IMS DataPropagator for z/OS

Diagnosis

Version 3 Release 1

GC27-1209-00

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Note!

Before using this information and the product it supports, be sure to read the general information under “Notices” on page 45.

First Edition (October 2001) (Softcopy Only)

This edition applies to Version 3 Release 1 of IMS DataPropagator, 5655-E52, and to any subsequent releases until otherwise indicated in new editions or technical newsletters. This edition is available in softcopy format only. The technical changes for this edition are indicated by a vertical bar to the left of a change. Make sure you are using the correct edition for the level of the product.

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About This Book

This book helps you to identify and describe problems with IMS DataPropagator for z/OS, (hereafter referred to as IMS DPROP). It assumes that you have already made an attempt to ensure that the suspected failure is not a user error or the result of an incorrect usage of IMS DPROP.

It is designed to guide you in using procedures that apply to your specific problem. You learn how to describe program failures using *keywords*. These are agree-upon words or abbreviations used to describe a single aspect of a program failure.

This book explains how to systematically select a set of keywords to describe a program failure.

You can then use this *search argument* (a set of keywords) to determine whether your failure has been previously documented and if a correction exists in an IBM software support database. If the problem has not been reported, you can use this book to guide you in analyzing the problem and reporting it to an IBM Support Center representative.

You can also use information contained in this book on IMS DPROP's diagnostic aids to help you analyze or recreate the problem.

IMS DataPropagator Version 3 Release 1 can operate in conjunction with DB2 DataPropagator to update databases supported by DB2 DataPropagator. Therefore, target DB2 for OS/2 tables can also be updated periodically with the point-in-time state of a source IMS database.

This softcopy book is available only in PDF and BookManager formats. This book is available on the **z/OS Software Products Collection Kit, SK3T-4270.** You can also get the most current versions of the PDF and BookManager formats by going to the IBM Data Management Tools Web site at www.ibm.com/software/data/db2imstools and linking to the Library page.

Changes to this Book for IMS DPROP for z/OS Version 3 Release 1

This edition, which is available in softcopy format only, includes technical and editorial changes. The terminology for DPROP Asynchronous has been changed to LOG-ASYNC while functionally remaining the same. The key functional changes are the addition of the new MQSeries-based Asynchronous Propagation (MQ-ASYNC). MQ-ASYNC uses IMS DPROP MQ-Capture and MQ-Apply components to propagate changes in real-time or point-in-time.

For more information on this please see *IMS DataPropagator for z/OS: Concepts* which is a new book in the IMS DataPropagator for OS/390 and z/OS library.

Product Library Changes

The IMS DPROP Version 3 Release 1 library has been updated with information about MQ Series asynchronous propagation. There are now three IMS DPROP Administrator Guides, one for each primary mode of propagation:

- *IMS DPROP Administrators Guide for Log Asynchronous Propagation*
- *IMS DPROP Administrators Guide for MQSeries Asynchronous Propagation*
- *IMS DPROP Administrators Guide for Synchronous Propagation*

A new book, *IMS DataPropagator for z/OS: Concepts* has been added to the library which removes part one of the previous Release 2.2 Administration Guide and provides a conceptual description of all the modes of data propagation.

Terms Used in This Book

In this book:

- “IMS” refers to IMS/ESA
- “z/OS” refers to the MVS follow-on, OS/390 and IBM's "z Operating System"
- “RH propagation” refers to relational to hierarchical (DB2 to IMS) propagation
- “HR propagation” refers to hierarchical to relational (IMS to DB2) propagation
- “RUP” refers to the Relational Update Program within IMS DPROP
- “HUP” refers to the Hierarchical Update Program within IMS DPROP

  Note: HR propagation is performed by the RUP, and RH propagation is performed by the HUP.
- “CUT” refers to the Capture System Utility within IMS DPROP
- “MQ-ASYNC” refers to MQ Series Asynchronous propagation
- “MQCAP” refers to the capture component of the MQ-ASYNC propagation
- “MQAPP” refers to the apply component of the MQ-ASYNC propagation

The following terms are synonymous in this book:

- *File* and *data set*
- *DXT* and *DataRefresher*.

  Unless a specific version or release is referenced, these terms refer to either of the following:

  - DXT Version 2 Release 5
  - DataRefresher Version 1 or higher

- Databases that have been *quiesced* also mean set to *READONLY status*.

  In all cases, these terms refer to either or both of the following:

  - Any database that can be propagated, except for DEDBs, that have been set to READONLY status.
  - DEDBs that have been taken offline with a /DBR command.

Further Information

Books referred to in this book, and other books which could be helpful are listed in the "Bibliography" on page 44 at the back of this book.

Chapter 1. Developing Your Search Argument

This chapter helps you describe IMS DPROP program failures with *keywords* in a *search argument*. A *keyword* is a word or abbreviation that describes one aspect of your program failure, such as the component identification number or the type of failure. You will systematically develop a keyword string that describes the program failure to use as a *search argument*.

You can then use this search argument to search an IBM software support database, for example the Software Support Facility (SSF). SSF is an online database containing information about the resolution of reported problems called Authorized Program Analysis Reports (APARs). If your search results in a positive match, you will find a similar problem description in the database. A program temporary fix (PTF) may also be available that resolves the problem. If the failure is unknown, you will use these keywords to describe the failure when contacting your IBM Support Center for assistance or when reporting an unsolved problem.

Using Keywords

Each keyword describes one aspect of a program failure. Grouped together, a set of keywords will describe a specific problem in detail.

The following describes the keywords available for IMS DPROP and their usage:

Component Identification
The component identification keyword for IMS DPROP is 5655E5200.

This is the first keyword in the search argument. A search of the database with this keyword alone would detect all reported problems for IMS DPROP.

Type-of-failure
Specifies the type of failure that occurred.

Function
Specifies the name of the IMS DPROP function executing at the time the problem occurred.

Symptom
Supplies additional details about the failure. For example, message and module names. You select these keywords as you follow the type-of-failure keyword procedure that applies to your problem.

Add symptom keywords to the search argument *gradually* so that you receive all the problem descriptions matching your problem. You can reduce the number of positive problem description matches If you receive too many problem descriptions to examine, you can include additional keywords in various combinations using the *And/Or* selection criteria in the search argument to reduce the number of matches.

Using the Structured Database Format

Use the structured database (SDB) format if your installation has a tool for performing structured searches. The structured keywords consist of a prefix, which identifies the type of symptom, followed by a slash (/) and the data part of the keyword. For example, the SDB format for system abend code S0C4 is `AB/S0C4`. Each search argument example in the procedures that follow shows a free-form example followed by an SDB example. For a complete description of SDB format, see *A Structured Approach to Describing and Searching Problems*.

Diagnosing a Problem

Once you have determined that the problem was not caused by a user error, you can build a keyword string to describe the program failure by:

1. Checking the component identification keyword. This is always used to start a keyword string.
2. Following the steps described in Chapter 2, “Building a Keyword String” on page 3 to build your search argument.

When you have completed your search argument, use the information described in Chapter 3, “Searching for a Matching Problem” on page 9 to find out how to search the IBM software support database. If a match does not exist, refer to Chapter 4, “Getting Help from Your IBM Support Center” on page 10 for an explanation of the procedure involved in obtaining further help.

The *IMS DPROP Messages and Codes* contains a description of IMS DPROP messages, user abends and reason codes.

Chapter 2. Building a Keyword String

A type-of-failure keyword describes an external symptom of a program failure. The various types of keywords that should be used with IMS DPROP are described in this section.

Component Identification Keyword

Your keyword string always begins with the component identification number. The component identification number for IMS DPROP is: **5655E5200**.

Use the component identification keyword *with at least one type-of-failure keyword* to search the IBM software support database. The next section tells you how to select a type-of-failure keyword.

Type-of-Failure Keyword

Figure 1 shows the possible failure types and where each is described in this chapter. To find out which procedure to use to select your keywords, go to the section associated with the program failure you have identified.

Figure 1. Types of IMS DPROP Failures

Type of Failure	Problem	Procedure Name and Page Number
Abend	Abnormal termination of the system (system abend) or of an exit routine	"Using the Abend (ABENDxxx) Procedure" on page 4
User abend	IMS DPROP abnormal termination with a user abend completion code	"Using the User Abend (ABENDUxxxx) Procedure" on page 5
Documentation	Deficiency in documentation through omission or inaccuracy	"Using the Documentation (DOC) Procedure" on page 5
Performance	Performance degradation	"Using the Performance (PERFM) Procedure" on page 6
Message	Error associated with a IMS DPROP message	"Using the Message (MSG) Procedure" on page 7
Incorrect output	Missing or incorrect output from any IMS DPROP component	"Using the Incorrect Output (INCORROUT) Procedure" on page 7
Wait/Loop	No response from IMS DPROP functions, or unexpected program suspension or looping	"Using the Wait and Loop (WAIT | LOOP) Procedure" on page 8

Using the Abend (ABENDxxx) Procedure

Use the keywords described in this section when the system terminates abnormally with a system abend completion code. Refer to “Using the User Abend (ABENDUxxxx) Procedure” on page 5 if a user abend has occurred.

Keyword: ABENDxxx

Compare the completion code and PSW instruction address in both the MVS-formatted part of the dump and the IMS-formatted part. If they are different, use only the data from the IMS-formatted section because the system dump data can be produced by abnormal termination of ABEND processing. Replace the xxx part of the ABENDxxx keyword with the system abend code from the dump. For example, if the abend code is 0C4, use `ABEND0C4`.

Keyword: RCxx

Use this keyword only if the abend has an associated return code as described in *OS/390 MVS System Codes*. Use the return code in place of xx; for example, if the return code is 08, use `RC08`.

Keyword: module name

To determine the name of the module where the abend occurred, find the PSW instruction address at the time of abend. Locate this address in the storage section of the dump, and scan backward through the eye catchers until you find the module name.

ABENDxxx Search Argument Example

If ABEND0C4 occurred in IMS DPROP module EKYRUP00, use the following search argument:

```
5655E5200  ABEND0C4 EKYRUP00
```

For a structured database search, use:

```
PIDS/5655E5200 AB/S0C4 RIDS/EKYRUP00
```

where:

`PIDS` is the prefix for the component identifier

`AB` is the prefix for the abend code

`S0C4` is the system abend code

`RIDS` is the prefix for the module keyword

Using the User Abend (ABENDUxxxx) Procedure

Use this procedure when a IMS DPROP user abend occurs. Develop a search argument for a user abend only if you cannot solve your problem by looking up the message, abend, and reason codes in *IMS DPROP Messages and Codes*.

Keyword: ABENDUxxxx

Replace the xxxx part of the ABENDUxxxx keyword with the user abend code. IMS DPROP issues user abend codes 1103 through 1109. User abends are always represented in decimal.

If IMS DPROP did not issue the abend code, check for user abend codes issued by other products.

Keyword: RSNxxxxxxxx

Replace the xxxxxxxx part of the RSNxxxxxxxx keyword with the abend reason code. Reason codes are described in *IMS DPROP Messages and Codes*.

ABENDUxxxx Search Argument Example

Assume the following events happened:

ABENDU1103 occurred in IMS DPROP module EKYR050X.
Reason code 00500070 was issued.

The search argument you use is:

```
5655E5200  ABENDU1103  RSN00500070
```

For a structured database search, use:

```
PIDS/5655E5200 AB/U1103 PRS/00500070
```

Using the Documentation (DOC) Procedure

Use the following keywords when the problem is caused by incorrect or missing information in a IMS DPROP publication.

Keyword: order number

The order number keyword identifies the manual that contains the error. The format for the order number is *ppnnnnnnee*, where:

pp is the alphabetic prefix

nnnnnn is the six-digit base publication number

ee is the edition number, which is optional

DOC Search Argument Example

You can use the following search argument to check for APARs against the first edition of *IMS DPROP Installation Guide*:

```
5655E5200 GC27121200
```

For a structured database search, you can use:

```
PIDS/5655E5200  PUBS/GC27121200
```

You can add more keywords to narrow the search. For example, to search for an APAR affecting the documentation of the DEBUG keyword on the TRACE control statement, you can OR the keywords TRACE and DEBUG to the above search argument.

Using the Performance (PERFM) Procedure

Most performance problems are related to system tuning and must be handled by system engineers and system programmers. Use the following keywords only when the performance problem cannot be corrected by system tuning.

Keywords: PERFM and PERFORMANCE

Always use the keywords PERFM and PERFORMANCE for performance problems. You must use the *Or* selection criterion to combine these keywords in the search argument.

Keyword: function

If you know the IMS DPROP function that was executing, you can include the function keyword in your search argument. Figure 2 on page 6 contains IMS DPROP functions and keywords.

Figure 2. IMS DPROP Functions and Keywords

IMS DPROP Function	Function Keyword
Audit Extract utility	AUDU
Consistency Check utility	CCU
DL/I Load utilities	DLU
IMS DPROP system definition	DPROPGEN
Hierarchical Update program	HUP
Mapping Verification and Generation	MVG
MVG Subfunctions:	
Map Capture exit routine	MCE
Mapping Verification and Generation Utility	MVGU
Relational Update program	RUP
Status Change utility	SCU
Status Change utility Subfunction:	
Time Stamp Marker Facility	TSMF
Service Functions	SER
Selector	SEL
Receiver	RCV
PRDS Registration utility	PRU
Time Stamp Marker Facility	TSMF
Capture System Utility	CUT
MQ Capture Component	CAP
MQ Apply Component	APP

PERFM | PERFORMANCE Search Argument Example

You can use the following search argument to check for all performance APARs affecting the Consistency Check utility (CCU):

```
5655E5200  PERFM | PERFORMANCE  CCU
```

For a structured database search, you can use:

```
PIDS/5655E5200  PERFM | PERFORMANCE  RIDS/CCU
```

Using the Message (MSG) Procedure

IMS DPROP Messages and Codes describes IMS DPROP messages. If, after analyzing the message, you feel the message should not have been issued or describes an error condition incorrectly, use the MSGxxxxxxxx keyword.

Keyword: MSGxxxxxxxx

Replace the xxxxxxxx part of keyword MSGxxxxxxxx with the message identifier (for example, message EKYC020E is MSGEKYC020E).

MSG Search Argument Example

For example, if you receive the message:

```
EKYC020E DBDNAME dbdname WAS NOT FOUND IN THE
MAPPING TABLES
```

and you determine that the *dbdname* was correctly specified, use the following search argument:

```
5655E5200  MSGEKYC020E
```

For a structured database search, use:

```
PIDS/5655E5200  MS/EKYC020E
```

Messages from Related Products

If a message is from a related product, check the explanation for the message in the appropriate manual, as shown in Figure 3, before performing your search.

Figure 3. Prefixes Indicating Messages from Related Products

Prefix	Product	Described In
DFS	IMS	*IMS/ESA Messages and Codes*
DSN	DB2	*DB2 Messages and Codes*
DVR	DataRefresher	the appropriate DataRefresher or DXT documentation
Various	MVS	*OS/390 MVS System Messages, Volume 1*

Using the Incorrect Output (INCORROUT) Procedure

Use this keyword to identify problems associated with incorrect output.

Keyword: INCORROUT

Use this keyword when any of the following is true:

- Output was expected, but not received (missing)
- Output was different from what was expected (incorrect)
- Data is not consistent in the IMS and DB2 databases

Keyword: function

If you know which IMS DPROP function was executing, include the function keyword in your search argument. See Figure 2 on page 6 for a list of IMS DPROP functions and their keywords.

INCORROUT Search Argument Example

If you suspect that the Relational Update Program (RUP) created incorrect output, use the following search argument:

```
5655E5200 INCORROUT RUP
```

For a structured database search, use:

```
PIDS/5655E5200 INCORROUT RIDS/RUP
```

Using the Wait and Loop (WAIT | LOOP) Procedure

If you suspect that IMS DPROP is looping or waiting, do the following:

1. Issue the MVS CANCEL command with the DUMP option against the address space where IMS DPROP is executing.
2. Determine which program (IMS DPROP, MVS, IMS, DB2, or DXT) has control.
3. Build your search argument and contact the IBM Support Center for help.

Note: In some situations, waits are normal. For example, the Status Change utility waits until IMS releases update authorization for a database before processing can continue.

Keywords: WAIT and LOOP

Symptoms for a WAIT can be indistinguishable from symptoms for a LOOP. Use both keywords by linking them with the *Or* selection criterion in the search argument.

Keyword: function

If IMS DPROP was looping or waiting, and you know which IMS DPROP function was executing, include the function keyword in your search argument. See Figure 2 on page 6 for a list of IMS DPROP functions and their keywords.

WAIT | LOOP Search Argument Example

If you suspect a wait or loop in IMS DPROP, use the following search argument:

```
5655E5200 WAIT | LOOP
```

Use the following for a structured database search:

```
PIDS/5655E5200 WAIT | LOOP
```

Chapter 3. Searching for a Matching Problem

If you have the necessary access, you can use your completed search argument to check an IBM software support database (for example SSF), for similar problems that may have been reported previously to IBM.

Use your search argument to search a software support database as follows:

1. Run the program temporary fix SMP PTF list program, or obtain access to online SMP/E dialogs. This lists the PTFs that have been applied. You can determine the maintenance level of the IMS DPROP system by identifying either the APARs, the PTFs, or both, that have been applied.

   Note: You need to know the maintenance level if you have to report the problem to your IBM Support Center.

2. Search the software support database using the search argument you have developed. Use the following guidelines for greater effectiveness when performing your search:

   - Start with a broad search argument to receive all problem descriptions that match the problem
   - If you find too many APARs to examine, combine additional keywords to the search argument in various combinations to reduce the number of matches using the *And/Or* selection criteria.

3. Eliminate any APARs also appearing in the SMP PTF list from the list of matches as they have already been applied.

4. Compare each remaining APAR with the current failure symptoms. If you find an appropriate APAR, check whether it has been closed.

   - If the APAR has been closed, correct your problem by applying the fix associated with the APAR.
   - If the APAR has not been closed, ask your IBM Support Center what to do until it is closed.

5. If the unsolved problem was caused by missing or incorrect information in a IMS DPROP publication, either:

   - Describe the problem on the Reader's Comment Form in the back of the manual, and mail the form so that the error can be corrected in a future edition. Such corrections are not catalogued in the software support database.
   - If the problem is severe or liable to cause lost time for other users, contact your IBM Support Center as described in Chapter 4, “Getting Help from Your IBM Support Center” on page 10.

6. If you do not find an appropriate APAR, contact the IBM Support Center for assistance. Go to Chapter 4, “Getting Help from Your IBM Support Center” on page 10 to find out how to report your problem.

Chapter 4. Getting Help from Your IBM Support Center

If your search argument did not produce a successful solution to your problem, contact your IBM Support Center. The Support Center can help you solve your problem, and determine whether an APAR is necessary.

Figure 4 tells you how to report a problem, what information to gather, and how to submit your documentation.

Figure 4. Getting Help from Your IBM Support Center

Procedure	What to Do
Reporting a problem	To report a problem, contact your IBM Support Center. Supply the following information: • Customer number • Release level • Current maintenance level (from PTF list) • The search argument (or arguments) you used to search the IBM software support database • For a documentation problem, the page number of the error
Gathering the necessary documentation	Make sure you have the appropriate information from the following list: • The audit trail records • The message table in the DPROP directory • Output from the CCU • SYSUDUMP or SYSABEND dump • Output from the DPROP trace In addition to these items, supply information related to the DB2 or IMS environment, depending on whether the problem involves IMS or DB2. For a documentation associated problem, you also need the page number of the documentation error.
Submitting the documentation	If the Support Center determines that an APAR is necessary, a number is assigned to your problem, and you must submit the documentation you have gathered. When submitting material for an APAR to IBM, carefully pack and clearly label *all materials* sent to IBM with the following information: 1. The APAR number assigned by IBM 2. A list of data sets on the tape, including any JCL 3. A description of how the tape was made that includes the: • Exact JCL listing or the list of commands used • Recording mode and density • Tape labeling • Record format and block size used for each data set

Chapter 5. IMS DPROP Diagnostic Aids

IMS DPROP diagnostic aids collect information to help you analyze and fix data propagation problems. This chapter describes each aid and gives suggestions for using them. Figure 5 lists the diagnostic aids and where you can find information about them in this and other IMS DPROP manuals.

Figure 5. IMS DPROP Diagnostic Aids

IMS DPROP Diagnostic Aids	Where Described
IMS DPROP trace	In "IMS DPROP Trace" following this table.
Log records created by IMS DPROP	"IMS Log Records Written by IMS DPROP" on page 31.
RUP and HUP error reporting	"RUP and HUP Error Reporting for Synchronous and Asynchronous Propagation" on page 31.
Audit trail	"Audit Trail" on page 32, the *IMS DPROP Reference*, and the *Reference* manual.
Consistency Check utility	"Consistency Check Utility (CCU)" on page 34, the *Reference* manual, and the appropriate *Administrators Guide* for your propagation mode.
Message mapping table in the IMS DPROP directory	"Message Mapping Table in the IMS DPROP Directory" on page 34 and the *IMS DPROP Reference*.
Messages	"Messages and Codes" on page 35, and *IMS DPROP Messages and Codes*.
Abend codes and reason codes	"Messages and Codes" on page 35 and the *IMS DPROP Messages and Codes*.
SQL error codes	"SQL Error Codes" on page 35 and the related DB/2 documentation.
DL/I status codes	"DL/I Status Codes" on page 36 and the related IMS documentation.
MQ error codes	"MQ Error Codes" on page 36 and related MQ documentation.

IMS DPROP Trace

The IMS DPROP trace provides internal and external tracing.

The *internal trace* allows you to obtain information about program flow—the entries and exits from each IMS DPROP module. IMS DPROP writes this trace to a wraparound trace table in virtual storage. Internal tracing is always active.

The *external trace* captures diagnostic information such as changed DL/I data and SQL update statements for propagation. In certain situations, IMS DPROP creates external trace records even if you have not turned on the trace. IMS DPROP writes external trace records to a trace data set (//EKYTRACE, //EKYLOG, or the IMS log).

You can activate external tracing when you first use data propagation or when you suspect that it is not functioning correctly. Detailed trace information is useful when analyzing questionable data.

Specifying trace options and starting the external trace differs depending on whether you are using:

- Synchronous propagation with the Relational Update Program (RUP) or Hierarchical Update Program (HUP)
- LOG-ASYNC propagation with the RUP
- User Asynchronous propagation with the RUP
- IMS DPROP utility functions

Figure 6 shows the options that are supported for each type of processing.

Figure 6. Summary of Trace Options

Trace Options	**Support for Synchronous Propagation**	**Support for LOG-ASYNC Propagation**	**Support for IMS DPROP utilities**	**Support for MQ-ASYNC**
TRACE control statement in the //EKYIN data set	yes	yes	yes	yes
DEBUG keyword	yes	yes	yes	yes
DBD keyword	yes	yes*	no	yes
PSB keyword	yes	yes*	no	yes
SEG keyword	yes	yes*	no	yes
TRDEST control statement in the //EKYIN data set	yes	no yes/no**	no	yes
TRACEON/TRACEOFF control statements for the SCU	yes	no	no	no
Output to				
IMS log	yes	no	no	yes***
//EKYTRACE data set	yes	yes	yes	yes
//EKYLOG data set	yes	yes	yes	yes

Note:

* Only relevant for Receiver.

** **Yes** for LOG-ASYNC, **No** for User Asynchronous.

*** Only for MQCAP.

The information on providing trace specifications is contained in the following:

- Synchronous propagation with the RUP and HUP is contained in “Tracing for Synchronous Propagation” on page 13.
- Asynchronous propagation with the RUP is contained in “Tracing LOG-Asynchronous Propagation” on page 15.
- IMS DPROP utilities is contained in “Tracing for IMS DPROP Utilities” on page 18.

Tracing for Synchronous Propagation

This section describes two ways to start the trace for synchronous propagation:

- Using a TRACE control statement in the //EKYIN data set of the propagating IMS region
- Executing the Status Change utility (SCU)

This section also provides information on how to specify the trace output destination.

Starting the Trace with the TRACE Control Statement

To start the trace for all types of IMS DPROP processing, put a TRACE control statement in the //EKYIN data set in the JCL of the region where IMS DPROP is executing. In a DB/DC environment, the //EKYIN DD statement is defined in the JCL of the dependent region. In an IMS batch environment, this statement is defined in the JCL of the batch region.

The keywords on the TRACE statement which limit or control the scope of the external trace are:

DEBUG Controls the type and amount of data traced. It is the only **required** keyword.

See “Selecting a DEBUG Level” on page 19 for more information about the DEBUG keyword.

DBD Limits the trace output to the propagating activities of a specific DL/I DBD.

PSB Limits the trace output to the propagating activities of a specific physical PSB.

SEG Limits the trace output to the propagating activities of a specific segment type.

If no databases, PSB or segment types are specified, then tracing occurs for all databases and segment types involved in propagation.

Figure 7 contains an example of the TRACE control statement you can use to start the trace.

```
//EKYIN DD *
TRACE DEBUG=2 ;
/*
```

Figure 7. Activating the Trace with a TRACE Control Statement

The *IMS DPROP Reference* contains a description of the TRACE control statement.

Specifying Trace Destination with the TRDEST Control Statement

Include a TRDEST statement with the DEST keyword in the //EKYIN data set to direct the external trace output to either one or a combination of the following:

- The IMS log
- A sequential data set defined on the //EKYTRACE DD statement
- A sequential data set defined on the //EKYLOG DD statement

Figure 8 on page 14 contains an example of the TRDEST statement you can use to direct trace output to the //EKYTRACE data set.

```
//EKYIN DD *
TRACE DEBUG=2 ;
TRDEST DEST=EKYTRACE ;
/*
```

Figure 8. Example of TRDEST Control Statement

Job steps that involve updating many propagated segment types should be directed to trace records to the IMS log or //EKYLOG data set rather than the //EKYTRACE data set because:

- Data on the //EKYTRACE data set is formatted during job step processing.
- Trace data on the IMS log or //EKYLOG is not formatted, resulting in shorter path length and less trace output. You can selectively format and print the log trace records later using DFSERA10 and EKYZ620X. See "Selecting, Formatting, and Printing the IMS DPROP Trace Records" on page 23 for further information.

If you choose to direct trace output to the //EKYTRACE data set, the JCL must include an //EKYTRACE DD statement that defines a data set large enough to hold all trace records. Figure 9 contains examples of //EKYTRACE DD statements.

```
//EKYTRACE DD SYSOUT=A
//EKYTRACE DD DSN=DPROP.TRACE.JOBNAME,DISP=(MOD,CATLG),
//           UNIT=SYSDA,SPACE=(CYL,(50,50))
```

Figure 9. Examples of //EKYTRACE DD Statements

If you choose to direct trace output to the //EKYLOG data set, the JCL must include a //EKYLOG DD statement that defines a data set large enough to hold all trace records. Figure 10 contains examples of two //EKYLOG DD statements.

```
//EKYLOG   DD SYSOUT=A
//EKYLOG   DD DSN=DPROP.TRACE.JOBNAME,DISP=(MOD,CATLG),
//           UNIT=SYSDA,SPACE=(CYL,(50,50))
```

Figure 10. Examples of //EKYLOG DD Statements

Refer to the *IMS DPROP Reference* for a description of the TRDEST control statement.

Starting or Stopping the Trace with the Status Change Utility

With synchronous propagation, you can also start the trace by executing the SCU. The SCU TRACEON control statement uses the DEBUG, DBD, SEG, and ALL keywords to control and limit the scope of tracing.

DEBUG Controls the type and amount of data traced.

DBD Limits the trace output to the propagating activities of a specific DL/I DBD.

SEG Limits the trace output to the propagating activities of a specific segment type.

ALL Specifies all PRs of a IMS DPROP system.

The TRACEON statement starts tracing for all job steps updating the databases or segments specified on the statement. You must specify a level of tracing with the DEBUG keyword. Figure 11 contains examples of TRACEON control statements.

```
TRACEON DBD=SKILLDB ;
TRACEON DBD=SKILLDB,DEBUG=2 ;
TRACEON DEBUG=2,DBD=SKILLDB ;
TRACEON DEBUG=2,DBD=(SKILLDB,INVENTRY) ;
TRACEON DEBUG=2,DBD=SKILLDB,SEG=ROOT ;
TRACEON DEBUG=3,DBD=SKILLDB,SEG=(ROOT,CHILD1) ;
```

Figure 11. Examples of TRACEON Control Statements

You can change the DEBUG level of an already active trace by starting the SCU with a TRACEON statement that specifies the new DEBUG level. Successive TRACEON statements can be entered for the same database or segment type.

To turn off the trace, use the TRACEOFF control statement of the SCU. This statement uses the DBD, SEG, and ALL keywords. Figure 12 contains examples of TRACEOFF control statements.

```
TRACEOFF DBD=SKILLDB ;
TRACEOFF DBD=(SKILLDB,INVENTRY) ;
TRACEOFF DBD=SKILLDB,SEG=ROOT ;
TRACEOFF SEG=(ROOT,CHILD1),DBD=SKILLDB ;
```

Figure 12. Examples of TRACEOFF Control Statements

Refer to the *IMS DPROP Reference* for more information about the TRACEON and TRACEOFF control statements.

Tracing LOG-Asynchronous Propagation

To activate the trace for job steps that propagate data asynchronously, put a TRACE control statement in the //EKYIN data set allocated to the job step. The keywords supported are described in Figure 6 on page 12. The DEBUG keyword is mandatory. Figure 6 contains a summary of the trace options. See “Starting the Trace with the TRACE Control Statement” on page 13 for information about specifying the TRACE statement.

For information about the diagnostic data provided by each DEBUG level and suggestions about when to use each level, see “Selecting a DEBUG Level” on page 19.

External trace output always goes to the //EKYTRACE or //EKYLOG data set. The JCL of the region used to call the RUP asynchronously must include a //EKYTRACE or //EKYLOG DD statement that defines a data set large enough to hold all trace records. Data on the //EKYTRACE data set is formatted automatically during job step processing while the //EKYLOG data set can be selectively formatted with DFSERA10 and EKYZ620X in a subsequent job step. See “Selecting, Formatting, and Printing the IMS DPROP Trace Records” on page 23 for details. Examples of trace output are contained in “Interpreting Trace Output” on page 24.

You can list the TRACE control statements you specified in the //EKYIN data set and any error messages associated with these statements by providing a //EKYPRINT DD statement in the JCL of the region where IMS DPROP is executing.

With asynchronous propagation you cannot:

- Start and stop the trace using the TRACEON and TRACEOFF control statements of the SCU.
- Direct output to the IMS log.

Tracing MQ-Asynchronous Propagation

To activate the trace for job steps that propagate data asynchronously using Message Queue, (MQ-ASYNC) put a TRACE control statement in the //EKYIN data set allocated to the job step. The keywords supported are described in Figure 6 on page 12. The DEBUG keyword is mandatory. Figure 6 contains a summary of the trace options. See “Starting the Trace with the TRACE Control Statement” on page 13 for information about specifying the TRACE statement.

For information about the diagnostic data provided by each DEBUG level and suggestions about when to use each level, see “Selecting a DEBUG Level” on page 19.

External trace output always goes to the //EKYTRACE or //EKYLOG data set. The JCL of the region used to call the RUP asynchronously must include a //EKYTRACE or //EKYLOG DD statement that defines a data set large enough to hold all trace records. Data on the //EKYTRACE data set is formatted automatically during job step processing while the //EKYLOG data set can be selectively formatted with DFSERA10 and EKYZ620X in a subsequent job step. See “Selecting, Formatting, and Printing the IMS DPROP Trace Records” on page 23 for details. Examples of trace output are contained in “Interpreting Trace Output” on page 24.

You can list the TRACE control statements you specified in the //EKYIN data set and any error messages associated with these statements by providing a //EKYPRINT DD statement in the JCL of the region where IMS DPROP is executing.

With MQ-ASYNC propagation you cannot:

- Start and stop the trace using the TRACEON and TRACEOFF control statements of the SCU.
- Direct output to the IMS log for the MQAPP .

Specifying Trace Destination with the TRDEST Control Statement

Include a TRDEST statement with the DEST keyword in the //EKYIN data set to direct the external trace output to either one or a combination of the following:

- A sequential data set defined on the //EKYTRACE DD statement
- A sequential data set defined on the //EKYLOG DD statement

Figure 13 contains an example of the TRDEST statement you can use to direct trace output to the //EKYTRACE data set.

```
//EKYIN DD *
TRACE DEBUG=2 ;
TRDEST DEST=EKYTRACE ;
/*
```

Figure 13. Example of TRDEST Control Statement

Job steps that involve updating many propagated segment types should be directed to trace records to the //EKYLOG data set rather than the //EKYTRACE data set because:

- Data on the //EKYTRACE data set is formatted during job step processing.
- Trace data on //EKYLOG is not formatted, resulting in shorter path length and less trace output. You can selectively format and print the log trace records later using DFSERA10 and EKYZ620X. See “Selecting, Formatting, and Printing the IMS DPROP Trace Records” on page 23 for further information.

If you are directing trace output to the //EKYTRACE data set, the JCL must include an //EKYTRACE DD statement that defines a data set large enough to hold all trace records. Figure 14 contains examples of //EKYTRACE DD statements.

```
//EKYTRACE DD SYSOUT=A
//EKYTRACE DD DSN=DPROP.TRACE.JOBNAME,DISP=(MOD,CATLG),
//        UNIT=SYSDA,SPACE=(CYL,(50,50))
```

Figure 14. Examples of //EKYTRACE DD Statements

If you are directing trace output to the //EKYLOG data set, the JCL must include a //EKYLOG DD statement that defines a data set large enough to hold all trace records. Figure 15 contains examples of two //EKYLOG DD statements.

```
//EKYLOG   DD SYSOUT=A
//EKYLOG   DD DSN=DPROP.TRACE.JOBNAME,DISP=(MOD,CATLG),
//        UNIT=SYSDA,SPACE=(CYL,(50,50))
```

Figure 15. Examples of //EKYLOG DD Statements

Refer to the *IMS DPROP Reference* for a further description of the TRDEST control statement.

Tracing for IMS DPROP Utilities

To activate the trace for the IMS DPROP utilities, SCU, MVGU, CCU, and the SEL, provide a TRACE control statement in the //EKYIN data set allocated to the job step. Only the DEBUG keyword is valid on the TRACE control statement. Refer to "Starting the Trace with the TRACE Control Statement" on page 13 for information about specifying the TRACE statement.

External trace output for the utilities goes to the //EKYTRACE or //EKYLOG data set. The JCL of the region where the utility is executing must include a //EKYTRACE or //EKYLOG DD statement that defines a data set large enough to hold all trace records. The data traced during formatting of the traced data in these data sets occurs automatically or as a subsequent job step:

- Data on the //EKYTRACE data set is formatted automatically during job step processing.
- Data on the //EKYLOG data set is formatted with DFSERA10 and EKYZ620X in a subsequent job step. For details, see "Selecting, Formatting, and Printing the IMS DPROP Trace Records" on page 23.

For examples of trace output, see "Interpreting Trace Output" on page 24.

To list the TRACE control statements you specified in the //EKYIN data set and any error messages associated with these statements, provide a //EKYPRINT DD statement in the JCL of the region where the IMS DPROP utility is executing.

When tracing for IMS DPROP utilities, the following restrictions apply:

- Only the DEBUG keyword is valid on the TRACE control statement. DBD, PSB, and SEG are not supported.
- You cannot start and stop the trace by using the TRACEON and TRACEOFF control statements of the SCU.
- You cannot direct output to the IMS log.

See "Specifying Trace Destination with the TRDEST Control Statement" on page 17 for details about the TRDEST control statement or refer to the *IMS DPROP Reference* for a further description.

Selecting a DEBUG Level

You must specify a DEBUG level on the TRACE statement in the //EKYIN data set or the TRACEON statement of the SCU to control the type and amount of trace data produced. You can specify one or more DEBUG levels. Figure 16 shows the diagnostic data that is collected for each DEBUG level. Figure 17 on page 23 shows which of these levels you can use for different types of job steps.

Figure 16 (Page 1 of 3). Diagnostic Data Traced for Each DEBUG Level

DEBUG Level	Type of Diagnostic Data
1	This trace level is continually active and writes the information it gathers to a wraparound table in virtual storage. It compiles, for example, information on the entries and exits of exit routines.
2	• **RUP executions:** Changed DL/I data, including: Changed DL/I segments with their fully concatenated keys DL/I segment name DBD name Type of update Propagating SQL update statements issued by IMS DPROP, including: Type of update Table name Description of any SQL WHERE clause, including column names and contents Description of all propagated columns, including column names and contents SQL error code **MQCAP executions:** Changed DL/I data, including: Changed DL/I segments with their fully concatenated keys DL/I segment name DBD name Type of update Propagating SQL update statements issued by IMS DPROP, including: Type of update Table name Description of any SQL WHERE clause, including column names and contents Description of all propagated columns, including column names and contents SQL error code The MQ Series message The compressed MQ Series message

Figure 16 (Page 2 of 3). Diagnostic Data Traced for Each DEBUG Level

DEBUG Level	**Type of Diagnostic Data**
2(continued)	• **MQAPP executions:** Changed DL/I data, including: Changed DL/I segments with their fully concatenated keys DL/I segment name DBD name Type of update Propagating SQL update statements issued by IMS DPROP, including: Type of update Table name Description of any SQL WHERE clause, including column names and contents Description of all propagated columns, including column names and contents SQL error code The retrieved MQ Series message The uncompressed MQ Series message • **Receiver executions:** List of PRs that are active for the current execution of the Receiver The value of each HOLD Recovery Token at which a DB2 commit is executed Changed DL/1 data including: Changed DL/I segments with their fully concatenated keys DL/I segment name DBD name Type of update Propagating SQL update statements issued by IMS DPROP, including: Type of update Table name Description of any SQL WHERE clause, including column names and contents Description of all propagated columns, including column names and contents SQL error code

Figure 16 (Page 3 of 3). Diagnostic Data Traced for Each DEBUG Level

DEBUG Level	Type of Diagnostic Data
2(continued)	• **HUP executions:** Changed DB2 data, including: Changed DB2 rows, including column names and contents DB2 table name Type of update Propagating IMS update calls issued by IMS DPROP including: Type of IMS Update Call IMS DBD name IMS segment name SSAs used in the IMS update call IMS segments with their fully concatenated key • **CCU executions:** DL/I segments, including: Segment data Fully concatenated key Segment name DBD name DB2 rows, including SQLDA describing the DB2 rows and the DB2 column values.
4	Calls to the RUP and HUP, including interface control blocks. Calls to Segment User exit, Field User exit, and Propagation User exit routines (including input and output from exit routines).
8	Entry to and exit from modules and major routines, and at internal specified locations.
16	Relevant control blocks, at internally specified locations, of the RUP, the HUP, the IMS DPROP service functions (including the Selector, the Receiver and the Time Stamp Marker Facility), and IMS DPROP components (with the exception of CCU, DLU, MVG, MVGU, and the Map Capture exit).
32	Selector and Receiver executions using the debug level 32 result in detailed tracing associated with the processing of IMS log record type X'9904' the IMS Changed Data Capture Record. When IMS DPROP detects a problem that allows IMS DPROP processing to continue, the whole MVS subtask is dumped to the //EKYSNAP data set.
64	Trace of activities and control blocks of the CCU, DLU, MVG, MVGU, and Map Capture exit.

Note: The RUP and HUP create trace records for propagation requests (PRs) belonging to a generalized mapping case and for user mapping and propagation.

For user mapping and propagation, the RUP and HUP trace the changed data and calls to the Propagation exit routine. The RUP and HUP do *not* trace the propagating SQL and DL/I calls issued by the Propagation exit routine. However, the Propagation exit routine can request tracing of its SQL and DL/I calls by calling the IMS DPROP tracing functions. For information about how the Propagation exit routine requests tracing of the SQL and DL/I calls, see *IMS DPROP Customization Guide*.

About Debug Level 1

DEBUG level 1 is always active. The output from this level is used primarily by the IBM Support Center.

About Debug Level 2

For job steps that perform synchronous or asynchronous propagation with the RUP or HUP, you can use DEBUG level 2 in the following situations:

- When you first use IMS DPROP.
- When you propagate new data.
- After you change propagation definitions, such as PR, DL/I database, or DB2 table definitions.
- When you suspect that propagation is not functioning correctly. For example, a mapping definition can be wrong, or a IMS DPROP software error can occur.
- When you think the SQL statements and IMS calls issued by the RUP or HUP are not executing correctly or are not executing against the correct table or database.

  Because this debug level traces the changed data and the propagating update statements issued by IMS DPROP, you can see how the changed data is being propagated by IMS DPROP.

DEBUG level 2 increases path length of data propagation and generates large amounts of data and additional I/Os. If you specify level 2 for just a few databases, and a small percentage of DL/I updates are propagated, performance is affected less. However, the amount of trace data can still be large.

Using Higher Debug Levels

The IBM Support Center can request that you activate a tracing level higher than 2 for problem analysis. Levels higher than 2 substantially increase path length and produce a lot of data, having a more serious effect on performance. If you activate these DEBUG levels, increase the number of log volumes or the size of the //EKYTRACE or //EKYLOG data set to accommodate the additional trace output.

Specifying Multiple Debug Levels

Because you can activate one or more DEBUG levels, the DEBUG value can be from 1 through 127. For example, if you want to activate levels 2, 4, 8, and 16, you specify DEBUG=30 (2+4+8+16=30).

How IMS DPROP Assigns Debug Levels for Multiple Statements

IMS DPROP assigns DEBUG levels when you use multiple TRACE statements in the //EKYIN data set or multiple SCU TRACEON statements, or a combination of these statements as follows:

For multiple TRACE control statements, IMS DPROP combines the DEBUG values. Both levels 2 and 4 are active in the following example:

```
//EKYIN DD *
TRACE DEBUG=2 ;
TRACE DEBUG=4 ;
/*
```

For multiple TRACEON control statements, the DEBUG level on the last statement overrides the level on the previous statement, for example:

```
TRACEON DBD=DB1 DEBUG=2
TRACEON DBD=DB1 DEBUG=4
```

DEBUG level 4 replaces level 2 for database DB1. Later you can activate the trace for a different database (DBD=DB3) with the following TRACEON statement:

```
TRACEON DBD=DB3 DEBUG=2
```

IMS DPROP activates the trace for database DB3 at level 2; level 4 is still active for database DB1.

For a combination of TRACE and TRACEON control statements, IMS DPROP combines the DEBUG values on all control statements.

For example, assume you used these TRACE statements:

```
TRACE DBD=DB1 DEBUG=2
TRACE DBD=DB1 DEBUG=4
```

At this point, the trace is active for levels 2 and 4. If you later entered the following TRACEON control statement specifying the same database and a new DEBUG level:

```
TRACEON DBD=DB1 DEBUG=8
```

then the IMS DPROP trace is active for DEBUG levels 2, 4, and 8.

Debug Levels That Apply to Different Types of IMS DPROP Job Steps

Figure 17 shows which DEBUG levels are applicable for each type of IMS DPROP job step.

Figure 17. DEBUG Levels for Different Types of Job Steps

Level	Propagating Job Step	CCU and DLU Job Steps	MVG, MVGU and Map Capture exit Job Steps	IMS DPROP Utilities*	Selector	Receiver	MQCAP or MQAPP
1	Y	Y	Y	Y	Y	Y	Y
2	Y	Y	N	N	N	Y	Y
4	Y	Y	N	N	N	Y	Y
8	Y	Y	Y	Y	Y	Y	Y
16	Y	Y	Y	Y	Y	Y	Y
32	Y	Y	Y	Y	Y	Y	Y
64	N	Y	Y	N	N	N	N

Note:

* Other than CCU, DLU, MVG, MVGU, or Map Capture exit.

Selecting, Formatting, and Printing the IMS DPROP Trace Records

To select, format, and print the records IMS DPROP writes to the IMS log or //EKYLOG data set, use the File Select and Formatting Print utility (DFSERA10) with IMS DPROP exit EKYZ620X. Figure 18 on page 24 shows the JCL you can use to print all SNAP, error message, and entry and exit records. The OPTION statement instructs DFSERA10 to pass all type X'E0' IMS log records (VALUE=E0) or //EKYLOG records to exit EKYZ620X for formatting and printing.

```
//EXAMPLE1 EXEC   PGM=DFSERA10
//STEPLIB  DD     DSN=IMSVS.RESLIB,DISP=SHR
//         DD     DSN=DPR.LOAD,DISP=SHR
//EKYRESLB DD     DSN=DPR.LOAD,DISP=SHR
//SYSUT1   DD     DSN=IMS.LOG.SLDS,DISP=SHR,VOL=SER=123456,UNIT=TAPE
//SYSPRINT DD     SYSOUT=*
//SYSIN  DD  *
OPTION   PRINT OFFSET=5,FLDTYP=X,VALUE=E0,FLDLEN=1,COND=E,EXITR=EKYZ620X
END
/*
```

Figure 18. Sample JCL to Print IMS DPROP Trace Records with DFSERA10, Exit EKYZ620X

Figure 19 shows the JCL you can use to print only the trace records associated with a DL/I database named CUSTOMER.

- The first OPTION statement instructs DFSERA10 to select all type X'E0' records (VALUE=E0). COND=M means another selection condition follows.
- The second OPTION statement specifies the additional condition that only SNAP records with subcode X'E2' (VALUE=S) must be selected. COND=M means that another condition follows.
- The third OPTION statement limits the selection to records with a database name of CUSTOMER. COND=E means that this is the last condition. Only records that meet these three conditions are formatted and printed.

```
//EXAMPLE2 EXEC   PGM=DFSERA10
//STEPLIB  DD     DSN=IMSVS.RESLIB,DISP=SHR
//         DD     DSN=DPR.LOAD,DISP=SHR
//EKYRESLB DD     DSN=DPR.LOAD,DISP=SHR
//SYSUT1   DD     DSN=IMS.LOG.SLDS,DISP=SHR,VOL=SER=123456,UNIT=TAPE
//SYSPRINT DD     SYSOUT=*
//SYSIN  DD  *
OPTION   PRINT OFFSET=5,FLDTYP=X,VALUE=E0,FLDLEN=1,COND=M
OPTION   PRINT OFFSET=13,FLDTYP=C,VALUE=S,FLDLEN=1,COND=M
OPTION   PRINT OFFSET=149,FLDTYP=C,VALUE=CUSTOMER,FLDLEN=8,COND=E,EXITR=EKYZ620X
END
/*
```

Figure 19. Sample JCL to Print IMS DPROP Trace Records with DFSERA10, Exit EKYZ620X

For more complete information about using the File Select and Formatting utility (DFSERA10), see *IMS/ESA Utilities Reference: System*.

Interpreting Trace Output

For easier debugging, IMS DPROP trace uses the following call routines.

Call to a Segment Exit Routine

If you request DEBUG level 4, IMS DPROP writes interface information after returning from a Segment exit routine. Figure 20 on page 25 contains an example of the trace of a call to a Segment exit routine.

```
*** 20:36:29.67 90.052  EKYR980X   --RUP--   USER-REQUESTED TRACE/SNAP                             :
    DPR ID   = T096606    IMS ID   = KOEX       USER ID  =
    JOB NAME = T096606R   PSB NAME = KOEPSB3    RECOV TK = 0000000000000000
    DBD NAME = DB1        SEG NAME = SEG1       TAB NAME = TABLE01
    RUP CALL = 00000001   PR ID    = PR001      HUP CALL = 00000000

.                        DAX (SEG-LEVEL-EXIT CB)                                                   :
02F8CD40  C4E5D9E7 C3C4C1E7 00000000 00000000  00000000 00000000 00000000 00000000 *DVRXCDAX........................*
02F8CD60  D5D6C4D3 C4C2F140 40404040 40404040  40404040 40404040 40404040 40404040 *NODLDB1                         *
02F8CD80  40404040 D2D6C5D7 E2C2F340 E2C5C7F1  40404040 40404040 40404040 40404040 *    KOEPSB3 SEG1                *
02F8CDA0  40404040 40404040 40404040 00005194  00000000 02F4A780 00000002 00000078 *            ...M.....4X.........*
02F8CDC0  00000078 00000000 C5E2C140 C2C1E340  C4D7D9E2 C9C5C6C2 D9F1F440 C4C2F140 *........ESA BAT DPRSIEFBR14 DB1 *
02F8CDE0  40404040 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *    ............................*
02F8CE00  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CE20  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CE40  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CE60  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CE80  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CEA0  00000000 00000000 00000000 00000000  00000000 C9E2D9E3 00000000 00000000 *....................ISRT........*
02F8CEC0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CEE0  00004040 00000000 40404040 40404040  40404040 40404040 40404040 40404040 *..  ....                        *
02F8CF00  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02F8CF20  40404040 40404040 00000000 00000000  00000000 00000000 00000000 00000000 *        ........................*
02F8CF40  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CF60  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CF80  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CFA0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F8CFC0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*

.                        SEGMENT BEFORE EXIT-PROCESSSING                                           :
02F4A7C4  0078F6F9 02000240 00000003 4012345C  40F2F2F3 F4F74001 23456740 01234567 *..69... .... ..* 22347 .... ....*
02F4A7E4  89012345 40E9E9E9 E940F0F2 40C5C6C7  C840C7C7 C7C74000 0240E5C8 40F1F9F8 *I... ZZZZ 02 EFGH GGGG .. VH 198*
02F4A804  F860F1F2 60F3F040 F1F04BF0 F74BF0F8  40F1F9F8 F860F0F2 60F2F260 F1F24BF0 *8-12-30 10.07.08 1988-02-22-12.0*
02F4A824  F44BF0F6 4BF1F2F3 F4F5F640 40404040  40404040 40404040                   *4.06.123456                     *

.                        SEGMENT AFTER EXIT-PROCESSING                                             :
02F95800  0078F6F9 02000240 00000003 4012345C  40F2F2F3 F4F74001 23456740 01234567 *..69... .... ..* 22347 .... ....*
02F95820  89012345 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *I...............................*
02F95840  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F95860  00000000 00000000 00000000 00000000  00000000 00000000                   *........................        *

.                        ANCHOR-AREA                                                               :
02F3D0A0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F3D0C0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
```

Figure 20. Trace of a Call to a Segment Exit Routine

The trace record includes:

- On the first line:
  - Time and date.
  - Name of the module that calls the trace (the module is EKYR980X in the example in Figure 20).
  - Either USER-REQUESTED TRACE/SNAP explaining that the user requested the trace, or ERROR TRACE/SNAP explaining that IMS DPROP created the trace because it detected an error.
- IMS DPROP header information in the next four lines, if IMS DPROP creates the trace in a job step that propagates data.
- DAX control block which is used as an interface between IMS DPROP and the Segment exit routine.
- Segment data before the exit routine is called.
- Segment data after IMS DPROP returns from the exit routine.

- Anchor area associated with the exit routine.

Call to a Field Exit Routine

If you request DEBUG level 4, IMS DPROP writes interface information after returning from a Field exit routine. Figure 21 contains an example of a call to Field exit routine.

```
*** 16:22:43.84 90.197  EKYR050X   --RUP--   USER-REQUESTED TRACE/SNAP                                  :
    DPR ID   = T096606    IMS ID   = KOEX       USER ID  =
    JOB NAME = T096606L   PSB NAME = KOEPSB1    RECOV TK = A268C62D25F2B501
    DBD NAME = DB1        SEG NAME = SEG1       TAB NAME = TABLE01
    RUP CALL = 00000001   PR ID    = PR001      HUP CALL = 00000000

.                       UDT (FLD-LEVEL-EXIT CB)                                                         :
02F664A0  C4E5D9E7 C3E4C4E3 82F061C8 00000000  00000000 00000000 00000000 00000000 *DVRXCUDTB0/H....................*
02F664C0  E2E30000 C5E2C140 C2C1E340 C4D7D9E2  C5D2E8C5 E7C6D3F1 00000000 00000000 *ST..ESA BAT DPRSEKYEXFL1........*
02F664E0  00000000 00000000 00000000 00000000  00000000 C1C10000 00040000 00000000 *....................AA..........*
02F66500  C3400000 00200000 00000000 00000000  00000000 00000000 00000000 00000000 *C ..............................*
02F66520  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F66540  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F66560  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F66580  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F665A0  00000000 E7404000 00000000 40404040  40404040 40404040 40404040 40404040 *....X  .....                    *
02F665C0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02F665E0  40404040 40404040 40404040                                              *                                *

.                       FIELD BEFORE EXIT-PROCESSING                                                    :
02F62BD0  F2F2F2F2                                                                *2222                            *

.                       FIELD AFTER EXIT-PROCESSING                                                     :
02FB5800  F1F1F1F1 F0F0F1F0 F1F1F1F1 F0F0F1F0  F1F1F1F1 F0F0F1F0 F1F1F1F1 F0F0F1F0 *11110010111100101111001011110010*

.                       ANCHOR-AREA                                                                     :
02F520C0  00093008 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02F520E0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
```

Figure 21. Trace of a Call to a Field Exit Routine

The trace record includes the following:

- Time and date.
- Name of the module that calls the trace (the module is EKYR050X in the example contained in Figure 21).
- Either USER-REQUESTED TRACE/SNAP, explaining that the user requested the trace, or ERROR TRACE/SNAP, explaining that IMS DPROP created the trace because it detected an error.
- If IMS DPROP creates the trace in a job step that propagates data, the next four lines provide IMS DPROP header information.
- UDT control block, which is used as an interface between IMS DPROP and the Field exit routine.
- Field data before calling the exit routine.
- Field data after calling the exit routine.
- Anchor area associated with the exit routine.

Call to a Propagation Exit Routine for IMS-to-DB2 Propagation

For HR-propagation, if you request DEBUG level 4, IMS DPROP writes interface information after returning from a Propagation exit routine. Figure 22 on page 27 shows an example of a call to a Propagation exit routine.

```
*** 16:33:09.15 90.197  EKYR990X   --RUP--   USER-REQUESTED TRACE/SNAP                                  :
    DPR ID   = T096606    IMS ID   = KOEX       USER ID  =
    JOB NAME = T096606L   PSB NAME = KOEPSB1    RECOV TK = A268C88134296701
    DBD NAME = DB1        SEG NAME = SEG2       TAB NAME = TAB2
    RUP CALL = 00000002   PR ID    = PR001      HUP CALL = 00000000

.                       PIC (PROPAGATION EXIT CB)                                                       :
02FA9C60  C5D2E8D9 C3D7C9C3 C5D2E8C5 E7D7D9F1  C8D91F00 02FA9000 D7D9F0F0 F1404040 *EKYRCPICEKYEXPR1HR......PR001   *
02FA9C80  D7D9E2C5 E3F14040 F1F9F9F0 60F0F760  F1F660F1 F64BF3F2 4BF3F84B F8F4F6F8 *PRSET1  1990-07-16-16.32.38.8468*
02FA9CA0  F4F00000 40404040 40404040 00000000  00000000 00000000 00000000 00000000 *40..        ....................*
02FA9CC0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9CE0  00000000 C5E2C140 C2C1E340 C4D7D9E2  00000000 00000000 00000000 E7400000 *....ESA BAT DPRS............X ..*
02FA9D00  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9D20  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9D40  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9D60  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9D80  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9DA0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9DC0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9DE0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9E00  40404040 40404040 40404040 40404040  40404040 40404040 00000000 00000000 *                        ........*
02FA9E20  00000000 C4C2F140 40404040 E2C5C7F2  40404040 40404040 40404040 E3C1C2F2 *....DB1     SEG2            TAB2*
02FA9E40  40404040 40404040 40404040 40400000  00000000 00000000 00000000 00000000 *              ..................*
02FA9E60  02FAF3B0 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *..3.............................*
02FA9E80  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9EA0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9EC0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9EE0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9F00  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9F20  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9F40  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
02FA9F60  00000000 00000000 00000000 00000000  E2D8D3C3 C1404040 00000088 00000000 *................SQLCA   ...H....*
02FA9F80  00004040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *..                              *
02FA9FA0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
02FA9FC0  40404040 40404040 C4E2D540 40404040  00000000 00000000 00000001 FFFFFFFF *        DSN     ................*
02FA9FE0  00000000 00000000 40404040 40404040  00000000 00000000                   *........        ........        *
```

Figure 22. Trace of a Call to a Propagation Exit Routine

This trace record includes:

- Time and date.
- Name of the module that calls the trace (the module is EKYR990X in the example contained in Figure 22).
- Either USER-REQUESTED TRACE/SNAP, explaining that the user requested the trace, or ERROR TRACE/SNAP, explaining that IMS DPROP created the trace because it detected an error.
- If IMS DPROP creates the trace in a job step that propagates data, the next four lines provide IMS DPROP header information.
- PIC control block which is used as an interface between IMS DPROP and the Propagation exit routine.

Additional interface information (such as the XPCB, the XSDB control block, and the DL/I data) provided by IMS DPROP to the Propagation exit routine are traced only if you also request DEBUG level 2. This additional interface information is traced at entry to the RUP.

Call to a Propagation Exit Routine for DB2-to-IMS Propagation

For RH-propagation, if you request DEBUG level 4, IMS DPROP writes interface information before and after invocation of the Propagation exit routine.

Figure 23 contains an example of the trace written before invocation of the Propagation exit routine for RH-propagation.

```
*** 14:50:51.71 93.005  EKYH200X    --HUP--  TRACE  (USERREQ)   BEFORE CALL OF PROPAGATION EXIT ROUTINE :
    DPR ID   = DPM2E      IMS ID   = KOEX       USER ID  =
    JOB NAME = U096277    PSB NAME = T2PSBA     RECOV TK = A6D947AC282F1E11
    DBD NAME = T2DBDPD    SEG NAME =            TAB NAME = TD4000
    RUP CALL = 00000000   PR ID    = ZTD4000    HUP CALL = 00000001

.                       HUP EXTERNAL INTERFACE (HEC) OF EXIT: DPRTPE1
034ADAE0  C5D2E840 C8C5C340 00000000 00000000  03536D00 03536D00 03402310 03582214 *EKY HEC .........._..._.. ......*
034ADB00  00000000 00000000 034ADB20 00000002  00000000 00000000 00000000 00000000 *................................*
034ADB20  E3F2C4C2 C4D7C440 E2C4F0F0 F0F04040  40404040 40404040 E3F2C4C2 C4D7C440 *T2DBDPD SD0000          T2DBDPD *
034ADB40  E2C4F4F0 F0F04040 C8E4D7D7 C3C2C440                                      *SD4000  HUPPCBD                 *
```

Figure 23. Trace Before the Call to a Propagation Exit Routine for RH-Propagation

This trace record includes:

- Time and date.
- Name of the module that calls the trace. (the module is EkYH200X in the example contained in Figure 22).
- Either “USERREQ,” explaining that the user requested the trace, or “ERROR,” explaining that IMS DPROP created the record after detecting an error.
- Following four lines provide IMS DPROP header information.
- HEC control block which is used as an interface between IMS DPROP and the Propagation exit routine.

Figure 24 on page 29 contains an example of the trace written after invocation of the Propagation exit routine for RH-propagation.

```
*** 14:51:10.71 93.005  EKYH200X    --HUP--  TRACE  (USERREQ)   AFTER RETURN OF PROPAGATION EXIT ROUTINE:
    DPR ID   = DPM2E      IMS ID   = KOEX       USER ID  =
    JOB NAME = U096277    PSB NAME = T2PSBA     RECOV TK = A6D947AC282F1E11
    DBD NAME = T2DBDPD    SEG NAME = SD4000     TAB NAME = TD4000
    RUP CALL = 00000000   PR ID    = ZTD4000    HUP CALL = 00000001

.                        PROPAGATION EXIT INTERFACE (PIC) OF EXIT: DPRTPE1
034ADB80  C5D2E8D9 C3D7C9C3 C4D7D9E3 D7C5F140  D9C80700 03536000 E9E3C4F4 F0F0F040 *EKYRCPICDPRTPE1 RH....-.ZTD4000 *
034ADBA0  D7D9E2C5 E3F14040 F1F9F9F3 60F0F160  F0F560F1 F34BF2F6 4BF1F34B F4F5F4F3 *PRSET1  1993-01-05-13.26.13.4543*
034ADBC0  F6F70000 C8E4D7D7 C3C2C440 00000000  00000000 00000000 00000000 00000000 *67..HUPPCBD ....................*
034ADBE0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADC00  00000000 C5E2C140 C2C1E340 C4D7D9E2  00000000 00000000 00000000 E7400000 *....ESA BAT DPRS............X ..*
034ADC20  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADC40  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADC60  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADC80  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADCA0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADCC0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADCE0  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADD00  40404040 40404040 40404040 40404040  40404040 40404040 40404040 40404040 *                                *
034ADD20  40404040 40404040 40404040 40404040  40404040 40404040 00000000 00000000 *                        ........*
034ADD40  00000000 E3F2C4C2 C4D7C440 E2C4F4F0  F0F04040 E3F0F9F6 F6F3F040 E3C4F4F0 *....T2DBDPD SD4000  T096630 TD40*
034ADD60  F0F04040 40404040 40404040 40400000  00000000 00000000 00000000 00000000 *00            ..................*
034ADD80  034AD750 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *..P&............................*
034ADDA0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADDC0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADDE0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADE00  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADE20  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADE40  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADE60  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADE80  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADEA0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADEC0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADEE0  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADF00  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADF20  00000000 00000000 C4C6E2C1 C9C24040  00000080 00000000 00000000 C8E4D7D7 *........DFSAIB  ............HUPP*
034ADF40  C3C2C440 00000000 00000000 00000000  00000000 00000022 00000022 00000000 *CBD ............................*
034ADF60  00000000 00000000 00000000 00000000  00000000 000AE828 00000000 00000000 *......................Y.........*
034ADF80  00000000 00000000 00000000 00000000  00000000 00000000 00000000 00000000 *................................*
034ADFA0  00000000 00000000 00000000 00000000  00000000 00000000                   *........................        *
```

Figure 24. Trace After the Call to a Propagation Exit Routine for RH-Propagation

This trace record includes:

- Time and date.
- Name of the module that calls the trace. (the module is EKYH200X in the example contained in Figure 24).
- Either “USERREQ” explaining that the user requested the trace, or “ERROR,” explaining that IMS DPROP created the record after detecting an error.
- Following four lines provide IMS DPROP header information.
- PIC control block which is used as an interface between IMS DPROP and the Propagation exit routine.

The following additional interface information, provided by IMS DPROP to the Propagation exit routine, is also traced:

- CDCDA when DEBUG level 2 is selected.
- DB2 Changed Data Capture Data Description (CDCDD) when DEBUG level 4 is selected.

Figure 25 contains an example of the tracing of the CDCDD.

```
*** 14:50:51.24 93.005  EKYH020X    --HUP--  TRACE  (USERREQ)   AFTER CHANGED DATA SELECTED FOR PROCESS :
    DPR ID   = DPM2E      IMS ID   = KOEX       USER ID  =
    JOB NAME = U096277    PSB NAME = T2PSBA     RECOV TK = A6D947AC282F1E11
    DBD NAME =            SEG NAME =            TAB NAME =
    RUP CALL = 00000000   PR ID    =            HUP CALL = 00000001

.                       DB2 CHANGED DATA CAPTURE DEFINITION RECORD (CDCDD): T096630.TD4000
03522160  00000560 E2000000 00000000 E3F0F9F6  F2F7F740 E3C1C2D3 C5F0F140 40404040 *...-S.......T096630 TD4000      *
03522180  40404040 40401992 12231622 05723475  00000000 00000000 00000000 0022C4BF *      .K......................D.*
035221A0  FA5E0000 00226E98 6C030000 00000000  00000000 C3C4C3C4 C4404040 0000050C *.;....>Q%...........CDCDD   ....*
035221C0  001D001D 01C40006 000001F4 00000000  0004C3D6 D3F14040 40404040 40404040 *.....D.....4......COL1          *
035221E0  40404040 40404040 40404040 40404040  01F40002 00000000 00000006 0004C3D6 *                .4............CO*
03522200  D3C24040 40404040 40404040 40404040  40404040 40404040 40404040 01F40002 *LB                          .4..*
03522220  00000000 00000008 0004C3D6 D3C84040  40404040 40404040 40404040 40404040 *..........COLH                  *
03522240  40404040 40404040 01F00004 00000000  0000000A 0004C3D6 D3C64040 40404040 *        .0...........COLF       *
03522260  40404040 40404040 40404040 40404040  40404040 01E40500 00000000 0000000E *                    .U..........*
03522280  0004C3D6 D3D74040 40404040 40404040  40404040 40404040 40404040 40404040 *..COLP                          *
035222A0  01E40501 00000000 00000011 0004C3D6  D3E94040 40404040 40404040 40404040 *.U............COLZ              *
035222C0  40404040 40404040 40404040 01E00004  00000000 00000014 0004C3D6 D3C54040 *            ..............COLE  *
035222E0  40404040 40404040 40404040 40404040  40404040 40404040 01E00008 00000000 *                        ........*
03522300  00000018 0004C3D6 D3C44040 40404040  40404040 40404040 40404040 40404040 *......COLD                      *
03522320  40404040 01C40006 000001F4 00000020  0004C3D6 D3C34040 40404040 40404040 *    .D.....4......COLC          *
03522340  40404040 40404040 40404040 40404040  01C00004 000001F4 00000026 0005C3D6 *                .......4......CO*
03522360  D3E5C340 40404040 40404040 40404040  40404040 40404040 40404040 01D40004 *LVC                         .M..*
03522380  0000FFFE 0000002C 0004C3D6 D3C74040  40404040 40404040 40404040 40404040 *..........COLG                  *
035223A0  40404040 40404040 01D00004 0000FFFE  00000030 0005C3D6 D3E5C740 40404040 *        ..............COLVG     *
035223C0  40404040 40404040 40404040 40404040  40404040 0180000A 000001F4 00000036 *                    .......4....*
035223E0  0004C3D6 D3C14040 40404040 40404040  40404040 40404040 40404040 40404040 *..COLA                          *
03522400  01840008 000001F4 00000040 0004C3D6  D3E34040 40404040 40404040 40404040 *.D.....4... ..COLT              *
03522420  40404040 40404040 40404040 0188001A  000001F4 00000048 0004C3D6 D3E24040 *            .H.....4......COLS  *
03522440  40404040 40404040 40404040 40404040  40404040 40404040 01F00004 00000000 *                        .0......*
03522460  00000062 0005C3D6 D3C2C640 40404040  40404040 40404040 40404040 40404040 *......COLBF                     *
03522480  40404040 01E40501 00000000 00000066  0005C3D6 D3C2D740 40404040 40404040 *    .U............COLBP         *
035224A0  40404040 40404040 40404040 40404040  01F00004 00000000 00000069 0005C3D6 *                .0............CO*
035224C0  D3C8C640 40404040 40404040 40404040  40404040 40404040 40404040 01E40601 *LHF                         .U..*
035224E0  00000000 0000006D 0005C3D6 D3C8D740  40404040 40404040 40404040 40404040 *......._..COLHP                 *
03522500  40404040 40404040 01F40002 00000000  00000071 0005C3D6 D3C6C840 40404040 *        .4...........COLFH      *
03522520  40404040 40404040 40404040 40404040  40404040 01E40601 00000000 00000073 *                    .U..........*
03522540  0005C3D6 D3C6D740 40404040 40404040  40404040 40404040 40404040 40404040 *..COLFP                         *
03522560  01F40002 00000000 00000077 0005C3D6  D3D7C840 40404040 40404040 40404040 *.4............COLPH             *
03522580  40404040 40404040 40404040 01F10004  00000000 80000079 0005C3D6 D3D7C640 *            .1............COLPF *
035225A0  40404040 40404040 40404040 40404040  40404040 40404040 01E00008 00000000 *                        ........*
035225C0  0000007F 0005C3D6 D3C5C440 40404040  40404040 40404040 40404040 40404040 *..."..COLED                     *
035225E0  40404040 01E10004 00000000 80000087  0005C3D6 D3C4C540 40404040 40404040 *    ...........G..COLDE         *
03522600  40404040 40404040 40404040 40404040  01C10004 000001F4 8000008D 0006C3D6 *                .A.....4......CO*
03522620  D3C3E5C3 40404040 40404040 40404040  40404040 40404040 40404040 01C40004 *LCVC                        .D..*
03522640  000001F4 00000095 0006C3D6 D3E5C3C3  40404040 40404040 40404040 40404040 *...4...N..COLVCC                *
03522660  40404040 40404040 01D00004 0000FFFE  00000099 0006C3D6 D3C7E5C7 40404040 *        ...........R..COLGVG    *
03522680  40404040 40404040 40404040 40404040  40404040 01D40004 0000FFFE 0000009F *                    .M..........*
035226A0  0006C3D6 D3E5C7C7 40404040 40404040  40404040 40404040 40404040 40404040 *..COLVGG                        *
```

Figure 25. Trace of CDC Data Description

This trace record includes:

- Time and date.
- Name of the module that calls the trace. (the module is EKYH020X in the example contained in Figure 25).
- Either “USERREQ,” explaining that the user requested the trace, or “ERROR,” explaining that IMS DPROP created the record after detecting an error.
- Next four lines provide IMS DPROP header information.
- DB2 CDCDD which is passed to the Propagation exit routine.

IMS Log Records Written by IMS DPROP

During synchronous or asynchronous propagation with the RUP and HUP, IMS DPROP writes trace records and error message records to the IMS log, if the appropriate DEBUG level is specified.

RUP and HUP Error Reporting for Synchronous and Asynchronous Propagation

After detecting an error, the RUP and HUP provide the following kinds of diagnostic information:

- Write-to-operator (WTO) messages to the MVS console (for synchronous propagation only).
- Error messages to the audit trail.
- Error messages to the trace data set, which can be either the IMS log, the //EKYTRACE data set, or //EKYLOG data set.
- Error messages to the //EKYPRINT data set.
- SNAPs to the trace data set, as appropriate.

  SNAPs signaled by IMS DPROP include interface information between IMS DPROP and its caller. SNAPs signaled by the user exit routine include interface information between the user exit routine and IMS DPROP.

For ERROPT=IGNORE: For PRs with error option IGNORE, you can limit the number of error messages sent to the MVS console and the audit trail during each 15-minute interval, provided the failure does not cause an abend or a backout. You set the desired maximum values on parameters on the ERRCTL control statement of the SCU. These parameters are:

MAXPR Limits the number of messages sent to the MVS console or the audit trail for individual PRs. This value can also be set during PR generation, using DataRefresher or the MVGU.

MAXSSWTO Limits the number of messages sent to the MVS console for the whole IMS DPROP system.

MAXXAUD Limits the number of messages sent to the audit trail for the whole IMS DPROP system.

For information about using the ERRCTL control statement of the SCU, see the *Reference* manual.

The RUP's and HUP's error reporting logic for ERROPT=IGNORE: For individual PRs and the entire IMS DPROP system, IMS DPROP counts the error messages written to the console and audit trail in the Virtual Lookaside Facility (VLF) during one monitoring cycle. It compares these counts to the maximum values defined in the IMS DPROP directory, as shown in Figure 26. When the maximum number of propagation failures is exceeded, IMS DPROP stops writing error messages to either the console or the audit trail or both.

Figure 26 (Page 1 of 2). Error Message Output

Table	Field	Specifies
IMS DPROP PR mapping table	MAXERROR	Maximum number of propagation failures that each PR can report to the console and audit trail within each cycle

Figure 26 (Page 2 of 2). Error Message Output

Table	Field	Specifies
IMS DPROP master table	MAXWTO	Maximum number of propagation failures that the whole IMS DPROP system can report to the console within each cycle
IMS DPROP master table	MAXAUD	Maximum number of propagation failures that the whole IMS DPROP system can report to the audit trail within each cycle

If the VLF is not available, IMS DPROP does not suppress error messages unless the IMS DPROP system or the failing PR has a maximum error value of zero. If the VLF is available, but the VLF class used by IMS DPROP is too small to contain all the IMS DPROP VLF objects of IMS DPROP, then the VLF can delete the objects used to store error counts.

Even if message suppression is in effect, IMS DPROP writes all error messages to the trace data set (IMS log or //EKYTRACE or //EKYLOG data set) and the //EKYPRINT data set. IMS DPROP also writes at least one error message on the JES log and the console for each batch, BMP, or MPP job step that encounters a propagation failure.

When called by the CCU or the DLU, the RUP and HUP write error messages to the //CCUPRINT data set and the //EKYTRACE or //EKYLOG data set, and return an error code to the CCU or DLU. This allows the CCU or DLU to detect as many errors as possible in a single run.

Audit Trail

IMS DPROP records all important propagation events in the audit trail. The audit trail represents a repository of information that can be especially useful when problem diagnosis requires information about previous propagation events. The audit trail includes the following types of information:

- Error messages issued by the RUP and HUP
- Status changes made with the SCU
- Execution of programs in propagation-off and propagation-suspended modes
- Execution of the CCU
- Execution of the Mapping Verification and Generation component (MVG)
- Warning messages issued by MVG
- Significant events in Selector, Receiver, SCF or Time Stamp Marker Facility processing.

IMS DPROP writes audit trail records to System Management Facilities (SMF). The Audit Extract utility can load the SMF records into a DB2 table to make the audit trail information available for QMF queries.

The audit trail and the IMS DPROP trace serve different purposes. The audit trail stores *overview* information whereas the IMS DPROP trace stores *detailed* information, such as changed DL/I data and all propagating SQL statements. You can use the audit trail to answer, for example, the following questions:

- When was the last execution of the CCU?
- When was the last time the data was known to be consistent?

- When was data propagation suspended or deactivated?
- When did the RUP or the HUP report problems?
- When was the latest PR regenerated?

LOG-Asynchronous Propagation Only

- Did the Selector run complete normally?
- What groups did the Selector process successfully?
- What Propagation Request Datasets (PRDSs) have been registered by the PRU?
- What groups have been added to or deleted from the Selector Control File?
- What IMS Subsystems have been defined in the SCF?
- What stop timestamps have been created/deleted for a group?
- What quiesce timestamps have been created/deleted for a database?
- What databases have had start timestamps assigned?

End of LOG-Asynchronous Propagation Only

How the RUP and HUP Use the Audit Trail

After detecting propagation errors, the RUP and HUP create a header and then write the error message. The RUP and HUP can flood the audit trail with messages when the error option for a PR is IGNORE and the error did not cause an abend or a backout. To prevent this from happening, you can specify the maximum number of propagation errors that IMS DPROP is allowed to record for a PR during each error-reporting cycle.

The SCU allows you to reset the error counts to zero and start a new error-reporting period. Once you do this, IMS DPROP resumes writing error messages to the Audit Trail and to the OS/VS consoles. You may want to start a new error-reporting period after fixing a propagation problem so you can immediately see if IMS DPROP is still encountering the same problem.

For certain PRs, the database administrator may want to set the maximum number of recorded errors to zero. This can be useful if the PRs generate situations that IMS DPROP considers as propagation failures.

If you limited or suppressed message writing to the audit trail, the MVS console, or both, the RUP and HUP continue to write all error messages to the IMS trace data set (the IMS log, the //EKYTRACE, or //EKYLOG data set) and the //EKYPRINT data set.

For detailed information about how the RUP and HUP report error messages to the audit trail, see "RUP and HUP Error Reporting for Synchronous and Asynchronous Propagation" on page 31.

How the CCU Uses the Audit Trail

When writing to the audit trail, the CCU creates the appropriate header information followed by at least one record for each phase of processing.

For a description of the format of the audit trail records and information about accessing them, see *IMS DPROP Reference*.

How the DLU Uses the Audit Trail

Each DLU job step writes the following records to the audit trail:

- A start record
- A statistic record
- An end record

The end record includes the following information:

- IMS database name
- Return code
- DLU program name

Consistency Check Utility (CCU)

The CCU checks the consistency of propagated data between DL/I databases and the target DB2 tables. Its main functions are to:

- Compare the propagated data at the IMS field level and the DB2 column level for consistency.
- Report detected inconsistencies.
- Create files of SQL and DL/I and DL/I repair statements that the database administrator can use to resolve the inconsistencies.

You can check data consistency at the following times:

- Periodically to make sure the data on both sides is consistent.
- When you propagate new data.
- After you change propagation definitions.
- After a propagation failure.
- After application program errors.
- After an IMS or DB2 database reload.
- After operator errors.
- Periodically to compare IMS and DB2 data.

If the CCU finds any inconsistencies, you can use the DSNTEP2 utility to repair the DB2 data and the DFSDDLT0 program to repair the IMS data.

For information about the CCU, see the *Reference* manual and the *IMS DPROP Reference*. For information about the DSNTEP2 utility, refer to the *DB2 Command and Utility Reference*.

Message Mapping Table in the IMS DPROP Directory

The IMS DPROP directory consists of a set of tables used by the IMS DPROP system. One of the tables in this set is the message (MSG) mapping table. It contains warning messages issued by the MVG component during the creation of PRs. The MSG mapping table is useful for analyzing propagation failures for a specific PR or for specific data.

Figure 27 shows the layout of the MSG table. If the MVG finds no errors, the table is empty. Otherwise, it contains one or more rows.

Figure 27. The MSG Mapping Table

Name	Data Type	Contents	Description
PRID	char(8)	PR ID	Propagation request identifier.
MESSAGE	char(8)	Message number	The message number issued by MVG.
SEQUENCE	smallint	Sequence number	The sequence number if several messages are identical. The default is 1.
DBNAME	char(8)	Database name	Database name.
SEGNAME	char(8)	Segment name	Segment name.
TABQUAL	char(8)	Table qualifier	Used to access the DB2 catalog.
TABNAME	char(18)	Table name	Table name.
DPRNAME	char(8)	IMS DPROP name	IMS DPROP directory identifier chosen by the database administrator.
DPRTOKEN	dec(15,0)	IMS DPROP token	IMS DPROP token generated by IMS DPROP.
TEXT	varchar(254)	Message text	Message text.
ORIGIN	char(1)	Message origin	Indicates if the message was issued during a PR creation (blank) or a PR revalidation (R).

Messages and Codes

IMS DPROP issues messages that identify any errors that occur during processing. For some errors, IMS DPROP also issues an abend code and a reason code that identifies the error and the module that detected the error. Each IMS DPROP component issues a different abend code. Each reason code identifies the module and the reason for the error. To avoid confusion, IMS DPROP uses different abend codes from those used by IMS, DB2, and DataRefresher. See the *IMS DPROP Messages and Codes* for a description of messages, abends, and reason codes issued by IMS DPROP components.

SQL Error Codes

After detecting an SQL error code, IMS DPROP writes message EKYZ360E, which includes the error description provided by the DSNTIAR module of DB2. In addition, IMS DPROP writes messages with the following information:

- DB2 table name.
- Type of SQL operation.
- Key of any row accessed.

  For example, the key for the PR table can be the PR ID while the key for the SEG table can be the PR ID, database name, and the segment name.

IMS DPROP also issues several error messages for each propagation failure the SQL Update Module detects. Each message provides details about the error.

Refer to the *IMS DPROP Messages and Codes* for a description of IMS DPROP messages.

MQ Error Codes

After detecting an MQ error code, IMS DPROP writes message EKYZM89E, which contains the following information:

- Queue Manager Name
- Queue Name
- Issued MQ function
- Return code from MQ
- Reason code from MQ
- Error text explanation

DL/I Status Codes

When a non-blank DL/I status code is detected, IMS DPROP writes one of the following message:

- EKYZ380E
- EKYZ381E
- EKYZ382E

These messages include the following information:

- AIB subfunction code
- PCB name used for the DL/I call
- AIB return code from the DL/I call
- AIB reason code from the DL/I call

The message EKYZ380E contains in addition the:

- DBD name
- Segment name
- Status code

The message EKYZ381E contains in addition:

- Terminal name
- Userid
- Status code

IMS DPROP also issues the error message EKY2380E, EKY2381E, or EKY2382E for each propagation failure detected. Refer to the *IMS DPROP Messages and Codes* for a detailed description of the error messages.

Chapter 6. Asynchronous Propagation Problem Determination

The following describes possible steps to determine the solution when the IMS Archive, the Selector, the PRU, and the Receiver are all successful but committed IMS updates have not been propagated to DB2. It assumes that you have already made an attempt to ensure that the suspected failure is a not a user error or the result of an incorrect usage of IMS DPROP.

The information is divided into the following areas:

- “Problem Determination 0100: Receiver”
- “Problem Determination 0110: PRU Component” on page 39
- “Problem Determination 0120: Selector Component” on page 40

A series of questions guides you through possible reasons for errors. Solutions for a number of the errors are provided. You should contact your IBM Support Center for assistance if the possible reasons provided here do not help you to resolve the problem.

Problem Determination 0100: Receiver

001

Was the Receiver processing the right group?

Yes No

002

– Ensure the correct Receiver has been specified before resubmitting the job.

003

Was the correct PR assigned to the Receiver?

Yes No

004

– Ensure that the correct PR has been assigned and resubmit the job.

005

Did the Receiver complete with a return code of zero despite a PR failure being reported in the //EKYPRINT data set?

(The ERROPT for the PR failure is set to 'IGNORE'?)

Yes No

006

(Step **006** continues)

006 (continued)

Did the Receiver process the PRDS's sequentially, starting from the previous finishing point without using the NEXTPRDS operand, and processing to the end of the latest registered PRDS?

Yes No

007

– Resynchronize the DB2 target tables at a valid synchronization point (see the section on setting synchronization points, method 1 in the appropriate *Administrators Guide* for your propagation mode) and rerun the Receiver from the correct PRDS using the NEXTPRDS operand. The Receiver will process to the end of the latest registered PRDS. The Receiver ensures that the intermediate PRDS's are processed sequentially.

008

Was the PRDS with the “committed IMS update” registered?

(Check the query PRDSREG tables to see whether the PRDS is registered.)

Yes No

009

– Continue at “Problem Determination 0110: PRU Component” on page 39

010

Was the committed IMS update selected?

Yes No

011

– Continue at “Problem Determination 0120: Selector Component” on page 40.

012

A problem exists with the Receiver.
The Receiver is not propagating a committed IMS update captured on a PRDS which it is processing even though the relevant PR has been assigned to the Receiver and there are no failures reported for the PR.
Contact your IBM Support Center for assistance.

013

Fix the PR that failed.

Use the SCU to change the ERROPT for the PR's to BACKOUT and resynchronize the DB2 target tables at a valid synchronization point (see the section on setting synchronization points, method 1 in the appropriate *Administrators Guide* for your propagation mode) and rerun the Receiver from the correct PRDS using the NEXTPRDS operand. The Receiver will process to the end of the latest registered PRDS. The Receiver ensures that the intermediate PRDS's are processed sequentially.

Problem Determination 0110: PRU Component

001

Was the PRU executed with the correct REGISTER statement with the correct values for DSN, LEVEL or ENTRIES being used for the PRDS?

The PRU control statements are produced in the //EKYPREG data set by the Selector. If you are using this data set as input to the PRU, check the control statements used.

Yes   No

002

– Run the PRU with the correct control statements to register the required PRDS's and reexecute the Receiver.

003

Was the PRDS Unregistered before it was applied by all the appropriate Receivers?

Yes   No

004

– Run the PRU with the correct control statements to register the required PRDS's and reexecute the Receiver.

005

The PRDS has not been registered even though the PRU has been executed with the correct control statements and the PRDS has not been unregistered before the Receiver processed it.

Contact your IBM Support Center for assistance.

Problem Determination 0120: Selector Component

If committed IMS updates have not been put on the PRDS by the Selector, use the following set of questions to determine the cause of this problem.

001

Were the 9904 log records and the appropriate commit or abort records written to the IMS log and optionally to the CDCDS?

Yes No

002

- Edit the IMS database definition (DBD) to ensure that the EXIT keyword is specified correctly for the whole database or for each individual segment that sources propagation data.

  Regenerate the database definition and perform any ACBGEN changes online if you are using an online IMS system.

  Establish a NEW Synchronization Point (see the section on setting synchronization points, method 2 in the appropriate *Administrators Guide* for your propagation mode) re-extract and load the DB2 target tables, and restart Asynchronous Propagation.

003

Were the correct logs located from the DBRC RECON dataset by the Selector?

Check the Selector output (//SELPRINT) dataset to see the list of logs located by the Selector.

The following criteria are applied when locating the logs:

- Selector Start Time and Selector Stop Time
- Source database was allocated to the log
- In online situations, the SSID of the IMS subsystem producing the log

Note: The log files (SLDSs, CDCDSs, and batch logs) must be catalogued.

Yes No

004

Was the committed IMS update made between the Selector Start and Stop Times?

Yes No

005

- Rerun the Selector with the correct Start and Stop Times. You may also need to run the SCU TSMF control statements to reset the Start Times and this in turn may require a resynchronization of the DB2 target tables.
- Rerun the PRU to register the new PRDSs.
- You will also need to rerun the Receiver from the correct PRDS using the NEXTRPDS operand to the end of the latest registered PRDS. The Receiver ensures that the intermediate PRDS's are processed sequentially.

– If the Selector Stop Time was too early, you only need to run the Selector again to a later time. The committed IMS update should be selected.

006

Was the Group sensitive to the source DB in which the committed IMS update was made?
Yes No

007

– Use the GUU, SCF Compare and SCF Apply programs to update the SCF with the correct Group or DB records or manually update the SCF using the SCF Apply program and the SCF control statements.

- Resynchronize the DB2 target database at a valid synchronization point (see the section on setting synchronization points, method 1 in the appropriate *Administrators Guide* for your propagation mode)
- Assign the appropriate Group or Database Start Time for all the Group and Database records and rerun the Selector for the Group.
- Register the PRDS
- Run the Receiver from this PRDS (using NEXTPRDS=).

008

Was the Selector searching for logs from all the IMS Subsystems which are allowed to update the source database?
Default SSID's can be used (SCF 0101 records or group specific SSID's can be used (SCF 0301 records).
Yes No

009

– Use the SCF Apply program to add the correct SSID either as a default SSID or as a group specific SSID.

010

– A problem exists regarding the procedure the Selector is using to locate logs. Contact your IBM Support Center for assistance.

011

If the logs were correctly located, were the log records selected for each group?

Log records are selected for each Group specified in the Selector Control Statements. A separate PRDS is created for each group. Any log records selected for a group are written to the PRDS for the group. A log record can be selected for more than one group and the record is written to a PRDS for each group.

Log records are selected for each group based on the following:

- Group Start Time and Group Stop Time
- Group Sensitivity
- Whether the IMS update was committed

Yes No

012

Was the Selector update committed within the selection period.
Yes No

013

– The Selector is functioning as designed. The Uncommitted Log record should have been written to the Uncommitted Log Record data set.

014

Was the committed IMS update made in the time between the Group Start Time and the Group Stop Time?
Yes No

015

– If a new Group or DB2 Start Time was assigned before the Selector commenced, and the time is incorrect, use the SCU and ASSIGNTSM operand again with the values you require.

If the Group Start Time specified was too early, run the Selector again specifying a later time.

016

Was the Group sensitive to change in the IMS Database at a DB level, Segment level, or field level and is that sensitivity consistent with the PR definitions that source data from this database?
Yes No

017

– Use the GUU, SCF Compare and the SCF Apply programs to update the SCF with the correct Group Sensitivity records or manually update the SCF with the SCF Apply program and the necessary SCF control statements.

- Resume the DB2 target database at a valid synchronization point (see the section on setting synchronization points, method 1 in the appropriate *Administrators Guide* for your propagation mode)
- Assign the appropriate Group or Database Start Time for all the Group and Database records and reexecute the Selector for the Group.
- Register the PRDS
- Run the Receiver from this PRDS using the NEXTPRDS operand.

018

– Contact your IBM Support Center for assistance.

019

Did the Selector write the correct Register control statements to the //EKYPREG data set.

Yes No

020

– Contact your IBM Support Center for assistance.

021

– The Selector is functioning as designed.

Bibliography

The IMS DataPropagator for z/OS Version 3 Release 1 Library

Order Number	Book Title
GC27-1216	Administrators Guide for Log Asynchronous Propagation
GC27-1217	Administrators Guide for MQSeries Asynchronous Propagation
GC27-1215	Administrators Guide for Synchronous Propagation
SC27-1544	Concepts
GC27-1214	Customization Guide
GC27-1209	Diagnosis
GC27-1211	An Introduction
GC27-1212	Installation Guide
GC27-1213	Messages and Codes
GC27-1210	Reference
GC27-1208	Licensed Program Specification

Other Books Referenced in this Book

The following books are referred to in this book:

- *OS/390 MVS System Codes*, GC28-1644
- *OS/390 MVS System Messages, Volume 1*, GC28-1656
- *OS/390 MVS System Commands*, GC28-1826
- *OS/390 MVS System Management Facilities*, GC28-1628
- *IMS/ESA Utilities Reference: System*, SC26-4629
- *IMS/ESA Messages and Codes*, SC26-3071
- *DB2 Command and Utility Reference*, SC26-4891
- *A Structured Approach to Describing and Searching Problems*, SC34-2129

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Programming Interface Information

This manual is intended to help you diagnose problems in Data Propagator/Enterprise System Architecture (DPROP). This manual documents information that is diagnosis, modification or tuning information provided by DPROP.

Warning: Do not use this diagnosis, modification or tuning information as a programming interface.

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Glossary

A

abort record. An IMS DataPropagator propagation log record (38*nn* or 5938), indicating that the associated unit of work will not be committed by IMS and should not be propagated to DB2. *Compare with commit record*.

ACB. Application control block. Located in IMS.

Apply Program. A component of IMS MQ-DPROP that reads the MQSeries messages containing the changed data and passes it to the RUP. RUP transforms the changed data into relational format and updates the DB2 target tables.

Archive utility. A utility that filters out propagation log records from the records written to the IMS logs and writes them to Changed Data Capture data sets (CDCDSs).

Audit Extract utility. An IMS DPROP utility that inserts the IMS DPROP audit records written to SMF into the IMS DPROP audit table.

ACDC. Asynchronous changed data capture.

asynchronous changed data capture. An IMS function that captures the changes needed for IMS DPROP asynchronous propagation and saves them on the IMS logs. The function is mandatory for IMS DPROP asynchronous propagation and is either implemented by an SPE (IMS 3.1) or built into the program (subsequent releases of IMS).

asynchronous propagation. The propagation of data at a later time, not within the same unit of work as the update call.

AUDU. Audit Extract utility.

B

Batch Log data set. A data set that an IMS batch job uses to store propagation log records needed for IMS DPROP asynchronous propagation.

C

CAF. Call attach facility.

CCU. Consistency Check utility.

CDCDS. Changed Data Capture data sets.

CDCDS Registration utility. An IMS DPROP asynchronous propagation utility that registers new CDCDS to DBRC.

CDCDS Unregistration utility. An IMS DPROP asynchronous propagation utility that deletes CDCDS entries from DBRC.

CDU. CDCDS Unregistration utility.

CEC. central electronics complex.

Changed Data Capture data set (CDCDS). The data sets that the archive utility uses to store the IMS DPROP asynchronous propagation log records filtered during the archive process. CDCDSs contain only the propagation log records. These log records are used by the Selector in place of the corresponding SLDSs, that contain all IMS changes.

Changed Data Capture exit routine. See DB2 Changed Data Capture exit routine

Changed Data Capture function. See DB2 Changed Data Capture function.

commit record. An IMS DPROP asynchronous propagation log record (9928, 37*nn*, 41*nn*, or 5937) indicating that the associated unit of work has been committed by IMS and should be propagated to DB2. *Compare with abort record*.

concatenated key. See “IMS concatenated key” and “conceptual concatenated key.”

conceptual concatenated key. The conceptual concatenated key of a segment consists of the concatenated keys of the segment's immediate physical parent and physical ancestors. Unlike the Conceptual *fully* Concatenated key, the conceptual concatenated key does not include the concatenated key of the segment itself.

conceptual fully concatenated key. The conceptual fully concatenated key is an IMS DPROP concept useful for the propagation of entity segments that do not have a unique IMS fully concatenated key; but that are nevertheless uniquely identifiable.

The conceptual fully concatenated key of a segment consists of these parts:

- the concatenated key of the segment
- the concatenated keys of the segment's physical parent and physical ancestors

The conceptual fully concatenated key is therefore the combination of these parts:

- the IMS fully concatenated key
- the ID fields (if any) of the segment that contribute to the concatenated key of the segment
- the ID fields (if any) of the physical parent or ancestors that contribute to the concatenated keys of the physical parent or ancestor

So, the conceptual fully concatenated key is equal to that hypothetical IMS fully concatenated key, that you would see if including the ID fields into the IMS key-field at each hierarchical level.

The concept of conceptual fully concatenated key allows the support of segments with a unique conceptual fully concatenated key, much in the same way as segments with a unique IMS fully concatenated key.

concatenated key. The concatenated key is an IMS DPROP concept useful for the propagation of entity segments that are neither unique under their parent nor have a unique IMS key, but that are nevertheless uniquely identifiable through ID fields.

The concatenated key is a combination of these fields that identify the segment uniquely under its parent:

- the non-unique IMS key field (if any)
- ID fields

For segments having a unique IMS key field, the conceptual key and the IMS key field are identical.

Consistency Check utility (CCU). An IMS DPROP utility that checks whether the data that has been propagated between IMS and DB2 databases is consistent. If not, it reports the inconsistencies and generates statements the DBA can use to fix the inconsistencies. The CCU is applicable when generalized mapping cases are being used.

containing IMS segment. An IMS segment that contains internal segments (embedded structures) propagated by mapping case 3 Propagation Requests. It is referred to interchangeably as a “containing IMS segment” or “containing segment.”

containing segment. See containing IMS segment.

CRU. CDCDS Registration utility.

D

DBRM. Database Request Module.

Data Capture exit routine. See IMS data capture exit routine.

data capture function. An IMS function that captures the changes needed for data propagation.

DataRefresher. An IBM licensed program that lets you extract selected operational data on a periodic or one-time basis.

Data Extract Manager (DEM). A DataRefresher component that extracts the IMS data to which changes will subsequently be propagated. DEM also creates control statements for the DB2 Load utility to load the extracted IMS data into DB2 tables.

data propagation. The application of changes to one set of data to the copy of that data in another database system. See also synchronous propagation and IMS DPROP asynchronous propagation.

DB2 commit count. The number of IMS commit records that the IMS DPROP asynchronous propagation receiver is to apply to DB2 before it issues a DB2 commit.

DB2 Changed Data Capture exit routine. The routine to which the DB2 Changed Data Capture function passes the DB2 changes it has captured for propagation. This routine can be the IMS DPROP HUP routine, that propagates data, or your own exit routine.

DB2 Changed Data Capture function. A DB2 function that captures the DB2 changes needed for data propagation.

DB2 Changed Data Capture subexit routine. An optional IMS DPROP exit routine invoked whenever the HUP is called by DB2 changed data capture. The DB2 Changed Data Capture subexit routine can typically be used to perform generalized functions such as auditing all of the captured DB2 changes.

DB2-to-IMS propagation. Propagation of changed DB2 tables to IMS segments. It can be either:

- One-way DB2-to-IMS propagation
- DB2-to-IMS propagation, as part of two-way propagation

DBD. Database definition. The collection of macroparameter statements that describes an IMS database. These statements describe the hierarchical structure, IMS organization, device type, segment length, sequence fields, and alternate search fields. The statements are assembled to produce database description blocks.

DBDLIB. Database definition library.

DBPCB. Database program communication block.

DEDB. Data entry database.

DEM. Data Extract Manager.

directory. See IMS DPROP directory.

DLU. DL/1 Load Utilities. IMS DPROP utilities that are used to create (or re-create) the IMS databases from the content of the propagated DB2 tables. You can use DLU if you have implemented DB2 to IMS or two-way propagation.

DPROP-NR. The abbreviation for IBM IMS DataPropagator MVS/ESA through Version 2.2. At Version 3.1 the product name changed to IMS DataPropagator, abbreviated as IMS DPROP.

DataRefresher DEM. DataRefresher data extract manager.

DataRefresher Map Capture exit routine (MCE). See Map Capture exit routine.

DataRefresher UIM. See User Input Manager.

E

EKYMQCAP. The Capture component of MQ-DPROP. EKYMQCAP is an IMS data Capture exit routine. It runs as an extension to the updating IMS application programs, but it is transparent to them. EKYMQCAP obtains the changed data from the IMS Data Capture function and sends this data via MQSeries messages to the Apply Program.

EKYRESLB Dynamic Allocation exit routine. An IMS DPROP exit routine that can be used to allocate dynamically the IMS DPROP load module library to the EKYRESLB DD-name.

entity segment. The data being mapped from IMS to DB2 comes from one single hierarchic path down to a particular segment. This segment is called the entity segment. See also mapping case 1.

ER. Extract request.

Event Marker. A component of MQ-DPROP that runs on the same system as the IMS source databases. It is used to identify an event that occurs on the Source System. The customer must execute the Event Marker on the Source System at the time that the event occurs.

The Event Marker transmits an MQSeries message that identifies the event to the Apply Program. This MQSeries message is transmitted in FIFO sequence and in the same Propagation Data Streams as the changed IMS data.

When an occurrence of the Apply Program processes this message, the content of the target DB2 tables of this occurrence of the Apply Program reflect the content of the IMS source databases at the time that the Event Marker was executed on the Source System.

The Event Marker is used for an automated stop of the Apply Program when the content of the target DB2 tables reflects a particular Source System point in time.

exit routines. IMS DPROP contains seven exit routines. See the individual glossary entries for:

- DB2 Changed Data Capture exit routine
- DB2 Changed Data Capture subexit routine
- IMS Data Capture exit routine
- Field exit routine
- Map Capture exit routine
- Propagation exit routine
- Segment exit routine
- User exit routine

extension segment. The data being mapped from IMS to DB2 comes from a single hierarchic path down to an entity segment and from any segments immediately subordinate to the entity segment. The segments subordinate to the entity segment can have zero or one occurrence beneath a single occurrence of the entity segment. This type of subordinate segment is called an extension segment (as it extends the data in the entity segment). See also mapping case 2.

extract request (ER). A DataRefresher request to extract IMS data. Extract requests become IMS DPROP propagation requests once they are validated by the IMS DPROP MCE.

F

Field exit routine. An IMS DPROP exit routine you can write to complement the logic of IMS DPROP's generalized mapping cases. Field exit routines are typically used to convert an individual IMS data field between a customer format IMS DPROP does not support and a format you have defined in your propagation request.

FIFO. First-In-First-Out

fully concatenated key. See IMS fully concatenated key and conceptual fully concatenated key.

G

generalized mapping cases. The mapping cases provided by IMS DPROP. See mapping case 1, mapping case 2 and mapping case 3.

group definition file. The file that the Group Unload utility (GUU) uses to store the IMS sources that it extracts from the IMS DPROP directory tables. *See also, SCF Compare job and SCF Apply job*.

Group Unload utility (GUU). The IMS DPROP asynchronous propagation utility that extracts details of all IMS sources for the specified propagation group from the IMS DPROP directory tables at the receiver site and writes them to the Group Definitions File. *See also, SCF Compare job and SCF Apply job*.

GUU. Group Unload utility.

H

hierarchical update program (HUP). The IMS DPROP component that does the actual DB2-to-IMS propagation. HUP is the IMS DPROP-provided DB2 Changed Data Capture exit routine. The DB2 Changed Data Capture function calls HUP and provides to HUP the changed IMS rows.

Hierarchical to Relational propagation. This is one-way hierarchical to relational propagation: the one-way propagation of changed IMS segments to DB2 tables. The terms *hierarchical to relational propagation* and *one-way IMS-to-DB2 propagation* are interchangeable.

HUP. Hierarchical Update program.

HSSR. High speed sequential retrieval.

I

ID fields. *Identification (ID) fields* are non-key fields that:

- uniquely identify a segment under its parent
- do not change their value

Typical examples of IMS segments with ID fields, are segments where the data base administrator has not defined the ID fields as part of the IMS Key field. For example because the IMS applications need to retrieve the segment in another sequence than the ascending sequence of the ID fields.

identification fields. See ID fields.

IMS concatenated key. For an IMS segment, the concatenated key consists of:

- The key of the segment's immediate parent, and
- The keys of the segment's ancestors

Unlike the IMS **fully** concatenated key of the segment, the concatenated key does not include the key of the segment itself.

A logical child segment has two concatenated keys: a physical concatenated key and a logical concatenated key. The physical concatenated key consists of the key of the segment's physical parent and the keys of the physical ancestors of the physical parent. The logical concatenated key consists of the key of the segment's logical parent and the keys of the physical ancestors of the logical parent.

IMS Data Capture exit routine. The routine to which the IMS Data Capture function passes the IMS changes it has captured for propagation. For synchronous propagation, this routine can be the IMS DPROP RUP routine, that propagates data, or your own exit routine. For IMS DPROP asynchronous propagation, the data capture exit routine is a program you write that gets the changed data from IMS. Other programs that you write will later invoke IMS DPROP with the changed IMS data.

IMS data capture function. An IMS function that captures the changes needed for data propagation.

IMS DPROP. The abbreviated name for the IBM IMS DataPropagator product. Previously, this product was called IMS DataPropagator, abbreviated as DPROP-NR.

IMS DPROP directory. A set of DB2 tables containing the mapping and control information necessary to perform propagation.

IMS fully concatenated key. For an IMS segment, the fully concatenated key consists of:

- The key of the segment,
- The key of the segment's immediate parent, and
- The keys of the segment's ancestors.

Unlike the IMS concatenated key of the segment, the fully concatenated key includes the key of the segment itself.

IMS INQY data. The first 9904 (update) record in each IMS unit of work (UOW) contains IMS INQY data (transaction name, PSB name, and user ID). This information is written to the PRDS for the propagation group as the first record of the UOW.

IMS log files. The files that IMS uses to store details of all changes to IMS data. See also, batch log data sets, online data sets (OLDSs), system log data sets (SLDSs), and Changed Data Capture data sets (CDCDSs).

IMS logical concatenated key. One of the two IMS concatenated keys of a logical child segment (the other is an IMS physical concatenated key). The logical concatenated key consists of:

- The key of the segment's logical parent, and
- The keys of the physical ancestors of the logical parent.

IMS physical concatenated key. One of the two IMS concatenated keys of a logical child segment (the other is an IMS logical concatenated key). The physical concatenated key consists of:

- The key of the segment's physical parent, and
- The keys of the physical ancestors of the physical parent.

IMS-to-DB2 propagation. This is the propagation of changed IMS segments to DB2 tables. Distinguish between:

- One-way IMS-to-DB2 propagation
- IMS-to-DB2 propagation, as part of two-way propagation

ISC. Inter-system communications.

IXF. Integrated exchange format.

ISPF. Interactive system production facility or Interactive structured programming facility.

internal segments. Internal Segments is the IMS DPROP and DataRefresher term for structures embedded in IMS Segments, that are propagated through mapping case-3 propagation requests. Each embedded structure (i.e. each internal segment), is propagated to a different table; each occurrence of the embedded structure to one row of the table.

invalid unit of work. An IMS UOW that is missing a first record (containing the INQY data). If the IMS DPROP asynchronous propagation Selector detects an invalid unit, it responds according to what you specified on the INVUOW keyword of the SELECT control statements. If you specified:

IGNORE The Selector continues processing

STOP The Selector issues an error message and terminates

L

LOG-ASYNC. The IMS log-based, asynchronous propagation functions of IMS DPROP.

Once the IMS log records are archived (IMS Online Logs) or de-allocated (IMS Batch Logs) by IMS and then stored in time-stamp sequence, LOG-DPROP reads the IMS logs to find the changed data and then stores the changed data in PRDS datasets. The Receiver component of IMS DPROP reads the PRDSs, transforms the data into the relational format, and applies the changes to the target DB2 tables.

See asynchronous propagation.

logical concatenated key. See IMS logical concatenated key

M

MSDB. Main storage database.

Map Capture exit (MCE) routine. The map capture exit routine provided by DPROP. MCE is used when you provide mapping information through DataRefresher. MCE is called by DataRefresher during mapping and data extract to perform various validation and checking operations. The IMS DPROP MCE should be distinguished from the DataRefresher Map Capture exit, the DataRefresher routine that calls MCE.

mapping case. A definition of how IMS segments are to be mapped to DB2 tables. IMS DPROP distinguishes between mapping case 1, mapping case 2, and user mapping cases.

mapping case 1. One of the generalized mapping cases provided by IMS DPROP. Mapping case 1 maps one single segment type, with the keys of all parents up to the root, to a row in a single DB2 table.

mapping case 2. One of the generalized mapping cases provided by IMS DPROP. Mapping case 2 maps one single segment type, with the keys of all parents up to the root, plus data from one or more immediately subordinate segment types (with a maximum of one occurrence of each segment type per parent), to a row in a single DB2 table.

mapping case 3. One of the generalized mapping cases provided by IMS DPROP. Mapping case 3 supports the propagation of segments containing embedded structures. A typical example of an embedded structure is a repeating group of fields.

- each embedded structure can be propagated to/from a different table. Mapping case 3 propagates each occurrence of an embedded structure, with the key of the IMS segment, and the keys of the physical parent and ancestor, to/from a row of one DB2 table.
- the remaining data of the IMS segment (that is the fields that are not located in a embedded structure) can be propagated to/from another table.

Mapping Verification and Generation (MVG). An IMS DPROP component that validates the mapping information for each propagation request and stores it in the IMS DPROP directory. For a propagation request belonging to a generalized mapping case, MVG generates an SQL update module. MVG is invoked internally by MCE and MVGU.

Mapping Verification and Generation utility (MVGU). An IMS DPROP utility invoked by the DBA. MVGU creates propagation requests when DataRefresher is not used to provide mapping information (i.e., when you put the mapping information directly into the MVG input tables). MVGU also deletes or rebuilds propagation requests in the IMS DPROP directory.

MCE. Map Capture exit routine.

MIT. Master Index Table.

master table. The IMS DPROP directory master table, that is created when IMS DPROP is initialized. It consists of one row, containing system and error information.

MCE. Map Capture exit routine.

MQ-ASYNC. The MQSeries-based, asynchronous propagation functions of IMS DPROP.

An IMS Data Capture Exit routine provided by IMS DPROP obtains the IMS Database changes in real time from IMS and sends the changes via MQSeries messages to an IMS DPROP Apply program. The Apply program reads the MQSeries messages, transforms the data into relational format, and then applies the new data to the target DB2 tables.

MQ-ASYNC supports both near-real time propagation and automated point-in-time propagation.

MQSeries. A family of IBM licensed programs that provide message queuing services.

MQSeries for OS/390. The members of the MQSeries that run on OS/390 systems.

MSC. Multisystem communication.

MVG. Mapping Verification and Generation.

MVG input tables. A group of DB2 tables into which the DBA stores propagation request definitions when DataRefresher is not used to provide mapping information. Once the propagation requests are stored, the DBA invokes MVGU. MVGU invokes MVG, that validates the propagation request and copies the mapping definitions from the MVG input tables to the IMS DPROP directory.

MVGU. Mapping Verification and Generation utility.

N

Near RealTime. A delay of only a couple of seconds.

O

OLDS. Online Data Set.

One-way DB2-to-IMS propagation. This is the propagation of changed DB2 tables to IMS segments. Distinguish between:

- One-way DB2-to-IMS propagation
- DB2-to-IMS propagation, as part of two-way propagation

One-way IMS-to-DB2 propagation. This is the propagation of changed IMS segments to DB2 tables. Distinguish between:

- One-way IMS-to-DB2 propagation
- IMS-to-DB2 propagation, as part of two-way propagation

P

persistent MQSeries message. An MQSeries message that survives a restart of the MQSeries Queue Manager.

PCB. Program communication block.

Point In Time Propagation. An Asynchronous propagation is said to operate in 'Point In Time' mode, when the data content of the target databases matches the content of the source databases at a previous, clearly identified Point In Time. For example, a Point In Time Propagation can be used to reflect in the content of the target databases the logical end of a business day, or the logical end of business month, or the end of specific Batch jobstream that updated the source databases.

physical concatenated key. See IMS physical concatenated key.

PR. Propagation request.

PR ID. Propagation request identifier.

PRCT. Propagation Request Control Table

PRDS. Propagation Request Data Set

PRDS register file. A data set created by the IMS DPROP asynchronous propagation Selector that contains details of the associated PRDS.

propagation. See data propagation.

Propagation Data Stream. A stream of changed IMS data that flows in MQSeries messages from the Capture Component of IMS DPROP to the Apply Component of IMS DPROP. Propagation data streams are defined with PRSTREAM control statements in the //EKYTRANS file of EKYMQCAP.

propagation delay. The time elapsed between the update of the IMS source database by the application programs and the update of the target DB2 table by IMS DPROP.

propagation log records. IMS log records that the IMS DPROP asynchronous propagation Selector writes to PRDSs:

- 9904 (update) records
- Commit or abort records
- SETS/ROLS records

Propagation Request data set (PRDS). A sequential file into which the IMS DPROP asynchronous propagation Selector writes all propagation log records for a propagation group.

PRDS register table. An IMS DPROP directory table that is created at the Receiver site when IMS DPROP is installed. The table is initially empty and you must populate it, using the PRU REGISTER control statements.

PRDS Registration utility (PRU). An IMS DPROP asynchronous propagation utility that registers PRDSs in the PRDS Register Table.

Propagation exit routine. An IMS DPROP exit routine you can write to propagate data when the generalized mapping cases don't meet your needs. A Propagation exit routine must provide all the logic for data mapping, field conversion, and propagation.

propagation group. A subset of the propagation requests in the IMS DPROP directory propagation request table (IMS DPROP asynchronous only).

You can define as many propagation groups as you like, but any propagation request can be associated with one and only one propagation group.

propagation request (PR). A request to propagate data between IMS and DB2. You define propagation requests for each segment type that is to be propagated.

PR set. A group of logically related propagation requests, identified by having the same PRSET ID. PR sets are typically used when you propagate the same IMS data to multiple sets of DB2 tables.

propagation request control table (PRCT). An IMS DPROP directory table that is created at the Receiver site when IMS DPROP is installed. It contains details of all propagation requests defined to IMS DPROP and, in combination with the RCT, enables the Receiver to ascertain:

- Which propagation requests are assigned to which Receivers
- The activity status of all defined Receivers
- The activity status of all propagation requests that are assigned to defined Receivers

PRU. PRDS Registration utility.

PSB. Program specification block.

R

RCT. Receiver control table.

Receiver. An IMS DPROP asynchronous propagation component that retrieves the propagation log records from a PRDS and passes them to the RUP, that uses them to update the DB2 target tables.

Applies to LOG-DPROP.

RECEIVER control statement. A control statement that is input directly into the IMS DPROP asynchronous propagation Receiver JCL to specify:

- The name of the Receiver that is to process a PRDS
- The names of the DB2 subsystem to be accessed and the DB2 plan
- The number of committed UOWs to process before a DB2 commit is issued

Applies to LOG-DPROP.

Receiver control table (RCT). An IMS DPROP directory table, that is created at the Receiver site when IMS DPROP is installed. The table is initially empty and you must populate it, using the SCU CREATEREC control statement. It contains details of all Receivers and, in combination with the PRCT, enables the Receiver to ascertain:

- Which propagation requests are assigned to which Receivers
- The activity status of all defined Receivers
- The activity status of all propagation requests that are assigned to defined Receivers

Applies to LOG-DPROP.

Relational to Hierarchical propagation. This is one-way relational to hierarchical propagation: the one-way propagation of changed DB2 tables to IMS segments. The terms *relational to hierarchical propagation* and *one-way DB2-to-IMS propagation* are interchangeable.

relational update program (RUP). The IMS DPROP component that does the actual IMS to DB2 propagation. RUP is the IMS DPROP-provided IMS Data Capture exit routine.

For synchronous propagation, the IMS Data Capture function calls RUP with the changed IMS segments.

For user asynchronous propagation, your routine gets the changes from IMS and later calls RUP.

For IMS DPROP asynchronous propagation, the Receiver gets the changes from the Selector-Receiver Interface and later calls RUP. In either case, RUP propagates the changes to DB2.

RIR. RIR is an IMS DPROP abbreviation for DB2 Referential Integrity Relationship. Database administrators can define RIRs between tables in order to request that DB2 catches and prevents update anomalies in the relational databases.

Implementation of RIRs between propagated tables is:

- Optional for one-way IMS to DB2 propagation
- Strongly recommended for DB2 to IMS and two-way propagation

RTT. Resource translation table.

RUP. Relational Update program.

RUP control block table. A single IMS DPROP directory table that contains one RUP propagation control block (PRCB) for each propagated segment type. Each RUP PRCB contains details of the relevant database and segment.

S

SCF. Selector Control File.

SCF Apply job. Uses the SCF control statements to create new propagation groups and to list and modify existing propagation groups in the SCF.

SCF Compare job. Used to compare the contents of the Group Definitions File with the propagation groups in the SCF and to generate SCF control statements to bring the SCF into line with the Group Definitions File.

SCF control statements. Can be generated automatically by the IMS DPROP asynchronous propagation GUU or input directly into the IMS DPROP asynchronous propagation SCF Apply utility JCL. The control statements modify the contents of the SCF records.

SCU. Status Change utility.

segment exit routine. An IMS DPROP exit routine you can write to complement the logic of the generalized mapping cases. Segment exit routines are typically used to convert a changed data segment from the form it has in your IMS database to a form you have defined in your propagation request.

SELECT control statements. Control statements that are input directly into the IMS DPROP asynchronous propagation Selector JCL to define the execution options for the Selector.

Applies to LOG-DPROP.

Selector. An IMS DPROP asynchronous propagation component that collects propagation log records from the IMS log files and writes them to PRDSs for later processing by the IMS DPROP asynchronous propagation Receiver component.

Applies to LOG-DPROP.

Selector control file. Created at Selector installation or generation time and contains the following control information that is essential to the operation of the Selector:

- Database records and propagation group records
- DBRC information
- Timestamp information

Applies to LOG-DPROP.

SLDS. System Log Data Set.

SNAP. system network analysis program

Source System. An OS/390 system where IMS source databases of the IMS DPROP propagation reside.

SQL update module. A module generated by MVG for each propagation request belonging to a generalized mapping case. An SQL update module contains all the SQL statements required to propagate to DB2 the changed IMS data for that propagation request.

SSM. Subsystem member. An IMS JCL parameter that identifies the PDS member that describes connection between IMS and the DB2 subsystems.

Status Change utility (SCU). An IMS DPROP utility that:

1. Changes the status of propagation requests in the synchronous environment. Propagation requests can be active, inactive, or suspended. The SCU also performs a variety of other service functions.
2. Maintains the Timestamp Marker Facility and populates the RCT and the PRCT in IMS DPROP asynchronous propagation.

synchronous propagation. The propagation of data within the same unit-of-work as the update call.

T

Target System. An OS/390 system where DB2 target tables of the IMS DPROP propagation reside.

Timestamp Marker Facility. Supports the statements that create, assign, and delete timestamp markers in the SCF. It is run as part of the SCU.

TSMF. Timestamp Marker Facility.

TSMF Callable Interface. A facility that allows a user application to create a stop timestamp for one or more propagation groups.

Two-way propagation. The combination of IMS-to-DB2 propagation and DB2-to-IMS propagation for the same data.

TW propagation. See two-way propagation.

U

UIM. User Input Manager.

ULR. Uncommitted Log Record.

uncommitted log records (ULR). When the IMS DPROP asynchronous propagation Selector terminates, it writes all uncommitted log records (propagation log records that have not yet been either committed or aborted by IMS) to the uncommitted log record data set. On a subsequent Selector execution, these records will be either written to the appropriate PRDS (if they have been committed by IMS) or deleted from the uncommitted log record data set (if they have been aborted by IMS).

UOW. Unit of work.

USER-ASYNC. The User asynchronous propagation functions of IMS DPROP.

user exit. See exit routines.

User Input Manager (UIM). A DataRefresher component to which you describe your IMS databases and the mapping between IMS databases and DB2 tables. The mapping is defined by submitting extract requests. You can specify on an extract requests that the UIM is to invoke the DataRefresher Map Capture exit routine provided by IMS DPROP and pass it the DataRefresher mapping definitions of the extract request.

user mapping case. A mapping case you can develop if the generalized mapping cases don't meet your needs.

V

Virtual Lookaside Facility (VLF). An MVS/ESA component that is a specific implementation of data spaces. IMS DPROP exploits VLF for a high-performance retrieval of mapping information and other control information.

VLF. Virtual Lookaside Facility.

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Diagnosis
Version 3 Release 1

Publication No. GC27-1209-00

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