IMS

Application Programming: EXEC DLI Commands for CICS and IMS

Version 9

SC18-7811-00

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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 107.

First Edition (October 2004)

This edition applies to Version 9 of IMS (product number 5655–J38) and to all subsequent releases and modifications until otherwise indicated in new editions.

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About This Book

This information is available as part of the DB2® Information Management Software Information Center for z/OS® Solutions. To view the information within the DB2 Information Management Software Information Center for z/OS Solutions, go to http://publib.boulder.ibm.com/infocenter/dzichelp. This information is also available in PDF and BookManager® formats. To get the most current versions of the PDF and BookManager formats, go to the IMS™ Library page at www.ibm.com/software/data/ims/library.html.

This information is for CICS® application programmers whose programs use EXEC DLI commands in an IMS environment. This book lists and describes the EXEC DLI commands, and explains the procedures for writing application programs. For information on using databases (such as, position in the database, using multiple positioning, and using secondary indexing and logical relationships), see *IMS Version 9: Application Programming: Database Manager*.

Summary of Contents

This book explains the basics of writing the DL/I part of your application program with EXEC DLI commands. It also contains reference information about the parts of an IMS command-level application program such as EXEC DLI commands, system service calls, qualification statements, EXEC DLI options, the DIB (DL/I Interface Block), I/O areas, and status codes. These chapters are for experienced programmers who understand IMS application programming and need only to look up a fact such as the meaning of a particular status code. If you are one of those programmers, you may also want to have *IMS/ESA® Application Programming: EXEC DLI Commands for CICS and IMS Summary on hand*

Prerequisite Knowledge

IBM® offers a wide variety of classroom and self-study courses to help you learn IMS. For a complete list, see the IMS home page on the World Wide Web at: www.ibm.com/ims

This book assumes you are a CICS programmer familiar with the functions, facilities, hardware, and software in *CICS Family: General Information* and from the Library page of the IMS home page on the Web: www.ibm.com/ims.

This book also assumes that, if you plan to write a CICS program, you are familiar with the principles covered in *CICS Transaction Server for z/OS CICS Application Programming* and in other CICS documentation.

IBM Product Names Used in This Information

In this information, the licensed programs shown in Table 1 are referred to by their short names.

Table 1. Licensed Program Full Names and Short Names

Licensed program full name	Licensed program short name
IBM Application Recovery Tool for IMS and DB2	Application Recovery Tool
IBM CICS Transaction Server for OS/390®	CICS

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Table 1. Licensed Program Full Names and Short Names (continued)

Licensed program full name	Licensed program short name
IBM CICS Transaction Server for z/OS	CICS
IBM DB2 Universal Database™	DB2 Universal Database
IBM DB2 Universal Database for z/OS	DB2 UDB for z/OS
IBM Enterprise COBOL for z/OS and OS/390	Enterprise COBOL
IBM Enterprise PL/I for z/OS and OS/390	Enterprise PL/I
IBM High Level Assembler for MVS™ & VM & VSE	High Level Assembler
IBM IMS Advanced ACB Generator	IMS Advanced ACB Generator
IBM IMS Batch Backout Manager	IMS Batch Backout Manager
IBM IMS Batch Terminal Simulator	IMS Batch Terminal Simulator
IBM IMS Buffer Pool Analyzer	IMS Buffer Pool Analyzer
IBM IMS Command Control Facility for z/OS	IMS Command Control Facility
IBM IMS Connect for z/OS	IMS Connect
IBM IMS Connector for Java™	IMS Connector for Java
IBM IMS Database Control Suite	IMS Database Control Suite
IBM IMS Database Recovery Facility for z/OS	IMS Database Recovery Facility
IBM IMS Database Repair Facility	IMS Database Repair Facility
IBM IMS DataPropagator™ for z/OS	IMS DataPropagator
IBM IMS DEDB Fast Recovery	IMS DEDB Fast Recovery
IBM IMS Extended Terminal Option Support	IMS ETO Support
IBM IMS Fast Path Basic Tools	IMS Fast Path Basic Tools
IBM IMS Fast Path Online Tools	IMS Fast Path Online Tools
IBM IMS Hardware Data Compression-Extended	IMS Hardware Data Compression-Extended
IBM IMS High Availability Large Database (HALDB) Conversion Aid for z/OS	IBM IMS HALDB Conversion Aid
IBM IMS High Performance Change Accumulation Utility for z/OS	IMS High Performance Change Accumulation Utility
IBM IMS High Performance Load for z/OS	IMS HP Load
IBM IMS High Performance Pointer Checker for OS/390	IMS HP Pointer Checker
IBM IMS High Performance Prefix Resolution for z/OS	IMS HP Prefix Resolution
IBM Tivoli® NetView® for z/OS	Tivoli NetView for z/OS
IBM WebSphere® Application Server for z/OS and OS/390	WebSphere Application Server for z/OS
IBM WebSphere MQ for z/OS	WebSphere MQ
IBM WebSphere Studio Application Developer Integration Edition	WebSphere Studio
IBM z/OS	z/OS

Additionally, this information might contain references to the following IBM product names:

- ″IBM C/C++ for MVS″ or ″IBM C/C++ for MVS/ESA″ is referred to as either ″C/MVS″ or ″C++/MVS.″
- ″IBM CICS for MVS″ is referred to as ″CICS.″
- ″IBM COBOL for MVS & VM,″ ″IBM COBOL for OS/390 & VM,″ or ″IBM COBOL for z/OS & VM″ is referred to as ″COBOL.″
- ″IBM DataAtlas for OS/2″ is referred to as ″DataAtlas.″
- ″IBM Language Environment for MVS & VM″ is referred to as ″Language Environment.″
- ″IBM PL/I for MVS & VM″ or ″IBM PL/I for OS/390 & VM″ is referred to as ″PL/I.″

How to Read Syntax Diagrams

The following rules apply to the syntax diagrams that are used in this information:

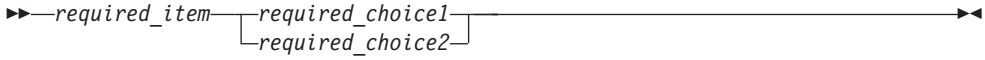
- Read the syntax diagrams from left to right, from top to bottom, following the path of the line. The following conventions are used:
  - The >>--- symbol indicates the beginning of a syntax diagram.
  - The ---> symbol indicates that the syntax diagram is continued on the next line.
  - The >--- symbol indicates that a syntax diagram is continued from the previous line.
  - The --->< symbol indicates the end of a syntax diagram.
- Required items appear on the horizontal line (the main path).

- Optional items appear below the main path.

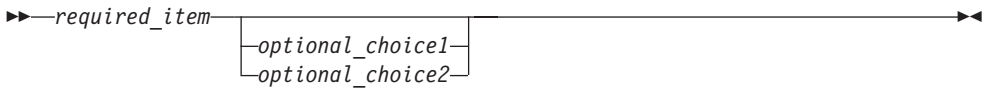
  If an optional item appears above the main path, that item has no effect on the execution of the syntax element and is used only for readability.

- If you can choose from two or more items, they appear vertically, in a stack.

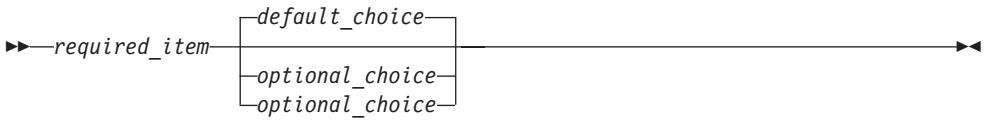
  If you *must* choose one of the items, one item of the stack appears on the main path.



  If choosing one of the items is optional, the entire stack appears below the main path.



  If one of the items is the default, it appears above the main path, and the remaining choices are shown below.



- An arrow returning to the left, above the main line, indicates an item that can be repeated.

If the repeat arrow contains a comma, you must separate repeated items with a comma.

A repeat arrow above a stack indicates that you can repeat the items in the stack.

- Sometimes a diagram must be split into fragments. The syntax fragment is shown separately from the main syntax diagram, but the contents of the fragment should be read as if they are on the main path of the diagram.

fragment-name:

- In IMS, a b symbol indicates one blank position.
- Keywords, and their minimum abbreviations if applicable, appear in uppercase. They must be spelled exactly as shown. Variables appear in all lowercase italic letters (for example, *column-name*). They represent user-supplied names or values.
- Separate keywords and parameters by at least one space if no intervening punctuation is shown in the diagram.
- Enter punctuation marks, parentheses, arithmetic operators, and other symbols, exactly as shown in the diagram.
- Footnotes are shown by a number in parentheses, for example (1).

How to Send Your Comments

Your feedback is important in helping us provide the most accurate and highest quality information. If you have any comments about this or any other IMS information, you can take one of the following actions:

- Go to the IMS Library page at www.ibm.com/software/data/ims/library.html and click the Library Feedback link, where you can enter and submit comments.
- Send your comments by e-mail to imspubs@us.ibm.com. Be sure to include the title, the part number of the title, the version of IMS, and, if applicable, the

specific location of the text on which you are commenting (for example, a page number in the PDF or a heading in the Information Center).

Summary of Changes

Changes to This Book for IMS Version 9

This book contains IMS Version 9 editorial changes.

Library Changes for IMS Version 9

Changes to the IMS Library for IMS Version 9 include the addition of one title, a change of one title, organizational changes, and a major terminology change. Changes are indicated by a vertical bar (|) to the left of the changed text.

The IMS Version 9 information is now available in the DB2 Information Management Software Information Center for z/OS Solutions, which is available at http://publib.boulder.ibm.com/infocenter/dzichelp. The DB2 Information Management Software Information Center for z/OS Solutions provides a graphical user interface for centralized access to the product information for IMS, IMS Tools, DB2 Universal Database (UDB) for z/OS, DB2 Tools, and DB2 Query Management Facility (QMF™).

New and Revised Titles

The following list details the major changes to the IMS Version 9 library:

- *IMS Version 9: IMS Connect Guide and Reference*

  The library includes new information: *IMS Version 9: IMS Connect Guide and Reference*. This information is available in softcopy format only, as part of the DB2 Information Management Software Information Center for z/OS Solutions, and in PDF and BookManager formats.

  IMS Version 9 provides an integrated IMS Connect function, which offers a functional replacement for the IMS Connect tool (program number 5655-K52). In this information, the term *IMS Connect* refers to the integrated IMS Connect function that is part of IMS Version 9, unless otherwise indicated.
- The information formerly titled *IMS Version 8: IMS Java User's Guide* is now titled *IMS Version 9: IMS Java Guide and Reference*. This information is available in softcopy format only, as part of the DB2 Information Management Software Information Center for z/OS Solutions, and in PDF and BookManager formats.
- To complement the IMS Version 9 library, a new book, *An Introduction to IMS* by Dean H. Meltz, Rick Long, Mark Harrington, Robert Hain, and Geoff Nicholls (ISBN # 0-13-185671-5), is available starting February 2005 from IBM Press. Go to the IMS Web site at www.ibm.com/ims for details.

Organizational Changes

Organization changes to the IMS Version 9 library include changes to:

- *IMS Version 9: IMS Java Guide and Reference*
- *IMS Version 9: Messages and Codes, Volume 1*
- *IMS Version 9: Utilities Reference: System*

The chapter titled ″DLIModel Utility″ has moved from *IMS Version 9: IMS Java Guide and Reference* to *IMS Version 9: Utilities Reference: System*.

The DLIModel utility messages that were in *IMS Version 9: IMS Java Guide and Reference* have moved to *IMS Version 9: Messages and Codes, Volume 1*.

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Terminology Changes

IMS Version 9 introduces new terminology for IMS commands:

type-1 command
A command, generally preceded by a leading slash character, that can be entered from any valid IMS command source. In IMS Version 8, these commands were called *classic* commands.

type-2 command
A command that is entered only through the OM API. Type-2 commands are more flexible than type-2 commands and can have a broader scope. In IMS Version 8, these commands were called *IMSplex* commands or *enhanced* commands.

Accessibility Enhancements

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products. The major accessibility features in z/OS products, including IMS, enable users to:

- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size

User Assistive Technologies

Assistive technology products, such as screen readers, function with the IMS user interfaces. Consult the documentation of the assistive technology products for specific information when you use assistive technology to access these interfaces.

Accessible Information

Online information for IMS Version 9 is available in BookManager format, which is an accessible format. All BookManager functions can be accessed by using a keyboard or keyboard shortcut keys. BookManager also allows you to use screen readers and other assistive technologies. The BookManager READ/MVS product is included with the z/OS base product, and the BookManager Softcopy Reader (for workstations) is available on the IMS Licensed Product Kit (CD), which you can download from the Web at www.ibm.com.

Keyboard Navigation of the User Interface

Users can access IMS user interfaces using TSO/E or ISPF. Refer to the *z/OS V1R1.0 TSO/E Primer*, the *z/OS V1R5.0 TSO/E User's Guide*, and the *z/OS V1R5.0 ISPF User's Guide, Volume 1*. These guides describe how to navigate each interface, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

Chapter 1. How EXEC DLI Application Programs Work with IMS

This chapter describes the components of your CICS program. It also describes the sample hierarchy used in the examples.

Your EXEC DLI application uses EXEC DLI commands to read and update DL/I databases. These applications can execute as pure batch, as a BMP program running with DBCTL or DB/DC, or as an online CICS program using DBCTL. Your EXEC DLI program can also issue system service commands when using DBCTL.

IMS DB/DC can provide the same services as DBCTL.

The following topics provide additional information:

- "Getting Started with EXEC DLI"
- "A Database Hierarchy Example" on page 2

Getting Started with EXEC DLI

Figure 1 shows the main elements of programs that use EXEC DLI commands to access DL/I databases. The main differences between a CICS program and a command-level batch or BMP program (represented by Figure 1) are that you do not schedule a PSB for a batch program, and that you do not issue checkpoints for a CICS program. The numbers to the left of the figure correspond to the notes that follow Figure 1.

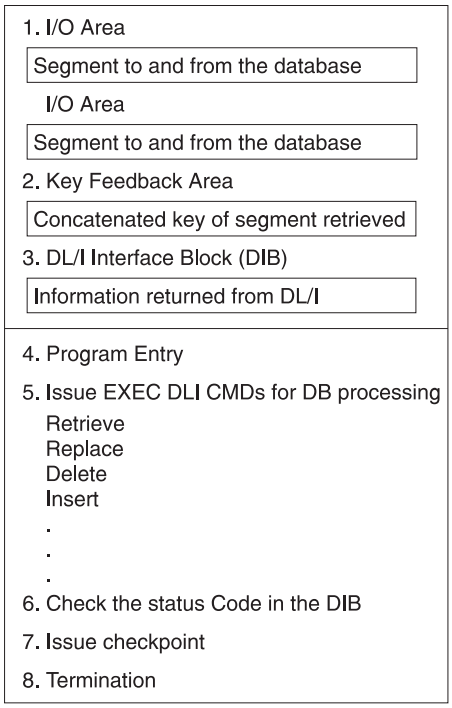

Figure 1. The Structure of a Command-Level Batch or BMP Program

Notes to Figure 1:

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1 I/O areas. DL/I passes segments to and from the program in the I/O areas. You may use a separate I/O area for each segment.

2 Key feedback area. DL/I passes, on request, the concatenated key of the lowest-level segment retrieved to the key feedback area.

3 DL/I Interface Block (DIB). DL/I and CICS place the results of each command in the DIB. The DIB contains most of the same information returned in the DB PCB for programs using the call-level interface.

Note: The horizontal line between **3** and **4** represents the end of the declarations section and the start of the executable code section of the program.

4 Program entry. Control is passed to your program during program entry.

5 Issue EXEC DLI commands. Commands read and update information in the database.

6 Check the status code. To find out the results of each command you issue, you should check the status code in the DIB after issuing an EXEC DLI command for database processing and after issuing a checkpoint command.

7 Issue checkpoint. Issue checkpoints as needed to establish places from which to restart. Issuing a checkpoint commits database changes and releases resources.

8 Terminate. This returns control to the operating system, commits database changes, and releases resources.

Requirement: CICS Transaction Server for z/OS runs with this version of IMS. Unless a distinction needs to made, all supported versions are referred to as CICS. For a complete list of supported software, see the *IMS Version 9: Release Planning Guide*.

A Database Hierarchy Example

Many of the examples use the medical hierarchy shown in Figure 2. The database contains information that a medical clinic might keep about its patients. To understand the examples, you should be familiar with the hierarchy and the segments it contains.

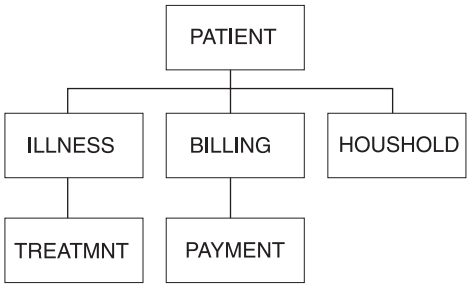

Figure 2. Medical Hierarchy

The tables that follow show the layouts of each segment in the hierarchy. The segment's field names are in the first row of each table. The number below each field name is the length in bytes that has been defined for that field.

- **PATIENT Segment**

  Table 2 on page 3 shows the PATIENT segment.

  It has three fields:

- The patient's number (PATNO)
- The patient's name (NAME)
- The patient's address (ADDR)

PATIENT has a unique key field: PATNO. PATIENT segments are stored in ascending order based on the patient number. The lowest patient number in the database is 00001 and the highest is 10500.

Table 2. PATIENT Segment

Field Name	Field Length
PATNO	5
NAME	10
ADDR	30

- **ILLNESS Segment**

  Table 3 shows the ILLNESS segment.

  It has two fields:

  - The date when the patient came to the clinic with the illness (ILLDATE)
  - The name of the illness (ILLNAME)

  The key field is ILLDATE. Because it is possible for a patient to come to the clinic with more than one illness on the same date, this key field is non unique, that is, there may be more than one ILLNESS segment with the same (an equal) key field value.

  Usually during installation, the database administrator (DBA) decides the order in which to place the database segments with equal or no keys. The DBA can use the RULES keyword of the SEGM statement of the DBD to specify the order of the segments.

  For segments with equal keys or no keys, RULES determines where the segment is inserted. Where RULES=LAST, ILLNESS segments that have equal keys are stored on a first-in-first-out basis among those with equal keys. ILLNESS segments with unique keys are stored in ascending order on the date field, regardless of RULES. ILLDATE is specified in the format YYYYMMDD.

Table 3. ILLNESS Segment

Field Name	Field Length
ILLDATE	8
ILLNAME	10

- **TREATMNT Segment**

  Table 4 on page 4 shows the TREATMNT segment.

  It contains four fields:

  - The date of the treatment (DATE)
  - The medicine that was given to the patient (MEDICINE)
  - The quantity of the medicine that the patient received (QUANTITY)
  - The name of the doctor who prescribed the treatment (DOCTOR)

  The TREATMNT segment's key field is DATE. Because a patient may receive more than one treatment on the same date, DATE is a non unique key field. TREATMNT, like ILLNESS, has been specified as having RULES=LAST. TREATMNT segments are also stored on a first-in-first-out basis. DATE is specified in the same format as ILLDATE—YYYYMMDD.

Table 4. TREATMNT Segment

Field Name	Field Length
DATE	8
MEDICINE	10
QUANTITY	4
DOCTOR	10

- **BILLING Segment**

  Table 5 shows the BILLING segment. It has only one field: the amount of the current bill. BILLING has no key field.

Table 5. BILLING Segment

Field Name	Field Length
BILLING	6

- **PAYMENT Segment**

  Table 6 shows the PAYMENT segment. It has only one field: the amount of payments for the month. The PAYMENT segment has no key field.

Table 6. PAYMENT Segment

Field Name	Field Length
PAYMENT	6

- **HOUSHOLD Segment**

  Table 7 shows the HOUSHOLD segment.

  It contains two fields:

  – The names of the members of the patient's household (RELNAME)

  – How each member of the household is related to the patient (RELATN)

  The HOUSEHOLD segment's key field is RELNAME.

Table 7. HOUSEHOLD Segment

Field Name	Field Length
RELNAME	10
RELATN	8

Chapter 2. Defining Application Program Elements

This chapter describes how to use EXEC DLI commands with the application interface block (AIB) and DL/I interface block (DIB). Defining feedback and I/O areas is also discussed.

The following topics provide additional information:

- "Specifying an Application Interface Block (AIB)"
- "Specifying the DL/I Interface Block (DIB)"
- "Defining a Key Feedback Area" on page 9
- "Defining I/O Areas" on page 9

Specifying an Application Interface Block (AIB)

EXEC DLI commands can use the AIB interface. For example, using the AIB interface, the format for the `GU` command would be `EXEC DLI GU AIB(aib)`, instead of `EXEC DLI GU USING PCB(n)` using the PCB format.

With CICS Transaction Server 1.1 or later, the EXEC DLI commands in Chapter 4, "EXEC DLI Commands for an Application Program," on page 31 are supported in the AIB format (as well as the PCB format).

With CICS Transaction Server 1.1 or later, and IMS/ESA Version 5, the AIB-only commands, ICMD, RCMD, and GMSG are supported by using the EXEC DLI interface.

The CICS EDF (execution diagnostic facility) debugging transaction supports AIB EXEC DLI requests, just as it handles PCB type requests.

AIB Mask

The AIB mask must be supplied by the application and referenced in the EXEC call instead of the PCB number (for example, `EXEC DLI GU AIB(aib)`).

The DIBSTAT field is set with a valid STATUS code when AIBRETRN = X'00000000' or x'00000900'. Applications should test AIBRETRN for any other values and respond accordingly.

CICS Restrictions with AIB Support

Restrictions due to function shipping include:

- The AIBLEN field must be between 128 and 256 bytes. 128 is recommended.
- LIST=NO must **not** be specified on any PCBs in the PSB.

Specifying the DL/I Interface Block (DIB)

Each time your program executes a DL/I command, DL/I returns a status code and other information to your program through the DL/I interface block (DIB), which is a subset of IMS PCB. Your program should check the status code to make sure the command executed successfully.

Each program's working storage contains its own DIB. The contents of the DIB reflect the status of the last DL/I command executed in that program. If the

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information in your program's DIB is required by another program used by your transaction, you must pass the information to that program.

To access fields in the DIB, use labels that are automatically generated in your program by the translator.

Restriction: These labels are reserved; you must not redefine them.

In your COBOL, PL/I, assembler language, and C programs, some variable names are mandatory.

For a COBOL program:

```
DIBVER    PICTURE X(2)
DIBSTAT    PICTURE X(2)
DIBSEGM    PICTURE X(8)
DIBSEGLV    PICTURE X(2)
DIBKFBL    PICTURE S9(4) COMPUTATIONAL
DIBDBDNM    PICTURE X(8)
DIBDBORG    PICTURE X(8)
```

```
DIBVER    CHAR(2)
DIBSTAT    CHAR(2)
DIBSEGM    CHAR(8)
DIBSEGLV    CHAR(2)
DIBKFBL    FIXED BINARY (15,0)
DIBDBDNM    CHAR(8)
DIBDBORG    CHAR(8)
```

For an assembler language program:

```
DIBVER    CL2
DIBSTAT    CL2
DIBSEGM    CL8
DIBSEGLV    CL2
DIBKFBL    H
DIBDBDNM    CL8
DIBDBORG    CL8
```

For a C program:

```
unsigned char     dibver    {2}  ;
unsigned char     dibstat   {2}  ;
unsigned char     dibsegm   {8}  ;
unsigned char     dibfic01  ;
unsigned char     dibfic02  ;
unsigned char     dibseglv  {2}  ;
signed short int  dibkfbl   ;
unsigned char     dibdbdnm  {8}  ;
unsigned char     dibdborg  {8}  ;
unsigned char     dibfic03  {6}  ;
```

The following notes explain the contents of each variable name. The name in parenthesis is the label used to access the contents.

1. **Translator Version (DIBVER)**

   This is the version of the DIB format your program is using. (DIBVER is used for documentation and problem determination.)

2. **Status Codes (DIBSTAT)**

   DL/I places a 2-character status code in this field after executing each DL/I command. This code describes the results of the command.

   After processing a DL/I command, DL/I returns control to your program at the next sequential instruction following the command. The first thing your program

should do after each command is to test the status code field and take appropriate action. If the command was completely successful, this field contains blanks.

The status codes that can be returned to this field (they are the only status codes returned to your program) are:

ƀƀ (Blanks) The command was completely successful.

BA For GU, GN, GNP, DLET, REPL, and ISRT commands. Data was unavailable.

BC For DLET, REPL, and ISRT commands. A deadlock was detected.

FH For GU, GN, GNP, DLET, REPL, ISRT, POS, CHKP, and SYMCHKP commands. The DEDB was inaccessible.

FW For GU, GN, GNP, DLET, REPL, ISRT, and POS commands. More buffer space is required than normally allowed.

GA For unqualified GN and GNP commands. DL/I returned a segment, but the segment is at a higher level in the hierarchy than the last segment that was returned.

GB For GN commands. DL/I reached the end of the database trying to satisfy your GN command and did not return a segment to your program's I/O area.

GD For ISRT commands. The program issued an ISRT command that did not have SEGMENT options for all levels above that of the segment being inserted.

GE For GU, GN, GNP, ISRT, and STAT commands. DL/I was unable to find the segment you requested, or one or more of the parents of the segment you are trying to insert.

GG For Get commands. DL/I returns a GG status code to a program with a processing option of GOT or GON when the segment that the program is trying to retrieve contains an invalid pointer.

GK For unqualified GN and GNP commands. DL/I returned a segment that satisfies an unqualified GN or GNP request, but the segment is of a different segment type (but at the same level) than the last segment returned.

II For ISRT commands. The segment you are trying to insert already exists in the database. This code can also be returned if you have not established a path for the segment before trying to insert it. The segment you are trying to insert might match a segment with the same key in another hierarchy or database record.

LB For load programs only after issuing a LOAD command. The segment you are trying to load already exists in the database. DL/I returns this status code only for segments with key fields.

NI For ISRT and REPL commands. The segment you are trying to insert or replace requires a duplicate entry to be inserted in a secondary index that does not allow duplicate entries. This status code is returned for batch programs that write log records to direct access storage. If a CICS program that does not log to disk encounters this condition, the program (transaction) is abnormally terminated.

TG For TERM commands. The program tried to terminate a PSB when one was not scheduled.

The listed 2 on page 6 indicate exceptional conditions, and are the only status codes returned to your program. All other status codes indicate error conditions and cause your transaction or batch program to abnormally terminate. If you want to pass control to an error routine from your CICS program, you can use the CICS HANDLE ABEND command; the last 2 bytes of the abend code are the IMS status code that caused the abnormal termination. For more information on the HANDLE ABEND command, see the application programming reference manual for your version of CICS. Batch BMP programs abend with abend 1041.

3. **Segment Name (DIBSEGM)**

   This is the name of the lowest-level segment successfully accessed. When a retrieval is successful, this field contains the name of the retrieved segment. If the retrieval is unsuccessful, this field contains the last segment, along the path to the requested segment, that satisfies the command.

   After issuing an XRST command, this field is either set to blanks (indicating a successful normal start), or a checkpoint ID (indicating the checkpoint ID from which the program was restarted).

   You should test this field after issuing any of the following commands:

   - GN
   - GNP
   - GU
   - ISRT
   - LOAD
   - RETRIEVE
   - XRST

4. **Segment Level Number (DIBSEGLV)**

   This is the hierarchic level of the lowest-level segment retrieved. When IMS DB retrieves the segment you have requested, IMS DB places, in character format, the level number of that segment in this field. If you are issuing a path command, IMS DB places the number of the lowest-level segment retrieved. If IMS DB is unable to find the segment you have requested, it gives the level number of the last segment it encountered that satisfied your command. This is the lowest segment on the last path that IMS DB encountered while searching for the segment you requested.

   You should test this field after issuing any of the listed commands:

   - GN
   - GNP
   - GU
   - ISRT
   - LOAD
   - RETRIEVE

5. **Key Feedback Length (DIBKFBL)**

   This is a halfword field that contains the length of the concatenated key when you use the KEYFEEDBACK option with get commands. If your key feedback area is not long enough to contain the concatenated key, the key is truncated, and this area indicates the actual length of the full concatenated key.

6. **Database Description Name (DIBDBDNM)**

   This is the fullword field that contains the name of the DBD. The DBD is the DL/I control block that contains all information used to describe a database. The DIBDBDNM field is returned only on a QUERY command.

7. **Database Organization (DIBDBORG)**

This is the fullword field that names the type of database organization (HDAM, HIDAM, HISAM, HSAM, GSAM, SHSAM, INDEX, or DEDB) padded to the right with blanks. The DIBDBORG field is returned only on a QUERY command.

Defining a Key Feedback Area

To retrieve the concatenated key of a segment, you must define an area into which the key is placed. The concatenated key returned is that of the lowest-level segment retrieved. (The segment retrieved is indicated in the DIB by the DIBSEGM and DIBSEGLV fields.)

Specify the name of the area using the KEYFEEDBACK option on a GET command.

A concatenated key is made up of the key of a segment, plus the keys for all of its parents. For example, say you requested the concatenated key of the ILLNESS segment for January 2, 1988, for patient number 05142. **0514219880102** would be returned to your key feedback field. This number includes the key field of the ILLNESS segment, ILLDATE, concatenated to the key field of the PATIENT segment, PATNO.

If you define an area that is not long enough to contain the entire concatenated key, the key is truncated.

Defining I/O Areas

You use I/O areas to pass segments back and forth between your program and the database. What an I/O area contains depends on the kind of command you are issuing:

- When you retrieve a segment, DL/I places the segment you requested in the I/O area.
- When you add a new segment, you build the new segment in the I/O area before issuing an ISRT command.
- Before you modify a segment, you first retrieve the segment into the then issue the DLET or REPL command.

Restriction: The I/O area must be long enough to contain the longest segment you retrieve from or add to the database. (Otherwise, you might experience storage overlap.) If you are retrieving, adding, or replacing multiple segments in one command, you must define an I/O area for each segment.

As an example of what a segment looks like in your I/O area, say that you retrieved the ILLNESS segment for Robert James, who came to the clinic on March 3, 1988. He was treated for strep throat. The data returned to your I/O area would look like this:

```
19880303STREPTHROA
```

COBOL I/O Area

The I/O area in a COBOL program should be defined as a 01 level working storage entry. You can further define the area with 02 entries.

```
IDENTIFICATION DIVISION.
.
.
.
DATA DIVISION.
```

```
WORKING-STORAGE SECTION.
01    INPUT-AREA.
    02 KEY PICTURE X(6).
    02 FIELD PICTURE X(84).
```

PL/I I/O Area

In PL/I, the name for the I/O area used in the DL/I call can be the name of a fixed-length character string, a major structure, a connected array, or an adjustable character string. **Restriction:** The PL/I I/O area *cannot* be the name of a minor structure or a character string with the attribute VARYING. If you want to define it as a minor structure, you can use a pointer to the minor structure as the parameter.

Your program should define the I/O area as a fixed-length character string and pass the name of that string, or define it in one of the other ways described previously and then pass the pointer variable that points to that definition. If you want to use substructures or elements of an array, use the DEFINED or BASED attribute.

```
DECLARE    1 INPUT_AREA,
           2 KEY CHAR(6),
           2 FIELD CHAR(84);
```

Assembler Language I/O Area

The I/O area in an assembler language program is formatted as follows:

```
IOAREA   DS   0CL90
KEY      DS   CL6
FIELD    DS   CL84
```

Chapter 3. Writing an Application Program

This chapter provides programming guidelines and information on preparing programs for execution using EXEC DLI commands. It also contains skeleton programs in assembler language, COBOL, PL/I, C, and C++.

The following topics provide additional information:

- "Programming Guidelines"
- "Preparing Your EXEC DLI Program for Execution" on page 29

Programming Guidelines

This description provides some guidelines for writing efficient and error-free programs

The number, type, and sequence of the DL/I requests your program issues affect the efficiency of your program. A program that is poorly designed runs if it is coded correctly. The suggestions that follow can help you develop the most efficient design possible for your application program. Inefficiently designed programs can adversely affect performance and are hard to change. Being aware of how certain combinations of commands or calls affects performance helps you to avoid these problems and design a more efficient program.

After you have a general sequence of calls mapped out for your program, use these guidelines to improve the sequence. Usually an efficient sequence of requests causes efficient internal DL/I processing.

- Use the simplest call. Qualify your requests to narrow the search for DL/I, but do not use more qualification than required.
- Use the request or sequence of requests that gives DL/I the shortest path to the segment you want.
- Use the fewest number of requests possible in your program. Each DL/I request your program issues uses system time and resources. You may be able to eliminate unnecessary calls by:
  - Using path requests if you are replacing, retrieving, or inserting more than one segment in the same path. If you are using more than one request to do this, you are issuing unnecessary requests.
  - Changing the sequence so that your program saves the segment in a separate I/O area, and then gets it from that I/O area the second time it needs the segment. If your program retrieves the same segment more than once during program execution, you are issuing an unnecessary request.
  - Anticipating and eliminating needless and nonproductive requests, such as requests that result in GB, GE, and II status codes. For example, if you are issuing `GN`s for a particular segment type and you know how many occurrences of that segment type exist, do not issue the `GN` that results in a GE status code. You can keep track of the number of occurrences your program retrieves, and then continue with other processing when you know you have retrieved all the occurrences of that segment type.
  - Issuing an insert request with a qualification for each parent instead of issuing Get requests for the parents to make sure that they exist. When you are inserting segments, you cannot insert dependents unless the parents exist. If DL/I returns a GE status code, at least one of the parents does not exist.

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- Keep the main section of the program logic together. For example, branch to conditional routines, such as error and print routines, in other parts of the program, instead of having to branch around them to continue normal processing.
- Use call sequences that make good use of the physical placement of the data. Access segments in hierarchical sequence as much as possible. Avoid moving backward in the hierarchy.
- Process database records in order of the key field of the root segments. (For HDAM databases, this order depends on the randomizing routine that is used. Check with your DBA for this information.)
- Try to avoid constructing the logic of the program and the structure of commands or calls in a way that depends heavily on the database structure. Depending on the current structure of the hierarchy reduces the program's flexibility.

Coding a Program in Assembler Language

The following sample is a CICS online program that is written in assembler language. It shows how the different parts of a command-level program fit together and how the EXEC DLI commands are coded.

Except for a few commands, this program applies to batch, BMP, and CICS programs. Any differences are highlighted in the notes for the sample assembler code. The numbering on the right of the sample code references these notes.

```
*ASM XOPTS(CICS,DLI)
*                                                                    1
R2       EQU   2
R3       EQU   3
R4       EQU   4
R11      EQU   11
R12      EQU   12
R13      EQU   13
DFHEISTG DSECT
SEGKEYA  DS    CL4
SEGKEYB  DS    CL4                                                   2
SEGKEYC  DS    CL4
SEGKEY1  DS    CL4
SEGKEY2  DS    CL4
CONKEYB  DS    CL8
SEGNAME  DS    CL8
SEGLEN   DS    H
PCBNUM   DS    H
AREAA    DS    CL80
AREAB    DS    CL80                                                  3
AREAC    DS    CL80
AREAG    DS    CL250
AREASTAT DS    CL360
*        COPY  MAPSET
*
*****************************************************************
*  INITIALIZATION
*  HANDLE ERROR CONDITIONS IN ERROR ROUTINE                          4
*  HANDLE ABENDS (DLI ERROR STATUS CODES) IN ABEND ROUTINE
*  RECEIVE INPUT MESSAGE
*****************************************************************
*
SAMPLE   DFHEIENT CODEREG=(R2,R3),DATAREG=(R13,R12),EIBREG=R11        5
*
         EXEC CICS HANDLE CONDITION ERROR(ERRORS)                     6
*
         EXEC CICS HANDLE ABEND LABEL(ABENDS)                         6
*
         EXEC CICS RECEIVE MAP ('SAMPMAP') MAPSET('MAPSET')           6
```

```
*        ANALYZE INPUT MESSAGE AND PERFORM NON-DLI PROCESSING
*
*********************************************************************
*  SCHEDULE PSB NAMED 'SAMPLE1'
*********************************************************************
*
         EXEC DLI SCHD PSB(SAMPLE1)                                    7
         BAL   R4,TESTDIB          CHECK STATUS
*
*********************************************************************
*  RETRIEVE ROOT SEGMENT AND ALL ITS DEPENDENTS
*********************************************************************
*
         MVC   SEGKEYA,=C'A300'                                        8
         EXEC DLI GU USING PCB(1) SEGMENT(SEGA) INTO(AREAA)           X
               SEGLENGTH(80) WHERE(KEYA=SEGKEYA) FIELDLENGTH(4)
         BAL   R4,TESTDIB          CHECK STATUS
GNPLOOP  EQU   *
         EXEC DLI GNP USING PCB(1) INTO(AREAG) SEGLENGTH(250)
         CLC   DIBSTAT,=C'GE'      LOOK FOR END                        9
         BE    LOOPDONE            DONE AT 'GE'
         BAL   R4,TESTDIB          CHECK STATUS
         B     GNPLOOP
LOOPDONE EQU   *
*
*********************************************************************
*  INSERT NEW ROOT SEGMENT
*********************************************************************
*
         MVC   AREAA,=CL80'DATA FOR NEW SEGMENT INCLUDING KEY'
         EXEC DLI ISRT USING PCB(1) SEGMENT(SEGA) FROM(AREAA)         X
               SEGLENGTH(80)
         BAL   R4,TESTDIB          CHECK STATUS
*
*********************************************************************
*  RETRIEVE 3 SEGMENTS IN PATH AND REPLACE THEM
*********************************************************************
*
         MVC   SEGKEYA,=C'A200'
         MVC   SEGKEYB,=C'B240'
         MVC   SEGKEYC,=C'C241'
         EXEC DLI GU USING PCB(1)                                     X
               SEGMENT(SEGA) WHERE(KEYA=SEGKEYA)                      X 10
               FIELDLENGTH(4)                                         X
               INTO(AREAA)                                            X
               SEGLENGTH(80)                                          X
               SEGMENT(SEGB) WHERE(KEYB=SEGKEYB) FIELDLENGTH(4)       X
               INTO(AREAB)                                            X
               SEGLENGTH(80)                                          X
               SEGMENT(SEGC) WHERE(KEYC=SEGKEYC) FIELDLENGTH(4)       X
               INTO(AREAC)                                            X
               SEGLENGTH(80)
         BAL   R4,TESTDIB
*        UPDATE FIELDS IN THE 3 SEGMENTS
         EXEC DLI REPL USING PCB(1)                                   X
               SEGMENT(SEGA) FROM(AREAA) SEGLENGTH(80)                X
               SEGMENT(SEGB) FROM(AREAB) SEGLENGTH(80)                X
               SEGMENT(SEGC) FROM(AREAC) SEGLENGTH(80)
         BAL   R4,TESTDIB          CHECK STATUS
*
*********************************************************************
*  INSERT NEW SEGMENT USING CONCATENATED KEY TO QUALIFY PARENT
*********************************************************************
*
         MVC   AREAC,=CL80'DATA FOR NEW SEGMENT INCLUDING KEY'
         MVC   CONKEYB,=C'A200B240'
         EXEC DLI ISRT USING PCB(1)                                   X
```

```
              SEGMENT(SEGB) KEYS(CONKEYB) KEYLENGTH(8)              X
              SEGMENT(SEGC) FROM(AREAC) SEGLENGTH(80)
         BAL   R4,TESTDIB          CHECK STATUS
*
*****************************************************************
*  RETRIEVE SEGMENT DIRECTLY USING CONCATENATED KEY
*  AND THEN DELETE IT AND ITS DEPENDENTS
*****************************************************************
*
         MVC   CONKEYB,=C'A200B230'
         EXEC DLI GU USING PCB(1)                                  X
               SEGMENT(SEGB)                                       X
               KEYS(CONKEYB) KEYLENGTH(8)                          X
               INTO(AREAB) SEGLENGTH(80)
         BAL   R4,TESTDIB          CHECK STATUS
         EXEC DLI DLET USING PCB(1)                                X
               SEGMENT(SEGB) SEGLENGTH(80) FROM(AREAB)
         BAL   R4,TESTDIB          CHECK STATUS
*
*****************************************************************
*  RETRIEVE SEGMENT BY QUALIFYING PARENT WITH CONCATENATED KEY,
*  OBJECT SEGMENT WITH WHERE OPTION USING A LITERAL,
*  AND THEN SET PARENTAGE
*
*  USE VARIABLES FOR PCB INDEX, SEGMENT NAME, AND SEGMENT LENGTH
*****************************************************************
*
         MVC   CONKEYB,=C'A200B230'
         MVC   SEGNAME,=CL8'SEGA'
         MVC   SEGLEN,=H'80'
         MVC   PCBNUM,=H'1'
         EXEC DLI GU USING PCB(PCBNUM)                             X
               SEGMENT((SEGNAME))                                  X
               KEYS(CONKEYB) KEYLENGTH(8) SETPARENT                X
               SEGMENT(SEGC) INTO(AREAC) SEGLENGTH(SEGLEN)         X
               WHERE(KEYC='C520')
         BAL   R4,TESTDIB          CHECK STATUS
*
*****************************************************************
*  RETRIEVE DATABASE STATISTICS
*****************************************************************
*
         EXEC DLI STAT USING PCB(1) INTO(AREASTAT)                 X
               VSAM FORMATTED LENGTH(360)
         BAL   R4,TESTDIB          CHECK STATUS
*
*****************************************************************
*  RETRIEVE ROOT SEGMENT USING BOOLEAN OPERATORS
*****************************************************************
*
         MVC   SEGKEY1,=C'A050'
         MVC   SEGKEY2,=C'A150'
         EXEC DLI GU USING PCB(1) SEGMENT(SEGA) INTO(AREAA)        X
               SEGLENGTH(80) FIELDLENGTH(4,4,4,4)                  X
               WHERE(KEYA > SEGKEY1 AND KEYA < SEGKEY2
               KEYA > 'A275' AND  KEYA < 'A350')
         BAL   R4,TESTDIB          CHECK STATUS
*
*****************************************************************
*  TERMINATE PSB WHEN DLI PROCESSING IS COMPLETED
*****************************************************************
*
         EXEC DLI TERM                                              11
*
*****************************************************************
*  SEND OUTPUT MESSAGE
*****************************************************************
```

```
*
         EXEC CICS SEND MAP('SAMPMAP') MAPSET('MAPSET')                  6
         EXEC CICS WAIT TERMINAL
*
*****************************************************************
*  COMPLETE TRANSACTION AND RETURN TO CICS
*****************************************************************
*
         EXEC CICS RETURN                                               12
*
*****************************************************************
*  CHECK STATUS IN DIB
*****************************************************************
*
TESTDIB  EQU   *
         CLC   DIBSTAT,=C'  '      IS STATUS BLANK                     13
         BER   R4                  YES - RETURN
*        HANDLE DLI STATUS CODES REPRESENTING EXCEPTIONAL CONDITIONS
*
         BR    R4                  RETURN
ERRORS   EQU   *
*        HANDLE ERROR CONDITIONS
*
ABENDS   EQU   *
*        HANDLE ABENDS INCLUDING DLI ERROR STATUS CODES
*
         END
```

Notes for the sample assembler code:

1 For a CICS online program containing EXEC DLI commands, you must specify the DLI and CICS options. For a batch or BMP program containing EXEC DLI, you must specify only the DLI option.

2 For reentry, define each of the areas the program uses—I/O areas, key feedback areas, and segment name areas in DFHEISTG.

3 Define an I/O area for each segment you retrieve, add, or replace (in a single command).

4 For a batch or BMP program containing EXEC DLI, you must save registers on entry and restore registers on exit according to z/OS register-saving conventions.

5 In a batch or BMP program, a DFHEIENT saves the registers on entry. Do not specify the EIBREG parameter in a batch program.

6 Do not code EXEC CICS commands in a batch or BMP program.

7 In a CICS online program, use the `SCHD PSB` command to obtain a PSB for the use of your program. Do *not* schedule a PSB in a batch or BMP program.

8 This `GU` command retrieves the first occurrence of SEGA with a key of A300. You do not have to provide the KEYLENGTH or SEGLENGTH options in an assembler language program.

9 This `GNP` command retrieves all dependents under segment SEGA. The GE status code indicates that no more dependents exist.

10 This `GU` command is an example of a path command. Use a separate I/O area for each segment you retrieve.

11 In a CICS online program, the `TERM` command terminates the PSB scheduled earlier. You do *not* terminate the PSB in a batch or BMP program.

12 For a batch or BMP program, code DFHEIRET with an optional RCREG parameter instead of EXEC CICS RETURN. The RCREG parameter identifies a register containing the return code.

13 After issuing each command, you should check the status code in the DIB.

Coding a Program in COBOL

The following sample program is written in COBOL. It shows how the different parts of a command-level program fit together, and how the EXEC DLI commands are coded. The sample program applies to the COBOL V4 compiler (5734-CB2), the OS/VS COBOL compiler (5740-CB1), IBM COBOL for z/OS & VM (5688-197), and the VS COBOL II compiler (5668-958 and 5668-940).

Except for a few commands, this program applies to batch, BMP, and CICS programs. Any differences are highlighted in the notes for the sample COBOL code. The numbering on the right of the sample code references the notes.

```
CBL LIB,APOST,XOPTS(CICS,DLI)        IDENTIFICATION DIVISION.
       PROGRAM-ID. SAMPLE.                                          1
       ENVIRONMENT DIVISION.
       CONFIGURATION SECTION.
.*     SOURCE-COMPUTER. IBM-370.
.*     OBJECT-COMPUTER. IBM-370.
       DATA DIVISION.
       WORKING-STORAGE SECTION.
       77  SEGKEYA               PIC X(4).
       77  SEGKEYB               PIC X(4).                          2
       77  SEGKEYC               PIC X(4).
       77  SEGKEY1               PIC X(4).
       77  SEGKEY2               PIC X(4).
       77  SEGKEY3               PIC X(4).
       77  SEGKEY4               PIC X(4).
       77  CONKEYB               PIC X(8).
       77  SEGNAME               PIC X(8).
       77  SEGLEN                COMP PIC S9(4).
       77  PCBNUM                COMP PIC S9(4).
       01  AREAA                 PIC X(80).
      *    DEFINE SEGMENT I/O AREA
       01  AREAB                 PIC X(80).
       01  AREAC                 PIC X(80).                         3
       01  AREAG                 PIC X(250).
       01  AREASTAT              PIC X(360).
      *    COPY MAPSET.
        PROCEDURE DIVISION.
      *
      * ***************************************************************
      *  INITIALIZATION
      *  HANDLE ERROR CONDITIONS IN ERROR ROUTINE
      *  HANDLE ABENDS (DLI ERROR STATUS CODES) IN ABEND ROUTINE
      *  RECEIVE INPUT MESSAGE
      * ***************************************************************
      *
           EXEC CICS HANDLE CONDITION ERROR(ERRORS) END-EXEC.         4
      *
           EXEC CICS HANDLE ABEND LABEL(ABENDS) END-EXEC.             4
      *
           EXEC CICS RECEIVE MAP ('SAMPMAP') MAPSET('MAPSET') END-EXEC. 4
      *    ANALYZE INPUT MESSAGE AND PERFORM NON-DLI PROCESSING
      *
      * ***************************************************************
      *  SCHEDULE PSB NAMED 'SAMPLE1'
      * ***************************************************************
      *
           EXEC DLI SCHD PSB(SAMPLE1) END-EXEC.
           PERFORM TEST-DIB THRU OK.                                  5
      *
      * ***************************************************************
      *  RETRIEVE ROOT SEGMENT AND ALL ITS DEPENDENTS
      * ***************************************************************
      *
           MOVE 'A300' TO SEGKEYA.
```

```
           EXEC DLI GU USING PCB(1) SEGMENT(SEGA) INTO(AREAA)
                SEGLENGTH(80) WHERE(KEYA=SEGKEYA)                    6
                FIELDLENGTH(4)
           END-EXEC.
           PERFORM TEST-DIB THRU OK.
       GNPLOOP.
           EXEC DLI GNP USING PCB(1) INTO(AREAG) SEGLENGTH(250)
           END-EXEC.
           IF DIBSTAT EQUAL TO 'GE' THEN GO TO LOOPDONE.
           PERFORM TEST-DIB THRU OK.
           GO TO GNPLOOP.
       LOOPDONE.
*
      * ***************************************************************
      *  INSERT NEW ROOT SEGMENT
      * ***************************************************************
      *
           MOVE 'DATA FOR NEW SEGMENT INCLUDING KEY' TO AREAA.
           EXEC DLI ISRT USING PCB(1) SEGMENT(SEGA) FROM(AREAA)
                SEGLENGTH(80) END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *
      * ***************************************************************
      * RETRIEVE 3 SEGMENTS IN PATH AND REPLACE THEM
      * ***************************************************************
      *
           MOVE 'A200' TO SEGKEYA.
           MOVE 'B240' TO SEGKEYB.
           MOVE 'C241' TO SEGKEYC.
           EXEC DLI GU USING PCB(1)
             SEGMENT(SEGA) WHERE(KEYA=SEGKEYA) FIELDLENGTH(4)        7
                INTO(AREAA)
                SEGLENGTH(80)
             SEGMENT(SEGB) WHERE(KEYB=SEGKEYB) FIELDLENGTH(4)
                INTO(AREAB)
                SEGLENGTH(80)
             SEGMENT(SEGC) WHERE(KEYC=SEGKEYC) FIELDLENGTH(4)
                INTO(AREAC)
                SEGLENGTH(80)
           END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *    UPDATE FIELDS IN THE 3 SEGMENTS
           EXEC DLI REPL USING PCB(1)
             SEGMENT(SEGA) FROM(AREAA) SEGLENGTH(80)
             SEGMENT(SEGB) FROM(AREAB) SEGLENGTH(80)
             SEGMENT(SEGC) FROM(AREAC) SEGLENGTH(80)
           END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *
      * ***************************************************************
      *  INSERT NEW SEGMENT USING CONCATENATED KEY TO QUALIFY PARENT
      * ***************************************************************
      *
           MOVE 'DATA FOR NEW SEGMENT INCLUDING KEY' TO AREAC.
           MOVE 'A200B240' TO CONKEYB.
           EXEC DLI ISRT USING PCB(1)
             SEGMENT(SEGB) KEYS(CONKEYB) KEYLENGTH(8)
             SEGMENT(SEGC) FROM(AREAC) SEGLENGTH(80)
           END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *
      * ***************************************************************
      *  RETRIEVE SEGMENT DIRECTLY USING CONCATENATED KEY
      *  AND THEN DELETE IT AND ITS DEPENDENTS
      * ***************************************************************
      *
           MOVE 'A200B230' TO CONKEYB.
```

```
           EXEC DLI GU USING PCB(1)
             SEGMENT(SEGB)
                KEYS(CONKEYB) KEYLENGTH(8)
                INTO(AREAB) SEGLENGTH(80)
           END-EXEC.
           PERFORM TEST-DIB THRU OK.
           EXEC DLI DLET USING PCB(1)
             SEGMENT(SEGB) SEGLENGTH(80) FROM(AREAB) END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *
      * ************************************************************
      *  RETRIEVE SEGMENT BY QUALIFYING PARENT WITH CONCATENATED KEY,
      *  OBJECT SEGMENT WITH WHERE OPTION,
      *  AND THEN SET PARENTAGE
      *
      *  USE VARIABLES FOR PCB INDEX, SEGMENT NAME, AND SEGMENT LENGTH
      * ************************************************************
      *
           MOVE 'A200B230' TO CONKEYB.
           MOVE 'C520' TO SEGKEYC.
           MOVE 'SEGA' TO SEGNAME.
           MOVE 80 TO SEGLEN.
           MOVE 1 TO PCBNUM.
           EXEC DLI GU USING PCB(PCBNUM)
             SEGMENT((SEGNAME))
                KEYS(CONKEYB) KEYLENGTH(8) SETPARENT
             SEGMENT(SEGC) INTO(AREAC) SEGLENGTH(SEGLEN)
                WHERE(KEYC=SEGKEYC) FIELDLENGTH(4) END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *
      * ************************************************************
      *  RETRIEVE DATABASE STATISTICS
      * ************************************************************
      *
           EXEC DLI STAT USING PCB(1) INTO(AREASTAT)
                VSAM FORMATTED LENGTH(360) END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *
      * ************************************************************
      *  RETRIEVE ROOT SEGMENT USING BOOLEAN OPERATORS
      * ************************************************************
      *
           MOVE 'A050' TO SEGKEY1.
           MOVE 'A150' TO SEGKEY2.
           MOVE 'A275' TO SEGKEY3.
           MOVE 'A350' TO SEGKEY4.
           EXEC DLI GU USING PCB(1) SEGMENT(SEGA) INTO(AREAA)
                SEGLENGTH(80) FIELDLENGTH(4,4,4,4)
                WHERE(KEYA > SEGKEY1 AND KEYA < SEGKEY2 OR
                      KEYA > SEGKEY3 AND KEYA < SEGKEY4)
           END-EXEC.
           PERFORM TEST-DIB THRU OK.
      *
      * ************************************************************
      *  TERMINATE PSB WHEN DLI PROCESSING IS COMPLETED
      * ************************************************************
      *
             EXEC DLI TERM END-EXEC.                                  8
      *
      * ************************************************************
      * ************************************************************
      *  SEND OUTPUT MESSAGE
      * ************************************************************
      *
           EXEC CICS SEND MAP('SAMPMAP') MAPSET('MAPSET') END-EXEC.
           EXEC CICS WAIT TERMINAL END-EXEC.
      *
```

```
* ************************************************************
*  COMPLETE TRANSACTION AND RETURN TO CICS
* ************************************************************
*
     EXEC CICS RETURN END-EXEC.
*
* ************************************************************
*  CHECK STATUS IN DIB
* ************************************************************
*
 TEST-DIB.
     IF DIBSTAT EQUAL TO '  ' THEN GO TO OK.
 OK.                                                          9
 ERRORS.
*    HANDLE ERROR CONDITIONS
 ABENDS.
*    HANDLE ABENDS INCLUDING DLI ERROR STATUS CODES
```

Notes for the sample COBOL code:

1 For a CICS online program containing EXEC DLI commands, you must specify the DLI and CICS options. For a batch or BMP program containing EXEC DLI, you must specify only the DLI option.

2 Define each of the areas the program uses—I/O areas, key feedback areas, and segment name areas—as 77- or 01-level working storage entries.

3 Define an I/O area for each segment you retrieve, add, or replace (in a single command).

4 Do not code EXEC CICS commands in a batch or BMP program.

5 For CICS online programs, you use a `SCHD PSB` command to obtain a PSB. You do *not* schedule a PSB in a batch or BMP program.

6 This `GU` command retrieves the first occurrence of SEGA with a key of A300. KEYLENGTH and SEGLENGTH are optional for IBM COBOL for z/OS & VM (and VS COBOL II). For COBOL V4 and OS/VS COBOL, KEYLENGTH and SEGLENGTH are required.

7 This `GU` command is an example of a path command. You must use a separate I/O area for each segment you retrieve.

8 For a CICS online program, the `TERM` command terminates the PSB scheduled earlier. You do *not* terminate the PSB in a batch or BMP program.

9 After issuing each command, you should check the status code in the DIB.

Coding a Program in PL/I

The following sample program is written in PL/I. It shows how the different parts of a command-level program fit together and how the EXEC DLI commands are coded.

Except for a few commands, this program applies to batch, BMP, and CICS programs. Any differences are highlighted in the notes for the sample PL/I code. The numbering on the right of the sample code references those notes.

```
*PROCESS INCLUDE,GN,XOPTS(CICS,DLI);                          1
 SAMPLE: PROCEDURE OPTIONS(MAIN);
 DCL      SEGKEYA                 CHAR (4);
 DCL      SEGKEYB                 CHAR (4);                    2
 DCL      SEGKEYC                 CHAR (4);
 DCL      SEGKEY1                 CHAR (4);
 DCL      SEGKEY2                 CHAR (4);
 DCL      SEGKEY3                 CHAR (4);
 DCL      SEGKEY4                 CHAR (4);
 DCL      CONKEYB                 CHAR (8);
```

```
 DCL      SEGNAME                 CHAR (8);
 DCL      PCBNUM                  FIXED BIN (15);
 DCL      AREAA                   CHAR (80);
     /*   DEFINE SEGMENT I/O AREA                                    */
 DCL      AREAB                   CHAR (80);
 DCL      AREAC                   CHAR (80);                                3
 DCL      AREAG                   CHAR (250);
 DCL      AREASTAT                CHAR (360);
     %INCLUDE MAPSET
     /*                                                                 */
     /*                                                                 */
     /* ************************************************************  */
     /*  INITIALIZATION                                                */
     /*  HANDLE ERROR CONDITIONS IN ERROR ROUTINE                      */
     /*  HANDLE ABENDS (DLI ERROR STATUS CODES) IN ABEND PROGRAM       */
     /*  RECEIVE INPUT MESSAGE                                         */
     /* ************************************************************  */
     /*                                                                 */
     EXEC CICS HANDLE CONDITION ERROR(ERRORS);                         4
     /*                                                                 */
     EXEC CICS HANDLE ABEND PROGRAM('ABENDS');                         4
     /*                                                                 */
     EXEC CICS RECEIVE MAP ('SAMPMAP') MAPSET('MAPSET');               4
     /* ANALYZE INPUT MESSAGE AND PERFORM NON-DLI PROCESSING          */
     /*                                                                 */
     /* ************************************************************  */
     /*  SCHEDULE PSB NAMED 'SAMPLE1'                                  */
     /* ************************************************************  */
     /*                                                                 */
     EXEC DLI SCHD PSB(SAMPLE1);
     CALL TEST_DIB;                                                    5

     /* ************************************************************ */
     /*  RETRIEVE ROOT SEGMENT AND ALL ITS DEPENDENTS                  */
     /* ************************************************************ */
     /*                                                                 */
     SEGKEYA = 'A300';
     EXEC DLI GU USING PCB(1) SEGMENT(SEGA) INTO(AREAA)
     WHERE(KEYA=SEGKEYA);                                              6
     CALL TEST_DIB;
GNPLOOP:
     EXEC DLI GNP USING PCB(1) INTO(AREAG);                            7
     IF DIBSTAT = 'GE' THEN GO TO LOOPDONE;
     CALL TEST_DIB;
     GO TO GNPLOOP;
 LOOPDONE:
     /*                                                                 */
     /* ************************************************************  */
     /*  INSERT NEW ROOT SEGMENT                                       */
     /* ************************************************************  */
     /*                                                                 */
     AREAA = 'DATA FOR NEW SEGMENT INCLUDING KEY';
     EXEC DLI ISRT USING PCB(1) SEGMENT(SEGA) FROM(AREAA);
     CALL TEST_DIB;
     /*                                                                 */
     /* ************************************************************ */
     /*  RETRIEVE 3 SEGMENTS IN PATH AND REPLACE THEM                  */
     /* ************************************************************ */
     /*                                                                 */
     SEGKEYA = 'A200';
     SEGKEYB = 'B240';
     SEGKEYC = 'C241';
     EXEC DLI GU USING PCB(1)
       SEGMENT(SEGA) WHERE(KEYA=SEGKEYA)                               8
          INTO(AREAA)
       SEGMENT(SEGB) WHERE(KEYB=SEGKEYB)
          INTO(AREAB)
```

```
      SEGMENT(SEGC) WHERE(KEYC=SEGKEYC)
         INTO(AREAC);
    CALL TEST_DIB;
    /* UPDATE FIELDS IN THE 3 SEGMENTS                              */
    EXEC DLI REPL USING PCB(1)
      SEGMENT(SEGA) FROM(AREAA)
      SEGMENT(SEGB) FROM(AREAB)
      SEGMENT(SEGC) FROM(AREAC);
    CALL TEST_DIB;
    /*                                                              */
    /* ************************************************************ */
    /*  INSERT NEW SEGMENT USING CONCATENATED KEY TO QUALIFY PARENT  */
    /* ************************************************************ */
    /*                                                              */
    AREAC = 'DATA FOR NEW SEGMENT INCLUDING KEY';
    CONKEYB = 'A200B240';
    EXEC DLI ISRT USING PCB(1)
      SEGMENT(SEGB) KEYS(CONKEYB)
      SEGMENT(SEGC) FROM(AREAC);
    CALL TEST_DIB;
    /*                                                              */
    /* ************************************************************  */
    /*  RETRIEVE SEGMENT DIRECTLY USING CONCATENATED KEY            */
    /*  AND THEN DELETE IT AND ITS DEPENDENTS                       */
    /* ************************************************************  */
    /*                                                              */
    CONKEYB = 'A200B230';
    EXEC DLI GU USING PCB(1)
      SEGMENT(SEGB)
         KEYS(CONKEYB)
         INTO(AREAB);
    CALL TEST_DIB;
    EXEC DLI DLET USING PCB(1)
      SEGMENT(SEGB) FROM(AREAB);
    CALL TEST_DIB;
    /*                                                              */
/* ************************************************************ */
    /*  RETRIEVE SEGMENT BY QUALIFYING PARENT WITH CONCATENATED KEY, */
    /*  OBJECT SEGMENT WITH WHERE OPTION                            */
    /*  AND THEN SET PARENTAGE                                      */
    /*                                                              */
    /*  USE VARIABLES FOR PCB INDEX, SEGMENT NAME                   */
    /* ************************************************************ */
    /*                                                              */
    CONKEYB = 'A200B230';
    SEGNAME = 'SEGA';
    SEGKEYC = 'C520';
    PCBNUM = 1;
    EXEC DLI GU USING PCB(PCBNUM)
      SEGMENT((SEGNAME))
         KEYS(CONKEYB) SETPARENT
      SEGMENT(SEGC) INTO(AREAC)
         WHERE(KEYC=SEGKEYC);
    CALL TEST_DIB;
    /*                                                              */
    /* ************************************************************ */
    /*  RETRIEVE DATABASE STATISTICS                                */
    /* ************************************************************ */
    /*                                                              */
    EXEC DLI STAT USING PCB(1) INTO(AREASTAT) VSAM FORMATTED;
    CALL TEST_DIB;
    /*                                                              */
    /* ************************************************************  */
    /*  RETRIEVE ROOT SEGMENT USING BOOLEAN OPERATORS               */
    /* ************************************************************  */
    /*                                                              */
    SEGKEY1 = 'A050';
```

```
    SEGKEY2 = 'A150';
    SEGKEY3 = 'A275';
    SEGKEY4 = 'A350';
    EXEC DLI GU USING PCB(1) SEGMENT(SEGA) INTO(AREAA)
         WHERE(KEYA &Ar; SEGKEY1 AND KEYA &Al; SEGKEY2 OR
               KEYA &Ar; SEGKEY3 AND KEYA &Al; SEGKEY4);
    CALL TEST_DIB;
    /*                                                            */
    /* ********************************************************** */
    /*  TERMINATE PSB WHEN DLI PROCESSING IS COMPLETED            */
    /* ********************************************************** */
    /*                                                            */

    EXEC DLI TERM;                                                 9

    /*                                                            */
    /* ********************************************************** */
    /*  SEND OUTPUT MESSAGE                                       */
    /* ********************************************************** */
    /*                                                            */
    EXEC CICS SEND MAP('SAMPMAP') MAPSET('MAPSET');                4
    EXEC CICS WAIT TERMINAL;
    /*                                                            */
    /* ********************************************************** */
    /*  COMPLETE TRANSACTION AND RETURN TO CICS                   */
    /* ********************************************************** */
    /*                                                            */
    EXEC CICS RETURN;                                              4
    /*                                                            */
    /* ********************************************************** */
    /*  CHECK STATUS IN DIB                                       */
    /* ********************************************************** */
    /*                                                            */
TEST_DIB: PROCEDURE;
    IF DIBSTAT = '  ' RETURN;                                     10

    /* HANDLE DLI STATUS CODES REPRESENTING EXCEPTIONAL CONDITIONS */
    /*                                                            */
OK:
END TEST_DB;
ERRORS:
    /* HANDLE ERROR CONDITIONS                                   */
    /*                                                            */
END SAMPLE;
```

Notes to the sample PL/I code:

1 For a CICS online program containing EXEC DLI commands, you must specify the DLI and CICS options. For a batch or BMP program containing EXEC DLI, you must specify only the DLI option.

2 Define, in automatic storage, each of the areas; I/O areas, key feedback areas, and segment name areas.

3 Define an I/O area for each segment you retrieve, add, or replace in a single command.

4 Do not code EXEC CICS commands in a batch or BMP program.

5 For CICS online programs, you use a `SCHD PSB` command to obtain a PSB. You do *not* schedule a PSB in a batch or BMP program.

6 This `GU` command retrieves the first occurrence of SEGA with a key of A300. Notice that you do not need to include the KEYLENGTH and SEGLENGTH options.

7 This `GNP` command retrieves all dependents under segment SEGA. The GE status code indicates that no more dependents exist.

8 This GU command is an example of a path command. You must use a separate I/O area for each segment you retrieve.

9 For a CICS online program, the TERM command terminates the PSB scheduled earlier. You do *not* terminate the PSB in a batch or BMP program.

10 After issuing each command, you should check the status code in the DIB.

Coding a Program in C

The following sample program is written in C. It shows how the different parts of a command-level program fit together and how the EXEC DLI commands are coded.

Except for a few commands, this program applies to batch, BMP, and CICS programs. Any differences are highlighted in the notes for the sample C code. The numbering on the right of the sample code references those notes.

```
#include < string.h>                                                    1
#include < stdio.h >                                                    2

   char  DIVIDER[120] = "----------------------------------------\
 ----------------------------------------------------------------";
   char  BLANK[120]   = "                                          \
                                                                   \0";
   char  BLAN2[110]   = "                                          \
                                                 \0";
   char  SCHED[120] = "Schedule PSB(PC3COCHD)         "                          3
   char  GN1[120] = "GN using PCB(2) Segment(SE2ORDER) check dibstat \
is blank";
   char   GNP1[120] = "GNP using PCB(2) check dibstat = GK or blank \
(or GE for last GNP)";
   char   GU1[120]  = "GU using PCB(2) Segment(SE2ORDER) where(\
FE2OGREF=000000'') check dibstat blank";
   char   GU2[120]  = "GU using PCB(2) Segment(SE2ORDER) where(\
FE2OGREF=000999'') check dibstat blank";
   char  REP1[120]  = "REPLACE using PCB(2) Segment(SE2ORDER) check \
dibstat is blank";
   char  DEL1[120]   = "DELETE using PCB(2) Segment(SE2ORDER) check \
dibstat is blank";
   char  INS1[120]   = "INSERT using PCB(2) Segment(SE2ORDER) where\
(FE2OGREF=''000999'') check dibstat is blank";
   char  TERM[120]   = "TERM - check dibstat is blank";
   char  STAT[120]   = "STAT USING PCB(2) VSAM FORMATTED";
   char  DATAB[6]    = "000999";
   char  DATAC[114]  = " REGRUN TEST INSERT NO1.";
   char  START[120]  = "PROGXIV STARTING";
   char  OKMSG[120]  = "PROGXIV COMPLETE";
   int   TLINE = 120;
   int   L11 = 11;
   int   L360 = 11;
   struct {
         char NEWSEGB[6];
         char NEWSEGC[54];
   } NEWSEG;
   char  OUTLINE[120];                                                   4
   struct {
         char OUTLINA[9];
         char OUTLINB[111];
   } OUTLIN2;
   struct {
         char  OUTLINX[9];
         char  OUTLINY[6];
         char  OUTLINZ[105];
   } OUTLIN3;
   char  GUIOA[60];
   char  GNIOA[60];
   struct {
```

```
          char ISRT1[6];
          char ISRT2[54];
    } ISRTIOA;
    struct {
          char REPLIO1[6];
          char REPLIO2[54];
    } REPLIOA;
    struct {
          char DLET1[6];
          char DLET2[54];
    } DLETIOA;
    struct {
          char STATA1[120];
          char STATA2[120];
          char STATA3[120];
    } STATAREA;
    struct {
          char DHPART[2];
          char RETCODE[2]
    } DHABCODE;

main()
{
          EXEC CICS ADDRESS EIB(dfheiptr);                              5
          strcpy(OUTLINE,DIVIDER);
          SENDLINE();
          strcpy(OUTLINE,START);
          SENDLINE();
     /*                                                    */
     /* SCHEDULE PSB                                       */
     /*                                                    */
          strcpy(OUTLINE,SCHED);
          SENDLINE();
          EXEC DLI SCHEDULE PSB(PC3COCHD);                              6
          SENDSTAT();
          TESTDIB();
     /*                                                   */
     /* ISSUE GU REQUEST                                  */
     /*                                                   */
          strcpy(OUTLINE,GU1);
          SENDLINE();
          EXEC DLI GET UNIQUE USING PCB(2)                              7
                SEGMENT(SE2ORDER)
                WHERE(FE2OGREF>="000000")
                INTO(&GUIOA) SEGLENGTH(60);
          strcpy(OUTLIN2.OUTLINA,"SE2ORDER=");
          strcpy(OUTLIN2.OUTLINB,GUIOA);
          SENDLIN2();
          SENDSTAT();
          TESTDIB();
     /*                                                 */
     /* ISSUE GNP REQUEST                               */
     /*                                                 */
  do {
          strcpy(OUTLINE,GNP1);
          SENDLINE();
          EXEC DLI GET NEXT IN PARENT USING PCB(2)                      8
                INTO(&GNIOA) SEGLENGTH(60);
          strcpy(OUTLIN2.OUTLINA,"SEGMENT=");
          strcpy(OUTLIN2.OUTLINB,GNIOA);
          SENDLIN2();
          SENDSTAT();
          if (strncmp(dibptr->dibstat,"GE",2) != 0)                    9
             TESTDIB();
   } while (strncmp(dibptr->dibstat,"GE",2) != 0);
     /*                                                  */
     /* ISSUE GN REQUEST                                 */
```

```
/*                                                    */
     strcpy(OUTLINE,GN1);
     SENDLINE();
     EXEC DLI GET NEXT USING PCB(2)
           SEGMENT(SE2ORDER)                                          10
           INTO(&GNIOA) SEGLENGTH(60);
     strcpy(OUTLIN2.OUTLINA,"SE2ORDER=");
     strcpy(OUTLIN2.OUTLINB,GNIOA);
     SENDLIN2();
     SENDSTAT();
     TESTDIB();
/*                                                    */
/* INSERT SEGMENT                                     */
/*                                                    */
     strcpy(OUTLINE,INS1);
     SENDLINE();
     strcpy(NEWSEG.NEWSEGB,DATAB);                                  11
     strcpy(NEWSEG.NEWSEGC,DATAC);
     strcpy(ISRTIOA.ISRT1,NEWSEG.NEWSEGB);
     strcpy(ISRTIOA.ISRT2,NEWSEG.NEWSEGC);
     strcpy(OUTLIN3.OUTLINX,"ISRT SEG=");
     strcpy(OUTLIN3.OUTLINY,ISRTIOA.ISRT1);
     strcpy(OUTLIN3.OUTLINZ,ISRTIOA.ISRT2);
     SENDLIN3();
     EXEC DLI ISRT USING PCB(2)
           SEGMENT(SE2ORDER)
           FROM(&ISRTIOA) SEGLENGTH(60);
     SENDSTAT();
     if (strncmp(dibptr->dibstat,"II",2) == 0)
           strncpy(dibptr->dibstat,"  ",2);
     TESTDIB();
/*                                                    */
/* ISSUE GN REQUEST                                   */
/*                                                    */
     strcpy(OUTLINE,GN1);
     SENDLINE();
     EXEC DLI GET NEXT USING PCB(2)                                 12
           SEGMENT(SE2ORDER)
           INTO(&GNIOA) SEGLENGTH(60);
     strcpy(OUTLIN2.OUTLINA,"SE2ORDER=");
     strcpy(OUTLIN2.OUTLINB,GNIOA);
     SENDLIN2();
     SENDSTAT();
     TESTDIB();
/*                                              */
/* GET INSERTED SEGMENT TO BE REPLACED          */
/*                                              */
     strcpy(OUTLINE,GU2);
     SENDLINE();
     EXEC DLI GET UNIQUE USING PCB(2)                               13
           SEGMENT(SE2ORDER)
           WHERE(FE2OGREF="000999")
           INTO(&ISRTIOA) SEGLENGTH(60);
     strcpy(OUTLIN3.OUTLINX,"ISRT SEG=");
     strcpy(OUTLIN3.OUTLINY,ISRTIOA.ISRT1);
     strcpy(OUTLIN3.OUTLINZ,ISRTIOA.ISRT2);
     SENDLIN3();
     SENDSTAT();
     TESTDIB();
/*                                                    */
/* REPLACE SEGMENT                                    */
/*                                                    */
     strcpy(OUTLINE,REP1);
     SENDLINE();
     strcpy(REPLIOA.REPLIO1,DATAB);                                 14
     strcpy(REPLIOA.REPLIO2,"REGRUN REPLACED SEGMENT NO1.");
     strcpy(OUTLIN3.OUTLINX,"REPL SEG=");
```

```
     strcpy(OUTLIN3.OUTLINY,REPLIOA.REPLIO1);
     strcpy(OUTLIN3.OUTLINZ,REPLIOA.REPLIO2);
     SENDLIN3();
     EXEC DLI REPLACE USING PCB(2)
           SEGMENT(SE2ORDER)
           FROM(&REPLIOA) SEGLENGTH(60);
     SENDSTAT();
     TESTDIB();
/*                                                */
/* ISSUE GN REQUEST                               */
/*                                                */
     strcpy(OUTLINE,GN1);
     SENDLINE();
     EXEC DLI GET NEXT USING PCB(2)                                    15
           SEGMENT(SE2ORDER)
           INTO(&GNIOA) SEGLENGTH(60);
     strcpy(OUTLIN2.OUTLINA,"SE2ORDER=");
     strcpy(OUTLIN2.OUTLINB,GNIOA);
     SENDLIN2();
     SENDSTAT();
     TESTDIB();
/*                                          */
/* GET REPLACED SEGMENT                     */
/*                                          */
     strcpy(OUTLINE,GU2);
     SENDLINE();
     EXEC DLI GET UNIQUE USING PCB(2)                                  16
           SEGMENT(SE2ORDER)
           WHERE(FE2OGREF="000999")
           INTO(&REPLIOA) SEGLENGTH(60);
     strcpy(OUTLIN3.OUTLINX,"REPL SEG=");
     strcpy(OUTLIN3.OUTLINY,REPLIOA.REPLIO1);
     strcpy(OUTLIN3.OUTLINZ,REPLIOA.REPLIO2);
     SENDLIN3();
     SENDSTAT();
     TESTDIB();
/*                                                */
/* ISSUE DELETE REQUEST                           */
/*                                                */
     strcpy(OUTLINE,DEL1);
     SENDLINE();
     strcpy(DLETIOA.DLET1,REPLIOA.REPLIO1);                            17
     strcpy(DLETIOA.DLET2,REPLIOA.REPLIO2);
     strcpy(OUTLIN3.OUTLINX,"DLET SEG=");
     strcpy(OUTLIN3.OUTLINY,DLETIOA.DLET1);
     strcpy(OUTLIN3.OUTLINZ,DLETIOA.DLET2);
     SENDLIN3();
     EXEC DLI DELETE USING PCB(2)
           SEGMENT(SE2ORDER)
           FROM(&DLETIOA) SEGLENGTH(60);
     SENDSTAT();
     TESTDIB();
/*                                                */
/* ISSUE STAT REQUEST                             */
/*                                                */
     strcpy(OUTLINE,STAT);
     SENDLINE();
     EXEC DLI STAT USING PCB(2)                                        18
           VSAM FORMATTED
           INTO(&STATAREA);
     SENDSTT2();
     TESTDIB();
/*                                                */
/* ISSUE TERM REQUEST                             */
/*                                                */
     strcpy(OUTLINE,TERM);
     SENDLINE();
```

```
        EXEC DLI TERM;                                                    19
        SENDSTAT();
        TESTDIB();
        strcpy(OUTLINE,DIVIDER);
        SENDLINE();
        SENDOK();
    /*                                                                    */
    /* RETURN TO CICS                                                     */
    /*                                                                    */
        EXEC CICS RETURN;
}
    /*                                                                    */
    /*                                                                    */
    /*                                                                    */
 SENDLINE()
 {
        EXEC CICS SEND FROM(OUTLINE) LENGTH(120);                         20
        EXEC CICS WRITEQ TD QUEUE("PRIM") FROM(OUTLINE) LENGTH(TLINE);
        strcpy(OUTLINE,BLANK);
        return;
 }

 SENDLIN2()
{
        EXEC CICS SEND FROM(OUTLIN2) LENGTH(120);
        EXEC CICS WRITEQ TD QUEUE("PRIM") FROM(OUTLIN2) LENGTH(TLINE);
        strcpy(OUTLIN2.OUTLINA,BLANK,9);
        strcpy(OUTLIN2.OUTLINB,BLANK,111);
        return;
 }

 SENDLIN3()
{
        EXEC CICS SEND FROM(OUTLIN3) LENGTH(120);
        EXEC CICS WRITEQ TD QUEUE("PRIM") FROM(OUTLIN3) LENGTH(TLINE);
        strcpy(OUTLIN3.OUTLINX,BLANK,9);
        strcpy(OUTLIN3.OUTLINY,BLANK,6);
        strcpy(OUTLIN3.OUTLINZ,BLANK,105);
        return;
 }

SENDSTAT()
{
        strncpy(OUTLIN2.OUTLINA,BLANK,9);
        strncpy(OUTLIN2.OUTLINB,BLAN2,110);
        strcpy(OUTLIN2.OUTLINA," DIBSTAT=");
        strcpy(OUTLIN2.OUTLINB,dibptr->dibstat);
        EXEC CICS SEND FROM(OUTLIN2) LENGTH(11);
        EXEC CICS WRITEQ TD QUEUE("PRIM") FROM(OUTLIN2) LENGTH(L11);
        strcpy(OUTLINE,DIVIDER);
        SENDLINE();
        return;
 }

SENDSTT2()
{
        strncpy(OUTLIN2.OUTLINA,BLANK,9);
        strncpy(OUTLIN2.OUTLINB,BLAN2,110);
        strcpy(OUTLIN2.OUTLINA," DIBSTAT=");
        strcpy(OUTLIN2.OUTLINB,dibptr->dibstat);
        EXEC CICS SEND FROM(STATAREA) LENGTH(360);
        EXEC CICS WRITEQ TD QUEUE("PRIM") FROM(STATAREA)
                  LENGTH(L360);
        return;
 }

SENDOK()
```

```
{
         EXEC CICS SEND FROM(OKMSG) LENGTH(120);
         EXEC CICS WRITEQ TD QUEUE("PRIM") FROM(OKMSG) LENGTH(TLINE);
         return;
 }

TESTDIB()                                                              21
{
    if (strncmp(dibptr->dibstat,"  ",2) == 0)
       return;
    else if (strncmp(dibptr->dibstat,"GK",2) == 0)
       return;
    else if (strncmp(dibptr->dibstat,"GB",2) == 0)
       return;
    else if (strncmp(dibptr->dibstat,"GE",2) == 0)
       return;
    else
       {
            EXEC CICS ABEND ABCODE("PETE");                            22
            EXEC CICS RETURN;
       }
         return;
 }
```

Notes for the sample C code:

1 You must include a standard header file `string.h` to gain access to string manipulation facilities.

2 You must include standard header file `stdio.h` to access the standard I/O library.

3 Define DL/I messages.

4 Define the I/O areas.

5 Program start.

6 Define PSB PC3COCHD.

7 Issue the first command. Retrieves the first occurrence of segment SE2ORDER and puts it into array OUTLIN2.

8 Issue the `GNP` command to get the next segment and put it into array OUTLIN2.

9 GE status codes indicate no more segments to get.

10 Get next segment SE2ORDER and put it into the array OUTLIN2.

11 Insert segment into array OUTLIN3.

12 Issue `GN` to retrieve next segment and put it into array OUTLIN2.

13 Get next segment that will be replaced and put it into OUTLIN3.

14 Replace the segment and put it into array OUTLIN3.

15 Get next segment and put it into array OUTLIN2.

16 Get the replaced segment and put it into array OUTLIN3.

17 Issue `DELETE` command after putting content of segment into array OUTLIN3.

18 Issue `STAT REQUEST` command.

19 Issue `TERM` command.

20 Output processing.

21 Check return code.

22 Do not code EXEC CICS commands in a batch or BMP program.

Preparing Your EXEC DLI Program for Execution

The steps for preparing your program for execution are as follows:

1. Run the CICS command language translator to translate the EXEC DLI and EXEC CICS commands. COBOL, PL/I, and assembler language programs have separate translators.
2. Compile your program.
3. Link-edit:
   - An online program with the appropriate CICS interface module
   - A batch or BMP program with the IMS interface module.

You can use CICS-supplied procedures to translate, compile, and link-edit your program. The procedure you use depends on the type of program (batch, BMP, or CICS online) and the language it is written in (COBOL, PL/I, or assembler language).

Translator Options Required for EXEC DLI

Even when you use the CICS-supplied procedures for preparing your program, you must supply certain translator options.

For a CICS online program containing EXEC DLI commands, you must specify the DLI and CICS options. For a batch or BMP program containing EXEC DLI commands, you must specify the DLI option..

You can also specify the options on the EXEC job control statement that invokes the translator; if you use both methods, the CBL and *PROCESS statement overrides those in the EXEC statement. For more information on the translator options, see *CICS Transaction Server for CICS Application Programming Guide*.

You must ensure that the translator options you use in a COBOL program do not conflict with the COBOL compiler options. When you translate an IBM COBOL for z/OS & VM program, you must use the COBOL for z/OS & VM translator option. Similarly, when you translate a VS COBOL II program, you must use the COBOL II translator option.

Compiler Options Required for EXEC DLI

If you want to compile your batch COBOL program with COBOL for z/OS & VM and then execute it AMODE(31) on z/OS, you must use the compiler option RENT. If you want to compile your batch COBOL program with VS COBOL II and then execute it AMODE(31) on z/OS, you must use the compiler options RES and RENT. For information on which compiler options should be used for a CICS program, see *CICS Application Programming Reference*.

Linkage Editor Options Required for EXEC DLI

If the compiler being used supports it, you can link a program written with EXEC commands as AMODE(31) RMODE(ANY).

Chapter 4. EXEC DLI Commands for an Application Program

This chapter explains the program specification block (PSB) and the different kinds of program communication blocks (PCBs). It also lists and describes the EXEC DLI commands. For each command, a syntax diagram is provided, along with information on options, restrictions, usage, and examples illustrating that usage.

The following topics provide additional information:

- "PCBs and PSB"
- "EXEC DLI Commands" on page 33

PCBs and PSB

A program specification block (PSB) used in a DBCTL environment can contain:

- I/O PCB
- Alternate PCBs
- DB PCBs
- GSAM PCBs

I/O PCB

In a DBCTL environment, an I/O PCB is needed to issue DBCTL service requests. Unlike the other types of PCB, it is not defined with PSB generation, but if the application program is using an I/O PCB, this has to be indicated in the PSB scheduling request.

Alternate PCB

An alternate PCB defines a logical terminal and can be used instead of the I/O PCB when it is necessary to direct a response to a terminal. Alternate PCBs appear in PSBs used in a CICS-DBCTL environment, but are used only in an IMS DC environment. CICS applications using DBCTL cannot successfully issue commands that specify an alternate PCB, an MSDB PCB, or a GSAM PCB. However, a PSB that contains PCBs of these types can be scheduled successfully in a CICS-DBCTL environment.

Alternate PCBs are included in the PCB address list returned to a call level application program. In an EXEC DLI application program, the existence of alternate PCBs in the PSB affects the PCB number used in the PCB keyword.

DB PCB

A database PCB (DB PCB) is the PCB that defines an application program's interface to a database. One DB PCB is needed for each database view used by the application program. It can be a full-function PCB, a DEDB PCB, or an MSDB PCB.

GSAM PCB

A GSAM PCB defines an application program's interface for GSAM operations.

When using DBCTL, a CICS program receives, by default, a DB PCB as the first PCB in the parameter list passed to it after scheduling. However, when your application program can handle an I/O PCB, you indicate this using the SYSSERVE

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keyword on the SCHD command. The I/O PCB is then the first PCB in the parameter address list passed back to your application program.

PCB Summary

This topic summarizes the information concerning I/O PCBs and alternate PCBs in various types of application programs.

Recommendation: You should read this topic if you intend to issue system service requests.

DB Batch Programs

Alternate PCBs are always included in the list of PCBs supplied to the program by DL/I irrespective of whether you have specified CMPAT=Y. The I/O PCB is returned depending on the CMPAT option.

If you specify CMPAT=Y, the PCB list contains the address of the I/O PCB, followed by the addresses of any alternate PCBs, followed by the addresses of any DB PCBs.

If you do not specify CMPAT=Y, the PCB list contains the addresses of any alternate PCBs followed by the addresses of the DB PCBs.

BMP Programs, MPPs, and IFPs

I/O PCBs and alternate PCBs are always passed to BMP programs. I/O PCBs and alternate PCBs are also always passed to MPPs and to IFP application programs.

The PCB list contains the address of the I/O PCB, followed by the addresses of any alternate PCBs, followed by the addresses of the DB PCBs.

CICS Programs with DBCTL

The first PCB always refers to the first DB PCB whether you specify the SYSSERVE keyword.

Table 8 summarizes the I/O PCB and alternate PCB information. The first column lists different DB environments, the second and third column specify if the I/O PCB or alternate PCB, respectively, is valid in the specified environment.

Table 8. Summary of PCB Information

	EXEC DLI	
Environment	**I/O PCB count included in PCB(n)**	**Alternate PCB count included in PCB(n)**
CICS DBCTL[1]	No	No
CICS DBCTL[2]	No	No
BMP	Yes	Yes
Batch[3]	No	Yes
Batch[4]	Yes	Yes

Notes:

1. SCHD command issued without the SYSSERVE option.
2. SCHD command issued with the SYSSERVE option for a CICS DBCTL command or for a function-shipped command which is satisfied by a remote CICS system using DBCTL.
3. CMPAT=N specified on the PSBGEN statement.
4. CMPAT=Y specified on the PSBGEN statement.

Format of a PSB

The following is the format of a PSB.

```
[IOPCB]
[Alternate PCB ... Alternate PCB]
[DBPCB ... DBPCB]
[GSAMPCB ... GSAMPCB]
```

Each PSB must contain at least one PCB. The I/O PCB must be addressable in order to issue a system service command. An alternate PCB is used only for IMS online programs, which can run only with the Transaction Manager. Alternate PCBs can be present even though your program does not run under the Transaction Manager. A DB PCB can be a full-function PCB, a DEDB PCB, or an MSDB PCB.

EXEC DLI Commands

The EXEC DLI commands are the only ones allowed for EXEC DLI. They can be used to read and update DL/I databases with a batch program, a BMP region (running DBCTL or DB/DC), or a CICS program using DBCTL.

The examples in this chapter use the PL/I delimiter. Code the commands in free form: Where keywords, operands, and parameters are shown separated by commas, no blanks can appear immediately before or after the comma. Where keywords, operands, and parameters are shown separated by blanks, you can include as many blanks as you wish. The format of the commands is the same for users of COBOL, PL/I, assembler language, C/370™, and C++/370.

Table 9 on page 34 provides a summary of the commands available to batch, BMP, and online programs. The descriptions in the following topics illustrate the general syntax of the EXEC DLI commands and the information supplied by each parameter and variable:

The examples included with each command refer to the "A Database Hierarchy Example" on page 2.

Summary of EXEC DLI Commands

A summary of all the EXEC DLI commands is provided in Table 9. The table lists the EXEC DLI commands and specifies if they are valid in the Batch, Batch-Oriented BMP, or CICS with DBCTL environment.

Table 9. Summary of EXEC DLI Commands

	Program Characteristics		
Request Type	**Batch**	**Batch- Oriented BMP**	**CICS with DBCTL[1]**
ACCEPT command[4]	Yes	Yes	Yes
CHKP command[4]	Yes	Yes	No
DEQ command[4]	Yes	Yes	Yes
DLET command [4]	Yes	Yes	Yes
Get commands (GU, GHU, GN, GHN, GNP, GHNP)[4]	Yes	Yes	Yes
GMSG command[5]	No	Yes	Yes
ICMD command[5]	No	Yes	Yes
ISRT command[4]	Yes	Yes	Yes
LOAD command	Yes	No	No
LOG command[4]	Yes	Yes	Yes
POS command[4]	No	Yes	Yes
QUERY command[4]	Yes	Yes	Yes
RCMD command[5]	No	Yes	Yes
REFRESH command[4]	Yes	Yes	Yes
REPL command[4]	Yes	Yes	Yes
RETRIEVE command	Yes	Yes	No
ROLB command	Yes	Yes	No
ROLL command	Yes	Yes	No
ROLS command[2,4]	Yes	Yes	Yes
SCHD command	No	No	Yes
SETS command[2,4]	Yes	Yes	Yes
SETU command	Yes	Yes	No
STAT command[3,4]	Yes	Yes	Yes
SYMCHKP command	Yes	Yes	No
TERM command	No	No	Yes

Table 9. Summary of EXEC DLI Commands (continued)

Request Type	Program Characteristics		
	Batch	Batch- Oriented BMP	CICS with DBCTL[1]
XRST command	Yes	Yes	No

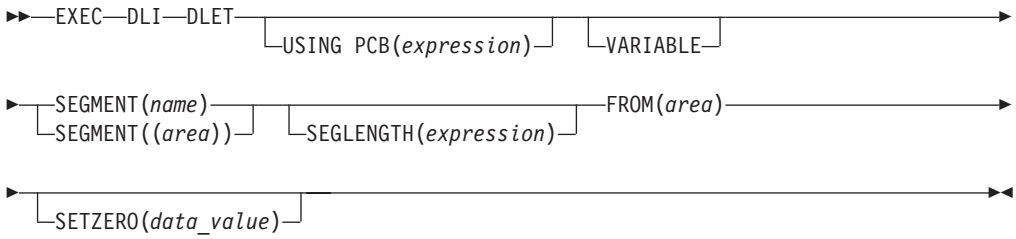
Notes:

1. In a CICS remote DL/I environment, commands in the CICS with DBCTL column are supported if you are shipping a function to a remote CICS that uses DBCTL.
2. ROLS and SETS commands are not valid when the PSB contains a DEDB.
3. STAT is a Product-sensitive programming interface.
4. Are supported in the AIB format.
5. Are described in the AOI documentation within the *IMS Version 9: Operations Guide*.

DLET Command

The Delete (DLET) command is used to remove a segment and its dependents from the database.

Format



Options

USING PCB(expression)
Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

VARIABLE
Indicates that a segment is variable-length.

SEGMENT(name)
Qualifies the command, specifying the name of the segment type you want to retrieve, insert, delete, or replace.

SEGMENT((area))
Is a reference to an area in your program containing the name of the segment type. You can specify an area instead of specifying the name of the segment in the command.

SEGLENGTH(expression)
Specifies the length of the I/O area into which the segment is retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs for any SEGMENT level that specifies the INTO or FROM option.)

Requirement: The value specified for SEGLENGTH must be greater than or equal to the length of the longest segment that can be processed by this call.

FROM(area)
Specifies an area containing the segment to be added, replaced, or deleted. Use FROM to insert one or more segments with one command.

SETZERO(data_value)
Specifies setting a subset pointer to zero.

Usage

You use the DLET command to delete a segment and its dependents from the database. You must first retrieve segments you want to delete, just as if you were replacing segments, The DLET command deletes the retrieved segment *and* its dependents, if any, from the database.

Example

"Evelyn Parker has moved away from this area. Her patient number is 10450. Delete her record from the database."

Explanation: You want to delete all the information about Evelyn Parker from the database. To do this, you must delete the PATIENT segment. When you do this, DL/I deletes all the dependents of that segment. This is exactly what you want DL/I to do—there is no reason to keep such segments as ILLNESS and TREATMNT for Evelyn Parker if she is no longer one of the clinic's patients.

Before you can delete the patient segment, you have to retrieve it:

```
EXEC DLI GU
     SEGMENT(PATIENT) INTO(PATAREA) WHERE (PATNO=PATNO1);
```

To delete this patient's database record, you issue a DLET command and use the FROM option to give the name of the I/O area that contains the segment you want deleted:

```
EXEC DLI DLET SEGMENT(PATIENT) FROM(PATAREA);
```

When you issue this command, the PATIENT segment, and its dependents—the ILLNESS, TREATMNT, BILLING, PAYMENT, and HOUSHOLD segments—are deleted.

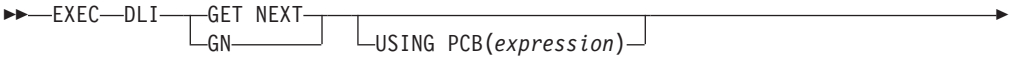
Restrictions

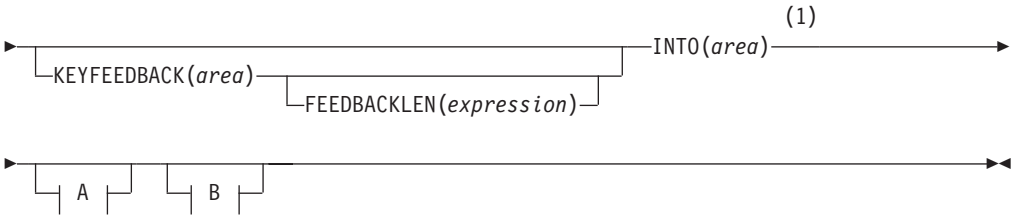
You cannot issue any commands using the same PCB between the retrieval command and the DLET command, and you can issue only one DLET command for each GET command.

GN Command

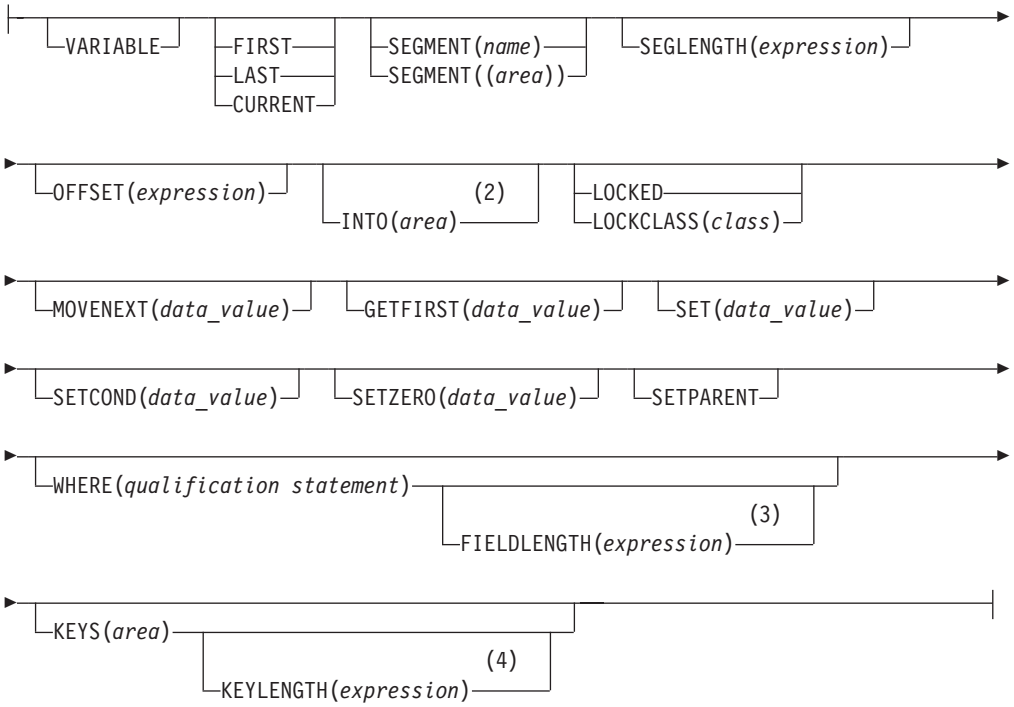
The GN command is used to retrieve segments sequentially.

Format

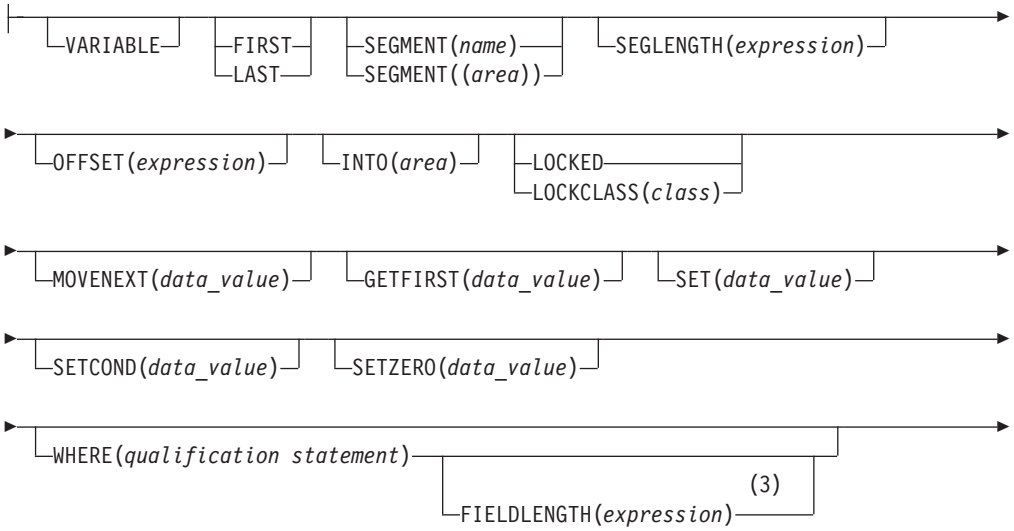


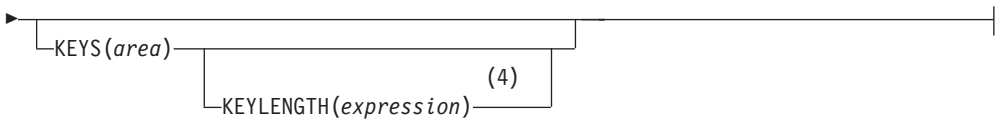


A For each parent segment (optional):



B For the object segment (optional):





Notes:

1 If you leave out the SEGMENT option, specify the INTO option as shown.

2 Specify INTO on parent segments for a path command.

3 If you use multiple qualification statements, specify a length for each, using FIELDLENGTH. For example: **FIELDLENGTH(24,8)**

4 You can use either the KEYS option or the WHERE option, but not both on one segment level.

Options

USING PCB(expression)
Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

KEYFEEDBACK(area)
Specifies an area into which the concatenated key for the segment is placed. If the area is not long enough, the key is truncated.

FEEDBACKLEN(expression)
Specifies the length of the key feedback area into which you want the concatenated key retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs and optional in PL/I and assembler language programs.)

INTO(area)
Specifies an area into which the segment is read.

VARIABLE
Indicates that a segment is variable-length.

FIRST
Specifies that you want to retrieve the first segment occurrence of a segment type, or that you want to insert a segment as the first occurrence.

LAST
Specifies that you want to retrieve the last segment occurrence of a segment type, or that you want to insert a segment as the last segment occurrence.

CURRENT
Qualifies the command, and specifies that you want to use the level of and levels above the current position as qualifications for this segment.

SEGMENT(name), SEGMENT((area))
Qualifies the command, specifying the name of the segment type or the area of your program containing the name of the segment type that you want to retrieve.

You can have as many levels of qualification for a GN command as there are levels in the database's hierarchy. Using fully qualified commands with the WHERE or KEYS option clearly identifies the hierarchical path and the segment

you want, and is useful in documenting the command. However, you do not need to qualify a GN command, because you can specify a GN command without the SEGMENT option.

Once you have established position in the database record, issuing a GN command without a SEGMENT option retrieves the next segment occurrence in sequential order.

If you specify a SEGMENT option without a KEYS or WHERE option, IMS DB retrieves the first occurrence of that segment type it encounters by searching forward from current position. With an unqualified GN command, the segment type you retrieve might not be the one you expected, so you should specify an I/O area large enough to contain the largest segment your program has access to. (After successfully issuing a retrieval command, you can find out from the DIB the segment type retrieved.)

If you fully qualify your command with a WHERE or KEYS option, you would retrieve the next segment in sequential order, as described by the options.

Including the WHERE or KEYS options for parent segments defines the segment occurrences that are to be part of the path to the segment you want retrieved. Omitting the SEGMENT option for a level, or including only the SEGMENT option without a WHERE option, indicates that any path to the option satisfies the command. DL/I uses only the qualified parent segments and the lowest-level SEGMENT option to satisfy the command. DL/I does not assume a qualification for the missing level.

SEGLENGTH(expression)
Specifies the length of the I/O area into which the segment is retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs for any SEGMENT level that specifies the INTO or FROM option.)

Requirement: The value specified for SEGLENGTH must be greater than or equal to the length of the longest segment that can be processed by this call.

OFFSET(expression)
Specifies the offset to the destination parent. It can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. Use OFFSET when you process concatenated segments in logical relationships. OFFSET is required whenever the destination parent is a variable-length segment.

LOCKED
Specifies that you want to retrieve a segment for the exclusive use of your program, until a checkpoint or sync point is reached. This option performs the same function as the Q command code, and it applies to both and full function. A 1-byte alphabetic character of 'A' is automatically appended as the class for the Q command code.

LOCKCLASS(class)
Specifies that you want to retrieve a segment for the exclusive use of your program until a DEQ command is issued or until a checkpoint or sync point is reached. (DEQ commands are not supported for Fast Path.) Class is a 1-byte alphabetic character (B-J), representing the lock class of the retrieved segment.

For full-function code, the LOCKCLASS option followed by a letter (B-J) designates the class of the lock for the segment. An example is LOCKCLASS('B'). If LOCKCLASS is not followed by a letter in the range B to J, then EXECDLI sets a status code of GL and initiates an ABENDU1041.

Fast Path does not support LOCKCLASS but, for consistency between full function and Fast Path, you must specify LOCKCLASS('x')), where x is a letter in the range B to J. An example is LOCKCLASS('B'). If LOCKCLASS is not followed by a letter in the range B to J, then EXECDLI sets a status code of GL and initiates an ABENDU1041.

MOVENEXT(data_value)
Specifies a subset pointer to be moved to the next segment occurrence after your current segment.

GETFIRST(data_value)
Specifies that you want the search to start with the first segment occurrence in a subset.

SET(data_value)
Specifies unconditionally setting a subset pointer to the current segment.

SETCOND(data_value)
Specifies conditionally setting a subset pointer to the current segment.

SETZERO(data_value)
Specifies setting a subset pointer to zero.

SETPARENT
Sets parentage at the level you want.

FIELDLENGTH(expression)
Specifies the length of the field value in a WHERE option.

KEYLENGTH(expression)
Specifies the length of the concatenated key when you use the KEYS option. It can be any expression in the host language that converts to the integer data type; if it is a variable, it must be declared as a binary halfword value. For IBM COBOL for z/OS & VM (or VS COBOL II), PL/I, or assembler language, KEYLENGTH is optional. For COBOL programs that are not compiled with the IBM COBOL for z/OS & VM (or the VS COBOL II) compiler, you must specify KEYLENGTH with the KEYS option.

KEYS(area)
Qualifies the command with the segment's concatenated key. You can use either KEYS or WHERE for a segment level, but not both.

"Area" specifies an area in your program containing the segment's concatenated key.

WHERE(qualification statement)
Qualifies the command, specifying the segment occurrence. Its argument is one or more qualification statements, each of which compares the value of a field in a segment to a value you supply. Each qualification statement consists of:

- The name of a field in a segment
- The relational operator, which indicates how you want the two values compared
- The name of a data area in your program containing the value that is compared against the value of the field

Usage

Use the GN command to sequentially retrieve segments from the database. Each time you issue a GN command, IMS DB retrieves the next segment, as described by the options you include in the command. Before issuing a GN command, you should establish position in the database record by issuing a GU command.

You do not have to use a segment option with a GN command. However, you should qualify your GN commands as much as possible with the KEYS or WHERE options after the SEGMENT option.

Examples

Example 1: "We need a list of all patients who have been to this clinic."

Explanation: To answer this request, your program would issue a command qualified with the segment name PATIENT until DL/I returned a GB status code to the program. (GB means that DL/I reached the end of the database before being able to satisfy your command). This command looks like this:

```
EXEC DLI GN
   SEGMENT(PATIENT) INTO(PATAREA);
```

Each time your program issued this command, the current position moves forward to the next database record.

Example 2: "What are the names of the patients we have seen since the beginning of this month?"

Explanation: A GN command that includes one or more WHERE or KEYS options retrieves the next occurrence of the specified segment type that satisfies the command. To answer this request, the program issues the following GN command until DL/I returned a GB status code. The example shows the command you use at the end of April, 1988 (assuming ILLDATE1 contains 198804010):

```
EXEC DLI GN
   SEGMENT(PATIENT) INTO(PATAREA)
   SEGMENT(ILLNESS) INTO(ILLAREA) WHERE(ILLDATE>=ILLDATE1);
```

Example 3:

```
EXEC DLI GN INTO(PATAREA);
```

Explanation: If you just retrieved the PATIENT segment for patient 04124 and then issued this command, you retrieve the first ILLNESS segment for patient 04124.

Restrictions

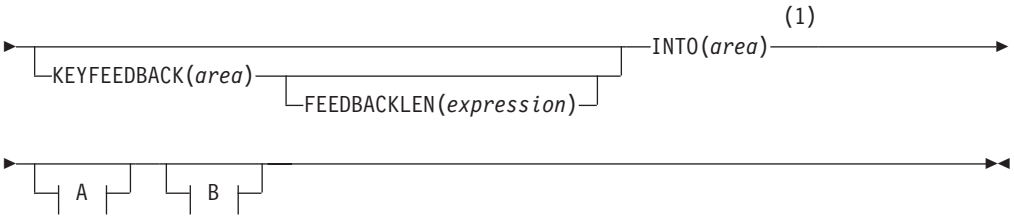
With an unqualified GN command, the retrieved segment type might not be the one expected. Therefore, specify an I/O area large enough to contain the largest segment accessible to your program.

Use either the KEYS option or the WHERE option, but not both on one segment level.

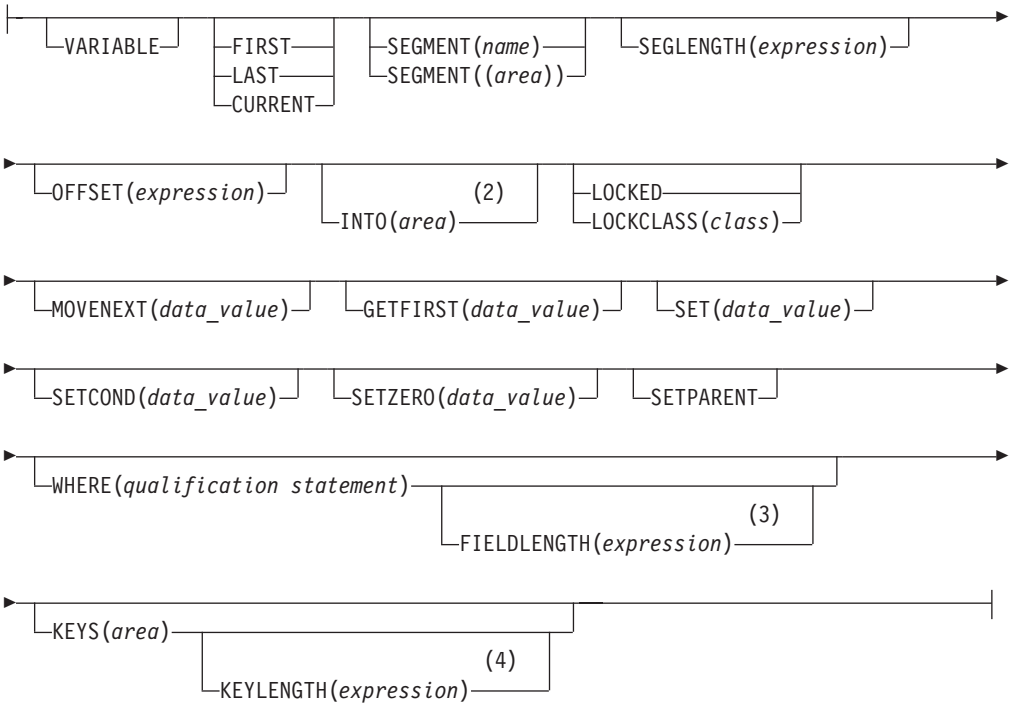
GNP Command

The Get Next in Parent (GNP) command is used to retrieve dependent segments sequentially.

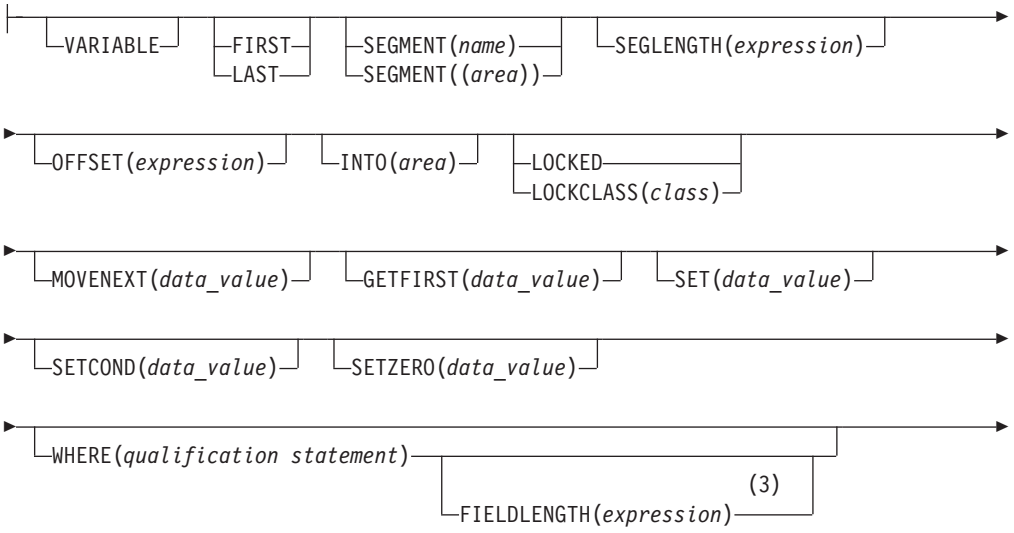
Format

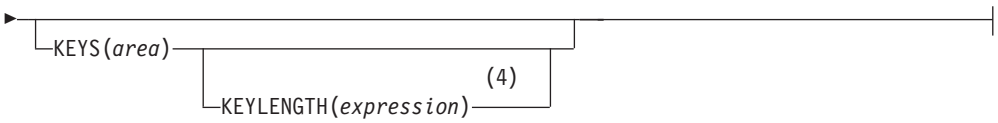


A For each parent segment (optional):



B For the object segment (optional):





Notes:

1 If you leave out the SEGMENT option, specify the INTO option as shown.

2 Specify INTO on parent segments for a path command.

3 If you use multiple qualification statements, specify a length for each, using FIELDLENGTH. For example: **FIELDLENGTH(24,8)**

4 You can use either the KEYS option or the WHERE option, but not both on one segment level.

Options

You can qualify your GNP command by using SEGMENT and WHERE options.

If you do not qualify your command, IMS DB retrieves the next sequential segment under the established parent. If you include a SEGMENT option, IMS DB retrieves the first occurrence of that segment type that it finds by searching forward under the established parent.

You can have as many levels of qualification for a GNP command as there are levels in the database's hierarchy. However, you should not qualify your command in a way that causes DL/I to move off of the segment type you have established as a parent for the command.

USING PCB(expression)
Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

KEYFEEDBACK(area)
Specifies an area into which the concatenated key for the segment is placed. If the area is not long enough, the key is truncated. Use this to retrieve a segment's concatenated key.

FEEDBACKLEN(expression)
Specifies the length of the key feedback area into which you want the concatenated key retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs and optional in PL/I and assembler language programs.)

INTO(area)
Specifies an area into which the segment is read. Use this to retrieve one or more segments with one command.

VARIABLE
Indicates that a segment is variable-length.

FIRST
Specifies that you want to retrieve the first segment occurrence of a segment type, or that you want to insert a segment as the first occurrence. Use this to retrieve the first segment occurrence of a segment type.

LAST
Specifies that you want to retrieve the last segment occurrence of a segment

type, or that you want to insert a segment as the last segment occurrence. Use this to retrieve the last segment occurrence of a segment type.

CURRENT
Qualifies the command, and specifies that you want to use the level of and levels above the current position as qualifications for this segment. Use this to retrieve a segment based on your current position.

SEGLENGTH(expression)
Specifies the length of the I/O area into which the segment is retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (SEGLENGTH is required in COBOL programs for any SEGMENT level that specifies the INTO or FROM option.)

Requirement: The value specified for SEGLENGTH must be greater than or equal to the length of the longest segment that can be processed by this call.

OFFSET(expression)
Specifies the offset to the destination parent. The argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. Use OFFSET when you process concatenated segments in logical relationships. OFFSET is required whenever the destination parent is a variable-length segment.

LOCKED
Specifies that you want to retrieve a segment for the exclusive use of your program, until a checkpoint or sync point is reached. Use this to reserve a segment for the exclusive use of your program. This option performs the same function as the Q command code, and it applies to both Fast Path and full function. A 1-byte alphabetic character of 'A' is automatically appended as the class for the Q command code.

LOCKCLASS(class)
Specifies that you want to retrieve a segment for the exclusive use of your program until a `DEQ` command is issued or until a checkpoint or sync point is reached. (`DEQ` commands are not supported for Fast Path.) `Class` is a 1-byte alphabetic character (B-J), representing the lock class of the retrieved segment.

For full-function code, the LOCKCLASS option followed by a letter (B-J) designates the class of the lock for the segment. An example is `LOCKCLASS('B')`. If `LOCKCLASS` is not followed by a letter in the range B to J, then EXECDLI sets a status code of GL and initiates an ABENDU1041.

Fast Path does not support `LOCKCLASS` but, for consistency between full function and Fast Path, you must specify `LOCKCLASS('x')`), where `x` is a letter in the range B to J. An example is `LOCKCLASS('B')`. If `LOCKCLASS` is not followed by a letter in the range B to J, then EXECDLI sets a status code of GL and initiates an ABENDU1041.

MOVENEXT(data_value)
Specifies a subset pointer to be moved to the next segment occurrence after your current segment.

GETFIRST(data_value)
Specifies that you want the search to start with the first segment occurrence in a subset.

SET(data_value)
Specifies unconditionally setting a subset pointer to the current segment.

SETCOND(data_value)
Specifies conditionally setting a subset pointer to the current segment.

SETZERO(data_value)
Specifies setting a subset pointer to zero.

SETPARENT
Sets parentage at the level you want.

WHERE(qualification statement)
Qualifies the command, specifying the segment occurrence. Its argument is one or more qualification statements, each of which compares the value of a field in a segment to a value you supply. Each qualification statement consists of:

- The name of a field in a segment
- The relational operator, which indicates how you want the two values compared
- The name of a data area in your program containing the value that is compared against the value of the field

FIELDLENGTH(expression)
Specifies the length of the field value in a WHERE option.

KEYS(area)
Qualifies the command with the segment's concatenated key. You can use either KEYS or WHERE for a segment level, but not both.

"Area" specifies an area in your program containing the segment's concatenated key.

KEYLENGTH(expression)
Specifies the length of the concatenated key when you use the KEYS option. It can be any expression in the host language that converts to the integer data type; if it is a variable, it must be declared as a binary halfword value. For IBM COBOL for z/OS & VM (or VS COBOL II), PL/I, or assembler language, KEYLENGTH is optional. For COBOL programs that are not compiled with the IBM COBOL for z/OS & VM (or VS COBOL II) compiler, you must specify KEYLENGTH with the KEYS option.

SEGMENT(name), SEGMENT((area))
Qualifies the command, specifying the name of the segment type or the area in your program containing the name of the segment type that you want to retrieve, insert, delete, or replace.

You can have as many levels of qualification for a GNP command as there are levels in the database's hierarchy. Using fully qualified commands with the WHERE or KEYS option clearly identifies the hierarchic path and the segment you want, and is useful in documenting the command. However, you do not need to qualify a GNP command at all, because you can specify a GNP command without the SEGMENT option.

Once you have established position in the database record, issuing a GNP command without a SEGMENT option retrieves the next segment occurrence in sequential order.

If you specify a SEGMENT option without a KEYS or WHERE option, IMS DB retrieves the first occurrence of that segment type it encounters by searching forward from current position. With an unqualified GNP command, the segment type you retrieve might not be the one you expected, so you should specify an I/O area large enough to contain the largest segment your program has access to. (After successfully issuing a retrieval command, you can find out from DIB the segment type retrieved.)

If you fully qualify your command with a WHERE or KEYS option, you would retrieve the next segment in sequential order, as described by the options.

Including the WHERE or KEYS options for parent segments defines the segment occurrences that are to be part of the path to the segment you want retrieved. Omitting the SEGMENT option for a level, or including only the SEGMENT option without a WHERE option, indicates that any path to the option satisfies the command. DL/I uses only the qualified parent segments and the lowest-level SEGMENT option to satisfy the command. DL/I does not assume a qualification for the missing level.

Usage

The Get Next in Parent (GNP) command makes it possible to limit the search for a segment; you can retrieve only the dependents of a particular parent. You must have established parentage before issuing a GNP command.

Examples

Example 1: "We need the complete record for Kate Bailey. Her patient number is 09080."

Explanation: To satisfy this request, you want only to retrieve the dependent segments of the patient whose patient number is 09080; you do not want to retrieve all the dependents of each patient. To do this, use the GU command to establish your position and parentage on the PATIENT segment for Kate Bailey. Then continue to issue a GNP without SEGMENT or WHERE options until DL/I returns all the dependents of that PATIENT segment. (A GE status code indicates that you have retrieved all the dependent segments.) To answer this request, your program can issue these commands:

```
EXEC DLI GU
     SEGMENT(PATIENT) INTO(PATAREA)
     WHERE (PATNO=PATNO1);
EXEC DLI GNP
     INTO(ILLAREA);
```

A GNP command without SEGMENT or WHERE options retrieves the first dependent segment occurrence under the current parent. If your current position is already on a dependent of the current parent, this command retrieves the next segment occurrence under the parent.

With an unqualified GNP command, the segment type you retrieve might not be the one you expected, so you should specify an I/O area large enough to contain the largest segment your program has access to. (After successfully issuing a GNP command, you can find out from the DIB the segment type retrieved.)

Example 2: "Which doctors have been prescribing acetaminophen for headaches?"

Explanation: A GNP command with only a SEGMENT option sequentially retrieves the dependent segments of the segment type you have specified under the established parent. Suppose that for this example, the key of ILLNESS is ILLNAME, and the key of TREATMNT is MEDICINE. You want to retrieve each TREATMNT segment where the treatment was acetaminophen. The name of the doctor who prescribed the treatment is part of the TREATMNT segment. (Assume that data area ILLNAME1 contains HEADACHE, and MEDIC1 contains ACETAMINOP). To answer this request, you can issue these commands:

```
EXEC DLI GN
     SEGMENT(ILLNESS) WHERE (ILLNAME=ILLNAME1);
EXEC DLI GNP
     SEGMENT(TREATMNT) WHERE (MEDICINE=MEDIC1);
```

To process this, your program continues issuing the GNP command until DL/I returned a GE (not found) status code, then your program retrieves the next headache segment and retrieves the TREATMNT segments for it. Your program does this until there were no more ILLNESS segments where the ILLNAME was headache.

Restrictions

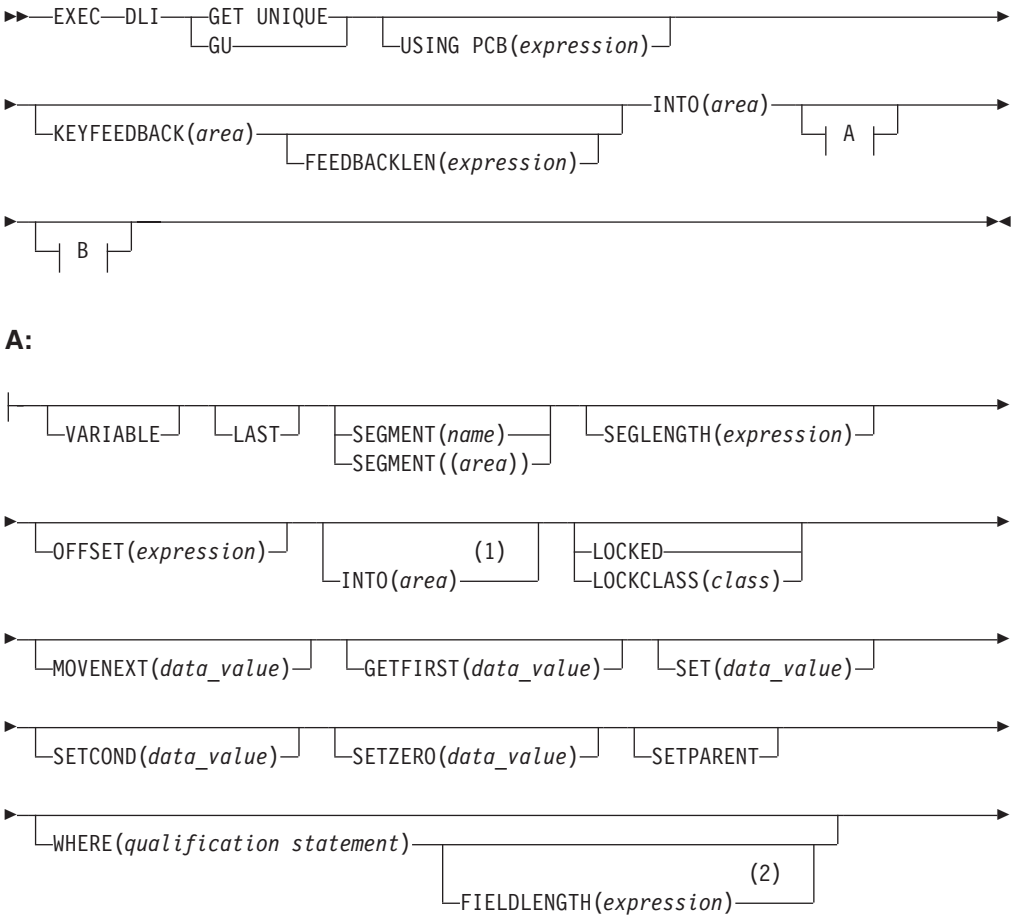
Restrictions for GNP command:

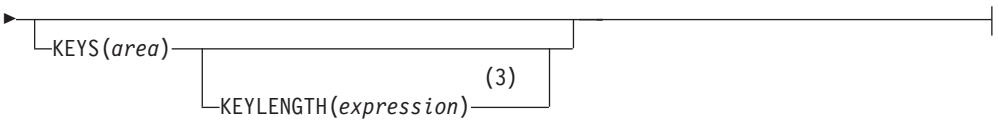
- You must have established parentage before issuing this command.
- You cannot qualify your GNP command in a way that causes DL/I to move off of the segment type you have established as the parent for the command.
- You can retrieve only the dependents of a particular parent.

GU Command

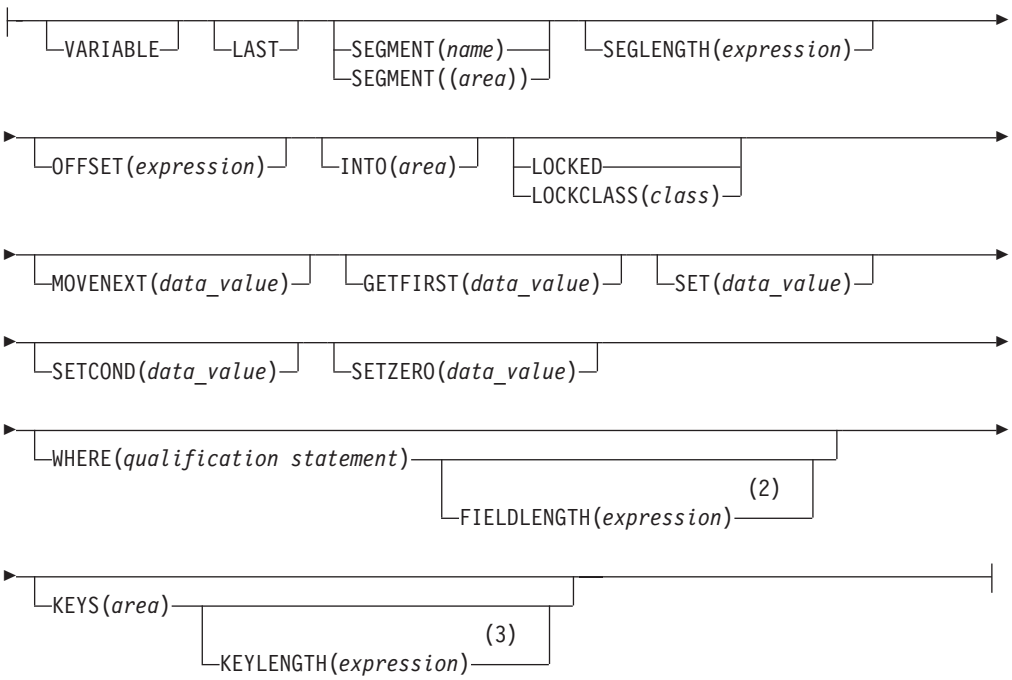
The Get Unique (GU) command is used to directly retrieve specific segments, and to establish a starting position in the database for sequential processing.

Format





B:



Notes:

1 Specify INTO on parent segments for a path command.

2 If you use multiple qualification statements, specify a length for each, using FIELDLENGTH. For example: **FIELDLENGTH(24,8)**

3 You can use either the KEYS option or the WHERE option, but not both on one segment level.

Options

USING PCB(expression)
Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

KEYFEEDBACK(area)
Specifies an area into which the concatenated key for the segment is placed. If the area is not long enough, the key is truncated.

FEEDBACKLEN(expression)
Specifies the length of the key feedback area into which you want the concatenated key retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs and optional in PL/I and assembler language programs.)

INTO(area)
Specifies an area into which the segment is read.

VARIABLE
Indicates that a segment is variable-length.

LAST
Specifies that you want to retrieve the last segment occurrence of a segment type, or that you want to insert a segment as the last segment occurrence.

SEGMENT(name), SEGMENT((area))
Qualifies the command, specifying the name of the segment type or the area in your program containing the name of the segment type that you want to retrieve, insert, delete, or replace.

To retrieve the first occurrence of a segment type, you need only specify the SEGMENT option. You can specify as many levels of qualification as there are hierarchic levels defined by the PCB you are using.

To establish position at the beginning of the database, issue a GU command with a SEGMENT option that names the root segment type.

If you leave out SEGMENT options for one or more hierarchic levels, DL/I assumes a segment qualification for that level. The qualification that DL/I assumes depends on your current position.

- If DL/I has a position established at the missing level, DL/I uses the segment on which position is established.
- If DL/I does not have a position established at the missing level, DL/I uses the first occurrence at that level.
- If DL/I moves forward from a position established at a higher level, DL/I uses the first occurrence at the missing level that falls within the new path.
- If you leave out a SEGMENT option for the *root* level, and DL/I has position established on a root, DL/I does not move from that root when trying to satisfy the command.

  You can have as many levels of qualification for a GU command as there are levels in the database's hierarchy. Using fully qualified commands with the WHERE or KEYS option clearly identifies the hierarchic path and the segment you want, and is useful in documenting the command. However, you do not need to qualify a GU command at all, because you can specify a GU command without the SEGMENT option.

  If you specify a SEGMENT option without a KEYS or WHERE option, IMS DB retrieves the first occurrence of that segment type it encounters by searching forward from current position. With an unqualified GU command, the segment type you retrieve might not be the one you expected, so you should specify an I/O area large enough to contain the largest segment your program has access to. (After successfully issuing a retrieval command, you can find out from DIB the segment type retrieved.)

  If you fully qualify your command with a WHERE or KEYS option, you would retrieve the next segment in sequential order, as described by the options.

  Including the WHERE or KEYS options for parent segments defines the segment occurrences that are to be part of the path to the segment you want retrieved. Omitting the SEGMENT option for a level, or including only the SEGMENT option without a WHERE option, indicates that any path to the option satisfies the command. DL/I uses only the qualified parent segments and the lowest-level SEGMENT option to satisfy the command. DL/I does not assume a qualification for the missing level.

SEGLENGTH(expression)
Specifies the length of the I/O area into which the segment is retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (SEGLENGTH is required in COBOL programs for any SEGMENT level that specifies the INTO or FROM option.)

Requirement: The value specified for SEGLENGTH must be greater than or equal to the length of the longest segment that can be processed by this call.

OFFSET(expression)
Specifies the offset to the destination parent. The argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. Use OFFSET when you process concatenated segments in logical relationships. OFFSET is required whenever the destination parent is a variable-length segment.

LOCKED
Specifies that you want to retrieve a segment for the exclusive use of your program, until a checkpoint or sync point is reached. This option performs the same function as the Q command code. It applies to both Fast Path and full function. A 1-byte alphabetic character of 'A' is automatically appended as the class for the Q command code.

LOCKCLASS(class)
Specifies that you want to retrieve a segment for the exclusive use of your program until a `DEQ` command is issued or until a checkpoint or sync point is reached. (`DEQ` commands are not supported for Fast Path.) `Class` is a 1-byte alphabetic character (B-J), representing the lock class of the retrieved segment.

For full-function code, the LOCKCLASS option followed by a letter (B-J) designates the class of the lock for the segment. An example is `LOCKCLASS('B')`. If `LOCKCLASS` is not followed by a letter in the range B to J, then EXECDLI sets a status code of GL and initiates an ABENDU1041.

Fast Path does not support `LOCKCLASS` but, for consistency between full function and Fast Path, you must specify `LOCKCLASS('x')`), where `x` is a letter in the range B to J. An example is `LOCKCLASS('B')`. If `LOCKCLASS` is not followed by a letter in the range B to J, then EXECDLI sets a status code of GL and initiates an ABENDU1041.

MOVENEXT(data_value)
Specifies a subset pointer to be moved to the next segment occurrence after your current segment.

GETFIRST(data_value)
Specifies that you want the search to start with the first segment occurrence in a subset.

SET(data_value)
Specifies unconditionally setting a subset pointer to the current segment.

SETCOND(data_value)
Specifies conditionally setting a subset pointer to the current segment.

SETZERO(data_value)
Specifies setting a subset pointer to zero.

SETPARENT
Sets parentage at the level you want.

FIELDLENGTH(expression)
Specifies the length of the field value in a WHERE option.

KEYLENGTH(expression)
Specifies the length of the concatenated key when you use the KEYS option. The argument can be any expression in the host language that converts to the integer data type; a variable must be declared as a binary halfword value. For IBM COBOL for z/OS & VM (or VS COBOL II), PL/I, or assembler language, KEYLENGTH is optional. For COBOL programs that are not compiled with the IBM COBOL for z/OS & VM (or VS COBOL II) compiler, you must specify KEYLENGTH with the KEYS option.

WHERE(qualification statement)
Use WHERE to further qualify your GU commands after using SEGMENT. If you fully qualify a GU command, you can retrieve a segment regardless of your position in the database record.

KEYS(area)
Use KEYS to further qualify your GU commands and specify the segment occurrence by using its concatenated key.

If you specify a SEGMENT option without a KEYS or WHERE option, IMS DB retrieves the first occurrence of that segment type it encounters by searching forward from current position. With an unqualified GU command, the segment type you retrieve might not be the one you expected, so you should specify an I/O area large enough to contain the largest segment your program has access to. (After successfully issuing a retrieval command, you can find out from DIB the segment type retrieved.)

If you fully qualify your command with a WHERE or KEYS option, you would retrieve the next segment in sequential order, as described by the options.

Including the WHERE or KEYS options for parent segments defines the segment occurrences that are to be part of the path to the segment you want retrieved. Leaving the SEGMENT option out for a level, or including only the SEGMENT option without a WHERE option, indicates that any path to the option satisfies the command. DL/I uses only the qualified parent segments and the lowest level SEGMENT option to satisfy the command. DL/I does not assume a qualification for the missing level.

Usage

Use the GU command to retrieve specific segments from the database, or to establish a position in the database for sequential processing.

You must at least specify the SEGMENT option with a GU command to indicate the segment type you want to retrieve. (IMS DB retrieves the first occurrence of the segment you named in the SEGMENT argument.)

When you need to retrieve a specific occurrence of a segment type, you can further qualify the command by using the WHERE or KEYS option after the SEGMENT option.

You probably want to further qualify your GU commands with the WHERE or KEYS option, and specify a specific occurrence of a segment type. If you fully qualify a GU command, you can retrieve a segment regardless of your position in the database record.

Examples

Example 1: "What illness was Robert James here for most recently? Was he given any medication on that day for that illness? His patient number is 05136."

Explanation: This example requests two pieces of information. To answer the first part of the request and retrieve the most recent ILLNESS segment, issue this GU command (assuming that PATNO1 contains 05163):

```
EXEC DLI GU
   SEGMENT(PATIENT) WHERE(PATNO=PATNO1)
   SEGMENT(ILLNESS) INTO(AREA);
```

Once you had retrieved the ILLNESS segment with the date of the patient's most recent visit to the clinic, you can issue another command to find out whether he was treated during that visit. If the date of his most recent visit was January 5, 1988, you can issue the following command to find out whether or not he was treated on that day for that illness (assuming PATNO1 contains 05163, and DATE1 contains 19880105):

```
EXEC DLI GU
   SEGMENT(PATIENT) WHERE(PATNO=PATNO1)
   SEGMENT(ILLNESS) WHERE(ILLDATE=DATE1)
   SEGMENT(TREATMNT) INTO(TRTAREA) WHERE(DATE=DATE1);
```

Example 2: "What is Joan Carter currently being treated for? Her patient number is 10320."

```
EXEC DLI GU
   SEGMENT(PATIENT) WHERE(PATNO=PATNO1)
   SEGMENT(ILLNESS) INTO(ILLAREA);
```

Explanation: In this example you want the ILLNESS segment for the patient whose patient number is 10320.

Example 3:

```
EXEC DLI GU
   SEGMENT(PATIENT)
   SEGMENT(ILLNESS)
   SEGMENT(TREATMNT) INTO(AREA);
```

Explanation: This example retrieves the first TREATMNT segment and specifies the three levels of qualification.

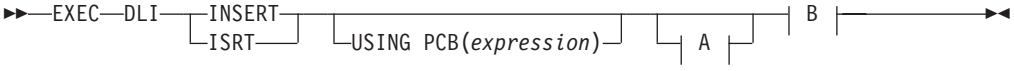
Restriction

You must at least specify the SEGMENT option to indicate the segment type you want to retrieve.

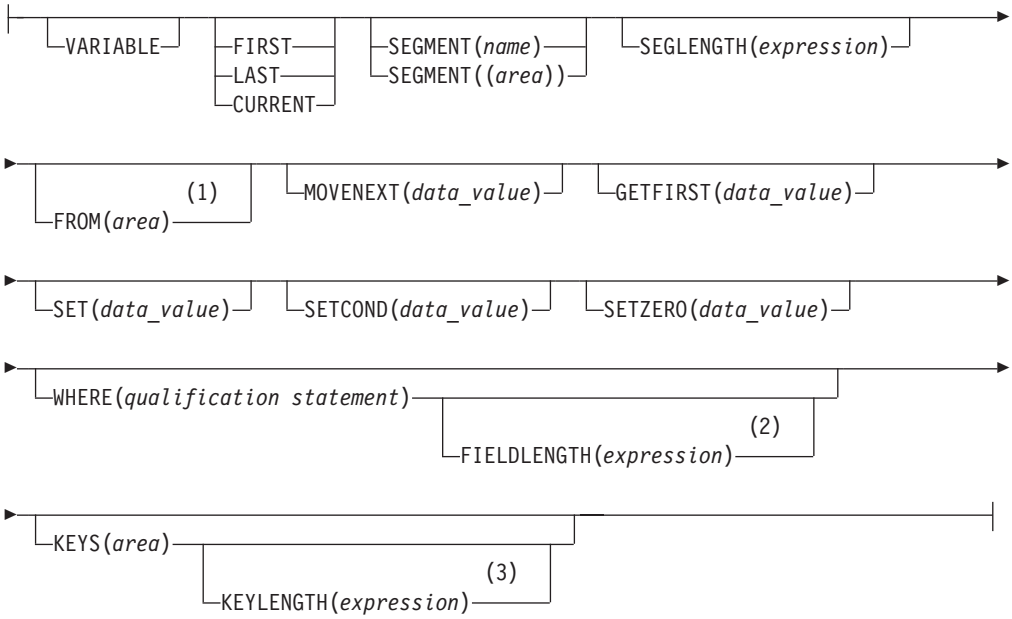
ISRT Command

The Insert (ISRT) command is used to add one or more segments to the database.

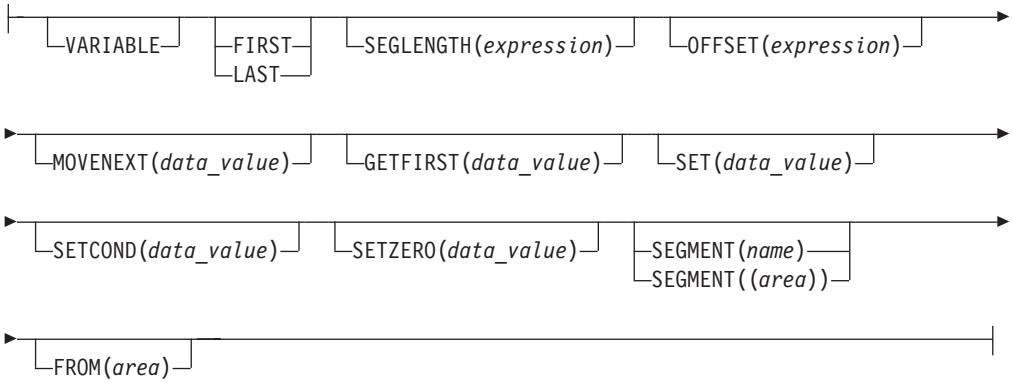
Format



A For each parent segment (optional):



B For the object segment (required):



Notes:

1 Specify FROM on parent segments for a path command.

2 If you use multiple qualification statements, specify a length for each, using FIELDLENGTH. For example: **FIELDLENGTH(24,8)**

3 You can use either the Keys option or the Where option, but not both on one segment level.

Options

USING PCB(expression)
Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

VARIABLE
Indicates that a segment is variable-length.

FIRST
Specifies that you want to retrieve the first segment occurrence of a segment

type, or that you want to insert a segment as the first occurrence. Use FIRST to insert a segment as a first occurrence of a segment type.

LAST
Specifies that you want to retrieve the last segment occurrence of a segment type, or that you want to insert a segment as the last segment occurrence. Use LAST to insert a segment as the last occurrence of a segment type.

CURRENT
Qualifies the command, and specifies that you want to use the level of and levels above the current position as qualifications for this segment. Use CURRENT to insert a segment based on your current position.

SEGMENT(name), SEGMENT((area))
Qualifies the command, specifying the name of the segment type or the area in the program containing the name of the segment type that you want to retrieve, insert, delete, or replace.

You must include at least a SEGMENT option for each segment you want to add to the database. Unless `ISRT` is a path command, the lowest level SEGMENT option specifies the segment being inserted. You cannot use a WHERE or KEYS option for this level.

If a segment has a unique key, DL/I inserts the segment in its key sequence. (If the segment does not have a key, or has a nonunique key, DL/I inserts it according to the value specified for the RULES parameter during DBDGEN.

If you specify a SEGMENT option for only the lowest level segment, and do not qualify the parent segments with SEGMENT, WHERE, or KEYS options, you must make sure that the current position is at the correct place in the database to insert the segment. The SEGMENT option that DL/I assumes depends on your current position in the database record:

- If DL/I has a position established at the missing level, DL/I uses the segment on which position is established.
- If DL/I does not have a position established at the missing level, DL/I uses the first occurrence at that level.
- If DL/I moves forward from a position established at a higher level, DL/I uses the first occurrence at the missing level that falls within the new path.
- If you leave out a SEGMENT option for the *root* level, and DL/I has position established on a root, DL/I does not move from that root when trying to satisfy the command.

It is good practice to always provide qualifications for higher levels to establish the position of the segment being inserted.

If you are inserting a root segment, you need only specify a SEGMENT option. DL/I determines the correct place for its insertion in the database by the key taken from the I/O area. If the segment you are inserting is not a root segment, but you have just inserted its immediate parent, the segment can be inserted as soon as it is built in the I/O area just by using a SEGMENT option for it in the `ISRT` command. You need not code the parent level segments to establish your position.

When you specify multiple parent segments, you can mix segments with and without the WHERE option. If you include only SEGMENT options on parent segments, DL/I uses the first occurrence of each segment type to satisfy the command.

SEGLENGTH(expression)
Specifies the length of the I/O area from which the segment is obtained. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs for any SEGMENT level that specifies the INTO or FROM option.)

Requirement: The value specified for SEGLENGTH must be greater than or equal to the length of the longest segment that can be processed by this call.

FROM(area)
Specifies an area containing the segment to be added, replaced, or deleted. Use FROM to insert one or more segments with one command.

MOVENEXT(data_value)
Specifies a subset pointer to be moved to the next segment occurrence after your current segment.

GETFIRST(data_value)
Specifies that you want the search to start with the first segment occurrence in a subset.

SET(data_value)
Specifies unconditionally setting a subset pointer to the current segment.

SETCOND(data_value)
Specifies conditionally setting a subset pointer to the current segment.

SETZERO(data_value)
Specifies setting a subset pointer to zero.

WHERE(qualification statement)
Qualifies the command, specifying the segment occurrence. Its argument is one or more qualification statements, each of which compares the value of a field in a segment to a value you supply. Each qualification statement consists of:

- The name of a field in a segment
- The relational operator, which indicates how you want the two values compared
- The name of a data area in your program containing the value that is compared against the value of the field

WHERE establishes position on the parents of a segment when you are inserting that segment. You can do this by specifying a qualification of WHERE or KEYS for the higher level SEGMENT options.

When you specify multiple parent segments, you can mix segments with and without the WHERE option. If you include only SEGMENT options on parent segments, DL/I uses the first occurrence of each segment type to satisfy the command.

FIELDLENGTH(expression)
Specifies the length of the field value in a WHERE option.

KEYS(area)
Qualifies the command with the segment's concatenated key. You can use either KEYS or WHERE for a segment level, but not both.

KEYs can be used to qualify a parent segment. Instead of using WHERE, you can specify KEYS and use the concatenated key of the segment as qualification. You can use the KEYS option once for each command, immediately after the highest level SEGMENT option.

"Area" specifies an area in your program containing the segment's concatenated key.

KEYLENGTH(expression)
Specifies the length of the concatenated key when you use the KEYS option. It can be any expression in the host language that converts to the integer data type; if it is a variable, it must be declared as a binary halfword value. For IBM COBOL for MBS & VM (or VS COBOL II), PL/I, or assembler language, KEYLENGTH is optional. For COBOL programs that are not compiled with the IBM COBOL for MBS & VM (or VS COBOL II) compiler, you must specify KEYLENGTH with the KEYS option.

Usage

To add new segments to an existing database, use the ISRT command. When you issue the ISRT command, DL/I takes the data from the I/O area you have named in the FROM option and adds the segment to the database. (The initial loading of a database requires using the LOAD command, instead of the ISRT command.)

You can use ISRT to add new occurrences of an existing segment type to a HIDAM, HISAM, or HDAM database. For an HSAM database, you can add new segments only by reprocessing the whole database or by adding the new segments to the end of the database.

Before you can issue the ISRT command to add a segment to the database, your program must build the segment to be inserted in an I/O area. If the segment has a key, you must place the correct key in the correct location in the I/O area. If field sensitivity is used, the fields must be in the order defined by the PSB for the application's view of the segment.

If you are adding a root segment occurrence, DL/I places it in the correct sequence in the database by using the key you supply in the I/O area. If the segment you are inserting is not a root, but you have just inserted its parent, you can insert the child segment by issuing an insert request qualified with only the segment name. You must build the new segment in your I/O area before you issue the ISRT request. You also qualify insert requests with the segment name when you add a new root segment occurrence. When you are adding new segment occurrences to an existing database, the segment *type* must have been defined in the DBD. You can add new segment occurrences directly or sequentially after you have built them in the program's I/O area.

If the segment type you are inserting has a unique key field, the location where DL/I adds the new segment occurrence depends on the value of its key field. If the segment does not have a key field, or if the key is not unique, you can control where the new segment occurrence is added by specifying either the FIRST, LAST, or HERE insert rule. Specify the rules on the RULES parameter of the SEGM statement for the database.

Examples

Example 1: "Add information to the record for Chris Edwards about his visit to the clinic on February 1, 1993. His patient number is 02345. He had a sore throat."

Explanation: First, build the ILLNESS segment in your program's I/O area. Your I/O area for the ILLNESS segment looks like this:

```
19930201SORETHROAT
```

Use the command to add this new segment occurrence to the database is:

```
EXEC DLI ISRT
     SEGMENT(PATIENT) WHERE (PATNO=PATNO1)
     SEGMENT(ILLNESS) FROM(ILLAREA);
```

Example 2: "Add information about the treatment to the record for Chris Edwards, and add information about the illness."

Explanation: You build the TREATMNT segment in a segment I/O area. The TREATMNT segment includes the date, the medication, amount of medication, and the doctor's name:

```
19930201MYOCINbbb0001TRIEBbbbbb&b
```

The following command adds both the ILLNESS segment and the TREATMNT segment to the database:

```
EXEC DLI ISRT
     SEGMENT(PATIENT) WHERE (PATNO=PATNO1)
     SEGMENT(ILLNESS) FROM(ILLAREA)
     SEGMENT(TREATMNT) FROM(TRETAREA);
```

Example 3:

```
EXEC DLI ISRT
     SEGMENT(ILLNESS) KEYS(CONKEY)
     SEGMENT(TREATMNT) FROM(TRETAREA);
```

Explanation: Using this command is the same as having a WHERE option qualified on the key field for the ILLNESS and PATIENT segments.

Restrictions

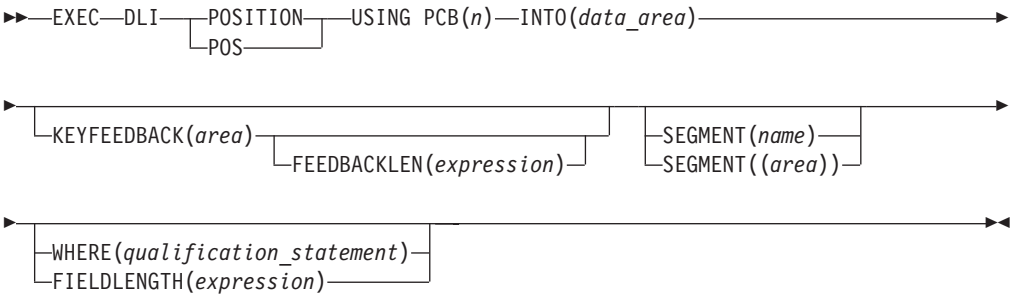
Restrictions the `ISRT` command:

- You cannot issue the `ISRT` command until you have built a new segment in the I/O area.
- You must specify at least one SEGMENT option for each segment being added to the database.
- When inserting a segment, you must have position established on the parents of the segment.
- If you specify a SEGMENT option for only the lowest level segment, and do not qualify the parent segments with SEGMENT, WHERE, or KEYS options, be sure that current position is at the correct place in the database to insert the segment.
- If you use a FROM option for a segment, you cannot qualify the segment by using the WHERE or KEYS option; DL/I uses the key field value specified in the I/O area as qualification.
- You must use a separate I/O area for each segment type you want to add.
- You cannot mix SEGMENT options with and without the FROM option. When you use a FROM option for a parent segment, you must use a FROM option for each dependent segment. (You can begin the path at any level, but you must not leave out any levels.)
- You can only use the FIRST option with segments that have either no keys or have a nonunique key with HERE specified on the RULES operand of the SEGM statement in the DBD.
- You can only use the LAST option when the segment has no key or a nonunique key, and the INSERT rule for the segment is either FIRST or HERE.

POS Command

The Position (POS) command retrieves the location of either a dependent or the segment.

Format



Options

USING PCB(n)
Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

INTO(data_area)
Specifies an area into which the segment is read.

KEYFEEDBACK(area)
Specifies an area into which the concatenated key for the segment is placed. If the area is not long enough, the key is truncated.

FEEDBACKLEN(expression)
Specifies the length of the key feedback area into which you want the concatenated key retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (FEEDBACKLEN is required in COBOL programs and optional in PL/I and assembler language programs.)

SEGMENT(name)
Qualifies the command, specifying the name of the segment type you want to retrieve, insert, delete, or replace.

SEGMENT((area))
Is a reference to an area in your program containing the name of the segment type. You can specify an area instead of specifying the name of the segment in the command.

WHERE(qualification statement)
Qualifies the command, specifying the segment occurrence. Its argument is one or more qualification statements, each of which compares the value of a field in a segment to a value you supply.

FIELDLENGTH(expression)
Specifies the length of the field value in a WHERE option.

Usage

Use the POS command to:

- Retrieve the location of a specific sequential dependent segment, including the last one inserted

- Determine the amount of unused space within each DEDB area

If the area specified by the POS command is unavailable, the I/O area is unchanged and an FH status code is returned.

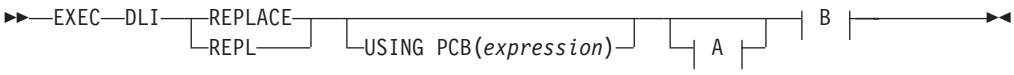
Restriction

The POS command is for DEDBs only.

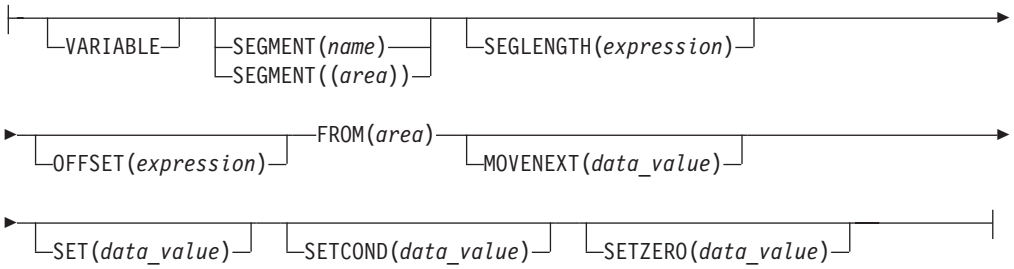
REPL Command

The Replace (REPL) command is used to replace a segment, usually to change the values of one or more of its fields.

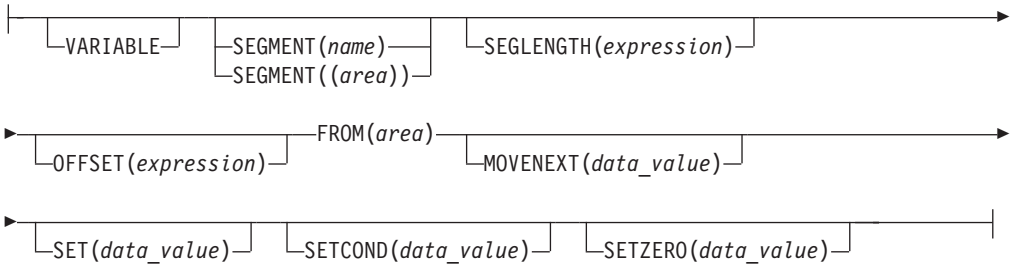
Format



A For each parent segment (optional):



B For the object segment (required):



Options

USING PCB(expression)
Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

VARIABLE
Indicates that a segment is variable-length.

SEGMENT(name)
Qualifies the command, specifying the name of the segment type you want to retrieve, insert, delete, or replace.

SEGMENT((area))
Is a reference to an area in your program containing the name of the segment type. You can specify an area instead of specifying the name of the segment in the command.

SEGLENGTH(expression)
Specifies the length of the I/O area from which the segment is obtained. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs for any SEGMENT level that specifies the INTO or FROM option.)

Requirement: The value specified for SEGLENGTH must be greater than or equal to the length of the longest segment that can be processed by this call.

OFFSET(expression)
Specifies the offset to the destination parent. It can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. You use OFFSET when you process concatenated segments in logical relationships. It is required whenever the destination parent is a variable length segment.

FROM(area)
Specifies an I/O area containing the segment to be added, replaced or deleted. You can replace more than the segment by including the FROM option after the corresponding SEGMENT option for each segment you want to replace. Including FROM options for one or more parent segments is called a path command.

The argument following FROM identifies an I/O area that you have defined in your program. You must use a separate I/O area for each segment type you want to replace.

MOVENEXT(data_value)
Specifies a subset pointer to be moved to the next segment occurrence after your current segment.

SET(data_value)
Specifies unconditionally setting a subset pointer to the current segment.

SETCOND(data_value)
Specifies conditionally setting a subset pointer to the current segment.

SETZERO(data_value)
Specifies setting a subset pointer to zero.

Usage

You must qualify the REPL command with at least one SEGMENT and FROM option, which together indicate the retrieved segments you want replaced.

If the Get command that preceded the REPL command was a path command, and you do not want to replace all of the retrieved segments or the PSB does not have replace sensitivity for all of the retrieved segments, you can indicate which of the segments are not to be replaced by omitting the SEGMENT option.

If your program attempts to do a path replace of a segment where it does not have replace sensitivity, the data for the segment in the I/O area for the REPL command must be the same as the segment returned on the preceding GET command. If the data changes in this situation, the transaction is abended and no data is changed as a result of the Replace command.

Notice that the rules for a REPL path command differ from the rules for an ISRT path command. You cannot skip segment levels to be inserted with an ISRT command, as you can with a REPL command.

To update information in a segment, you can use the REPL command. The REPL command replaces data in a segment with data you supply in your application program. First, you must retrieve the segment into an I/O area. You then modify the information in the I/O area and replace the segment with the REPL command. For your program to successfully replace a segment, that segment must already have been defined as replace-sensitive in the PCB by specifying PROCOPT=A or PROCOPT=R on the SENSEG statement in the PCB.

You cannot issue any commands using the same PCB between a Get command and the REPL command, and you can issue only one REPL command for each Get command.

Examples

Example 1:

```
EXEC DLI GU SEGMENT(PATIENT) INTO(PATAREA);
EXEC DLI REPL SEGMENT(PATIENT) FROM(PATAREA);
```

Explanation: This example shows that you cannot issue any commands using the same PCB between the Get command and the REPL command, and you can issue only one REPL command for each Get command. If you issue this commands and wanted to modify information in the segment again, you must first reissue the GU command, before reissuing the REPL command.

Example 2: "We have received a payment for $65.00 from a patient whose ID is 08642. Update the patient's billing record and payment record with this information, and print a current bill for the patient."

Explanation: The four parts to satisfying this processing request are:

1. Retrieve the BILLING and PAYMENT segments for the patient.
2. Calculate the new values for these segments by subtracting $65.00 from the value in the BILLING segment, and adding $65.00 to the value in the PAYMENT segment.
3. Replace the values in the BILLING and PAYMENT segments with the new values.
4. Print a bill for the patient, showing the patient's name, number, address, the current amount of the bill, and the amount of the payments to date.

To retrieve the BILLING and PAYMENT segments, issue a GU command. Because you also need the PATIENT segment when you print the bill, you can include INTO following the SEGMENT options for the PATIENT segment and for the BILLING segment:

```
EXEC DLI GU
     SEGMENT(PATIENT) INTO(PATAREA) WHERE (PATNO=PATNO1)
     SEGMENT(BILLING) INTO(BILLAREA)
     SEGMENT(PAYMENT) INTO(PAYAREA);
```

After you have calculated the current bill and payment, you can print the bill, then replace the billing and payment segments in the database. Before issuing the REPL command, you must change the segments in the I/O area.

Because you have not changed the PATIENT segment, you do not need to replace it when you replace the BILLING and PAYMENT segments. To indicate to DL/I that you do not want to replace the PATIENT segment, you do not specify the SEGMENT option for the PATIENT segment in the REPL command.

```
EXEC DLI REPL
     SEGMENT(BILLING) FROM(BILLAREA)
     SEGMENT(PAYMENT) FROM(PAYAREA);
```

This command tells DL/I to replace the BILLING and PAYMENT segments, but not to replace the PATIENT segment.

These two examples are called *path commands*. You use a path REPL command to replace more than one segment with one command.

Example 3: "Steve Arons, patient number 10250, has moved to a new address in this town. His new address is 4638 Brooks Drive, Lakeside, California. Update the database with his new address."

Explanation: You need to retrieve the PATIENT segment for Steve Arons and replace the address portion of the segment. To retrieve the PATIENT segment, you can use this GU command (assuming PATNO1 contains 10250):

```
EXEC DLI GU
     SEGMENT(PATIENT) INTO(PATAREA) WHERE (PATNO=PATNO1);
```

Since you are not replacing the first two fields of the PATIENT segment (PATNO and NAME), you do not have to change them in the I/O area. Place the new address in the I/O area following the PATNO and NAME fields. Then you issue the REPL command:

```
EXEC DLI REPL
     SEGMENT(PATIENT) FROM(PATAREA);
```

Example 4:

```
EXEC DLI GU SEGMENT(PATIENT) INTO(PATAREA)
     WHERE (PATNO=PATNO1)
     SEGMENT(ILLNESS) INTO(ILLAREA)
     SEGMENT(TREATMNT) INTO(TRETAREA);
EXEC DLI REPL SEGMENT(PATIENT) FROM(PATAREA)
     SEGMENT(TREATMNT) FROM(TRETAREA);
```

Explanation: This example assumes that you want to replace the PATIENT and TREATMNT segments for patient number 10401, but you do not want to change the ILLNESS segment. To do this issue this command (assuming PATNO1 contains 10401).

Restrictions

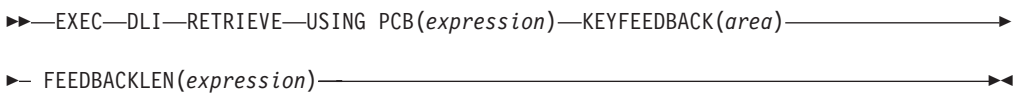
Restrictions for the REPL command:

- You cannot issue any commands using the same PCB between the Get command and the REPL command.
- You can issue only one REPL command for each Get command.
- To modify information in a segment, you must first reissue the GU command before reissuing the REPL command.
- You must qualify the REPL command with at least one SEGMENT option and one FROM option.
- If you use a FROM option for a segment, you cannot qualify the segment by using the WHERE or KEYS option; DL/I uses the key field value specified in the I/O area as qualification.

RETRIEVE Command

Use the RETRIEVE command to determine current position in the database in batch and BMP programs.

Format



Options

USING PCB(expression)

Specifies the DB PCB you want to use for the command. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

expression specifies the PCB for which you want to retrieve the concatenated key. It can be any expression in the host language that converts to the integer data type. You can specify either a number or a reference to a halfword containing a number. The value must be a positive integer not greater than the number of PCBs generated for the PSB. The first PCB in the list, the I/O PCB, is 1. The first DB PCB in the list is 2, the second is 3, and so forth.

KEYFEEDBACK(area)

Specifies an area into which the concatenated key for the segment is placed. If the area is not long enough, the key is truncated.

FEEDBACKLEN(expression)

Specifies the length of the key feedback area into which you want the concatenated key retrieved. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (It is required in COBOL programs and optional in PL/I and assembler language programs.)

expression is the length of the key feedback I/O area. It can be any expression in the host language that converts to integer data type; you can specify either a number or a reference to a halfword containing a number. For IBM COBOL for z/OS & VM (or VS COBOL II), PL/I, or assembler language, FEEDBACKLEN is optional. For COBOL programs that are not compiled with the IBM COBOL for z/OS & VM (or VS COBOL II) compiler, you must specify FEEDBACKLEN with the KEYFEEDBACK option.

Usage

If your program issues symbolic checkpoint commands it must also issue the extended RESTART (XRST) command or the RETRIEVE command. The RETRIEVE command is issued once, at the start of your program. You can use the RETRIEVE command to start your program normally, or to restart it in case of an abnormal termination.

You can use the RETRIEVE command from a specific checkpoint id or a time/date stamp. Because the RETRIEVE command attempts to reposition the database, your program also needs to check for correct position.

After issuing the RETRIEVE command, the segment type and level on which the position is established is returned to the DIBSEGM and DIBSEGLV fields in the

DIB. The value in DIBKFBL is set to the actual length of the concatenated key. The DIBSTAT field contains the value returned from the GU repositioning, not the XRST command.

The RESTART command attempts to reposition DL/I databases by issuing an internal GU qualified with the concatenated key. It is your responsibility to verify that your position in the database from the GU repositioning is the correct position for the checkpoint ID used in the XRST command. You can use the RETRIEVE command to retrieve the concatenated key used with the GU repositioning, and determine your current position in all the PCBs your program accesses.

Examples

```
EXEC DLI RETRIEVE USING PCB(2) KEYFEEDBACK(KEYAREA);
EXEC DLI RETRIEVE USING PCB(5) KEYFEEDBACK(KEYAREA);
```

Explanation: These RETRIEVE commands retrieve the concatenated key for the first and fourth DB PCBs. (The first PCB in the list is the I/O PCB, so the first DB PCB is the second one in the list.) After issuing the first RETRIEVE command, you can determine your position in the first DB PCB by examining the concatenated key in KEYAREA, and the values returned in the DIBSEGM and DIBSEGLV fields in the DIB. After issuing the second RETRIEVE command, you can determine your position in the fourth DB PCB by examining the same fields.

Restrictions

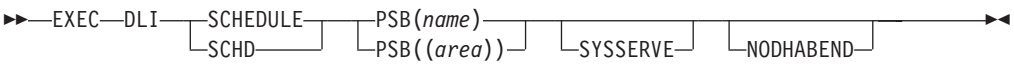
Restrictions for the RETRIEVE command:

- You cannot use this command in a CICS program.
- To use this command, you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- You cannot use this command unless the system log is stored on direct access storage and dynamic backout has been specified. You must also specify BKO=Y in the parm field of your JCL when you execute the program.

SCHD Command

The Schedule (SCHD) command is used to schedule a PSB in a CICS online program. For information on the I/O PCB, see “PCBs and PSB” on page 31.

Format



Options

PSB(name)
Specifies the name of the PSB available to your application program that you want to schedule with the SCHD command.

PSB((area))
Specifies an 8-byte data area in your program that contains the name of the PSB available to your program that you want to schedule with the SCHD command.

SYSSERVE
Specifies that the application program can handle an I/O PCB and might issue a system service request in the logical unit of work (LUW).

NODHABEND
Specifies that a CICS transaction does not fail with a DHxx abend.

Should a schedule fail under EXEC DLI, a status code might be returned in the DIB, causing a CICS transaction to fail with a DHxx abend. This option prevents this. Following an unsuccessful SCHD command, the control, as well as the status code in the DIB are passed back to the application program, which can then take the appropriate action.

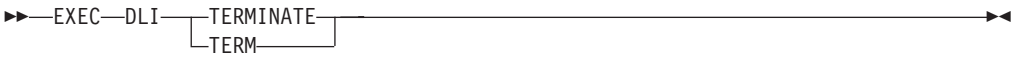
Usage
Before you can access DL/I databases from a CICS program, you must notify DL/I that your program will be accessing a database by scheduling a PSB. Do this by issuing the SCHD command. When you no longer plan to use a PSB, or you want to schedule a subsequent PSB (one or more), you must terminate the previous PSB with the TERM command. (For more information on the I/O PCB and PSB, see “PCBs and PSB” on page 31)

The SCHD command can be specified two ways (see “Examples”).

Examples
```
EXEC DLI SCHD PSB(psbname)SYSSERVE;
EXEC DLI SCHD PSB((AREA));
```

Explanation: These examples show two ways to schedule a PSB in a CICS program.

TERM Command
The Terminate (TERM) command is used to terminate a PSB in a CICS online program.

Format


Options
No options are allowed with the TERM command.

Usage
If you want to use a PSB other than the one already scheduled, use the TERM command to release the PSB.

When you issue the TERM command, all database changes are committed and cannot be backed out. Because returning to CICS also terminates the PSB and commits changes, you need not use the TERM command unless you want to schedule another PSB, or commit database changes before returning to CICS.

No options are allowed with the TERM command. If your program subsequently needs a PSB that has terminated, it must reschedule that PSB by issuing another SCHD command.

In most applications, you do not need to use the TERM command.

Example
```
EXEC DLI TERM
```

Explanation: This example shows how to terminate a PSB with the TERM command.

System Service Commands

The following system service commands require that you first issue the SCHD command with the SYSSERVE keyword:

- "ACCEPT Command"
- "DEQ Command" on page 68
- "LOG Command" on page 70
- "QUERY Command" on page 70
- "REFRESH Command" on page 71
- "ROLS Command" on page 74
- "SETS Command" on page 75
- "SETU Command" on page 76
- "STAT Command" on page 77

The following system service commands are valid in batch or BMP regions or programs without first issuing the SCHD command with the SYSSERVE keyword:

- "CHKP Command" on page 67
- "ROLB Command" on page 72
- "ROLL Command" on page 73
- "SYMCHKP Command" on page 78
- "XRST Command" on page 80

The following system service commands are valid in an online CICS program using DBCTL:

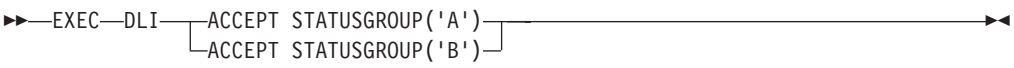
- ACCEPT
- DEQ
- LOG
- QUERY
- REFRESH
- ROLS
- SETS
- STAT

To issue system service commands, the input/output PCB (I/O PCB) is required. For detailed information on the I/O PCB, as well as the PSB, and PCB, see "PCBs and PSB" on page 31.

ACCEPT Command

The Accept (ACCEPT) command is used to tell IMS to return a status code to your program, rather than abend the transaction.

Format



Options

STATUSGROUP('A')
Informs IMS that the application is prepared to accept status codes regarding unavailability. IMS then returns a status code instead of pseudoabending if a call issued later requires access to unavailable data.

This is a required option.

STATUSGROUP('B')
Informs IMS that the application is prepared to accept status codes regarding unavailability and deadlock occurrence. IMS returns a status code instead of pseudoabending if a call issued later requires access to unavailable data or deadlock occurrence.

Usage

Use the ACCEPT command to tell IMS to return a status code instead of abending the program. These status codes result because PSB scheduling completed without all of the referenced databases being available.

Example

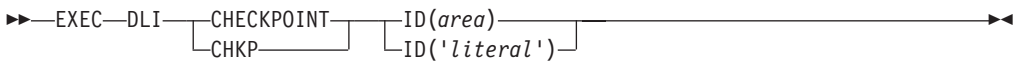
```
EXEC DLI ACCEPT STATUSGROUP('A');
```

This example shows how to specify the ACCEPT command.

CHKP Command

The Checkpoint (CHKP) command is used to issue a basic checkpoint and to end a logical unit of work. You cannot use this command in a CICS program.

Format



Options

ID(area)
Contains the checkpoint ID. Specifies the name of an area in your program containing the checkpoint ID. The area pointed to is eight bytes. If you are using PL/I, specify this option as a pointer to a major structure, an array, or a character string.

ID('literal')
'literal' is an 8-byte checkpoint ID, enclosed in quotation marks. In CHKP commands the area pointed to is 8 bytes long.

Usage

The two kinds of commands that allow you to make checkpoints are: the CHKP, or basic Checkpoint command, and the SYMCHKP, or Symbolic Checkpoint command.

Batch programs can use either the symbolic or the basic command.

Both checkpoint commands make it possible for you to commit your program's changes to the database and to establish places from which the program can be restarted, should it terminate abnormally.

You must not use the CHKPT=EOV parameter on any DD statement to take an IMS checkpoint.

Both commands cause a loss of database position at the time the command is issued. Position must be reestablished by a GU command or other method of establishing position.

It is not possible to re-establish position in the midst of nonunique keys or nonkeyed segments.

You can issue the basic CHKP command to commit your program's changes to the database and establish places from which your program can be restarted. When you issue a basic CHKP command, you must provide the code for restarting your program.

When you issue a CHKP command, you specify the ID for the checkpoint. You can supply either the name of a data area in your program that contains the ID, or you can supply the actual ID, enclosed in single quotes. See "Examples."

Examples

```
EXEC DLI CHKP ID(chkpid);
EXEC DLI CHKP ID('CHKP0007');
```

Explanation: These examples show how to specify the CHKP command.

Restrictions

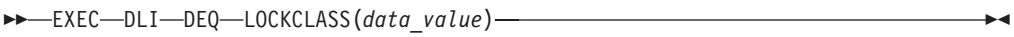
Restrictions for the CHKP command:

- You cannot use this command in a CICS program.
- You must first define an I/O PCB for your program before you can use the CHKP command.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.

DEQ Command

The Dequeue (DEQ) command is used to release a segment that is retrieved with the LOCKCLASS option.

Format



Option

LOCKCLASS(data_value)

Specifies that you want to release the lock that is being held as the result of an earlier GU, GN, or GNP command that had a LOCKCLASS option with the same data_value. Data_value must be a 1-byte alphabetic character in the range of B to J.

For full function, specify the LOCKCLASS option followed by the lock class of that segment (for example, LOCKCLASS('B')). If the option is not followed by a letter (B-J), EXECDLI sets a status code of GL and initiates an ABENDU1041.

DEQ commands are not supported for Fast Path.

Usage

Use the DEQ command to release locks on segments that were retrieved using the LOCKCLASS option. Using LOCKCLASS on Get commands allows you to reserve segments for exclusive use by your transaction. No other transaction is allowed to

update these reserved segments until either your transaction reaches a sync point or the DEQ command has been issued, thereby releasing the locks on these reserved segments. The LOCKCLASS option lets your application program leave these segments and retrieve them later without any changes having been added.

Example

Your program can use the LOCKCLASS option as follows:

```
EXEC DLI DEQ LOCKCLASS(data_value)
EXEC DLI GU SEGMENT(PARTX)
       SEGMENT(ITEM1) LOCKCLASS('B') INTO(PTAREA1);
EXEC DLI GU SEGMENT(PARTX)
       SEGMENT(ITEM2) LOCKCLASS('C') INTO(PTAREA2);
EXEC DLI DEQ LOCKCLASS('B');
```

Explanation: This example shows the format of the DEQ command, where data_value is a 1-byte alphabetic character in the range B to J. The DEQ command releases the lock that was gotten and held with a LOCKCLASS of 'B' for the PARTX segment as a result of the first GU. The lock that was gotten with a LOCKCLASS of 'C' on the PARTX segment during the second GU remains held.

Restriction

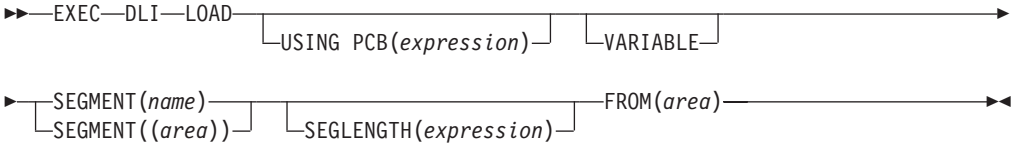
Restrictions for the DEQ command:

- To use this command you must first define an I/O PCB for your program.

LOAD Command

The Load (LOAD) command is used to add a segment sequentially while loading the database.

Format



Options

USING PCB(expression)
Specifies the DB PCB you want to use. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

VARIABLE
Indicates that a segment is variable-length.

SEGMENT(name)
Specifies the name of the segment type you want to retrieve, insert, delete, or replace.

SEGMENT((area))
A reference to an area in your program containing the name of the segment type. You can specify an area instead of the name of the segment in the command.

SEGLENGTH(expression)
Specifies the length of the I/O area from which the segment is obtained. Its

argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number. (SEGLENGTH is required in COBOL programs for any SEGMENT level that specifies the INTO or FROM option.)

Requirement: The value specified for SEGLENGTH must be greater than or equal to the length of the longest segment that can be processed by this call.

FROM(area)
Specifies an area containing the segment to be added, replaced, or deleted.

Usage

The LOAD command is used for database load programs, which are described in *IMS Version 9: Administration Guide: Database Manager*.

Example

```
EXEC DLI LOAD
       SEGMENT(ILLNESS) FROM(ILLAREA);
```

LOG Command

The Log (LOG) command is used to write information to the system log.

Format

Options

FROM(area)
Specifies an area containing the segment to be added, replaced, or deleted.

LENGTH(expression)
Specifies the length of an area.

Usage

You use the LOG command to write information to the system log. For detailed information on this command, see *IMS Version 9: Application Programming: Design Guide*.

Example

```
EXEC DLI LOG
       FROM(ILLAREA) LENGTH(18);
```

Restriction

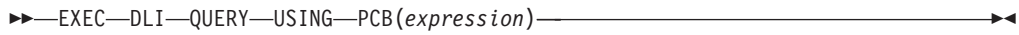
Restrictions for the LOG command:

- To use this command you must first define an I/O PCB for your program.

QUERY Command

The Query (QUERY) command obtains status code and other information in the DL/I interface block (DIB), which is a subset of the IMS PCB.

Format



Options
USING PCB(*expression*) is required. No other options are allowed with the QUERY command.

Usage
For full-function databases, the DIB should contain NA, NU, TH or blanks. For an explanation of the codes, see *IMS Version 9: Messages and Codes, Volume 1*.

Use the QUERY command after scheduling the PSB but before making the database call. If the program has already issued a call using the DB PCB, you then use the REFRESH command to update the information in the DIB.

Examples

Example 1:

```
EXEC DLI QUERY USING PCB(expression);
```

Explanation: This example shows how to specify the QUERY command. In this example, (n) specifies the PCB.

Example 2:

```
EXEC DLI REFRESH DBQUERY;
```

Explanation: If your program has already issued a call using the DB PCB name, use the REFRESH command to update the information in the DIB. The REFRESH command updates all DB PCBs. You can issue it only one time.

Restrictions

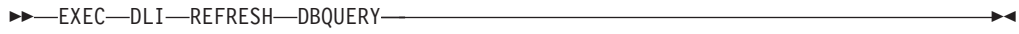
Restrictions for the QUERY command:

- To use this command you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.

REFRESH Command

The Refresh (REFRESH) command is used to obtain the most recent information from the DIB for the most recently issued command.

Format



Options
DBQUERY is required. Other options are not allowed with the REFRESH command.

Usage
The REFRESH command is used with the QUERY command.

The QUERY command is used after scheduling the PSB but before making the first database call. If the program has already issued a call using the DB PCB, use the REFRESH command to update the information in the DIB.

The REFRESH command updates all DB PCBs. It can be issued only once.

Example

```
EXEC DLI REFRESH DBQUERY;
```

Explanation: This example shows how to specify the REFRESH command.

Restrictions

Restrictions for the REFRESH command:

- To use this command, you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- You can issue this command only one time.

ROLB Command

The Roll Back (ROLB) command is used to dynamically back out changes and return control to your program. You cannot use this command in a CICS program.

Format

Options

No options are allowed with the ROLB command.

Usage

When a batch or BMP program determines that some of its processing is invalid, two commands make it possible for the program to remove the effects of its inaccurate processing. These are the rollback commands, ROLL (see "ROLL Command" on page 73) and ROLB.

The ROLB command is valid in batch programs when the system log is stored on direct access storage and dynamic backout has been specified through the use of the BKO execution parameter.

Issuing the ROLB causes IMS DB to back out any changes your program has made to the database since its last checkpoint, or since the beginning of the program if your program has not issued a checkpoint. When you issue a ROLB command, IMS DB returns control to your program after backing out the changes, so that your program can continue processing with the next statement after the ROLB command.

Example

```
EXEC DLI ROLB;
```

Explanation: This example shows how to dynamically back out changes and return control to your program with the ROLB command.

Restrictions

Restrictions for the ROLB command:

- You cannot use this command in a CICS program.
- You must first define an I/O PCB for your program before you can use this command.

- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- You cannot use this command when the system log is stored on direct access storage and dynamic backout has not been specified.

ROLL Command

The Roll (ROLL) command is used to dynamically back out changes. You cannot use this command in a CICS program

Format

Options

No options are allowed with the ROLL command.

Usage

When a batch program determines that some of its processing is invalid, two commands make it possible for the program to remove the effects of its inaccurate processing. These are the rollback commands, ROLL and ROLB (see “ROLB Command” on page 72).

You can use ROLL in batch programs.

Issuing the ROLL causes CICS and DL/I to back out any changes your program has made to the database since its last checkpoint, or since the beginning of the program provided your program has not issued a checkpoint. When you issue a ROLL command, DL/I terminates your program after backing out the updates.

Example

```
EXEC DLI ROLL;
```

Explanation: This example shows how to dynamically back out changes with the ROLL command.

If you use the ROLL command, IMS terminates the program with user abend code U0778. This type of abnormal termination does not produce a storage dump.

Restrictions

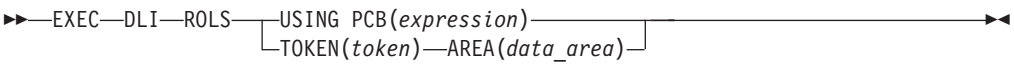
Restrictions for the ROLL command:

- You cannot use this command in a CICS program.
- You must first define an I/O PCB for your program before you can use this command.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- You cannot use this command when the system log is stored on direct access storage and dynamic backout has been specified. You must also specify BKO=Y in the parm field of your JCL when you execute the program.

ROLS Command

The Roll Back to SETS or SETU (ROLS) command is used to back out to a processing point set by an earlier SETS command.

Format



Options

USING PCB(expression)
Specifies the DB PCB you want to use. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

TOKEN(token)
A 4-byte token associated with the current processing point. If you specify both TOKEN and AREA, the ROLS command backs out to the SETS or SETU you specified.

AREA(data_area)
The name of the area to be restored to the program when a ROLS command is issued. The first 2 bytes of the data-area field contain the length of the data-area, including the length itself. The second 2 bytes must be set to X'0000'. If you specify both TOKEN and AREA, the ROLS command backs out to the SETS you specified.

The ROLS call has two formats: with TOKEN and AREA (for IOPCB only) and without TOKEN and AREA (for IOPCB or DBPCB).

Usage

Use the SETS and ROLS commands to define multiple points at which to preserve the state of DL/I full-function databases and to return to these points later. (For example, you can use them so your program can handle situations that can occur when PSB scheduling completes without all of the referenced DL/I databases being available.)

Use of the SETS and ROLS commands apply only to DL/I full-function databases. This means that if a logical unit of work (LUW) is updating types of recoverable resources other than full-function databases, for example, VSAM files, the SETS and ROLS requests have no effect on the non-DL/I resources. The backout points are *not* CICS commit points; they are intermediate backout points that apply only to DBCTL resources. It is up to you to ensure the consistency of all the resources involved.

You can use the ROLS command to backout to the state all full-function databases were in before either a specific SETS or SETU request or the most recent commit point.

Examples

Example 1:

```
EXEC DLI ROLS TOKEN(token1) AREA(data_area)
```

Explanation: In this example (for IOPCB only), backout takes place to the corresponding TOKEN, as specified by a prior SETS call, and control returns to the application.

Example 2:

```
EXEC DLI ROLS USING PCB(PCB5)
```

Explanation: In this example, for IOPCB or DBPCB, backout takes place to the prior sync point and the application is pseudoabended with a U3033 status code. Control does **not** return to the application.

In this example, PCB5 is the number of a DB PCB that has received a 'data unavailable' status code. This command results in the same action that would have occurred had the program not issued an ACCEPT STATUSGROUPA command. (See Chapter 8, “Data Availability Enhancements,” on page 105.)

Example 3:

```
EXEC DLI ROLS
```

Explanation: In this example, for IOPCB or DBPCB, backout takes place to the prior sync point and the application is pseudoabended with a U3033, provided the previous reference to that PCB gave an unavailable status code. Control does **not** return to the application.

Restrictions

Restrictions for the ROLS command:

- To use this command you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- You cannot use this command when the system log is stored on direct access storage and dynamic backout has been specified. You must also specify BKO=Y in the parm field of your JCL when you execute the program.

SETS Command

The Set a Backout Point (SETS) command is used to define points in your application at which to preserve the state of the DL/I databases before initiating a set of DL/I requests to perform a function. Your application can issue a ROLS command later if it cannot complete the function.

Format

Options

TOKEN(mytoken)
A 4-byte token associated with the current processing point.

AREA(data_area)
The name of the area to be restored to the program when a SETS command is issued. The first 2 bytes of the data-area field contain the length of the data-area, including the length itself. The second 2 bytes must be set to X'0000'.

Usage

You can use the SETS command to define multiple points at which to preserve the state of the DL/I databases and to return to these points later. For example, you can use the SETS command to allow your program to handle situations that can occur when PSB scheduling completed without all of the referenced DL/I databases being available.

The SETS command applies only to DL/I full-function databases. If a logical unit of work (LUW) is updating types of recoverable resources other than full-function databases, for example VSAM files, the SETS command has no effect on the non-DL/I resources. The backout points are *not* CICS commit points; they are intermediate backout points that apply only to DBCTL resources. It is up to you to ensure the consistency of all the resources involved.

Example

```
EXEC DLI SETS TOKEN(mytoken) AREA(data_area)
```

Explanation: This example shows how to specify the SETS command.

Restrictions

Restrictions for the SETS command:

- To use this command you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- In batch, you can only use this command when the system log is stored on direct access storage and dynamic backout has been specified. You must also specify BKO=Y in the parm field of your JCL when you execute the program.
- It is rejected when the PSB contains a DEDB or MSDB PCB, or when the call is made to a DB2 database.
- It is valid, but not functional, if unsupported PCBs exist in the PSB or if the program uses an external subsystem.

SETU Command

The Set a Backout Point Unconditionally (SETU) command is identical to the SETS command except that it does not get rejected if unsupported PCBs are in the PSB or if the program uses an external subsystem.

Format

Options

TOKEN(mytoken)
A 4-byte token associated with the current processing point.

AREA(data_area)
The name of the area to be restored to the program when a SETU command is issued. The first 2 bytes of the data-area field contain the length of the data-area, including the length itself. The second 2 bytes must be set to X'0000'.

Usage

You can use the SETU command to define multiple points at which to preserve the state of the DL/I databases and to return to these points later. For example, you can use the SETU command to allow your program to handle situations that can occur when PSB scheduling completed without all of the referenced DL/I databases being available.

The SETU command applies only to DL/I full-function data bases. If a logical unit of work (LUW) is updating types of recoverable resources other than full-function databases, such as VSAM files, the SETU command has no effect on the non-DL/I resources. The backout points are *not* CICS commit points; they are intermediate backout points that apply only to DBCTL resources. It is up to you to ensure the consistency of all the resources involved.

Example

```
EXEC DLI SETU TOKEN(mytoken) AREA(data_area)
```

Explanation: This example shows how to specify the SETU command.

Restrictions

Restrictions for the SETU command:

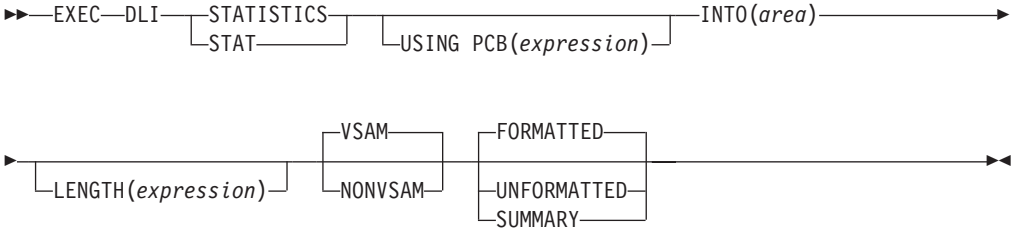
- You cannot use this command in a CICS program.
- To use this command you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- You cannot use this command when the system log is stored on direct access storage and dynamic backout has been specified. You must also specify BKO=Y in the parm field of your JCL when you execute the program.

STAT Command

This topic contains programming interface information.

The Statistics (STAT) command is used to obtain IMS database statistics that you can use in debugging your program.

Format



Options

USING PCB(expression)
Specifies the DB PCB you want to use. Its argument can be any expression that converts to the integer data type; you can specify either a number or a reference to a halfword in your program containing a number.

INTO(area)
Specifies an area into which the data is read.

LENGTH(expression)
Specifies the length of an area.

VSAM/NONVSAM
Specifies database type.

FORMATTED/UNFORMATTED/SUMMARY
Specifies type of output.

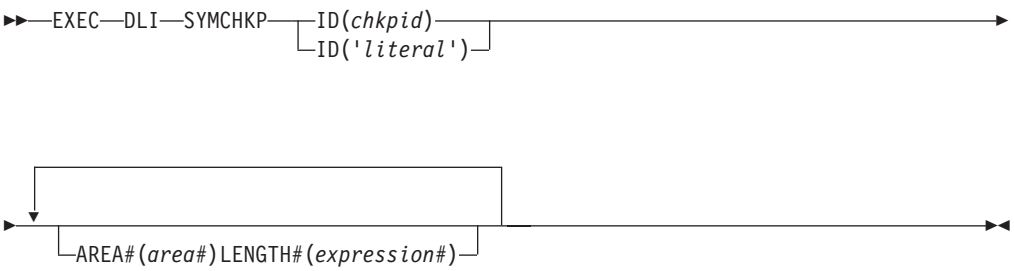
Usage
The STAT command is described in *IMS Version 9: Application Programming: Design Guide*.

Examples
For examples of the STAT command, see *IMS Version 9: Application Programming: Database Manager*.

SYMCHKP Command

The Symbolic Checkpoint (SYMCHKP) command is used to issue a symbolic checkpoint and to end a logical unit of work.

Format



Options
ID(chkpid)
Is the name of an 8-byte area in your program containing the checkpoint ID. If you are using PL/I, specify this parameter as a pointer to a major structure, an array, or a character string.

ID('literal')
Is the 8-byte checkpoint ID, enclosed in quotation marks.

AREA#(area#)
Specifies the areas in your program you want IMS to checkpoint. You do not need to specify any area to checkpoint; however, you cannot specify more than seven areas. If you specify more than one area, you must include all intervening areas. For example, if you specify AREA3, you must also specify AREA1 and AREA2. The areas you specify using the SYMCHKP command must be the same and in the areas specified in the XRST command.

LENGTH#(expression#)
Can be any expression in the host language that converts to the integer data type; you can specify either a number or a reference to a halfword containing a number. For IBM COBOL for z/OS & VM (or VS COBOL II), PL/I, or assembler language programs, LENGTH1 to LENGTH7 are optional. For COBOL

programs that are not compiled with the IBM COBOL for z/OS & VM (or VS COBOL II) compiler, LENGTHx (where x is 1 to 7) is required for each AREAx (where x is 1 to 7) that you specify.

Usage

The two kinds of commands that allow you to make checkpoints are: the CHKP, or basic Checkpoint command, and the SYMCHKP, or Symbolic Checkpoint command.

Batch programs can use either the symbolic or the basic command.

Both checkpoint commands make it possible for you to commit your program's changes to the database and to establish places from which the program can be restarted, should it terminate abnormally. You must not use the CHKPT=EOV parameter on any DD statement to take an IMS checkpoint.

Refer to *IMS Version 9: Application Programming: Design Guide* for an explanation of when and why you should issue checkpoints in your program. Both commands cause a loss of database position at the time the command is issued. Position must be reestablished by a GU command or other method of establishing position.

In addition to committing your program's changes to the database and establishing places from which your program can be restarted, the Symbolic Checkpoint command:

- Works with the Extended Restart (XRST) command to restart your program if it terminates abnormally.
- Can save as many as seven data areas in your program, which are restored when your program is restarted. You can save variables, counters, and status information.

Example

```
EXEC DLI SYMCHKP
     ID(chkpid)
     AREA1(area1) LENGTH1(expression1)
     ...
     AREA7(area7) LENGTH7(expression7)
```

Explanation: This example shows how to issue a symbolic checkpoint and to end a logical unit of work with a SYMPCHKP command.

Restrictions

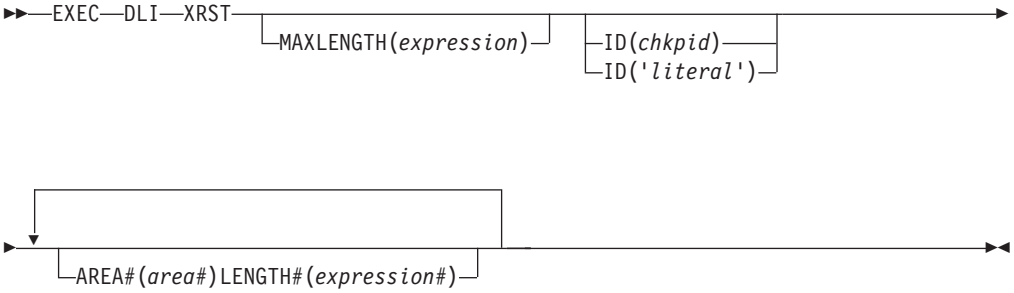
Restrictions for the SYMCHKP command:

- If you issue this command, you must also issue the XRST command.
- You cannot use this command in a CICS program.
- To use the SYMCHKP command you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- The areas you specify using the SYMCHKP command must be the same, and in the same order, as the areas specified in the XRST command.
- If you specify more than one area, you must specify all intervening areas. For example, if you specify AREA3, you must also specify AREA1 and AREA2.
- When specifying expression1 with a COBOL program that is not compiled with the IBM COBOL for z/OS & VM (or the VS COBOL II) compiler, LENGTHx (where x is 1 to 7) is required for each AREAx (where x is 1 to 7) that you specify.

XRST Command

The Extended Restart (XRST) command is used to issue an extended restart, and to perform a normal start or an extended restart from a checkpoint ID or time/date stamp. If you use Symbolic Checkpoint commands in your program, you must use the XRST command.

Format



Options

MAXLENGTH(expression)
Specifies the length of an area from which a program is restarted. This parameter is the longest segment in the PSB, or of all the segments in a path, if you use path commands in your program. It can be any expression in the host language that converts to the integer data type. You can specify either a number or a reference to a halfword containing a number. MAXLENGTH is not required, and defaults to 512 bytes.

ID(chkpid) ID('literal')
This parameter is either the name of a 30-byte area in your program or a 30-byte checkpoint ID, enclosed in quotes. This parameter is optional; you can specify a checkpoint ID or a time/date stamp in the parm field of your JCL instead. If you specify both, IMS uses the value in the parm field of the EXEC statement. If you are starting your program normally, do not specify a checkpoint ID, or ensure that the field pointed to by the *chkpid* contains blanks.

If your program is restarted and the CKPTID= value in the PARM field of the EXEC statement is not used, then the rightmost bytes beyond the checkpoint ID being used in the I/O area must be set to blanks.

You can issue a XRST command after supplying a time/date stamp of IIIIDDDHHMMSST, or from a specific checkpoint in your program by supplying a checkpoint ID. IIIIDDD is the region ID and day; HHMMSST is the actual time in hours, minutes, seconds, and tenths of seconds. The system message DFS0540I supplies the checkpoint ID and time/date stamp.

If you are using PL/I, specify *chkpid* as a pointer to a major structure, an array, or a character string.

AREA#(area#)
Area# specifies the first area in your program you want to restore. You can specify up to seven areas. You are not required to specify any areas; however, if you specify more than one area, you must include all intervening areas. For example, if you specify AREA3, you must also specify AREA1, and AREA2. The areas you specify on the XRST command must be the same—and in the same

order—as the areas you specify on the SYMCHKP command. When you restart the program, only the areas you specified in the SYMCHKP command are restored.

LENGTH#(expression#)
Specifies the length of an area from which a program is restarted. Its argument can be any expression in the host language that converts to the integer data type; you can specify either a number or a reference to a halfword containing a number. For IBM COBOL for z/OS & VM (or VS COBOL II), PL/I, or assembler language programs LENGTH1 to LENGTH7 are optional. For COBOL programs that are not complied with the IBM COBOL for z/OS & VM (or VS COBOL II) compiler, LENGTHx (where x is 1 to 7) is required for each AREAx (where x is 1 to 7) that you specify. Each qualification statement consists of:

- The name of a field in a segment
- The relational operator, which indicates how you want the two values compared
- The name of a data area in your program containing the value that is compared against the value of the field

Usage

If your programs issues Symbolic Checkpoint commands it must also issue the Extended Restart (XRST) command. The XRST is issued once, at the start of your program. You can use the XRST command to start your program normally, or to extend restart it in case of an abnormal termination.

You can extend restart your program from a specific checkpoint ID, or a time/date stamp. Because the XRST attempts to reposition the database, your program also needs to check for correct position.

After issuing the XRST command, you should test the DIBSEGM field in the DIB. After a normal start, the DIBSEGM field should contain blanks. At the completion of an Extended Restart, the DIBSEGM field will contain a checkpoint ID. Normally, XRST will return the 8-byte symbolic checkpoint ID, followed by 4 blanks. If the 8-byte ID consists of all blanks, then XRST will return the 14-byte time-stamp ID. The only successful status code for an XRST command is a blank status code. If DL/I detects any error while processing the XRST command, your program abends.

Example

```
EXEC DLI XRST MAXLENGTH(expression)
   ID(chkpid)
   AREA1(area1) LENGTH1(expression1)
   ...
   AREA7(area7) LENGTH7(expression7)
```

Explanation: This example shows how to specify the XRST command.

Restrictions

Restrictions for the XRST command:

- You cannot use this command in a CICS program.
- To use this command you must first define an I/O PCB for your program.
- You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.
- You cannot use this command unless the system log is stored on direct access storage and dynamic backout has been specified. You must also specify BKO=Y in the parm field of your JCL when you execute the program.

Chapter 5. Recovering Databases and Maintaining Database Integrity

This chapter describes the commands you can use to help recover data accessed by your program and maintain data integrity:

- The Basic Checkpoint command, CHKP, which you can use to issue checkpoints from a batch or BMP program
- The Symbolic Checkpoint command, SYMCHKP, which you can use to issue checkpoints from a batch or BMP program and to specify data areas that can be restored when you restart your program
- The Extended Restart command, XRST, which you can use along with symbolic checkpoints to start or restart your batch or BMP program
- The rollback commands, ROLL and ROLB, which you can use to dynamically back out database changes from a batch or BMP program
- The managing-backout-points commands, SETS and ROLS, which you can use to set multiple backout points and then return to these points later
- The Dequeue command, DEQ, which releases previously reserved segments

To use any of the commands, you must have defined an I/O PCB for your program, except for the DEDB DEQ calls, which are issued against a DEDB PCB.

The following topics provide additional information:

- "Issuing Checkpoints in a Batch or BMP Program"
- "Restarting Your Program and Checking for Position" on page 84
- "Backing Out Database Updates Dynamically: The ROLL and ROLB Commands" on page 84
- "Using Intermediate Backout Points: The SETS and ROLS Commands" on page 84

Issuing Checkpoints in a Batch or BMP Program

The two kinds of commands that allow you to make checkpoints are: the CHKP, or Basic Checkpoint command, and the SYMCHKP, or Symbolic Checkpoint command.

Batch programs can use either the Symbolic Checkpoint or the Basic Checkpoint command.

Both checkpoint commands make it possible for you to commit your program's changes to the database and to establish places from which the batch or BMP program can be restarted, in cases of abnormal termination.

Requirement: You must not use the CHKPT=EOV parameter on any DD statement to take an IMS checkpoint.

Because both checkpoint commands cause a loss of database position at the time the command is issued, you must reestablish position with a GU command or other methods.

You cannot reestablish position in the midst of nonunique keys or nonkeyed segments.

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Issuing the CHKP Command

When you issue a CHKP command, you must provide the code for restarting your program and you must specify the ID for the checkpoint. You can supply either the name of a data area in your program that contains the ID, or you can supply the actual ID, enclosed in single quotes. For example, either of the following commands is valid:

```
EXEC DLI CHKP ID(chkpid);
EXEC DLI CHKP ID('CHKP0007');
```

Issuing the SYMCHKP Command

The SYMCHKP command in batch and BMP programs:

- Works with the Extended Restart (XRST) command to restart your program if it terminates abnormally. which are restored when your program is restarted. You can save variables, counters, and status information.

For examples of how to specify the SYMCHKP command, see “SYMCHKP Command” on page 78.

Restarting Your Program and Checking for Position

Programs that issue Symbolic Checkpoint commands must also issue the Extended Restart (XRST) command. You must issue XRST once, as the first command in the program. You can use the XRST command to start your program normally, or to restart it in case of an abnormal termination. You can restart your program from one of the following:

- A specific checkpoint ID
- A time/date stamp

Because the XRST command attempts to reposition the database, your program also needs to check for correct position.

Backing Out Database Updates Dynamically: The ROLL and ROLB Commands

When a batch program determines that some of its processing is invalid, the ROLL and ROLB commands make it possible for the program to remove the effects of its inaccurate processing.

You can use both ROLL and ROLB in batch programs. You can only use the ROLB command in batch programs if the system log is stored on direct access storage and if you have specified BKO=Y in the parm field of your JCL.

Issuing either of these commands causes DL/I to back out any changes your program has made to the database since its last checkpoint, or since the beginning of the program if your program has not issued a checkpoint.

Using Intermediate Backout Points: The SETS and ROLS Commands

Use the SETS and ROLS commands to define multiple points at which to preserve the state of DL/I full-function databases and to return to these points later. (For example, you can use them to allow your program to handle situations that can occur when PSB scheduling complete without all of the referenced DL/I databases being available.)

The SETS and ROLS commands apply only to DL/I full-function databases. Therefore, if a logical unit of work (LUW) is updating recoverable resources other than full-function databases (VSAM files, for example), the SETS and ROLS requests have no effect on the non-DL/I resources. The backout points are *not* CICS commit points; they are intermediate backout points that apply only to DBCTL resources. Your program must ensure the consistency of all the resources involved.

Before initiating a set of DL/I requests to perform a function, you can use a SETS command to define points in your application at which to preserve the state of DL/I databases. Your application can issue a ROLS command later if it cannot complete the function. You can use the ROLS command to back out to the state all full-function databases were in before either a specific SETS request or the most recent commit point.

Chapter 6. Processing Fast Path Databases

Using EXEC DLI commands under DBCTL, a CICS program or a batch-oriented BMP program can access DEDBs. Parameters allow your program to use facilities of the DEDBs such as subset pointers.

A DEDB contains a root segment and as many as 127 types of dependent segment. One of these types can be a sequential dependent; the other 126 are direct dependents. Sequential dependent segments are stored in chronological order. Direct dependent segments are stored hierarchically.

DEDBs provide high data availability. Each DEDB can be partitioned, or divided into multiple “areas.” Each area contains a different set of database records. In addition, you can make up to seven copies of each area data set. If an error exists in one copy of an area, application programs can access the data by using another copy of that area. This is transparent to the application program. When an error occurs to data in a DEDB, IMS does not stop the database. It makes the data in error unavailable, but continues to schedule and process application programs. Programs that do not need the data in error are unaffected.

DEDBs can be shared among application programs in separate IMS systems. Sharing DEDBs is virtually the same as sharing full-function databases, and most of the same rules apply. IMS systems can share DEDBs at the area level (instead of at the database level as with full-function databases), or at the block level.

The following topics provide additional information:

- “Processing DEDBs with Subset Pointers”
- “The POS Command” on page 97

Processing DEDBs with Subset Pointers

Subset pointers and the options you use with them are optimization tools that significantly improve the efficiency of your program when you need to process long segment chains. Subset pointers divide a chain of segment occurrences under the same parent into two or more groups, or subsets. You can define as many as eight subset pointers for any segment type. You then define the subset pointers from within an application program (see “Subset Pointer Options” on page 90). Each subset pointer points to the start of a new subset. For example, in Figure 3 on page 88 suppose you defined one subset pointer that divided the last three segment occurrences from the first four. Your program can then refer to that subset pointer through options, and directly retrieve the last three segment occurrences.

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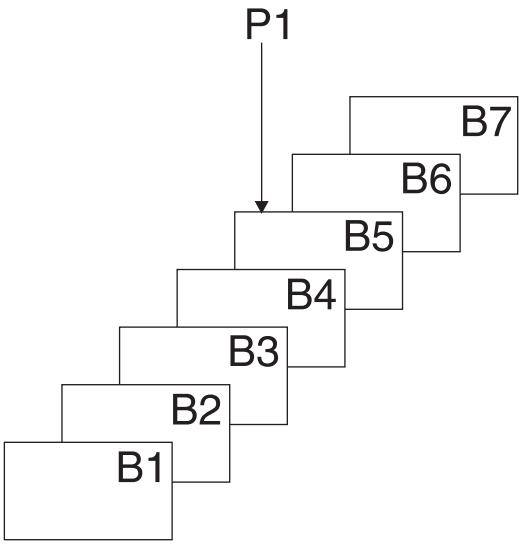

Figure 3. Processing a Long Chain of Segment Occurrences with Subset Pointers

You can use subset pointers at any level of the database hierarchy, except at the root level. Subset pointers used for the root level are ignored.

Figure 4 and Figure 5 on page 89 show some of the ways you can set subset pointers. Subset pointers are independent of one another, which means that you can set one or more pointers to any segment in the chain. For example, you can set more than one subset pointer to a segment, as shown in Figure 4.

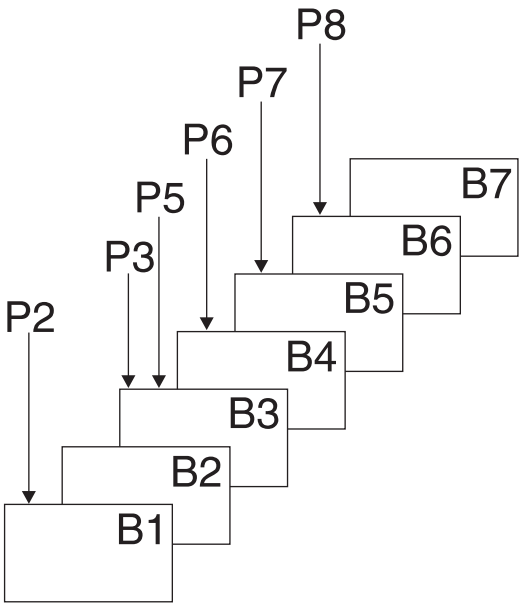

Figure 4. Examples of Setting Multiple Subset Pointers

Alternatively, you can define a one-to-one relationship between the pointers and the segments, as shown in Figure 5 where each segment occurrence has one subset pointer.

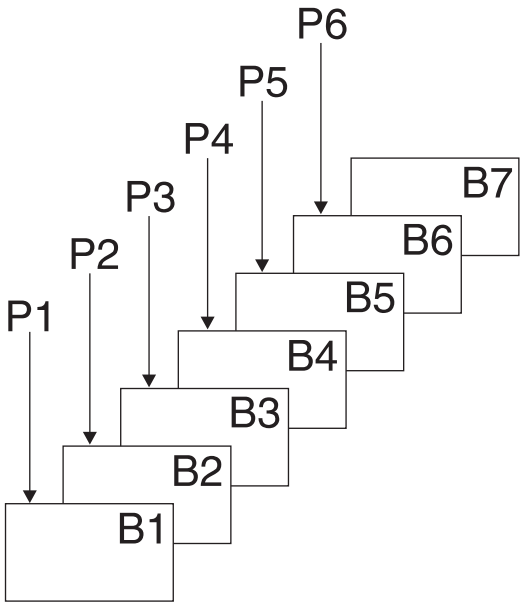

Figure 5. More Examples of Setting Subset Pointers

Figure 6 on page 89 shows how the use of subset pointers divides a chain of segment occurrences under the same parent into subsets. Each subset ends with the last segment in the entire chain. For example, the last segment in the subset defined by subset pointer 1 is B7.

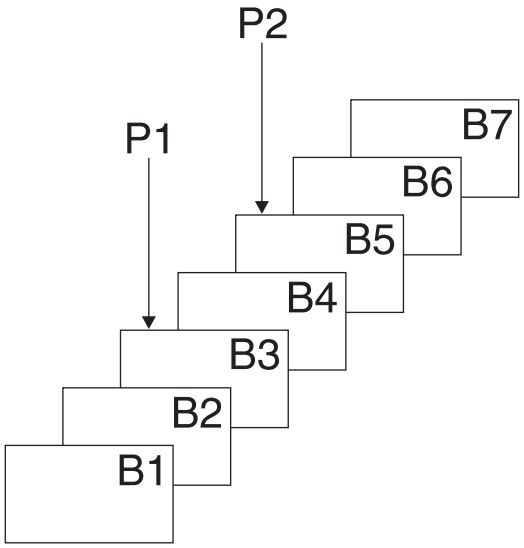

Figure 6. How Subset Pointers Divide a Chain into Subsets

Preparing to Use Subset Pointers

For your program to use subset pointers, the pointers must be defined in the DBD for the DEDB, and in your program's PSB:

- In the DBD, you specify the number of pointers for a segment chain. You can specify as many as eight pointers for any segment chain.
- In the PSB, you specify which pointers your program uses; you define this on the SENSEG statement. (Each pointer is defined as an integer from 1 to 8.) You also specify on the SENSEG statement whether your program can set the pointers it

uses. If your program has read-only sensitivity, it cannot set pointers, but can only retrieve segments using subset pointers already set. If your program has update sensitivity, it can update subset pointers by using the SET, SETCOND, MOVENEXT, and SETZERO options.

After the pointers are defined in the DBD and the PSB, an application program can set the pointers to segments in a chain. When an application program finishes executing, the subset pointers used by that program remain as they were set by the program and are not reset.

Designating Subset Pointers

To use subset pointers in your program, you must know the numbers for the pointers as they were defined in the PSB. Then, when you use the subset pointer options, you specify the number for each subset pointer you want to use immediately after the option; for example, you would use P3 to indicate that you want to retrieve the first segment occurrence in the subset defined by subset pointer 3. No default exists, so if you do not include a number between 1 and 8, IMS considers your qualification statement invalid and returns an AJ status code to your program.

Subset Pointer Options

To take advantage of subsets, application programs use five different options.

GETFIRST Allows you to retrieve the first segment in a subset.

SETZERO Sets a subset pointer to zero.

MOVENEXT Sets a subset pointer to the segment following the current segment. Current position is at the current segment.

SET Unconditionally sets a subset pointer to the current segment. Current position is at the current segment.

SETCOND Conditionally sets a subset pointer to the current segment. Current position is at the current segment.

Banking Transaction Application Example

The examples in this chapter are based on a sample application, the recording of banking transactions for a passbook account. The transactions are written to a database as either posted or unposted, depending on whether they were posted to the customer's passbook. For example, when Bob Emery does business with the bank, but forgets to bring in his passbook, an application program writes the transactions to the database as unposted. The application program sets a subset pointer to the first unposted transaction, so it can be easily accessed later. The next time Bob remembers to bring in his passbook, a program posts the transactions. The program can directly retrieve the first unposted transaction using the subset pointer that was previously set. After the program has posted the transactions, it sets the subset pointer to zero; an application program that subsequently updates the database can determine that no unposted transactions exist. Figure 7 on page 91 summarizes the processing performed when the passbook is unavailable.

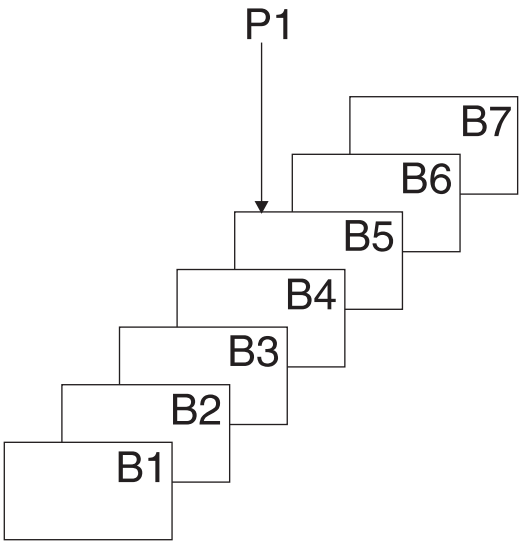

Figure 7. Processing Performed for the Sample Passbook Example when the Passbook is Unavailable

When the passbook is available, an application program adds the unposted transactions to the database, setting subset pointer 1 to the first unposted transaction. Figure 8 summarizes the processing performed when the passbook is available.

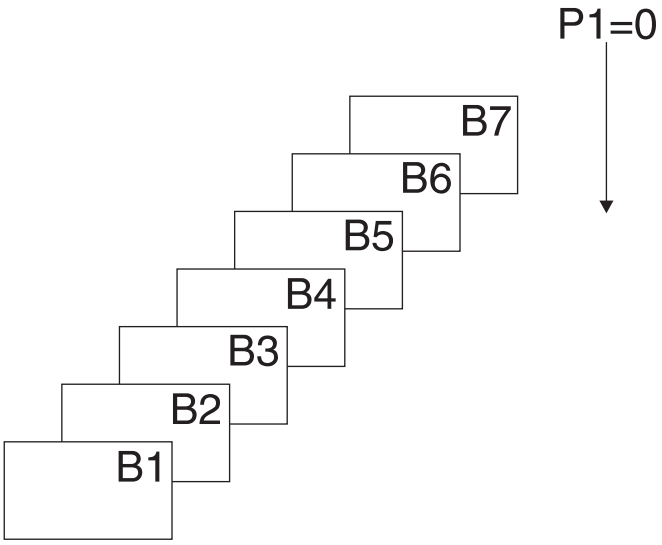

Figure 8. Processing Performed for the Sample Passbook Example when the Passbook is Available

When the passbook is available, an application program retrieves the first unposted transaction using the program, then posts all unposted transactions, setting subset pointer 1 to zero.

GETFIRST Option: Retrieving the First Segment of a Subset

To retrieve the first segment occurrence in the subset, your program issues a Get command with the GETFIRST option. The GETFIRST option does not set or move the pointer, but indicates to IMS that you want to establish position on the first

segment occurrence in the subset. The GETFIRST option is like the FIRST option, except that the GETFIRST option applies to the subset instead of to the entire segment chain.

Using the “Banking Transaction Application Example” on page 90, imagine that Bob Emery visits the bank with his passbook and you want to post all of the unposted transactions. Because subset pointer 1 was previously set to the first unposted transaction, your program can use the following command to retrieve that transaction:

```
EXEC DLI GU SEGMENT(A) WHERE(AKEY = 'A1')
     SEGMENT(B) INTO(BAREA) GETFIRST('1');
```

As shown in Figure 9, this command retrieves segment B5. To continue processing segments in the chain, you can issue Get Next commands, as you would if you were not using subset pointers.

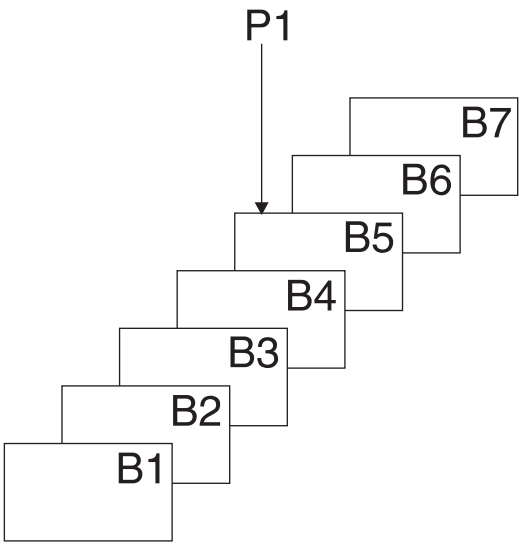

Figure 9. Retrieving the First Segment in a Chain of Segments

If the subset does not exist (subset pointer 1 has been set to zero), IMS returns a GE status code, and your position in the database immediately follows the last segment in the chain. Using the passbook example, the GE status code indicates that no unposted transactions exist.

You can specify only one GETFIRST option per qualification statement; if you use more than one GETFIRST in a qualification statement, IMS returns an AJ status code to your program. The rules for using the GETFIRST option are:

1. You can use GETFIRST with all options except:
   - FIRST
   - LOCKCLASS
   - LOCKED
2. Other options take effect after the GETFIRST option has, and position has been established on the first segment in the subset.
3. If you use GETFIRST with LAST, the last segment in the segment chain is retrieved.

4. If the subset pointer specified with GETFIRST is not set, IMS returns a GE status code, not the last segment in the segment chain. See “SETZERO, MOVENEXT, SET, and SETCOND Options: Setting the Subset Pointers.”
5. Do not use GETFIRST with FIRST. This causes you to receive an AJ status code.
6. GETFIRST overrides all insert rules, including LAST.

SETZERO, MOVENEXT, SET, and SETCOND Options: Setting the Subset Pointers

The SETZERO, MOVENEXT, SET, and SETCOND options allow you to redefine subsets by modifying the subset pointers. Before your program can set a subset pointer, it must establish a position in the database. A command must be fully satisfied before a subset pointer is set. The segment a pointer is set to depends on your current position at the completion of the command. If a command to retrieve a segment is not completely satisfied, and a position is not established, the subset pointers remain as they were before the command was issued.

- **Setting the subset pointer to zero: SETZERO**

  The SETZERO option sets the value of the subset pointer to zero. After your program issues a command with the SETZERO option, the pointer is no longer set to a segment; the subset defined by that pointer no longer exists. (IMS returns a status code of GE to your program if you try to use a subset pointer having a value of zero.)

  Using the “Banking Transaction Application Example” on page 90, say that you used the GETFIRST option to retrieve the first unposted transaction. You would then process the chain of segments, posting the transactions. After posting the transactions and inserting any new ones into the chain, you would use the SETZERO option to set the subset pointer to zero as shown in the following command:

  ```
  EXEC DLI ISRT SEGMENT(A) WHERE(AKEY = 'A1')
       SEGMENT(B) FROM(BAREA) SETZERO('1');
  ```

  After this command, subset pointer 1 would be set to zero, indicating to a program updating the database later on that no unposted transactions exist.

- **Moving the subset pointer forward to the next segment after your current position: MOVENEXT**

  To move the subset pointer forward to the next segment after your current position, your program issues a command with the MOVENEXT option. Using the “Banking Transaction Application Example” on page 90, say that you wanted to post some of the transactions, but not all, and that you wanted the subset pointer to be set to the first unposted transaction. The following command sets subset pointer 1 to segment B6.

  ```
  EXEC DLI GU SEGMENT(A) WHERE(AKEY = 'A1')
       SEGMENT(B) INTO(BAREA) GETFIRST('1') MOVENEXT('1');
  ```

  The process of moving the subset pointer with this command is shown in Figure 10 on page 94. If the current segment is the last in the chain, and you use a MOVENEXT option, IMS sets the pointer to zero.

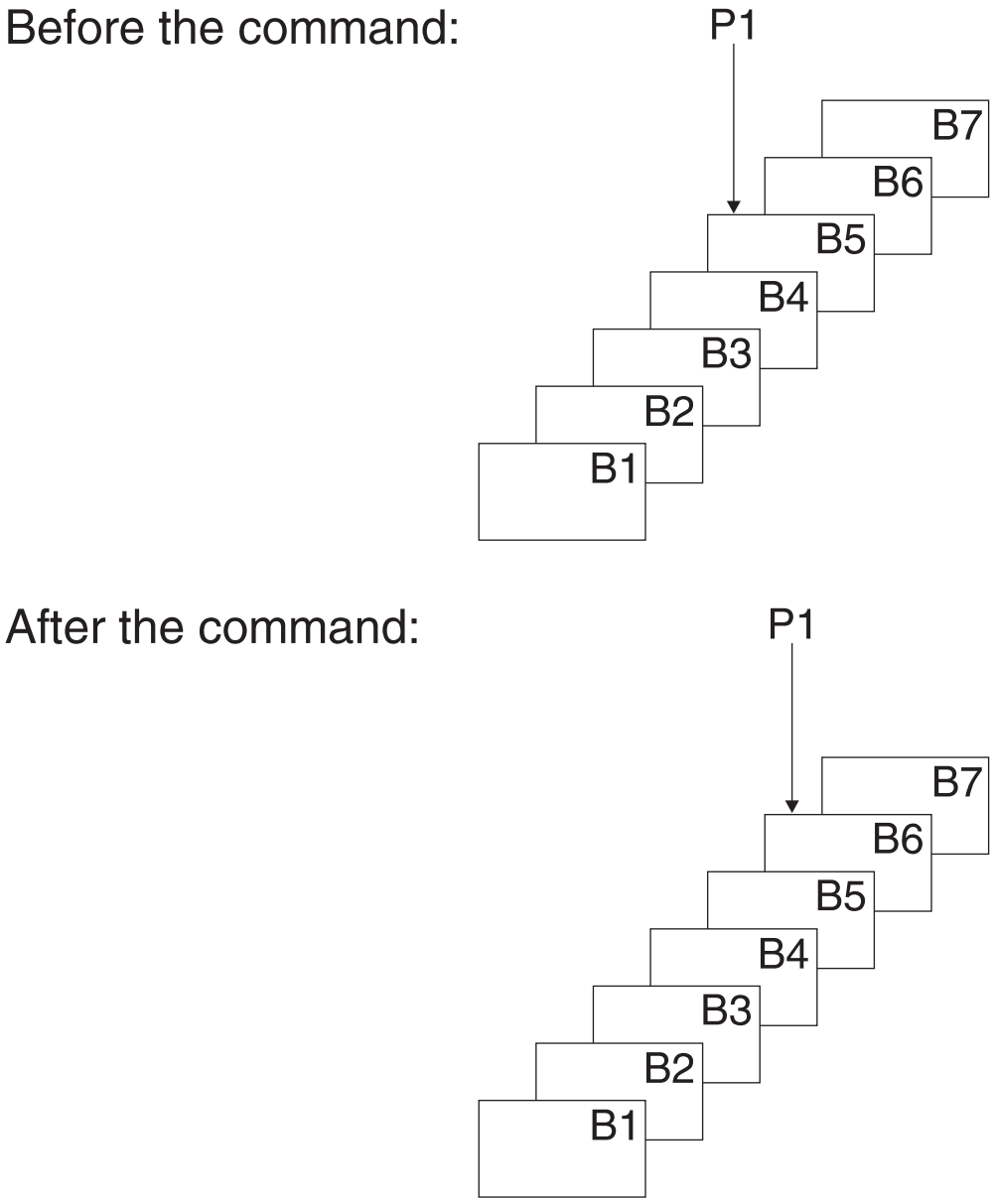

Figure 10. Moving the Subset Pointer to the Next Segment after Your Current Position

- **Setting the subset pointer unconditionally: SET**

  You use the SET option to set a subset pointer. The SET option sets a subset pointer unconditionally, regardless of whether or not it is already set. When your program issues a command that includes the SET option, IMS sets the pointer to your current position.

  For example, to retrieve the first B segment occurrence in the subset defined by subset pointer 1, and to reset pointer 1 at the next B segment occurrence, you would issue the following commands:

```
EXEC DLI GU SEGMENT(A) WHERE(AKEY = 'A1')
     SEGMENT(B) INTO(BAREA) GETFIRST('1');
EXEC DLI GN SEGMENT(B) INTO(BAREA) SET('1');
```

  After you have issued these commands, instead of pointing to segment B5, subset pointer 1 points to segment B6, as shown in Figure 11 on page 95.

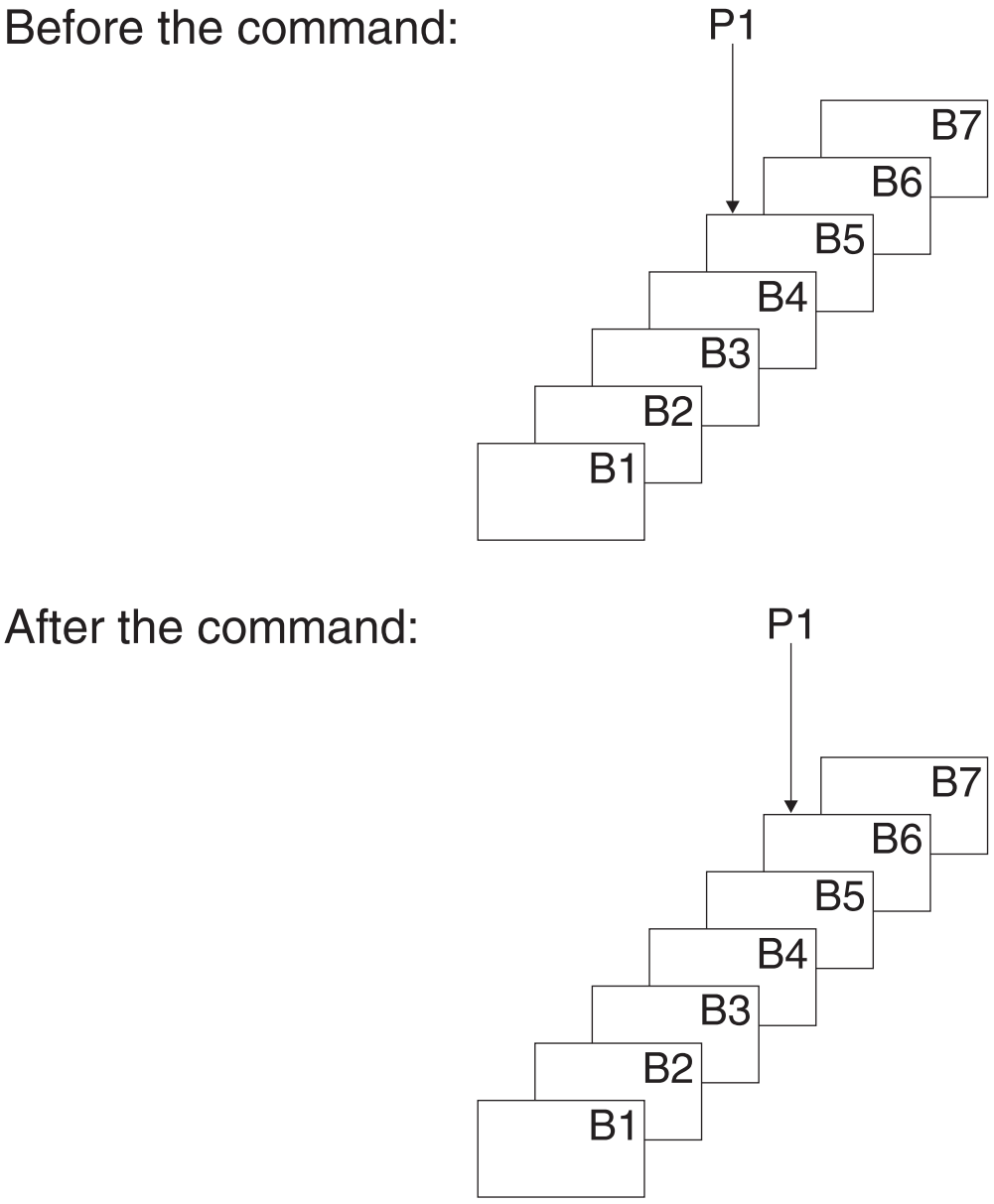

Figure 11. Unconditionally Setting the Subset Pointer to Your Current Position

- **Setting the subset pointer conditionally: SETCOND**

  Your program uses the SETCOND option to conditionally set the subset pointer. The SETCOND option is similar to the SET option; the only difference is that, with the SETCOND option, IMS updates the subset pointer only if the subset pointer is *not* already set to a segment.

  Using the passbook example, say that Bob Emery visits the bank and forgets to bring his passbook; you add the unposted transactions to the database. You want to set the pointer to the first unposted transaction so that when you post the transactions later, you can immediately access the first one. The following command sets the subset pointer to the transaction you are inserting, if it is the first unposted one:

```
EXEC DLI ISRT SEGMENT(A) WHERE(AKEY = 'A1')
     SEGMENT(B) FROM(BAREA) SETCOND('1');
```

As shown by Figure 12, this command sets subset pointer 1 to segment B5. If unposted transactions already existed, the subset pointer is not changed.

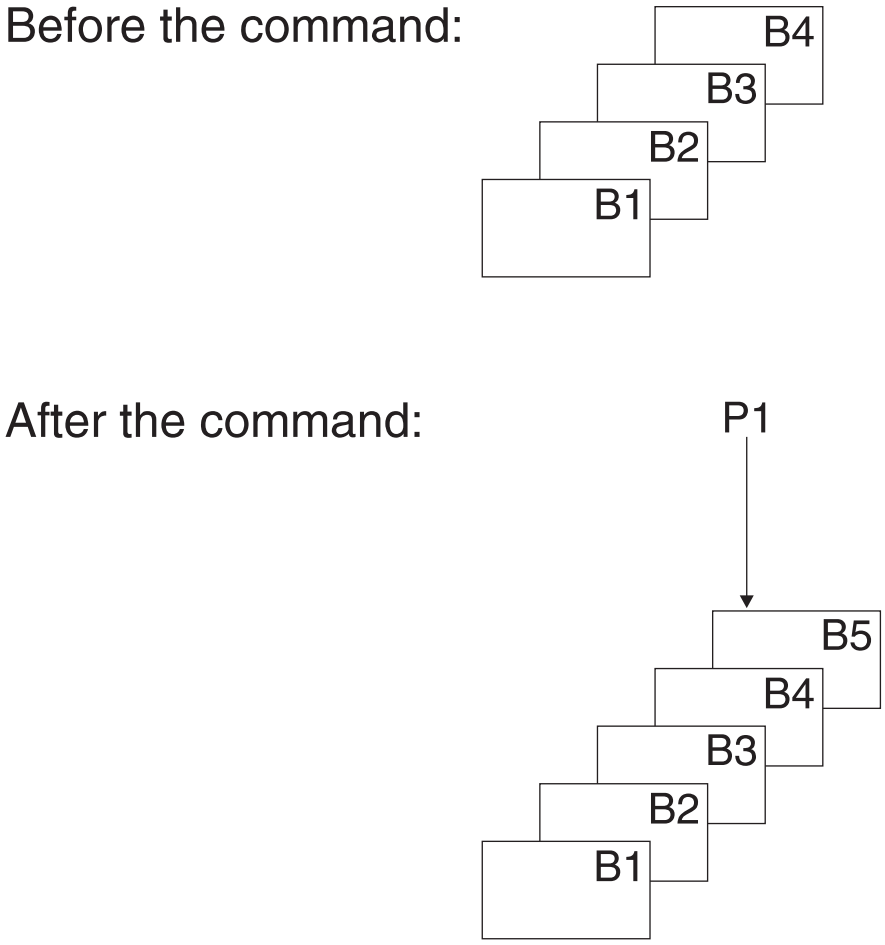

Figure 12. Conditionally Setting the Subset Pointer to Your Current Position

Inserting Segments in a Subset

When you use the GETFIRST option to insert an unkeyed segment in a subset, the new segment is inserted before the first segment occurrence in the subset. However, the subset pointer is not automatically set to the new segment occurrence. For example, the following command inserts a new B segment occurrence in front of segment B5, but does not set subset pointer 1 to point to the new B segment occurrence:

```
EXEC DLI ISRT SEGMENT(A) WHERE(AKEY = 'A1')
     SEGMENT(B) FROM(BAREA) GETFIRST('1');
```

To set subset pointer 1 to the new segment, you use the SET option along with the GETFIRST option, as shown in the following example:

```
EXEC DLI ISRT SEGMENT(A) WHERE(AKEY = 'A1')
     SEGMENT(B) FROM(BAREA) GETFIRST('1') SET ('1');
```

If the subset does not exist (subset pointer 1 has been set to zero), the segment is added to the end of the segment chain.

Deleting the Segment Pointed to By a Subset Pointer

If you delete the segment pointed to by a subset pointer, the subset pointer points to the next segment occurrence in the chain. If the segment you delete is the last in the chain, the subset pointer is set to zero.

Combining Options

You can use the SET, MOVENEXT, and SETCOND options with other options, and you can combine subset pointer options with each other, provided they do not conflict. For example, you can use GETFIRST and SET together, but you cannot use SET and SETZERO together because their functions conflict. If you combine options that conflict, IMS returns an AJ status code to your program.

You can use one GETFIRST option per qualification statement, and one update option (SETZERO, MOVENEXT, SET, or SETCOND) for each subset pointer.

Subset Pointer Status Codes

If you make an error in a qualification statement that contains subset pointer options, IMS can return these status codes to your program:

AJ The qualification statement used a GETFIRST, SET, SETZERO, SETCOND, or MOVENEXT option for a segment for which there are no subset pointers defined in the DBD.

The subset options included in the qualification statement are in conflict; for example, if one qualification statement contained a SET option and a SETZERO option for the same subset pointer, IMS would return an AJ status code. S means to set the pointer to current position; Z means to set the pointer to zero. You cannot use these options together in one qualification statement.

The qualification statement included more than one GETFIRST option.

The pointer number following a subset pointer option is invalid. You either did not include a number, or included an invalid character. The number following the option must be between 1 and 8, inclusive.

AM The subset pointer referenced in the qualification statement was not specified in the program's PSB. For example, if your program's PSB specifies that your program can use subset pointers 1 and 4, and your qualification statement referenced subset pointer 5, IMS would return an AM status code to your program.

Your program tried to use an option that updates the pointer (SET, SETCOND, or MOVENEXT) but the program's PSB did not specify pointer update sensitivity.

The POS Command

You can use the POS command (only with DEDBs) to:

- Retrieve the location of a specific sequential dependent segment, or retrieves the location of the last inserted sequential dependent segment.
- Tell you the amount of unused space within each DEDB area. For example, you can use the position information that IMS returns for a POS command to scan or delete the sequential dependent segments for a particular time period.

For the syntax of the POS command, see "POS Command" on page 58.

If the area the POS command specifies is unavailable, the I/O area is unchanged and the status code FH is returned.

Locating a Specific Sequential Dependent Segment

When you have position on a particular root segment, you can retrieve the position information and the area name of a specific sequential dependent segment of that root. If you have a position established on a sequential dependent segment, the search starts from that position. IMS returns the position information for the first sequential dependent segment that satisfies the command.

To retrieve this information, you issue a POS command with a qualification statement containing the segment name of the sequential dependent. The current position after this kind of POS command is in the same place that it is after a GNP command.

After a successful POS command, the I/O area contains:

LL A 2-byte field giving the total length of the data in the I/O area, in binary.

Area Name An 8-byte field giving the ddname from the AREA statement.

Position An 8-byte field containing the position information for the requested segment.

If the sequential dependent segment that is the target of the POS command is inserted in the same synchronization interval, no position information is returned. Bytes 11-18 contain X'FF'; other fields contain normal data.

Unused CIs A 4-byte field containing the number of unused CIs in the sequential dependent part.

Unused CIs A 4-byte field containing the number of unused CIs in the independent overflow part.

Locating the Last Inserted Sequential Dependent Segment

You can also retrieve the position information for the most recently inserted sequential dependent segment of a given root segment. To do this, you issue a POS command with a qualification statement containing the root segment as the segment name. The current position after this type of command follows the same rules as position after a GU.

After a successful command, the I/O area contains:

LL A 2-byte field containing the total length of the data in the I/O area, in binary.

Area Name An 8-byte field giving the ddname from the AREA statement.

Position An 8-byte field containing the position information for the most recently inserted sequential dependent segment. This field contains zeros provided no sequential dependent for this root exist.

Unused CIs A 4-byte field containing the number of unused CIs in the sequential dependent part.

Unused CIs A 4-byte field containing the number of unused CIs in the independent overflow part.

Identifying Free Space with the POS Command

To retrieve the area name and the next available position within the sequential dependent part from all online areas, you can issue an unqualified POS command. This type of command also retrieves the free space in the independent overflow and sequential dependent parts.

After a successful unqualified POS command, the I/O area contains the length (LL) followed by the same number of entries as areas within the database. Each entry contains field two through five shown below:

LL A 2-byte field containing the total length of the data in the I/O area, in binary. The length includes the 2 bytes for the LL field, plus 24 bytes for each entry.

Area Name An 8-byte field giving the ddname from the AREA statement.

Position An 8-byte field giving the next available position within the sequential dependent part.

Unused CIs A 4-byte field containing the number of unused CIs in the sequential dependent part.

Unused CIs A 4-byte field containing the number of unused CIs in the independent overflow part.

The P Processing Option

If the P processing option has been specified (with the PROCOPT parameter) in the PCB for your program, a GC status code is returned to your program whenever a command to retrieve or insert a segment causes a Unit of Work (UOW) boundary to be crossed. Although crossing the UOW boundary probably has no particular significance for your program, the GC status code indicates that this is a good time to issue a CHKP command. The advantages of doing this are:

- Your position in the database is kept. Issuing a CHKP normally causes position in the database to be lost, and the application program has to reestablish position before it can resume processing.
- Commit points occur at regular intervals.

When a GC status code is returned, no data is retrieved or inserted. In your program, you can either:

- Issue a CHKP command, and resume database processing by reissuing the command that caused the GC status code.
- Ignore the GC status code and resume database processing by reissuing the command that caused the status code.

Chapter 7. Comparing Command-Level and Call-Level Programs

This chapter summarizes some of the differences between command- and call-level programs. If you are familiar with DL/I calls but not with EXEC DLI commands, this information will help you understand the commands and options you can use to perform the tasks that you performed using calls.

The following topics provide additional information:

DL/I Calls for IMS and CICS

Table 10 provides a quick reference for using DL/I calls in a Batch, Batch-Oriented BMP, or CICS with DBCTL environment.

Table 10. DL/I Calls Available to IMS and CICS Command-Level Application Programs

	Program Characteristics		
Request Type	**Batch**	**Batch-Oriented BMP**	**CICS with DBCTL[1]**
CHKP call (symbolic)	Yes	Yes	No
CHKP call (basic)	Yes	Yes	No
GSCD call[2]	Yes	No	No
INIT call	Yes	Yes	Yes
ISRT call (initial load)	Yes	No	No
ISRT call	Yes	Yes	Yes
LOG call	Yes	Yes	Yes
SCHD call	No	No	Yes
ROLB call	Yes	Yes	No
ROLL call	Yes	Yes	No
ROLS call (Roll Back to SETS)[3]	Yes	Yes	Yes
ROLS call (Roll Back to Commit)	Yes	Yes	Yes
SETS call[3]	Yes	Yes	Yes
STAT call[4]	Yes	Yes	Yes
TERM call	No	No	Yes
XRST call	Yes	Yes	No

Notes:

1. In a CICS remote DL/I environment, CALLs in the CICS-DBCTL column are supported if you are shipping a function to a remote CICS that uses DBCTL.
2. GSCD is a Product-sensitive programming interface.
3. SETS and ROLS calls are not valid when the PSB contains a DEDB.
4. STAT is a Product-sensitive programming interface.

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Comparing EXEC DLI Commands and DL/I Calls

Table 11 compares EXEC DLI commands with DL/I calls and explains what the commands do. For example, in a command-level program, you use the LOAD command instead of the ISRT call to initially load a database.

Table 11. Comparing Call-Level and Command-Level Programs: Commands and Calls

Call-Level	Command-Level	Allows you to...
INIT call	ACCEPT command	Initialize for data availability status codes.
CHKP call (basic)	CHKP command	Issue a basic checkpoint.
DEQ call	DEQ command	Release segments retrieved using LOCKCLASS option or Q command code.
DLET call	DLET command	Delete segments from a database.
GU, GN, and GNP calls	GU, GN, and GNP commands[1]	Retrieve segments from a database.
GHU, GHN, and GHNP calls[1]	GU, GN, and GNP commands[1]	Retrieve segments from a database for updating.
GSCD call	GSCD call[2]	Retrieve system addresses.
ISRT call	ISRT command	Add segments to a database.
ISRT call	LOAD command	Initially load a database.
LOG call	LOG command	Write a message to the system log.
POS call	POS command	Retrieve positioning or space usage or positioning and space usage in a DEDB area.
INIT call	ACCEPT command	Initialize for data availability status.
INIT call	QUERY command	Obtain information of initial data availability.
INIT call	REFRESH command	Availability information after using a PCB.
REPL call	REPL command	Replace segments in a database.
XRST call	RETRIEVE command	Issue an extended restart.
ROLL or ROLB call	ROLL or ROLB command	Dynamically back out changes.
ROLS call	ROLS command	Back out to a previously set backout point.
PCB call	SCHD command	Schedule a PSB.
SETS call	SETS command	Set a backout point.
SETU call	SETU command	Set a backout point even if unsupported PCBs (like DEDBs or MSDBs) are present.
STAT call[3]	STAT command	Obtain system and buffer pool statistics.
CHKP call (extended)	SYMCHKP command	Issue a symbolic checkpoint.
TERM call	TERM command	Terminate a PSB.
XRST call	XRST command	Issue an extended restart.

Notes:

1. Get commands are just like Get Hold calls, and the performance of Get commands and Get calls is the same.
2. You can use the GSCD call in a batch command-level program. GSCD is a Product-sensitive programming interface.
3. STAT is a Product-sensitive programming interface.

Comparing Command Codes and Options

Table 12 compares the options you use with EXEC DLI commands with the command codes you use with DL/I calls. For example, the LOCKED option performs the same function as a Q command code.

Table 12. Comparing Call-Level and Command-Level Programs: Command Codes and Options

Call- Level	Command-Level	Allows You to...
C	KEYS option	Use the concatenated key of a segment to identify the segment.
D	INTO or FROM specified on segment level to be retrieved or inserted.	Retrieve or insert a sequence of segments in a hierarchic path using only one request, instead of having to use a separate request for each segment. (Path call or command).
F	FIRST option	Back up to the first occurrence of a segment under its parent when searching for a particular segment occurrence. Disregarded for a root segment.
L	LAST option	Retrieve the last occurrence of a segment under its parent.
M	MOVENEXT option	Set a subset pointer to the segment following the current segment.
N	Leave out the SEGMENT option for segments you do not want replaced.	Designate segments you do not want replaced, when replacing segments after a get hold request. Usually used when replacing a path of segments.
P	SETPARENT	Set parentage at a higher level than what it usually is (the lowest hierarchic level of the request).
Q	LOCKCLASS, LOCKED	Reserve a segment so that other programs are not able to update it until you have finished processing it.
R	GETFIRST option	Retrieve the first segment in a subset.
S	SET option	Unconditionally set a subset pointer to the current segment.
U	No equivalent for command level programs.	Limit the search for a segment to the dependents of the segment occurrence on which position is established.
V	CURRENT option	Use the hierarchic level of and levels above the current position as qualifications for the segment.
W	SETCOND option	Conditionally set a subset pointer to the current segment.
Z	SETZERO option	Set a subset pointer to zero.
–	No command-level equivalent.	Null. Use an SSA in command code format without specifying the command code. Can be replaced during execution with the command codes you want.

Chapter 8. Data Availability Enhancements

Your program might fail when it receives a status code indicating that a DL/I full-function database is unavailable. To avoid this, you can use data availability enhancements. After a PSB has been scheduled in DBCTL, your application program can issue requests to indicate to IMS that the program can handle data availability status codes and to obtain information about the availability of each database.

The following topics provide additional information:

- "Accepting Database Availability Status Codes"
- "Obtaining Information about Database Availability"

Accepting Database Availability Status Codes

These status codes occur because PSB scheduling was completed without all of the referenced databases being available. Use the ACCEPT command to tell DBCTL to return a status code instead of abending the program:

```
EXEC DLI ACCEPT STATUSGROUP('A');
```

Obtaining Information about Database Availability

You can put data availability status codes into each of the DB PCBs if:

- In a CICS DBCTL environment, by using the PSB scheduling request command, SCHD.
- In a Batch or BMP environment, at initialization time.

You can obtain the data availability status codes within the DL/I interface block (DIB) by using the following QUERY command:

```
EXEC DLI QUERY USING PCB(n);
```

n specifies the PCB.

The QUERY command is used after scheduling the PSB but before making the first database call. If the program has already issued a call using a DB PCB, then the QUERY command must follow the REFRESH command:

```
EXEC DLI REFRESH DBQUERY
```

The REFRESH command updates the information in the DIB. You can only issue this command one time.

For full-function databases, the DIBSTAT should contain NA, NU, TH, or blanks. For MSDBs and DEDBs, the DIBSTAT always contains blanks.

If a CICS command language translator has been used to translate the EXEC DLI commands, then, in addition to data availability status, the DBDNAME will be returned in the DIB field DIBDBDNM. Also, the name of the database organization will be returned in the DIB field DIBDBORG.

For an explanation of the data availability codes, see *IMS Version 9: Messages and Codes, Volume 1*.

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Bibliography

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CICS Transaction Server for z/OS V2.3 CICS Application Programming Guide, SC34-6231

CICS Transaction Server for z/OS V2.3 CICS Application Programming Reference, SC34-6232

CICS Family: CICS TS for z/OS Communications from CICS on System/390, SC34-6031

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