



Data Facility
Hierarchical Storage Manager
Version 2 Release 5.0

LY35-0098-2

Diagnosis Guide

Fifth Edition (December 1989)

The order number of this publication is LY35-0098-2. Changes from the previous edition are marked with a vertical bar in the left margin.

This is a major revision of LY35-0098-1, which is now obsolete. Significant changes are summarized under "Summary of Amendments." This edition applies to Version 2, Release 5, Modification Level 0 of the Data Facility Hierarchical Storage Manager, Licensed Program 5665-329, and to all subsequent releases and modification levels until specified otherwise in new editions or technical newsletters.

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Preface

This book is intended to help you diagnose Data Facility Hierarchical Storage Manager (DFHSM) problems. It contains internal product information that is provided as additional guidance for this diagnosis. The information in this book must not be used for programming purposes.

Because this book is useful only for diagnosing failures in the operation of DFHSM, we assume that you have already made a preliminary determination that the suspected failure is not a usage error.

Trademarks

The following term is a trademark of IBM and is used in this book:

- MVS/ESA.

Major Divisions of this Book

This book is divided into the following sections:

- **Chapter 1, "Introduction"**
- **Chapter 2, "Developing and Using the Keywords"** explains how to build and use a complete keyword string to specify program failures.
 - **"Search Argument Procedure"** explains how to use the keyword string developed from the diagnostic procedures as a search argument in the Software Support Facility (SSF), the Early Warning System (EWS), or IBMLink/ServiceLink.
 - **"Type of Failure Specification"** describes the types of program failures for which keywords are available.
- **Chapter 3, "Basic Documentation Requirements"** lists the minimum documentation that will be needed by the IBM support group to diagnose customer problems or to document an Authorized Program Analysis Report (APAR).
- **Chapter 4, "The Problem Determination Aid (PDA) Facility"** explains the use of this diagnostic tool.
- **Chapter 5, "Copying PDA Trace, Dump, Journal and DFHSM Log Data Sets to Tape"** shows JCL examples that demonstrate one way to copy these data sets to tape.
- **Chapter 6, "Isolating a DFDSS Error"** explains how to obtain a DFDSS dump while running DFHSM.
- **Chapter 7, "Locating Modules and Control Blocks in a Dump"** shows by example how to obtain important information from a dump.

Prerequisite Books

You should be familiar with the information presented in the following:

Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 General Information, GH35-0092

Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 System Programmer's Guide, SH35-0085.

Related Books

The following books contain related information:

Field Engineering Programming System General Information, G229-2228

Data Facility Device Support, DADSM and Common VTOC Access Facility: Diagnosis Guides, SC26-3968

Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 System Programmer's Command Reference, SH35-0083

Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 Diagnosis Reference Volume 4, LY35-0104

Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 Installation and Customization Guide, SH35-0084

Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 User's Guide, SH35-0093

Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 Messages SH35-0094

Resource Access Control Facility (RACF) General Information Manual, GC28-0722

TSO/E Version 2 Programming Guide, SC28-1874

TSO/E Version 2 Programming Services, SC28-1875.

MVS/XA Books

MVS/Extended Architecture Data Administration Guide, GC26-4140

MVS/Extended Architecture Data Administration: Macro Instruction Reference, GC26-4141

MVS/Extended Architecture Debugging Handbook Volume 1, LC28-1164

MVS/Extended Architecture Integrated Catalog Administration: Access Method Services Reference, GC26-4135

MVS/Extended Architecture VSAM Administration: Macro Instruction Reference, GC26-4152

MVS/Extended Architecture VSAM Catalog Administration: Access Method Services Reference, GC26-4136.

MVS/ESA and MVS/DFP Books

- MVS/ESA Application Development Guide, GC28-1821*
- MVS/ESA Application Development Macro Reference, GC28-1822*
- MVS/ESA Basics of Problem Determination, GC28-1839*
- MVS/ESA Diagnosis: System Reference, LY28-1011*
- MVS/ESA Diagnosis: Data Areas, Volume 1, LY28-1043*
- MVS/ESA Diagnosis: Data Areas, Volume 2, LY28-1044*
- MVS/ESA Diagnosis: Data Areas, Volume 3, LY28-1045*
- MVS/ESA Diagnosis: Data Areas, Volume 4, LY28-1046*
- MVS/ESA Diagnosis: Data Areas, Volume 5, LY28-1047*
- MVS/ESA Diagnosis: Special Analysis Techniques, LY28-1840*
- MVS/ESA Diagnosis: Using Dumps and Traces, LY28-1843*
- MVS/ESA JCL User's Guide, GC28-1830*
- MVS/ESA Message Library: System Codes, GC28-1815*
- MVS/ESA Message Library: System Messages, Volume 1, GC28-1812*
- MVS/ESA Message Library: System Messages, Volume 2, GC28-1813*
- MVS/DFP Version 3 Release 2: System Programming Reference, SC26-4567*
- MVS/ESA System Programming Library: Application Development Guide, GC28-1852*
- MVS/ESA System Programming Library: Application Development Macro Reference, GC28-1857*
- MVS/ESA System Programming Library: System Management Facilities (SMF), GC28-1819*
- MVS/DFP Version 3 Release 2: Access Method Services for the Integrated Catalog Facility, SC26-4562*
- MVS/DFP Version 3 Release 2: Access Method Services for VSAM Catalogs, SC26-4570*
- MVS/DFP Version 3 Release 2: Diagnosis Guide, LY27-9570*
- MVS/DFP Version 3 Release 2: Diagnosis Reference, LY27-9571*
- MVS/DFP Version 3 Release 2: General Information, GC26-4552*
- MVS/DFP Version 3 Release 2: Macro Instructions for VSAM Data Sets, SC26-4569*
- MVS/DFP Version 3 Release 2: Macro Instructions for Non-VSAM Data Sets, SC26-4558*
- MVS/DFP Version 3 Release 2: Managing VSAM Data Sets, SC26-4568*
- MVS/DFP Version 3 Release 2: Managing Non-VSAM Data Sets, SC26-4557.*

Summary of Changes

Version 2 Release 5.0

This edition includes the following changes or additions:

- A chapter has been added that explains the documentation requirements of the DFHSM support group.
- A chapter has been added that explains the Problem Determination Aid Facility (PDA).
- A chapter has been added that demonstrates how to copy PDA trace, dump, journal, and DFHSM log data sets to tape.
- A chapter has been added that explains how to obtain a DFDS dump while running DFHSM.
- The chapter on locating modules and control blocks in a dump has been modified to include more examples.
- A list of acronyms has been added.

This edition also includes miscellaneous editorial modifications.

Version 2 Release 4.0

This edition includes technical modifications to the information. Change bars are incorporated throughout the book to indicate where the technical modifications are made.

Enhancements made within this release are:

- Recognition and preservation of SMS class names
- Management of data sets based on management class specifications
- Conversion of data sets to SMS-managed data sets
- Expiration of backup versions
- Support of system reblockable sequential data sets.

This edition also includes miscellaneous editorial modifications.

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Chapter 1. Introduction

The purpose of this book is to help you determine if there is a failure in the operation of the Data Facility Hierarchical Storage Manager (DFHSM) and how to resolve it by the use of keywords. A keyword describes one aspect of a program failure. When doing your own software data base search or contacting the IBM Support Center for assistance, you should identify your program failure with as many of the keywords as apply to the problem.

The full keyword string describes the following areas:

- The type of failure
- The command involved
- The DFHSM function involved
- The load module and/or CSECT
- The component identification number
- The release and modification level.

Each keyword that you add makes the search argument more specific. The more precise the keyword string, the more selective the search, thereby yielding fewer matches in the software data base. If you do not find a similar problem in the data base, you can broaden the scope of the search by deleting keywords.

Software Support Data Bases

Once a keyword string is selected, it is used to search an online data base. Several different software support facilities exist for researching software problems.

- Software Support Facility (SSF)

SSF is an IBM online data base containing information about all current APARs and PTFs.

IBM Support Center personnel have access to SSF and are responsible for using the set of keywords you provide as a search argument. Support Center personnel may help you improve the effectiveness of your search argument. If the problem has previously been reported, they can retrieve the records describing the failure and correction.

- IBMLink/ServiceLink

IBMLink/ServiceLink is an interactive program that includes applications and application functions with the following capabilities:

Search and browse authorized program analysis reports (APARs) and program temporary fixes (PTFs)

Service request and delivery

Preventive service planning

Automatic software alert process.

- Info/System

Info/System is an interactive retrieval program product designed for use with the companion data base feature Info/MVS. The data base is divided into several logical files of related or similar information, one of which is IBM's Early Warning System (EWS).

- **Early Warning System (EWS)**

EWS is a microfiche copy of the data contained in SSF. It can help you locate a problem with the same symptoms as yours and determine a correction to the problem. It is organized by component identifier and indexed by APAR system code (for example, OY, OZ, UY, and UZ). EWS is published monthly and is available to IBM program product customers.

Chapter 2. Developing and Using the Keywords

To develop and use a complete keyword string, perform the procedures that follow in "Search Argument Procedure" through "Type of Failure Specification."

Search Argument Procedure

Each keyword describes one aspect of a program failure. The more precisely the keyword describes the failure, the more selective the resulting search will be, thus increasing the chance of finding an APAR (authorized program analysis report) that already addresses a similar failure.

Use PTF (program temporary fix) numbers as a keyword only if you feel that the PTF has caused the problem. The match you are looking for might have been found for a program with an earlier or later PTF level than yours.

You will be most successful in searching a software support data base by observing the following rules:

- Use the keywords you have developed as your search argument.
- Spell the keywords the same way every time, exactly as they have been specified in this manual.
- Include all the appropriate keywords in any discussion with IBM. If an APAR is opened by IBM and documentation is requested, include the keyword strings in the APAR documentation you send to IBM.
- Search the software support data base using the appropriate keywords:
 - Type of failure
 - Command involved
 - DFHSM function involved¹
 - Load module and/or CSECT
 - Component identifier
 - Release and modification level.

Procedure

The following procedure explains how to use the keyword string as a search argument in SSF, EWS, or IBMLink/ServiceLink.

1. After entering the keyword string, scan the resulting list of known or similar problems. Eliminate APAR fixes that are already installed on your system.
2. If you find a matching APAR problem description, contact the IBM Support Center or use IBMLink/ServiceLink to obtain the fix.
3. If you do not find a matching APAR problem description, broaden the search by eliminating keywords from the search argument as follows:
 - a. Omit the release and modification level keyword from the search argument, thereby widening the search to include similar failures on other release and modification levels.

¹ This refers to basic functions. Use keywords such as backup, recall, etc.

- b. Begin dropping other keywords from the search argument to widen the search.
4. If you still do not find a matching APAR problem description, contact the support center. They may be able to refine your search argument further and find a match in the data base. Otherwise they may direct you to gather additional failure-related information, or your call may be referred to the IBM level 2 support group.

Specifying the Failing Component Identifier

The component identification number should be used whenever DFHSM is suspected of being the failing component. The component identification keyword should be used with other keywords to search SSF, EWS, or IBMLink/ServiceLink. Used alone, it produces a full listing of APARs against DFHSM.

Procedure

The component identification number for DFHSM Version 2 is 566532901. Using the release and modification level keyword with the component identification number narrows the symptom search to the specified version, release, and modification level. The release and modification keyword is explained in "Specifying the Release and Modification Level" on page 9

Type of Failure Specification

The following keywords identify the type of failure that occurred in DFHSM:

- ABENDxxx
- INCORROUT
- LOOP
- MSGxxxxxxxx
- WAIT
- xxxxxxxxxxx (Documentation)
- PERFM

Select one keyword from the preceding list that best describes the program failure and follow the procedure for the particular failure type.

ABENDxxx

Use this keyword when the system, DFHSM, or any program that services DFHSM ends abnormally. (Also see Chapter 6, "Isolating a DFDSS Error" on page 21.) When specifying this keyword, you should have available an unformatted stand-alone dump, an unformatted SYS1.DUMP, or a SYSMDUMP.

Do not use this keyword if the abnormal end was forced by the system or the operator because of a prolonged wait state or an endless loop; for those situations, refer to the WAIT and LOOP keywords.

Procedure

1. The format of the keyword string is:

566532901 Rxxx ABENDxxx modulename

Rxxx is the release and modification level keyword, and its optional use can reduce the number of matches in the search.

2. Add the ABEND code to the keyword. For example, use ABEND0C6 if an 0C6 abnormal end occurred.
3. If the abnormal end occurred in a DFHSM module, message ARC0003I indicates the module name and offset of the abnormal end. If message ARC0003I was returned with module and offset unknown, then the abend was not in a DFHSM module and you should use the next procedure.
4. If the address in the program status word (PSW) is not within ARCCTL or ARCWCTL, determine the system service routine that was called or invoked by DFHSM. This can be done by finding the location in storage where the abend occurred and reading backward in the dump until you find the name of the module that abended. See the following example:

00DDCFD0.	00000000	00000000	00000000	00000000	
00DDBFEO.	00000000	00000000	00000000	00000000	
00DDBFEO.	00000000	00000000	00000000	00000000	
00DDC000.	47F0F00C	001847F0	F006011E	05C041B0	.00....00....{..	
00DDC010.	CFF4AF0	F00407FF	47F0C080	C9C7C7F0	...00....0{.IG60	←
00DDC020.	F1F9C2E9	F0F261F1	F961F8F8	C8C4D7F2	19BZ02/19/88HDP2	←
00DDC030.	F2F3F040	E4E8F1F8	F6F4F840	F5F6F6F5	230 UY18648 5665	
00DDC040.	60E7C1F2	404DC35D	40C3D6D7	E8D9C9C7	-X2A (C) COPYRIG	
00DDC050.	C8E340C9	C2D440C3	D6D9D74B	40F1F9F8	HT IBM CORP. 198	
00DDC060.	F26B40F1	F9F8F240	D3C9C3C5	D5E2C5C4	2, 1982 LICENSED	
00DDC070.	40D4C1E3	C5D9C9C1	D3E24060	40D7D9D6	MATERIALS - PRO	
00DDC080.	D7C5D9E3	E840D6C6	40C9C2D4	40009180	PERTY OF IBM .j.	
00DDC090.	10254780	C114900F	D0004120	20005F20A...}.....7.	

Note: This example was obtained by using IPCS.

In this example, an abend occurred at address xxxxxxxx, which is not shown. Reading backward in the dump, the module name IGG019BZ was found. This is the module that abended. There can be a few lines or several pages between the abend address and the associated module name.

After determining the module name, the format of the keyword string should be *ABENDxxx modulename* where modulename is the non-DFHSM module name just determined. Do not use the DFHSM component identification number (566532901) or the Rxxx keyword.

Note: Further assistance can be obtained by looking at the diagnosis guide for the product that contains the non-DFHSM module.

User Exit Abends

Note: Because IBM does not support user exits, it is the user's responsibility to debug user exit abends.

If the system fails in a user exit, you can force DFHSM to generate a dump. You can prevent DFHSM from continuing its normal ESTAE recovery process by using the DFHSM PATCH command to set the MCVTFDMP flag on. For example:

```
PATCH .MCVT.+2D X'01' VERIFY(.MCVT.+2D X'00')
```

You should maintain the other flags, if any, from the current setting in the byte being patched. Use the DISPLAY command to determine the current setting of the other flags before issuing the PATCH command.

See *Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 Diagnosis Reference Volume 4* for more information about the PATCH and DISPLAY commands.

INCORROUT

Use this keyword when the expected output was not received (missing) or when the output was different from what was expected (incorrect).

Procedure

1. The format of the keyword string is:

566532901 Rxxx INCORROUT keyword

where keyword is a word or words relating to what you were doing at the time incorrect output was generated. Rxxx is the release and modification level keyword, and its optional use can reduce the number of matches in the search.

2. If you are receiving incorrect output and using a command such as HLIST, you should put the keyword *HLIST* (or whatever command you are using) in the search string.

LOOP

Use this keyword if some part of the program code runs endlessly; include situations in which some part of the output repeats endlessly.

Do not use this keyword for an intentional loop used to wait for some resource. For this condition refer to the WAIT keyword.

Procedure

1. The format of the keyword string is:

566532901 Rxxx LOOP modulename

Rxxx is the release and modification level keyword, and its optional use can reduce the number of matches in the search.

2. If a DFHSM program suspends activity for no apparent reason, it could be in a loop or wait state. A loop can be evident from a never-ending request found by the QUERY ACTIVE command or from some other symptom such as a page of output being printed repeatedly. If a loop is not evident, use the WAIT keyword.
3. If you have a complete storage dump, locate the address where the LOOP occurred. DFHSM modules contain the module name near the beginning of the module. See the following example:

00007C30.	00000000	00000000	00000000	00000000	
00007C40.	00000000	00000000	00000000	00000000	
00007C50.	00000000	00000000	00000000	00000000	
00007C60.	47F0F022	1DC1D9C3	C1C2D4E2	C74BF8F7	.00..ARCABMSG.87	←
00007C70.	F0F4F44B	F1F0F0F0	F3F14BC8	C8D4F2F3	044.100031.HHM23	
00007C80.	F0F290EC	D00C18CF	1FFF43F0	C5081F00	02..}.....0E...	
00007C90.	BF07C509	47F0C03C	00000200	89F00008	..E..0}.....i0..	

Note: This example was obtained by using IPCS.

4. Locate the system trace table to determine if a DFHSM task is being dispatched repeatedly in the same module. For an example of a system trace table, see *MVS|Extended Architecture Debugging Handbook Volume 1*. If the loop involves more than one DFHSM module, the repetitive invoking of these modules by DFHSM can be identified by the PDA Trace Facility. See Chapter 4, "The Problem Determination Aid (PDA) Facility" on page 13 for further information.

MSGxxxxxxxx

Use this keyword when any of the following conditions occur:

- DFHSM issued a message that indicated an internal program error.
- A message is not issued in some set of conditions that should cause it to be issued.
- A message is issued in some set of conditions that should not cause it to be issued.
- A message contains invalid or missing data.

Procedure

1. The format of the keyword string is:

566532901 Rxxx MSGxxxxxxxx

Rxxx is the release and modification level keyword, and its optional use can reduce the number of matches in the search.

2. Replace the xxxxxxxx in the MSGxxxxxxxx keyword with the message identifier. For example, if the message number is ARC0025I, the MSGxxxxxxxx keyword is MSGARC0025I.

WAIT

Use this keyword when the following condition exists:

- While waiting for some condition to be satisfied, the system, DFHSM, or some program that services DFHSM has suspended activity without issuing a message.

Do not use this keyword if the wait occurs after an abnormal end, as the result of an unanswered message, or because of an endless loop in DFHSM. Use the ABEND or LOOP keyword.

Procedure

1. The format of the keyword string is:

566532901 Rxxx WAIT modulename resourcename

Rxxx is the release and modification level keyword, and its optional use can reduce the number of matches in the search. The module name and resource name are optional keywords.

2. The wait state can have many causes. Listed below are some of the most common of these causes:
 - The system resource manager has marked DFHSM non-dispatchable because of excessive paging.
 - DFHSM has serialized on a resource and is locked out by another task in this system or by a task in another system.
 - A backup task is waiting for a backup volume to become available. These backup volumes were made unavailable because another processing unit went down while running backup.

xxxxxxxxxx (Documentation)

Use the documentation keyword when a programming problem appears to be caused by incorrect, missing, or ambiguous information in one of the DFHSM books.

Procedure

1. The format of the keyword string is:

566532901 xxxxxxxxxxx keyword

Keyword is an optional word, such as the command or DFHSM function involved. For example, if the DFHSM function was migration, use the keyword *migration*.

2. Enter the order number of the publication in place of xxxxxxxxxxx, the documentation keyword. Include the letter prefix and version number, but omit all hyphens. For example, if the order number is SH35-0083-02, the Documentation keyword is *SH35008302*.
3. Locate the page in the book on which the error or omission occurs and prepare a description of the problem. You should also include this information in the error description when submitting documentation for an APAR.

PERFM

Use this keyword when some part of DFHSM performs below explicitly stated expectations and the performance problem cannot be corrected by system tuning. Most performance problems can be related to system tuning and should be handled by system engineers and system programmers.

Procedure

1. The format of the keyword string is:

566532901 Rxxx PERFM

Rxxx is the release and modification level keyword, and its optional use can reduce the number of matches in the search.

Specifying the Release and Modification Level

This keyword identifies the release and modification level of DFHSM. R502 represents Release 5, Modification Level 0.

The following table shows the release and modification keyword for the current releases of DFHSM Version 2.

Release and Modification	Keyword	Description
240	R402	base
	R411	English panels
	R412	Kanji panels
250	R502	base
	R511	English/ISPF panels
	R513	English/ISMF panels

Because it is difficult to determine exactly which release and modification level to specify, first try all the symptom-related keywords to conduct your search. If the list of matches is too large, add the release and modification level keyword to reduce the number of matches.

The release and modification keyword is required on APAR forms.

Chapter 3. Basic Documentation Requirements

Documentation Needed for Problem Diagnosis

When the proper diagnostic procedures have been followed, user specifications have been checked for accuracy, and the keyword search has proven unsuccessful, you should then contact the IBM Support Center for further assistance.

If the Support Center representatives cannot immediately resolve the problem, they may pass the problem call to the DFHSM Level 2 support group. When the support group representatives phone, they will request that you have certain documentation at hand to aid in the diagnosis of the problem.

The documentation normally needed to engage in a telephone conversation with the level 2 support group will be:

- The PDA trace, preferably in a form that can be browsed on line
- An unformatted dump, obtained as a SYS1.DUMP or SYSMDUMP

The dump should be available to be browsed on line by IPCS or as a printed hardcopy.

Because it is possible that the support group will need other documentation, either to pursue problem diagnosis or to open an APAR, you should keep the following for possible future use:

- The system console log from around the time the problem occurred
- The portion of the journal pertaining to the problem
- Portions of the DFHSM X and Y logs pertaining to the problem
- The command activity log, if appropriate
- The specific activity log, if appropriate.

These should be retained until you are sure they will not be needed.

Documentation Needed for an Authorized Program Analysis Report (APAR)

If IBM opens an APAR addressing your problem, you should be prepared to supply such information as the customer number, version, release and modification level, current maintenance level (from PTF list), and the keyword string used to search SSF, EWS, or IBMLink/ServiceLink.

You will also be asked to supply various types of information that describe the DFHSM functions used, data base, environment, or activities. Applicable items of information from the following list may also be requested.

- JCL listings (for a failure related to a BATCH job).
- System console log.
- Portions of the DFHSM X and Y logs pertaining to the problem.

- The command activity log, if appropriate.
- The specific activity log, if appropriate.
- PDA trace.
- If the problem relates to a specific data set, a DFDSS logical dump of the data set on tape.
- A copy of any traces or dumps taken.
- For a wait failure, a complete description of the resource being waited for and the program module that is waiting.
- For LOOP failures, some indication of the location of the loop. This could be taken from console trace addresses or it could be one or more module names taken from the PDA trace. Try to get at least a partial trace of the loop.
- For documentation failures, the location of the error in the manual and a description of the problem it caused.
- For PERFM failures, a description of the actual performance, the expected performance, and the source of the performance specification.

Note: When you submit any of the requested documentation on tape, you should write it on a **STANDARD LABEL TAPE**. A hardcopy of the DCB information for each data set and the **JCL used to create the tape** will also be required.

Chapter 4. The Problem Determination Aid (PDA) Facility

During DFHSM processing, the Problem Determination Aid Facility gathers diagnostic information about DFHSM's processing, stores this information in a circular file² within storage, and periodically writes it to a circular file on DASD. The circular DASD file consists of two data sets, ARCPDOX and ARCPDOY. ARCPDOX is the active data set.

For detailed information on using the Problem Determination Aid, see

- "DFHSM Problem Determination Aid Facility" in *Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 Installation and Customization Guide*
- "Tracing DFHSM's Processing" in *Data Facility Hierarchical Storage Manager: Version 2 Release 5.0 System Programmer's Guide*.

Browsing the PDA Data Set

The following examples, obtained by using the ISPF browse function and the HEX DATA command, are given to aid you in identifying the trace entries when you are discussing the PDA trace data set with the IBM level 2 support group.

The following example shows a portion (four entries) of a PDA trace data set as it would appear on your terminal screen, just before issuing the HEX DATA command.

Note: The file name (in this example DFHSM.PDOX) is set by you in your startup procedure.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==> HEX DATA

LOCK .ENQ ..D....ARCGPA ..BAKQ..E..L.....
UNLK .DEQ ..D....ARCGPA ..BAKQ..L.....
MCTL .ENTR ..D.N.....Y.
IRCB .ENTR ..D.U.....H.MCTL
    
```

² This type of file appends data until full; then, starting at the beginning of the file, subsequent incoming data overwrites the data already there.

The following example shows the same data set as in the previous example, after issuing the HEX DATA command. Note that the display has expanded and each entry is now shown in EBCDIC and hexadecimal.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ===>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D24005C5D5D840008CEEC470040A29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000
UNLK .DEQ ..D...ARCGPA ..BAKQ..L.....
E4D5D3D24008C4C5D840008CEEC470080A28C1D9C3C7D7C1404006FFC2C1D2D803FFD300000000000000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000
MCTL .ENTR ..D.N.....Y.
D4C3E3D34000C5D5E3D9008D3EC471D50BFC00302F700E00FD8DA800
00000000000000000000000000000000000000000000000000000000000000000000000000000000000
IRCB .ENTR ..D.U.....H.MCTL
C9D9C3C24001C5D5E3D9008D3EC471E40CFC00302EC800D4C3E3D340
00000000000000000000000000000000000000000000000000000000000000000000000000000000000

```

For simplicity, the remaining examples show only the first entry.

Module Name Identifier

In the following example, the highlighted five bytes are the last five bytes of the DFHSM module that generated the entry. The highlighting is done in both the EBCDIC and hexadecimal portions of the examples, whenever it is significant to do so.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ===>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D240 05C5D5D840008CEEC470040A29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000

```

Trace Point Identifier

The highlighted byte in the following example is the individual trace point identifier.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ===>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D240 05 C5D5D840008CEEC470040A29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
00000000000000000000000000000000000000000000000000000000000000000000000000000000000

```

Type-of-trace Identifier

The highlighted four bytes in the following example show the type-of-trace identifier.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D24005 C5D5D840 008CEEC470040A29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    
```

Task Control Block (TCB) Identifier

The highlighted three bytes in the following example show the unique TCB identifier. The first byte is the address space identifier. If this byte is zeroed, the TCB is in DFHSM primary address space; otherwise it is in secondary address space. The next two bytes are the second and third bytes (middle two bytes) of the TCB address.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D24005C5D5D840 008CEE C470040A29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    
```

Time of Day Clock Entry

The highlighted three bytes in the following example show the fourth, fifth, and sixth bytes of the eight-byte processing unit time-of-day (TOD) clock entry.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D24005C5D5D840008CEE C47004 0A29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000
    
```

Data Segment Length

A number of variable length data segments can follow the TOD clock entry, one for each trace value recorded. In the following example there are four data segments. The highlighted byte shows the length of the first segment (0A or ten bytes), and the bracketed area is the segment. Note that the length byte is included in the total length.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D24005C5D5D840008CEEC470040A 0A 29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
00000000000000000000000000000000 0000000
    
```

Parameter Keyword Identifier

The highlighted byte in the first data segment is the parameter keyword identifier, as shown in the following example.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D24005C5D5D840008CEEC470040A 29 C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD30000
00000000000000000000000000000000 0000000
    
```

Parameter Data

The highlighted bytes in the following example show the variable data for this entry.

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==>

LOCK .ENQ ..D... ARCGPA ..BAKQ..E..L.....
D3D6C3D24005C5D5D840008CEEC470040A29 C1D9C3C7D7C14040 06FFC2C1D2D803FFC503FFD30000
00000000000000000000000000000000 0000000
    
```

This bracketed area is the second data segment of this entry and the highlighted byte is the length of the segment (six bytes).

```

BROWSE -- DFHSM.PDOX ----- LINE
COMMAND ==>

LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....
D3D6C3D24005C5D5D840008CEEC470040A29C1D9C3C7D7C14040 06 FFC2C1D2D803FFC503FFD30000
00000000000000000000000000000000
    
```

Padding

The highlighted area in the following example shows that the last entry is optionally padded with binary zeros.

```
BROWSE -- DFHSM.PDOX ----- LINE  
COMMAND ==>  
  
LOCK .ENQ ..D...ARCGPA ..BAKQ..E..L.....  
D3D6C3D24005C5D5D840008CEEC470040A29C1D9C3C7D7C1404006FFC2C1D2D803FFC503FFD3 0000  
00000000000000000000000000000000000000000000000000000000000000000000000000000000
```


Chapter 5. Copying PDA Trace, Dump, Journal and DFHSM Log Data Sets to Tape

The JCL examples in this section show how to copy certain data sets onto a tape so that they can be submitted to IBM as APAR documentation. The tapes that you use for this purpose must be standard label tapes.

Note: Because of numerous variations in hardware and software, these JCL jobs may not work in all environments. They are shown only as examples. Also note that you should choose the data set names, relative file numbers, tape volume serial number, and unit type (shown highlighted) that are consistent with your naming conventions.

When you create your JCL, do not use high-level qualifiers of SYS1, HSM, or DFHSM in the data set names specified in the SYSUT2 DD cards, as these may be reserved names in the system where your tape will be off-loaded. It is recommended that you use the APAR number as the high-level qualifier, followed by a qualifier that describes the content of the data set.

PDA Trace Data Set

This JCL shows a method of copying the PDA trace data set to tape.

```
//PDACOPY JOB MSGCLASS=A
//S1 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT1 DD DSN=DFHSM.PDOY,DISP=SHR
//SYSUT2 DD DSN=0Y99999.PDOY,LABEL=(1,SL),VOL=SER=TAPE01,
//          DISP=(NEW,KEEP),UNIT=TAPE
```

Dump Data Set

This JCL shows a method of copying a dump data set to tape.

```
//DMPCOPY JOB MSGCLASS=A
//S1 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT1 DD DSN=SYS1.DUMP00,DISP=SHR
//SYSUT2 DD DSN=0Y99999.DUMP,LABEL=(2,SL),VOL=SER=TAPE01,
//          DISP=(NEW,KEEP),UNIT=TAPE
```

Journal Data Sets

If you are running SETSYS CDSVERSIONBACKUP(TAPE), then copy the appropriate journal data set(s) to tape. Be sure when you send them to IBM to include a hardcopy of the JCL used.

If you have allocated the CDSs in your startup procedure, use the following JCL to copy the online journal data sets to tape.

```
//JRNCOPY JOB MSGCLASS=A
//S1 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT1 DD DSN=DFHSM.JRNL.BACKUP.V0000002,DISP=SHR
//SYSUT2 DD DSN=0Y99999.JRNL,LABEL=(3,SL),VOL=SER=TAPE01,
//          DISP=(NEW,KEEP),UNIT=TAPE
```

Note: if DFHSM
is in operation, the
disposition for DFHSM
must also be SHR.

DFHSM Log Data Set

This JCL shows a method of copying the DFHSM log Y data set to tape.

If the data that is needed is on the active DFHSM log (log X), run the JCL job, issue the SWAPLOG command, and run the JCL job again.

```
//LOGCOPY JOB MSGCLASS=A
//S1 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT1 DD DSN=DFHSM.LOGY,DISP=SHR
//SYSUT2 DD DSN=0Y99999.LOGY,LABEL=(4,SL),VOL=SER=TAPE01,
//          DISP=(NEW,KEEP),UNIT=TAPE
```

Activity Log Data Sets

This JCL shows a method of copying the activity log data sets to tape.

If you are running ACTLOGTYPE(DASD) and you wish to process the current activity logs, issue the following:

- SETSYS ACTLOGTYPE(SYSOUT)

This closes and de-allocates the current activity logs.

- SETSYS ACTLOGTYPE(DASD)

This allocates new activity logs. Now the old logs can be browsed or copied to tape using the following JCL example.

```
//ALOGCOPY JOB MSGCLASS=A
//S1 EXEC PGM=IEBGENER
//SYSPRINT DD SYSOUT=A
//SYSIN DD DUMMY
//SYSUT1 DD DSN=HSMACT.H1.BAKLOG.D89012.T085721,DISP=SHR
//SYSUT2 DD DSN=0Y99999.ACTLOG,LABEL=(5,SL),VOL=SER=TAPE01,
//          DISP=(NEW,KEEP),UNIT=TAPE
```

Chapter 6. Isolating a DFDSS Error

While running DFHSM and using DFDSS as a data mover, you can encounter a maintenance problem if an error occurs that is not isolated to DFDSS. You can try to duplicate this error by running DFDSS separately. If this fails to produce similar results, DFHSM can be patched to cause DFDSS to generate a dump at the time this specific error occurs.

Patch the DFHSM field MCVTDSSM as follows:

```
PATCH .MCVT.+454 nnn
```

For *nnn*, substitute the 3-character number from the DFDSS message (*ADRnnnx*) that was issued when the problem first occurred.

When a message number is patched into this normally blank field, DFDSS will produce either SYSUDUMP or SYSABEND dump output that can help to determine the cause of the error.

Chapter 7. Locating Modules and Control Blocks in a Dump

Many important DFHSM data areas can be located by their addresses in the Management Communication Vector Table (MCVT). Figure 1 shows how two base items (MCVT, ARCESD) can be located when the dump includes low storage.

Note: The following information and examples refer only to the DFHSM primary address space. For dumps occurring in the ABARS secondary address space, contact the IBM Support Group for further assistance.

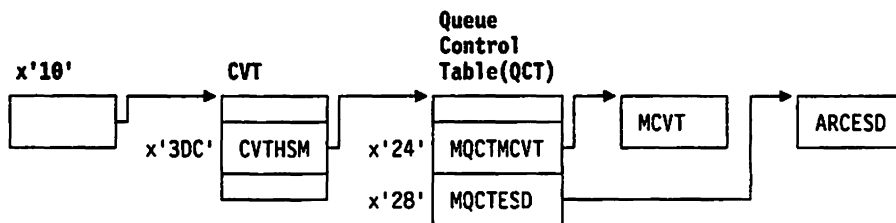


Figure 1. Locating the MCVT and Module ARCESD

When the low storage is not available, it is helpful to know that MCVT follows the module ARCCBS, and that ARCESD and ARCCBS are ordered as the first two modules of the DFHSM load module ARCCTL.

The first occurrence of the word MCVT will be in ARCESD (see the following example), and the associated address will give the actual location of the MCVT.

All DFHSM modules and major DFHSM control blocks, such as the MCVT, the management control record (MCR), and the backup control record (BCR) are each pointed to by the ARCESD module.

Note: Dump examples were obtained and processed by using IPCS.

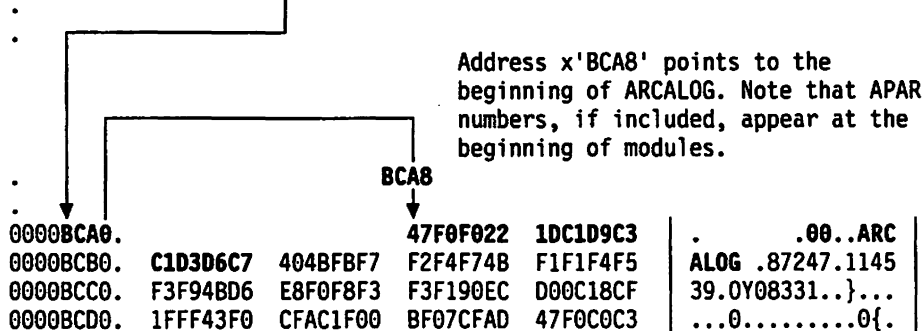
The following example, a segment of a dump, shows the beginning of ARCESD. It contains eight-byte module name fields followed by corresponding four-byte address fields for each DFHSM module. By using this information, you can efficiently locate these modules within the dump. Note that even though most modules have their names at the beginning of the module, ARCESD does not.

Beginning of ARCESD

000060A0.	00000000	00000000	D4C3E5E3	40404040MCVT
000060B0.	0000774C	C2C3D940	40404040	0000757C	...<BCR ...@
000060C0.	C4C3D940	40404040	0000768C	D4C3D940	DCRMCR
000060D0.	40404040	000074B4	C1D9C3C3	E5E34040ARCCVT
000060E0.	0000774C	D4E2D9E2	C1404040	00186328	...<MSRSA
000060F0.	C2E2D9E2	C1404040	00189128	D6E2D9E2	BSRSA ..j.OSRS
00006100.	C1404040	00211B88	C1D9C3C1	C2D4E2C7	A ...hARCA BMSG
00006110.	00007C60	C1D9C3C1	C3D9C5D3	00008170	..@-ARCA CREL..a.
00006120.	C1D9C3C1	C4C5E7E3	00000000	C1D9C3C1	ARCA EXT...ARCA
00006130.	C4E5C440	00008D28	C1D9C3C1	D3C3C2E5	DVD ...ARCA LCBV
00006140.	000090E0	C1D9C3C1	D3C9E2E3	0000A368	... \ARCA LIST..t.
00006150.	C1D9C3C1	D3D5C4D9	0000A5A8	C1D9C3C1	ARCA LND R..vyARCA
00006160.	D3D5C4E2	0000AC30	C1D9C3C1	D3D6C740	LND S...ARCA LOG
00006170.	0000BCA8	C1D9C3C1	D3D6D3C4	0000CC58	...yARCA LOLD....
00006180.	C1D9C3C1	D3E2C4D7	0000D4F8	C1D9C3C1	ARCA L S D P..M8ARCA

The following example demonstrates how to locate a specific module (in this case ARCALOG) in the dump. The module name and its corresponding address are located in ARCESD, and then the leftmost column is scanned until this address is again located.

000060A0.	00000000	00000000	D4C3E5E3	40404040MCVT
000060B0.	0000774C	C2C3D940	40404040	0000757C	...<BCR ...@
000060C0.	C4C3D940	40404040	0000768C	D4C3D940	DCRMCR
000060D0.	40404040	000074B4	C1D9C3C3	E5E34040ARCCVT
000060E0.	0000774C	D4E2D9E2	C1404040	00186328	...<MSRSA
000060F0.	C2E2D9E2	C1404040	00189128	D6E2D9E2	BSRSA ..j.OSRS
00006100.	C1404040	00211B88	C1D9C3C1	C2D4E2C7	A ...hARCA BMSG
00006110.	00007C60	C1D9C3C1	C3D9C5D3	00008170	..@-ARCA CREL..a.
00006120.	C1D9C3C1	C4C5E7E3	00000000	C1D9C3C1	ARCA EXT...ARCA
00006130.	C4E5C440	00008D28	C1D9C3C1	D3C3C2E5	DVD ...ARCA LCBV
00006140.	000090E0	C1D9C3C1	D3C9E2E3	0000A368	... \ARCA LIST..t.
00006150.	C1D9C3C1	D3D5C4D9	0000A5A8	C1D9C3C1	ARCA LND R..vyARCA
00006160.	D3D5C4E2	00AC30	C1D9C3C1	D3D6C740	LND S...ARCA LOG
00006170.	0000BCA8	D9C3C1	D3D6D3C4	0000CC58	...yARCA LOLD....
00006180.	C1D9C3C1	E2C4D7	0000D4F8	C1D9C3C1	ARCA L S D P..M8ARCA



The MCVT, in addition to storing flags, also contains pointers of work queues and chained lists. Figure 2 on page 25 shows some of the useful data sources.

In addition to DFHSM data areas, information normally formatted in a dump is useful. This includes registers from the save areas at entry to ABEND and the list of outstanding enqueues. The registers point to the automatic storage areas associated with the last routines in control. Almost all of the useful debugging

information is contained in the automatic storage for each routine, in the registers at the time an abnormal condition occurred, or in DFHSM data areas pointed to from the MCVT.

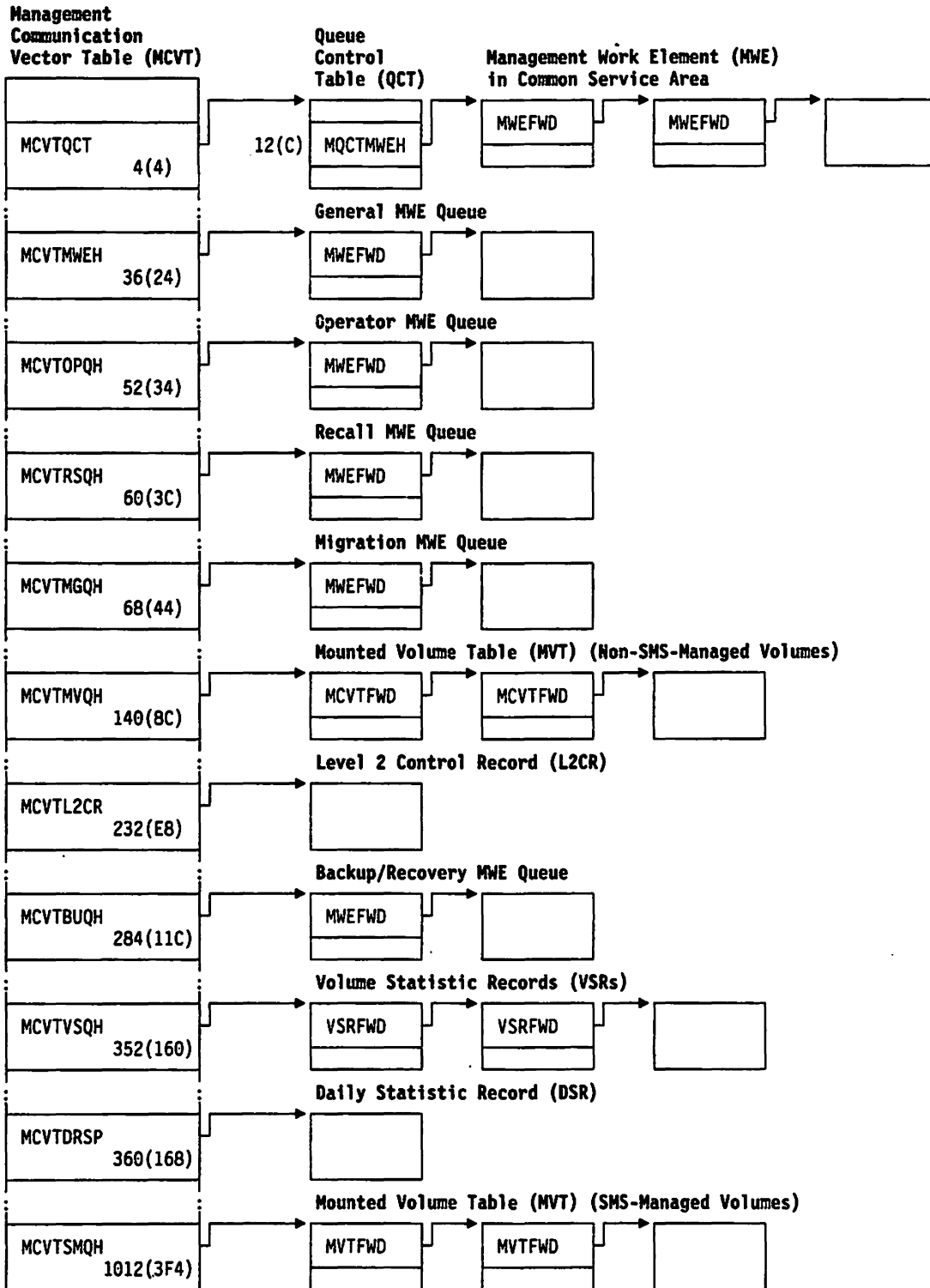


Figure 2. Using the Management Communication Vector Table

List of Acronyms

ABEND	Abnormal end.	SMS	Storage Management Subsystem. An operating environment that helps automate and centralize the management of storage. To manage storage, SMS provides the storage administrator with control over data class, storage class, management class, storage group, and ACS routine definitions.
APAR	Authorized program analysis report.	SSF	Software Support Facility.
BCDS	backup control data set. A VSAM, key-sequenced data set that contains information about backup versions of data sets, backup volumes, dump volumes, and volumes under control of the backup and dump functions of DFHSM.	TCB	Task control block.
BCR	Backup control record.	TOD	Time of day.
CSECT	Control section.	TSO	time sharing option. An option on the operating system for a System/370 that provides interactive time sharing from remote terminals.
CVT	Communications vector table.	TTOC	Tape table of contents record.
DADSM	Direct Access Device Space Management.	VSAM	virtual storage access method. An access method for indexed or sequential processing of fixed and variable-length records on direct access devices. The records in a VSAM data set or file can be organized in logical sequence by a key field (key sequence), in the physical sequence in which they are written on the data set or file (entry-sequence), or by relative-record number.
DASD	direct access storage device. A device in which the access time is effectively independent of the location of data.	VTOC	volume table of contents. (1) A table on a direct access volume that describes each data set on the volume. (2) An area on a disk or diskette that describes the location, size, and other characteristics of each file and library on the disk or diskette.
DFDSS	Data Facility Data Set Services. An IBM licensed program used to copy, move, dump, and restore data sets and volumes.		
DFHSM	Data Facility Hierarchical Storage Manager. An IBM licensed program used to manage volumes and data sets in an MVS operating environment.		
EBCDIC	Extended Binary Coded Decimal Interchange Code.		
EWS	Early Warning System.		
IPCS	Interactive problem control system.		
ISPF	Interactive System Productivity Facility. An IBM licensed program used to develop, test, and run application programs interactively. ISPF is the interactive access method for all storage management functions.		
JCL	Job control language.		
MCR	Management control record.		
MCVT	Management communication vector table.		
MVS/ESA	MVS/Enterprise Systems Architecture. An MVS operating system environment that supports accessing of virtual storage in multiple address spaces and data spaces.		
PDA	Problem determination aid.		
PDSE	Partitioned data set extended.		
RACF	Resource Access Control Facility. An IBM-licensed program that provides access control by identifying and verifying users to the system. RACF authorizes access to resources, logs unauthorized access attempts, and logs accesses to protected data sets.		
SDSP	small data set packing. In DFHSM, the process used to migrate data sets that contain equal to or less than a specified amount of actual data. The data sets are written as one or more records into a VSAM data set on a migration level 1 volume.		

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