data set name is exactly the same and the DISP parameter is changed from NEW to OLD or SHR.
- **LABEL** - If either EXPDT or RETPD is specified as a subparameter of the LABEL parameter when a tape is created, that hold criteria is used to protect the data set. There are also several BrightStor CA-1 EXPDT keywords and ACCODE parameter values which can be used to specify hold criteria. If no JCL retention is specified, the BrightStor CA-1 Default Retention is used. Hold criteria specified in the Retention Data Set (RDS) can be used to override the BrightStor CA-1 Default Retention, and, optionally, even JCL-supplied retention.

- **ACCODE** - Certain BrightStor CA-1 EXPDT keywords and processing options can be specified using the ACCODE JCL keyword. This allows placing Julian dates in the actual HDR1 of standard label tapes while specifying a BrightStor CA-1 EXPDT keyword. Although ACCODE is primarily for ANSI labeled tape, the first character can be any letter. If the next two characters are “CA,” the remainder is used to select the expiration or retention option.

2.2 Tape Library Considerations

The efficient operation of the tape library under BrightStor CA-1 requires every tape to be identified by a unique volume serial number and physically stored in volume serial sequence. Numbers should be assigned consecutively when possible.

BrightStor CA-1 controls volumes having alphanumeric volume serial numbers; however, a translation of that alphanumeric into a numeric must be possible. The translation scheme is specified at installation time through two exit routines and is used for internal system processing only. The TMSBLDUE utility can be used to assist in this translation. Externally, an alphanumeric volume serial number is always used.

If the Scratch Pool Management feature is being used, a request for a pool-controlled tape must be satisfied by mounting a volume within the defined scratch pool range, or the volume is demounted and the request reissued.

Utilities such as DITTO that copy from tape mark to tape mark should not be used to copy tapes under the control of BrightStor CA-1. This causes a mismatch between the volume serial number on the external reel label and the volume serial number in the tape label record. Utilities such as BrightStor CA-1/Copycat or IEBGENER that use normal OPEN logic are recommended for tape-to-tape copy functions.

2.3 Standard Label (SL) and ANSI Label (AL)

2.3.1 OPEN for Input

BrightStor CA-1 compares the data set name specified in the DD statement with the corresponding data set name that is recorded for the volume in the TMC. If the data set names are identical, processing is allowed to continue; otherwise, the job is abended. This validity check is performed *after* the operating system has checked the 17-character data set name in the tape header record against the data set name requested in the DD statement. The validity check by BrightStor CA-1 compares the complete 44-character data set name. After input has been authorized, the *last used* information is updated in the TMC.

This input data set name check maintains the integrity of the TMC by preventing duplicate volume serial numbers. If an abend occurs, it usually indicates that a tape has been written on without the knowledge of BrightStor CA-1: either the standard MVS OPEN routines were bypassed, the tape was written on outside the installation without being properly checked out-of-area, or the special BrightStor CA-1 EXPDT keyword for nonresident tapes was used incorrectly.

The Alternate Internal Volume Substitution (AIVS) feature of BrightStor CA-1 allows volumes created on another BrightStor CA-1 system or a foreign volume (one not created on a BrightStor CA-1 system) to retain their original internal volume serial number, while assigning a new external volume serial number which BrightStor CA-1 uses to track the tape. When processing an AIVS volume during OPEN for Input, BrightStor CA-1 checks that the volume serial number on the tape matches the internal volume serial number recorded in the TMC. Verification of the file name will not proceed unless the internal volume serial number on the tape matches that recorded in the TMC.

2.3.2 OPEN for Output

For nonspecific output requests, any tape which does not meet specific requirements is immediately demounted, and a mount for a new scratch tape is requested. Eligibility for output access is determined entirely by information in the TMC. Any expiration date contained on the tape header label is ignored for BrightStor CA-1 controlled volumes. An operator has no authority to make decisions as to which volumes can be written on, as with normal tape processing.

A tape volume is only considered eligible for scratch when two conditions are met: (1) the expiration date in the TMC Volume record is not in the future, and (2) the status indicator in the TMC Volume record reflects the volume as scratch.

The BrightStor CA-1 system option LAB allows external tape labels to be printed automatically for every OPEN of an output tape for the first file.

2.3.3 Scratch Pool Management Protection

Further protection is provided with the use of the BrightStor CA-1 Scratch Pool Management feature, which allows you to restrict nonspecific output access to *tape pools* of BrightStor CA-1 controlled volume ranges. If any tape is mounted from outside a requested scratch pool range, the tape is demounted and the request is reissued. Similarly, if a tape from a defined pool is mounted for a non-pool request, the volume is demounted and the mount request reissued.

Assignment of volumes to tape pools and definition of access rules is accomplished in the TMOSCRxx and TMONSMxx members of CAI.PPOPTION. An exit is provided for customization of processing. If you have changed the scratch subpool rules and are trying to MOD onto a tape, BrightStor CA-1 continues to enforce using the same subpool as the first tape when requesting the mount of another tape.

2.4 Other Labels

2.4.1 Nonlabel (NL)

NL tapes are handled in basically the same manner as SL tapes, including input and output validity checking and protection. The volume serial number of the NL tape is supplied by the operator through a console response. This external volume serial number is used to locate the proper TMC record, then moved into the appropriate system control blocks to allow:

- NL nonspecific output tapes to be cataloged to the system
- NL nonspecific output tapes to be used in generation data groups
- the external volume serial number to be printed on the SYSMMSG listing

2.4.2 Bypass Label Processing (BLP)

BLP processing is the same as NL processing except that BrightStor CA-1 processes any file sequence as a file sequence of 1 with BLP. The input data set name validity check as described for SL processing is performed. The data set name found in the TMC record for the volume and the DSN specified in the DD statement are used.

2.4.3 Nonstandard Label (NSL)

Complete protection is available for NSL tapes; however, your NSL routines must be modified to interface with BrightStor CA-1. This interface consists of calling BrightStor CA-1 at the appropriate locations in the NSL routines and interpreting the resulting return code after BrightStor CA-1 has performed the appropriate validity checks.

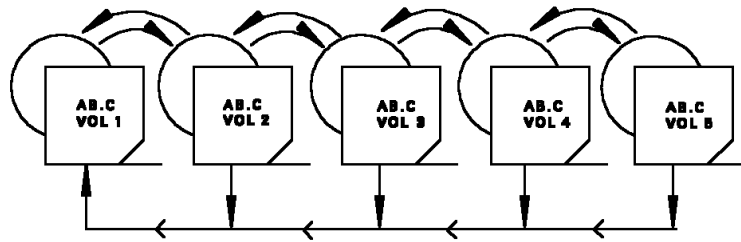
2.4.4 CLOSE Processing

CLOSE (end-of-file) processing is the same for all label types, except secondary files created with BLP. The TMC is updated to reflect the number of blocks written to the file and any read or write errors that were encountered. A status flag is set to indicate BrightStor CA-1 tracked the closing of the file.

2.5 Data Sets

2.5.1 Multivolume Data Sets

Multivolume data sets, those which span more than one physical volume, are protected individually as soon as each volume is created. Multivolume data sets are chained together with backward and forward pointers in the TMC record as illustrated in the following figure:



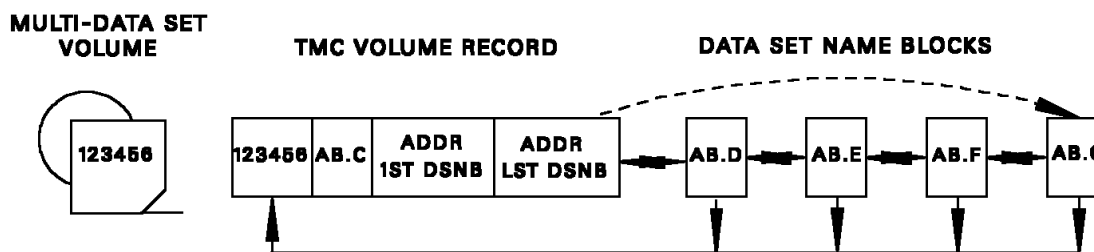
Multivolume Chaining

An additional feature of multivolume processing occurs on input for either NL or SL. The volumes must be mounted in the sequence in which they were created. This assures proper processing even when the operator mounts the wrong tape, or when the volume serial numbers are specified in the wrong order in the JCL statement or in the system catalog.

Updates to TMC records for multivolume data sets through BrightStor CA-1 online facilities can be made only to the first volume. The update is then automatically applied to all volumes of the data set. Updates to fields pertaining to the tape volume only, not the data set, can be made to the single Volume record. System responses to updates for other than the first volume specify the first volume serial number of the set.

2.5.2 Multi-Data Set Volumes

A multi-data set volume refers to a tape that contains more than one physical data set. Multiple data sets on a tape volume are often referred to as *stacked* data sets. BrightStor CA-1 keeps information concerning all data sets on a tape volume by using a special record, a Data Set Name Block (DSNB), for each secondary data set. The DSNBs are then chained together by pointers, as shown in the following figure. Secondary data sets are listed on the appropriate reports.



Multi-Data Set Chaining

Each DSNB record for secondary files stores the expiration date used when the file was created. During multifile creation, if a numerically higher expiration date is presented for a secondary file, the Volume record for the first file is updated with the higher expiration date, and this becomes the controlling expiration date. With ANSI-labeled tapes, IBM does not permit the expiration date for a secondary file to exceed the expiration date for any previous data set on the volume.

2.5.3 Disposition MOD Processing

Tapes OPENED with a disposition of MOD are controlled with the same criteria as input processing, which means the data set name in the TMC must match the data set name in the DD statement or the job abends. If the volume has multiple data sets, only the last data set on the volume can be opened with DISP=MOD.

The highest expiration date found in the existing TMC record or the JCL, is assigned to the data set opened with DISP=MOD.

2.5.4 Checkpoint Restart

If a multivolume data set is being processed by checkpoint restart, BrightStor CA-1 unchains and expires any remaining volumes from an existing multivolume chain. Tapes from the scratch pool can be used to satisfy subsequent output requests.

2.5.5 Recreating Data Sets

You are allowed to recreate the last data set on a tape volume if you: (1) specify the same data set name as the one used to originally create the data set, and (2) change the JCL disposition parameter to OLD or SHR. If original BLKCNT=0 then DISP=NEW will also be allowed for recreate. If a multivolume data set is being recreated and uses fewer volumes than the original file, BrightStor CA-1 has an option to either unchain and expire any remaining volumes from an existing chain, or to keep all existing volumes in the chain.

BrightStor CA-1 assumes that you are aware of these conditions and allows the file to be written over. The TMC expiration date for the data set is changed to match the specifications in the JCL of the recreating step. Recreation is never allowed if the tape is a *permanent hold* tape (LABEL=EXPDT=99365 or LABEL=EXPDT=99366 or ACCODE=xCAPERM), or if the tape is marked out-of-area to a location other than a special BrightStor CA-1 out-of-area code. An exit is provided to disallow recreating data sets based on data set name and job name. Closed loop GDG processing is allowed by disregarding the generation and version number (G0000V00).

2.6 Special Processing for Input

Normal input processing under BrightStor CA-1 consists of checking the data set name requested in the DD statement against the data set name recorded in the TMC and updating the TMC fields with *last used* information. Three special input processing situations may occur:

1. When the data set name in the TMC is set to HEXZEROS (the default), the actual data set name is stored in the TMC the first time a tape is read under BrightStor CA-1.
2. Another special processing situation arises for out-of-area tapes. Tapes can be checked out-of-area under BrightStor CA-1 by inserting an OUTCODE in the TMC Volume record. This indicates the tape has been removed from the premises. If an out-of-area tape is used for input, it is assumed that the tape has been returned and it is automatically checked-in, unless the out-of-area code is assigned to the BrightStor CA-1 Vault Management System.

If a tape has been brought back from the vault, and a manual CHECKIN has been performed on the volume (OUTCODE=VMS), all volumes in the set that have been checked are automatically checked-in during open processing. This allows the tapes to be sent back to the vault if they are still eligible. In addition, the BrightStor CA-1 system option RV ensures the expiration date of the tapes returned from the vault do not expire before the vaulting system sends them back.

3. If the tape was checked out-of-area during scratch processing, then read for input under BrightStor CA-1 control, the tape is automatically checked in and the TMC record is updated with the new data set name and expiration date. The expiration date or retention period can be specified in the DD statement (even though the tape is being used as input).

If no expiration date or retention period is specified, the BrightStor CA-1 system option KEYTAP is used to assign the retention. This provides a reliable, simple means of controlling tapes created on systems which are not under BrightStor CA-1 control, such as key-to-tape processing. This is explained further under

2.6.1 Programs Which Bypass OPEN

Occasionally, production systems in an installation may create output tapes which do not go through a normal OPEN. For these cases, a special pool of verified scratch tapes should be used. The information needed to protect these tapes correctly can be entered into the TMC using BrightStor CA-1 batch or online inquiry and update facilities.

2.7 Tape Control

2.7.1 EDM Controlled Tapes

BrightStor CA-1 allows tapes controlled by BrightStor CA-1 to be used and managed by external systems. The External Data Manager (EDM) feature supports this process for systems such as DFHSM. BrightStor CA-1 options define which products are EDMs and which data sets are to be treated as EDM controlled. BrightStor CA-1 supports multiple EDMs.

When the correct criteria is presented during OPEN processing, BrightStor CA-1 sets a status indicator designating EDM control and records the EDMID. The tape is not eligible for scratch processing until the EDM informs BrightStor CA-1 that it has released the tape for scratch. BrightStor CA-1 system option REDM can be used by the EDM to specify extended retention criteria for tapes released from EDM control. In addition, a facility is provided to define a scratch pool for each EDM.

BrightStor CA-1 does not create DSNBs or chain multivolume data sets for tapes that are EDM controlled; BrightStor CA-1 treats these tapes as single volume, single file data sets. An exit is available to define the criteria that determines which tapes are to be treated as EDM controlled. However, the ability to assign multiple EDMIDs through the selection criteria in the TMOEDMxx member of CA1.PPOPTION minimizes the need for this exit.

2.7.2 Nonresident Tapes

Nonresident tapes should not be confused with EDM controlled tapes. Nonresident tapes are simply identified, not managed. EDM controlled tapes are supported by compatible interfaces between the EDM system and BrightStor CA-1.

Tape volumes which are not considered part of the installation tape library and are not controlled by BrightStor CA-1 can be processed by specifying a special keyword in the DD statement that references the nonresident tape.

Standard MVS protection is maintained and the operator is required to verify that the volume being processed is actually a nonresident tape if there is a matching volume serial number in the TMC (during output processing). This verification process ensures the integrity of BrightStor CA-1.

The use of a nonresident tape is recorded in the Audit data set to provide a record of all nonresident processing. The keyword which allows nonresident tape processing is an expiration date of 98000, and is specified as LABEL=EXPDT=98000 or ACCODE=xCANORES in the appropriate DD statement that references the tape.

Nonresident tapes having a volume serial number outside the range of the TMC can be used as input without the nonresident specification. All nonresident output requests must contain the nonresident keyword, regardless of whether there is a corresponding Volume record in the TMC.

An exit is available which allows tapes to automatically bypass BrightStor CA-1 control.

2.8 Console Tape Messages

Unique BrightStor CA-1 console messages are issued to the operator as conditions warrant. They are in standard operating system format and operators adapt to them very quickly. A complete description of all console messages and valid responses (when required) is contained in the *BrightStor CA-1 Message Guide*.

For example, when an NL or BLP tape is OPENed, the operator is asked to enter the volume serial number. For a specific volume request, the volume serial number entered must be the same as specified in the JCL; if not, BrightStor CA-1 assumes the wrong tape is mounted and has the tape demounted.

For a nonspecific request, the volume serial number *must* be replied twice. This gives the operator a chance to correct any “finger checks.” The volume serial number is then used to access the TMC information.

Provisions are available to process nonresident tapes whose volume serial numbers are identical to those in the BrightStor CA-1 controlled tape library. When this type of tape is mounted for output and the JCL specifies the keyword indicating a nonresident tape (LABEL=EXPDT=98000 or ACCODE=xCANORES), the operator is asked to verify that the tape actually is a nonresident tape.

Nonresident tapes are protected with the standard system type protection. That is, for SL tapes, if the HDR1 expiration date is greater than the current date, the operator has the option to override the expiration date and allow output, or to demount the tape.

If the operator mounts a tape for output and BrightStor CA-1 determines the tape cannot be used as a scratch, the operator receives a console message stating it is not a scratch and specifies a reason code. Some possible reasons might be:

- Nonresident tape was requested but BrightStor CA-1 tape is mounted
- Wrong tape is mounted for NL, BLP specific request
- Tape is BrightStor CA-1 permanent hold
- Tape is marked out-of-area
- Possible duplicate volume serial number (TMC DSN and HDR1 DSN do not match)
- Tape has not been scratched
- Tape is part of a multivolume data set
- Tape contains secondary files, and the output request is not for file n+1 (tape contains n files)
- Tape has been remounted as part of a multivolume data set
- Tape is mounted from the wrong scratch pool
- CA-9/R+ (Reliability Plus) indicates a bad tape

In most instances, the tape is demounted and another scratch request is issued. There are circumstances, however, when BrightStor CA-1 abends the tape job for certain types of processing violations.

BrightStor CA-1 also provides protection in the event that dual-density drives are in use, or label types are mixed within the environment. BrightStor CA-1 system options LCHG and DCHG determine whether dynamic label or density changes can occur in the realtime environment. Appropriate demounts or verification messages are issued, depending on the options in use. System option TCHG controls whether recording technique (TRTCH) changes are allowed.

If Auxiliary Disposition is used, messages issued display the tape drive, volume serial number, and the free-form message text. No console response is required; however, operator action can be specified such as `HOLD TAPE FOR THE NEXT JOB`. Auxiliary Disposition messages can be forced to remain on the screen until cleared by the operator.

To help the operator identify work tapes (such as sort work files), the creation of any temporary data set on a BrightStor CA-1 controlled tape causes two messages to go to the console. At both `OPEN` and `CLOSE`, the operator receives the drive and volume serial number of the work files. The `OPEN` message also includes the job name, `ddname`, expiration date, and data set name. The `CLOSE` message includes the comment `WORK TAPE` (or `WORK FILE`, for a secondary data set). Once work tapes are demounted, the operator can place them back in the scratch pool.

Whenever BrightStor CA-1 issues an abend, a console message is displayed showing the job name, step name, `ddname`, tape drive address, volume serial number, and data set name. Codes are also provided to indicate the issuing module and reason for the abend. The *BrightStor CA-1 Message Guide* describes the reason and corrective action for all BrightStor CA-1 abends.

All tape mount messages are prefixed with special message IDs. If the mount request requires a tape from a specific tape pool, the mount message is modified by the Scratch Pool Management feature to include the tape pool identification.

Chapter 3. Data Set Retention

The protection and retention of data sets is determined by the expiration date stored in the TMC. This expiration date is automatically updated every time a data set is created on a tape volume. Expiration dates may be supplied:

- in the LABEL parameter of the DD statement
- in the ACCODE parameter in the JCL
- by the BrightStor CA-1 Default Retention
- by the BrightStor CA-1 Default Abend Retention
- from the Retention Data Set (processed by the TMSEXPDT program)

Each of these is explained in this chapter.

3.1 Keyword Expiration and Retention

BrightStor CA-1 provides expiration and retention for tape data sets through specific criteria supplied as values on the JCL EXPDT, RETPD, or ACCODE parameters. If the JCL does not supply either value, the BrightStor CA-1 Default Retention (BrightStor CA-1 system option RP) is assigned when the data set is opened.

You can optionally establish retention in batch program TMSEXPDT using the BrightStor CA-1 Retention Data Set. All expiration dates can be treated as Julian dates by setting the BrightStor CA-1 system option TRUXPD to YES. This option applies to realtime processing only.

BrightStor CA-1 does treat certain Julian dates as EXPDT keywords with special retention characteristics. They are expressed in Julian format in JCL and in a special keyword format to BrightStor CA-1 batch utilities. Through the use of a special DD (BrightStor CA-1 system option KEYDD) in the creating JCL, dates normally considered to be EXPDT keywords can be defined as legitimate Julian expiration dates.

3.1.1 LABEL Parameter

LABEL=RETPD=0	A temporary data set. If it is for the first file, the volume remains in scratch status after use.
LABEL=EXPDT=yyddd	Standard system Julian expiration date.
LABEL=EXPDT=yyyy/ddd	Standard MVS expiration date for DFP 2.3 or above.
LABEL=RETPD=dddd	Standard system retention period. If the retention period specified calculates to a date greater than 97365, it is considered a valid date by BrightStor CA-1 and not a keyword date.
LABEL=EXPDT=88uuu	User Control EXPDT keyword that you can create. Specifies that a tape is held permanently.
LABEL=EXPDT=90ddd	Catalog Days Control EXPDT keyword plus minimum retention keyword. Specifies that a tape data set is held at least ddd days. Once ddd days has been met, the expiration date is changed to CATALOG and is protected as long as the data set is cataloged.
LABEL=EXPDT=98000	Nonresident EXPDT keyword. Specifies that the tape volume being processed is not under BrightStor CA-1 control. See Nonresident Tapes on page 2-12.
LABEL=EXPDT=98ddd	Days Since Last Used Control EXPDT keyword. Specifies that a tape data set is held as long as it is used every ddd days, and ddd can be any value between 001 and 366. As long as a tape data set is being utilized at least as frequently as every ddd days, it is protected. When the data set is not used for ddd

days, it becomes eligible for scratch. This is an excellent means of controlling tapes used for testing.

LABEL=EXPDT=99000

Catalog Control EXPDT keyword. Specifies that a tape data set is protected as long as it has an entry in the system catalog. As soon as BrightStor CA-1 determines that the data set no longer has an entry in the system catalog, it becomes eligible for scratch. 99000 is frequently used for generation data groups.

LABEL=EXPDT=99ccc

Cycle Control EXPDT keyword. Specifies that ccc cycles of a data set are to be held. This retention is based entirely on the number of cycles to be maintained in the TMC. Cycle Control can be used for simple data sets and generation data groups. For GDGs, the number of tapes retained by BrightStor CA-1 does not necessarily need to equal the number of system catalog entries. The definition of a BrightStor CA-1 cycle is determined by BrightStor CA-1 system options CDAY and CJOB.

LABEL=EXPDT=99365

Never scratch EXPDT keyword. Specifies that a tape is held permanently. Data sets held with this keyword cannot be recreated on the same tape; however, these data sets may have additional information MODed on. 99365 is often considered to be “manual” control, as these tapes can not be scratched until the volume is manually expired.

LABEL=EXPDT=99366

Never scratch EXPDT keyword. Specifies that a tape is held permanently. The same rules apply as for 99365.

Note: If an expiration date supplied in the JCL is less than the system date, BrightStor CA-1 arbitrarily sets the TMC EXPDT to STATS/001, which is treated as permanent retention. Manual intervention is required to reset the retention actually desired. If a temporary data set is specified but a retention or expiration date into the future is specified, the tape is not considered temporary by BrightStor CA-1.

3.1.2 ACCODE Parameter

In addition to specifying the expiration date by way of the JCL LABEL parameter, certain dates can be expressed using the JCL ACCODE parameter.

Note: *x* can be any letter of the alphabet.

ACCODE=xCAEXPDT	Specifies that the value specified in the JCL LABEL= parameter is a true expiration date, and not a BrightStor CA-1 EXPDT keyword.
ACCODE=xCAKEYWD	Specifies that the value specified in the JCL LABEL= parameter is a BrightStor CA-1 EXPDT keyword, and not an explicit expiration date. This applies <i>only</i> if the value specified is a valid BrightStor CA-1 EXPDT keyword value.
ACCODE=xCACATLG	Same as LABEL=EXPDT=99000 or the BrightStor CA-1 EXPDT keyword CATALOG or CATLG.
ACCODE=xCANORES	Same as LABEL=EXPDT=98000 or the BrightStor CA-1 EXPDT keyword FOREIGN.
ACCODE=xCAPERM	Same as LABEL=EXPDT=99365 or 99366 or the BrightStor CA-1 EXPDT keyword PERMANENT or PERM.
ACCODE=xCAUSER	Same as LABEL=EXPDT=88000 or the BrightStor CA-1 EXPDT keyword USER/000.

3.1.3 Specifying BrightStor CA-1 EXPDT Keywords

Listed below are the JCL Julian format of BrightStor CA-1 EXPDT keywords and the corresponding BrightStor CA-1 batch and online keyword expression of these values.

JCL EXPDT	Equivalent Keywords	Description of BrightStor CA-1 Expiration Date Keywords
	ZEROS	A date with an internal value of zeros is always displayed as zeros. However, the date can only be entered as any number of 0s, or the word ZEROS.
yyyy/ddd	yyyy/ddd	Julian date format. The acceptable range of Julian dates is 1960/001 through 2155/366. BrightStor CA-1 validates all input dates to ensure that they fall within this range.
88uuu	USER/uuu	This keyword allows you to create your own keywords for processing. BrightStor CA-1 treats this as PERMANENT.
90ddd	CATLG/ddd	Retain ddd days, then retain while data set is cataloged to the operating system.
98000	FOREIGN	This is a nonresident tape, so do not update the TMC. This value is not stored in the TMC but appears in the Audit data set for type 3 (exception) records. BrightStor CA-1 does not allow you to set the expiration of a data set to FOREIGN in a TMC record.
98ddd	LDATE/ddd	Retain ddd days after date on which tape was last used.
99000	CATLG or CATALOG	Retain while data set is cataloged to the operating system.
99ccc	CYCLE/ccc	Retain ccc cycles.
99365,99366	PERM or PERMANENT	Retain data set permanently.
	STATS/sss	Status of held tape where sss is the reason code indicating why the tape is being held. This keyword has no JCL equivalent. It is set by programs through the SET_KEYWORD function, or is entered through the keyword format STATS/sss, to apply permanent retention (other than 99365) to an unknown situation, such as a broken chain. Certain Version 4.x expiration dates are set to STATS/sss during a TMC conversion from Version 4.x to Version 5.1. For more information, see the discussion of the TMSCONTM utility in the <i>BrightStor CA-1 Release Guide</i> .
	STATS/001	The EXPDT in the JCL is less than the current date; therefore, BrightStor CA-1 set the EXPDT to STATS/001 to prevent the tape from scratching prematurely.
	STATS/002	There is a multivolume chaining error. A TMC volume with this EXPDT is chained to a volume not in the TMC.

JCL EXPDT	Equivalent Keywords	Description of BrightStor CA-1 Expiration Date Keywords
	STATS/003	In RMM the EXPDT was 98000. In the conversion routine of RMM to BrightStor CA-1, the EXPDT is set to STATS/003.
	STATS/004	In RMM the EXPDT was blanks. In the conversion routine of RMM to BrightStor CA-1, the EXPDT is set to STATS/004.

3.1.3.1 Other Considerations

Warning messages are generated in BrightStor CA-1 ISPF and TIQ functions for dates entered in the Julian format, yyddd, that correspond to a BrightStor CA-1 Version 4.x EXPDT keyword.

EXPDT=yyddd date supplied in the JCL falls within the BrightStor CA-1 EXPDT keyword range, it is treated as a keyword unless:

- The CAI.PPOPTION parameter TRUXPD is set to YES (TRUXPD=NO is the default). This option treats all dates as true expiration dates.
- If a special DD statement defined in CAI.PPOPTION by the KEYDD keyword which defaults to TMNOKEY is present in the same step, the date is treated as a true expiration date. This is also true for EXPDT=yyyy/ddd.

The CAI.PPOPTION parameter KEYDD, which identifies the ddname (TMNOKEY is the default) placed in the JCL as DD DUMMY, indicates that a date specified in the JCL as 98ddd or 99ccc is treated as a Julian expiration date instead of a BrightStor CA-1 EXPDT keyword. This override applies to all tapes created in the step in which this special ddname was specified.

If TRUXPD=YES, the CAI.PPOPTION parameter KEYDD acts as an override, allowing dates specified in the JCL as 98ddd or 99ccc to be treated as BrightStor CA-1 EXPDT keywords instead of true expiration dates.

- If LABEL=EXPDT=98ddd or 99ccc was specified and the KEYDD ddname is in the JCL with TRUXPD=NO, the date is treated as a Julian date (see example).
- If LABEL=EXPDT=98ddd or 99ccc was specified and the KEYDD ddname is in the JCL with TRUXPD=YES, the date is treated as a BrightStor CA-1 keyword.
- If LABEL=EXPDT=98ddd or 99ccc was specified and the KEYDD ddname is *not* in the JCL with TRUXPD=NO, BrightStor CA-1 treats the date as a BrightStor CA-1 keyword.
- If LABEL=EXPDT=98ddd or 99ccc was specified and the KEYDD ddname is *not* in the JCL with TRUXPD=YES, BrightStor CA-1 treats the date as a Julian date.

Example:

The JCL to retain a tape until the 71st day of 1998 might look something like this:

```
//SYSUT2 DD DSN=A.B.C,UNIT=TAPE,DISP=(NEW,CATLG),  
// LABEL=EXPDT=98071  
//TMNOKEY DD DUMMY
```

Note: BrightStor CA-1 does not distinguish between LABEL=EXPDT=98071 and LABEL=EXPDT=1998/071. Both formats appear to BrightStor CA-1 as 98071.

To treat all dates as true expiration dates, set the TRUXPD option to YES in the TMOOPT_{xx} of CALPPOPTION.

When ACCODE is specified with a valid combination for BrightStor CA-1, EXPDT is not interpreted. If ACCODE=xCAEXPDT, the expiration date is treated as an expiration date regardless of any BrightStor CA-1 definition. If ACCODE=xCAKEYWD, the expiration date is treated as a keyword.

3.2 BrightStor CA-1 Retention Processing

3.2.1 Default Retention

An installation-defined Default Retention (BrightStor CA-1 system option RP) is assigned to any tape data set that is created without an expiration date, retention period or ACCODE parameter in the JCL. The default can be either a given number of days, a specific Julian date, or BrightStor CA-1 keyword date. A status indicator in the TMC reflects the assignment of the Default Retention.

- When the Default Retention is taken, BrightStor CA-1 can optionally set another status indicator to indicate that the expiration date is eligible to be overridden if there is an entry for the data set in the Retention Data Set.
- When the JCL provides an EXPDT, RETPD or ACCODE parameter, this status indicator is not turned on. However, BrightStor CA-1 system option RO does allow the indicator to be set, regardless of the JCL specification, so that you can use the Retention Data Set (RDS) to enforce tape retention standards in your environment.

In either case, if there is no corresponding entry in the Retention Data Set (RDS), BrightStor CA-1 honors the date calculated at OPEN for output.

3.2.2 Default Abend Retention

When a tape data set normally OPENed for output (DISP=NEW or DISP=MOD) is CLOSEd by an abend, the program is probably to be rerun and the normal retention period of the tape may no longer be valid. To allow for this condition, BrightStor CA-1 changes the expiration date for the tape data sets CLOSEd by abend to the Default Abend Retention (BrightStor CA-1 system option ABE) and sets a status indicator. An exit is available to establish retention other than the Default Abend Retention. The expiration date can also be assigned by the Retention Data Set if the ABEND keyword is specified for the data set.

3.2.3 Retention Data Set

The Retention Data Set (RDS) is used to supply expiration criteria after a tape data set has been created. The batch program TMSEXPDT processes the RDS and compares the control statements it contains with TMC records. For the RDS to override the expiration date, a status indicator in the TMC record must indicate that the data set is eligible to be overridden. This indicator is always turned on when there is no JCL-supplied EXPDT, RETPD or ACCODE parameter.

BrightStor CA-1 system option RO provides the means to turn this indicator on even when the JCL supplies the retention, giving the RDS the final authority on all tape data set retention. When the option is on, it facilitates centralized enforcement of retention standards. A Retention Data Set option of SELECT=ALL allows all TMC records meeting selection criteria to be assigned a new expiration date regardless of the status indicator in the TMC.

3.3 Work Tapes

BrightStor CA-1 considers a tape volume a *work tape* when the first file used is specified as temporary. This can be done in several ways:

- LABEL=RETPD=0 is specified in the JCL.
- No data set name is specified unless a future expiration date or retention period is specified.
- A temporary data set name is specified (DSN=&&xxx) unless a future expiration date or retention period is specified.
- The JCL specifies DISP=(NEW,DELETE).

BrightStor CA-1 issues a work tape message in these instances. If the file being processed is not file 1, a work file message is issued (this is also issued if a secondary file is being read for input and there is no corresponding DSNB record in the TMC; BrightStor CA-1 does not require DSNB records to read secondary files for input).

Work tapes or files can be disallowed by setting the BrightStor CA-1 system option WRKFLS to NO. In this case, a one day retention is assigned to the data set, disqualifying the volume for a subsequent use as a scratch tape.

Chapter 4. Tape Library Maintenance

A number of facilities are provided to automate tape library maintenance functions. The following facilities and processes are described in this chapter:

- Tape Volume Scratch
- Operating System Catalog Correspondence
- BrightStor CA-1 Backup and Restore Facilities
- Initializing New Tape Volumes
- Special Tape Processing
- Online Inquiry and Update Facilities

4.1 Tape Volume Scratch

Tape volumes may be scratched by the BrightStor CA-1 TMSCLEAN program or by an online SCRATCH command.

TMSCLEAN can optionally enforce SMS Management Class maximum retention specifications. Any tape data set found with an expiration date exceeding the SMS Management Class retention is scheduled for SCRATCH processing the following day.

TMSCLEAN determines which of the tapes held by Days Since Last Used Control (LABEL=EXPDT=98ddd) and Catalog Days Control (LABEL=EXPDT=90ddd) are to become eligible for scratch OR RESET TO Catalog Control. The TMSCLEAN utility is usually executed as part of the BrightStor CA-1 daily maintenance job stream. Other programs normally executed in this stream are:

TMSEXPDT Compares those tape data sets which were created with the BrightStor CA-1 Default Retention Period to the data sets and SMS Management Classes listed in the Retention Data Set (RDS). If a match is found, the TMC expiration date is updated based on the RDS retention criteria. If a system option (RO) was selected, the RDS overrides any EXPDT, RETPD, or ACCODE values assigned from the JCL. Specific abend expiration dates can also be assigned.

TMSCYCLE Determines which of the data sets held by Cycle Control (LABEL=EXPDT=99ccc) are to be removed from Cycle Control.

Each utility provides an exit to allow for customization of processing.

Other BrightStor CA-1 utilities are commonly integrated into the BrightStor CA-1 daily maintenance job stream. See the *BrightStor CA-1 Administrator and Operator Guide* for a complete description.

4.1.1 Scratch Tape Generation

When executed with a SCRATCHLIST parameter, TMSCLEAN marks as scratch any eligible volumes and produce a report file reflecting the volumes to be pulled and placed in the scratch pool.

The report file created by TMSCLEAN can be subsequently processed by Advantage CA-Earl to produce a listing by assigned scratch pool, label type, or any other field contained in the TMC.

4.1.2 Scratch Tape Inventory

When executed with a SCRATCHRELIST parameter, TMSCLEAN generates a report file of all volumes currently in scratch status in the TMC. No additional scratching is performed.

This variation of TMSCLEAN is frequently executed weekly, so that tapes that were not in their slot in the library when pulling the SCRATCHLIST can be placed into the scratch pool. A portion of a TMSCLEAN report is shown below.

THURSDAY, JUNE 06, 1996.158		YOUR COMPANY NAME				PAGE 2	
TMS REPORT-05		SCRATCH AND CLEAN LISTING FOR 'SL ' CRTG VOLUMES FOR SCRATCH SUBPOOL -					
VOLSER	FILE DATA SET NAME SEQ	CLN DATE CNT CLEANED	USE BASE CLN VOLSER	CA-1 KEYWD	SPEC. HNDLE	UNCATALOG INDICATOR	F1 F2 F3 F4 LOC ID
TDI010	1 NOBGE01.TMS52.DDRTESTI	ZEROS	TDI010	CATLG			45 00 04 08
TDI021	1 NOBGE01.TMS52.TAPE02	ZEROS	TDI021	CATLG			E5 00 00 08
TDI031	1 NOBGE01.SRMDAL.DATAIN	ZEROS	TDI031				45 00 04 00
TDI049	1	ZEROS	TDI049	CATLG	*AIVS		E7 80 00 48 KEY2
980023	1 SYS4.TEST.FOREIGN1	ZEROS	980023	CATLG	*AIVS		E6 80 00 48
980032	1 SYS4.TEST.SHOW	ZEROS	980032		*AIVS		E6 00 00 40
LABEL TYPE TOTAL							
	SCRATCH TAPES =	23					
	MARKED FOR CLEANING=	1					
	MARKED AS *BAD* =	0					
	NEED TO BE RE-INIT =	3					
	NUMBER OF FOREIGN =	0					
	NEED TO BE ERASED =	0					
SCRATCH POOL TOTAL							
	SCRATCH TAPES =	24					
	MARKED FOR CLEANING=	1					
	MARKED AS *BAD* =	0					
	NEED TO BE RE-INIT =	3					
	NUMBER OF FOREIGN =	0					
	NEED TO BE ERASED =	0					
MEDIA TYPE TOTAL							
	SCRATCH TAPES =	24					
	MARKED FOR CLEANING=	1					
	MARKED AS *BAD* =	0					
	NEED TO BE RE-INIT =	3					
	NUMBER OF FOREIGN =	0					
	NEED TO BE ERASED =	0					
GRAND TOTAL							
	SCRATCH TAPES =	24					
	MARKED FOR CLEANING=	1					
	MARKED AS *BAD* =	0					
	NEED TO BE RE-INIT =	3					
	NUMBER OF FOREIGN =	0					
	NEED TO BE ERASED =	0					

TMS Report 05 - Scratch and Clean Listing for SL Tape Volumes

4.1.3 Tape Cleaning and Certification

The TMSCLNOA utility can indicate which scratch tapes require cleaning based on your criteria. This criteria is passed as parameter input to TMSCLNOA, and can be a number of days since last cleaning, number of uses, number of read/write errors, or any combination of the three. Once the criteria is met, the next time the volume is listed on the scratch list a “clean” indicator is posted. The tape should then be cleaned before it is used as a scratch. When a tape marked for cleaning is used again for output, the fields associated with clean criteria in the TMC record are automatically reset.

Additionally, BrightStor CA-1 interfaces with CA-9/R+ (Reliability Plus), which can flag problem tapes. The comment *BAD* is annotated for each suspect tape on the TMSCLNOA Advantage CA-Earl report. CA-9/R+ can also flag appropriate tapes for cleaning.

Tape certification is important in some installations. The certification process can be tracked by using a portion of the 50-byte User Data Field. This field can be suballocated into any number of fields using your own keywords. This makes it available for updates and displays of the information. A certification indicator can be implemented in this area which could be updated through BrightStor CA-1 online or batch utilities.

4.2 Operating System Catalog Correspondence

Keeping the operating system catalog entries for tape data sets synchronized with the TMC entries can be helpful in eliminating abends and other related problems.

BrightStor CA-1 facilities assist in this effort:

- BrightStor CA-1 can automatically uncatalog scratched data sets from the operating system catalog during scratch processing (TMSCLEAN). Depending on your selection of the BrightStor CA-1 system option UNCATA, the uncatalog action either (1) applies to all data sets or (2) excludes GDG data sets and data sets under Cycle Control or Catalog Control or (3) excludes all data sets.

In addition, the Advantage CA-Earl output file generated by TMSCLEAN can be saved and used on other systems in conjunction with the TMSUNCAT utility to uncatalog tape data sets found on system catalogs. This allows for a single TMSCLEAN to execute in an environment without shared catalogs, and still uncatalog those tape data sets from other systems.

- A TMC to operating system catalog correspondence utility (TMSOSCAT) is available which provides a means of determining the differences between the TMC and the system catalog. The output report lists the records compared and indicates discrepancies.

Various options are available to limit the comparison. An exit is also available to control the TMC records being processed. Two listing sequences are available, one by data set name (the system catalog controls the comparison), the other by volume serial number (the TMC controls the comparison). The information provided can help you research invalid comparisons and perform the appropriate manual updates to either the TMC or the system catalog. A sample of the TMSOSCAT output is provided on the next page.

4.2 Operating System Catalog Correspondence

THURSDAY, AUGUST 30, 1996.242				YOUR COMPANY NAME				PAGE=00002							
TMS REPORT-17 TAPE MANAGEMENT CATALOG (TMC) AND OS/VS CATALOG DIFFERENCES															
DATA SET NAME (TMC)				VSN	VSQ	FSQ	EXPDT	DATA SET NAME (CATALOG)				VSN	VSQ	FSQ	ERR
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.TEST.COMP		980000	001	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			CAI.CA1.LOADLIB		980001	001	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID2.DS01.MULTITMP		980001	001	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSB01		980001	001	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC.DS01		980001	001	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC01		980001	001	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSA02		980002	001	002	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC.DS02		980002	001	002	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC02		980002	001	002	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DS002		980002	001	002	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC.DS03		980002	001	003	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC03		980002	001	003	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSB01		980002	002	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC.DS01		980002	002	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC01		980002	002	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSA04		980003	001	004	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC.DS04		980003	001	004	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC04		980003	001	004	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DS004		980003	001	004	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC.DS03		980003	002	003	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DSC03		980003	002	003	6		
*****	NO	TMC	ENTRY	FOUND	*****			CAI.TEST.ACF2.TAPE01		980005	001	001	6		
*****	NO	TMC	ENTRY	FOUND	*****			CAI.TEST.ACF2.TAPE02		980005	001	002	6		
*****	NO	TMC	ENTRY	FOUND	*****			CAI.TEST.ACF2.TAPE03		980005	001	003	6		
*****	NO	TMC	ENTRY	FOUND	*****			USERID1.DS01.NOCOMP		980009	001	001	1		
CAI.TEST.ACF2.CREATE					980009	001	001	1997/365							
TMS.TESTAGGR.FILE2					980009	001	002	1997/365	*****	NO	CATALOG	ENTRY	FOUND	*****	5
TMS.TESTAGGR.FILE3					980009	001	003	1997/250	SSDDEV.CA1.CL050B6.DS05		980009	001	004	1	
TMS.TESTAGGR.FILE4					980009	001	004	1997/180	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.TEST.FILE1					980010	001	001	CYCLE/015	USERID2.RET00010		980010	001	001	1	
*****	NO	TMC	ENTRY	FOUND	*****				USERID1.RET00010		980010	001	001	6	
*****	NO	TMC	ENTRY	FOUND	*****				USERID1.TEST002		980010	001	001	6	
CAI.TEST.FILE1					980011	002	001	CYCLE/015	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.TEST.FILE5					980012	001	005	CATALOG	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.TEST.FILE4					980012	002	004	CYCLE/015	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.TEST.FILE2					980013	001	002	2018/012	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.TEST.FILE3					980013	001	003	CATALOG	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.TEST.FILE4					980013	001	004	CYCLE/015	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.TEST.FILE1					980013	003	001	CYCLE/015	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.NLTEST.FILE4					980014	001	004	CYCLE/015	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.NLTEST.FILE3					980014	002	003	CATALOG	*****	NO	CATALOG	ENTRY	FOUND	*****	5
*****	NO	TMC	ENTRY	FOUND	*****				CAI.TEST.ACF2.CREATE		980015	001	001	6	
CAI.NLTEST.FILE1					980015	001	001	CYCLE/015	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.NLTEST.FILE2					980015	001	002	2018/012	*****	NO	CATALOG	ENTRY	FOUND	*****	5
CAI.NLTEST.FILE3					980015	001	003	CATALOG	*****	NO	CATALOG	ENTRY	FOUND	*****	5
*****	NO	TMC	ENTRY	FOUND	*****				CAI.TEST.ACF2.CREATED		980016	001	001	6	
*****	NO	TMC	ENTRY	FOUND	*****				CAI.TEST.ACF2.CREATED1		980017	001	001	6	
*****	NO	TMC	ENTRY	FOUND	*****				CAI.TEST.ACF2.CREATEB		980018	001	002	6	
*****	NO	TMC	ENTRY	FOUND	*****				CAI.TEST.GDGBASE.G0002V00		980019	001	001	6	
*****	NO	TMC	ENTRY	FOUND	*****				CAI.TEST.GDGBASE.G0002V00		980020	002	001	6	

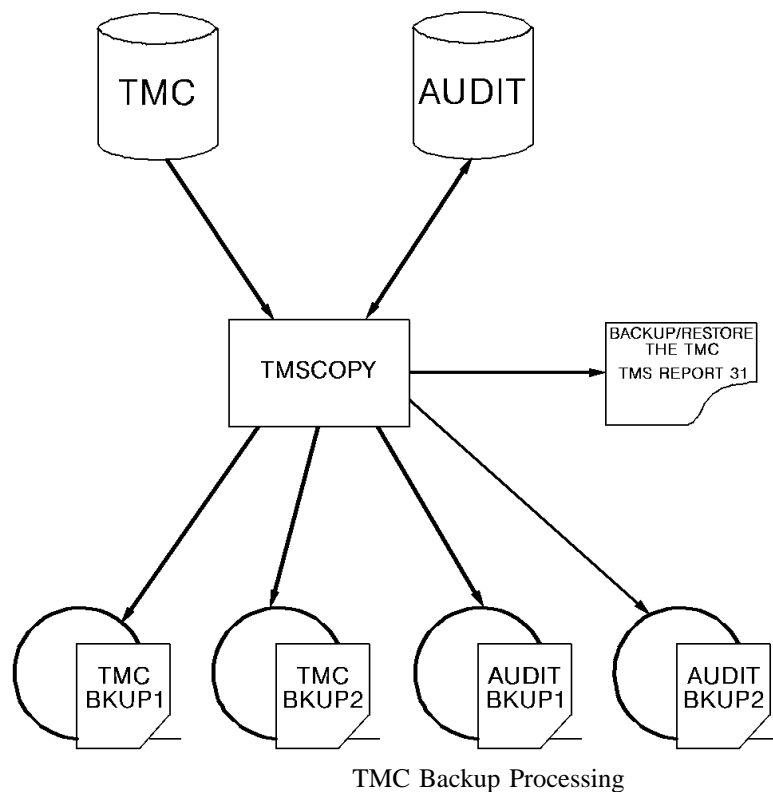
Sample TMSOSCAT Report

4.3 BrightStor CA-1 Backup/Restore Facilities

Since the TMC contains the information on the current status of all volumes assigned to BrightStor CA-1 control, and can significantly affect realtime tape processing, reliable backup and restore capabilities are essential. The batch utility TMSCOPY performs both functions.

The Audit data set is critical to this process. The Audit should reside on a different DASD volume than the TMC (preferably on a different bank/channel). Any realtime, batch, or online update to a TMC record causes an image record to be placed in the Audit data set, with a special code and the date/time stamp of the update.

The logic of TMSCOPY is such that the TMC image is backed up to two tape volumes (one for vault storage), and all Audit records written since the prior TMSCOPY execution are also backed up to tape, and Audit pointers are reset to indicate this action. The illustration below depicts this process.



The Audit backup data is useful for day-to-day TMC activity reporting, and, in certain instances, can be used in special TMC restore processing.

If a RESTORE is necessary, the latest TMC backup tape is used to recreate the TMC. Then the Audit records which have been written since that backup was taken are automatically applied to the TMC. The resulting TMC is restored to its status at the point of failure.

BrightStor CA-1 maintains the information as to which Audit records should be applied, how far back to go, when the latest backup was taken and which tape is the latest backup. If another number is presented during restore processing, appropriate warning messages are issued to the console.

Since the Audit data set is so vital to the restore process, BrightStor CA-1 provides absolute protection to ensure that available Audit data can always restore a damaged TMC to the point of failure. The Audit is formatted, or mapped, with a given number of Audit records (usually enough for two days worth of activity). BrightStor CA-1 system option THAUDT defines a threshold level of Audit records. When this level has been reached, warning messages are issued to the console indicating a TMC backup is needed.

If the Audit records written since the previous backup actually reach the total allocation, BrightStor CA-1 abends all tape requests until such time as a TMSCOPY backup can be executed. In this manner, BrightStor CA-1 can consistently restore a TMC to a point of failure without loss of database integrity, because there is no chance that the Audit data set does not contain all transactions since the previous backup.

If TMC backup processing is carefully planned, the Audit threshold should never be reached. The Audit data set is designed to continue recording transactions even when the TMC backup is running. There is no operating system interference and certainly no need to interrupt tape processing during the TMSCOPY backup execution.

4.4 Initializing New Tape Volumes

BrightStor CA-1 control over tape initialization is provided to prevent:

- Duplication of internal volume serial numbers
- Initialization of nonscratch volumes
- Gaps in volume ranges if tapes are destroyed or permanently removed

The BrightStor CA-1 tape initialization program TMSTPNIT is designed to coordinate tape initialization with the TMC.

Additional facilities:

- BrightStor CA-1 ensures that reinitialization of current volumes is performed only if the record in the TMC is in scratch status.
- The TMC record must reflect scratch status when old volumes are replaced with new ones.
- The TMC record must be in *inactive* (delete) status when new ranges of tapes are activated.
- Allow specification of the owner and ACCESS values for tapes being initialized.
- Verify that the internal VOLSER on a cartridge label matches a tape in the TMC that is in scratch status. This ensures that a wrong tape was not mounted.

An exit is available to control the processing of the tapes.

4.5 Special Tape Processing

4.5.1 Displaying Tape Header Label Information

When it is necessary to know the contents of the label on a tape, the utility TMSTPPRO can be used to display the header information on a console. If the tape is under BrightStor CA-1 control, TMSTPPRO can compare the header and TMC information and report any discrepancy.

4.5.2 Erasing Sensitive Data

The TMSTPPRO utility provides the means to erase tapes containing sensitive data, once the volume is in scratch status. BrightStor CA-1 system option DSEALL can be set to force all scratch tapes to be erased before they are allowed to be used again. An exit is available to control the processing of the tapes.

The online ERASE command can be used to indicate that degause processing has been performed for a volume.

4.6 Online Inquiry and Update Facilities

BrightStor CA-1 online inquiry and update facilities, BrightStor CA-1 ISPF and TIQ Online Inquiry/Update, enable you to:

- Inquire/update TMC volume records
- Inquire/update TMC DSNB records
- Inquire by cataloged data set name
- Inquire on TMC and Audit data set control records
- Generate external tape label requests

Online access is provided through:

BrightStor CA-1 ISPF
Unicenter CA-7 console
BrightStor CA-Roscoe
BrightStor CA-1/Viewpoint
CA-Unicenter/STAR
CICS transaction
JES3 DSP
MVS console (started task)
TSO CLIST

While field-specific updates are possible, BrightStor CA-1 provides special utility functions to reduce the amount of manual input required for common TMC update functions:

ADD	Marks an inactive (deleted) volume record as active
CHECKIN	Checks in a tape that has been marked out-of-area
CHECKOUT	Marks volumes out-of-area (BrightStor CA-1 ISPF only)
CLEANED	Resets fields in the TMC to reflect that a tape has been cleaned (used when a tape is cleaned prior to being identified as needing cleaning by TMSCLEAN)
DELETE	Marks an active, scratch status volume record as inactive (deleted)
EXLBL	Generates an external tape label request for a volume
EXPIRE	Changes the expiration date to the current date
EXTEND	Extends the expiration date for x number of days from the current expiration date
RETAIN	Sets the expiration date to x number of days from the creation date

ERASE Indicates volume has gone through physical degause

SCRATCH Scratches a volume set immediately

Note: ERASE and SCRATCH are available only through the ISPF interface.

Internal and external security is provided to prevent invalid access or update attempts. The required BrightStor CA-1 Security Table can be tailored to meet your installation standards (default internal security access rules are provided).

In addition, BrightStor CA-1 can interface with your in-house security system (such as eTrust CA-ACF2 or CA-Top Secret) to further protect the BrightStor CA-1 online inquiry and update resources. The BrightStor CA-1 Data Set Security feature provides protection on a volume specific level.

See the *BrightStor CA-1 Systems Programmer Guide* for information on security implementation. Specific information on the use of the online facilities is provided in the *BrightStor CA-1 Administrator and Operator Guide*.

Chapter 5. Reports and Utilities

A number of report and utility programs are provided to allow the information contained in the TMC to be used to manage and control the tape environment. A full description of all BrightStor CA-1 utilities, the required JCL, control statements, parameter options, and examples of the reports produced is contained in the *BrightStor CA-1 Utilities and Reports Reference Guide*.

5.1 Reports

Some BrightStor CA-1 utilities generate a flat file suitable for processing by Advantage CA-Earl or a report writer. This allows reports to be generated in any desired sequence and to include any TMC field. Control statement specifications determine the contents and format of the report. Provided sample members in the source library can produce data set name lists, a volume serial master, scratch forecast lists, reports from Audit data set, and out-of-area lists. Other batch reports are summarized below.

5.1.1 Audit Data Set Reports (TMSAUDIT)

Selected Audit records are printed at your request. There are six types of Audit records:

- Batch or online TMC update activity
- Tape input processing activity
- Tape output processing activity
- Exceptions (nonresident tape processing, password violations, record updates bypassed by user exits, and so forth)
- Tapes rejected for use by BrightStor CA-1 (not scratch violations)
- TMC structural modification and BrightStor CA-1 initialization information

Reports on one, all, or a combination of Audit record types can be produced. Sort sequence can be by data set name, volume serial, or Audit date/time. Audit reports can also be requested for specific volume serial numbers or a range of volume serial numbers to assist in researching tape activity.

5.1.2 Advantage CA-Earl Interface (TMSEARL)

This program allows the selection of any variety of records for reporting. You can select the data to be printed and the output format, such as all tapes not read for input in the last six months or all single file tape volumes that have less than 100 blocks of data. Many sample members are provided in the source library.

5.1.3 Batch TMC Inquiry (TMSBINQ)

This program prints selected TMC records in a variety of optional formats:

- SHORT** Only the most important fields
- LONG** All fields
- DUMP** A hexadecimal dump of all fields

Specification of records to be printed is by cataloged data set name, volume serial number, or range of volume serial numbers. DSNBs and TMC control records can also be printed.

The sample TMSBINQ report shown below illustrates a volume containing multiple data sets.

MONDAY, JANUARY 02, 1995.002		YOUR COMPANY NAME				PAGE=00001
TMS REPORT-12	BATCH INQUIRY	VOL=300001				
300001	DSN=CORPSTD.ARCHIVE.SEC110	ACCT=TMS USER ACCOUNTING AREA		CDDNAME=OUT1		CUNIT=0E81
	EXPDT=CATALOG	CDATE=1995/002	CTIME=09.23	CJOB=ARCHIVE1	CSTEP=STEP1	CPGM=COMPARCH
	FLAG1=41=(CLO,RDS)			FLAG2=40=(OUT)		
	FLAG3=02=(MTF)			FLAG4=00		
	VOLSEQ=000001	1STVOL=	PREVVOL=	NEXTVOL=	DSN17=TD.ARCHIVE.SEC110	
	NUMDSNB=00001	1STDSNB=0001101	LSTDSNB=0000001			
	LDATE=1995/002	LTIME=09.24	LJOB=ARCHIVE1	LUNIT=0E81	LPGM=COMPARCH	BLKCNT=0000082
	TRTCH=9TRK	DEN=6250	LABEL=SL	RECFM=FB	LRECL=000144	BLKSIZE=000144
	OUTDATE=ZEROS	OUTCODE=	SLOT=000000	BTHDATE=1995/002	COUNT=00012	VENDOR=
	TRERRI= 0001	TRERRC= 0000	TWERRI= 0001	TWERRC= 0000	SMSMC=	EDMID=
	PRERRI= 0001	PRERRC= 0000	PWERRI= 0001	PWERRC= 0000		ROBID=000
	DATECLN=1994/145	USECLN=000010	CLNCNT=002	BATCHID=	HOOKID=OP SLOT	ROBTY=
	AUDATE=1994/002	AUTIME=09.24	USERID=CORPUR1	CPUID=XE76	AUCODE=02	AUFLAG1=00
***** DSNBS *****						
300001	ACTIND=80	DSN=CORPSTD.ARCHIVE.SEC120	NEXTDSNB=0000000	PREVDSNB=0000000	CURDSNB=0000001	
	EXPDT=CATALOG	VOLSER=300001	FILSEQ=002	F1STVSN=300001	FLAG1=01=(RDS)	FLAG2=00
	CDATE=1995/002	CTIME=09.24	CJOB=ARCHIVE1	CSTEP=STEP2	CPGM=COMPARCH	
	RECFM=FB	LRECL=00144	BLKSIZE=000144			
	BATCHID=	HOOKID=CLOSE IO	BID=FF	SMSMC=	BLKCNT=000502	
	AUDATE=1995/002	AUTIME=09.24	USERID=CORPUR1	CPUID=XE76	AUCODE=02	AUFLAG1=00
END OF REPORT 12						

5.2 BrightStor CA-1 Vault Management System

In an installation that utilizes multiple tape storage locations, the BrightStor CA-1 Vault Management System (VMS) controls the movement of tape volumes from one location to another. Typically, critical tape volumes are cycled out of the central tape library to progressively more secure and less accessible storage areas (vaults) and finally back to the central library. With VMS, tapes that meet installation-defined vaulting criteria are automatically checked *out-of-area* with the proper vault code, and reports are generated indicating the current location and destination for tapes that require movement.

Under VMS, a vault is defined as any identifiable location. A vault is typically a fireproof safe or an off-site storage location. Any number of locations can be defined, and a maximum number of slots can be defined for each vault. Warning messages are issued when the number of slots in a vault exceed the value specified. Tapes in a vault can be located by slot numbers, which are automatically assigned by VMS and reused as volumes flow out of the vault and new volumes flow in.

Once you have defined the vaults, the data sets to be vaulted, and the vaulting criteria, the Vault Management System (VMS) automatically manages tape vaulting. Whenever the VMS batch programs are executed, picking, distribution and inventory reports are generated for each vault using the report writer format. The reports can be sorted by slot number, volume serial number, or data set name.

VMS utilizes six basic types of retention criteria. Logical combinations (**AND** and **OR**) of the retention criteria are allowed. A tape can be held in a vault based on:

- the number of cycles (creations) in the vault
- the number of days since moved to the vault
- the number of days since the volume was created
- a specific, future date
- the expiration date of the tape
- the number of days passed since the volume was last used

Movement criteria, location IDs, and data set names are defined in a Vault Pattern Description (VPD) data set. Data sets can be identified by a high-level qualifier, be fully qualified or identified by BrightStor CA-1 pattern masking specification. Vaults and movement information can be added, changed, or deleted simply by editing and *redefining* the VPD.

BrightStor CA-1 system option CYD can be used to define a cycle as consisting of all tapes with the same data set name created on the same date. An exit is available to allow tailoring of the TMC record selection.

The Vault Management System (VMS) is discussed in the *BrightStor CA-1 Administrator and Operator Guide*.

Chapter 6. Other BrightStor CA-1 Features

BrightStor CA-1 provides a number of optional features which you can use if they are applicable for your site. Several of these features described in this chapter are:

- External Security
- Auxiliary Disposition
- Prestaging Input and Output Tapes
- Accounting Information and User Data
- BrightStor CA-1 Tape Control for Non-CA-1 Systems
- Batch Update System
- BrightStor CA-1 External Label Processing

6.1 External Security

BrightStor CA-1 has many security options available that enable your external security system to control data set access, use of BrightStor CA-1 services, use of BrightStor CA-1 online interfaces, and use of NL and NSL label types, and to bypass BrightStor CA-1 control (LABEL=EXPDT=98000 or ACCODE=xCANORES). This affords your tape data sets the same level of protection as your DASD data sets. An exit is available to allow for customization of security processing.

Data set security and other security-related features are discussed in the *BrightStor CA-1 Systems Programmer Guide*.

6.2 Auxiliary Disposition

The Auxiliary Disposition facility is a communication technique to help eliminate the paper work involved with special tape handling requests and to assure that those requests are fulfilled in a timely manner.

This facility provides direct communication from the person setting up the job to the master console, tape operator, or tape librarian when the tape volumes are closed or reach end-of-volume. The message appears immediately after the operating system KEEP message.

One of the more common reasons to use Auxiliary Disposition is to notify an operator or librarian that a tape needs to be sent off-site. Such tapes normally require an external label, and Auxiliary Disposition provides an option to generate an external label request at the same time the messages are displayed.

The feature also provides the means to mark tapes out-of-area automatically.

Auxiliary Disposition utilizes a sequential data set which contains all messages required to communicate the special tape handling requests for a particular step. This data set is recognized by BrightStor CA-1 by a unique ddname (BrightStor CA-1 system option DSN), and can be a sequential disk data set, a member of a PDS, or included in the job stream following a DD *.

Auxiliary Disposition is invoked at the time a tape is closed or demounted, or it can be invoked as a separate step to give all the disposition messages at one time.

The message format is free-form text. Operator training is minimal because messages can contain all the information needed to perform special tape handling.

Included with this feature is the capability to automatically check tapes out-of-area. Typical requests the Auxiliary Disposition can display are:

- routing to microfiche
- routing to a special printer
- asking the operator to hold the tape for later use in another job

The Auxiliary Disposition facility is discussed in the *BrightStor CA-1 Administrator and Operator Guide*.

6.3 Prestaging Input and Output Tapes

Input tape handling procedures can be greatly improved by giving the tape librarian or production control the facility to prestage or set up jobs ahead of time. The BrightStor CA-1 prestaging program is designed to aid in this task.

The TMSPULL utility allows reporting to facilitate prestaging tape volumes for production processing. TMSPULL generates listings of all required input and output volumes for a normal production job.

- One report is produced to allow the tapes to be retrieved and organized for the other report to reference.
- The Pull List is in shift, cart ID, and volume serial number sequence. Other report information includes job name, data set name, and volume sequence number.
- The Setup List is in shift, job name and volume serial number sequence. Other report information includes cart slot number, volume sequence number, data set name, out-of-area code, and slot number.
- The prestaging facility is driven by a PDS that contains the information necessary to produce the list of tapes to be pulled.
- Each PDS member contains information relative to one job with the member name being the job name. The PDS member contains:
 - the shift designation number (36 are available)
 - the cart on which the tapes are to be placed
 - the input data sets to be selected
- Scratch tapes can be requested for output data sets.
- The list can be generated from the information in the MVS Catalog or the Tape Management Catalog (TMC).
- Provision is made to indicate other than a current generation for GDGs.
- Appropriate scheduling of the TMSPULL program and proper set up of the TMSPULL PDS can assure the operators that all input and output volumes required for a job or groups of jobs are available before the job is submitted for execution.

A complete discussion of the TMSPULL utility is provided in the *BrightStor CA-1 Utilities and Reports Reference Guide*.

6.4 Accounting Information and User Data

Each Volume record on the Tape Management Catalog (TMC) contains a 50-byte User Data Field which is available to you for the storage of any desired information. This field can be used to store accounting information, certification information, or any data beneficial to effective tape management in your installation.

The accounting interface allows accounting information to be automatically extracted from the accounting fields located in the JOB card, EXEC statement, or through the operating system, and stored. BrightStor CA-1 automatically picks up the appropriate accounting information for every tape as data sets are created.

For more information on the job accounting exits, see the *BrightStor CA-1 Systems Programmer Guide*.

If automatic capture of accounting information is not desired, then the entire User Data Field is available for any other purpose. The User Data Field is accessed through a standard BrightStor CA-1 or site-defined keyword by online inquiry and update or batch functions.

For more information on the User Data Field, see the *BrightStor CA-1 Systems Programmer Guide*.

6.5 BrightStor CA-1 Tape Control for Non-BrightStor CA-1 Systems

A non-BrightStor CA-1 system is one which cannot access the TMC and Audit data sets during data set creation. This can be an MVS CPU which does not share the DASD volumes that contain the TMC and Audit data sets, a non-MVS operating system such as DOS, or a non-IBM operating system.

In these situations, take extra precautions to ensure that tapes created on these non-BrightStor CA-1 systems are properly integrated into the BrightStor CA-1 environment.

- Use the AIVS feature, described below, to manage the tapes.
- If all tapes created on non-BrightStor CA-1 systems are later used as input under BrightStor CA-1, then the Key Tape Procedure can be followed. (See Key Tape Procedure on page 6-8.)
- If the tapes may or may not be used as input under BrightStor CA-1, then either the Batch Update System or, if activity is slight, BrightStor CA-1 online inquiry and update can be used to update the TMC with the new status of the tapes as they are created.

It is recommended that all tapes in the environment be initialized in the BrightStor CA-1 TMC. This allows the management facilities of BrightStor CA-1 (reports, automatic scratch control, Vault Management System, and so on) to be utilized for tapes created on both BrightStor CA-1 and non-BrightStor CA-1 systems.

6.5.1 Alternate Internal Volume Substitution

BrightStor CA-1 Alternate Internal Volume Substitution (AIVS) processing provides an effective way to track tapes created on a non-BrightStor CA-1 system. With AIVS processing, BrightStor CA-1 can track foreign and duplicate volumes. Foreign volumes are those volumes created outside of the control of BrightStor CA-1, while duplicate volumes are those volumes with volume serial numbers which conflict with volumes defined to BrightStor CA-1. Duplicate volumes are typically volumes which have been created on another BrightStor CA-1 system whose TMC is being merged with an existing TMC.

AIVS support is provided in BrightStor CA-1 by recording the internal or actual volume serial number (ACTVOL) from the tape header in the TMC and tracking the tape with an external volume serial number defined to BrightStor CA-1. When an AIVS tape is to be OPENed for input processing, the JCL VOL=SER= parameter or system catalog entry for the file must refer to the external volume serial number. The mount message issued contains both the external and actual volume serial number obtained from the TMC volume record.

AIVS tapes are defined to BrightStor CA-1 either by directly entering the foreign tape information through the Build New TMC Record online command or by executing the

TMSMERGE utility to merge another TMC with duplicate volume serial numbers. If an AIVS tape is to be reused, it must be initialized with an actual volume serial number equal to the external volume serial number.

6.5.2 Key Tape Procedure

For tapes which are created on a non-BrightStor CA-1 system and used as input under BrightStor CA-1, the Key Tape procedure allows control with minimal manual effort. Tapes that are expired, are not in a vault (no slot number) and are marked out-of-area are eligible for Key Tape Processing. To implement the Key Tape procedure, you must determine the number of tapes which are needed during a certain period (daily, weekly, and so on). When the TMSCLEAN program is executed, indicate how many scratch tapes are to be logged out-of-area to the individual locations (tapes can be selected based on VOLSER, density or label type).

As the tapes go scratch, they are automatically logged out-of-area. The scratch tapes can then be placed in an area close to the non-BrightStor CA-1 system. After they are written on, they are filed in the tape library. Protection is maintained because BrightStor CA-1 does not allow these scratch tapes to be used for output as long as they are marked out-of-area.

When the tape is subsequently used as input under BrightStor CA-1, the TMC is automatically updated to contain the new data set name and an expiration date. If an EXPDT or RETPD is specified in the JCL, it is used; if not, the value of BrightStor CA-1 system option KEYTAP is used to protect the tape for the retention period that you specified.

All other pertinent TMC fields are updated, and the out-of-area code is removed. BrightStor CA-1 then has complete control of the tape for tracking, reporting, and protection purposes.

6.5.3 Other Procedures

If tape creation activity on non-BrightStor CA-1 systems is slight, then a procedure using the BrightStor CA-1 online inquiry and update feature may suffice. Tapes to be used as output on the non-BrightStor CA-1 system can be verified as valid scratches. After creation, the appropriate fields can be updated in the TMC.

If these tapes are to be vaulted, VMS requires the following fields to have valid data:

- DSN
- EXPDT
- CDATE
- CTIME
- CJOB
- LDATE
- VOLSEQ

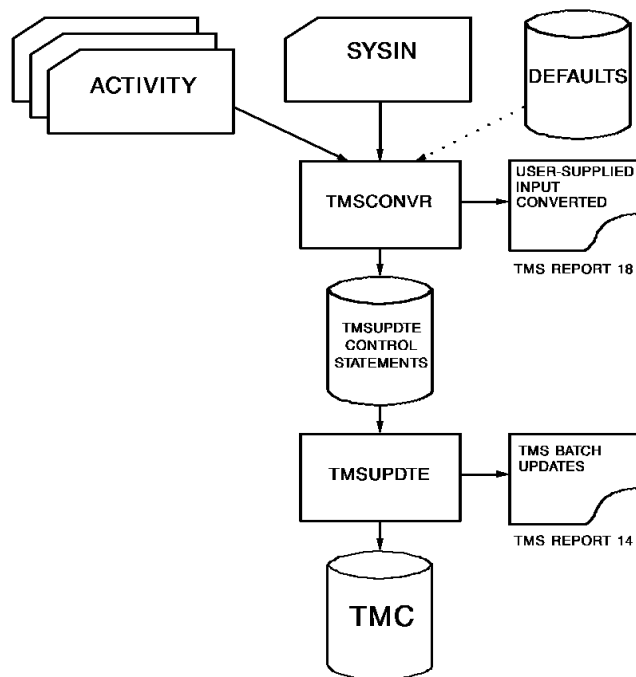
The TMSUPDTE batch utility can also be used.

6.6 Batch Update System

The BrightStor CA-1 Batch Update System enables users to update the Tape Management Catalog (TMC) with status information regarding tape volumes and data sets by supplying only minimal information (for example, data set name and volume serial number) and letting other standard data pertaining to the data set be picked up from another file. TMSCONVR, a multipurpose utility, processes the data.

The following figure illustrates the Batch Update System process. A sequential Activity file contains the volume serial numbers and data set names of all newly created tapes. This file is processed by TMSCONVR in conjunction with an optional Defaults file.

The Defaults file contains any additional information which should be put in the TMC record for a particular data set. For each data set, the Defaults file would normally contain the appropriate expiration date or retention period, the creating job name, and so forth. The format of the Defaults file and the Activity file must be sequential; the fields are site-defined. The output of TMSCONVR is processed by TMSUPDTE, which actually updates each TMC record for the tapes specified in the Activity file.



Batch Update System Flow

6.7 BrightStor CA-1 External Label Processing

External labels are not required in the BrightStor CA-1 environment. A legitimate need for them exists, however, if tapes are to be sent off-site for subsequent processing.

BrightStor CA-1 has a feature that facilitates the printing of external tape labels on a dedicated printer, console, or WTO route code. External label requests from all sources in BrightStor CA-1 are routed to the Online Label Interface for printing. This can be done from a single CPU or from multiple CPUs.

There are five methods for tape label generation:

TMSLBLPR

A stand-alone program that runs as a started task or batch job and produces labels in either realtime or batch mode. An exit is available that allows labels to be selectively generated based on the data set name, job name, and so forth.

BrightStor CA-1 system option

BrightStor CA-1 system option LAB allows labels to be produced at OPEN for all output tapes.

Auxiliary Disposition

Two different uses of Auxiliary Disposition that can either generate a label at volume CLOSE or EOV, or, when executed as a separate step, generate labels for system cataloged data sets and optionally uncatalog them.

Online Interfaces

Labels can be generated on demand through the BrightStor CA-1 online interfaces.

Online Label Interface

Labels can be generated on demand by sending a direct request to the Online Label Interface using the appropriate commands.

The format of the external label requests can be tailored to site specifications. An example of a suitable device for printing labels would be an IBM 3287 or equivalent device.

The TMSLBLPR utility is discussed in the *BrightStor CA-1 Utilities and Reports Reference Guide*. Installation options are fully detailed in the *BrightStor CA-1 Systems Programmer Guide*. Auxiliary Disposition, the online facilities, and the Online Label Interface (OLI) are included in the *BrightStor CA-1 Administrator and Operator Guide*.

Chapter 7. Evaluating a Tape Management System

Choosing a tape management system is a critical decision. It involves determining not only how a data center currently operates but how it should ideally operate, both now and in the future.

It is particularly important for the tape management system to provide adequate protection of your tape data sets and effective management and control of your tape library.

Several areas should be addressed when evaluating a tape system for a particular environment:

Data Protection	Is it as close to 100 percent as possible?
System Efficiency	Is there minimal overhead and maximum efficiency, while still providing that important protection?
Installation and Implementation	How difficult and time-consuming a task is this?
Flexibility	Are sufficient user options available to effectively tailor the system to any environment? Will operations, tape librarians, and applications programmers find the system easy to use?
Management and Control	Can it manage all aspects of tape handling? Are the required capabilities provided?
System Integrity	What preventive measures are available to prevent people from making critical mistakes?

The following discussion addresses these concerns as they apply to BrightStor CA-1.

7.1 Data Protection

- For multi-data set tapes, each file is recorded and protected. Output is not allowed for any file other than $n + 1$ (where n is the number of existing files). The volume is retained based on the highest expiration date among all files on the volume.
- For multivolume data sets, all volumes are chained, and updates affecting the data set (as opposed to the volume) can only be made to the first volume of the data set.
- For multivolume data sets, an output volume cannot be remounted accidentally during multivolume data set creation.
- On input, data set names are verified to ensure the data recorded in the Tape Management Catalog (TMC) is correct for the volume. This also controls duplicate volume serial numbers.
- On output, a tape can not be written on unless it has been identified as a scratch by TMSCLEAN. Data set recreation on the same volume is permitted.
- A permanent hold tape can never be written over. (DISP=MOD is allowed.)
- The TMC is updated immediately at data set OPEN, CLOSE and EOVS. There is no queuing of TMC updates.
- MOD tapes are controlled so that:
 - What is intended is allowed. Modifications are added to the data set.
 - What is not intended is prevented. Modifications do not write over the current data set.
- Nonlabel (NL) and Bypass Label Processing (BLP) tapes are controlled and protected.
- The Tape Management Catalog (TMC) is not updated if the tapes are not under BrightStor CA-1 control that is, if they are non-BrightStor CA-1 tapes.

7.2 System Efficiency

- BrightStor CA-1 operates in a true, realtime processing mode, as an extension of your operating system. Resource requirements are nominal for these functions.
- The Tape Management Catalog (TMC) and Audit data sets are accessed by Execute Channel Program (EXCP) processing. Records are always read directly based on a one-to-one correspondence of relative record to volume serial number (or in the case of the Audit, an internal counter). No extraneous reads to find the proper records are required. No storage is required for BDAM or other operating system access method modules.
- The TMC is read a full track or cylinder at a time to expedite processing for reports and utilities.
- The Audit data set is a wraparound data set and, as a result, the TMC backup process does not require that tape mounts or TMC and Audit recording stop while the backup is running.
- The Audit threshold notifies operations when the Audit data set is approaching capacity. There is never a need to stop operations because the Audit data set is full, nor is a TMC record update ever lost because the Audit is full.
- The realtime processing programs used by BrightStor CA-1 are modular and function-oriented to provide the capabilities necessary with a minimum number of instructions executed and a minimum number of modules loaded into storage.

7.3 Installation and Implementation

- The installation of BrightStor CA-1 is performed with SMP/E for MVS systems or SMP Version 10 for Fujitsu systems. Optionally, you can take advantage of CA-ACTIVATOR in MVS, an ISPF panel-driven facility which guides you through the SMP/E installation.
- System options generally require simple editing of the appropriate parameter library members, and can be changed without an IPL of the operating system.
- Utilities, reports, and the BrightStor CA-1 online inquiry and update facility can all be tested without installing BrightStor CA-1 operating system intercepts.
- Several methods are available to generate data for the BrightStor CA-1 Tape Management Catalog (TMC).

7.4 Flexibility

- Options are available, both when implementing the system and later, in the variety of extended features which you can use as needed. User exits provide a means to completely customize the system if necessary.
- The Tape Management Catalog (TMC) can be extended for both Volume records and for Data Set Name Block (DSNB) records, or reduced by deleting a range of serial numbers no longer required.
- BrightStor CA-1 provides the facilities to combine two TMCs or to migrate data from an existing TMC to another TMC.
- Tape retention can be user-controlled through the JCL or centralized with the Retention Data Set.
- Available interfaces with other products allow for extended BrightStor CA-1 facilities.
- BrightStor CA-1 provides special expiration date keywords that enhance tape retention.

7.5 Management and Control

- BrightStor CA-1 programs produce standard reports which satisfy the reporting requirements of most installations.
- The Advantage CA-Earl interface provides reports on any combination of data fields within the Tape Management Catalog (TMC) or Audit data set. You define the report format, which can contain totals, headings, and so forth.
- The Vault Management System (VMS) is used to efficiently cycle tapes through one or more critical off-site vaults. Criteria for holding tapes in the vaults may be different for each data set and for each vault.
- Extensive internal and external security is available to protect the TMC from invalid access and realtime access to sensitive files.
- Auxiliary Disposition communicates postprocessing requests directly to the console operator or tape librarian and provides selective external label printing.
- External labels can be printed automatically or on demand.
- The prestaging facility provides input and output tapes for advance preparation of production jobs.
- Tape utilities provide the ability to verify tape header labels and initialize tapes.
- Scratch Pool Management allows you to restrict nonspecific output access to tape pools of BrightStor CA-1 controlled volume ranges.
- The accounting interface provides for the automatic recording of job or step accounting information.

7.6 System Integrity

- At initialization, BrightStor CA-1 verifies the integrity of the operating system interface.
- Since an accurate system date and time is critical for managing tapes, BrightStor CA-1 performs checking during initialization and normal processing to ensure they are correct.
- When the Tape Management Catalog (TMC) is backed up, the volume serial number (VOLSER) of the backup tape is automatically recorded. If a restore is necessary, this VOLSER is checked against the tape mounted for the restore. This assures that the most current backup tape is used.
- The Audit data set provides complete TMC integrity. No record can be modified in the TMC without a corresponding record being written to the Audit data set.
- Approximately every 30 minutes, BrightStor CA-1 verifies that the databases have not been moved or recataloged since the previous BrightStor CA-1 initialization.
- BrightStor CA-1 notifies operations when the number of used Data Set Name Blocks (DSNBs) exceeds a site-defined level.
- BrightStor CA-1 notifies operations when the number of Audit records written exceeds a site-defined level.

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