

z/VM



DFSMS/VM Diagnosis Guide

Version 5 Release 1.0

z/VM



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Note!

Before using this information and the product it supports, read the information in "Notices" on page 51.

First Edition (September 2004)

This edition applies to version 5, release 1, modification 0 of IBM z/VM (product number 5741-A05) and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces GC24-6046-00.

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Contents

About This Book	vii
Who Should Read This Book	vii
What You Should Know before Reading This Book	vii
What This Book Contains	vii
Where to Find More Information	vii
How to Send Your Comments to IBM	viii
Summary of Changes	ix
GC24-6087-00, z/VM Version 5 Release 1	ix
Chapter 1. Introduction	1
DFSMS/VM Environment	1
Shared File System	1
Coordinated Resource Recovery	1
DFSMS/VM Virtual Machines	1
Transparent Services Access Facility (TSAF) Considerations	2
Chapter 2. DFSMS/VM Messages	3
Logging DFSMS/VM Messages	3
Reviewing Console Logs	4
Log Files	5
Accessing Log Files	6
Chapter 3. Diagnosing DFSMS/VM	7
Does a Problem Exist?	7
Identifying the Problem	8
Determining the Type-of-Failure	9
Abend Failures	10
ISMF Abend	10
Master or Server Machine Abends	11
DFSMS or DFSMSRM Command Abend	12
Wait/Loop Failures	12
Incorrect Output Failures	16
Authorization Failures	17
Documentation Errors	17
Obtaining a Virtual Machine Dump	18
Identifying Functions in DFSMS/VM Components	19
Chapter 4. DFSMS/VM Virtual Machine Problems	23
Work Directory	23
Report File	23
Request File	23
Probable Causes of DFSMS Failure	24
Master Machine Does Not Respond	24
Master Machine Cannot Dispatch a Request	25
No DFSMS/VM Command Messages Logged	25
Command Response Seems Slow	25
Log File Space Fills Often	26
Chapter 5. Diagnosing the User Virtual Machine	27

ISMF Diagnostic Aids	27
ISMF Messages and Message Help	27
ISPF Logs	28
ISMF Error Table Display Panel	32
Using ISMF Error Table Display	33
DFSMS Command	34
Probable Causes of User Virtual Machine Failure	34
No DFSMS Error Messages Appear	34
Copy Operation Seems Slow	35
Request Submitted But No Response	35
Chapter 6. Diagnosing the Space Management Virtual Machines	37
No Migration of Files Occurs	37
No Recall of Files Occurs	38
Out-of-Space Condition Occurs on Primary Storage	38
Low Utilization of Primary Storage	39
Chapter 7. Diagnosing the Minidisk Operations	41
DFSMS Master and Minidisk Server Machines	41
Probable Causes of Minidisk Function Failure	41
Master Machine Cannot Dispatch a Request	41
Server Machine Cannot be Initialized	41
Timeout Occurs During Selection Process	42
Minidisk MOVE Request Fails	42
Move Operation Seems Slow	44
Chapter 8. Contacting the IBM Support Center	45
Component Identification	46
Function Level	46
Appendix A. Additional Procedures to Diagnose RMS	47
Working with Tape Hardware Errors	47
Error Handling with the CSL-Routine Interface	48
RMS Master Recovery and Restart Handling	49
Notices	51
Programming Interface Information	52
Trademarks	52
Glossary	53
Bibliography	55
Where to Get z/VM Books	55
z/VM Base Library	55
System Overview	55
Installation and Service	55
Planning and Administration	55
Customization	55
Operation	55
Application Programming	55
End Use	56
Diagnosis	56
Books for z/VM Optional Features	56
Data Facility Storage Management Subsystem for VM	56

Directory Maintenance Facility	57
Performance Toolkit for VM™	57
Resource Access Control Facility	57
Additional Publications	57
Index	59

About This Book

This book provides information for diagnosing problems encountered while running DFSMS/VM® and for users collecting data for diagnosis for contacting the IBM® Support Center.

Who Should Read This Book

This book is intended for VM storage administrators and system programmers who must identify, describe, report, and resolve failures in all components of DFSMS/VM. Because this book is useful only for diagnosing failures in the operation of DFSMS/VM, we assume that you have already determined that the suspected failure is not a user error.

What You Should Know before Reading This Book

This publication assumes that you understand the hardware controls and features of your installation. It also assumes you have experience with programming concepts and techniques.

What This Book Contains

This book begins with an introduction to debugging. Separate chapters then provide diagnostic guidance information including the use of messages, dumps, commands, and diagnostic aids that are available for debugging problems within DFSMS/VM, and also problems with:

- the user virtual machine
- space management virtual machines
- minidisk operations.

Where to Find More Information

For information about related publications, refer to the “Bibliography” on page 55.

Links to Other Online Books

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Summary of Changes

This book contains terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

GC24-6087-00, z/VM Version 5 Release 1

This edition supports the general availability of z/VM Version 5 Release 1 (z/VM V5R1).

Chapter 1. Introduction

This book will assist you in obtaining diagnostic information and identifying sources of failure within the Data Facility Storage Management Subsystem/Virtual Machine (DFSMS/VM).

DFSMS/VM Environment

DFSMS/VM Function Level 221 manages storage space within the Shared File System (SFS), provides MOVE and CHECK processing for CMS minidisks, and offers a high-level interface for requesting removable media services (RMS) functions. DFSMS/VM processing requires interaction with two of z/VM's components: the Conversational Monitor System (CMS), and the Control Program (CP).

Shared File System

The Shared File System is a CMS file system for sharing CMS files among users. While retaining a high degree of compatibility with the minidisk system, the CMS file system with SFS introduces significant functions in support of distributed computing. DFSMS/VM manages SFS files through the use of DFSMS commands and through the Interactive Storage Management Facility (ISMF) interface.

For additional information about SFS, read:

- *z/VM: CMS File Pool Planning, Administration, and Operation*, which describes the CMS Shared File System.
- *z/VM: CMS User's Guide*, which describes how to use the CMS Shared File System.
- *z/VM: CMS Commands and Utilities Reference*, which describes the general user CMS commands.
- *z/VM: CMS Application Development Guide*, which describes how to develop programs that use the SFS program functions.

Coordinated Resource Recovery

Coordinated resource recovery (CRR) is required when more than one file pool is being managed by DFSMS/VM, or if the file pool being managed is separate from the work directory file pools. See *z/VM: CMS File Pool Planning, Administration, and Operation* for further information about CRR.

DFSMS/VM Virtual Machines

When you issue a DFSMS or DFSMSRM command or use ISMF, DFSMS/VM handles your request in the user's virtual machine or DFSMS/VM virtual machines. Table 1 on page 2 describes these virtual machines.

Virtual Machine	Default Name	Function
DFSMS master	SMSMASTR	Receives minidisk and space management requests. The request is then submitted to the appropriate server virtual machine for processing. Some requests will be processed in the master.
RMS master	RMSMASTR	Receives all RMS requests submitted with DFSMSRM interactive commands or CSL routine programming interface.
DFSMS server	SMSSRVnn	Handles space management and minidisk list requests received by DFSMS master.
Minidisk server	DGTSRVnn	Handles minidisk management MOVE and CHECK requests, and minidisk list requests received by DFSMS master.
User machine		Independent of DFSMS master or servers. Handles ISMF, DFSMS, and DFSMSRM commands. Also handles the RMS CSL calls. Depending on the function selected, the request is processed in the user machine or is submitted to the DFSMS master or the RMS master for processing.

Transparent Services Access Facility (TSAF) Considerations

DFSMS/VM identifies a global resource during initialization and the identify request is submitted to the TSAF virtual machine (if active). Because the identify request is a synchronous request, the DFSMS master will not continue with the initialization process until a response is received. Since TSAF can create a file while processing an identify request, both DFSMS/VM and TSAF can become disabled when the TSAF virtual machine's A-disk is an SFS file space in a file pool being managed by DFSMS/VM. To prevent the possibility of a disabled condition in both DFSMS/VM and TSAF, if both are installed, TSAF's A-disk must either be:

- On a non-DFSMS managed file pool

or

- A read/write minidisk.

To ensure favorable results during initialization of TSAF, first start and initialize the DFSMS master virtual machine and then autolog the TSAF virtual machine.

Chapter 2. DFSMS/VM Messages

DFSMS/VM messages provide helpful information on the status or current processing activities of DFSMS/VM, and aid in determining what type of action, if any, is necessary to resolve unsuccessful processing.

When removable media services (RMS) functions are called under program control by means of Callable Services Library (CSL) routines, errors are described to the caller as reason codes. Related messages logged on the RMS master console or in a log file, or sent to the 3495 notify user ID, can be helpful in diagnosing problems.

If an error occurs or you suspect a problem, review any associated messages that may appear in the log file, on the console or in a report file. By reviewing the messages, you may be able to determine the reason for the error and how to resolve it. You can obtain detailed message information by locating the message in the *z/VM: DFSMS/VM Messages and Codes* manual, or by using online message help as described in *z/VM: System Messages and Codes - CP*. For an explanation of RMS reason codes, refer to *z/VM: DFSMS/VM Removable Media Services*.

Logging DFSMS/VM Messages

DFSMS/VM can place messages in a log file, the virtual machine's console, or both. You can select the logging of messages with one of two pairs of control statements:

```
DFSMS_LOG_TO_FILE
DFSMS_LOG_TO_CONSOLE
```

or

```
RM_LOG_TO_FILE
RM_LOG_TO_CONSOLE
```

The control statements prefixed with DFSMS apply to logging in the DFSMS master and server virtual machines. Statements prefixed with RM apply to logging in the RMS master.

When LOG_TO_FILE is selected, specify an SFS file space where the log file can be maintained.

DFSMS/VM logs a message to the log file or console according to its severity and the severity specified in the control statement.

DFSMS/VM presents messages in four categories: severe, error, warning, and informational. The message category is indicated by a severity code letter in each message: S, E, W, or I, respectively. The severity codes are defined as follows:

Category	Meaning
Severe	A component of DFSMS/VM abends or otherwise stops because of some condition.
Error	DFSMS/VM cannot perform a function because of a condition that DFSMS/VM does not expect.

Messages

Warning	DFSMS/VM performs the function correctly, but the results may not be what the command issuer expects.
Informational	DFSMS/VM performs the function correctly, and the results are what the command issuer expects.

You must specify logging of at least severe messages with one of these keywords. The recommended setting of the DFSMS_LOG_TO_FILE keyword or RM_LOG_TO_FILE keyword is 3. By choosing a setting of 3, severe, error, and warning messages are logged, while maintaining efficient response time on the system.

During diagnosis, the recommended setting of the DFSMS_LOG_TO_CONSOLE keyword or RM_LOG_TO_CONSOLE keyword is 4. By choosing a setting of 4, you retain a complete record of DFSMS/VM processing on the console.

See the *z/VM: DFSMS/VM Customization* manual for additional information about DFSMS/VM control file keywords.

Notes:

1. To capture the messages (CP, CMS, and DFSMS/VM) displayed on the console, place the following statement in the PROFILE EXEC of the virtual machine before starting DFSMS/VM, or enter the CP command on the console of the virtual machine whose messages are to be captured.

```
CP SPool CONSOLE STArt *
```

Be aware that by spooling the console, the spool file size can increase rapidly consuming large amounts of spool space.

2. During initialization, all messages appear on the console regardless of the message severity specified in the control file statement. Logging to file takes place after initialization is complete.

Reviewing Console Logs

To review a console log file, do the following:

1. Log on to the DFSMS/VM virtual machine in question.
2. Enter

```
Begin
```

to resume operation in the virtual machine.

3. Enter

```
#CP SP CONS CLOSE TO userid
```

to send the console file of the virtual machine to a specific user ID.

4. On the user ID's virtual machine, browse the console log for error messages.

The message format is:

```
DGTxxxnnns
```

or

```
FSMxxxnnns
```

or

```
IGDxxxnnns
```


where:

xxx represents a three-character CSECT (control section) identifier that is requested by the IBM service representative if assistance is required.

nnnn is the message number.

s indicates the severity of the error (I=Informational, W=Warning, E=Error, S=Severe).

CP and CMS messages also appear in the console file.

5. Locate the error message either with online message help or in *z/VM: DFSMS/VM Messages and Codes*. You will find explanations and suggested actions accompanying the error message. CP and CMS messages can be found in *z/VM: System Messages and Codes - CP* and *z/VM: System Messages and Codes - CMS and REXX/VM*.
6. If a message found on a DFSMS/VM virtual machine console file indicates a problem on another DFSMS/VM virtual machine, then check the indicated DFSMS/VM virtual machine.
7. To locate all messages associated with a specific request, check the console log files of all servers.

Log Files

Log files are created by the DFSMS/VM virtual machines in the file space specified with the DFSMS/VM control file statement `DFSMS_LOG_TO_FILE` or `RM_LOG_TO_FILE`. The file name of a log file is the name of the master or server machine that created it. The file type is the date that the log file was created. A new log file is started with the first request after midnight of each day and is the active file for that day.

The following are examples of log file IDs:

```
SMSMASTR 20020331
SMSSRV01 20020330
RMSMASTR 20020331
DGTSRV01 20020401
```

The following examples show the contents of a log file. In the log file, long messages wrap without regard to word length.

Note: The column headings shown in the example log files are not part of the log file. They are included only to clarify the message contents and format. Also, for space management, CP and CMS messages are not placed in the log file. With the exception of abend messages, minidisk servers do place some CP, CMS, and DirMaint™ messages in the log file when an error occurs.

Messages

An example of SMS log file contents follows:

Date of Message YYYYMMDD	Time of Message HHMMSS	Request ID	Message
↓	↓	↓	↓
20020913	083043	0000003	FSMEIF1211I DFSMS DETERMINE MANAGEMENT CLASS received from user KEN, request identifier = 3
20020913	083048	0000021	FSMEIF1211I DFSMS DETERMINE MANAGEMENT CLASS received from user DON, request identifier = 21

An example of minidisk log file contents follows:

Date of Message YYYYMMDD	Time of Message HHMMSS	Request ID	Message
↓	↓	↓	↓
20020929	160615	0000300	DVHALC3297E No gap of sufficient size found in candidate area(s).
20020929	161036	0000327	FSMHXF4031E DGTQDIRM EXEC function, AMDISK failed
20020929	160615	0000300	DASD 0500 DETACHED
20020929	160836	0000327	HCPDTV040E Device 05FF does not exist
20020929	160837	0000327	FSMDCM4020E Error from CP command DETACH, return code = 40
20020929	161036	0000327	DVHAMD3298E DASD allocation attempt failed.
20020929	161036	0000327	FSMHXF4031E DGTQDIRM EXEC function, RMDISK failed

To view the log file message text (without the year, time, and request ID), issue **verify 25 *** in XEDIT. This allows you to view all of the message text on your screen without having to scroll left or right.

Note: DFSMS/VM may encounter an error while writing to the log file causing all subsequent messages to be logged to the console. This is true even if logging to the console has not been selected. Date, time, and request ID do not appear with messages destined for the console.

Accessing Log Files

You must have at least read authority to view a log file.

1. Determine the name of the directory containing the log files by locating the DFSMS/VM control file statement `DFSMS_LOG_TO_FILE` or `RM_LOG_TO_FILE`. For example, assume the control file statement:

```
DFSMS_LOG_TO_FILE 4 VMSYSU:SMSLOG.
```

2. To access the log file directory, enter:

```
ACCESS VMSYSU:SMSLOG. Z
```

3. Always access the current day's log file with the `NOLOCK` option because DFSMS/VM keeps a lock on the current day's log file. For example:

```
XEDIT SMSMASTR 20020324 Z (NOLOCK
```

You may omit the `NOLOCK` option if you are accessing a previous day's log file.

Chapter 3. Diagnosing DFSMS/VM

This chapter provides procedures for determining which DFSMS/VM virtual machine has a problem. It also describes some of the tools available to assist you in determining what the problem is and where it is. Once you have identified which virtual machine has the problem, you are then directed to that particular chapter for additional procedures.

Does a Problem Exist?

Problems that may occur during DFSMS/VM processing are:

- Recoverable and unrecoverable abends (abnormal ends)
- Unexpected or incorrect results
- Loop
- Wait state
- Authorization

Abend: The most obvious indication of a problem is the abnormal ending (abend) of a request. An abend occurs when an error condition that cannot be resolved by DFSMS/VM causes the request to end prematurely. When this occurs, DFSMS/VM issues a message providing information that can help you isolate the problem.

Note: Abend messages issued by DFSMS/VM in the master and server virtual machines will display on the virtual machine's console. If the virtual machine is operating in DISConnect mode (logged on but with no console) and the console has not been started to capture messages, then the messages are not retained.

DFSMS/VM creates a dump when the abend occurs in the master or server virtual machines and places it in its reader. Save this dump information for later reference. The spool file containing the dump will have the name VMDUMP DFSMS associated with it.

Unexpected or Incorrect Results: Another indication of a problem is unexpected or incorrect output or results. If your output is missing, incorrect, or in a different format than expected, a problem exists. Messages and return codes provide explanations to assist you in problem determination.

Loop: A loop is a set of instructions processed repeatedly while a certain condition is present. Infinite loops are caused when the condition in the loop is never satisfied and no other processing takes place in the virtual machine. If your processing takes longer than anticipated, or your output is repeated more than expected, DFSMS/VM may have looped.

Wait State: A virtual machine can be placed in an enabled or disabled wait by the application running in the virtual machine. A virtual machine in an enabled wait may accept other requests and may perform other tasks. Enabled wait states occur frequently, and are quite easily resolved or resolve themselves. Disabled wait states are not easily resolved but usually indicate that a severe problem has been recognized by the application and can be resolved only by restarting CMS.

Authorization: If the proper authorization has not been granted to a user, then the request is rejected and a message is displayed on the user's virtual machine. User

IDs must be given proper authority either in the DFSMS authorization file located at DGTVAUTH DATA VMSYS:DFSMS.CONTROL, RACF®, or through a user-defined exit.

Identifying the Problem

If a problem occurs while you are using DFSMS/VM, you need to identify the source of the problem. Suspected sources of the problem are:

- DFSMS or DFSMSRM commands
- DFSMS master or server virtual machines
- RMS master virtual machine
- Minidisk server virtual machines
- Interactive Storage Management Facility (ISMF) commands
- Interactive Systems Productivity Facility (ISPF)
- Conversational Monitor System (CMS)
- Shared File System (SFS) servers
- DirMaint or its equivalent
- Control program (CP)
- Transparent Services Access Facility (TSAF)
- Resource Access Control Facility (RACF) or its equivalent
- Program Development Facility (PDF)
- Missing current service

Immediate signs of problems within DFSMS/VM can be found in:

- Messages
- Return codes
- Reason codes

Messages: A message is a sentence or phrase describing a situation or problem that the system has encountered while processing a request or command. Messages displayed on the user's console honor the EMSG setting so the message number may or may not be shown.

Messages may display on the console of the user's virtual machine or appear in a report file whenever the DFSMS or DFSMSRM command is invoked. Either command can be invoked at the CMS command line or from within ISMF.

On the DFSMS/VM virtual machines (except the user machine), messages can be placed in a log file, in the virtual machine's console file, or in both. Certain DFSMS commands place messages in a report file. At the completion of command processing, the report file is sent to the requestor as a reader file. Refer to *z/VM: DFSMS/VM Storage Administration* for the options and syntax of the DFSMS commands that create report files, refer to *z/VM: DFSMS/VM Removable Media Services* for the options and syntax of the DFSMSRM commands that create report files.

Browse through the report file for any DFSMS/VM messages and either go to the *z/VM: DFSMS/VM Messages and Codes* or use online message help for the explanations and suggested actions for these messages.

Return codes: A return code is a number generated by the application being executed. DFSMS/VM return codes describe the result of processing a DFSMS/VM request and should be referenced to determine the success or failure of the

request. For most applications, a return code of 0 indicates success, a return code of 4 a warning, anything else indicates an error has been encountered.

Refer to *z/VM: DFSMS/VM Messages and Codes* for a description of the DFSMS/VM return codes.

Reason Code: A reason code provides additional information about an error or condition. Reason codes are used extensively by CSL routines and the space management function of DFSMS/VM. Refer to the publications listed below for information on the following reason codes:

- SFS reason codes, see *z/VM: CMS Callable Services Reference*
- ISMF reason codes, see *z/VM: DFSMS/VM Messages and Codes*
- RMS reason codes, see *z/VM: DFSMS/VM Removable Media Services*

Determining the Type-of-Failure

Type-of-failure is the external symptom of the failure. Use Table 2 to determine the type-of-failure that best describes your problem.

Type-of-Failure	Description	Procedure
Abend	Abnormal termination indicated by: <ul style="list-style-type: none"> • An ISPF abend panel • A CMS message identifying an abend • A master or server machine console message • A master or server machine goes to a CMS ready 	See “Abend Failures” on page 10.
Wait/Loop	Program unexpectedly suspended, or messages or instructions are repeated. Symptoms of this failure are: <ul style="list-style-type: none"> • No program response • Repeating messages • Repeating sequence of ISMF panels • No response from the master machine or server machine • Coordinated resource recovery (CRR) “hang” 	See “Wait/Loop Failures” on page 12.
Incorrect Output	Error indicated by: <ul style="list-style-type: none"> • Incorrect or missing output • Incorrect ISMF panel flow or information 	See “Incorrect Output Failures” on page 16.
Authorization	Certain commands fail to process for some or all users.	See “Authorization Failures” on page 17.
Documentation	Incorrect or incomplete documentation.	See “Documentation Errors” on page 17.

Abend Failures

When using DFSMS/VM, an abend may occur in one of the following virtual machines:

- User machine
- DFSMS or RMS master
- DFSMS server or minidisk server

The types of abends covered in this section are:

- ISMF abend on the user machine
- Master or server machine abend
- DFSMS or DFSMSRM command abend on the user machine

ISMF Abend

Use this section when an abend is indicated in the user's machine by:

- An Interactive System Productivity Facility (ISPF) abend panel
- A CMS message

ISPF Abend Panel

Figure 1 shows a sample ISPF abend panel, which is displayed when an abend occurs in ISPF or ISMF. Be sure to note the abend code.

```
-----ERROR RECOVERY-----  
COMMAND ===>  
  
* * * * *  
* * * * *  
* *          ISPF PROCESSOR ENDED ABNORMALLY          * *  
* * * * *  
* *          Task ABEND code 0C1                      * *  
* * * * *  
* *          Press ENTER to display primary option menu. * *  
* *          Enter HELP command for list of common ABEND CODES. * *  
* * * * *  
* * * * *  
* * * * *
```

Figure 1. Sample ISPF Abend Panel

CMS Message

When ISMF stops abnormally and ISPF is in TEST/TRACE mode, the ISPF abend panel does not appear. Instead, a CMS message is displayed that identifies the failure. Figure 2 on page 11 shows a sample CMS message that identifies an abend condition.

```
DMSITP141T Operation exception occurred at 020004 in routine DGTBMCOP
```

Figure 2. Sample CMS Abend Message

Be sure to note the exception, address, and the routine name for reporting to the IBM Support Center.

Master or Server Machine Abends

Two types of abends may occur in a master or server machine: recoverable and nonrecoverable.

In a recoverable abend, DFSMS/VM creates a dump of the virtual machine's storage and ends the task processing at the time of abend. The user ID that submitted the request is notified of an error but is not notified of an abend, and other requests are processed.

In a nonrecoverable abend, DFSMS/VM may create a dump and DFSMS/VM is terminated in the virtual machine. To recover from this type of abend, IPL CMS and restart DFSMS/VM.

When a DFSMS/VM virtual machine abends, the following information appears on the virtual machine's console:

- Message FSMRCE9907S, providing the interrupt code and program status word (PSW).
- Message FSMRCE9908S, providing the contents of general registers at the time the abend occurred.
- Other messages, indicating whether a dump is taken and when it is completed.

Figure 3 shows sample output for a DFSMS master machine abend.

```
FSMEIF1211I DFSMS MIGRATE with NOWAIT received from user VMTEST0,
request identifier = 30
FSMRCE9907S ABEND code 000000C1 in DFSMS at PSW = 03EC0000 81F29094
FSMRCE9908S General Purpose Registers at time of ABEND:
GPRs 0-3 = 01D4F5F3 000C1000 01D4F1F0 00000000
GPRs 4-7 = 01D6D958 01E15766 00000000 00000008
GPRs 8-11 = 00000100 00000004 01E2F8E8 01F0A02F
GPRs 12-15 = 00000000 01D4F030 81F0982E 00000000

FSMRCE9910S Dump of virtual storage is in progress
FSMRCE9911S Dump of virtual storage has completed
```

Figure 3. Example of a DFSMS Master Abend Message

In Figure 3, the DFSMS/VM virtual machine abended with a X'0C1', as shown in message FSMRCE9907S and creates a dump. Since the abend is recoverable, DFSMS/VM continues processing other requests, but processing of the request that has caused the abend is terminated. If another abend occurs within two minutes of the last one, message FSM9909S is issued indicating that the CMS dump for this abend is suppressed and DFSMS/VM continues operating.

If an abend should occur such that DFSMS/VM cannot recover, the virtual machine is placed in either VM READ or CP READ status. You will need to initial program load (IPL) CMS to restart DFSMS/VM.

DFSMS or DFSMSRM Command Abend

Whether issued from the command line or from ISMF, any DFSMS/VM command that results in an abend generates a CMS message such as the one shown in Figure 4, and appears on the user's virtual machine console.

```
VMTEST0 abending: CMS Abend code 000000C4 generated at location 004E2044

CPU 0 General Registers at Entry to Abend:
R00 = 004DD000 000C4000 0041D000 0041D024
R04 = 004DE000 00004000 003D6298 00421000
R08 = 003D6000 00000000 00000000 003DF957
R12 = 003DE958 0041D9C0 403D6412 00000000

Calling Trace for Current Task:
  At offset 000000D6 in Proc FSMTADDE with EPA 003DE958 and DSA 0041D9C0
    ----- First 128 Bytes of DSA for Proc FSMTADDE -----
    00000000 0041D620 00000000 00000000 00000000 00000000 00000000 00000000
    00000000 00000000 00000000 00000000 00000000 00000000 00000000 00000000
    00000000 00000000 0041E2B0 00421000 003A5530 0041D000 00000000 00000000
    00000000 00000000 003D6F49 003D6E34 003D6E17 003D6E17 003D6E2B 003D6C37

  From offset 000000F8 in Proc FSMGLBS with EPA 003D6318 and DSA 0041D620
    ----- First 128 Bytes of DSA for Proc FSMGLBS -----
    00000000 0041D0A8 0041D9C0 403D6412 003DE958 004DD000 003D6C38 0041D000
    0041D024 004DE000 00004000 003D6298 00421000 003D6000 00000000 003A7820
    003D5FFF 003D6318 0041D9C0 00421000 003A5530 0041D000 00000000 00000000
    00000000 00000000 003D5F4F 003D5EA0 003D5FB1 003D5E88 00000000 00000000

  From offset 000000F8 in Proc DGTBSMS with EPA 003D5000 and DSA 0041D0A8
    ----- First 128 Bytes of DSA for Proc DGTBSMS -----
    003CBDE0 0041D030 0041D620 603D50FA 003D6318 004DD000 003D5E2C 00000000
    004DF444 004DE000 00004000 003D6298 00421000 003D6000 00000000 003A7820
    003D5FFF 003D5000 0041D620 00421000 003A5530 0041D000 00000000 00000000
    00000000 00000000 004DF440 004DF43C 00000000 00000000 00000000 00000000

End of Calling Trace
DMSABE148T System abend 0C4 called from 003DEA2E reason code 00000000
CMS
```

Figure 4. Example of a DFSMS Command Abend Message

DFSMS/VM does not recover and no dump is created. If you wish to obtain a dump, refer to “Obtaining a Virtual Machine Dump” on page 18 for further information. You should IPL CMS after the abend.

Wait/Loop Failures

The result of a wait or loop condition is no response within a reasonable time which can be perceived as poor response or poor performance. In either case, a wait or loop is a problem that can be detected by entering the following from a privileged user ID:

```
#CP IND USER userid
```

where `userid` is the virtual machine suspected of being in a wait or loop.

Figure 5 on page 13 is an example of the results of the CP command.


```

USERID=SMSMASTR MACH=XA  STOR=0032M VIRT=V XSTORE=NONE
IPLSYS=CMS      DEVNUM=00010
PAGES: RES=000818 WS=000818 LOCK=000000 RESVD=000000
NPREF=000000  PREF=000000  READS=000072  WRITES=011343
XSTORE=000000  READS=000000  WRITES=000000  MIGRATES=000000
CPU 00: CTIME=03:59 VTIME=001:04 TTIME=001:07 IO=001178
        RDR=000000  PRT=000511  PCH=000065
Ready; T=0.01/0.01 15:59:10

```

Figure 5. Sample of Results From First CP IND USER

Enter the same CP command again after 15 or more seconds have elapsed. Figure 6 is an example of the results of the second command. Compare the times (VTIME and TTIME) of each command.

```

USERID=SMSMASTR MACH=XA  STOR=0032M VIRT=V XSTORE=NONE
IPLSYS=CMS      DEVNUM=00010
PAGES: RES=000818 WS=000818 LOCK=000000 RESVD=000000
NPREF=000000  PREF=000000  READS=000072  WRITES=011343
XSTORE=000000  READS=000000  WRITES=000000  MIGRATES=000000
CPU 00: CTIME=04:01 VTIME=001:50 TTIME=001:54 IO=001181
        RDR=000000  PRT=000513  PCH=000065
Ready; T=0.01/0.01 16:01:16

```

Figure 6. Sample of Results From the Second CP IND USER

If there is no change in those times, then DFSMS/VM is not executing instructions and may be waiting. If there is a change in either VTIME or TTIME, DFSMS/VM is processing work and may be in a loop.

Is it a Wait?

Determine a wait in one of two ways: examine the wait bit in the virtual machine's PSW or monitor the sequence of instructions being processed.

To determine if a virtual machine is in a wait state, log on to the virtual machine in question.

Enter:

```
BEGIN
```

to resume processing in the virtual machine.

Enter:

```
#CP DISPLAY PSW
```

to display the PSW. Figure 7 on page 14 shows a sample output of the CP command.

```
PSW = 000E0000 00E3737A
```

Figure 7. Sample of PSW

Bit 14 of the PSW is the wait bit and when it is a 1, the virtual machine is in a wait state. In the example, bit 14 is found in X'E' (the fourth character from the left) which represents bits 12 to 15 of the PSW. The binary equivalent of X'E' is 1110 which shows bit 14 as 1, indicating that the virtual machine is in a wait state.

If the virtual machine is not waiting, then bits 12 to 15 of the PSW would be X'C' (bit 14 is 0).

If bit 14 indicates that the machine is not waiting, check for instruction processing.

Note: Because of interactions between DFSMS/VM and CMS, the wait bit in the PSW may not always indicate when a wait state exists.

To monitor instruction processing, enter:

```
#CP TRACE INST RUN
```

If instructions are being processed, CP displays them on the console. This indicates that the virtual machine is not in a wait state, but may be in a loop.

To stop the trace, enter:

```
#CP TRACE END ALL
```

and refer to “Is It a LOOP?” on page 15 for further information.

If no instructions are being displayed on the console, then the virtual machine is in a wait state and a dump must be obtained.

To create a dump, enter:

```
#CP VMDUMP 0:END FORMAT DFSMS * The machine is waiting
```

Note: Include a “dumpid” following the asterisk (*). This is a 1 to 100 character string describing the purpose of the dump. The resulting dump is placed in the virtual machine’s reader.

Coordinated Resource Recovery (CRR) Wait

CRR wait condition may cause operations on the DFSMS master and server to be suspended. If you suspect a CRR wait, log on to the SFS file pool server suspected of being involved in the CRR wait.

Enter:

```
QUERY PREPARED FOR ALL
```

The status and task ID of the work that is prepared and connected is displayed.

To force the work to begin, enter:

```
FORCE PREPARED taskid COMMIT
```

This may break the deadlock and DFSMS master and server machines will resume operation.

For more information on the QUERY and FORCE commands, refer to the *z/VM: CMS File Pool Planning, Administration, and Operation*.

SFS Wait

A file pool being managed by DFSMS/VM may have one or more DFSMS/VM requests in a wait state. To determine if a DFSMS/VM request is in a wait state in a file pool, enter the following command from a user ID that has SFS administrator authority:

```
QUERY FILEPOOL AGENT filepoolid
```

filepoolid is the file pool name of the SFS file pool where you suspect the wait to be in effect.

The command displays information on the status of SFS agents. The display is formatted in columns, and the column with the heading "WAIT" indicates the type of wait for the SFS request. When the wait type is "DFSMS/VM Wait" then SFS on that file pool is waiting for a response from the DFSMS master virtual machine. You must then determine why the DFSMS master is not responding to the SFS request.

Is It a LOOP?

Symptoms of a loop include the continual repetition of messages or the continual repetition of a set of instructions. Repeated messages appear in the log file or the console of a virtual machine or in a report file. Review the log file, the console, or the report file.

To determine if a virtual machine is looping, log on to the virtual machine in question and enter:

```
BEGIN
```

to resume processing.

To capture all console output, enter:

```
#CP SPOOL CONSOLE START *
```

Then enter:

```
#CP TRACE INST RUN
```

to display the instructions being processed.

As soon as the command is accepted by CP, the instructions are displayed as they are processed. If nothing is displayed, then the virtual machine is in a wait state and should be handled as such.

If instructions are displayed, then the application is doing work. Check the addresses associated with each instruction closely. Repeating addresses indicate that a loop exists. The repetition of addresses may be noticed immediately or it may take some time to observe it. Be patient. If no repetition of addresses is noticed after a reasonable length of time, then no loop exists.

Once you have determined that instructions are being repeated, you must dump the virtual machine.

Enter:

```
#CP TRACE END ALL
```

to stop the trace.

Enter:

```
#CP TRACE INST NORUN
```

to place the virtual machine in single-instruction execution mode.

When CP accepts the command, an instruction is displayed and the virtual machine is placed in CP READ. Once this occurs, enter:

```
VMDUMP 0:END FORMAT DFSMS * loop in smsmaster
```

Note: Include a “dumpid” following the asterisk (*). This is a 1 to 100 character string describing the reason for the dump. The resulting dump is placed in the virtual machine’s reader.

The console file should also be saved. Enter:

```
SPOOL CONSOLE CLOSE
```

Both files should be saved as CMS files and be available when reporting a problem to the IBM Support Center. Use the DUMPLOAD command to load the reader spool file into a CMS file. To do this, enter:

```
DUMPLOAD SPOOL NOPRINT
```

This could result in a large file and may require a large file space. For additional information about DUMPLOAD, see *z/VM: CP Commands and Utilities Reference*.

Incorrect Output Failures

Incorrect output is defined as:

- Expected output that is not produced
- Output that is different than expected
- Output that should not be generated
- ISMF panel information or flow that is erroneous

Incorrect output can be the result of a previous failure. Such conditions can be difficult to analyze because the component affected may not be the one that caused the problem. Review previous messages, abends, console logs, or other program responses. They may indicate the source of the failure.

Accumulate as much of the following information as possible. It can help you isolate or resolve your problem, and the IBM Support Center may request this information.

- When did you first notice the problem?
- How did you identify the problem?
- Can you re-create the problem?

- Is the problem continuous or intermittent?
- Were any system changes or maintenance recently applied; for example, a new device, software product, or PTF with the associated APAR?
- What changes have been made to the DFSMS/VM control file, installation-wide exits, configurations, or ACS processing?
- Does the problem occur with a specific minidisk or device, at a particular time of day, or with any other unique condition?

Note: Before reporting an ISMF panel problem, be sure that the incorrect output is not the result of a customized panel or message. If the panel has been modified, retry the operation using the IBM-supplied copy.

Authorization Failures

DFSMS/VM defines certain commands as requiring storage administrator authority; therefore, selected user IDs must be granted proper authority before submitting such commands. Failure to grant proper authority results in DFSMS/VM rejecting some requests.

Proper authorization can be granted using the DGTVAUTH DATA file, RACF, or by a user-defined exit. Make sure proper authority has been granted to selected user IDs before allowing them to submit privileged commands.

If DFSMS/VM is using RACF for authorization and RACF becomes unavailable, DFSMS/VM uses the authorization file DGTVAUTH DATA. This may result in authorization failures if the files does not match RACF. RACF also enables authorization schemes that are not supported by the DGTVAUTH DATA file. This may result in unexpected authorization problems. DFSMS/VM must be stopped and restarted to reestablish the link to RACF.

A file pool to be managed by DFSMS/VM must be granted storage administrator authority to allow the SFS file pool server to communicate with the DFSMS master virtual machine. Without this authorization, unexpected results occur. For example, newly created files or directories may not be assigned a management class, or certain DFSMS commands will be rejected. The file pool server's user ID must either be placed in the DGTVAUTH DATA file, be defined to RACF, or be defined to your installation's security manager.

Refer to the *z/VM: DFSMS/VM Customization* for information on tailoring authorization for your installation.

Documentation Errors

For a minor publication error, submit a readers' comment form from the back of the publication in error. Either mail the form, or fax it to (607) 752-2327. If the error is serious and of general concern to other users, record the document page in error and order number of the publication. Be sure to include the suffix number. Then contact the IBM Support Center to report the error and the problem it has caused.

Obtaining a Virtual Machine Dump

Under certain conditions, DFSMS/VM creates dumps when it detects an abnormal condition which warrants that a dump be created. But there may be cases when a dump must be created manually using the CP VMDUMP command. Also, a dump is most effective and useful when recorded and saved at the time the abnormal condition is recognized.

- To create a dump on the user virtual machine:

1. Enter the following commands before entering a DFSMS/VM command (for example, ISMF, DFSMS, DFSMSRM or an application that calls an RMS CSL routine):

```
SET RELPAGE OFF
```

```
#CP TRACE PROG NORUN
```

2. Enter the DFSMS/VM command (ISMF, DFSMS, or DFSMSRM) or start the application that calls RMS CSL routines.

At this time the virtual machine may abend or enter a wait state. If an abend occurs, a message is displayed and the virtual machine is placed in CP READ status because of the TRACE PROG command.

If no abend occurs, a wait state may exist and may be determined by either a CP message or by displaying the PSW. Refer to “Wait/Loop Failures” on page 12 for further information.

3. Enter the following command:

If ISMF was entered in the previous step.

```
VMDUMP 0:END FORMAT ISMF
```

If DFSMS, DFSMSRM, or an RMS CSL application was entered in the previous step.

```
VMDUMP 0:END FORMAT DFSMS
```

- To create a dump on a master or server virtual machine:

1. Log on to the virtual machine in question.

Assuming that there is no DFSMS/VM application running in the virtual machine, enter:

```
#CP IPL CMS
```

to restart CMS in the virtual machine.

2. Enter:

```
ACCESS (NOPROF
```

at the VM READ to prevent the PROFILE EXEC from executing.

3. Enter:

```
SET RELPAGE OFF
```

to hold the page frames being used.

4. Enter:

```
#CP TRACE PROG NORUN
```

to stop the program when CP detects a program check.

5. Enter:

```
PROFILE
```

to invoke the PROFILE EXEC and start the DFSMS/VM application in the virtual machine.

6. Recreate the problem either by entering the command that caused the error or by starting the application that caused the error. This should be done soon after DFSMS/VM initialization completes, but it is still possible for an error to occur during initialization. In either case, the error is recognized by CP.

If an abend occurs, CP displays a message and places the virtual machine in CP READ status because of the TRACE PROG command. If a wait occurs, it can be determined either by a CP message or by displaying the PSW and checking the status of the wait bit. Refer to “Wait/Loop Failures” on page 12 for further information.

Enter the following to create a dump:

```
#CP VMDUMP 0:END FORMAT DFSMS
```

Use the DUMpload command to load a virtual machine dump from a reader spool file into a CMS dump file. To do this, enter:

```
DUMpload SPOOL NOPRINT
```

This could create a large file and require a large file space. For additional information about DUMpload, see *z/VM: CP Commands and Utilities Reference*.

For details on how to read the dump, see *z/VM: Dump Viewing Facility*. For details on the VMDUMP command, see the *z/VM: CP Commands and Utilities Reference*.

Identifying Functions in DFSMS/VM Components

Figure 8 on page 20 lists various DFSMS/VM functions and the DFSMS/VM components that perform those functions. Use the information in this table to determine which component of DFSMS/VM should be monitored as a possible source of the problem.

You can also use the table to locate the DFSMS/VM component that was performing the specific function when the error occurred. After you have located the DFSMS/VM component, use the following list to determine which chapter or publication to reference for additional help.

- CMS command line — Go to Chapter 5, “Diagnosing the User Virtual Machine” on page 27.
- ISMF panel — Go to Chapter 5, “Diagnosing the User Virtual Machine” on page 27.
- Space management master or server — Go to Chapter 4, “DFSMS/VM Virtual Machine Problems” on page 23 and Chapter 6, “Diagnosing the Space Management Virtual Machines” on page 37.
- Minidisk management server — Go to Chapter 4, “DFSMS/VM Virtual Machine Problems” on page 23 and Chapter 7, “Diagnosing the Minidisk Operations” on page 41.

Diagnosing DFSMS/VM

- Removable media services master — Go to Chapter 4, “DFSMS/VM Virtual Machine Problems” on page 23, Appendix A, “Additional Procedures to Diagnose RMS” on page 47, and *z/VM: DFSMS/VM Removable Media Services*.

Function	Component						
	CMS Command Line	USER VM		Space Management Master	Space Management Server	Minidisk Management Server	Removable Media Services Master
		ISMF Panel					
ACTIVATE	✓	✓	✓				
ALTER	✓	✓	✓	✓			
Autologging Services			✓				
CHECK	✓	✓	✓		✓		
CLEAR		✓					
CONVERT	✓		✓	✓			
COPY	✓						
DELETE	✓		✓	✓			
DEMOUNT	✓						✓
DISCARD	✓	✓*	✓				✓
Display Active Configuration		✓	✓	✓			
ERTB		✓					
FILTER		✓					
HELP		✓					
HIDE		✓					
LIST		✓					
LIST Application		✓					
List Management Classes		✓	✓	✓			
Main Dialog		✓					
MANAGE	✓		✓	✓			
Management Class Assignments	✓	✓	✓	✓			
MESSAGE		✓					
MIGRATE	✓	✓	✓	✓			
Minidisk Application	✓	✓	✓	✓	✓		
MOUNT	✓						✓
MOVE	✓	✓	✓		✓		

* Does not apply to RMS requests

Figure 8 (Part 1 of 2). DFSMS/VM Component Functions

Function	Component					
	USER VM		Space Management Master	Space Management Server	Minidisk Management Server	Removable Media Services Master
	CMS Command Line	ISMF Panel				
PROFILE		✓				
Providing lists of minidisks that meet selection criteria		✓	✓		✓	
Queuing and assigning work to server machines			✓			
QUERY of Minidisk Operations	✓	✓	✓			
QUERY of Space Management Requests	✓	✓	✓			
QUERY DFSMSLEVEL	✓					
QUERY LIBRARY	✓					✓
QUERY REQUESTS	✓		✓			✓
RECALL	✓	✓	✓	✓		
REFRESH		✓				
REPEAT (⇒)		✓				
REPORT SPACEMANAGEMENT	✓		✓	✓		
RESET DEVICE CATEGORY	✓					✓
RESHOW		✓				
RETURN		✓				
Returning results of DFSMS commands (except MOVE and CHECK)			✓			
SAVE		✓				
SET DEVICE CATEGORY	✓					✓
SET VOLUME CATEGORY	✓					✓
SORT		✓				
STOP	✓	✓	✓			✓

Figure 8 (Part 2 of 2). DFSMS/VM Component Functions

Chapter 4. DFSMS/VM Virtual Machine Problems

This chapter contains information on where an error may occur in any of the DFSMS/VM virtual machines.

Work Directory

The work directory is used to hold report files and request files. Defined with the `WORK_DIRECTORY` statement in the DFSMS/VM control file, the work directory must have sufficient space allocated to it or commands do not complete normally. Place message log files in a separate top directory, preferably in a top directory whose name does not begin with DFSMS. This is recommended because DFSMS/VM will not manage an SFS directory with a top directory name that starts with DFSMS, and log files should be managed in order to recover necessary storage space. Log files can consume space quickly and this may cause the work directory to run out of space necessary for completing DFSMS work.

Report File

A report file is created by DFSMS/VM commands that require a file for messages. The file is created soon after receipt of the command by the DFSMS master machine and is erased after it has been sent to the requester. The file name of a report file is “resource” with a file type of “Tnnnnnnn” for the DFSMS master, and a file type of “Unnnnnnn” for the RMS master. “Resource” is the value specified in the `GLOBAL_RESOURCE_ID` statement of the DFSMS/VM control file. “T” or “U” is a constant and “nnnnnnn” is the request ID assigned to the command request. For example:

```
DFSMS001  T0000327      (created by DFSMS master)
DFSMS001  U0090909      (created by RMS master)
```

If for some reason DFSMS/VM is unable to send the report file to the requester, it is not erased until a new request is assigned the same request ID. This can happen when DFSMS/VM restarts or when all possible values for request IDs are exceeded causing a “wraparound”. To save the file, either rename it or remove it from the work directory. If the report file is associated with a command request that can be restarted, the report file is appended whenever the command request is restarted.

For additional information on report files, see the *z/VM: DFSMS/VM Storage Administration*.

Request File

A request file has a copy of the command request submitted for processing. Not all command requests are placed in a request file. If a command request is one that is placed in a request file, DFSMS/VM creates the request file soon after the request is validated. The file is erased when processing of that request completes. If for some reason DFSMS/VM terminates while the request is being processed, the request file is not erased and the request is restarted when the DFSMS master virtual machine is restarted.

Virtual Machine Problems

The file name of a request file is “resource” with a file type of “Ennnnnnn” for the DFSMS master and a file type of “Annnnnnn” for the RMS master.

“Resource” is the value specified in the GLOBAL_RESOURCE_ID statement of the DFSMS/VM control file. “E” or “A” is a constant value and “nnnnnnn” is the request ID assigned to the command request. For example:

```
DFSMS001  E0000327      (created by DFSMS master)
DFSMS001  A0090909      (created by RMS master)
```

A request file can be erased manually before restarting DFSMS/VM in the DFSMS master virtual machine but this is not recommended. Erase a request file only after you have determined that the file is no longer needed (for example, the request has been processed) or it has been determined that the request is the cause of a failure in DFSMS/VM (for example, DFSMS/VM initializes successfully in the master virtual machine but as soon as the request in question is restarted a failure occurs).

Probable Causes of DFSMS Failure

Possible errors may occur while you are using DFSMS/VM; possible causes for and resolutions to those errors are listed here. For information about any of the DFSMS/VM control file keyword-value pairs, see *z/VM: DFSMS/VM Customization*.

Master Machine Does Not Respond

Normally, if the DFSMS master or RMS master is not operational, a message will be issued soon after a DFSMS/VM request is submitted.

Probable causes for this condition can be:

- The virtual machine is not logged on. Make sure it is defined correctly in the system directory and is being autologged at IPL.
- Errors in the PROFILE EXEC. To determine if an error exists, monitor the execution of the profile when starting the master virtual machine. Correct any errors, and IPL CMS to restart DFSMS/VM in the virtual machine.
- The DFSMS/VM control file is in error or other conditions exist that prevent DFSMS/VM initialization. Correct the errors and IPL CMS again to restart DFSMS/VM in the virtual machine.

When a DFSMS/VM request does not result in an indication that either the DFSMS master or the RMS master is not available, then the request is accepted. But if no response is received, then one of the following can be the cause:

- If the servers are forced off the system or if the servers abend, it is possible that the master machine may not recognize that a server is missing and continues to wait to dispatch your request to a server. Make sure the server machines are operational.
- DFSMS/VM may be looping in the master, be in a wait state, or may have abended. See “Wait/Loop Failures” on page 12 for further information.

Master Machine Cannot Dispatch a Request

Probable causes when the master machine cannot dispatch a request:

- An incorrect value in the DFSMS_SERVER_VM or MINIDISK_SERVER_VM keyword.
If the value is incorrect, the master machine cannot autolog the server machine and therefore cannot dispatch a request to a server machine.
- The server virtual machine is defined correctly but fails during initialization. Log on to the server and monitor the console messages during initialization.
- The server machines are identified correctly, but the maximum number of connections (MAXCONN) exceeded the allowed connections.
Verify that the MAXCONN value is the proper one. See the *z/VM: DFSMS/VM Customization* for information about calculating a new MAXCONN value if one is needed.
- DFSMS/VM may be looping in the server, be in a wait state, or may have abended. See “Wait/Loop Failures” on page 12 for further information.
- Use the DFSMS QUERY STATUS command to determine if all servers are busy with their assigned tasks.
- Changes made to DGTQAUTO may prevent the logon of a server machine.

No DFSMS/VM Command Messages Logged

Verify that you have specified the correct level of messages to be logged for these DFSMS/VM control file keywords:

- DFSMS_LOG_TO_CONSOLE
- DFSMS_LOG_TO_FILE
- RM_LOG_TO_CONSOLE
- RM_LOG_TO_FILE

The SFS directory where the log file is maintained has run out of space. Verify this by checking the SFS directory allocation. You may need to erase or move some of the log files or allocate more space.

For more information about specifying the correct level of messages, logging to file, and logging to console, see “Logging DFSMS/VM Messages” on page 3.

Command Response Seems Slow

DFSMS/VM requests can be submitted with a WAIT (synchronous) or NOWAIT (asynchronous) option. This option is implied, defaulted, or can be specified depending on the command being used. When NOWAIT is specified or defaulted, DFSMS/VM responds with little or no delay displaying message DGT2026I, once the request has been accepted for processing by the master. When WAIT is specified or defaulted, DFSMS/VM does not respond until processing of the request completes. It is with the synchronous (WAIT) requests where response is most noticeable. Some possible causes for slow command response are:

- Number of users on the VM system is too high.
- VM resources are constrained. I/O load is not balanced or not enough real storage is available.

Virtual Machine Problems

- DFSMS/VM server machines unable to handle the workload. When too many requests are in the queue and not enough servers are available, increase the number of server machines. Enter DFSMS QUERY STATUS to display the number of servers available and the number of tasks available per server to determine how busy the master and server are.
- All requests submitted are being processed but very slowly. The number of tasks for the servers may be too high. Decrease the number of tasks per server.
- The SFS file pool server is not configured properly. Refer to the *z/VM: DFSMS/VM Customization* for information about parameters.

Log File Space Fills Often

When logging messages to a file and the file space fills frequently, you must increase the file space, remove some log files, or change the keyword value for DFSMS_LOG_TO_FILE or RM_LOG_TO_FILE to select specific message categories. Another possibility is to define and assign a management class to the log files that identifies expiration criteria which allows you to control the file space using the DFSMS MANAGE command. Also, do not place the log file in a directory whose top directory name begins with “DFSMS” because the DFSMS MANAGE command will bypass the directory.

Chapter 5. Diagnosing the User Virtual Machine

DFSMS/VM functions are invoked within the user's virtual machine by:

- A DFSMS or DFSMSRM command entered on the CMS command line or while in an ISMF session
- An ISMF function while in an ISMF session
- A program that calls RMS CSL routines

This chapter provides procedures for determining where a DFSMS/VM problem in the user's machine may exist.

For information on RMS CSL routines see Appendix A, "Additional Procedures to Diagnose RMS" on page 47.

ISMF Diagnostic Aids

These diagnostic aids are available to help you diagnose problems that may occur while using ISMF:

- ISMF messages and message help
- ISPF log
- ISMF Error Table Display (ERTB) panel

The following sections discuss each of the diagnostic aids.

Note: When a DFSMS or DFSMSRM command is entered on the command line of an ISMF panel, ISMF diagnostic aids are no longer available.

ISMF Messages and Message Help

When an error occurs while you are using ISMF, a short message appears at the top right corner of the current panel as in Figure 9:

```

                                MINIDISK SELECTION PANEL  LIST DOES NOT EXIST
COMMAND ==>
SELECT SOURCE OF MINIDISK LIST ==> 1    (1 - saved list, 2 - new list)

```

Figure 9. Sample of a Short Message

If you need more information about the error, press **PF1** or enter the **HELP** command. A long message, such as the one shown in Figure 10 appears.

```

                                MINIDISK SELECTION PANEL  LIST DOES NOT EXIST
COMMAND ==>
The specified list does not exist because it was not saved
SELECT SOURCE OF MINIDISK LIST ==> 1    (1 - saved list, 2 - new list)

```

Figure 10. Sample of a Long Message

To obtain additional information, press **PF1** again. A message panel appears, such as the one shown in Figure 11 on page 28. Message panels contain the message

Diagnosing the User Virtual Machine

number, the short message, the long message, and an explanation of the error, along with a suggested action.

```
HELP-----ISMF MESSAGE-----HELP
COMMAND ==>

MESSAGE NUMBER: DGTJM006

SHORT MESSAGE: LIST DOES NOT EXIST

LONG MESSAGE: The specified list does not exist because it was not
              saved

EXPLANATION:
The saved list generation did not execute successfully because the
list does not exist in the output table library. It is possible that
you did not use the SAVE command to save the list or due to an
unexpected ISMF internal error, the list was not saved.

SUGGESTED ACTION:
Use the SAVE command on the list panel to save the list. Then you
will be able to generate the saved list by using the list name. If
the error persists, contact your system programmer or IBM for
assistance.

Use ENTER to continue with ISMF HELP, Use END to return to ISMF.
```

Figure 11. Sample of a Message Panel

ISPF Logs

ISMF uses the ISPF log to record information about line operators, commands, and error conditions detected during processing. Use the ISMF PROFILE application to specify the level of error information you want ISMF to record in the ISPF log. That information can help you keep track of the tasks you perform in an ISMF session and can assist you in diagnosing errors.

ISMF supplies default values in your ISMF user profile, which you can view or change to suit your needs. Using the ISMF PROFILE application, you can record standard log information with or without any of this additional information:

- Detailed error data
- Inter-module trace data
- Trace-point trace data

To record ISMF processing and error information in the ISPF log, you must turn on the ISPF log and list. Use the ISPF parameter panels to request keeping of logs and lists. Figure 12 on page 29 shows a sample ISPF panel requesting both the log and list. For more information about specifying ISPF log parameters, see the *ISPF Dialog Management Guide and Reference*, SC34-4266.


```

----- CONSOLE, LOG, AND LIST DEFAULTS -----
COMMAND ==>

CONSOLE PROCESS OPTION ==> D      (K or D)           LINES PER PAGE:
LOG PROCESS OPTION      ==> K      (PD, K, D, or N)     LOG ==> 80
LIST PROCESS OPTION     ==> K      (PD, K or D)         LIST ==> 80

VALID PROCESS OPTIONS:
  PD - Print file and delete
  K - Keep file (without printing)
  D - Delete (erase) file (without printing)
  N - Do not generate log file

LOG/LIST SPOOL OPTIONS:
  NUMBER OF COPIES ==> 1           SPOOL CLASS ==> A
  BIN NUMBER       ==>             'FOR' USER ==>
  3800 KEYWORDS   ==>

FOR SPOOLING LOG/LIST TO ANOTHER PERSON OR MACHINE:
  USER/MACHINE ID ==>
  NODE/LINK ID    ==>
  TAG TEXT        ==>
    
```

Figure 12. ISPF Console, Log, and List Defaults Panel

Changing the Values in Your ISMF User Profile

You can invoke the ISMF PROFILE application by using one of two methods:

- You can choose option **0** on the ISMF Primary Option menu
- You can enter the **PROFILE** command on the command line of most ISMF panels, except the ISMF Primary Option menu, ISMF Profile Option menu, Logging Control Entry panel, or ISMF Error Table Display panel

When you select the ISMF PROFILE option or enter the PROFILE command, ISMF displays an ISMF Profile Option menu shown in Figure 13.

```

DGTSPPF1           ISMF PROFILE OPTION MENU
ENTER SELECTION OR COMMAND ==>

SELECT ONE OF THE FOLLOWING:

  0  USER MODE           - Change ISMF user mode
  1  LOGGING CONTROL     - Control how ISMF logs and traces errors
  X  EXIT                - Return to ISMF Primary Option Menu

USE ENTER TO SELECT OPTION;
USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.
    
```

Figure 13. ISMF Profile Option Menu

Diagnosing the User Virtual Machine

On the ISMF Profile Option menu, select option **1**, “Logging and Abend Control,” to view or change the values in your profile. When you select option **1**, a Logging Control Entry panel such as the one shown in Figure 14 on page 30 appears.

```
DGTDPPF2          LOGGING CONTROL ENTRY PANEL
COMMAND ==>>

OPTIONALLY SPECIFY ONE OR MORE:

LOG DETAILED ERROR DATA ==> Y   (Y or N)
LOG INTER-MODULE TRACE  ==> N   (Y or N)
LOG TRACE-POINT TRACE   ==> N   (Y or N)

DISPLAY ERTB WHEN THE RECORD BELOW IS LOGGED ==> N   (Y or N)

MODULE NAME ==>                (8 Characters)
PROC  NAME ==>                (1 to 8 Characters)
RETURN CODE ==>                (1 to 4 Digits)
REASON CODE ==>                (1 to 4 Digits)
SHORT MSG  ==>                (8 Characters)
LONG MSG   ==>                (8 Characters)
SERVICE   ==>                (1 to 8 Characters)
FEEDBACK   ==>                (1 to 35 Characters)

USE ENTER TO REVIEW PROFILE;
USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.
```

Figure 14. Logging Control Entry Panel

On the Logging Control Entry panel, you can:

- Direct ISMF to record additional error information in the ISPF log by entering **Y** in any of the first three logging control fields.
- Cause ISMF to automatically present the ISMF Error Table Display (ERTB) panel if an ISMF error record is created in which the contents match the values you enter. You can do this by entering **Y** in the DISPLAY ERTB WHEN THE RECORD BELOW IS LOGGED field, and by entering the values for comparison in the appropriate fields.

For more information about the ISMF Error Table Display panel, see “ISMF Error Table Display Panel” on page 32.

Recording Standard Log Information

Enter **N** in all the logging control fields on the Logging Control Entry panel, and run with the ISPF log turned on. ISMF records the following information for line operators and commands performed interactively and successfully:

- The line operator or command name
- The list entry for which a line operator has been used
- The ISMF application used
- A completion message
- The request identifier for the line operator

For error conditions:

- The ISMF application used when the error has occurred
- The function performed
- The list entry associated with a line operator in error, if applicable
- The return code and reason code for the error

You will find explanations for ISMF return codes and reason codes in *z/VM: DFSMS/VM Messages and Codes*.

Logging Detailed Error Data

If you enter **Y** in the LOG DETAILED ERROR DATA field on the Logging Control Entry panel, ISMF records the following additional information for error conditions:

- The name of the ISMF module and the steps that detected the error
- The ID of the error message associated with the failure and the ID of the last panel displayed before the error
- The name of the external service that failed and any error information that the external service returned

Figure 15 shows a sample ISPF log that contains detailed error data.

```

1 TIME                *** ISPF TRANSACTION LOG ***                USERID: USER01    DATE: 01/12/03    PAGE: 1

08:17  START OF ISPF LOG - - - - SESSION # 4 -----
08:20  ***** ISMF ERROR ***** - APPLICATION(DGT1 - MINIDISK); FUNCTION(SELECT)
08:20                                     - RETURN CODE(0012); REASON CODE(1104)
08:20  ***** ISMF ERROR ***** - APPLICATION(DGT1 - MINIDISK); FUNCTION(SELECT)
08:20                                     - RETURN CODE(0012); REASON CODE(1104)
08:20  ***** ISMF ERROR ***** - APPLICATION(DGT1 - MINIDISK); FUNCTION(SELECT)
08:20                                     - RETURN CODE(0012); REASON CODE(1104)
08:21  ***** ISMF ERROR ***** - APPLICATION(DGT - MAIN DLG); FUNCTION(MAIN DLG)
08:21                                     - RETURN CODE(0004); REASON CODE(1555)
08:21                                     - MODULE(DGTFMD06); PROCEDURE(SCTCLEAR)
08:21                                     - MESSAGE ID( - ); LAST PANEL(DGTDNSD1)
08:21                                     - SERVICE(NONE); FEEDBACK(STORAGE ID:AR)
08:21  END OF ISPF LOG - - - - SESSION # 4 -----

```

Figure 15. ISPF Log with Detailed Error Data

Logging Inter-Module Trace Data

If you enter **Y** in the LOG INTER-MODULE TRACE field on the Logging Control Entry panel, ISMF logs a record for each module that has run during an ISMF session. That information can help you diagnose loops or determine module flow when there is more than one possible path to an error. The log record for an inter-module trace contains:

- The name of the module
- The contents of register 1 (the address of the input to the module) and register 11 (the address of the autodata area) during the trace entry
- Any additional recorded trace data

Figure 16 on page 32 shows a sample ISPF log that contains ISMF inter-module trace entries.

Diagnosing the User Virtual Machine

1	TIME	*** ISPF TRANSACTION LOG ***			USERID: USER01	DATE: 01/12/03	PAGE: 1
	08:22	START OF ISPF LOG	- - -	SESSION # 5	-----		
	08:22	ISMF	- TRACE	- MODULE ID(DGTFCTTE);	REG 1(00198B1D);	REG 11(0026A390)	
	08:22			- TRACE DATA()			
	08:22	ISMF	- TRACE	- MODULE ID(DGTFCTE1);	REG 1(0018629F);	REG 11(0026A498)	
	08:22			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFJM01);	REG 1(0015CF91);	REG 11(0026A358)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFJM02);	REG 1(0015DBA9);	REG 11(00227D58)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFJM19);	REG 1(001661BD);	REG 11(00227548)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFJM19);	REG 1(001661BD);	REG 11(00227548)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFCTB1);	REG 1(00185E27);	REG 11(0026A1F0)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFCTIN);	REG 1(001967B5);	REG 11(00227488)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFARB1);	REG 1(001850BF);	REG 11(00227530)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFFOB1);	REG 1(00186537);	REG 11(00227560)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFJM03);	REG 1(0015EEE1);	REG 11(00227DE8)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFJM05);	REG 1(001628A9);	REG 11(00229710)	
	08:23			- TRACE DATA()			
	08:23	ISMF	- TRACE	- MODULE ID(DGTFJM5A);	REG 1(0016888D);	REG 11(00227530)	
	08:23			- TRACE DATA()			

Figure 16. ISPF Log with Inter-Module Trace Entries

Logging Trace-Point Trace Data

Enter **Y** in the LOG TRACE-POINT TRACE field on the Logging Control Entry panel. ISMF records additional trace data from preestablished points in ISMF modules or functions. Used with the inter-module trace, this data provides detailed information about the flow of ISMF modules and functions. The log record contains:

- The ID of the trace point
- The contents of register 1 (the address of the input to the module) and register 11 (the address of the autodata area) during the trace entry
- Any additional recorded trace data

Figure 17 shows a sample ISPF log that contains ISMF trace-point entries.

1	TIME	*** ISPF TRANSACTION LOG ***			USERID: USER01	DATE: 01/12/03	PAGE: 1
	08:33	START OF ISPF LOG	- - -	SESSION # 9	-----		
	08:35	ISMF	- TRACE	- POINT ID(DGTFCTFT);	REG 1(001C1964);	REG 11(001C1C30)	
	08:35			- TRACE DATA(VGET SERVICE)	
	08:35	END OF ISPF LOG	- - -	SESSION # 9	-----		

Figure 17. ISPF Log with Trace-Point Entries

ISMF Error Table Display Panel

When an error occurs, you can display the ISMF Error Table Display panel by entering the ERTB command on the command entry line. Or, if you want to trace an error, you can have the ISMF Error Table Display panel appear when a particular type of error occurs. You indicate this on the Logging Control Entry panel.

You can use the information displayed in the ISMF Error Table Display panel to help diagnose an error. Figure 18 on page 33 shows a sample ISMF Error Table Display panel.

```

                                ISMF ERROR TABLE DISPLAY PANEL
COMMAND ==>

ISMF ERTB ADDRESS:  00244170                USER: VMTEST0
ERROR ENTRY ADDRESS: 0024463C                DATE: 01/12/03
LAST PANEL DISPLAYED: DGTDSJF1              TIME: 08:40

ENTRY: 0024458C
-----
MODULE NAME: DGTFLSC1      ENTRY: 002445E4      ENTRY: 0024463C
PROC  NAME: INITVARS      -----
RETURN CODE: 0008         MODULE NAME: DGTFLSSA
REASON CODE: 3034        PROC  NAME: CHKARRAY
SHORT MSG:                RETURN CODE: 0012
LONG MSG:                 REASON CODE: 3293
SERVICE: VGET            SHORT MSG:
FEEDBACK: CALLMOD:DGTF   SERVICE:             LONG MSG:
                   LSCL CALLPR   FEEDBACK: CALLMOD:DGTF  SERVICE: DGTFLSPL
                   OC:CALLLSC1   LSBL CALLPR           FEEDBACK: CALLMOD:DGTF
                                           JFLD CALLPR
                                           OC:PROCLIST

USE ENTER TO REVIEW DISPLAYED ENTRIES; USE UP/DOWN COMMAND FOR OTHER ENTRIES
USE HELP COMMAND FOR HELP; USE END COMMAND TO EXIT.

```

Figure 18. Sample ISMF Error Table Display Panel

The panel shows three ERTB entries at a time. When the panel is first displayed, the entry on the right is the current entry. You can use the UP and DOWN commands to view other ERTB entries. A maximum of 15 entries appear in an ISMF error table.

Using ISMF Error Table Display

An error can occur while you are waiting for a response to a request that is performed interactively. The DFSMS master or any server machine returns error information to the ISMF Error Table Display panel.

For example, if an error occurs in the selection process for a new minidisk list, the DFSMS master or server machine returns this information:

- Module name
- Procedure name
- Return code
- Reason code

ISMF return codes and reason codes are explained in *z/VM: DFSMS/VM Messages and Codes*.

If you are not waiting for a response when the DFSMS master machine encounters a problem (you have issued a request that is queued for processing), no information about the error appears in the ISMF error table.

For example, the DFSMS master machine does not report an error to ISMF if it has already accepted your MOVE request, but then has a problem dispatching the request to a minidisk server machine. Those errors are reported in a reader file along with a message as to the reason for the failure.

DFSMS Command

The DFSMS or DFSMSRM commands can be divided into the following requests:

- Functional
- Operational
- Reporting
- User

Functional requests are those that perform some kind of action on files, minidisks, or the IBM 3495. These requests include the MIGRATE, RECALL, MANAGE, CONVERT, MOVE, MOUNT, DEMOUNT, SET, and RESET commands. When a command or request is accepted for processing by the DFSMS master or RMS master, a request ID is assigned. This request ID is returned in message DGT2026I when the request is submitted as an asynchronous request (NOWAIT option or implied). It is also used to identify log messages associated with the request and to identify request and report files. The output of these requests is a report returned as a reader file to the user that issued the command. This report contains the request ID as well as messages that describe the successful or unsuccessful results of the command.

Operational requests such as the STOP and ACTIVATE commands, change the operating mode of the DFSMS/VM virtual machines. The results of these requests are displayed on the user's console without a request ID.

The reporting requests such as the QUERY and REPORT commands provide information about the files being managed by DFSMS/VM or the status of DFSMS/VM. Results are displayed on the user's console or placed in a report file.

User requests execute on the user virtual machine without the services of a master or server virtual machine. The DFSMS COPY and DFSMS CHECK requests are in this category and assume that all minidisks needed for successful execution of the request are available in the user's virtual machine. Messages are displayed on the user's console, and a file may be placed in the user's disk or SFS directory accessed as mode A.

See the *z/VM: DFSMS/VM Storage Administration* for more detailed information about the DFSMS commands.

Probable Causes of User Virtual Machine Failure

Some possible errors that may occur while using DFSMS/VM in the user virtual machine and some possible causes for and resolutions to those errors are listed in this section. For more information about any of the DFSMS/VM control file keyword-value pairs mentioned here, see *z/VM: DFSMS/VM Customization*.

No DFSMS Error Messages Appear

If you do not receive any error messages after issuing a DFSMS/VM command, enter:

```
Q SET
```

to display error message function setting and the current virtual machine values. To make sure that full error message function is in effect, enter:

SET EMSG ON

Copy Operation Seems Slow

If a copy operation is taking a long time to process, it may be because:

- CMS COPYFILE is being used due to a DFSMS COPY restriction. DFSMS/VM can copy to a target minidisk using a block size that is different from the source minidisk. When this option is specified with REBLOCK while in ISMF or BLKSIZE with the DFSMS command, DFSMS/VM uses CMS COPYFILE.

Refer to the *z/VM: DFSMS/VM Storage Administration* for a list of DFSMS COPY and MOVE restrictions.

- The PACE option is specified on the DFSMS COPY command. This creates a 2-second delay between the move of each input data unit. The default is not to delay.

Request Submitted But No Response

A DFSMS/VM request has been submitted but no response is received after a reasonable length of time. Some possible causes are:

- DFSMS/VM is initialized but the master is in a “stop” state. For example, the master is in CP READ status. This can place the user machine in a communications wait state, which disables the user virtual machine. Make sure the master is operational and accepting requests. The user’s virtual machine will be enabled as soon as the request is accepted and processed. If for some reason the user’s virtual machine remains disabled, the command #CP IPL CMS may be necessary or the user ID must be forced off the system. The latter can be done only from a privileged user ID with the CP FORCE command.
- DFSMS is looping in the user’s virtual machine. Refer to “Wait/Loop Failures” on page 12 for further information.
- The user’s virtual machine has been placed in a wait state. Refer to “Wait/Loop Failures” on page 12 for further information.
- Errors occurred during initialization of the DFSMS master virtual machine that may have prevented DFSMS from becoming operational. Check the console and log file of the DFSMS master to resolve the problem.
- Errors occurred during initialization of a DFSMS server virtual machine that may have prevented DFSMS from becoming operational. Check the console and log file of the server to resolve the problem. Also, check the console of the DFSMS master machine for possible errors while autologging the servers.
- An error in SFS or a locking problem may have put the master or server machines in a wait state. Refer to “Wait/Loop Failures” on page 12 for further information.
- DFSMS/VM in a master or server machine may be looping or be in a wait state. Refer to “Wait/Loop Failures” on page 12 for further information.
- The user virtual machine becomes disabled after issuing certain DFSMS commands (for example, MANAGE with WAIT and the automatic recall of a migrated file). Some DFSMS commands submitted with the NOWAIT option (either implied or specified) may be accepted but never processed. This condition occurs when statements MIGRATION_ LEVEL_1 and DFSMS_SERVER_VM are not specified in the control file, which place

Diagnosing the User Virtual Machine

DFSMS/VM in EXPIRE-ONLY mode. This means no command migrates are possible. However, other commands are accepted and processed. If a user virtual machine becomes disabled as a result of a space management command, issue the DFSMS DISCARD command to discard the request in question. Another option is to issue a DFSMS STOP SMS (IMMEDIATE command which will discard requests accepted but not processed and then ends DFSMS/VM. If space management requests are required, enable a DFSMS server virtual machine.

- All servers are busy. The master machine is waiting for a server to become available so that the request can be dispatched for processing. The number of tasks per server may be too low. Increase the number of tasks per server or define additional servers. You can determine how busy DFSMS/VM is by using the DFSMS QUERY STATUS command or the DFSMS QUERY REQUESTS ALL command.
- One or all servers are not available. An abend may have occurred in the server machine and it may need restarting, or DFSMS in the server machine is looping or in a wait state. Verify that the servers are operational.
- Changes have been made to installation-wide exits. Verify that the changes are correct.
- Changes made to DGTQAUTO may prevent the log on of a server machine. Verify that the changes are correct.
- A secondary user was specified when defining the server virtual machine and the secondary user is logged on. This causes DirMaint messages to be routed to the secondary user and prevents the server from receiving the needed response. Make sure the secondary user is logged off and remove the secondary user ID from the CONSOLE statement found in the directory definition.

Chapter 6. Diagnosing the Space Management Virtual Machines

You may be able to determine where the problem occurred based on the operation in progress. The DFSMS master and server machines provide the following functions:

```

ACTIVATE
ALTER
CONVERT
DELETE
DISCARD
MANAGE
MIGRATE
QUERY
RECALL
REPORT
STOP

```

No Migration of Files Occurs

The report file sent to the user as a result of a DFSMS/VM request contains messages that may indicate a problem in migrating files. Also check the log file for information on migration level 2. The messages can assist you in determining the probable cause which can be one of the following:

- For migration level 1, the MIGRATION_LEVEL_1 SFS statement is missing from the DFSMS/VM control file or the statement begins with an asterisk (*), which is treated as a comment.

Specify a file pool and user ID in the statement. Be sure to remove the asterisk (*) that appears at the beginning of the MIGRATION_LEVEL_1 statement.

- For migration level 2, the MIGRATION_LEVEL_2 DFDSM IUCV statement is missing from the DFSMS/VM control file or the statement begins with an asterisk (*), which is treated as a comment.
- For migration level 2, if authentication is enabled on the ML2 server, the password parameter on the MIGRATION_LEVEL_2 keyword in the DFSMS/VM control file must match the password for the DFSMS node on the ML2 server.
- The file pool where migration level 1 is defined is not available.
- The storage space designated for migration level 1 is out of space.

To verify if this is true, enter:

```
QUERY FILEPOOL STORGRP filepoolid
```

where "filepoolid" is the secondary storage file pool. Review the response paying close attention to minidisk information.

- The DFSMS master or server machine is down.
- The requester is not authorized to migrate files.
- The ML2 server may be unavailable, which prevents migration of files to migration level 2. Verify this by issuing DFSMS QUERY STATUS to determine the availability of the ML2 server.

For information on obtaining status on ML2, see *Tivoli Storage Manager for VM Program Directory*.

No Recall of Files Occurs

The report file sent to the user as a result of a DFSMS/VM request contains messages that may indicate a problem in recalling files. The log file may also contain other messages that may be helpful in resolving problems with recalling files. The messages can assist you in determining the probable cause which can be one of the following:

- Storage group where the recalled file is to be placed is overcommitted and no physical storage space is available.

Make room for the file in the storage group (for example, erase files) or add one or more minidisks to the storage group.

- User has issued the CMS command SET RECALL OFF.

Have the user enter the SET RECALL ON command.

- DFSMS/VM is not operational.

Resolve the problem and restart DFSMS/VM.

- DFSMS/VM is in expiration-only mode and can not recall files.

Make sure that the MIGRATION_LEVEL_1 keyword exists and is correctly identified in the DFSMS/VM control file, and that the statement does not begin with an asterisk (*). DFSMS/VM bypasses statements that begin with an asterisk.

- Check that the name specified on the GLOBAL_RESOURCE_ID keyword, the MIGRATION_LEVEL_1 keyword, and the FULLY_QUALIFIED_LUNAME in the DFSMS/VM control file match the corresponding migration level 1 subdirectory. If any of these three keywords are renamed in the DFSMS/VM control file, the corresponding migration level 1 subdirectory must also be renamed or recall of files does not occur.

- The file to be recalled is in migration level 2 and the MIGRATION_LEVEL_2 keyword is not specified in the DFSMS/VM control file or is in error.

Make sure that the MIGRATION_LEVEL_2 keyword is specified correctly.

- For migration level 2, if authentication is enabled on the ML2 server, the password parameter on the MIGRATION_LEVEL_2 keyword in the DFSMS/VM control file must match the password for the DFSMS node on the ML2 server.

- The ML2 server may be unavailable which prevents the recall of files from migration level 2.

The migration level 1 SFS file pool and the ML2 server must be operational.

Out-of-Space Condition Occurs on Primary Storage

The DFSMS/VM control file keyword, STORGRP_HIGH_THRESHOLD is used by the DFSMS MANAGE command to control the high limit of space used in the storage group. If the threshold percentage is set very high (for example, near 99%), the space management function of the MANAGE command would be limited and the possibility of an out-of-space condition is increased.

If the `STORGRP_LOW_THRESHOLD` percentage is set too high, it may leave too many files in the storage group, and it may run out of storage before the next `DFSMS MANAGE` command is invoked.

If the `STORGRP_LOW_THRESHOLD` percentage is set too low, it may cause too many files to be migrated, therefore impacting system performance.

Other possibilities for out-of-space conditions are:

- Overcommitting the storage group. Migrated files that are being recalled require space in primary storage but the space is not available.
- `MANAGE` command not invoked often enough.
- Management class attributes for expiration and migration specify long retention periods.
- Larger files assigned management classes that have long retention periods.

Low Utilization of Primary Storage

The `DFSMS/VM` control file keyword, `STORGRP_LOW_THRESHOLD` is used by the `DFSMS MANAGE` command to control the lower limit of used space in primary storage. If the percentage is set very low (for example, near 20%), too many files are being migrated as a result of the `MANAGE` command which results in primary storage not being fully utilized. Management class attributes for expiration and migration specifying very short retention periods can also result in low utilization of primary storage.

Chapter 7. Diagnosing the Minidisk Operations

This chapter provides information for using the diagnostic aids available for minidisk operations.

DFSMS Master and Minidisk Server Machines

You may be able to determine where a problem has occurred based on the operation in progress. The DFSMS master machine and minidisk server machines provide the following minidisk management functions:

- Minidisk selection
- CHECK
- MOVE
- DISCARD
- QUERY

Probable Causes of Minidisk Function Failure

Some possible errors that may occur while you are using the minidisk function of DFSMS/VM and some possible causes for and resolutions to those errors are listed in this section. For more information about any of the DFSMS/VM control file keyword-value pairs mentioned here, see *z/VM: DFSMS/VM Customization*.

Master Machine Cannot Dispatch a Request

Check the MINIDISK_SERVER_VM keyword in the DFSMS/VM control file if the DFSMS master machine is not dispatching a request to a server machine. This keyword specifies the name of the minidisk server machine. Verify that a valid minidisk server machine user ID has been specified for this keyword and that the virtual machine is operational.

See also “Master Machine Cannot Dispatch a Request” on page 25.

Server Machine Cannot be Initialized

Check the following keywords if a minidisk server cannot be initialized:

- MINIDISK_SERVER_VM, which specifies a virtual machine that processes ISMF and minidisk requests.

Verify that the user ID specified for the MINIDISK_SERVER_VM keyword is included in the CP directory. You cannot initialize a server machine unless it is in the CP directory.

- DIRECTORY_VM, which specifies the virtual machine that performs CP directory maintenance services.

Check the value specified for DIRECTORY_VM and make sure it is the name of the correct directory maintenance machine. This value must be valid to initialize a server machine. The default is DIRMAINT.

Verify that the minidisk server virtual machine is included in the waive password list (WPW) of the virtual machine that performs CP directory maintenance services.

Diagnosing Minidisk Operations

Also, the minidisk server machine may not initialize if a directory lock is held on the server machine. When this happens, messages are logged in the minidisk server machine console file. When using DirMaint, enter:

```
DIRM UNLOCK userid
```

to unlock the server machine. You will have to reinitialize the server machine after it is unlocked, by re-IPLing CMS.

- Virtual machine is defined but initialization fails at the startup of DFSMS/VM. Log on to the user ID of the failing virtual machine and run the PROFILE EXEC to monitor the console messages.

Also, the virtual machine may have abended. Log on to the virtual machine to verify that it is operational.

Timeout Occurs During Selection Process

Timeout can be caused by several factors:

- If the DIRECTORY_TIMEOUT value is too low, selection failures can occur in ISMF.

Check the DIRECTORY_TIMEOUT keyword in the DFSMS/VM control file.

DIRECTORY_TIMEOUT specifies the maximum amount of time the minidisk server machine waits for a response from the directory maintenance (DIRMAINT) server machine. The default is 120 seconds unless you modify DIRECTORY_TIMEOUT. Try increasing the DIRECTORY_TIMEOUT value.

- The minidisk server virtual machine is defined in the directory as having a secondary user and the secondary user is logged on. This causes any messages that are meant for the minidisk server to be sent to the secondary user. The timeout occurs during the selection process because the minidisk server machine does not receive any messages from the DIRMAINT server machine.

Check the directory definition of the minidisk server machine.

To prevent messages from being sent to the secondary user, log it off immediately. To avoid the problem altogether, remove the secondary user ID from the CONSOLE statement in the directory definition of the minidisk server machine.

- The directory maintenance virtual machine may not be getting dispatched quickly enough, or often enough.

Consider setting the QUICKDSP function so that the directory maintenance machine can get immediate access to system resources. Also, set the SHARE function to a value that provides a higher system-resource-access priority. Both QUICKDSP and SHARE can be specified with the CP SET command or specified in directory control statements for the directory maintenance virtual machine.

Minidisk MOVE Request Fails

The minidisk server machine may reject a MOVE request if you specify a value for one of the following keywords in which no override of the DFSMS/VM control file value is allowed.

- MINIDISK_LINK_MODE_LIMIT specifies the CP link mode that allows the minidisk server machine to establish a link to a minidisk only under one of the following conditions:
 - Establish link if there are no existing links at the time. The server virtual machine issues a CP link mode EW for the minidisk.
 - Establish link if there are no existing write links at the time. The server virtual machine issues a CP link mode SW for the minidisk.
 - Establish link despite existing read/write links. The server virtual machine issues a CP link mode MW for the minidisk.

Specifying an incorrect value may result in the server machine rejecting work. To ensure data integrity, MINIDISK_LINK_MODE_LIMIT is set with a default value of 1, which allows the minidisk server to link only when there are no existing links. Make sure the value you have specified for this keyword is correct for your installation.

- MINIDISK_RESERVED_LIMIT specifies whether reserved minidisks are allowed to be moved.

If you specify N for this keyword, you cannot move reserved minidisks. Specifying Y allows you to selectively prevent or permit moves of reserved minidisks from the Move Entry panel. Make sure the value you have specified for this keyword is correct for your installation. The default is N.

- MINIDISK_IPLTEXT_LIMIT allows you to prevent the minidisk server from moving a minidisk which contains IPL text.

Acceptable values for this keyword are N, which prevents the minidisk server from moving such minidisks, and Y, which permits the minidisk server to move the CMS part of the minidisk and re-create the IPL text on the target minidisk. Make sure that the value you have specified for this keyword is correct for your installation.

Note: If Y is specified for this keyword, Y must also be specified for MINIDISK_MISMATCH_LIMIT or the move is rejected.

- MINIDISK_MISMATCH_LIMIT allows you to specify whether the minidisk server should move a CMS minidisk when there is a mismatch between the size of the minidisk as CP sees it and the size as CMS sees it.

The default value for this keyword is N, which specifies that the minidisk server machine should not move minidisks when there is a size mismatch. The value Y allows such a minidisk move to occur. Make sure that the value you have specified for this keyword is correct.

Note: Y must be specified for this keyword, if Y has been specified for MINIDISK_IPLTEXT_LIMIT.

- Verify all necessary recommended setup steps have been completed for the Directory Maintenance product required for DFSMS/VM minidisk move operations. For required DirMaint setup steps, see the tailoring section of Chapter 6 in the *Program Directory for DFSMS/VM Function Level 221*.

Move Operation Seems Slow

Verify that work is being done by the minidisk servers. You can do this by entering the following command from a privilege class E user ID:

```
CP IND USER userid
```

where *userid* is the user ID of the minidisk server. Do this several times at 30 second intervals. Check the VTIME or TTIME values and compare them with the previous ones. A change in these values indicates that the virtual machine is working.

The minidisk server machine may not be getting access to the system resources often enough. Consider giving the virtual machine in question a higher SHARE RELATIVE value. Use the CP SET SHARE command to dynamically change the RELATIVE value. Also, consider giving the virtual machine immediate access to system resources by issuing the CP command, SET QUICKDSP *userid* ON.

Another possibility may be that CMS COPYFILE is being used due to a DFSMS COPY restriction. DFSMS/VM can copy to a target minidisk using a block size that is different from the source minidisk. When this option is specified with REBLOCK while in ISMF or BLKSIZE with the DFSMS command, DFSMS/VM uses CMS COPYFILE.

Chapter 8. Contacting the IBM Support Center

When the proper diagnostic procedures have been followed and user specifications have been checked for accuracy, you should then contact the IBM Support Center for further assistance and supply this information:

- Customer number
- Processor number such as type, model, and serial
- Component ID of DFSMS/VM
- Current DFSMS/VM function level
- Current DFSMS/VM service level (list of PTFs that have been applied and the associated APAR)
- A brief description of the problem which includes type of failure, abend codes, exception codes, message numbers and text, and routine names

If the Support Center representatives cannot immediately resolve the problem, they may pass the problem call to the DFSMS/VM 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. Therefore, you should keep the following for possible future reference:

- System console log from around the time the problem occurred
- Dump information
- Log files
- Report files
- Command text as entered
- For a wait or loop failure, all the data that was gathered while determining a wait/loop
- For a documentation failure, the location of the error in the manual and a description of the problem it caused
- ISPF transaction logs with problem related information
- Copy of DFSMS/VM control file (DGTVCNTL DATA)
- Messages in question

If you wish to supply IBM this information on tape, use the VMFPLC2 or TAPE command to transfer it to tape.

You will also be asked to supply various types of information that describe the DFSMS/VM functions used, environment, and activities. Applicable items of information from the following list may also be requested.

- Copy of master or server virtual machine directory definitions
- Copy of PROFILE EXEC of master or server virtual machines if it is not the one supplied by IBM
- Copy of directory definitions of SFS servers managed by DFSMS/VM for secondary storage
- Copy of DMSPARMS file for SFS servers

Component Identification

The component identifier is a number that identifies DFSMS/VM within the IBM software support database. For DFSMS/VM, the component ID is 570611601.

Function Level

To determine the function level of DFSMS/VM enter the following on the user's virtual machine:

```
DFSMS QUERY DFSMSLEVEL
```

A message is displayed indicating the function level of DFSMS/VM.

Appendix A. Additional Procedures to Diagnose RMS

This section provides information and references to help with the diagnosis of removable media services (RMS).

RMS diagnostics are handled as part of the routine DFSMS/VM diagnostic procedures as discussed in:

- Chapter 2, “DFSMS/VM Messages” on page 3.

Note: In addition to optional logging to the console or log file, or both, when the RMS master encounters 3490 hardware errors during library communication, it always reports these errors directly to the library notify user ID associated with the 3495 by means of the RM_AUTO_LIBRARY parameter in the DFSMS/VM control file.

- Chapter 3, “Diagnosing DFSMS/VM” on page 7 for determining which DFSMS/VM virtual machine has a problem, and a description of tools available to assist you in determining what the problem is and where it is.
- Chapter 4, “DFSMS/VM Virtual Machine Problems” on page 23 for information on where an error may occur for any of the DFSMS/VM virtual machines.
- Chapter 5, “Diagnosing the User Virtual Machine” on page 27 for user virtual machine problem determination and problems associated with the command interface.

Note: RMS does not use the ISMF interface.

Working with Tape Hardware Errors

As VM/ESA’s native interface to the 3495 hardware, RMS issues hardware commands to tape subsystems associated with 3495s and therefore has a role in reporting hardware failures.

Methods for identifying hardware errors are described below, along with references to other sources for detailed information on associated diagnosis techniques.

- Check the library notify user ID console for hardware errors.
- Check the status of each unit in the 3495 by using the Library Manager Console. See the *IBM TotalStorage™ Enterprise Automated Tape Library (3494) Introduction and Planning Guide* and the *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide*.
- Run VM I/O traces (real and virtual) for problem determination with tape subsystems. See the *z/VM: CP Commands and Utilities Reference*.
- When hardware errors are encountered, the RMS master returns sense data in message FSM2019E. See the *IBM Enhanced 3490E Model F Tape Subsystem Installation, Planning, and Operator's Guide*, GG32-0378, for descriptions of sense data format and the ERA codes. Also see the “Library Hardware Error Reason Codes” table in *z/VM: DFSMS/VM Messages and Codes*.

Error Handling with the CSL-Routine Interface

In addition to the standard DFSMS/VM CMS command interface, RMS offers a CSL-routine application programming interface that requires that errors be handled under program control. Information provided in this section offers guidance in interpreting return and reason codes and refers to relevant material in the *z/VM: DFSMS/VM Removable Media Services*.

Table 3 provides assistance in understanding the CSL reason code ranges and their explanations.

The reason codes range from 0000 to 0100 and from 3000 to 3999, and are separated into seven categories as illustrated in Table 3. (Keep the categorization of reason codes in mind when coding to the RMS CSL interface).

Table 3. Reason Code Protocol

Reason Code	Explanation
0000–0100	Reports errors encountered in accepting the request for processing. These errors are detected by the RMS master.
3000–3099	Reports errors in the way the request was specified. These errors are detected by the RMS master.
3100–3199	Reports errors experienced by the RMS master. These errors prevent processing of the request.
3200–3299	Reports errors experienced after primary processing of the request has occurred. For example, the volume is successfully mounted, but Logical Write Protect cannot be set.
3300–3499	Reports completion status.
3500–3899	Reports reason codes for I/O errors reported by the hardware. Note: reason codes 3500 - 3599 are status codes that denote configuration-related problems; for example, a mount is issued to a device that is not in a library.
3900–3999	Reports errors detected by the CSL itself. These errors are detected before the connection is made to the RMS master and are common to all CSL routines; they are not routine-specific.

The RMS programming interface defined for RMS CSL routines also includes two sets of return and reason codes. The first set of return and reason codes describes the problems encountered during execution of the CSL routine and alerts the caller to any need for examining the second set of return and reason codes. The second set of return and reason codes describes the status of the RMS operation processing performed by the RMS master during handling of the request. For a complete definition and explanation of the codes and interpretation of the dual return and reason codes, see “RMS Programming Interfaces” in *z/VM: DFSMS/VM Removable Media Services*.

See “Library Hardware Error Reason Codes” table in *z/VM: DFSMS/VM Messages and Codes* for a list of library hardware error reason codes cross-referenced to ERA codes.

To diagnose problems encountered when the CSL interface is used, the RMS master console, log files, or both are especially useful because messages (including those with sense data) are not provided on the requester’s console.

RMS Master Recovery and Restart Handling

In a typical VM 3495 environment, a tape management virtual machine is the RMS master's primary client. For tape management machine software to function adequately in managing tape drive and cartridge resources, it is important that the RMS master machine handle its own recovery and restart in a predictable manner. The RMS master restart and recovery processes are described here.

During initialization of the RMS master machine, the following recovery actions are taken, so that resources are in a known state in the event that the machine restart follows an abend or immediate STOP command:

- For all library tape drives that are currently available (that is, not attached to a virtual machine), library activity on those drives is cancelled. Any mounted volumes are demounted, and the drives are left free. (These drives may have been attached to the RMS master for the processing of an RMS request prior to a machine restart).
- The following recovery actions result for an RMS request that was in process when an immediate STOP command is issued or an RMS master abend occurs:
 - MOUNT

DFSMS/VM issues message FSM2128I, return code = 8, reason code = 3388, indicating that the request cannot be completed. Reissue the MOUNT command. Note, if a MOUNT CATEGORY request has been issued and the category was assigned to the device (by a SET DEVCAT request) in sequential order, it is possible that one volume in the category can be skipped from the user's point of view. This may occur if the original MOUNT command has completed after the abend. The volume will be demounted when the RMS master initializes. When the user reissues the request, the next volume in the category is mounted.
 - DEMOUNT

DFSMS/VM issues message FSM2127I, return code = 0, reason code = 3384, indicating that the DEMOUNT has completed, but that the volume label has not been verified.
 - QUERY LIBRARY

The device is left free. DFSMS/VM issues message FSM2999E, return code = 8, reason code = 0, indicating that the request cannot be completed. Reissue the QUERY command.
 - SET VOLCAT

Upon initialization, the RMS master cannot determine if the volume has been assigned to the requested category. DFSMS/VM issues message FSM2007E, return code = 8, reason code = 3300, indicating that the completion status of the request is unknown. To determine if a volume category has been changed, issue a QUERY LIBRARY VOLUME command. Reissue the SET VOLCAT command if the volume category has not been changed. (You may initially reissue the SET VOLCAT command; however, if the category has already been changed, reissuing this command has the potential to change the position of the volume within its category).

Additional Procedures to Diagnose RMS

– SET VOLCAT BULK

Messages FSM3010I and FSM3011I are written to the report file indicating that no further processing could be completed. You have the option to edit the SET BULK file to eliminate the volumes that have already been processed and reissue the command for the remaining volumes, or reissue the command with the original SET BULK file. In this case, because the volumes will be processed again in the same order as they were processed in the original command, the fact that each volume's category sequence number will be changed should be of no concern as the volumes will be placed in their original order.

– SET/RESET DEVCAT

Upon initialization, the RMS master cannot determine if the requested category has been assigned to a device. DFSMS/VM issues message FSM2007E, return code = 8, reason code = 3300, indicating that the completion status of the request is unknown. You may issue a QUERY LIBRARY DEVICE command to determine the category assigned to the device, and reissue the SET DEVCAT or RESET DEVCAT command if necessary. Alternatively, you may initially reissue the SET DEVCAT or RESET DEVCAT command.

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Glossary

For a list of z/VM terms and their definitions, see the *z/VM: Glossary* book.

The glossary is also available through the online HELP Facility. For example, to display the definition of “cms,” enter:

```
help glossary cms
```

You will enter the glossary HELP file and the definition of “cms” will be displayed as the current line. While you are in the glossary HELP file, you can also search for other terms.

If you are unfamiliar with the HELP Facility, you can enter:

```
help
```

to display the main HELP menu, or enter:

```
help cms help
```

for information about the HELP command.

For more information about the HELP Facility, see the *z/VM: CMS User's Guide*.

Bibliography

This bibliography lists the books in the z/VM product library. For abstracts of these books and information about current editions and available media, see *z/VM: General Information*.

Where to Get z/VM Books

z/VM books are available from the following sources:

- IBM Publications Center at www.ibm.com/shop/publications/order/
- z/VM Internet Library at www.ibm.com/eserver/zseries/zvm/library/
- IBM eServer zSeries Online Library: *z/VM Collection* CD-ROM, SK2T-2067

z/VM Base Library

The following books describe the facilities included in the z/VM base product.

System Overview

z/VM: General Information, GC24-6095

z/VM: Glossary, GC24-6097

z/VM: License Information, GC24-6102

z/VM: Migration Guide, GC24-6103

Installation and Service

z/VM: Guide for Automated Installation and Service, GC24-6099

z/VM: Service Guide, GC24-6117

z/VM: VMSES/E Introduction and Reference, GC24-6130

Planning and Administration

z/VM: CMS File Pool Planning, Administration, and Operation, SC24-6074

z/VM: CMS Planning and Administration, SC24-6078

z/VM: Connectivity, SC24-6080

z/VM: CP Planning and Administration, SC24-6083

z/VM: Getting Started with Linux on zSeries, SC24-6096

z/VM: Group Control System, SC24-6098

z/VM: I/O Configuration, SC24-6100

z/VM: Performance, SC24-6109

z/VM: Running Guest Operating Systems, SC24-6115

z/VM: Saved Segments Planning and Administration, SC24-6116

z/VM: Secure Configuration Guide, SC24-6138

z/VM: TCP/IP Planning and Customization, SC24-6125

eServer zSeries 900: Planning for the Open Systems Adapter-2 Feature, GA22-7477

eServer zSeries: Open Systems Adapter-Express Customer's Guide and Reference, SA22-7935

eServer zSeries: Open Systems Adapter-Express Integrated Console Controller User's Guide, SA22-7990

z/OS and z/VM: Hardware Configuration Manager User's Guide, SC33-7989

Customization

z/VM: CP Exit Customization, SC24-6082

Operation

z/VM: System Operation, SC24-6121

z/VM: Virtual Machine Operation, SC24-6128

Application Programming

z/VM: CMS Application Development Guide, SC24-6069

z/VM: CMS Application Development Guide for Assembler, SC24-6070

z/VM: CMS Application Multitasking, SC24-6071

z/VM: CMS Callable Services Reference, SC24-6072

z/VM: CMS Macros and Functions Reference, SC24-6075

z/VM: CP Programming Services, SC24-6084

z/VM: CPI Communications User's Guide, SC24-6085

z/VM: Enterprise Systems Architecture/Extended Configuration Principles of Operation, SC24-6094

z/VM: Language Environment User's Guide, SC24-6101

z/VM: OpenExtensions Advanced Application Programming Tools, SC24-6104

z/VM: OpenExtensions Callable Services Reference, SC24-6105

z/VM: OpenExtensions Commands Reference, SC24-6106

z/VM: OpenExtensions POSIX Conformance Document, GC24-6107

z/VM: OpenExtensions User's Guide, SC24-6108

z/VM: Program Management Binder for CMS, SC24-6110

z/VM: Reusable Server Kernel Programmer's Guide and Reference, SC24-6112

z/VM: REXX/VM Reference, SC24-6113

z/VM: REXX/VM User's Guide, SC24-6114

z/VM: Systems Management Application Programming, SC24-6122

z/VM: TCP/IP Programmer's Reference, SC24-6126

Common Programming Interface Communications Reference, SC26-4399

Common Programming Interface Resource Recovery Reference, SC31-6821

OS/390: DFSMS Program Management, SC27-0806

z/OS: Language Environment Concepts Guide, SA22-7567

z/OS: Language Environment Debugging Guide, GA22-7560

z/OS: Language Environment Programming Guide, SA22-7561

z/OS: Language Environment Programming Reference, SA22-7562

z/OS: Language Environment Run-Time Messages, SA22-7566

z/OS: Language Environment Writing ILC Applications, SA22-7563

End Use

z/VM: CMS Commands and Utilities Reference, SC24-6073

z/VM: CMS Pipelines Reference, SC24-6076

z/VM: CMS Pipelines User's Guide, SC24-6077

z/VM: CMS Primer, SC24-6137

z/VM: CMS User's Guide, SC24-6079

z/VM: CP Commands and Utilities Reference, SC24-6081

z/VM: Quick Reference, SC24-6111

z/VM: TCP/IP User's Guide, SC24-6127

z/VM: XEDIT Commands and Macros Reference, SC24-6131

z/VM: XEDIT User's Guide, SC24-6132

CMS/TSO Pipelines: Author's Edition, SL26-0018

Diagnosis

z/VM: Diagnosis Guide, GC24-6092

z/VM: Dump Viewing Facility, GC24-6093

z/VM: System Messages and Codes - AVS, Dump Viewing Facility, GCS, TSAF, and VMSES/E, GC24-6120

z/VM: System Messages and Codes - CMS and REXX/VM, GC24-6118

z/VM: System Messages and Codes - CP, GC24-6119

z/VM: TCP/IP Diagnosis Guide, GC24-6123

z/VM: TCP/IP Messages and Codes, GC24-6124

z/VM: VM Dump Tool, GC24-6129

z/OS and z/VM: Hardware Configuration Definition Messages, SC33-7986

Books for z/VM Optional Features

The following books describe the optional features of z/VM.

Data Facility Storage Management Subsystem for VM

z/VM: DFSMS/VM Customization, SC24-6086

z/VM: DFSMS/VM Diagnosis Guide, GC24-6087

z/VM: DFSMS/VM Messages and Codes, GC24-6088

z/VM: DFSMS/VM Planning Guide, SC24-6089

z/VM: DFSMS/VM Removable Media Services, SC24-6090

z/VM: DFSMS/VM Storage Administration, SC24-6091

Directory Maintenance Facility

z/VM: Directory Maintenance Facility Commands Reference, SC24-6133

z/VM: Directory Maintenance Facility Messages, GC24-6134

z/VM: Directory Maintenance Facility Tailoring and Administration Guide, SC24-6135

Performance Toolkit for VM™

z/VM: Performance Toolkit, SC24-6136

Resource Access Control Facility

External Security Interface (RACROUTE) Macro Reference for MVS and VM, GC28-1366

Resource Access Control Facility: Auditor's Guide, SC28-1342

Resource Access Control Facility: Command Language Reference, SC28-0733

Resource Access Control Facility: Diagnosis Guide, GY28-1016

Resource Access Control Facility: General Information, GC28-0722

Resource Access Control Facility: General User's Guide, SC28-1341

Resource Access Control Facility: Macros and Interfaces, SC28-1345

Resource Access Control Facility: Messages and Codes, SC38-1014

Resource Access Control Facility: Migration and Planning, GC23-3054

Resource Access Control Facility: Security Administrator's Guide, SC28-1340

Resource Access Control Facility: System Programmer's Guide, SC28-1343

IBM Enhanced 3490E Model F Tape Subsystem Installation, Planning, and Operator's Guide, GG32-0378

IBM TotalStorage™ Enterprise Automated Tape Library (3494) Introduction and Planning Guide, GA32-0448

IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide, GA32-0449

IBM Magstar® Virtual Tape Server: Implementation Guide, SG24-2229

IBM Magstar 3494 Tape Libraries: A Practical Guide, SG24-4632

Lights Out! Advanced Tape Automation Using VM/ESA, GG24-4347

IBM Compiler and Library for SAA REXX/370 User's Guide and Reference, SH19-8160

Additional Publications

This section lists other publications that you may find helpful.

IBM SAA® AD/Cycle® C/370™ V1.2 Programming Guide for LE/370 V1.3, SC09-1840

ISPF for VM Dialog Management Guide, SC34-4009

Tivoli® Storage Manager for OS/390® Edition: VM Server Program, GI10-0556

Tivoli Storage Manager for VM Program Directory, GI10-0557

Index

A

abends
 description 7
 DFSMS command 12
 DFSMS/VM virtual machine 11
 DFSMSRM command 12
 on master and server machines 11
accessing log files 6

C

changing ISMF primary options 29
component function table 20
component identification 46
console logs, reviewing 4
contacting the IBM Support Center 45
coordinated resource recovery 1

D

detecting a loop in DFSMS/VM 13
DFSMS/VM control file
 checking keyword-value pairs 34, 41
 DGTVCNTL DATA 41
 DIRECTORY_VM keyword-value pair 41
 keyword-value pairs 41
 MINIDISK_SERVER_VM keyword-value pair 41
 space management console messages 3
 STORGRP_HIGH_THRESHOLD keyword 38
 STORGRP_LOW_THRESHOLD keyword 39
 syntax errors 34, 41
 trace information control keywords 41
DFSMS/VM messages
 CMS messages 10
 command 8
 displayed messages 8
 incorrect output type-of-failure 16
 no RMS messages logged 25
 no space management messages logged 25
 PACE option 35
 removable media services log file 47
 sample abend message 12
DFSMS/VM virtual machines 1
DFSMS/VM wait/loop
 detecting a loop 13
 is it a loop 15
 symptoms 13
DGTVCNTL DATA file 3, 37
Dialog Management 27
displaying ISMF error table 30
displaying PSW 13

documentation requirements
 component identification 46
 error in publications 45
 function level 46
 list of 45
 recording a document number 17
 service level 46
 wait/loop failures 45
 when to use a readers' comment form 17
does a problem exist 7
DUMpload command, use of 16, 19

E

error table display
 displaying error table 30
 error table 30
 panel 32

F

failure types
 abend 10
 authorization 17
 documentation 17
 incorrect output 16
 wait/loop 12
file migration does not occur 37
finding the FMID 46
function level 46
functional requests 34

G

gathering information
 command for displaying PSW 13
 command for displaying registers 13
glossary information 53

I

identifying functions of DFSMS/VM 19
identifying the problem 8
incorrect output symptoms 16
inspecting PSW for wait state 13
introduction
 coordinated resource recovery 1
 DFSMS/VM environment 1
 DFSMS/VM virtual machines 1
 Shared File System 1
ISMF abend panel 10
ISMF error table 33

ISMF trace
 panel for requesting ISMF trace 30
 tracing additional points 32
 tracing module entry 31
 tracing the failing module 31
ISPF Dialog Manager
 abend panel 10
 parameter panel 28
 sample log entry 31

K

keyword-value pairs
 incorrect value specified 42
 MINIDISK_SERVER_ 41

L

log files 5, 47
logging control entry panel 30

M

message format 4
message type-of-failure 9
minidisk move
 MINIDISK_IPLTEXT_LIMIT 43
 MINIDISK_LINK_MODE_LIMIT 43
 MINIDISK_MISMATCH_LIMIT 43
 MINIDISK_RESERVED_LIMIT 43
minidisk operations
 DFSMS master and minidisk server machines 41
 diagnosing 41
 functions 41
minidisk selection panel 27
minidisk server machine
 minidisk server abend 11
 probable causes of failure 25, 41

O

obtaining ISPF log/listing 28
obtaining virtual machine dumps 18
operational requests 34
out-of-space condition occurs 38

P

performance type-of-failure
 command response slow 25
 when using COPYFILE 35
 when using DFSMS PACE option 35
problem description
 authorization 7
 command response slow 25
 DFSMS master cannot dispatch a request 25
 DFSMS master cannot send a request 41

problem description (*continued*)
 DFSMS master does not respond 24
 incorrect results 7
 infinite loop 7
 log file space fills often 26
 low utilization of primary storage 39
 minidisk MOVE request fails 42
 minidisk server cannot be initialized 41
 move operation seems slow 44
 no DFSMS/VM command messages logged 25
 no file migration occurs 37
 out-of-space condition occurs on primary
 storage 38
 RMS master does not respond 24
 timeout occurs during selection 42
 unexpected results 7
 wait state 7
problem identification
 does problem exist 7
 messages 8
 obtaining virtual machine dumps 18
 reason codes 9
 return codes 8
processing time
 command response slow 25
 copy processing 35
 move processing 44
 PACE option 35
 using COPYFILE 35
PSW wait state bit 13

R

recording a document number 17
report file 23
reporting requests 34
request file 23
requesting ERTB display 30
requesting ISMF trace 30
reviewing space management console logs 4
RMS master virtual machine
 accessing log files 6
 diagnosing 47
 log files 5
 logging facility 47
 logging messages 3
 message categories 3
 message format 4
 messages 3
 problem determination 47
 report file 23
 request file 23
 work directory 23

S

- service level 46
- Shared File System 1
- shared file system wait 15
- space management machines
 - accessing log files 6
 - DFSMS/VM control file 3, 37
 - diagnosing 23, 37
 - functions of 37
 - log files 5
 - logging messages 3
 - message categories 3
 - message format 4
 - probable causes of failure 24
 - report file 23
 - request file 23
 - reviewing console logs 4
 - work directory 23
- Support Center, IBM 45
- syntax errors in DFSMS control file 41
- syntax errors in DFSMS/VM control file 34

T

- trace
 - controlling server machine messages 41
 - for asynchronous request 33
 - for synchronous request 33
 - information control keywords 41
 - ISMF detailed error data 31
 - ISMF inter-module entry 31
 - ISMF standard log information 30
 - panel for requesting ISMF trace 30
 - tracing additional points 32
- trace information control keywords 41
- TSAF 2
- type-of-failures
 - abend 7, 10
 - authorization 7
 - description 9
 - documentation 17
 - incorrect output 16
 - incorrect results 7
 - infinite loop 7
 - ISMF abend 10
 - list of 9
 - unexpected results 7
 - wait state 7
 - wait/loop 12

U

- user machine operations
 - aids to diagnosing ISMF 27
 - changing PROFILE application 29
 - controlling command line position 27

- user machine operations (*continued*)
 - diagnosing 27
 - displaying ERTB panel 32
 - error table 32
 - ERTB command 32
 - ISMF error table 30
 - ISMF primary option panel 29
 - ISMF tracing 28
 - ISPF logging 28
 - logging error data 31
 - long message 27
 - minidisk selection panel 27
 - sample message panel 28
 - short message 27
 - standard log information 30
- using DFSMS options to get a message file 8
- using Dialog Management 27
- using PACE option 35
- using virtual machine dumps 18

V

- VMDUMP command, use of 19

W

- wait state bit 13
- wait, shared file system 15
- wait/loop
 - checking PSW bit 13
 - DFSMS 12
 - master machine 13
- when CMS message is issued 10
- when to use a readers' comment form 17
- work directory 23

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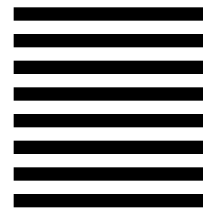
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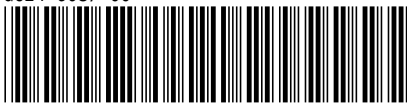


Program Number: 5741-A05



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Version 5 Release 1.0