# SMARTdata UTILITIES for OS/2

SC26-7063-02

# VSAM in a Distributed Environment

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# About This Book

This publication introduces the Application Programming Interface (API) for VSAM in a Distributed Environment, program number 5648-02012. It discusses the capabilities of the VSAM APIs and how they are used to access remote and local data organized in various file types.

The first chapter introduces VSAM for OS/2 and Distributed Data Management. It describes the features of VSAM and the characteristics of the VSAM record files and file types.

The remainder of the book is divided into two sections.

Part 1 describes the VSAM APIs (also referred to as functions) in detail. It tells you how to code the APIs, gives information about VSAM parameters, and information about the VSAM flags. The last chapter in Part 1 describes the VSAM reply messages.

Part 2 describes how to use the Distributed FileManager (DFM) for remote record access. It describes start-up activities, how to configure DFM, and how record file data is converted using A Data Language (ADL). DFM uses CDRA coded character set identifiers (CCSIDs) to define the language for data conversion. Appendix A contains character conversion tables for various countries. Appendix B lists the ADL subset supported by DFM for OS/2. Appendix C lists OS/2 commands that DFM does not support.

## Who Should Read This Publication

This book is for you if you are an application programmer who wants to write applications that open, access, modify, and close record files on local or remote systems.

## What You Should Know Before Reading This Publication

You should have an understanding of Distributed Data Management (DDM) architecture level 4.0 and C programming language, as well as other programming languages such as COBOL and PL/1.

# Bibliography

You can order books by calling IBM* Software Manufacturing Solutions at 1-800-879-2755.

*Table 1. SMARTdata UTILITIES for OS/2 Publications*

| **Publication Title** | **Order Number** |
|---|---|
| SMARTdata UTILITIES for OS/2 Set | SBOF-6131 |
| SMARTdata UTILITIES for OS/2: VSAM in a Distributed Environment | SC26-7063 |
| SMARTdata UTILITIES Data Description and Conversion | SC26-7091 |
| SMARTdata UTILITIES A Data Language Reference for Data Description and Conversion | SC26-7092 |

*Table 2. Other Publications*

| **Publication Title** | **Order Number** |
|---|---|
| DDM Architecture: Specifications for ADL | SC21-8286 |
| Character Data Representation Architecture, Level 2 | SC09-1390 |
| IBM Systems Journal: Volume 31, No. 3, 1992 | G321-5483 |
| Compilers–Principles, Techniques, and Tools: by the Addison–Wesley Publishing Company | — |
| IEEE Standard for Binary Floating–Point Arithmetic: | 754-1985 |
| INTEL** 387** DX User | — |
| IBM Distributed Data Management: General Information | GC21-9527 |
| IBM Distributed Data Management: Reference Guide | SC21-9526 |
| Using Distributed Data Management for the IBM Personal Computer | SC21-9643 |
| AS/400* Communications:Distributed Data Management Guide | SC21-9600 |
| CICS/Distributed Data Management: User's Guide | SC33-0695 |
| IBM 4680 Store Systems: Distributed Data Management: User's Guide | SC30-4915 |
| DFSMS/MVS Version 1 Release 2 Distributed FileManager/MVS Guide and Reference | SC26-4915 |

# Summary of Changes

This section summarizes the changes made for this edition.

## July 1997

- Minor changes have been made to Part 1 to make this information more platform independent.
- The following VSAM API Common Parameters have been added:
  - ALCINISZ (Allocate Initial Extent)—DFM only
  - FILCHGDT (File Change Date)—DFM only
  - LSTACCDT (Last Access Date)—DFM only
  - LSTARCDT (Last Archived Date)—DFM only
- Information has been deleted about disk caching.
- A new chapter has been added, Chapter 16, “Information for the Application Programmer” on page 551, to discuss information the C, COBOL, and PL/I application programmer should know.
- A new appendix has been added, Appendix E, “Programming Extended Attributes in VSAM APIs” on page 571, to discuss programming extended attributes in VSAM APIs.

## June 1996

The major technical changes are:

- Chapter 7. VSAM Reply Messages

  The following reply messages have been added:

  - COMMRM (Communications Error)
  - CVTNFNRM (Conversation Table Not Found)
  - DDFNFNRM (Data Description File Not Found)
  - PRCCNVRM (Conversational Protocol Error)
  - XLATERM (Translation Error)
- Chapter 12. Assigning and Releasing Drive Letters

  You can specify a parameter list when issuing the **DFMDRIVE ASSIGN** command to assign a drive letter.

  A new command has been added, **DFMDRIVE SETPARM**, to set a drive parameter list.

# Using This Reference

Before you begin using this reference, read the following sections to understand the format and access functions for VSAM APIs.

## Notation Conventions

The function descriptions and examples are shown in C language. Lengths, code points, bit flag masks, and other values are shown in the following hexadecimal notation:

```
X'hex value'
```

with the hexadecimal value enclosed in single quotes following a capital X.

Bit constants appear in the following format:

```
B'bit value'
```

with the bit value enclosed in single quotes following a capital B.

Severity codes are shown in decimal and hexadecimal notation.

**Note:** See the file DUBCODPT.H in the installation directory (default: C:\IBMDDM\H) for an example of the code point notation.

## Function Descriptions

The functions in this book follow a pseudo-C high-level language format. The following example outlines the sections for each &prod. function:

## DDMExample (Example)

This is the purpose of the function.

### Syntax

This is the invocation format (Call Interface) for the function and describes all the parameters of the function.

```
#include os2.h
#include dub.h

APIRET DDMExample (ULONG             Parm 1,
                   PULONG            Parm 2,
                   );
```

### Parameters

This section contains the parameters that apply to the function.

**Parm1**
The first parameter (ULONG) of the function.

**Parm2**
The second parameter (PULONG) of the function.

There are four types of parameters:

| | |
|---|---|
| **Function specific** | Used only by the function, such as FileName. |
| **Common** | Described in Chapter 4, “VSAM API Common Parameters” on page 363 |
| **AccessFlags** | Described in “AccessFlags (Access Flags)” on page 401 |
| **CreateFlags** | Described in “CreateFlags (Create Flags)” on page 407 |

### Returns

This section lists all possible reply messages that can be generated by invoking this function.

This information is returned in the form of reply messages. For function-specific information on reply messages, see the specific function in Chapter 3, “VSAM API Functions” on page 45. For general information on reply messages, see Chapter 6, “VSAM API Reply Messages” on page 413.

In addition, each function returns a return-code value of the type APIRET. For descriptions of the severity code (SVRCOD) values, see “SVRCOD (Severity Code)” on page 396.

To retrieve the reply messages, the DDMGetReplyMessage function must be issued immediately after the &prod. function that generates the messages. If any other record I/O function is called by the current &prod. thread of execution, any reply messages queued are lost.

**Note:** All error codes that refer to security or DDM network communications functions are not supported in &prod..

## Remarks

This section contains general comments about the function.

## Effect on Cursor Position

This section describes the effect the function has on the position of the cursor.

## Locking (for Local VSAM File System Only)

This section describes the kind of file locking that occurs for each function.

## Exceptions

This section contains tables that list the reply messages you will normally receive and provide detailed information about what causes the reply messages.

## Record File Attributes by File Class

This section describes the record file attributes by file class.

## Examples

This section contains examples to illustrate what changes may be caused by the function invocation, such as cursor movement and limit resetting.

## DDMExample

# Chapter 1. Introduction to VSAM as a DDM Implementation

This chapter describes the subset of the Distributed Data Management (DDM) architecture supported by the VSAM APIs. It discusses the API parameters, flags, and messages.

This chapter describes:

- Distributed Data Management Concepts
- Record types and attributes
- Access Methods
- Record file types
- VSAM cursor
- Lock management

## Distributed Data Management Overview

SMARTdata UTILITIES implements two components that manage access to files: the local VSAM file system and Distributed FileManager (DFM). The local VSAM file system provides record-type access on the workstation. The Distributed FileManager provides client remote record access to other DDM server implementations. The availability of these SMARTdata UTILITIES components is platform dependent. See the appropriate SMARTdata UTILITIES publication for your platform.

The Distributed Data Management architecture is a methodology used to store, organize, and access data. The architecture defines the protocol for data connectivity between computer systems, regardless of their individual application programs, user applications, hardware, or software.

Using the VSAM APIs, C application programmers can retrieve, add, update, and delete data records from files that reside on the same system or other systems,

The DDM architecture is based on a client/server model. The system that initiates a request for access to data is called the **source** system, or **client**. The system that contains the requested data is called the **target** system, or **server**.

**Note:** In conformance with this model, the local VSAM file system behaves like a server, though the data is local.

The following terms are used in describing how DDM works.

**Local File**
If data is requested from a file that is located on the system that initiated the request, that file is called a local file.

**Remote File**
If data is requested from a file that is not located on the system that initiated the request, that file is called a remote file.

**Note:** The definition of local or remote is always from the point of view of the system requesting the data.

**Source System** The system that initiates requests for access to data is called the source system. The source system can request data from its own local files or from the remote files of another system. A component of the source system is the DDM client. It translates the source system's request for data from a remote system into a standardized DDM request. The DDM client routes the request to the network access software of the source system, which sends the request to the corresponding network access software of the system that contains the requested data.

**Target System** The system that contains the requested data is called the target system. A component of the target system is the DDM server, which receives the DDM client's request and translates it into a data management request that the target system understands. Once the target system has processed the request, it returns the results of the request to the DDM server. The DDM server routes the results of the request to the network access software which sends the results to the source system.

The Distributed Data Management architecture is represented in Figure 1. The text that follows describes the steps involved in record file access.

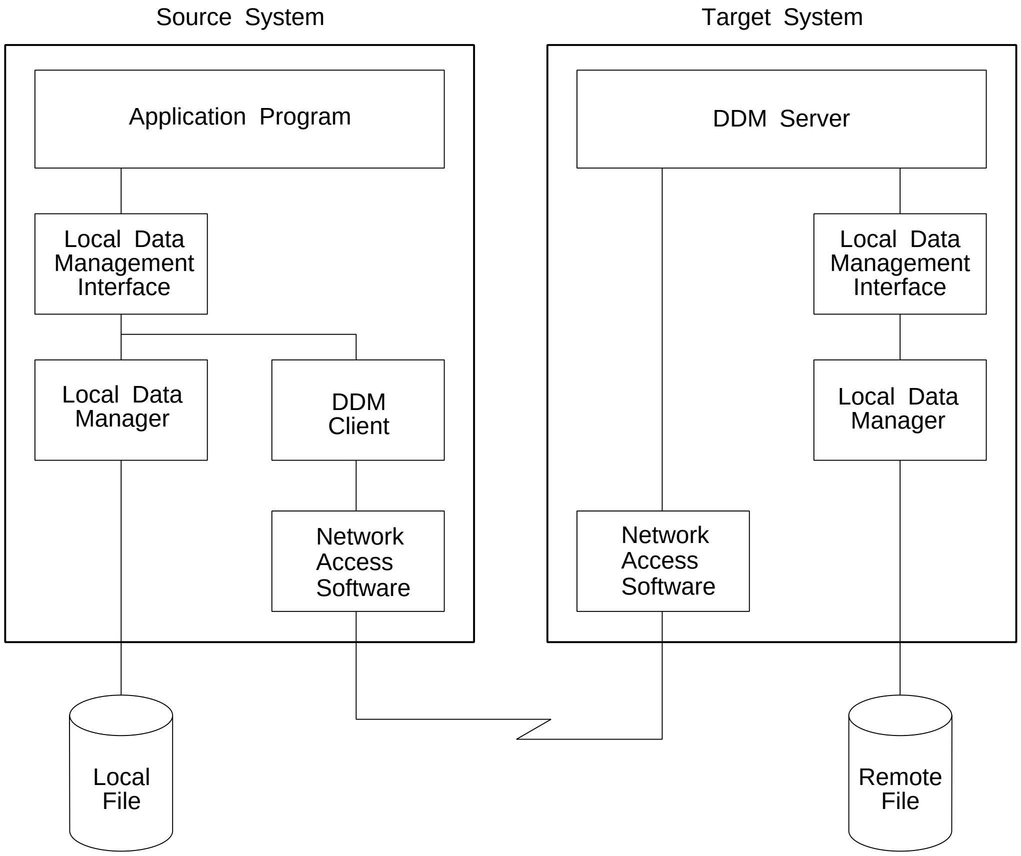


*Figure 1. Overview of DDM Processing*

- An **Application Program** initiates processing by requesting data.
- The **Local Data Management Interface (LDMI)** determines whether the data requested by the application is on a local (source) or a remote (target) system. If the data is on the local system, the **Local Data Manager** (LDM) of the source system retrieves the requested data from storage. If the data is on the remote system, LDMI invokes the DDM Client.
- The **Distributed Data Management Client** translates the local command into one or more Distributed Data Management commands.
- The **network access software** on the **Source System** transmits the commands to the network access software on the **Target System**.
- The **network access software** on the **Target System** directs the Distributed Data Management command to the Distributed Data Management Server, which handles the request.
- The **Distributed Data Management Server** interprets the Distributed Data Management commands and builds the calls for LDMI on the Target system. The

Distributed Data Management Server builds a data stream with the retrieved data. It then inserts a reply into the data stream and transmits it back to the source system.

Starting with the following section, the rest of this chapter discusses how the DDM architecture is implemented in SMARTdata UTILITIES and supported by the VSAM APIs.

## DDM Record Types

Every record-oriented file consists of a set of records. Records are the basic unit of data stored in record-oriented files and are transferred between requesters and files. The record length can be either fixed or variable. The *record number* indicates the record's position in the file in which it is stored. The first position for a record in a file has a record number of one.

The VSAM APIs support two DDM record formats: RECORD and RECINA.

### RECORD formats

These are active records and can have fixed or variable lengths. When you create a file, specify a RECLEN (Record Length) attribute as either the length of the fixed records or the maximum length of the variable records. See 392. for a description of the record length parameter.

**Fixed-length record (RECFIX)**
A record whose length is specified as an attribute (RECLEN) of the file in which it is stored and cannot be changed.

**Variable-length record (RECVAR)**
A record whose length can be changed after it has been written to a file. The length of individual records in the file varies from record to record, but it cannot exceed the maximum length specified by the file's RECLEN attribute.

**Initially-variable-length record (RECIVL)**
A record whose length is specified the first time it is written to a file. Once a file position in a file has been assigned a record length, the length of the record position is fixed and cannot be changed. The length of individual records in the file varies from record to record, but it cannot exceed the maximum length specified by the file's RECLEN attribute.

### RECINA formats

These are inactive records used to represent record positions where a record has never been inserted or where a previously active record has been deleted. The RECINA parameter specifies the required length of any record to be inserted at that record position.

## Record Attribute Lists (RECALs)

A record attribute list (RECAL) is used to transmit more than one attribute of a record as a single unit. For example, the record number or key value and the record itself can be returned in a RECAL. A RECAL can also return duplicate records using the RECCNT parameter and DATA fields. The record is returned as DATA and the number of duplicate records is returned in RECCNT.

See “RECAL (Record Attribute List)” on page 389 for a description of the RECAL parameter.

## Extended Attributes

The VSAM APIs support Extended Attributes (EAs) to associate DDM attributes with a file. The set of VSAM API file attributes is a superset of the standard set of file attributes. This allows programs using the VSAM APIs to access both DDM and operating system dependent attributes without opening the file.

The DDM file attributes supported by the local VSAM file system are listed in Table 11 on page 39 and Table 12 on page 40. Table 11 on page 39 lists the EAs that can only be viewed, and Table 12 on page 40 lists the EAs that can be modified.

The VSAM APIs assume each DDM file attribute is described in a DDM format. These formats are described in Chapter 4, “VSAM API Common Parameters” on page 363.

The EAs reflecting DDM file attributes are coded in C with a prefix of “.DDM_.” The VSAM APIs use the OS/2 DOS-like “EAOP2” structures to read and write EA lists.

The following example is an overview of how to request two EAs (.DDM_DELCP and .DDM_FILCLS) when issuing DDMQueryFileInfo for a sequential, delete-capable file in the current directory. For examples of C code to set up the “GEA2List” and “FEA2List,” see Appendix E, “Programming Extended Attributes in VSAM APIs” on page 571 .

```
DDMQueryFileInfo("\SAMPLE.SEQ",
                     1L,
                     pointer to an EAOP2 structure,
                     size of EAOP2 structure);

   Input Data Structures
       struct _EAOP2 {
              (4)pointer to GEA2List structure
              (4)pointer to FEA2List structure
              (4)offset to error if any
};                                    /* end of EAOP2 structure */
struct _GEA2List {
   ----- (4)length of structure = 25
   │     (4)nextentry offset = 10 /* each entry  must be on a 4 byte boundary */
   │     (1)length of name 1 = A
   ----- (B)name 1 = .DDM_DELCP
   ----- (4)next entry offset = 0 /* no entry after this one */
   │     (1)length of name 2 = B
   ----- (C)name 2 = .DDM_FILCLS
 };                            /* end of GEA2List structure */

 Structure _FEA2List {
           (4)Length of structure = 3C /* total length of data expected */
                                    /* each entry is on an 4 byte boundary */
  };                                /* end of FEA2List structure */

Output Data Structures

    Structure _FEA2List {
       -----(4)length of structure = 3C
       │    (4)next entry offset = 1C /*note: each entry must be on a 4 byte
       │                               boundary */
       │    (1)flag byte = 0
       │    (1)length of name 1 = A
       │    (2)length of value for name 1 = 7
       │    (B)name 1 = .DDM_DELCP
       │    (7)value 1 = 00000007   /* length of value */
       │                 111B       /* DDM code point for DELCP */
       -----             F1         /* DDM Value for TRUE */
            (2)                     /* 2 bytes of padding to force */
                                    /* next entry to a 4 byte      */
                                    /* boundary                    */
       -----(4)next entry offset = 0 /* there is no next entry */
       │    (1)flag byte = 0
       │    (1)length of name 2 = B
       │    (2)length of value for name 2 = 8
       │    (C)name 2 = .DDM_FILCLS
       │    (8)value 2 = 00000008  /* length of value */
       │                  1110      /* code point for FILCLS */
       -----              143B      /* sequential file */

                                   /* end FEA2List structure */
 };
```

## Record Files

A *record file* is a file in which data is stored as a set of discretely addressable structures called records. A record file class describes a method of organizing, accessing, and managing a set of records. The VSAM APIs support sequential, direct, keyed, and alternate index file classes.

All files have the following major components:

- File attributes that are stored as Extended Attributes (EAs), such as record length and file class.
- File record extents that store the record data.
- Special objects:
  - The index of a keyed file is stored in a separate file that is given an internal VSAM name, .DDMEA (AIX local VSAM file system only).
  - Alternate index files related to a base key file.

The length of the records of a file can be either fixed or variable. Once a variable-length record is inserted into a record position of the file, the length of the record at that position remains fixed if the record class is initially variable. It remains variable if the record class is variable.

A file is created with either *delete-capable* or *non-delete-capable* status. If a file is delete-capable, you can issue the DDMDeleteRec function to delete records from that file. If a file is non-delete-capable, the DDMDeleteRec function is rejected when issued for the file. You specify delete status when creating the file.

An *access method* is used to process records in a record file. The VSAM APIs support methods that access records by number and by key value. When the DDMOpen (Open File) function opens the file, the access method is bound to a file and remains bound to the file until the DDMClose (Close File) function closes the file or the function is terminated. The access method maintains a cursor for each file to which it is bound. The cursor is set to the beginning of the file when the access method is used to open a file. Access methods are described in “Access Methods” on page 18. The DDM cursor and cursor movement is described in “DDM Cursor” on page 21.

Records can be inserted into a file when it is created, or the application can insert the records later. In order to update or delete a record in a file, you must place an update intent on the record by using the appropriate VSAM API.

**Important Note**

The local VSAM file system cannot prevent non-DDM access to local VSAM managed files. If these files are processed by non-DDM functions (such as other APIs or user functions), information about the files can be lost and the local VSAM file system will not be able to process the files. Therefore, users MUST NOT access local VSAM-managed files using non-DDM functions.

## Record File and Record Length Classes

The VSAM APIs support the following record classes:

- Sequential
- Direct

- Keyed
- Alternate index

The VSAM APIs support three logical record length classes:

- Fixed
- Variable
- Initially Variable

For the local VSAM file system, each of the file classes supported is implemented as a meta-file on top of a standard file. Each file (see Figure 2) consists of two parts.

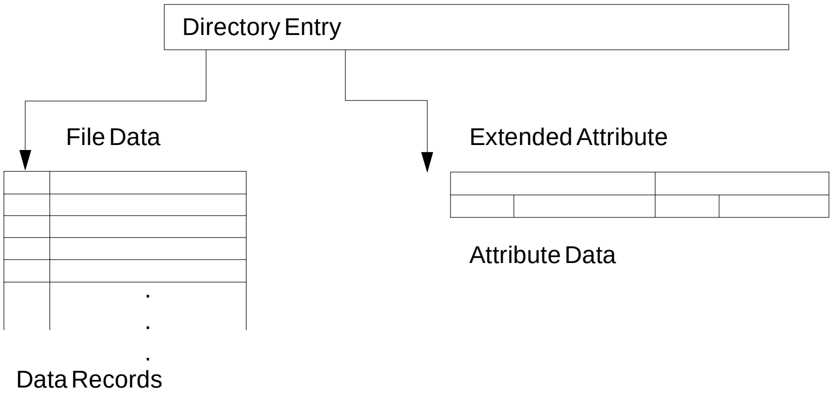


*Figure 2. Local VSAM File Component Parts. This figure illustrates the two component parts of a Record File within a Byte Stream file: the Data Records and the Attribute Data.*

1. Data and Control Structures (Records)

   This is the user file data along with an architected set of control data structures. These structures are defined in a way that allows the DDM file model semantics to be implemented on top of a standard file. From the file system perspective, this is simply the data portion of the file.

2. Attribute Data

   The Attribute Data is additional descriptive information required to describe a record-oriented file. This information is called the DDM Attributes. For the AIX local VSAM file system, all of the DDM Attributes are kept in .DDMEA files.

## Sequential Files

A sequential file contains records that are arranged in exactly the same order they were placed in the file.

After the initial loading of records, additional records can be added at End-of File (EOF) or inserted into existing inactive record positions. There is no relationship between the contents of a record and its record number.

When a sequential file is created, its allocated record positions can be either:

- initialized to a specified default value,
- initialized as inactive records, or
- uninitialized.

When a file is opened, the cursor is positioned at the Beginning-of-File (BOF). The BOF position for a sequential file is always the position before any record position. The first record position of a sequential file is always the first record in the file, whether the record is active or inactive. The EOF position for a sequential file is one position past the last record position at which an active or inactive record exists. The last record position of a sequential file is always the last active or inactive record in the file.

Figure 3 gives a logical view of a sequential file with variable-length records.

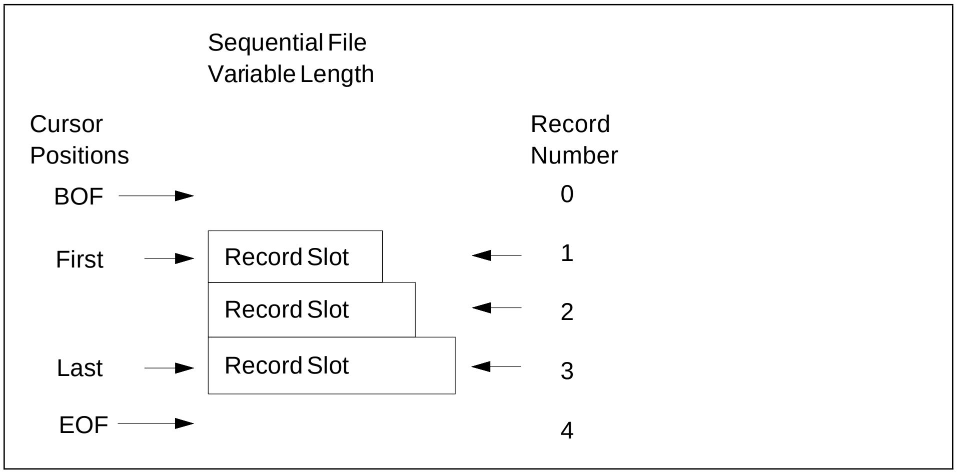


*Figure 3. Sequential File with Variable-Length Records*

## Quasi Byte Stream Files

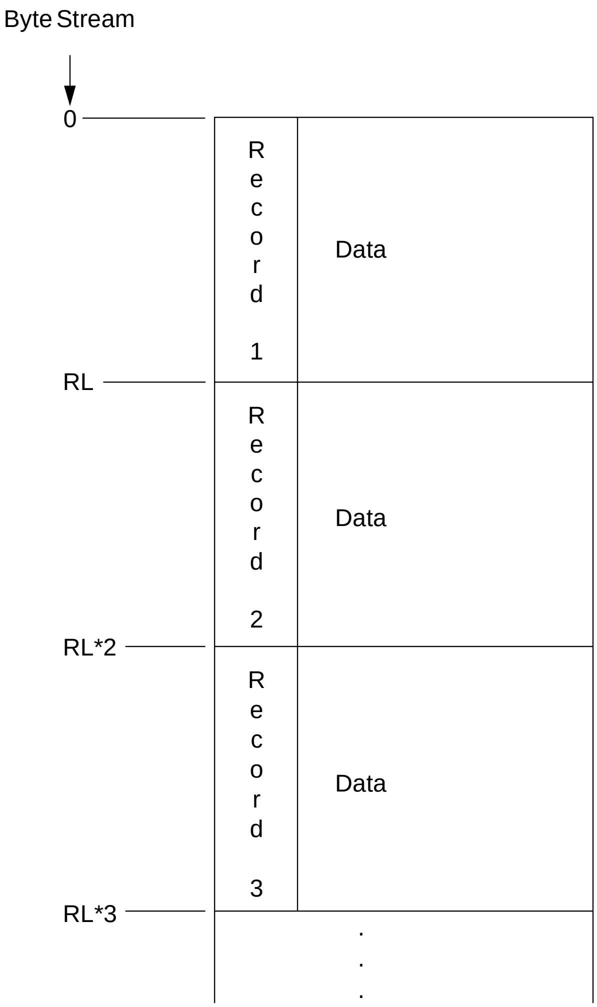
There is a special requirement that a certain type of local VSAM file also look like a byte stream file. A quasi byte stream file is a sequential record file that is created with non-delete-capable status and with fixed-length records. It does not have any record headers or separators. A quasi byte stream file can be read as a pure byte stream file through local byte stream I/O with no change to byte stream applications. There can be no inactive records in a quasi byte stream record file.

Since the file has the same format as a byte stream file, byte stream applications are able to do byte stream read operations on this type of sequential record file.

**Important Note**

Non-VSAM API applications can read, but not modify, local quasi-byte stream files. If these files are modified by non-VSAM functions, such as user functions, the file attributes will not be updated and information about the files can be lost.

The format of quasi byte stream record files is shown in Figure 4 on page 10



NOTE: RL = Max Record Length (4K default)

*Figure 4. Quasi Byte Stream Record File*

## Direct Files

A direct file contains records that have a relationship between the record contents and the position at which the record is stored. An application program inserting a record into a direct file uses the record number to find the place to insert the record. The application uses the value of one of the record fields as the record number, or calculates a record number value.

When you open the file, the cursor points to the BOF position. For direct files:

**The BOF position** is always one position before the first record position.

**The first record position** is the first active record position of the file.

Do not confuse this with *record number one*, which can contain an active record, but not necessarily so.

**The last record position** is always the last active record in the file.

**The EOF position** is one position past the last active record position.

You can insert a record at EOF or past EOF in a direct file. If you insert a record past EOF, VSAM will insert inactive records (if they don't already exist) starting at EOF up to the record position where the desired record is to be inserted. For direct files with delete-capable status, you can move the EOF position toward the beginning of the file by deleting the last active record in the file.

The physical boundary for a direct file is defined by the requester when the file is created.

When you create a direct file, you can specify allocated positions as either:

- Initialized to a specified default active record. If you initialize a file with default records, all allocated record positions are active.
- Initialized as inactive records. If you initialize a direct file with inactive records, each record position in the file is inactive until a record is inserted into it. Records can be inserted at any inactive record position within the physical boundaries of the file as long as space is available in the file.
- Uninitialized and treated as inactive records because they are beyond the EOF.

See Figure 5 for a logical view of the BOF, EOF, first record position, and last record position.

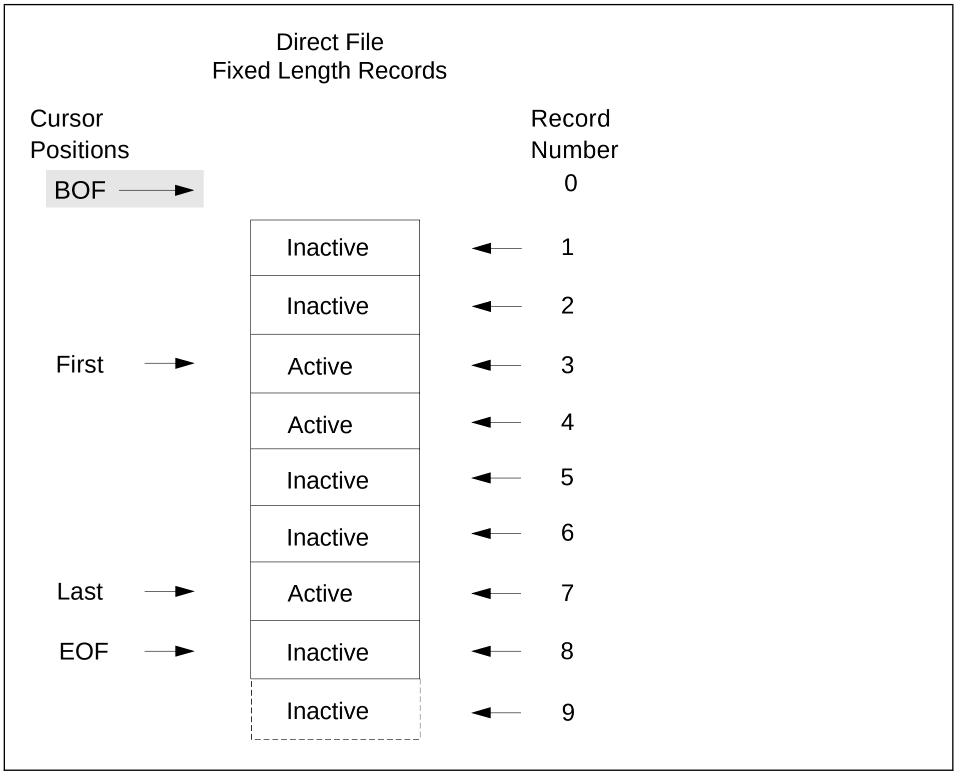


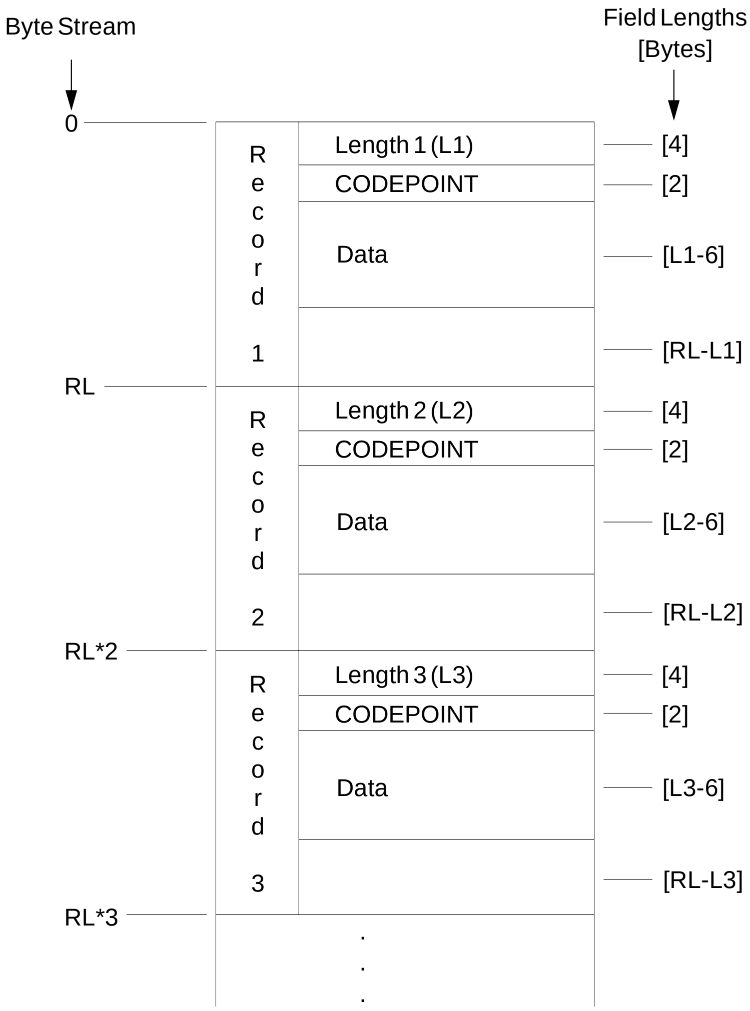
*Figure 5. Direct File with Inactive Fixed-Length Records. Note that the EOF is one position past the last active record, even though there is another inactive record in the file.*

## Media Formats for Direct and Sequential Files

The media formats, or data and control structures, for direct and sequential files are identical. However, a number of semantic differences between them are found in the descriptions of the access functions. Some differences are:

- The EOF positioning is different when you delete records from the end of the file: EOF for direct files retreats, while EOF for sequential files does not.
- In direct files, records can be inserted beyond EOF, and EOF gets moved after the last active inserted record. For sequential files, records can be inserted at, but not beyond, EOF.
- Cursor positioning differs: in DDMSetFirst, DDM_ALLREC must always be False for direct files.

Direct and sequential files have the format shown in Figure 6 on page 13.



NOTE: RL = Max Record Length

*Figure 6. Direct / Sequential File Format. This figure shows the format of a direct or sequential file superimposed on a byte stream file. The same format applies to fixed-, variable-, and initially-variable-length records.*

## Keyed Files

A keyed file is implemented as two files: a DDM sequential file (called the base file or keyed file) and an index file that maps keys to record numbers.

When a keyed file is created, the file name specified in the function is used for the base file. A name is generated by the file system for the index file. The index file is always placed in the same subdirectory as the base file. The name (not including path) of the base file is placed in the attribute information of the index file and vice versa for the name of the index file.

When the base file is later opened, the name and path information given in DDMOpen is used to locate the base file. The attribute information in the base file is used to get the index file name. Then the same path specified in the function is used to locate the index file. The base and its index must always be in the same subdirectory.

Keyed sequential files contain an overlying B-Tree Indexing structure. Figure 7 illustrates the basic keyed file concepts. Note that the data field of the index file contains a base-file record number.

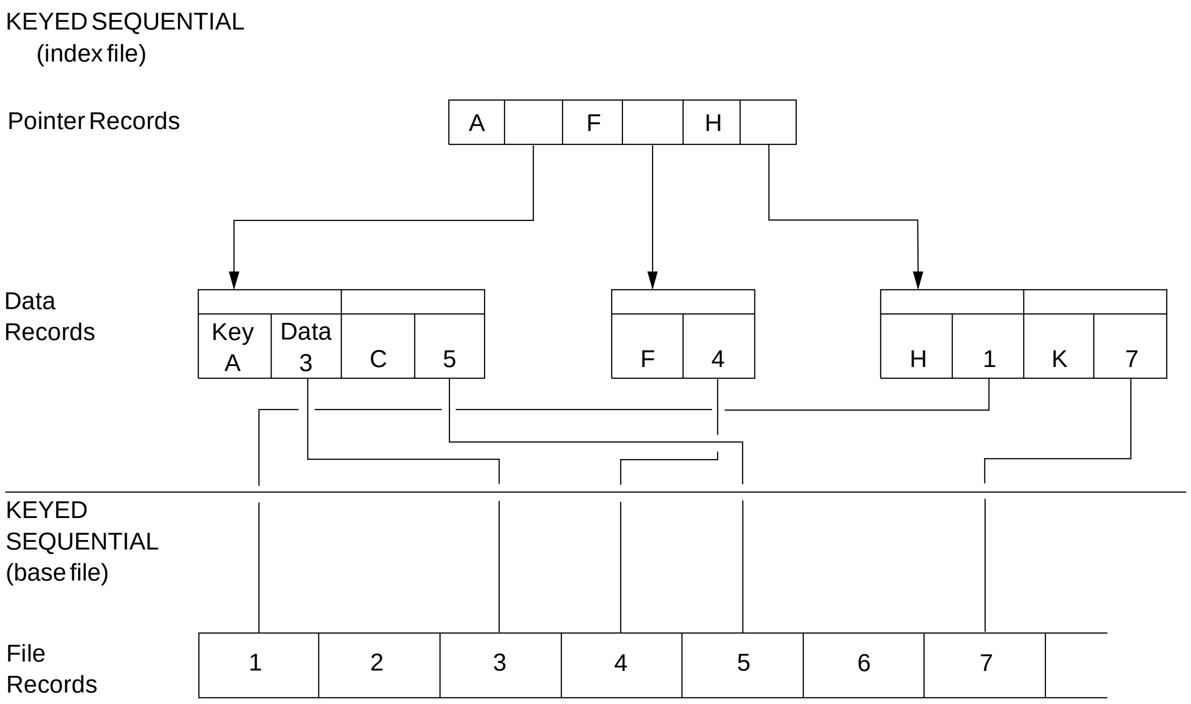


*Figure 7. Keyed File. Example of the structure of a local VSAM file system keyed file. Note that a "keyed file" really consists of two files: an index file and a base file.*

A keyed file supports keyed access to the records in the file. Each keyed file has a *file index* that contains an entry for each active record in the file. The index allows an application to process records by referring to the key of the record.

The key, also called the *key field* or *record key* is the portion of the record containing information that identifies the record. Index entries identify a record by the value of its key and the position of the record in the file. The index is ordered as specified by the file attribute, KEYDEF, which you defined when the file is created.

A keyed file has a primary index and can have multiple alternate index files. Any update to a keyed file causes automatic updates to all alternate index files built on that file.

A variable-length record in a keyed file must be large enough for all the key field values in the file index and any alternate index files that use the keyed file as a base file.

When they are created, keyed files can be either:

- initialized with inactive records,
- initialized with active records that have a specified default value, or
- uninitialized.

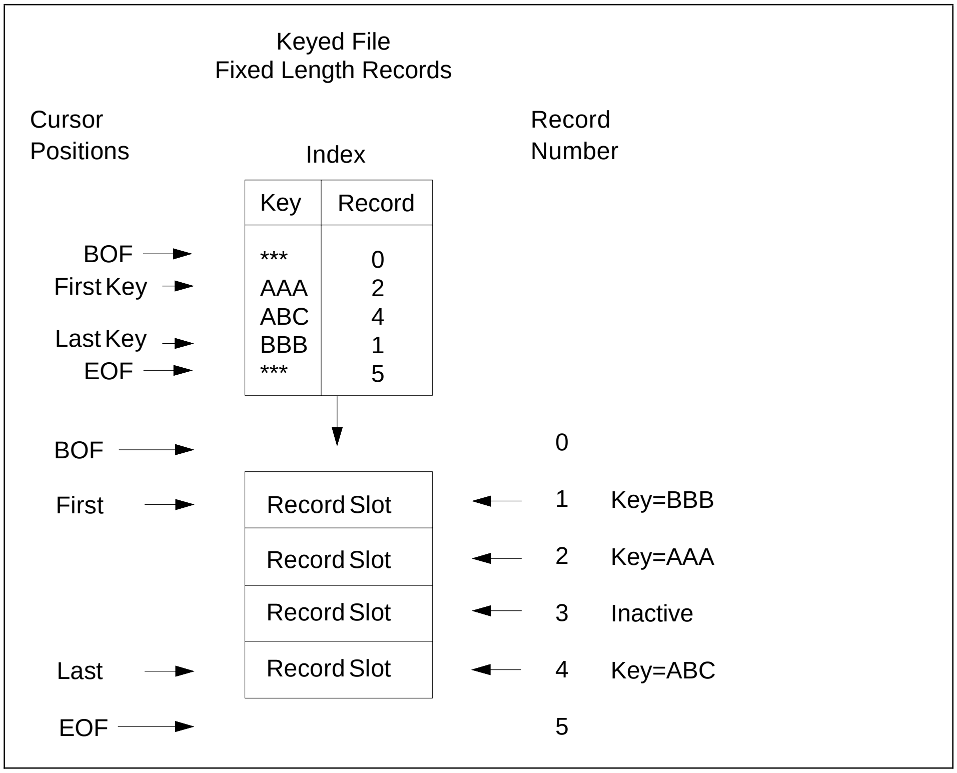
The BOF for a keyed file is the position before any record positions. When the file is opened, the cursor is positioned at the BOF. The first record position is the first active or inactive record position of the file. This may not be the first record in key sequence.

The EOF position for a keyed file is one past the last record position at which an active or inactive record exists. The last record position is the last active or inactive position of the file. This may not be the last record in key sequence.

***Cursor Positioning Functions:*** Different VSAM APIs have different cursor positioning characteristics:

1. DDMSetNextRec and DDMSetPrevious, set the cursor position relative to **record positions** in the file.
2. DDMSetKeyNext, DDMSetKeyPrevious, and DDMSetNextKeyEqual, set the cursor position relative to **key sequence**.

In Figure 8 on page 16, for example, if the cursor is initially positioned at EOF, DDMSetKeyPrevious moves the cursor to the record whose key is BBB, the last key by key sequence.



| Key | Record |
|---|---|
| *** | 0 |
| AAA | 2 |
| ABC | 4 |
| BBB | 1 |
| *** | 5 |

*Figure 8. Keyed File of Fixed-Length Records*

## Alternate Index File

Physically, an alternate index file is identical to the index portion of a keyed file. An alternate index file allows the user to view the *base file* from a different perspective. Typically, an alternate index file will key off a different portion of the base records, thus allowing the user to retrieve records in a different sequence from that provided by the normal keyed file processing. VSAM APIs only support alternate indexes for keyed files. The index file is built from the base portion of the keyed file.

A *base file* is an existing keyed file upon which an alternate index is built. Base file records are the same as the alternate index file records, however the record contents of the base file do not appear in the alternate index file. The base key file has one primary index, and can have multiple alternate index files. Each alternate index file contains an entry for each active record in the file. Updates to a base file result in automatic updates to all of its alternate index files. Every alternate index file has a separate set of attributes.

The BOF and EOF positions in an alternate index file are the same as those of its base file. When you open the file the cursor is positioned at BOF.

If the file has variable record lengths, the lengths must be large enough to include all of the key field values for the alternate index file.

The key, which is also called the *key field* or *record key*, is the portion of the record containing information that identifies the record. Index entries use the value of a record key and the position of the record in the file to identify the record. You use the KEYDEF attribute when creating the file to specify the ordering of the records.

Figure 7 on page 14 illustrates index files.

### Fixed-, Variable-, and Initially-Variable-Length Records

The media formats for fixed-, variable-, and initially-variable-length records are identical. However, there are a number of semantic differences between them, found in the descriptions of the access functions.

Some semantic differences between the three classes of record lengths are:

- Fixed-length records must all be the same length.
- Variable-length records can be overwritten with either smaller or larger records as long as the maximum record size is not exceeded.
- Initially-variable-length records can be any size up to the maximum record length when first inserted. Only a record of the same size can overwrite the original record at that location.

### File Naming Conventions

The VSAM APIs do not enforce any specific file naming syntax. A file name provided by the application must conform to the naming syntax of the local installed byte stream file system (such as Fat or HPFS) or the target remote DDM system. However, conversion of mixed-case file names to upper-case file names can occur. Thus, any reply messages that contain a file name may not reflect the case that was used as input to the API.

The local VSAM system on OS/2 supports the double backslash naming convention for files located on remote nodes of a Local Area Network (LAN). Note that this convention (known as UNC, for Universal Naming Convention) is only supported for LANs administered by the OS/2 LAN Server product. UNC is used to represent remote file names that were never qualified with a drive letter, for example: DosOpen (\\servername\dir1\a.dat).

## Performance Considerations

The following sections recommend which access method to use to optimize performance.

## Sequential and Direct Files

For sequential or direct files use the following access methods.

- Specify RELRNDAM on DDMOpen if the predominant order of reading records will be sequential.
- Specify RNDRNDAM on DDMOpen if the predominant order of reading records will be random.
- Specify CMBRNAM if you do not expect a sequential or random access bias.

## Keyed and Alternate Index Files

For keyed and alternate files use the following access methods.

- Specify RELKEYAM on DDMOpen if:
  1. the predominant order of reading records will be in key sequence,
  2. the file was loaded in key sequence,
  3. you expect new records to be added in key sequence, and
  4. the file was created without delete capability (DDM_DELCP).
- Specify RNDKEYAN on DDMopen If the predominant order of reading records will be random.
- Specify CMBKEYAM on DDMOpen
  1. if you do not expect a key sequence or random access bias, or
  2. if the predominant order of reading records will be in key sequence but the file is or has become "disorganized" because it was not loaded sequentially, or because it was created with delete capability (DDM_DELCP).

If a keyed file becomes disorganized (less sequential) after many delete and insert operations, you may be able to improve performance by reorganizing the file using DDMUnLoadFile UnloadOrder=KEYORD and DDMLoadFile.

## Access Methods

The VSAM APIs have a series of access methods that provide consistent ways to access the records in a file. To understand how your choice of access method can also affect performance, see Performance Considerations.

For all access methods, the file indexes are updated when keys are updated or when records are inserted or deleted. The following list describes the access methods that the VSAM APIs use when opening files with DDMOpen:

- RELRNBAM (Relative by Record Number Access Method)

  Use this access method to process records according to the current cursor position in the record number sequence. The record number is not specified to identify the record; all positioning is relative to the current cursor position. For keyed and alternate index files, records are processed as though the file were sequential. The indexes over the file are maintained when keys are updated or when records are inserted or deleted.

You can use this access method with sequential, direct, keyed, or alternate index files.

- RNDRNBAM (Random by Record Number Access Method)

  Use this access method to process records in a random sequence as determined by the requester. Record numbers (the positions of records in the file) are used to identify the records. For keyed and alternate index files, records are processed as though the file were sequential. The indexes over the file are maintained when keys are updated or when records are inserted or deleted.

  You can use this access method for sequential, direct, keyed, or alternate index files.

- CMBRNBAM (Combined Record Number Access Method)

  This access method combines the functional capabilities of the RELRNBAM and the RNDRNBAM access methods. The cursor can be set to point to any record by specifying its record number. Relative requests for neighboring records can then be made without specifying record numbers. For keyed and alternate index files, records are processed as though the file were sequential. The indexes over the file are maintained when keys are updated or when records are inserted or deleted.

  You can use this access method for sequential, direct, keyed, or alternate index files.

- RELKEYAM (Relative by Key Access Method)

  Use this access method to process records of keyed or alternate index files in key value sequence. Records can be accessed by moving forward or backward from the current record according to the key sequence. If duplicate keys are present in the file, they are processed in First-In-First-Out (FIFO) order. If a record's key value is modified, its record number is not changed. The indexes over the file are maintained when keys are updated or when records are inserted or deleted.

  You can use this access mothod for keyed or alternate index files only.

- RNDKEYAM (Random by Key Access Method)

  Use this access method to process records in keyed or alternate index files in a random sequence as determined by the requester. Records are selected by their key values, not by their relative positions. If a record's key value is modified, its record number is not changed. The indexes over the file are maintained when keys are updated or when records are inserted or deleted.

  You can use this access method for keyed or alternate index files only.

- CMBKEYAM (Combined Key Access Method)

  This access method combines the functional capabilities of the RELKEYAM and the RNDKEYAM access methods. The cursor can be set to point to any record by specifying its key. Relative requests for neighboring records can then be made without specifying keys. If duplicate keys are present in the file, they are processed in FIFO order. If a record's key value is modified, its record number is not changed. The indexes over the file are maintained when keys are updated or when records are inserted or deleted.

This access method is valid for keyed or alternate index files only.

- CMBACCAM (Combined Access Method)

  This access method combines the functional capabilities of the CMBKEYAM and the CMBRNBAM access methods. The cursor can be set to a record with a key or to a record number. Then, from that position, the cursor can be set relatively by key value or by record number. If duplicate keys are present in the file, they are processed in FIFO order. If a record's key value is modified, its record number is not changed. The indexes over the file are maintained when keys are updated or when records are inserted or deleted.

Table 3 shows the access methods you can use with each file class.

*Table 3. Access Method by File Class*

| Access Method | Access Description | SF | DF | KF | AIF |
|---|---|---|---|---|---|
| RELRNBAM | Relative by record number | X | X | X | X |
| RNDRNBAM | Random by record number | X | X | X | X |
| CMBRNBAM | Combined by record number | X | X | X | X |
| RELKEYAM | Relative by key | | | X | X |
| RNDKEYAM | Random by key | | | X | X |
| CMBKEYAM | Combined by key | | | X | X |
| CMBACCAM | Combined access | X | X | X | X |

**X** The access method supports the file class.

**Blank** The access method does not support the file class.

**SF** Sequential file.

**DF** Direct file.

**KF** Keyed File

**AIF** Alternate Index File

## Promoting Access Methods

The DDM architecture permits the promotion of user-specified access methods. For remote data access, see your DDM server implementation documentation. The following promotions and exceptions pertain to the local VSAM file system.

To open a file, an application program issues the DDMOpen (Open File) function. The local VSAM file system verifies whether the type of file specified by the function can be opened by DDMOpen and notifies the application. If the file can be opened, then:

1. The specified access method is promoted to the appropriate CMB*xxx*AM.
2. The file is opened under that access method.

3. The access method is bound to the file. The access method remains bound to the file until an application program issues a DDMClose function or the application program is terminated.

If the access method cannot be applied to the file class, the attempt to open the file is rejected with the INVRQSRM reply message. The local VSAM file system also issues the INVRQSRM reply message when a keyed file class function is issued for a non-keyed file.

Each access method defines the VSAM APIs it supports under its instance commands list. These instance commands are also called the *access method commands.* For more information on the commands, see Chapter 2, “Function Lists” on page 33, “Access Functions Applicable to Each File Class” on page 36, and “Cursor-Positioning Functions Applicable to Each File Class” on page 37.

Access method commands are processed by the local VSAM file system and applied against the access method to which the file is bound. If a command is issued and is not supported by the file class, unpredictable results may occur.

The local VSAM file system uses the following promotion rules:

- Promote RELRNBAM and RNDRNBAM access methods to CMBRNBAM to allow any direct or sequential file to be accessed by any of the record number cursor positioning functions.
- Promote RELKEYAM, RNDKEYAM, and CMBKEYAM access methods to CMBACCAM to allow any keyed file to be accessed by any of the cursor positioning functions.

## DDM Cursor

Each open file in the DDM architecture has a logical structure associated with it called a cursor. The cursor points to a particular position within the file and also maintains certain information about the file. The DDM cursor has the following logical elements:

- The current position in the file. This can be BOF, an individual record number in the file, or EOF. When the file is opened, the cursor is initially set to BOF.
- The access intent specified for the file when it was opened.
- The level of file sharing specified when the file was opened.
- A hold cursor indicator that specifies if hold cursor position has been requested or not. This indicator is set (or remains set) if the DDM_HLDCSR bit in the AccessFlags parameter of the DDMSet*xxx* functions is true and is reset if the DDM_HLDCSR bit is false.
- The most recent update intent placed on a record in the file. The update intent is set by the DDMSetUpdate*xxx* functions. It may also be set by the DDMGetRec function and by most of the DDMSet*xxx* functions by setting Bit 0 in the AccessFlags parameter.

  Note that the update intent can only be specified for a single record.

- The position of the record with this update intent. This record position can be different from the current record if a DDMSetUpdate*xxx* function was issued or a DDMInsertRecEOF or DDMInsertRecKey function is issued with the DDM_HLDUPD bit of the AccessFlags parameter set.
- A locked record indicator that specifies whether the update intent record is locked.
- The high key limit for the file that is set with the DDMSetKeyLimits function.

The cursor position can be adjusted explicitly by issuing the appropriate DDMSet*xxx* function. The effect each function has on the cursor position is described for each function in the "Effect on Cursor Position" section.

The hold cursor indicator is checked by the DDMSetNextRec, DDMSetKeyNext, and DDMSetNextKeyEqual functions to determine if the cursor should remain at its current position. If the hold cursor indicator has been set on by a previous function and the DDM_HLDCSR bit in the AccessFlags parameter of the current function is false, the cursor remains at its current position when:

- The function is DDMSetNextRec and one of the following conditions is true.
  - The record is active.
  - The record is inactive and the DDM_ALLREC bit in the AccessFlags parameter of this function is true.
- The function is DDMSetKeyNext and the record is active.
- The function is DDMSetNextKeyEqual, the specified key is equal to the key of the current record, and the record is active.

In all other cases, the cursor position is updated.

In the case of errors, the cursor position can be determined from the CSRPOSST (Cursor Position Status) parameter returned in the reply message. (The value of CSRPOSST is always `X'F1'`.) The CSRPOSST (Cursor Position Status) parameter is described in Chapter 4, "VSAM API Common Parameters" on page 363.

## DDM Lock Management

DDM lock management supervises the file and record locks of one or more users on a set of files. The responsibilities of lock management are to:

- Accept lock requests and determine whether the lock request can be granted.
- Keep track of all the file locks held by each user.
- Update the correct cursor to track the granting and releasing of record locks.

### Concurrency Protection

File and record locks provide concurrency protection in a multi-user, shared data environment. An example of a typical concurrency problem occurs when an update to a record is lost because of simultaneous updating of the file by two or more users. Figure 9 on page 23 illustrates this problem.

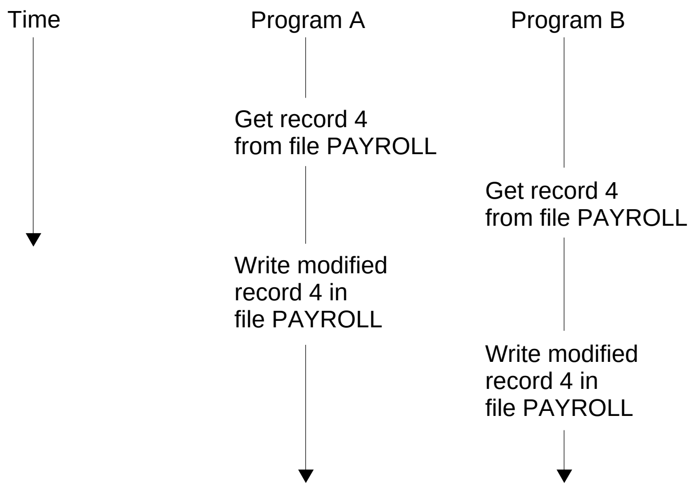


*Figure 9. Lost Update Concurrency Problem*

Another concurrency problem occurs when a user does not have exclusive rights to a file after it has been accessed. This means that a user cannot read and retrieve the same data from a file accessed before because another user has modified it in the interim. This is called a repeatable read problem.

To avoid these and other concurrency problems, lock protection is needed for files and records. DDM provides file and record locking functions.

The following pages describe the requesting and granting of file and record locks and the level of protection available with locks. The responsibilities of lock management are also summarized.

## File Locking

DDM file locks require a requester to obtain an appropriate level of access to a file before allowing any operations to be performed on any record in the file. A requester obtains the appropriate level of access by acquiring a lock that indicates the requester's processing intentions for the file and the degree to which the requester is willing to share the file with concurrent users.

DDM allows the requester to declare processing intentions as follows (the DDM abbreviation for the processing intent is given in parentheses):

- Reference Only (**GET**)

  The requester intends to read or use the data in the specified file, but does not intend to modify, delete, or insert any data in the file.

- Change (**MOD**)

  The requester intends to update the file by modifying, deleting, or inserting data.

The requester can declare the tolerable level of file sharing with concurrent users. The possible sharing levels are as follows (the DDM abbreviation for the sharing level is given in parentheses):

- No Sharing (**NON**)

  The requester wants exclusive control of the file and is not willing to share the file with any concurrent users.

- Reference Only (**GET**)

  The requester is only willing to share the file with concurrent users that have Reference Only (GET) intention.

- Change (**MOD**)

  The requester is willing to share the file with concurrent users that intend to get, modify, delete, or insert data in the file.

Concurrent users are defined as threads of the same process or threads from different processes.

These processing intentions and file sharing levels produce the combinations listed in Table 4. These combinations are the basis for the different types of DDM-specified file locks.

*Table 4. File Locking Combinations*

| | **Sharing Level** | | |
|---|---|---|---|
| **Processing Intent** | **NON** | **GET** | **MOD** |
| **GET** | GETNONLK | GETGETLK | GETMODLK |
| **MOD** | MODNONLK | MODGETLK | MODMODLK |

A requester can acquire many locks on a single file as long as there are no lock conflicts. A lock conflict is a request by any process to obtain a file lock for a file that is already locked exclusively by another process. The locks can all be of the same lock type or different types. The operating system defines the maximum number of file locks a single requester can have on a single file. If a file lock is requested for a file that already has the maximum number of file locks on it, the RSCLMTRM (Resource Limit Error) reply message is returned.

If the file to be locked is an alternate index file, both the base file and the alternate index file are locked.

## Requesting and Releasing File Locks

File locks are requested and released implicitly by the following functions:

| Function | Action |
|---|---|
| DDMOpen | Open file |
| DDMCreateAltIndex | Create alternate index file |
| DDMDelete* | Delete file |
| DDMLoadFileFirst | Load records into file |
| DDMLoadFileNext | Load next record into the file |
| DDMUnLoadFileFirst | Unload records from file |
| DDMUnLoadFileNext | Unload next record from the file |
| DDMRename | Rename file |
| ***** DDMDelete does *not* implicitly release a file lock. The file no longer exists after a DDMDelete. | |

## Record Locking (Implementation is Dependent on the Server)

The local VSAM file system supports record locking only for files on the client OS/2 system. This section describes this support.

The local VSAM file system supports record locks so that a requester can perform intended operations on a record without interference from concurrent users. Record locks are used only when the requester opens a file with an intent to update the file and specifies that the file is to be shared with another updater. This is called *opened for multiple updaters.*

The local VSAM file system obtains only exclusive record locks. This means that only the requester can update the record. Concurrent users are unable to read the record. Record locks requested for an alternate index file are obtained on the records of the base file. Each process can lock one record in a file. Thus, multiple records in a file can be locked if the file was opened for multiple updaters.

The local VSAM file system does not prevent more than one process from updating a record concurrently; it does not prevent multiple threads within a process from accessing and updating the same record. When threads from the same process are accessing a file using the same file handle, they should use a semaphore to provide mutual exclusion on the file.

### Requesting and Releasing Record Locks

Record locks can be implicitly obtained by the following functions:

| Function | Action |
|---|---|
| DDMGetRec | Get record function |
| DDMDeleteRec | Delete record function |
| DDMInsertRec*xxx* | Any insert record function |
| DDMModifyRec | Modify record function |
| DDMSet*xxx* | Any set function |

Record locks can be explicitly obtained by the following functions:

| Function | Action |
|---|---|
| DDMSetUpdateNum | Set update intent by record number |
| DDMSetUpdateKey | Set update intent by key value |

The DDMClose function implicitly releases all record locks. Table 5 summarizes which functions lock records and when these record locks are released. DDMUnLockRec explicitly removes a record lock.

*Table 5. Releasing Record Locks*

| | Release Lock When | | | | |
|---|---|---|---|---|---|
| **Implicit Lock Commands** | **Function Completed** | **Record Updated** | **Cursor Moved** | **File Closed** | **See Note** |
| DDMGetRec | | X | X | X | X |
| DDMSet*xxx* | | X | X | X | X |
| DDMSetUpdateKey | | X | X | X | X |
| DDMSetUpdateNum | | X | X | X | X |
| DDMModifyRec | X | | | | |
| DDMDeleteRec | X | | | | |
| DDMInsertRec*xxx* | X | | | | |

**Note:** DDMUnLockRec, or any function that references a record other than the one currently pointed to by the cursor.

## Promoting Locks (Implementation is Dependent on the Server)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation.

The local VSAM file system uses the following locking rules:

- Only exclusive record locks are obtained. This means that only the requester can update the record. Concurrent users are unable to read the record. For more information, see “Record Locking (Implementation is Dependent on the Server)” on page 25.
- DDMLoadFileFirst/Next file locks are promoted to MODNONLK.
- DDMCopyFile promotes “copy-from file” parameter to GETNONLK and the “copy-to file” parameter to MODNONLK.
- Only one exclusive file lock can be held on a file.

A requester can request a GETMODLK, MODGETLK, or MODMODLK lock on a file that is on a redirected drive of a LAN server. To prevent an application from reading a file that another application (on a different system) is modifying, the local VSAM file system promotes the lock as follows:

- GETMODLK to GETGETLK
- MODGETLK to MODNONLK
- MODMODLK to MODNONLK

### Granting File and Record Locks

All requests for a lock are made to the operating system by the local VSAM file system. For file locks, the operating system examines all of the file locks held by concurrent users on a file, determines whether a conflict would occur, and decides whether the requested lock can be granted.

Table 6 is a summary of the rules for granting file locks. The left column lists the requested lock types with the strongest lock at the top. Across the top of the table are all of the concurrent user-held locks, from the strongest to the weakest. To read the table, locate the requested lock type in the left column. Then, locate the strongest of the locks held by concurrent users across the top of the table. The intersection of the selected row and column indicates whether the lock request can be granted or whether a lock conflict occurs.

*Table 6 (Page 1 of 2). Table for Granting File Locks*

| **Requested Lock** | **Concurrent User Held File Lock** | | | | | | |
|---|---|---|---|---|---|---|---|
| | **MODNONLK** | **GETNONLK** | **MODGETLK** | **MODMODLK** | **GETGETLK** | **GETMODLK** | **None** |
| MODNONLK | * | * | * | * | * | * | GT |
| GETNONLK | * | * | * | * | * | * | GT |
| MODGETLK | * | * | * | * | * | GT | GT |
| MODMODLK | * | * | * | GT | * | GT | GT |
| GETGETLK | * | * | * | * | GT | GT | GT |

*Table 6 (Page 2 of 2). Table for Granting File Locks*

| Requested Lock | Concurrent User Held File Lock | | | | | | |
|---|---|---|---|---|---|---|---|
| | **MODNONLK** | **GETNONLK** | **MODGETLK** | **MODMODLK** | **GETGETLK** | **GETMODLK** | **None** |
| GETMODLK | * | * | GT | GT | GT | GT | GT |

**Notes:**

**GT** Lock request is granted.

***** Lock conflict occurs.

The local VSAM file system only attempts to get the lock once and then the lock request is refused with one of the following reply messages:

- File in use reply message (FILIUSRM) if the request is for a file lock.
- Record in use reply message (RECIUSRM) if the request is for a record lock.

## DDM Architecture Promotions and Exceptions

All promotions and exceptions described below are allowed by the DDM architecture and by the SAA subset definitions.

The following promotions and exceptions are made by the local VSAM file system:

- Promote the RELRNBAM and RNDRNBAM access methods to the CMBRNBAM access method.

  This allows any direct or sequential file to be accessed by any of the record number cursor positioning commands.

- Promote the RELKEYAM, RNDKEYAM, and CMBKEYAM access methods to the CMBACCAM access method.

  This allows any keyed file to be accessed by any of the cursor positioning commands.

- This item is for OS/2 local VSAM files on the client OS/2 workstation only:

  The local VSAM file system obtains only exclusive record locks. This means that only the requester can update the record. Concurrent users are unable to read the record.

- DDMLoadFileFirst/Next file locks are promoted to MODNONLK.

- DDMCopyFile promotes "copy from file" parameter to GETNONLK and the "copy to file" parameter to MODNONLK.

- Only one exclusive file lock can be held on a file.

- DDMLoadFileFirst returns FILIUSRM instead of INVRQSRM when a file has already been opened by DDMOpen, DDMLoadFileFirst (DDM_CHAIN flag on), or DDMUnLoadFileFirst (More Data flag on).

- DDMUnLoadFileFirst returns FILIUSRM instead of INVRQSRM when a file has already been opened by DDMOpen, DDMLoadFileFirst (DDM_CHAIN flag on).

- DDMDelete and DDMRename returns FILIUSRM instead of INVRQSRM when a file has already been opened by DDMOpen, DDMLoadFileFirst (DDM_CHAIN flag on), or DDMUnLoadFileFirst (More Data flag on).

## Technical Considerations

This section contains a list of implementation considerations:

- As part of its internal processing, when the local VSAM file system is instructed to open (DDMOpen) a member of a keyed file set, all members are opened, using the same access and file share values as specified for the explicitly opened file. If a subsequent DDMOpen function is issued for a different member of that file set using different access and file share specifications, a conflict will occur.

  For example, assuming base file X.BAS and alternate index file X.ALT. If X.BAS is opened for Insert Access Intent with FileShare NONE, VSAM issues a DosOpen for X.BAS and X.ALT, using the same access and share specification. Any subsequent attempts to open X.ALT with Get Access Intent will fail because X.ALT was already opened with FileShare NONE.

- Attempting to issue a name-based VSAM API for a file not belonging to the local VSAM file system will result in the function being rejected with the FILATHRM reply message and a server diagnostic code of 1 (for local VSAM file systems only).
- When processing multiple records, it is faster to request multiple records with DDMSetNextRec than to request a single record multiple times. The same applies for DDMSetPrevious and the key file equivalents.
- The local VSAM file system can control access to the same file from multiple processes. It does not control access to the same file from multiple threads in the same process. The process is responsible for synchronization of its threads.
- Exercise caution in defining the record length for a variable-length file. Variable-record-length files are implemented as fixed-record-length files with each record being the maximum length variable record allowed. If small records are used in a variable-length file with a large record length, there can be an excessive amount of unused space within the file. (For local VSAM file systems only.)

# Part 1. VSAM in a Distributed Environment

This part describes VSAM in a distributed environment for local file access. It contains descriptions of VSAM APIs, their common parameters, flags, and reply messages.

**Chapter 2. Function Lists** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 33

**Chapter 3. VSAM API Functions** . . . . . . . . . . . . . . . . . . . . . . . . . . . 45

**Chapter 4. VSAM API Common Parameters** . . . . . . . . . . . . . . . . . . . 363

**Chapter 5. VSAM API Flags** . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 401

**Chapter 6. VSAM API Reply Messages** . . . . . . . . . . . . . . . . . . . . . . 413

# Chapter 2. Function Lists

The tables in this chapter group the VSAM APIs according to their capabilities. The VSAM APIs are called VSAM API functions, VSAM functions, or simply functions. The tables describe:

1. VSAM Function Parameters
2. VSAM Functions
3. Access Functions Applicable to Each File Class
4. Cursor–Positioning Functions Applicable to Each File Class
5. Record File Attributes by File Class
6. Modifiable Record File Attributes by File Class
7. Access Functions Applicable to Each Access Method

The server support of these APIs is implementation specific. In general, the details in this chapter is specific to the local VSAM file system.

## VSAM Function Descriptions

Table 7 lists and briefly describes each VSAM function.

*Table 7 (Page 1 of 3). VSAM Functions*

| Function | Description of Function |
|---|---|
| DDMClose | Terminates the logical connection that DDMOpen establishes between the requester and a file. |
| DDMCopyFile | Copies a record-oriented file to the target system. |
| DDMCreateAltIndex | Creates an alternate index file on the target system. The alternate index file provides a key-field access sequence to the records in an existing base target system file. In VSAM, the base file must be a keyed file. |
| DDMCreateRecFile | Creates a record file on the target system. |
| DDMDelete | Deletes a file from the target system, releases all locks held on the file, and releases the space it occupied. |
| DDMDeleteRec | Deletes the record that has an update intent placed on it. |
| DDMForceBuffer | Commits a file's cached information to non-volatile storage. |
| DDMGetRec | Gets and returns the record indicated by the current cursor position. |
| DDMGetReplyMessage | Gets and returns a reply message issued from the previously requested function. |
| DDMInsertRecEOF | Inserts a record at the end of the file. |
| DDMInsertRecKey | Inserts one or more records, according to their key values, wherever there is available space in the file. |
| DDMInsertRecNum | Inserts one or more records at the position specified by the record number parameter. |
| DDMLoadFileFirst | Loads one or more records into a file. |
| DDMLoadFileNext | Continues the load of one or more records into a file. Issue DDMLoadFileFirst before DDMLoadFileNext. |

*Table 7 (Page 2 of 3). VSAM Functions*

| Function | Description of Function |
|---|---|
| DDMModifyRec | Modifies the record that has an update intent placed upon it. |
| DDMOpen | Establishes a logical connection between the using program on the source system and the file on the target system. |
| DDMQueryFileInfo | Returns the information for a specific file. |
| DDMQueryPathInfo | Returns information for a specific file or subdirectory. |
| DDMRename | Renames an existing file. |
| DDMSetBOF | Sets the cursor to the beginning of file (that is, to the position ahead of the first record on the file). |
| DDMSetEOF | Sets the cursor to the end of file (that is, to the position following the last record of the file). |
| DDMSetFileInfo | Specifies information for a file or a directory. |
| DDMSetFirst | Sets the cursor to the first record of the file. |
| DDMSetKey | Positions the cursor based on the key value supplied and the relational operator specified for the relational operator parameter. |
| DDMSetKeyFirst | Sets the cursor to the first record of the file in key sequence. |
| DDMSetKeyLast | Sets the cursor to the last record of the file in key sequence order. |
| DDMSetKeyLimits | Sets the limits of the key values for subsequent DDMSetKeyNext or DDMSetNextKeyEqual functions. |
| DDMSetKeyNext | Sets the cursor to the next record of the file in the key sequence order that follows the record currently indicated by the cursor. |
| DDMSetKeyPrevious | Sets the cursor to the previous record of the file in the key sequence order that precedes the record currently indicated by the cursor. |
| DDMSetLast | Sets the cursor to the last record of the file. |
| DDMSetMinus | Sets the cursor to the record number of the file indicated by the cursor minus the number of record positions specified by the CsrDisp parameter. |
| DDMSetNextKeyEqual | Sets the cursor to the next record in the key sequence if the key field of that record has a value specified in the KeyValBuf parameter. |
| DDMSetNextRec | Sets the cursor to the next record of the file that has a record number one greater than the current record position. |
| DDMSetPathInfo | Specifies information for a file or a directory. |
| DDMSetPlus | Sets the cursor to the record number of the file indicated by the cursor plus the integer number of records specified by the CsrDisp parameter. |
| DDMSetPrevious | Sets the cursor to the record of the file that has a record number one less than the current cursor position. |
| DDMSetRecNum | Sets the cursor to the record of the file indicated by the RecordNumber parameter. |
| DDMSetUpdateKey | Places an update intent on the record that has a key value equal to the KeyValBuf parameter. The cursor position is not changed. |
| DDMSetUpdateNum | Places an update intent on the record at the position specified by the RecordNumber parameter. The cursor position is not changed. |

*Table 7 (Page 3 of 3). VSAM Functions*

| Function | Description of Function |
|---|---|
| DDMTruncFile | Moves EOF to current cursor position. |
| DDMUnLoadFileFirst | Transfers one or more records of a source file to a target system. |
| DDMUnLoadFileNext | Continues the transfer of one or more source file records to a target system. Issue DDMUnLoadFileFirst before DDMUnLoadFileNext. |
| DDMUnLockRec | Releases all implicit record locks on records. |

## Parameters Used in Function Descriptions

Table 8 lists and describes the parameters used with VSAM functions.

*Table 8. Parameters Used with VSAM Functions*

| Parameter Data Type | Description |
|---|---|
| USHORT | 2 bytes. |
| ULONG | 4 bytes. This is the natural word size of the system. It may be passed by value or reference as a parameter. |
| PBYTE | Pointer to a byte. |
| PULONG | Pointer to a ULONG. |
| szNAME | Null (0) terminated ASCII character string. This parameter is passed only by reference. |
| PSZ | Pointer to a null-terminated string. |
| HDDMLOAD | 4 bytes. Contains a handle to a DDM file being loaded with DDMLoadFileNext. |
| PHDDMLOAD | Pointer to a handle to a DDM file being loaded with DDMLoadFileNext. |
| HDDMFILE | 4 bytes. Contains a handle to a DDM file. |
| PHDDMFILE | Pointer to a handle to a DDM file. |
| PDDMRECORD | Pointer to a DDM record structure. |
| PDDMOBJECT | Pointer to a DDM object structure. |
| PKEYDEFBUF | Pointer to a DDM key buffer structure. |
| PDDMDFTREC | Pointer to a DDM default record initialization buffer. |
| PRECNUM | Pointer to a DDM record number structure. |
| RECNUM | DDM record number structure. |
| CODEPOINT | 2 bytes |
| PEAOP2 | Pointer to an EAOP2 structure. |
| PRESULTSCODES | Pointer to a structure used in DosExecPgm. |
| OTHER | Any other structure. This parameter is passed only by reference. |

## Access Functions Applicable to Each File Class

Table 9 on page 37 lists the functions that can be used with each file class.

*Table 9. Access Functions Applicable to Each File Class*

| Functions | Description | SF | DF | KF | AIF |
|---|---|---|---|---|---|
| DDMClose | Close file | X | X | X | X |
| DDMCopyFile | Copy file | X | X | X | |
| DDMCreateAltIndex | Create alternate index file | | | | X |
| DDMCreateRecFile | Create record file | X | X | X | |
| DDMDelete | Delete file | X | X | X | X |
| DDMDeleteRec | Delete record | X | X | X | X |
| DDMGetRec | Get record | X | X | X | X |
| DDMInsertRecEOF | Insert record at EOF | X | X | X | X |
| DDMInsertRecKey | Insert record by key | | | X | X |
| DDMInsertRecNum | Insert record by number | X | X | X | X |
| DDMLoadFileFirst | Load first file | X | X | X | |
| DDMLoadFileNext | Load next file | X | X | X | |
| DDMModifyRec | Modify record | X | X | X | X |
| DDMOpen | Open file | X | X | X | X |
| DDMRename | Rename file | X | X | X | X |
| DDMSetUpdateKey | Set update intent by key | | | X | X |
| DDMSetUpdateNum | Set update intent by record number | X | X | X | X |
| DDMTruncFile | Move EOF to current cursor position | X | | | |
| DDMUnLoadFileFirst | Unload first file | X | X | X | X |
| DDMUnLoadFileNext | Unload next file | X | X | X | X |
| DDMUnLockRec | Unload implicit record lock | X | X | X | X |

**X** The function is supported by the file class.

**Blank** The function is not supported by the file class and may cause unpredictable results.

**SF** Sequential file.

**DF** Direct file.

**KF** Keyed file.

**AIF** Alternate index file.

## Cursor-Positioning Functions Applicable to Each File Class

Table 10 on page 38 lists the cursor-positioning functions that can be used with each file class.

*Table 10. Cursor Positioning Functions Applicable to Each File Class*

| **Functions** | **Description** | **SF** | **DF** | **KF** | **AIF** |
|---|---|---|---|---|---|
| DDMSetBOF | Set cursor to BOF | X | X | X | X |
| DDMSetEOF | Set cursor to EOF | X | X | X | X |
| DDMSetFirst | Set cursor to first record | X | X | X | X |
| DDMSetKey | Set cursor by key | | | X | X |
| DDMSetKeyFirst | Set cursor to first record by key | | | X | X |
| DDMSetKeyLast | Set cursor to last record by key | | | X | X |
| DDMSetKeyLimits | Set key limits | | | X | X |
| DDMSetKeyNext | Set cursor to next record by key | | | X | X |
| DDMSetKeyPrevious | Set cursor to previous record by key | | | X | X |
| DDMSetLast | Set cursor to last record | X | X | X | X |
| DDMSetMinus | Set cursor minus | X | X | X | X |
| DDMSetNextKeyEqual | Set cursor to next record with equal key | | | X | X |
| DDMSetNextRec | Set cursor to next record | X | X | X | X |
| DDMSetPlus | Set cursor plus | X | X | X | X |
| DDMSetPrevious | Set cursor to previous record | X | X | X | X |
| DDMSetRecNum | Set cursor to record number | X | X | X | X |

| | |
|---|---|
| **X** | The function is supported by the file class. |
| **Blank** | The function is not supported by the file class and unpredictable results may occur. |
| **SF** | Sequential file. |
| **DF** | Direct file. |
| **KF** | Keyed file. |
| **AIF** | Alternate index file. |

## Record File Attributes by File Class

These EAs can be viewed by using DDMQueryPathInfo or DDMQueryFileInfo functions on the local VSAM file system.

*Table 11 (Page 1 of 2). Record File Attributes by File Class*

| | | **File Class** | | | |
|---|---|---|---|---|---|
| **Record File Attributes Name** | **EA Description** | **Sequential File** | **Direct File** | **Keyed File** | **Alternate Index File** |
| ACCMTHLS | Access Method List | X | X | X | X |
| ALTINDLS | Alternate Index File List | | | X | |
| BASFILNM | Base File Name | | | | X |
| DELCP | Record Deletion Capability | X | X | X | X |
| DFTREC | Default Record | X | X | X | X |
| DTACLSNM | Data Class Name | X | X | X | X |
| EOFNBR | End of File Record Number | X | X | X | X |
| FILBYTCN | File Byte Count Number | X | X | X | X |
| FILCLS | File Class | X | X | X | X |
| FILCRTDT | File Creation Date | X | X | X | X |
| FILHDD | Hidden File | X | X | X | X |
| FILINISZ | Initial File Size | X | X | X | X |
| FILPRT | File Is protected. | X | X | X | X |
| FILSIZ | Number of active and inactive record positions. Not applicable to files with variable-length records. | X | X | X | X |
| FILSYS | System File | X | X | X | X |
| GETCP | Record Get Capability | X | X | X | X |
| INSCP | Record Insert Capability | X | X | X | X |
| KEYDEF | Key Definition | | | X | X |
| KEYDUPCP | Duplicate Keys Capability | | | X | X |
| MAXARNB | Maximum Active Record Number | X | X | X | X |
| MGMCLSNM | Management Class Name | X | X | X | X |
| MODCP | Record Modify Capability | X | X | X | X |
| RECLEN | Record Length | X | X | X | X |
| RECLENCL | Record Length Class | X | X | X | X |
| RTNCLS | Retention Class | X | X | X | X |
| STGCLSNM | Storage Class Name | X | X | X | X |
| TITLE | Title | X | X | X | X |

*Table 11 (Page 2 of 2). Record File Attributes by File Class*

| Record File Attributes Name | EA Description | File Class | | | |
|---|---|---|---|---|---|
| | | Sequential File | Direct File | Keyed File | Alternate Index File |
| **X** The file EA is supported by the file class. | | | | | |
| **Blank** The file EA is not supported by the file class. | | | | | |

## Modifiable Record File Attributes by File Class

These EAs can be modified using DDMSetPathInfo or DDMSetFileInfo functions on the local VSAM file system.

*Table 12. Modifiable Record File Attributes by File Class*

| Record File Attributes Name | EA Description | File Class | | | |
|---|---|---|---|---|---|
| | | Sequential File | Direct File | Keyed File | Alternate Index File |
| DELCP | Record Deletion Capability | X (see **note**) | X | X | X |
| FILHDD | Hidden File | X | X | X | X |
| FILINISZ | Initial File Size | X | X | X | X |
| FILPRT | File Is Protected | X | X | X | X |
| FILSYS | System File | X | X | X | X |
| GETCP | Record Get Capability | X | X | X | X |
| INSCP | Record Insert Capability | X | X | X | X |
| MGMCLSNM | Management Class Name | X | X | X | X |
| MODCP | Record Modify Capability | X | X | X | X |
| STGCLSNM | Storage Class Name | X | X | X | X |
| TITLE | Title | X | X | X | X |
| **X** The file EA is supported by the file class. | | | | | |
| **Note** The file EA is not modifiable if the record length class is “fixed.” | | | | | |

## Private File Attributes by File Class

These EAs are private to the local VSAM file system and cannot be viewed or modified with VSAM functions and should not be changed by the native workstation commands.

*Table 13. Private File Attributes by Class*

| | | File Class | | | |
|---|---|---|---|---|---|
| **Record File Attributes Name** | **EA Description** | **Sequential File** | **Direct File** | **Keyed File** | **Alternate Index File** |
| MINARNB | Minimum Active Record Number | X | X | X | X |
| VERSION | RLIO version that created this file | X | X | X | X |
| PRMINDEX | Name of Primary Index File | | | X | |
| BASCHGDT | Base file change date | | | | X |
| BASEFILE | Name of Base File (see **note**) | | | X | |
| MAXFILESIZE | Maximum File Size | X | X | X | X |
| FILCHGDT | File Change Date | X | X | X | X |
| LSTACCDT | Last Access Date | X | X | X | X |
| PHYEOF | Physical End of File | X | X | X | X |

**X** The file EA is supported by the file class.

**Blank** The file EA is not supported by the file class.

**Note** Used for Primary Index File Only.

## Access Functions Applicable to Each Access Method

*Table 14 (Page 1 of 2). Access Functions Applicable to Each Access Method*

| Functions | RELRNBAM | RNDRNBAM | CMBRNBAM |
|---|---|---|---|
| DDMClose | 1 | 1 | X |
| DDMDeleteRec | 1 | 1 | X |
| DDMGetRec | 1 | 1 | X |
| DDMInsertRecEOF | 1 | 1 | X |
| DDMInsertRecKey | | | |
| DDMInsertRecNum | 2 | 1 | X |
| DDMModifyRec | 1 | 1 | X |
| DDMOpen | 1 | 1 | X |
| DDMSetBOF | 1 | 1 | X |
| DDMSetEOF | 1 | 1 | X |
| DDMSetFirst | 1 | 1 | X |
| DDMSetKey | | | |
| DDMSetKeyFirst | | | |
| DDMSetKeyLast | | | |
| DDMSetKeyLimits | | | |
| DDMSetKeyNext | | | |
| DDMSetKeyPrevious | | | |
| DDMSetLast | 1 | 1 | X |
| DDMSetMinus | 1 | 2 | X |
| DDMSetNextKeyEqual | | | |
| DDMSetNextRec | 1 | 2 | X |
| DDMSetPlus | 1 | 2 | X |
| DDMSetPrevious | 1 | 2 | X |
| DDMSetRecNum | 2 | 1 | X |
| DDMSetUpdateKey | | | |
| DDMSetUpdateNum | 2 | 1 | X |
| DDMTruncFile | 1 | 1 | X |
| DDMUnLockRec | 1 | 1 | X |

*Table 14 (Page 2 of 2). Access Functions Applicable to Each Access Method*

| Functions | RELRNBAM | RNDRNBAM | CMBRNBAM |
|---|---|---|---|

**X** The function is supported by the CMBRNBAM access method.

**1** RELRNBAM and RNDRNBAM are promoted to CMBRNBAM.

**2** The function is processed without regard to the restrictions associated with this access method because the access method is promoted to CMBRNBAM access method (local VSAM file system only).

**Blank** The function is not supported by the access method and may cause unpredictable results.

## Access Functions Applicable to Each Access Method Continued

*Table 15. Access Functions Applicable to Each Access Method Continued*

| Functions | RELKEYAM | RNDKEYAM | CMBKEYAM | CMBACCAM |
|---|---|---|---|---|
| DDMClose | 1 | 1 | 1 | X |
| DDMDeleteRec | 1 | 1 | 1 | X |
| DDMGetRec | 1 | 1 | 1 | X |
| DDMInsertRecEOF | 2 | 2 | 2 | X |
| DDMInsertRecKey | 1 | 1 | 1 | X |
| DDMInsertRecNum | 2 | 2 | 2 | X |
| DDMModifyRec | 1 | 1 | 1 | X |
| DDMOpen | 1 | 1 | 1 | X |
| DDMSetBOF | 1 | 1 | 1 | X |
| DDMSetEOF | 1 | 1 | 1 | X |
| DDMSetFirst | 2 | 2 | 2 | X |
| DDMSetKey | 2 | 1 | 1 | X |
| DDMSetKeyFirst | 1 | 1 | 1 | X |
| DDMSetKeyLast | 1 | 1 | 1 | X |
| DDMSetKeyLimits | 1 | 2 | 1 | X |
| DDMSetKeyNext | 1 | 2 | 1 | X |
| DDMSetKeyPrevious | 1 | 1 | 1 | X |
| DDMSetLast | 2 | 2 | 2 | X |
| DDMSetMinus | 2 | 2 | 2 | X |
| DDMSetNextKeyEqual | 1 | 2 | 1 | X |
| DDMSetNextRec | 2 | 2 | 2 | X |
| DDMSetPlus | 2 | 2 | 2 | X |
| DDMSetPrevious | 2 | 2 | 2 | X |
| DDMSetRecNum | 2 | 2 | 2 | X |
| DDMSetUpdateKey | 2 | 1 | 1 | X |
| DDMSetUpdateNum | 2 | 2 | 2 | X |
| DDMTruncFile | 2 | 2 | 2 | X |
| DDMUnLockRec | 1 | 1 | 1 | X |

**X** The function is supported by the CMBACCAM access method.

**1** RELKEYAM, RNDKEYAM, and CMBKEYAM are promoted to CMBACCAM.

**2** The function is processed without regard to the restrictions associated with this access method because the access method is promoted to CMBACCAM access method (local VSAM file system only).

# Chapter 3. VSAM API Functions

This chapter describes the VSAM API functions, their formats and characteristics.

The functions are in alphabetical order and are presented in the structure described in “DDMExample (Example)” on page xxiv.

This section describes the General-Use Programming Interface you can use to obtain the services of SMARTdata UTILITIES.

## DDMClose (Close File)

This function ends the logical connection that DDMOpen establishes between the requester and a file.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMClose (HDDMFILE          FileHandle
                );
```

## Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| CLSDMGRM | X'125E' | File Closed with Damage |
| HDLNFNRM | X'1257' | File Handle Not Found |

## Remarks

The DDMClose function considers the file closed unless the reply message indicates that an error was detected before starting the DDMClose function. For example, if you receive a SYNTAXRM, PRCCNVRM, or FUNNSPRM reply message. This is true even if the reply message has a severity code greater than 4.

The DDMClose function also works on byte stream files.

In order to reflect changes in file attributes from open-file activities, DDMClose updates the following EAs if the file was opened with other than just GETAI. Examples of changes in file attributes from open-file activities are: update, insert, delete, or truncate.

- EOFNBR
- FILSIZ
- MAXARNB

These EAs are updated not only for a base file, but for all associated index files when DDMClose is issued.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
This function destroys the cursor. there is no cursor position.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as it was before the function was called. If the error termination occurs after starting DDMClose, this function destroys the cursor. Therefore, there is no cursor position. The value of the CSRPOSST

(Cursor Position Status) parameter on the reply message indicates the state of the cursor.

**Severe Termination (SVRCOD of 16 or higher)**
CSRPOSST on the reply message. indicates the cursor position. If the severe termination occurs after starting DDMClose, this function destroys the cursor. Therefore, there is no cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

This function releases all locks that are held by the VSAM file system on records in the file. All file locks that were acquired implicitly by the DDMOpen function are released.

If DDMClose ends with a reply message that has a severity code value of ERROR or higher, then:

- For error termination (SVRCOD of 8): Record locks and file locks are the same as before DDMClose was issued. If the error termination occurs after starting DDMClose, this function releases all record locks. The file lock that is obtained by DDMOpen is released.
- For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message determines the state of the record locks. If the severe termination occurs after starting the DDMClose function, this function releases all record locks. The file lock that is obtained by DDMOpen is released.

Even if an error occurs after starting DDMClose, this function releases all record locks, and the file lock that is obtained by DDMOpen is released.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file is not open (the file handle is not valid). | HDLNFNRM |
| The file is closed, but it is not possible to complete all operations on the file. | CLSDMGRM |

## DDMCopyFile (Copy File)

This function copies a file to the target system. (You cannot use DDMCopyFile to copy an alternate index file.)

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMCopyFile (PSZ               FromFileName,
                    PSZ               ToFileName,
                    ULONG             CopyFlags,
                    PBYTE             SubsetDefBuf,
                    CODEPOINT         ToFileOld,
                    CODEPOINT         ToFileNew
                    );
```

### Parameters

**FromFileName**
The pointer (PSZ) to the name of the record-oriented file to be copied. This file is the source of the DDMCopyFile function.

**ToFileName**
The pointer (PSZ) to the name of the record-oriented file to copy to. This file is the target of the DDMCopyFile function.

**CopyFlags**
CopyFlags must be set to 0. The bit flags are:

| Bit | Meaning |
|---|---|
| **0–31** | Reserved flags. |

**SubsetDefBuf**
The pointer (PBYTE) to the subset definition buffer. This pointer must be set to null.

**ToFileOld**
The code point (CODEPOINT) that specifies the action to take if the file name that is pointed to by ToFileName already exists. The only valid value is:

**CPYERR** Return Duplicate File Name (X'1483').

The function is rejected with DUPFILRM, and the option returns an error condition (SVRCOD=X'0008'). You must specify CPYERR.

**ToFileNew**
The code point (CODEPOINT) that specifies the action to take if the file name that is pointed to by ToFileName does not exist. The only valid value is:

**CPYDTA** Copy with Data Option (X'1466').

You should create a new file and copy the data to it. The new file is created with the same file attribute values as the copy-from file for the following file EAs:

| | |
|---|---|
| DELCP | File Deletion Capability |
| DFTREC | Default Record |
| DTACLSNM | Data Class Name |
| FILCLS | File Class |
| FILINISZ | Initial File Size |
| FILPRT | File Protected |
| GETCP | File Get Capability |
| INSCP | File Insert Capability |
| KEYDEF | Key Definition |
| KEYDUPCP | Duplicate Keys Capability |
| MODCP | File Modify Capability |
| MGMCLSNM | Management Class Name |
| RECLEN | Record Length |
| RECLENCL | Record Length Class |
| RTNCLS | File Retention Class |
| STGCLSNM | Storage Class Name |
| TITLE | A Brief Description |

For the definition of these EAs, see Chapter 4, “VSAM API Common Parameters” on page 363.

The other file attributes are set as appropriate for a newly created file. The data content of the Fromfile is copied to the Tofile. CPYDTA must be specified.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| DUPFILRM | X'1207' | Duplicate File Name |
| FILDMGRM | X'125A' | File Damaged |
| FILIUSRM | X'120D' | File in Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RSCLMTRM | X'1233' | Resource Limits Reached on Target System |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

For remote files, Distributed FileManager requires that the path information for both the FromFile name and the ToFile name must be specified, and it must be the same (for OS/2 only).

## DDMCopyFile

Since alternate index files cannot be copied:

- An alternate index file cannot be specified as the FromFile name.
- An alternate index file cannot be copied as an indirect result of copying the base file.

DDMCopyFile does not return the count of the number of records that are copied.

When the FromFile contains damaged records, DDMCopyFile ends without creating a new ToFile copy.

When the FromFile contains inactive records, the inactive records are copied to the ToFile.

### Effect on Cursor Position

There is no effect on the cursor position.

### Locking (for Local VSAM File System Only)

DDMCopyFile does the following:

If the FromFile exists:

1. Attempts to obtain a GETNONLK on the FromFile.

   If the GETNONLK lock is obtained, the function is processed (successfully or unsuccessfully). If the GETNONLK lock is not obtained, the function is rejected with a FILIUSRM reply message.
2. The function releases the GETNONLK lock it obtained on the file.

If DDMCopyFile ends with a reply message that has a severity code value of ERROR or higher:

- For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The ToFile exists and CPYERR is specified.<br>The FromFile name is the same as the ToFile name. | DUPFILRM |
| The EAs described for ToFileNew are required, but cannot be found in the FromFile EA buffer when creating the ToFile. | FILDMGRM |
| The FromFile is open. | FILIUSRM |
| The ToFile name is invalid. | FILNAMRM |
| CopyFlags contains a value other than zero. | INVFLGRM |
| The FromFile is an alternate index file.<br>The file class is invalid or is not found. | INVRQSRM |
| SubsetDefBuf contains a value other than null.<br>ToFileOld contains a value other than CPYERR (X'1483').<br>ToFileNew contains a value other than CPYDTA (X'1466'). | PRMNSPRM |

| This Causes a Reply Message to be Generated with SRVCOD = X'04' for each out-of-sync file in the file object and the Function Continues | With This Reply Message |
|---|---|
| For the FromFile, if the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file. DDMCopyFile does not re-synchronize the file-change date and time of the FromFile. | FILDMGRM |

## DDMCreateAltIndex (Create Alternate Index File)

This function creates an alternate index file on the target system.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMCreateAltIndex (PSZ           FileName,
                          PSZ           BaseFileName,
                          ULONG         CreateFlags,
                          PKEYDEFBUF    KeyDefBuf,
                          CODEPOINT     DupFilOpt,
                          PEAOP2        EABuf
                          );
```

## Parameters

**FileName**

The pointer (PSZ) to the name of the file to be created. This file must be in the same directory as the base file. If a path is not specified, the current path of the base file will be used.

**BaseFileName**

The pointer (PSZ) to the name of the record-oriented file on which the created file is to be based.

**CreateFlags**

The CreateFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **10–31** | Reserved flags |
| **9** | DDM_FILPRT (Protected File) |
| **2–8** | Reserved flags |
| **1** | DDM_TMPFIL (Temporary File) |
| **0** | DDM_ALDUPKEY (Allow Duplicate Keys) |

For detailed information on the create flags, see Chapter 5, “VSAM API Flags” on page 401.

**KeyDefBuf**

The pointer to the key definition buffer (PKEYDEFBUF). The format of the key definition buffer when the function is called:

| | | | | | |
|---|---|---|---|---|---|
| LL | X'1114' | X'0..10' | X'140F' | KeySeq | X'0044' |

| | |
|---|---|
| KeyLen | KeyDisp |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of the last Key Displacement field.

**X'1114'** The value (CODEPOINT) indicating the following field is a key definition.

**X'00000010'** The length (ULONG) of the key definition. This length includes the length field and the Key Displacement field.

**X'140F'** The value (CODEPOINT) indicating the following data is a key field definition.

**KeySeq** Either X'1420' for Ascending Key Sequence field or X'1421' for Descending Key Sequence field.

**X'0044'** The value (CODEPOINT) indicating the key field is a byte string.

**KeyLen** The length (USHORT) of the key field.

**KeyDisp** The offset (ULONG) from the beginning of the key field in the record. If multiple Key Field Definitions are provided, the fields are concatenated to form a combined key. The maximum length of the key is 255 bytes.

Multiple key field definitions are allowed in the Key Definition Buffer. The following example shows two key definitions:

| | | | | | |
|---|---|---|---|---|---|
| X'0..26' | X'1114' | X'0..10' | X'140F' | X'1420' | X'0044' |

| | | | |
|---|---|---|---|
| ... | X'0013' | X'00000010' | ... |

| | | | | | |
|---|---|---|---|---|---|
| X'0..12' | X'140F' | X'1420' | X'0044' | X'0003' | X'0..04' |

The following structures define the key definition buffer:

```
/* Define the following key definition buffer structure,           */
/* modeling it after the _DDMOBJECT structure defined in DUBDEFS.H */

typedef struct _MYKEYDEFBUF
{
  ULONG        cbKeyDefBuf;
  CODEPOINT    cpKeyDefBuf;
  KEYFLDDEF    KeyFldDef[1];
} MYKEYDEFBUF, *PMYKEYDEFBUF;


/* Use the following structure to map each key field definition. */
/* It is defined in DUBDEFS.H.                                   */

typedef struct _KEYFLDDEF
{
  ULONG      cbKeyFldDef;
  CODEPOINT  cpKeyFldDef;
  CODEPOINT  cpSequence;
  CODEPOINT  cpKeyClass;
  USHORT     cbKeyField;
  ULONG      oKeyField;
} KEYFLDDEF, *PKEYFLDDEF;
```

where:

**cbKeyDefBuf** The length (ULONG) of the key definition buffer from the beginning of cbKeyDefBuf to the end of oKeyField in the last key field definition.

**cpKeyDefBuf** The code point value (KEYDEF) indicating that this is a key definition buffer object.

**KeyFldDef** One or more contiguous key field definition structures (KEYFLDDEF). Specify an index value that indicates the number of key fields to be defined.

- **cbKeyFldDef** The length (ULONG) of the key field definition structure from the beginning of cbKeyFldDef to the end of oKeyField.

- **cpKeyFldDef** The code point value (KEYFLDDF) indicating that this is a key field definition object.

- **cpSequence** The code point value that indicates the key order:

  **SEQASC** Ascending key sequence field

  **SEQDSC** Descending key sequence field

- **cpKeyClass** The code point value (BYTSTRDR) indicating that the key field is a byte string.

- **cbKeyField** The length (USHORT) of the key field.

**oKeyField** The offset (ULONG) from the beginning of the key field in the record. If multiple key field definitions are provided, the fields are concatenated to form a combined key. The maximum length of the key is 255 bytes.

**DupFilOpt**
Indicates the value (CODEPOINT) for the action to be taken if a file with the same name already exists. The valid values are:

**DUPFILDO** Return Duplicate File Name (X'1459').

The function is rejected with DUPFILRM, and this option returns an error condition (SVRCOD=X'0008').

**EXSCNDDO** Return Existing Condition (X'145A'). The function is rejected with EXSCNDRM, and this option returns a warning condition (SVRCOD=X'0004').

**EABuf**
The pointer (PEAOP2) to the address of the file's EA data to be set by DDMCreateAltIndex. This is NULL if no additional DDM file attributes are to be set at create time. Refer to “Extended Attributes” on page 5 for more information on the format of this buffer.

Only the following DDM file attributes can be specified in the EA Buffer that is pointed to by this parameter:

TITLE
MGMCLSNM
DTACLSNM
STGCLSNM

For the definition of these EAs, see Chapter 4, “VSAM API Common Parameters” on page 363.

If any other file attributes are specified in this buffer, the function is rejected and a PRMNSPRM reply message is given.

The MGMCLSNM or STGCLSNM file attributes for an alternate index can be specified as different from the base file. However, the target system may not support the difference.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ACCATHRM | X'1230' | Not Authorized to Access Method |
| ADDRRM | X'F212' | Address Error |
| BASNAMRM | X'1234' | Invalid Base File Name |
| DRCATHRM | X'1237' | Not Authorized to Directory |
| DRCFULRM | X'1258' | Directory Full |
| DUPFILRM | X'1207' | Duplicate File Name |
| EXSCNDRM | X'123A' | Existing Condition |

| Message ID | Code Point | Message Title |
|---|---|---|
| FILDMGRM | X'125A' | File Damaged |
| FILNFNRM | X'120E' | File Not Found |
| FILSNARM | X'120F' | File Space Not Available |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYDEFRM | X'123D' | Invalid Key Definition |
| KEYVALRM | X'1240' | Invalid Key Value |
| LENGTHRM | X'F211' | Field Length Error |
| OPNMAXRM | X'1244' | Concurrent Opens Exceeds Maximum |
| PRMNSPRM | X'1251' | Parameter Not Supported |
| RECIUSRM | X'124A' | Record in Use |
| RSCLMTRM | X'1233' | Target Resource Limits Reached |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

The alternate index file provides an alternate key field access to the records in an existing keyed file.

This function does not require the base file to have any access capabilities. If, however, the base file is created without any access capabilities, DDMSetPathInfo must be used to set the access capabilities that are required for further processing.

This function requires exclusive access to the keyed file, which must be closed.

Certain attributes are derived from the base file EAs when creating an alternate index. Derived EAs have the same values as the base file. The following EAs are derived from the base file for the alternate index file:

- DELCP
- EOFNBR
- FILINISZ
- GETCP
- INSCP
- MAXARNB
- MODCP
- RECLEN
- RECLENCL

## Effect on Cursor Position

There is no effect on the cursor position.

## Locking (for Local VSAM File System Only)

No locks are obtained on the alternate index file as the result of this function.

DDMCreateAltIndex does the following:

1. Attempts to obtain a MODGETLK lock on the base file.

If the MODGETLK lock is obtained, DDMCreateAltIndex is processed (successfully or unsuccessfully). If the MODGETLK lock is not obtained, DDMCreateAltIndex is rejected with the FILIUSRM reply message.

2. Releases the MODGETLK lock it obtained on the base file.

If DDMCreateAltIndex ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The base file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the base file locks may not be the same as before the function was issued.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file specified by BaseFileName is the name of a direct or sequential file. | BASNAMRM |
| The new file cannot be entered into the directory because the directory is full. | DRCFULRM |
| The FileName is equal to the BaseFileName, regardless of whether the file exists or the specification of the DupFilOpt parameter.<br>**Note:** If a file exists with the same name, the DupFilOpt parameter specifies the action to take for this condition. | DUPFILRM |
| The alternate index files that exist for the specified base file have a last-change date/time for that base file that is different than the current system last-change date/time (System Object Attribute). | FILDMGRM |
| The base file is open (regardless of the sharing mode specified). | FILIUSRM |
| The file specified by BaseFileName is an alternate index file.<br>The FileName specified has a path qualifier that is different than the path qualifier specified for BaseFileName. | INVRQSRM |
| The KeyDefBuf parameter specifies a key length of zero or a value greater than 255.<br>The KeyDefBuf parameter specifies a key that does not fall within the boundaries of the record. | KEYDEFRM |
| Invalid file attributes specified in the EA buffer. | PRMNSPRM |

## DDMCreateAltIndex

| This Causes a Reply Message to be Generated with SRVCOD = X'04' and the Function Continues | With This Reply Message |
|---|---|
| For the base file only, if the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file. DDMCreateAltIndex re-synchronizes the file-change date and time of all files in the keyed file object, unless a higher severity condition prevents it from doing so. | FILDMGRM |

## DDMCreateRecFile (Create Record File)

This function creates a record-oriented file on the target system.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMCreateRecFile (PSZ            FileName,
                         ULONG          CreateFlags,
                         ULONG          RecLen,
                         CODEPOINT      RecLenCls,
                         PKEYDEFBUF     KeyDefBuf,
                         ULONG          InitFileSiz,
                         LONG           MaxFileSiz,
                         CODEPOINT      DupFilOpt,
                         CODEPOINT      DftRecOp,
                         ULONG          RecCnt,
                         PEAOP2         EABuf,
                         CODEPOINT      FileClass,
                         PDDMDFTREC     DftRecBuf
                         );
```

### Parameters

**FileName**
A pointer (PSZ) to the name of the record-oriented file to be created.

**CreateFlags**
The CreateFlags (ULONG) specify the action to be taken depending on whether the flag bit is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **10–31** | Reserved flags |
| **9** | DDM_FILPRT (Protected File) |
| **8** | DDM_FILSYS (System File) |
| **7** | DDM_FILHDD (Hidden File) |
| **6** | DDM_MODCP (Allow Modify Record Capability) |
| **5** | DDM_INSCP (Allow Insert Record Capability) |
| **4** | DDM_GETCP (Allow Get Record Capability) |
| **3** | DDM_INIEX (Inhibit Initial Extent) |
| **2** | DDM_DELCP (Allow Record Deletion Capability) |
| **1** | DDM_TMPFIL (Temporary File) |
| **0** | DDM_ALDUPKEY (Allow Duplicate Keys) |

For detailed information on the create flags, see “CreateFlags (Create Flags)” on page 407.

**RecLen**
Specifies the maximum length (ULONG) of the user data in the DDM record object. For information on the maximum and minimum record lengths, see “RECLEN (Record Length)” on page 392.

**RecLenCls**
Indicates the value (CODEPOINT) for the type of record length that the record on the file can have. Valid values are:

**RECFIX** Fixed Length Record (X'142E')

**RECIVL** Initially-Variable-Length Record (X'142F')

**RECVAR** Variable-Length Record (X'1431')

**KeyDefBuf**
The pointer to the key definition buffer (PKEYDEFBUF) or NULL. This parameter is ignored if the create is not being done for a keyed file. When the function is called, the format of the key definition buffer is:

| | | | | | |
|---|---|---|---|---|---|
| LL | X'1114' | X'0..10' | X'140F' | KeySeq | X'0044' |

| | | |
|---|---|---|
| KeyLen | KeyDisp | ... |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of the last Key Displacement field.

**X'1114'** The value (CODEPOINT) indicating the following field is a key definition.

**X'0..10'** The length (ULONG) of the key definition. This length includes length field through the Key Displacement field.

**X'140F'** The value (CODEPOINT) indicating the following data is a key field definition.

**KeySeq** The value (CODEPOINT) to indicate ascending or descending key sequence field:

X'1420' Ascending Key Sequence field
X'1421' Descending Key Sequence field

Key Sequence always assumes the sorting order of the target system.

**X'0044'** The value (CODEPOINT) indicating the key field is a byte string.

**KeyLen** The length (USHORT) of the key field.

**KeyDisp** The offset (ULONG) from the beginning of the key field in the record. If multiple Key Field Definitions are provided, the fields are concatenated to form a combined key. The maximum length of the key is 255 bytes.

Multiple key field definitions are allowed in the Key Definition Buffer. The following example shows two key definitions:

| | | | | | |
|---|---|---|---|---|---|
| X'0..26' | X'1114' | X'0..10' | X'140F' | X'1420' | X'0044' |

| | | | | | |
|---|---|---|---|---|---|
| X'0..13' | X'0..12' | X'0..10' | X'140F' | X'1420' | X'0044' |

| | |
|---|---|
| X'0..08' | X'0..04' |

The following structures define the key definition buffer:

```
/* Define the following key definition buffer structure,          */
/* modeling it after the _DDMOBJECT structure defined in DUBDEFS.H */

typedef struct _MYKEYDEFBUF
{
  ULONG        cbKeyDefBuf;
  CODEPOINT    cpKeyDefBuf;
  KEYFLDDEF    KeyFldDef[1];
} MYKEYDEFBUF, *PMYKEYDEFBUF;


/* Use the following structure to map each key field definition. */
/* It is defined in DUBDEFS.H.                                    */

typedef struct _KEYFLDDEF
{
  ULONG      cbKeyFldDef;
  CODEPOINT  cpKeyFldDef;
  CODEPOINT  cpSequence;
  CODEPOINT  cpKeyClass;
  USHORT     cbKeyField;
  ULONG      oKeyField;
} KEYFLDDEF, *PKEYFLDDEF;
```

where:

**cbKeyDefBuf** The length (ULONG) of the key definition buffer from the beginning of cbKeyDefBuf to the end of oKeyField in the last key field definition.

**cpKeyDefBuf** The code point value (KEYDEF) indicating that this is a key definition buffer object.

**KeyFldDef** One or more contiguous key field definition structures (KEYFLDDEF). Specify an index value that indicates the number of key fields that are defined.

**cbKeyFldDef** The length (ULONG) of the key field definition structure from the beginning of cbKeyFldDef to the end of oKeyField.

**cpKeyFldDef** The code point value (KEYFLDDF) indicating that this is a key field definition object.

**cpSequence** The code point value that indicates the key order:

**SEQASC** Ascending key sequence field

**SEQDSC** Descending key sequence field

**cpKeyClass** The code point value (BYTSTRDR) indicating that the key field is a byte string.

**cbKeyField** The length (USHORT) of the key field.

**oKeyField** The offset (ULONG) from the beginning of the key field in the record. If multiple key field definitions are provided, the fields are concatenated to form a combined key. The maximum length of the key is 255 bytes.

**InitFileSiz**
The first time space is allocated for records, specifies the initial number (ULONG) of records to allocate. A value of 0 indicates that the file exists but has no allocated space. A nonzero value for this parameter causes space to be allocated, but the contents of the space is undefined. Use RecCnt to initialize the space. InitFileSiz can be used to reduce the fragmentation of a file if you know the approximate size it will grow to. Reducing fragmentation can improve product performance. A remote target system might ignore this information.

**MaxFileSiz**
Specifies the maximum number (LONG) of records that can be allocated to the file. A value of -1 indicates that the file size is unlimited.

**DupFilOpt**
The value (CODEPOINT) indicating the action to take if a file with the same name already exists. The valid values are:

**DUPFILDO** Return Duplicate File Name (X'1459').

The function is rejected with DUPFILRM, and the option returns an error condition (SVRCOD=X'0008').

**EXSCNDDO** Return Existing Condition (X'145A').

The function is rejected with EXSCNDRM, and the option returns a warning condition (SVRCOD=X'0004').

**DftRecOp**

The value (CODEPOINT) indicating the action a create file function should take to initialize the data contents of the file.

If the value is specified as NIL, the file is not initialized with default records.

If a value other than NIL is specified, the file is initialized with at least the number of records that are specified. The number of records that are specified is through the RecCnt variable that is related to this parameter. This function ignores the value of the DDM_INIEX parameter flag.

The valid values are:

**DFTINAIN** Default inactive record initialization (X'1460'). Specifies that the file is to be initialized with inactive records.

If the file is created with initially-varying-length records or with variable-length records, the initialized records have a length equal to RecLen.

If the file is not delete-capable and is not a direct file, DFTRECRM is returned.

**DFTTRGIN** Default target initialization (X'145F').

Specifies that the file is to be initialized with active records whose contents are determined by the target server. All records have the same initial contents that is defined by the target server. the local VSAM file system initializes records with the '!' character.

If the file is created with initially-varying-length records or with variable-length records, the initialized records have a length equal to RecLen.

**DFTSRCIN** Default source initialization (X'1449').

Specifies that the file is to be initialized with active records whose contents are defined by the DftRecBuf parameter. The contents of DftRecBuf are replicated or truncated to match the record length of the file. This means that DftRecBuf(X'00') causes the file to be initialized with records that consist of all zeros. A DftRecBuf(‘ABC’) would initialize a file with 10-byte records with ‘ABCABCABCA’ as the initialization record.

If the file is created with initially-varying-length records or with variable-length records, the initialized records have a length equal to RecLen.

**NIL** Do not initialize the data content of the file (X'002A').

**RecCnt**

Specifies the number (ULONG) of records to initialize. This parameter works in conjunction with the DftRecOp parameter. If the DftRecOp parameter is specified as NIL, RecCnt is ignored. Records are initialized in the space that is allocated by InitFileSiz with additional space that is allocated as needed.

**EABuf**

The pointer (PEAOP2) to the file's EA data to be set by DDMCreateRecFile, or NULL if no additional DDM file attributes are to be set at create time. Refer to “Extended Attributes” on page 5 for more information on the format of this buffer.

The following DDM file attributes can be specified in EABuf:

TITLE
MGMCLSNM
DTACLSNM
STGCLSNM

For the definition of these EAs, see Chapter 4, “VSAM API Common Parameters” on page 363.

**FileClass**

Indicates the value (CODEPOINT) for the class or type of record file to create. Valid values are:

| | |
|---|---|
| **DIRFIL** | Direct File (X'140C') |
| **KEYFIL** | Keyed File (X'141E') |
| **SEQFIL** | Sequential File (X'143B') |

**DftRecBuf**

The pointer (PDDMDFTREC) to the default record initialization buffer or NULL. When this function is called, the format of the buffer is:

| | | |
|---|---|---|
| LL | X'142B' | Initialization Record |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the default initialization record from the beginning of LL to the end of the Initialization Record. |
| **X'142B'** | The value (CODEPOINT) indicating that the following content is the default initialization record. |
| **Data** | The default initialization record information. |

See “DFTREC (Default Record)” on page 371 for more information.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ACCATHRM | X'1230' | Not Authorized to Access Method |
| ADDRRM | X'F212' | Address Error |
| DFTRECRM | X'1204' | Default Record Error |
| DRCATHRM | X'1237' | Not Authorized to Directory |
| DUPFILRM | X'1207' | Duplicate File Name |
| EXSCNDRM | X'123A' | Existing Condition |
| FILATHRM | X'123B' | Not Authorized to File |
| FILIUSRM | X'120D' | File in Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |

| Message ID | Code Point | Message Title |
|---|---|---|
| FILSNARM | X'120F' | File Space Not Available |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| OPNMAXRM | X'1244' | Concurrent Opens Exceeds Maximum |
| PRMNSPRM | X'1251' | Parameter Not Supported |
| RSCLMTRM | X'1233' | Target Resource Limits Reached |
| SYNTAXRM | X'124C' | Data Stream Syntax Error |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

DDMCreateRecFile does not require the file to have any access capabilities. If however, the base file is created without any access capabilities, DDMSetPathInfo must be used to set the access capabilities that are required for further processing.

## Effect on Cursor Position

There is no effect on the cursor position because the file is not open.

## Locking (for Local VSAM File System Only)

No locks are obtained and held on the file by this function.

## Exceptions

If a file exists on the target system with the same name, the DupFilOpt parameter specifies the action to take for this condition.

| This Causes the Function to Be Rejected | With This Reply Message |
|---|---|
| The new file cannot be entered into the directory because the directory is full. | DRCFULRM |
| The file is not delete-capable and is not a direct file. | DFTRECRM |
| The KeyDefBuf parameter specifies a key length of zero or a value greater than the maximum allowed by the target system.<br>The KeyDefBuf parameter defines a key that cannot be mapped to the key-field capabilities of the target server. | KEYDEFRM |
| The DDM_ALDUPKEY is false and DftRecOp is not NIL. | SYNTAXRM |
| DftRecOp (with a value other than NIL) is specified and RecCnt exceeds the maximum number of record positions that the target system allocates to the file. | VALNSPRM |

## DDMDelete (Delete File)

This function deletes a file from the target system, releases all locks that are held on the file, and releases the space the file occupied.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMDelete   (PSZ           FileName,
                    ULONG         Flags
                    );
```

### Parameters

**FileName**
The pointer (PSZ) to the name of the record-oriented file to be deleted.

**Flags**
The Flags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **1–31** | Reserved flags |
| **0** | DDM_OVRDTA (Overwrite Data)<br>Specifies that the data being deleted is to be overwritten with binary zeros. This prevents the data from being read by subsequent users of the allocated file space.<br>If the file is a keyed file or alternate index file, this flag specifies whether the indexes for the file are also overwritten. |

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| EXSCNDRM | X'123A' | Existing Condition |
| ADDRRM | X'F212' | Address Error |
| FILATHRM | X'123B' | Not Authorized to File |
| FILDMGRM | X'125A' | File Damaged |
| FILIUSRM | X'120D' | File In Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |

## Remarks

For an alternate index file, only the index is deleted. The base file of an alternate index file is not deleted.

The primary index file for the specified keyed file is also deleted.

Any alternate index files, using the specified file as a base file, must be deleted before the specified file can be deleted.

## Effect on Cursor Position

There is no effect on the cursor position because the file is not open.

## Locking (for Local VSAM File System Only)

DDMDelete does the following:

1. Attempts to obtain a MODNONLK lock on the file.

   If the MODNONLK lock is obtained, the function is processed (successfully or unsuccessfully). If the MODNONLK lock is not obtained, the function is rejected with FILIUSRM.

2. Releases the MODNONLK lock it obtained on the file.

If DDMDelete ends with a reply message that has a severity code value of: ERROR or higher, then:

- For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

## Exceptions

| This Causes the Function to Terminate Normally | With This Reply Message |
|---|---|
| The file specified by FileName cannot be found. | FILNFNRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file specified by FileName is the base file for one or more alternate index files.<br>The file specified by FileName is a protected file. | INVRQSRM |
| The requester has the file open. | FILIUSRM |

## DDMDeleteRec (Delete Record)

This function deletes a record that has an update intent on it.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMDeleteRec (HDDMFILE    FileHandle,
                     ULONG       Flags
                     );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**Flags**
The Flags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **1-31** | Reserved flags |
| **0** | DDM_OVRDTA (Overwrite Data)<br>Specifies whether the record being deleted is to be overwritten with binary zeros to prevent the data from being read by non-DDM applications.<br>**Note:** This flag is obsolete, but supported for compatibility with earlier releases. The deleted record space is always overwritten with binary zeros. |

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| EXSCNDRM | X'123A' | Existing Condition |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| RECIUSRM | X'124A' | Record in Use |
| RECDMGRM | X'1249' | Record Damaged |
| UPDINTRM | X'124E' | No Update Intent on Record |

### Remarks

DDMDeleteRec has the following effects:

- The data content of the record is no longer available.
- The record position becomes inactive and its length is preserved if it is initially variable or fixed.

- If the file contains variable-length records, the length of the record position goes to the maximum record length for the file. See "RECINA (Inactive Record)" on page 391 for a detailed description.
- If the file is a keyed file or an alternate index file, the associated indexes are updated to show that the record has been deleted.
- If the record's position is overwritten, it is overwritten with binary zeros.
- Update intent is removed.

Before this function can be used, an update intent must be placed on a record in the file. A DDMSet*xxx* or DDMGetRec function can be used to place an update intent on a record.

If the record that is deleted was the last active record in a direct file, EOF is backed up to the previous active record.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is not changed.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The CSRPOSST (Cursor Position Status) parameter on the reply message determines the state of the cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

DDMDeleteRec does the following:

If the file was opened for multiple updates, the access method attempts to acquire an EXCRECLK lock on the record that has an update intent placed on it. If the EXCRECLK lock cannot be obtained because of a lock conflict, the DDMDeleteRec is rejected with the RECIUSRM reply message.

If the EXCRECLK lock is obtained:

1. DDMDeleteRec is processed.
2. Because all record modifications are committed at the time of modification, the EXCRECLK lock is released from the record.
3. Even if DDMDeleteRec is rejected with an error reply, the obtained EXCRECLK lock is released from the record.

If DDMDeleteRec ends with a reply message that has a severity code value of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message determines the state of the record locks.

## Exceptions

| This Causes the Function to Terminate Normally | With This Reply Message |
|---|---|
| The file handle is not valid. | HDLNFNRM |
| Any reserved bits in Flags are active. | INVFLGRM |
| The DELAI access intent was not specified when the file was opened.<br>The file is not delete-capable.<br>The file is direct and the file is empty. | INVRQSRM |
| A damaged record (not an active or inactive record) is encountered. | RECDMGRM |
| There is not a record with update intent placed on it in the file. | UPDINTRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The record is already inactive. | EXSCNDRM |
| An EXCRECLK lock cannot be obtained. | RECIUSRM |

## Example

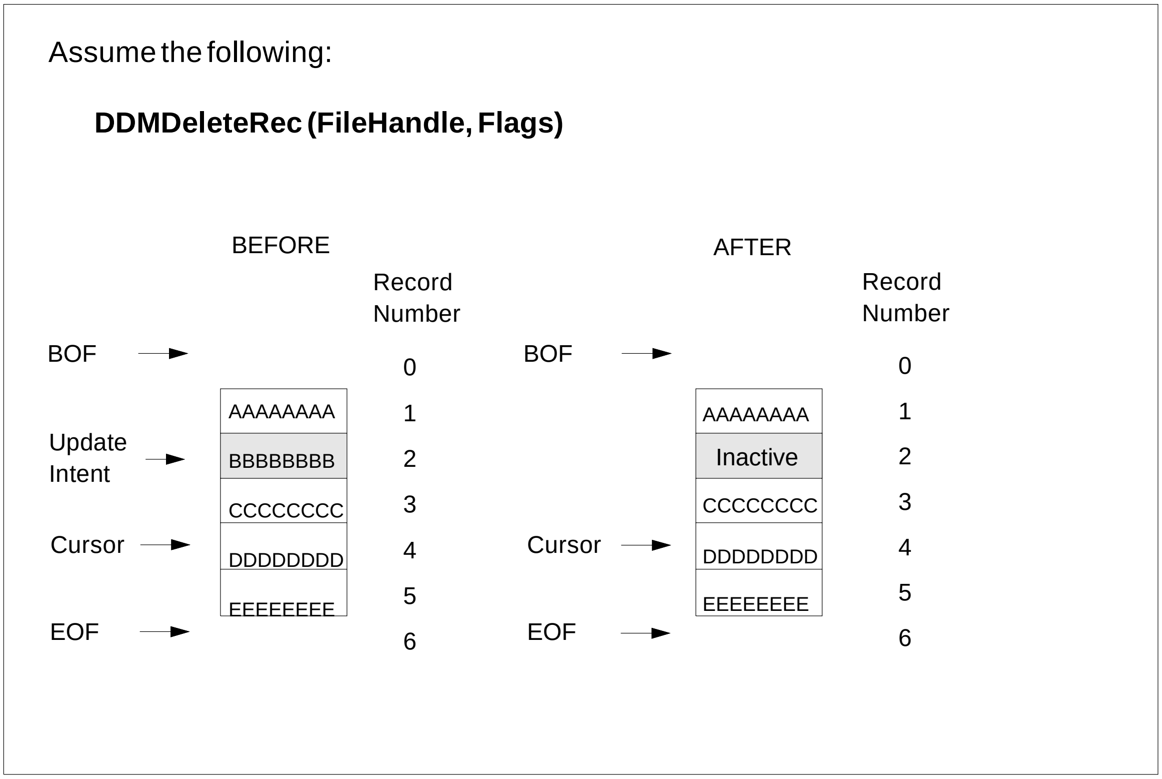


*Figure 10. DDMDeleteRec Function*

## DDMForceBuffer (Commit a File's Cached Information)

This function commits a file's cached information to non-volatile storage. The file's directory entry and EAs are updated (as if the file had been closed with a DDMClose), but the file remains in the open state.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMForceBuffer (HDDMFILE         FileHandle
                      );
```

### Parameters

**FileHandle**
The handle (HDDMFILE) of the open file whose cached information is to be committed to non-volatile storage. A value of X'FFFFFFFF' for this parameter causes all open files for this process to have their caches written to non-volatile storage.

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| HDLNFNRM | X'1257' | File Handle Not Found |

### Remarks

This function is analogous to the DosResetBuffer command.

To obtain the current EA values while a file is being used, you must issue a DDMForceBuffer and request the EA values to be returned. The EA values are returned through DDMQueryFileInfo or DDMOpen.

When a file is being used in the local VSAM file system, the file system maintains certain extended attributes in memory for each I/O operation that affects the file. When an alternate index file is being used, the local VSAM file system maintains only the base file EAs in memory. These changed EAs are permanently updated for the file as well as for all associated index files when a DDMForceBuffer or DDMClose function is issued.

### Effect on Cursor Position

If the file is opened without GETAI access intent, there is no effect on the cursor position.

If the file was opened with GETAI access intent, the cursor is positioned to EOF.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

The locks on the requester's files are the same before and after the DDMForceBuffer function. All record locks that are held by the requester are released.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is not valid. | HDLNFNRM |

## DDMGetRec (Get Record)

This function gets and returns the record that is indicated by the current cursor position. This function also optionally returns the record number and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMGetRec (HDDMFILE      FileHandle,
                  ULONG         AccessFlags,
                  PDDMRECORD    RecordBuf,
                  ULONG         RecordBufLen
                  );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) that is obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **4–31** | Reserved flags |
| **3** | DDM_RTNINA (Return Inactive Records) |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

**Note:** DDM_KEYVALFB is ignored for nonkeyed files.

For detailed information on access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer to the record buffer (PDDMRECORD) for the returned record. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples of RecordBuf Data Formats” on page 77.

**RecordBufLen**
The length (ULONG) of the Record Buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| CSRNSARM | X'1205' | Cursor Not Selecting a Record Position |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYMODRM | X'1260' | Key value was modified since cursor was last set |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |

## Remarks

As an option, DDMGetRec can:

- Specify whether inactive records should be returned (DDM_RTNINA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is not changed.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The CSRPOSST (Cursor Position Status) parameter on the reply message determines the cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file is opened for multiple updates, the access method acquires an implicit SHRRECLK on the record. This occurs if the requester does not lock the record with a SHRRECLK. If a different record is already locked, the lock on that record is released before the SHRRECLK on the current record is obtained.

The SHRRECLK is released when one of the following occurs:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The DDMUnLockRec function is issued.
- Any function is issued that references a record other than the one currently pointed to by the cursor. Examples of these functions are DDMInsertRecEOF,

DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum.

- The file is closed.

If none of these conditions are met, the record remains locked.

If the record lock is not obtained, the function is rejected with RECIUSRM.

If DDM_UPDINT(TRUE) is specified and the file is *not* opened for multiple updates, an update intent is placed on the record. However, the access method does *not* acquire any record locks.

If the function ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message. determines the state of the record locks.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| DDM_RECNBRFB or DDM_KEYVALFB is set or DDM_NODATA is not set and RecordBuf does not contain an address. | ADDRRM |
| The cursor is positioned to outside the bounds of the file.<br>The cursor position is unknown. | CSRNSARM |
| The file handle is not valid. | HDLNFNRM |
| Any of the reserved bits in AccessFlags are set. | INVFLGRM |
| The file was opened without GETAI specified.<br>DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents. | INVRQSRM |
| The file is a keyed or alternate index file, the cursor was last positioned by key value, and the key value has changed or the record has become inactive since the cursor was positioned to its current location. | KEYMODRM |
| The RecordBuf is not large enough to hold the returned record. | LENGTHRM |
| The record returned is damaged (not an active or inactive record). | RECDMGRM |
| The DDM_RTNINA parameter specifies that inactive records are *not* to be returned and the current record is inactive. | RECINARM |
| A record lock cannot be obtained. | RECIUSRM |

## Examples of RecordBuf Data Formats

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_RTNINA(FALSE)

**RecordBuf**

DATA FORMAT

| | | |
|---|---|---|
| LL | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the buffer from the beginning of LL to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_RTNINA(TRUE)

**RecordBuf**

DATA FORMAT

| | | |
|---|---|---|
| LL | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the buffer from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is an ULONG length of an inactive record.

**Data** Either the record data or the length (ULONG) of the inactive record.

---

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_RTNINA(FALSE)

**RecordBuf**

DATA FORMAT

## DDMGetRec

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_RTNINA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | CP | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of CP. |

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is an ULONG length of an inactive record.

**Data** Either the record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_RTNINA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_RTNINA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | CP | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** — The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** — The length (ULONG) of the field from the beginning of L1 to the end of the key value.

**X'1115'** — The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** — The record key value.

**L2** — The length (ULONG) from the beginning of L2 to the end of Data.

**CP** — The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** — Indicates that the following data is record data.
- **X'142D'** — Indicates that the following data is an ULONG length of an inactive record.

**Data** — Either the record data or the length (ULONG) of the inactive record.

---

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_RTNINA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** — The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** — The length (ULONG) of the field from the beginning of L1 to the end of RN.

**X'111D'** — The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) of the field from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) of the field from the beginning of L3 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_RTNINA(TRUE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) of the field from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number.

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) of the field from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) of the field from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **`X'144A'`** Indicates that the following data is record data.
- **`X'142D'`** Indicates that the following data is an ULONG length of an inactive record.

**Data** Either record data or the length (ULONG) of the inactive record.

## DDMGetReplyMessage (Get Reply Message)

This function gets and returns a reply message that is issued from the previously requested function in the current thread of execution.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMGetReplyMessage (PBYTE           RpyMsgBuf,
                           ULONG           RpyMsgBufLen,
                           ULONG           RpyMsgFlags
                           );
```

### Parameters

**RpyMsgBuf**
The pointer (PBYTE) to the reply message buffer for the returned reply message. For information on how to interpret the reply message data, see Chapter 6, "VSAM API Reply Messages" on page 413.

**RpyMsgBufLen**
The length (ULONG) of the reply message buffer. The length of the reply message buffer should be the same as the largest reply message plus four bytes for the length and four bytes for the code point fields.

**RpyMsgFlags**
The RpyMsgFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **1–31** | Reserved flags |
| **0** | Full Error Reply Message |

If this flag is set, at least one full error reply message is returned. If this flag is not set, only the USHORT code point that identifies the error reply message is returned. A subsequent repeat invocation of DDMGetReplyMessage with this flag that is not set causes the code point of the next reply message to be returned. The previous error reply message is lost.

## Returns

On return, APIRET contains one of the SVRCOD error codes. For a detailed description of the severity code values, see “SVRCOD (Severity Code)” on page 396.

| APIRET | Description |
|---|---|
| **X'00000000'** | All reply messages for last requested function have been received. |
| **X'00000004'** | There are more reply messages to be received. Call the DDMGetReplyMessage function again to get the next message. The reply messages are put in a process thread-based FIFO (first-in first-out) queue. Each call of DDMGetReplyMessage gets the next reply message from the queue.<br>If the currently executing thread issues a function other than DDMGetReplyMessage, before all of the reply messages have been received, the remaining reply messages are discarded. The process thread-based queue is filled with the reply messages from the requested function. |
| **X'00000008'** | Reply buffer is too small. The reply message buffer is not large enough to hold the reply message. If the buffer length is at least 1 ULONG, the first ULONG of the reply message buffer contains the length of the reply message. |
| **X'00000010'** | Warning error. A reply message was requested but there are no reply messages available. |
| **X'00000020'** | Error. An invalid reply message buffer address was specified. |
| **X'00000040'** | Severe error. An un-architected reply message object was encountered. One or more additional reply messages are available. The cause may be a target problem. |
| **X'00000080'** | Severe error. A reserved bit was set on in the RpyMsgFlags parameter. |

## DDMInsertRecEOF (Insert Records at EOF)

This function inserts records at the end of the file and optionally returns the record number and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMInsertRecEOF (HDDMFILE        FileHandle,
                        ULONG           AccessFlags,
                        PDDMRECORD      RecordBuf,
                        ULONG           RecCount,
                        PDDMOBJECT      FdbkBuf,
                        ULONG           FdbkBufLen
                        );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **12–31** | Reserved flags |
| **11** | DDM_HLDUPD (Hold Update Intent) |
| **10** | DDM_UPDCSR (Update Cursor) |
| **3–9** | Reserved flag |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | Reserved flag |

For detailed information on the access flags, see Chapter 5, "VSAM API Flags" on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the records to be inserted. When DDMInsertRecEOF is called, the format of RecordBuf is:

| | | | |
|---|---|---|---|
| LL | CP | Data | ... |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record description from the beginning of LL to the end of Data. |
| **CP** | The value (CODEPOINT) indicating that the following data is either Record Data or an Inactive Record Length. |

**X'144A'** Indicates that the following data is Record Data.

**X'142D'** Indicates that the following data is an ULONG Inactive Record Length. The number of record descriptions (Record Data or Inactive Record Lengths) should be the same as the number indicated in RecCount.

**Data** The record data.

Examples of the DDMInsertRecEOF function are shown in “Examples” on page 92.

**RecCount**
The count (ULONG) of the record descriptions in the record buffer.

**FdbkBuf**
The pointer (PDDMOBJECT) to the Feedback Buffer for the requested returned feedback data, or NULL if no information has been requested. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned feedback data formats are shown in “Remarks.”

**FdbkBufLen**
The length (ULONG) of the feedback buffer or 0.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DTARECRM | X'1206' | Invalid Data Record |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| FILFULRM | X'120C' | File is Full |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYVALRM | X'1240' | Invalid Key Value |
| LENGTHRM | X'F211' | Field Length Error |
| OBJNSPRM | X'1253' | Object Not Supported |
| RECIUSRM | X'124A' | Record in Use |
| RECLENRM | X'1215' | Record Length Mismatch |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

For files with variable-length records, new record positions that have the same length as the inserted records are created. Records to be inserted are contained in the record buffer.

After successful completion of this command, EOF points to the record position after the last inserted record.

This function processes the records in a Record Buffer as a group. This function treats inactive records in the group as place holders between the active records, as the group is inserted into the file. How the EOF is updated depends on the type of the file.

- If the file is a direct file, the EOF is only updated when an active record in the group is inserted. Therefore, inactive records that follow the last active record in a group are located at or beyond the EOF and are subject to overlay by other functions. The method of inserting records into a direct file can affect the file contents; for example:
  - When multiple records are inserted at a time, both active and inactive records can occur before the EOF (see Figure 11).
  - When individual records are inserted one at a time, only the active records will occur before the EOF (see Figure 12 on page 88).
- If the file is not a direct file, the EOF is updated as each record in the group is inserted. If all the records in the group are inserted successfully, the EOF is positioned after the last record in the group. This is true whether the record is an active or inactive record. The method of inserting records into these files does not affect the file contents.

Assume the following operating on a direct file:

```
/*                                                */
/*  In this example,                              */
/*                                                */
/*     (RECORD n)  indicates active record number n   */
/*     (RECINA n)  indicates inactive record number n */
/*                                                */
RecordBuf = (RECINA 1)(RECORD 2)(RECINA 3)(RECINA 4);
RecCount = 4;
```

**DDMInsertRecEOF(FileHandle, AccessFlags, RecordBuf, RecCount, FdbkBuf, FdbkBufLen);**

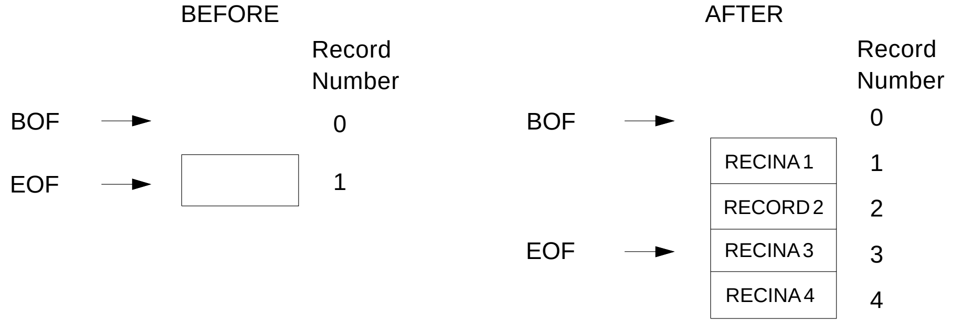
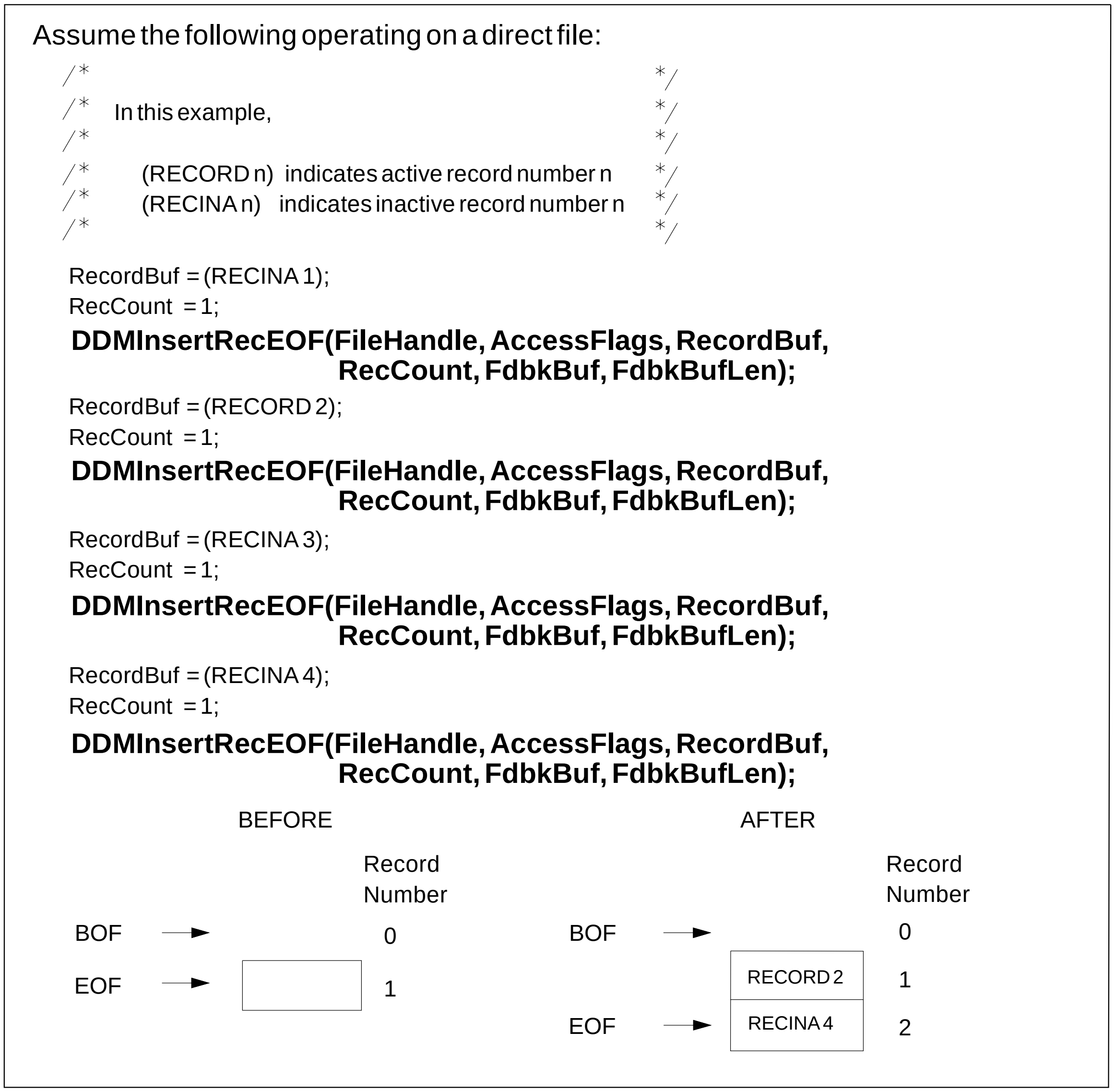


*Figure 11. DDMInsertRecEOF. Insert Multiple Records at the Same Time into a Direct File*

## DDMInsertRecEOF



Assume the following operating on a direct file:

```
/*                                                    */
/*  In this example,                                  */
/*                                                    */
/*     (RECORD n)  indicates active record number n   */
/*     (RECINA n)  indicates inactive record number n */
/*                                                    */

RecordBuf = (RECINA 1);
RecCount  = 1;
DDMInsertRecEOF(FileHandle, AccessFlags, RecordBuf,
                RecCount, FdbkBuf, FdbkBufLen);
RecordBuf = (RECORD 2);
RecCount  = 1;
DDMInsertRecEOF(FileHandle, AccessFlags, RecordBuf,
                RecCount, FdbkBuf, FdbkBufLen);
RecordBuf = (RECINA 3);
RecCount  = 1;
DDMInsertRecEOF(FileHandle, AccessFlags, RecordBuf,
                RecCount, FdbkBuf, FdbkBufLen);
RecordBuf = (RECINA 4);
RecCount  = 1;
DDMInsertRecEOF(FileHandle, AccessFlags, RecordBuf,
                RecCount, FdbkBuf, FdbkBufLen);
```

*Figure 12. DDMInsertRecEOF. Insert One Record into a Direct File*

RecCount specifies the number of records to be inserted at EOF. An instance of a record or an inactive record length must be set for each record to be inserted.

Depending on the value of the DDM_UPDCSR flag, this function sets the cursor to the inserted record or keeps its current setting. If RecCount specifies a value greater than 1 and the DDM_UPDCSR flag is set, the cursor is updated after each record is successfully inserted at the end of file.

If the DDM_RECNBRFB flag is set, the record number of the last inserted record is returned in FdbkBuf.

If the DDM_KEYVALFB flag is set, the key value of the last inserted record is returned in FdbkBuf.

If the DDM_HLDUPD flag is not set, the update intent on any record in the file is released. If the DDM_HLDUPD flag is set, the update intent on any record in the file remains in place.

When inserting records into a keyed or alternate index file, this function updates the file index and all associated indexes.

Inactive records can only be inserted if the file is delete-capable.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**

This function positions the cursor that is based on the DDM_UPDCSR flag. If DDM_UPDCSR is set, this function moves the cursor to the inserted record. If DDM_UPDCSR is not set, the cursor position is not changed.

**Error Termination (SVRCOD of 8)**

The cursor position is the same as before the function was called. If the RecCount is greater than 1, the cursor position is the same as it was before the last iteration of the function.

**Severe Termination (SVRCOD of 16 or higher)**

The CSRPOSST (Cursor Position Status) parameter on the reply message indicates the cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

DDMInsertRecEOF does the following:

1. If DDM_HLDUPD(FALSE) is specified and the requester has a SHRRECLK lock on a record in the file, the SHRRECLK lock is released.
2. If the file is opened for multiple updates, DDM_HLDUPD(TRUE) is specified, and the requester has a SHRRECLK lock on a record in the file. The SHRRECLK lock is *not* released.
3. In all cases, the access method attempts to acquire an EXCRECLK lock on the record. If the EXCRECLK lock cannot be obtained due to a lock conflict, the function is rejected with RECIUSRM.

   If the EXCRECLK lock is obtained:

   a. The record insert function is performed.

   b. The EXCRECLK lock is released from the record, because all record modifications are committed at the time of modification.

   c. The obtained EXCRECLK lock is released from the record, even if the function is rejected with an error reply.

4. If the function ends with a reply message that has a severity code of ERROR or higher, then:

   - For error termination (SVRCOD of 8): The record locks are the same as before the function was issued. If RecCount is greater than 1, the record locks are the same as before the last iteration of the function.
   - For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message determines the record locks.

## Exceptions

| This Causes the Function to be Terminated | With This Reply Message |
|---|---|
| The data in the RecordBuf is not a valid record type. | OBJNSPRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The DDM_KEYVALFB or DDM_RECNBRFB access flags are set and a pointer is not supplied to the FdbkBuf. | ADDRRM |
| The file is not delete-capable and the record to be inserted is RECINA. | DTARECRM |
| One of the following sets of conditions exists:<br>• The file is the base file for an alternate index file.<br>• The alternate index file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the alternate index.<br>or<br>• The file is an alternate index file.<br>• The file's base file does not allow duplicate keys, or another alternate index file with the same base file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the file's base file or in another alternate index file with the same base file. | DUPKDIRM |
| The following conditions exist:<br>• The file is a keyed file or alternate index file.<br>• The file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the file index. | DUPKSIRM |
| Inserting the record would cause the file to become full. | FILFULRM |
| The file handle is invalid. | HDLNFNRM |
| Any of the reserved bits are set in the access flags. | INVFLGRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file was opened without INSAI (Insert Record) access intent. | INVRQSRM |
| The file supports variable-length records, the file is a keyed file or an alternate index file, and the record to be inserted does not contain all of the fields for the specified file key. | KEYVALRM |
| The FdbkBuf is not large enough to hold the returned information. | LENGTHRM |
| An EXCRECLK lock cannot be obtained on the file. | RECIUSRM |
| If the following are *not* true:<br>1. If the record class is fixed and the record to be inserted is an active record, the length of the record must be equal to the length of the header plus the record length. (See “RECORD (Record)” on page 394 for more information.)<br>2. If the record to be inserted is an inactive record, the record length represented by the inactive record must be the same as the length defined for a record in the file. (See “RECINA (Inactive Record)” on page 391 for more information.) | RECLENRM |
| RecCount is not greater than zero. | VALNSPRM |

## Examples

Assume the following:

```
AccessFlags   =  0x00000000;       /* DDM UPDCSR=OFF */
RecCount      =  0x00000003;
```

**DDMInsertRecEOF (FileHandle, AccessFlags, RecordBuf,
RecCount, FdbkBuf, FdbkBufLen)**

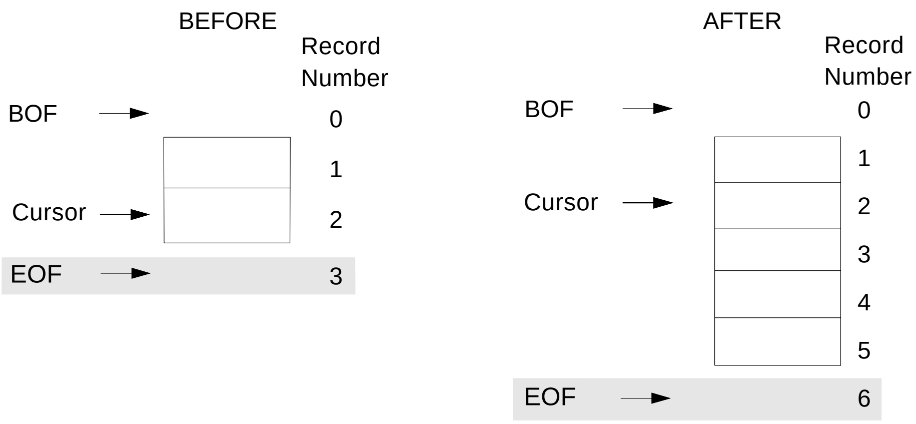
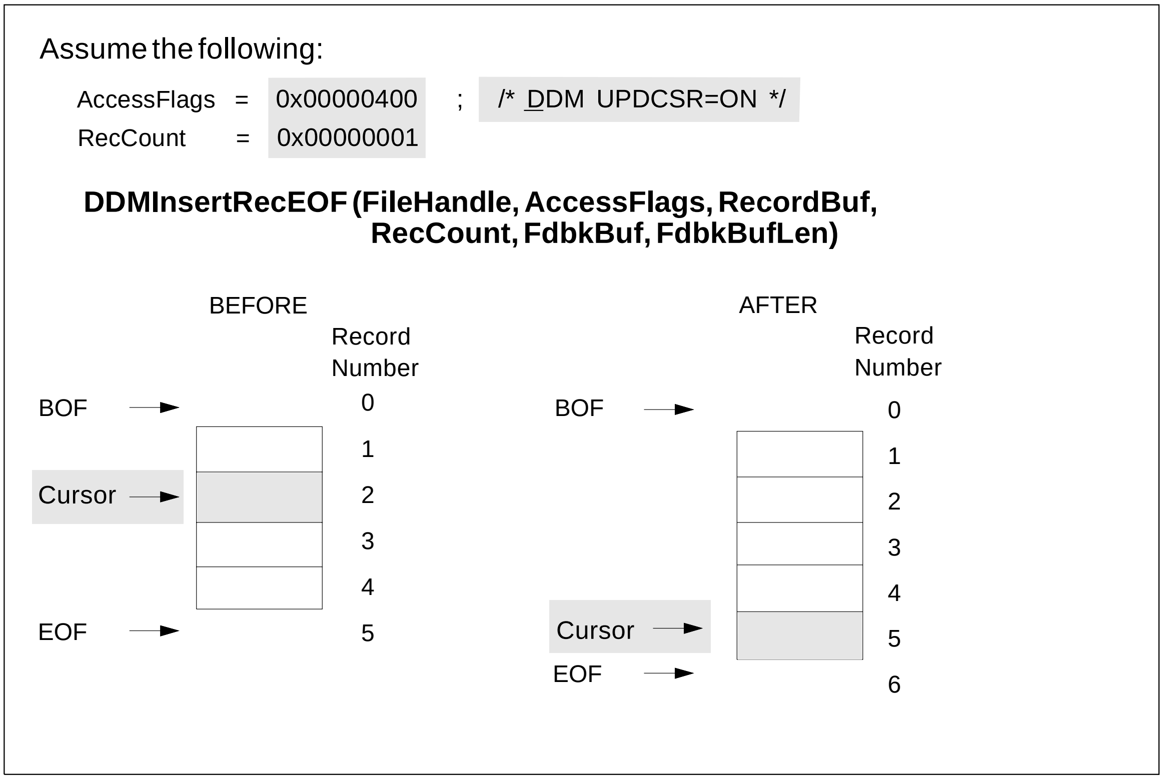


*Figure 13. DDMInsertRecEOF Function*



Assume the following:

```
AccessFlags  =  0x00000400   ;  /* DDM UPDCSR=ON */
RecCount     =  0x00000001
```

**DDMInsertRecEOF (FileHandle, AccessFlags, RecordBuf, RecCount, FdbkBuf, FdbkBufLen)**

*Figure 14. DDMInsertRecEOF Function with DDM_UPDCSR*

Examples of FdbkBuf returned data formats are:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE)

**FdbkBuf**
This parameter returns nothing.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE)

**FdbkBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the buffer from the beginning of LL to the end of RN. |

| | |
|---|---|
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE)

**FdbkBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the field from the beginning of LL to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE)

**FdbkBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

## DDMInsertRecKey (Insert Records by Key Value)

This function inserts records according to their key values and optionally returns the record number of the last record that is inserted.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMInsertRecKey (HDDMFILE        FileHandle,
                        ULONG           AccessFlags,
                        PDDMRECORD      RecordBuf,
                        PRECNUM         RecordNumber,
                        ULONG           RecCount
                        );
```

## Parameters

**FileHandle**
The file handle (HDDMFILE) that is obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **12–31** | Reserved flags |
| **11** | DDM_HLDUPD (Hold Update Intent) |
| **10** | DDM_UPDCSR (Update Cursor) |
| **2–9** | Reserved flags |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | Reserved flag |

For detailed information on access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the record descriptions and the records to be inserted by key. The format of the record buffer on when DDMInsertRecKey is called:

| | | | |
|---|---|---|---|
| LL | X'144A' | Data | ... |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record description from the beginning of LL to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is Record Data. The number of record descriptions (record data's) should be the same as the number indicated in RecCount. |

**Data** Record data.

**RecordNumber**
The pointer (PRECNUM) to an output variable of type RECNUM for the Record Number Feedback from the last record inserted. If the Record Number Feedback flag of AccessFlags has not been set, this parameter is ignored.

**RecCount**
The count (ULONG) of the record descriptions in the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DTARECRM | X'1206' | Invalid Data Record |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| FILFULRM | X'120C' | File is Full |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYVALRM | X'1240' | Invalid Key Value |
| RECLENRM | X'1215' | Record Length Mismatch |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

For files with a RECLENCL (record length class) of variable-length record, either:

- A new record position having the same length as the record to be inserted is created, or
- An existing record position containing an inactive record the same length as the record to be inserted is used.

The record structure must be consistent with the key definition on DDMCreateRecFile and DDMCreateAltIndex.

If the file supports variable-length records whose lengths are changeable, the length of the record position is changed to equal the length of the inserted record.

If RecCount specifies a value greater than 1, multiple records are inserted into the file. RecCount specifies the number of times the DDMInsertRecKey function will be performed. If the DDM_UPDCSR flag is set, the cursor position is updated after each iteration of the DDMInsertRecKey.

Depending on the setting of the DDM_UPDCSR flag, the cursor can be set to the inserted record or can retain its current setting.

If the DDM_RECNBRFB flag specifies that the record number of the inserted record is to be returned, RecordNumber is returned with the record number of the last record inserted.

At the completion of the function, any existing update intent is released unless the DDM_HLDUPD flag is set. In this case, the existing update intent remains in effect.

The file index and all other indexes that are associated with the file are updated to show the inserted records.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is based on the DDM_UPDCSR flag. If DDM_UPDCSR is set, the cursor is moved to the last inserted record. If DDM_UPDCSR is not set, the cursor position is not changed.

**Error Termination (SVRCOD of 8)**
The cursor position is the same If RecCount is greater than 1, the cursor position is the same as before the last iteration of the function.

**Severe Termination (SVRCOD of 16 or higher)**
The CSRPOSST (Cursor Position Status) parameter on the reply message indicates the cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

DDMInsertRecKey does the following:

1. If the file was opened for multiple updaters for each record to be inserted:

   a. If DDM_HLDUPD(FALSE) was specified and the requester currently has a SHRRECLK on a record in the file, the SHRRECLK is released.

   b. If DDM_HLDUPD(TRUE) was specified and the requester currently has a SHRRECLK on a record in the file, the SHRRECLK is not released.

   In all cases, the local VSAM file system attempts to acquire an EXCRECLK. If the EXCRECLK cannot be obtained due to a lock conflict, the function is rejected with RECIUSRM. If the EXCRECLK is obtained, the record insert function is performed. Since all record modifications are committed at the time of modification, the EXCRECLK is released from the record. Even if the function is rejected with an error reply, the obtained EXCRECLK is released from the record.

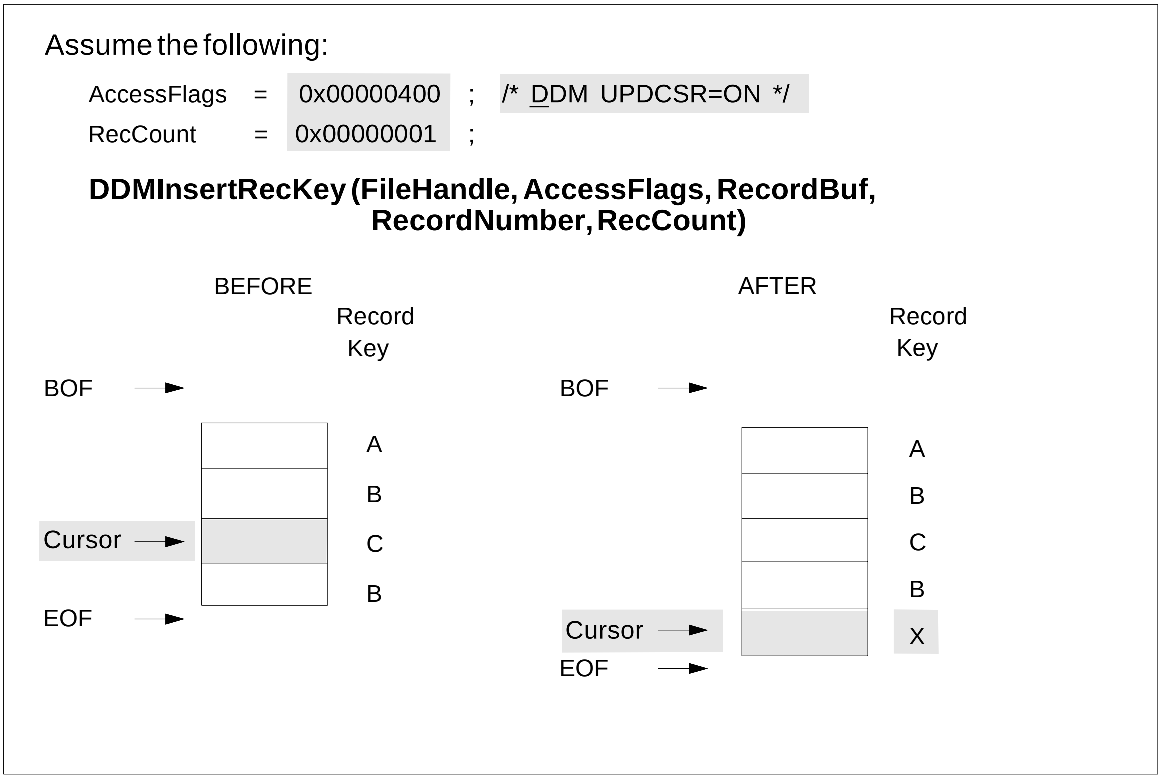
2. If the function ends with a reply message that has a severity code of ERROR or higher, then:

   - For error termination (SVRCOD of 8): The record locks are the same as before the function was issued. If RECCNT is greater than 1, the record locks are the same as before the last iteration of the function.
   - For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message determines the state of the record locks.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file is not delete-capable and the record to be inserted is RECINA. | DTARECRM |
| One of the following sets of conditions exists:<br>• The file is the base file for an alternate index file.<br>• The alternate index file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the alternate index.<br>or<br>• The file is an alternate index file.<br>• The file's base file does not allow duplicate keys, or another alternate index file with the same base file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the file's base file or in another alternate index file with the same base file. | DUPKDIRM |
| The following conditions exist:<br>• The file is a keyed file or alternate index file.<br>• The file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the file index. | DUPKSIRM |
| The file handle is invalid. | HDLNFNRM |
| The following conditions exist:<br>• The file supports variable-length records.<br>• The file is a keyed file or an alternate index file.<br>• The record to be inserted does not contain all of the fields for the specified file key. | KEYVALRM |
| An EXCRECLK record lock cannot be obtained. | RECIUSRM |
| The RECLENCL (Record Length Class) is fixed, and the length of the record to be inserted (LL) is not equal to the record length (RECLEN) of the file *plus* the length of the record header (see “RECORD (Record)” on page 394 for more information).<br>The record length of the record to be inserted exceeds the maximum record length of the file. | RECLENRM |

## Example



Assume the following:

```
AccessFlags   =   0x00000400   ;   /* DDM UPDCSR=ON */
RecCount      =   0x00000001   ;
```

**DDMInsertRecKey (FileHandle, AccessFlags, RecordBuf, RecordNumber, RecCount)**

*Figure 15. DDMInsertRecKey Function with DDM_UPDCSR*

## DDMInsertRecNum (Insert by Record Number)

This function inserts records at the position that is specified by the RecordNumber parameter and optionally returns the record key.

### Syntax

```
APIRET DDMInsertRecNum (HDDMFILE        FileHandle,
                        ULONG           AccessFlags,
                        PDDMRECORD      RecordBuf,
                        PDDMOBJECT      KeyFdbk,
                        ULONG           KeyFdbkLen,
                        RECNUM          RecordNumber,
                        ULONG           RecCount
                        );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **11–31** | Reserved flags |
| **10** | DDM_UPDCSR (Update Cursor) |
| **3–9** | Reserved flags |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **0–1** | Reserved flags |

For detailed information on access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the records to be inserted at the specified record number. When this function is called, the format of the record buffer is:

| | | | |
|---|---|---|---|
| LL | CP | Data | ... |

**Field** **Description**

**LL** The length (ULONG) of the record description from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following data is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is an ULONG inactive record length. The number of record descriptions (record Data or inactive record lengths) should be the same as the number indicated in the RecCount.

**Data** The data associated with this code point.

**KeyFdbk**

The pointer (PDDMOBJECT) to the key value feedback buffer of the last record inserted. If the DDM_KEYVALFB flag of AccessFlags has not been set, this parameter is ignored. The format of the key value feedback buffer on return from the function is:

| | | |
|---|---|---|
| LL | X'1115' | Key Value |

**Field** **Description**

**LL** The length (ULONG) of the response from the beginning of LL to the end of the Key Value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value.

**Key Value** The key value.

**KeyFdbkLen**

The length (ULONG) of the key value feedback buffer. The key value feedback buffer should be the same length as a key value, with an additional six bytes for the length and code point fields. If the DDM_KEYVALFB flag of AccessFlags has not been set, this parameter is ignored.

**RecordNumber**

The length (RECNUM) of the record number for the first record to be inserted. All other records are placed in consecutive record positions.

**RecCount**

The count (ULONG) of the record descriptions in the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DTARECRM | X'1206' | Invalid Data Record |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| DUPRNBRM | X'120A' | Duplicate Record Number |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYVALRM | X'1240' | Invalid Key Value |
| OBJNSPRM | X'1253' | Object Not Supported |
| RECDMGRM | X'1249' | Record Damaged |

## DDMInsertRecNum

| Message ID | Code Point | Message Title |
|---|---|---|
| RECIUSRM | X'124A' | Record in Use |
| RECLENRM | X'1215' | Record Length Mismatch |
| RECNBRRM | X'1224' | Record Number Out of Bounds |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

Records can only be inserted within the bounds of the file and only in inactive record positions:

- For sequential and keyed files, the bounds are record number 1 (inclusive) and the current EOF (exclusive).
- For direct files, the bounds are record number 1 For direct files, the bounds are:
  - Record number 1 (inclusive), and
  - The physical boundaries of the file (inclusive)

  as defined by the application when the file was created (this can be beyond the EOF position of the file).
- An alternate index file has the same bounds as its base file.

Depending on the value of the DDM_UPDCSR flag, the cursor can be set to the inserted record position or can retain its current setting.

The records in a Record Buffer are processed as a group. Inactive records in the group are treated as place holders between the active records as the group is inserted into the file. How the EOF is updated depends on the type of file. For example, if the file is a direct file and records are added at or beyond the current EOF, the EOF is only updated when an active record is inserted. Inactive records that follow the last active record will be located in the file at or beyond the EOF and are subject to overlay by other functions. See “DDMInsertRecEOF (Insert Records at EOF)” on page 85 for additional information and examples.

The RecCount parameter specifies the number of records to be inserted. The insertion of records begins at RecordNumber.

If RecCount specifies a value other than 1, the record number is increased after each record is inserted. The new record number must meet the same validity criteria as the original (previous) record number before the next record can be inserted. The validity criteria for record number refers to the file boundary rules for record insertion.

If RecCount specifies a value greater than 1 and the DDM_UPDCSR flag is set, the cursor is updated after each record is successfully inserted.

If Key Value Feedback is requested (DDM_KEYVALFB), the key value of the last record inserted is returned.

If the DDM_KEYVALFB flag is set and the file is not keyed, the flag is ignored.

The file index is updated when inserting records into a keyed or alternate index file or into the base file of an alternate index file.

If the file supports variable-length records whose lengths are changeable, the length of the record position is changed to match the length of the inserted record.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is based on the DDM_UPDCSR flag. If the DDM_UPDCSR flag is set, the cursor is moved to the inserted record. If the DDM_UPDCSR flag is not set, the cursor position is not changed.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was called. If RecCount is greater than 1, the cursor position is the same as before the last iteration of the function.

**Severe Termination (SVRCOD of 16 or higher)**
The CSRPOSST (Cursor Position Status) parameter on the reply message determines the cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If the file was opened for multiple updaters, then:

1. If the requester currently has a SHRRECLK on a record in the file, the SHRRECLK is released.
2. The access method attempts to acquire an EXCRECLK on the record.

   If the EXCRECLK cannot be obtained because of a lock conflict, the function is rejected with RECIUSRM. If the EXCRECLK is obtained, then:

   a. The record insert function is performed, and because all record modifications are committed at the time of modification, the EXCRECLK is released from the record.

   b. The obtained EXCRECLK is released from the record, even if the function is rejected with an error reply.

If the function ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued. If RecCount is greater than 1, the record locks are the same as before the last iteration of the function.
- For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message determines the state of the record locks.

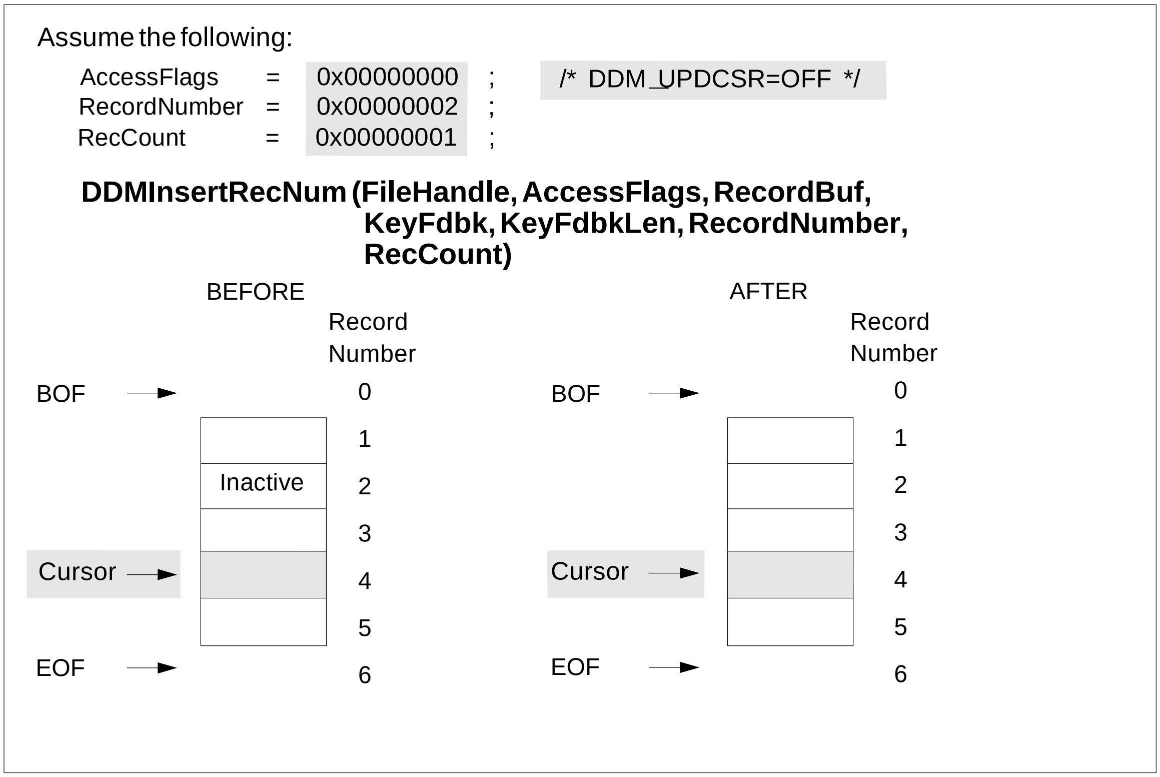
## DDMInsertRecNum

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The record buffer address is not greater than zero.<br>DDM_KEYVALFB access flag is specified and KeyFdbk is not specified. | ADDRRM |
| The file is not delete-capable and the record to be inserted is RECINA. | DTARECRM |
| One of the following sets of conditions exists:<br>• The file is the base file for an alternate index file.<br>• The alternate index file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the alternate index.<br>or<br>• The file is an alternate index file.<br>• The file's base file does not allow duplicate keys, or another alternate index file with the same base file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the file's base file or in another alternate index file with the same base file. | DUPKDIRM |
| The following are true:<br>• The file is a keyed file or an alternate index file.<br>• The file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value in the file index. | DUPKSIRM |
| The RecordNumber parameter specifies a record position that contains an active record. | DUPRNBRM |
| The file handle is invalid. | HDLNFNRM |
| Any of the reserved bits are set in the access flags. | INVFLGRM |
| The file was opened without INSAI (Insert Record) access intent. | INVRQSRM |
| The following are true:<br>• The file supports variable-length records.<br>• The file is a keyed file or an alternate index file.<br>• The record to be inserted does not contain all of the fields for the specified file key. | KEYVALRM |
| The Keyfdbk is not large enough to hold the returned key. | LENGTHRM |
| The data in the record is not a valid record. | OBJNSPRM |
| The record is to be inserted at a position that does not contain an active or inactive record. | RECDMGRM |
| An EXCRECLK lock cannot be obtained on the file. | RECIUSRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The combination of the following two are true:<br>• The file supports variable-length records whose lengths are not changeable (RECIVL).<br>• The record length of the record to be inserted is not equal to the record position length.<br>The record length of the record to be inserted exceeds the maximum record length of the file or is less than the minimum record length.<br>The following conditions are *not* true:<br>• If the record length class (RECLENCL) is fixed and the record to be inserted is an active record, the length of the record to be inserted (LL) must be equal to the record length (RECLEN) plus the length of the record header. (See "RECORD (Record)" on page 394 for more information.)<br>• If the record to be inserted is an inactive record, the record length specified in the inactive record (Data) must be equal to the record length (RECLEN) for the file. (See "RECINA (Inactive Record)" on page 391 for more information.) | RECLENRM |
| The RecordNumber parameter specifies a value that is outside the bounds of the file, for example:<br>• The record is outside the bounds for a direct file.<br>• The record would be inserted past the EOF for nondirect files.<br>• RecordNumber is not greater than zero. | RECNBRRM |
| RecCount is not greater than zero. | VALNSPRM |

## Examples

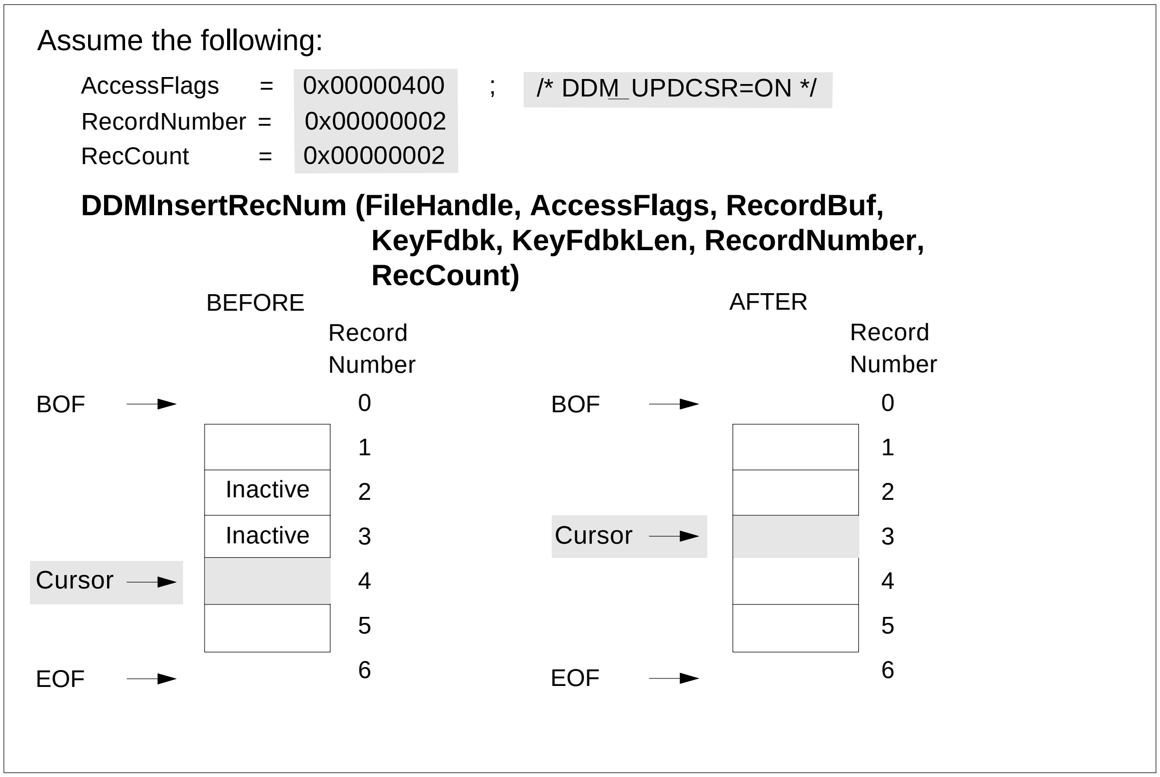


Assume the following:

```
AccessFlags   =  0x00000000  ;   /* DDM_UPDCSR=OFF */
RecordNumber  =  0x00000002  ;
RecCount      =  0x00000001  ;
```

**DDMInsertRecNum (FileHandle, AccessFlags, RecordBuf,
KeyFdbk, KeyFdbkLen, RecordNumber,
RecCount)**

*Figure 16. DDMInsertRecNum Function*



Assume the following:

```
AccessFlags     =  0x00000400   ;   /* DDM_UPDCSR=ON */
RecordNumber =  0x00000002
RecCount        =  0x00000002
```

**DDMInsertRecNum (FileHandle, AccessFlags, RecordBuf, KeyFdbk, KeyFdbkLen, RecordNumber, RecCount)**

*Figure 17. DDMInsertRecNum Function with Multiple Records*

## DDMLoadFileFirst (Load Records into File)

This function loads a file with one or more records that are contained in the record buffer.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMLoadFileFirst (PSZ            FileName,
                         PHDDMLOAD      LoadHandle,
                         ULONG          Flags,
                         PDDMRECORD     RecordBuf,
                         ULONG          RecCount,
                         );
```

### Parameters

**FileName**
The pointer (PSZ) to the name of the record-oriented file to be loaded.

**LoadHandle**
The pointer (PHDDMLOAD) to the location where the system returns a handle value that is to be used with a subsequent corresponding DDMLoadFileNext function.

**Flags**
The Flags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **1–31** | Reserved flags |
| **0** | DDM_CHAIN |

This bit notifies the system to keep system resources allocated on behalf of this LoadFile. When the chaining bit is on, any unwritten chained (related) buffers are to be written out or sent to the target system. This occurs on the completion of a DDMLoadFileNext function that has the DDM_CLOSE flag bit set to a value of 1.

When the chaining bit is off:

- The DDM server is allowed to deallocate resources on completion of the DDMLoadFileFirst function.
- A NULL value is returned for LoadHandle.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer. The record buffer can contain the following objects:

RECORD
RECINA

RECAL

These objects can be in mixed order, and they can be repeated.

The format of the record buffer when calling DDMLoadFileFirst is:

| | | | |
|---|---|---|---|
| LL | CP | Data | ... |

**Field** **Description**

**LL** The length (ULONG) of the record description from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data, an inactive record length, or a record attribute list containing a record number and record data.

**X'144A'** Indicates that the following data is record data (RECORD).

**X'142D'** Indicates that the following data is an inactive record (RECINA).

**X'1430'** Indicates that the following data is a Record Attribute List (RECAL) and can contain RECCNT, RECNBR, or both:

If CP is a record attribute list, the format of DATA is:

| | | | | | |
|---|---|---|---|---|---|
| L2 | X'111A' | RC | L3 | X'111D' | RN |

| | | |
|---|---|---|
| L4 | CP | Data |

**Field** **Description**

**L2** The length (ULONG) from the beginning of L2 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT (Record Count) parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N≥0, without replicating the contents of the record.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L3** The length (ULONG) from the beginning of L3 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list. When RC and RN are both specified, the record number specified by RN applies to the first occurrence of the record. Each subsequent record has a record number one greater than the previous record.

**L4** The length (ULONG) of the record description from beginning of L4 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a length (ULONG) of an inactive record.

**Data** The record data or the length (ULONG) of an inactive record.

If CP is a record or inactive record description, the format of Data is the record data or the length (ULONG) of an inactive record.

**RecCount**
The count (ULONG) of the record descriptions in the record buffer.

The number of record descriptions (record data and inactive record lengths) should be the same number as indicated in the record count. When a RECAL (Record Attribute List) is specified in RecordBuf and RECCNT of N is specified within the RECAL, the RecCount parameter reflects the N duplicate records. Therefore if RecordBuf contained 10 data records and a RECAL, with RECCNT having a value of 100, the value of RecCount would be 110.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DTARECRM | X'1206' | Invalid Data Record |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| DUPRNBRM | X'120A' | Duplicate Record Number |
| FILATHRM | X'123B' | Not Authorized to File |
| FILDMGRM | X'125A' | File Damaged |
| FILFULRM | X'120C' | File is Full |
| FILIUSRM | X'120D' | File In Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYVALRM | X'1240' | Invalid Key Value |
| LENGTHRM | X'F211' | Field Length Error |
| OBJNSPRM | X'1253' | Object Not Supported |
| RECDMGRM | X'1249' | Record Damaged |
| RECLENRM | X'1215' | Record Length Mismatch |
| RECNBRRM | X'1224' | Record Number Out of Bounds |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

A set of records can be transferred to a target server and:

- Placed in an empty, existing file.
- Appended to the records in an existing file.
- Distributed into record positions of an existing file.

The record buffer can contain any of the following items and any combination of these items:

- One or more inactive records.
- One or more records.
- One or more RECAL (Record Attribute List) parameters that contains a record and record number. If the record attribute list contains a key value attribute, the key value attribute is ignored.

The DDMLoadFileFirst function begins to load records into a file that is based on the following:

- If the first object is a record or an inactive record, the records are loaded at the EOF position for the file. In this case, the operation of DDMLoadFileFirst is similar to the DDMInsertRecEOF function.
- If the first object is a record attribute list, the records are loaded at the record position that is specified by the record number attribute. In this case, the operation of DDMLoadFileFirst is similar to the DDMInsertRecNum function.

Subsequent records are loaded in the next higher record position until a RECAL (Record Attribute List) is found or until the entire RecordBuf has been processed. If a RECAL parameter is found, the records that follow are loaded starting with the record position that is specified by the record number value (RN). This allows nonsequential loading of the file.

The records in RecordBuf are processed as a group. Inactive records in the group are treated as place holders between the active records as the group is inserted into the file. How the EOF is updated depends on the type of file. For example, if the file is a direct file and records are added at or beyond the current EOF. The EOF is only updated when an active record is inserted. Inactive records that follow the last active record will be located in the file at or beyond the EOF and are subject to overlay by other functions. See “DDMInsertRecEOF (Insert Records at EOF)” on page 85 for additional information and examples.

If the target file is a keyed file or the base file for an alternate index file, the appropriate indexes are updated as the records are loaded.

An inactive record can be loaded to an inactive record position of a delete-capable file that causes the record position to remain inactive.

If an error condition is encountered, do not use the file handle in a DDMLoadFileNext.

## Effect on Cursor Position

There is no effect on the cursor position because the file is not open.

## Locking (for Local VSAM File System Only)

DDMLoadFileFirst does the following:

1. Attempts to obtain a MODNONLK on the file.

   If the MODNONLK is obtained, the function is processed (successfully or unsuccessfully). If the MODNONLK is not obtained, the function is rejected with FILIUSRM.

2. Releases the MODNONLK it obtained on the file if the DDM_CHAIN bit is not active. If the DDM_CHAIN bit is active, the lock is released by DDMLoadFileNext with the DDM_CLOSE bit active.

If the function ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

## Exceptions

| This Causes the Function to be Terminated | With This Reply Message |
|---|---|
| The file gets full when loading. | FILFULRM |
| The MODNONLK cannot be obtained on the file. | FILIUSRM |
| The function tried to load the records outside the bounds of the file.<br>**Note:** This can occur if the RecCount parameter did not include the actual number of records that was specified in the RECAL descriptor. | RECNBRRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The record buffer address is not greater than zero. | ADDRRM |
| The file is not delete-capable and the record to be inserted is RECINA. | DTARECRM |
| The following are true:<br>• The file is a keyed file.<br>• An associated alternate index file does not allow duplicate keys.<br>• The loading of records would result in a duplicate key value. | DUPKDIRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The following are true:<br>• The file is a keyed file.<br>• The file does not allow duplicate keys.<br>• The loaded record would result in a duplicate key value. | DUPKSIRM |
| An attempt is made to load a record at an active record position. | DUPRNBRM |
| The file that the records are loaded into is a non-DDM file. | FILATHRM |
| The file has already been opened by DDMOpen, DDMLoadFileFirst (DDM_CHAIN flag on), or DDMUnLoadFileFirst (More Data flag on). | FILIUSRM |
| Any of the reserved bits are set in the access flags. | INVFLGRM |
| DDM_CHAIN is specified and LoadHandle is not specified.<br>The file does not have insert or modify capability. | INVRQSRM |
| The following are true:<br>• The file supports variable-length records.<br>• The file is a keyed file or the base file of an alternate index file.<br>• The record to be loaded does not contain all of the fields for the specified file key. | KEYVALRM |
| The records to be loaded are not active or inactive. | OBJNSPRM |
| The active or inactive records to be loaded are too long or too short for the record positions in the file. | RECLENRM |
| A RECAL specifies a RECNBR that is outside the boundaries of the file (see “DDMInsertRecNum (Insert by Record Number)” on page 100 for definition of file boundaries). | RECNBRRM |
| RecCount is not greater than zero. | VALNSPRM |

| This Causes a Reply Message to be Generated with SRVCOD = X'04' for each out-of-sync file in the file object. The Function Continues | With This Reply Message |
|---|---|
| If the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file.<br>DDMLoadFileFirst or DDMLoadFileNext re-synchronizes the file-change date and time during close processing unless a higher severity condition prevents it from doing so. | FILDMGRM |

## Examples

Assume the following:

```
RecordBuf   =  {0x0000000A, 0x144A, 'XXXX',
                0x0000000A, 0x144A, 'YYYY'}   ;
Flags       =    0x00000000  ;
RecCount    =    0x00000002  ;
```

**DDMLoadFileFirst (FileName, LoadHandle, Flags, RecordBuf, RecCount)**

Has the following effect:

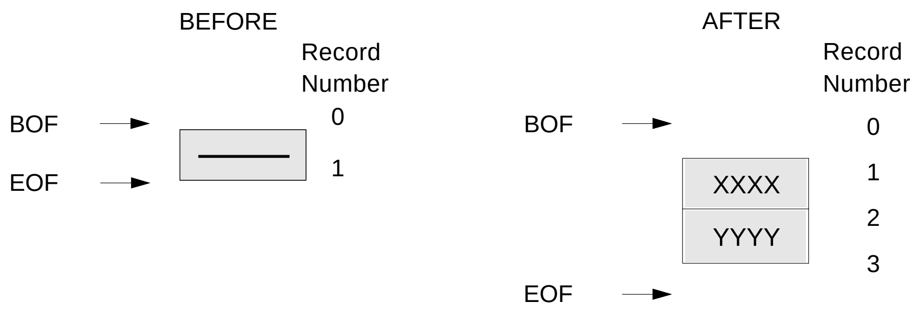


*Figure 18. DDMLoadFileFirst Function to a New File*

Assume the following:

```
RecordBuf   =  {0x0000000A, 0x144A, 'XXXX',
                0x0000000A, 0x144A, 'YYYY'}   ;
Flags       =   0x00000000   ;
RecCount    =   0x00000002   ;
```

**DDMLoadFileFirst (FileName, LoadHandle, Flags, RecordBuf, RecCount)**

Has the following effect:

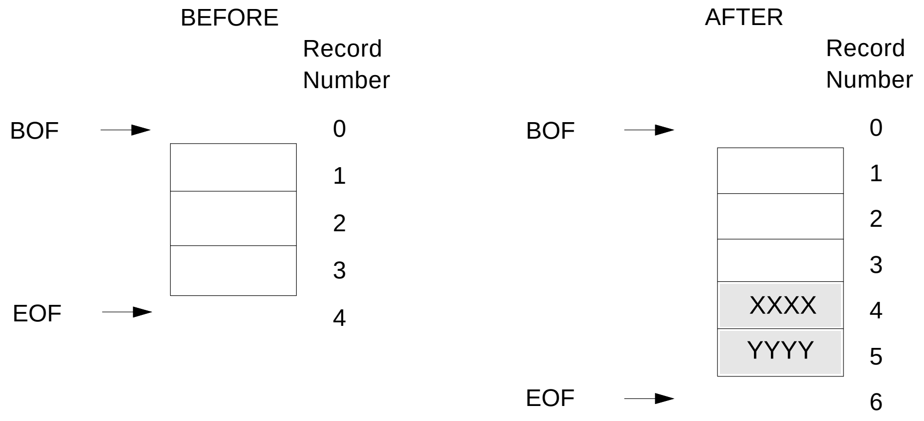
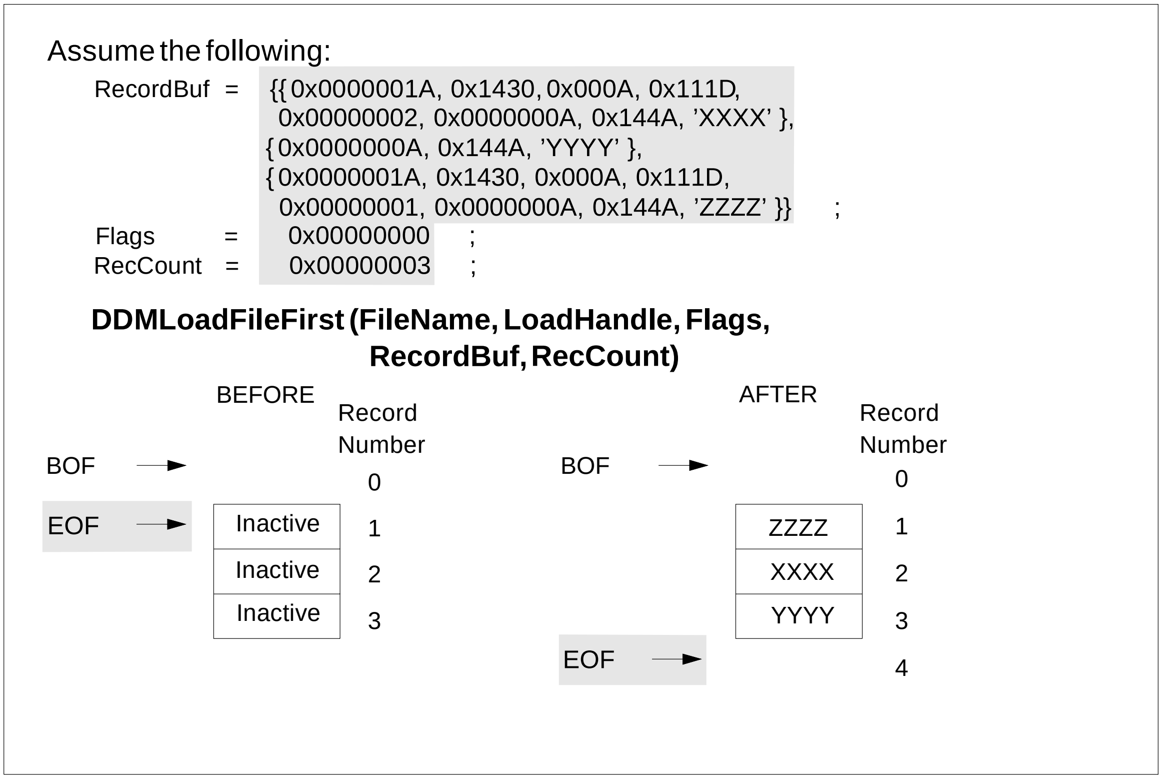


*Figure 19. DDMLoadFileFirst Function to Append to a File*



Assume the following:

```
RecordBuf  =  {{0x0000001A, 0x1430, 0x000A, 0x111D,
                0x00000002, 0x0000000A, 0x144A, 'XXXX' },
               {0x0000000A, 0x144A, 'YYYY' },
               {0x0000001A, 0x1430, 0x000A, 0x111D,
                0x00000001, 0x0000000A, 0x144A, 'ZZZZ' }}     ;
Flags      =    0x00000000    ;
RecCount   =    0x00000003    ;
```

**DDMLoadFileFirst (FileName, LoadHandle, Flags, RecordBuf, RecCount)**

*Figure 20. DDMLoadFileFirst Function to Random Load a Direct File*

## DDMLoadFileNext (Load Records into File)

This function continues the load of a file with the records that are contained in the record buffer.

**Note:** This function should be called after the DDMLoadFileFirst function.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMLoadFileNext (HDDMLOAD        LoadHandle,
                        ULONG           Flags,
                        PDDMRECORD      RecordBuf,
                        ULONG           RecCount
                        );
```

## Parameters

**LoadHandle**
The handle value (HDDMLOAD) previously returned to the caller with DDMLoadFileFirst.

**Flags**
The Flags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **1–31** | Reserved flags |
| **0** | DDM_CLOSE (Close LoadFile Requests).<br>A value of 1 for this bit flag notifies the system to end LoadHandle-based chaining and to deallocate LoadHandle-based system resources for this function. Any unwritten chained (related) buffers are written out or sent to the target system on the completion of the DDMLoadFileNext function. |

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer. The record buffer can contain the following objects:

RECORD
RECINA
RECAL

These objects can be in mixed order, and they can be repeated. It is not an error for the record buffer to be null when the DDM_CLOSE flag is set to 1. The format of the record buffer when calling DDMLoadFileNext is:

| | | | |
|---|---|---|---|
| LL | CP | Data | ... |

## DDMLoadFileNext

**Field** **Description**

**LL** The length (ULONG) of the record description from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data, an inactive record length, or a record attribute list containing a record number and record data.

- **X'144A'** Indicates that the following data is record data (RECORD).
- **X'142D'** Indicates that the following data is an ULONG length of an inactive record (RECINA).
- **X'1430'** Indicates that the following data is a RECAL (Record Attribute List), and can contain RECCNT, RECNBR, or both.

If CP is a record attribute list, the format of the DATA is:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| L2 | X'111A' | RC | L3 | X'111D' | RN | L4 | CP | Data |

**Field** **Description**

**L2** The length (ULONG) from the beginning of L2 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a RECCNT (Record Count). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N≥0, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L3** The length (ULONG) from the beginning of L3 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list. When RC and RN are both specified, the record number specified by RN applies to the first occurrence of the record. Each subsequent record has a record number one greater than the previous record.

**L4** The length (ULONG) of the record description from beginning of L4 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is an ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of an inactive record.

If CP is a record or inactive record description, the format of DATA is the record data or the length (ULONG) of an inactive record.

**RecCount**
The count (ULONG) of the record descriptions in the record buffer.

The number of record descriptions (record data and inactive record lengths) should be the same number as indicated in the record count. When a RECAL (Record Attribute List) is specified in RecordBuf and RECCNT of N is specified within the RECAL, the RecCount parameter reflects the N duplicate records. Therefore if RecordBuf contained 10 data records and a RECAL, with RECCNT having a value of 100, the value of RecCount would be 110.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DTARECRM | X'1206' | Invalid Data Record |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| DUPRNBRM | X'120A' | Duplicate Record Number |
| FILFULRM | X'120C' | File is Full |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| KEYVALRM | X'1240' | Invalid Key Value |
| LENGTHRM | X'F211' | Field Length Error |
| OBJNSPRM | X'1253' | Object Not Supported |
| RECDMGRM | X'1249' | Record Damaged |
| RECLENRM | X'1215' | Record Length Mismatch |
| RECNBRRM | X'1224' | Record Number Out of Bounds |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

A set of records can be transferred to a target server and either:

- Appended to the records in an existing file, or
- Distributed into record positions of an existing file.

The record buffer can contain any of the following items and any combination of these items:

- One or more inactive records.
- One or more records.
- One or more RECAL (Record Attribute List) parameters that contains a record and record number. If the record attribute list contains a key value attribute, the key value attribute is ignored.

DDMLoadFileNext begins to load records into a file that is based on the following:

- If the first object is a record or an inactive record, the records are loaded at the EOF position for the file. In this case, the operation of DDMLoadFileNext is similar to the DDMInsertRecEOF function.
- If the first object is a record attribute list, the records are loaded at the record position that is specified by the record number attribute. In this case, the operation of DDMLoadFileNext is similar to the DDMInsertRecNum function.

Subsequent records are loaded in the next higher record position until a RECAL (Record Attribute List) is found or until the entire RecordBuf has been processed. If a record attribute list is found, the records that follow are loaded starting with the record position that is specified by the record number value (RN). This allows nonsequential loading of the file.

The records in a Record Buffer are processed as a group. Inactive records in the group are treated as place holders between the active records as the group is inserted into the file. How the EOF is updated depends on the type of file. For example, if the file is a direct file and records are added at or beyond the current EOF, the EOF is only updated when an active record is inserted. Inactive records that follow the last active record will be located in the file at or beyond the EOF and are subject to overlay by other functions. See “DDMInsertRecEOF (Insert Records at EOF)” on page 85 for additional information and examples.

If the target file is a keyed file or the base file for an alternate index file, the appropriate indexes are updated as the records are loaded.

An inactive record can be loaded to an inactive record position of a delete-capable file causing the record position to remain inactive.

If an error condition is encountered, do not use the file handle in a DDMLoadFileNext.

## Effect on Cursor Position

There is no effect on the cursor position because the file is not open.

## Locking (for Local VSAM File System Only)

DDMLoadFileNext releases the MODNONLK that was obtained by DDMLoadFileFirst on the file, provided the DDM_CLOSE bit is active.

If this function ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

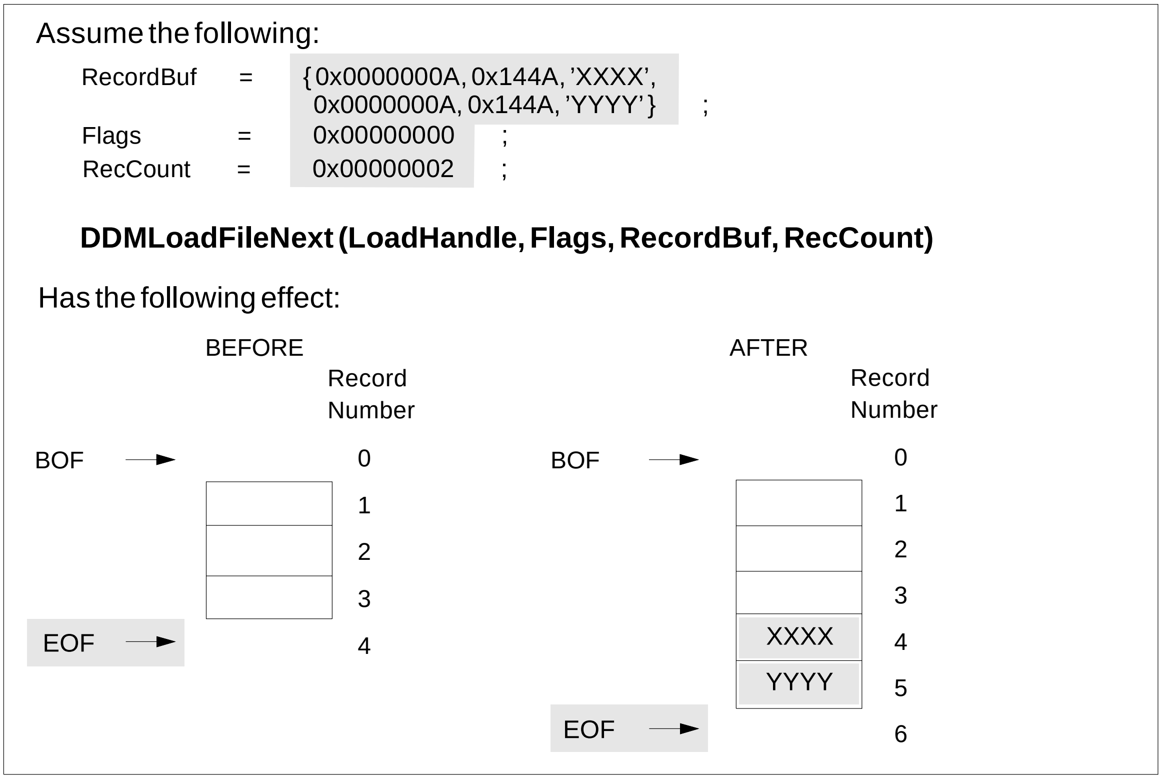
## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The record buffer address is not greater than zero. | ADDRRM |
| The file is not delete-capable and the record to be inserted is RECINA.<br>**Note:** An inactive record can be loaded to an inactive record position of a delete-capable file causing the record position to remain inactive. DTARECRM is not returned in this case. | DTARECRM |
| The following are true:<br>• The file is the base file for an alternate index file.<br>• The alternate index file does not allow duplicate keys.<br>• The inserted record would result in a duplicate key value. | DUPKDIRM |
| The following are true:<br>• The file is a keyed file.<br>• The file does not allow duplicate keys.<br>• The loaded record would result in a duplicate key value. | DUPKSIRM |
| An attempt is made to load an active or inactive record at an active record position. | DUPRNBRM |
| The handle from DDMLoadFileFirst is not used as the handle for a DDMLoadFileNext. | HDLNFNRM |
| The file gets full when loading. | FILFULRM |
| Any of the reserved bits are set in Flags. | INVFLGRM |
| The following are true:<br>• The file supports variable-length records.<br>• The file is a keyed file or the base file of an alternate index file.<br>• The record to be loaded does not contain all of the fields for the specified file key. | KEYVALRM |
| The records to be loaded were not valid records. | OBJNSPRM |
| The active or inactive records to be loaded are too long or too short for the record positions in the file. | RECLENRM |

## DDMLoadFileNext

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| A RECAL specifies a RECNBR that is outside the boundaries of the file (see “DDMInsertRecNum (Insert by Record Number)” on page 100 for definitions of file boundaries).<br>The function tried to load records outside the bounds of the file.<br>**Note:** This can occur if the record count parameter did not include the actual number of records that was specified in the RECAL descriptor. | RECNBRRM |
| RecCount is not greater than zero. | VALNSPRM |

## Examples



Assume the following:

```
RecordBuf    =   {0x0000000A, 0x144A, 'XXXX',
                  0x0000000A, 0x144A, 'YYYY'}   ;
Flags        =    0x00000000     ;
RecCount     =    0x00000002     ;
```

**DDMLoadFileNext (LoadHandle, Flags, RecordBuf, RecCount)**

Has the following effect:

*Figure 21. DDMLoadFileNext Function to Append to a File*

## DDMModifyRec (Modify Record)

This function modifies a record that has an update intent placed on it.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMModifyRec (HDDMFILE        FileHandle,
                     ULONG           AccessFlags,
                     PDDMRECORD      RecordBuf
                     );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **10–31** | Reserved flags |
| **9** | DDM_INHMODKY (Inhibit Modified Keys) |
| **0–8** | Reserved flag |

For detailed information on access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the record. The format of the record buffer when calling the function is:

| | | |
|---|---|---|
| LL | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record description from the beginning of LL to the end of record data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| HDLNFNRM | X'1257' | File Handle Not Found |

| Message ID | Code Point | Message Title |
|---|---|---|
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYUDIRM | X'1201' | Key Update Not Allowed by Different Index |
| KEYUSIRM | X'123F' | Key Update Not Allowed by Same Index |
| KEYVALRM | X'1240' | Invalid Key Value |
| OBJNSPRM | X'1253' | Object Not Supported |
| RECLENRM | X'1215' | Record Length Mismatch |
| UPDINTRM | X'124E' | No Update Intent on Record |

## Remarks

DDMModifyRec has the following effects:

- For a sequential or direct file, the contents of the record with the update intent are replaced with the supplied record.
- If the modification affects the key field (or fields) and DDM_INHMODKY is set, the function fails with a Key Update Not Allowed (KEYUDIRM or KEYUSIRM) message. Otherwise, the contents of the record with the update intent are replaced with the replacement record.
- For keyed and alternate index files, the associated indexes are updated.
- The record position becomes active if it was not active before.
- The cursor position does not change; it points to the same record position at the completion of the function.
- If the file supports variable-length records whose length is changeable, the length of the record position is changed to match the length of the modified record.
- Update intent is removed.

Before DDMModifyRec can be used, an update intent must be placed on a record in the file. A DDMSet*xxxx* or DDMGetRec function can be used to place an update intent on a record.

For direct files, EOF may change if the modified record was an inactive record that was past the current EOF.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is not changed.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The CSRPOSST (Cursor Position Status) parameter on the reply message determines the cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If the file was opened for multiple updaters:

1. The access method attempts to acquire an EXCRECLK lock on the record that has an update intent placed on it. If the EXCRECLK lock cannot be obtained because of a lock conflict, the function is rejected with the RECIUSRM reply message.
2. If the EXCRECLK lock is obtained, the DDMModifyRec function is performed. Because all record modifications are committed at the time of modification, the EXCRECLK lock is released from the record. Even if the function is rejected with an error reply, the obtained EXCRECLK lock is released from the record.

If DDMModifyRec ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message determines the state of the record lock.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| RecordBuf address is not supplied. | ADDRRM |
| Modification would result in duplicate keys in associated index file. | DUPKDIRM |
| Modification would result in duplicate keys in current index file. | DUPKSIRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits are set in the access flags. | INVFLGRM |
| The MODAI access intent was not specified when the file was opened. | INVRQSRM |
| KEYUDIRM | Modification would cause key in associated index file to be modified. |
| Modification would cause key in current index file to be modified. | KEYUSIRM |
| The file supports variable-length records; the file is a keyed file or an alternate index file; and the modified record does not contain all of the fields for the specified file key. | KEYVALRM |
| A record other than an active record is sent as the modified record. | OBJNSPRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The following are true:<br>• The file supports variable-length records whose length is not changeable (initially variable).<br>• The record length of the modified record is not equal to the record position length.<br>The record in the RecordBuf is not the correct length. | RECLENRM |
| The EXCRECLK lock cannot be obtained on the file. | RECIUSRM |
| No record in the file has an update intent placed on it. | UPDINTRM |

## Example

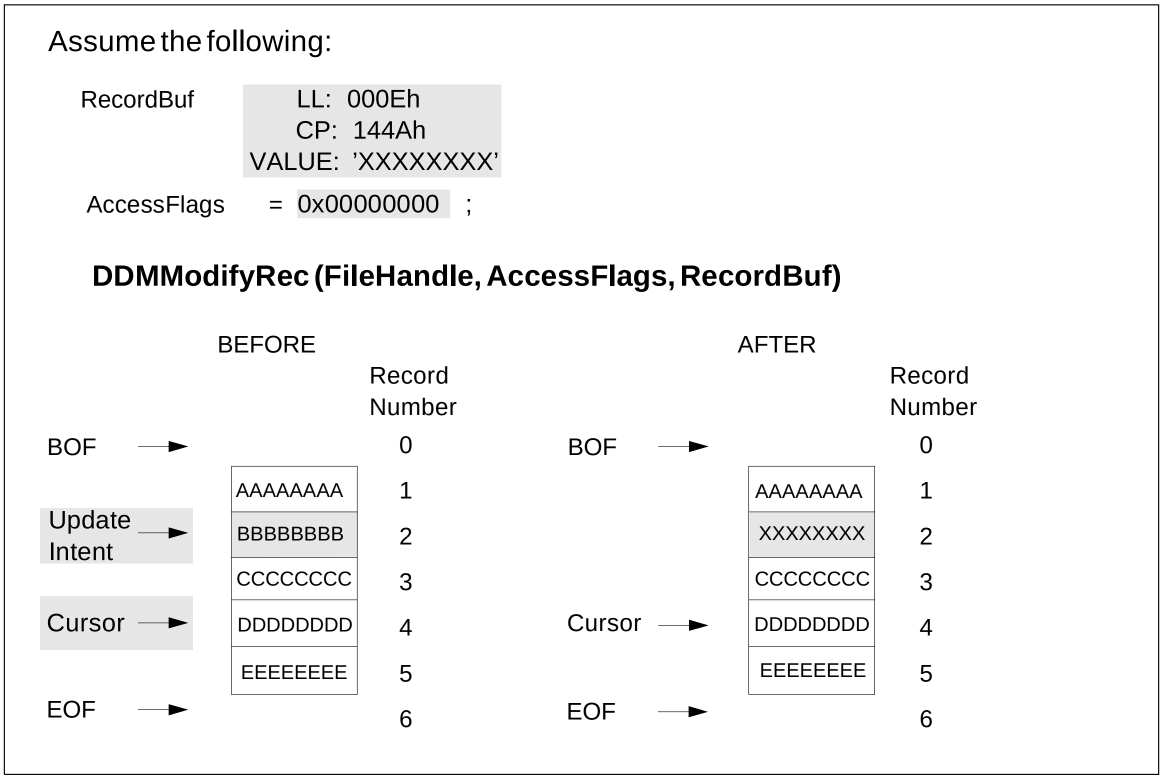


*Figure 22. DDMModifyRec Function. The BEFORE state illustrates a case where the cursor and the update intent are on different records. This occurs when a function like DDMSetUpdateNum or DDMSetRecNum is issued using the DDM_HLDCSR and DDM_UPDINT flags.*

## DDMOpen (Open File)

This function establishes a logical connection between the using program on the source system and the accessed file on the target system.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMOpen (PSZ              FileName,
                PHDDMFILE        FileHandle,
                CODEPOINT        AccessMethod,
                ULONG            AccIntList,
                USHORT           FileShare,
                PBYTE            EABuf,
                PBYTE            (reserved)
                );
```

## Parameters

**FileName**
The pointer (PSZ) to the name of the record-oriented file to be opened.

**FileHandle**
The pointer (PHDDMFILE) to the file handle returned for use on all subsequent file access and close requests for the file that is being opened.

**AccessMethod**
The value (CODEPOINT) indicating the requested access method for the file. Specifying the appropriate value identifies the requested access method. Valid values are:

| Value | Description |
|---|---|
| **X'1433'** | RELRNBAM (Relative by Record Number) |
| **X'1435'** | RNDRNBAM (Random by Record Number) |
| **X'1407'** | CMBRNBAM (Combined Record Number) |
| **X'1432'** | RELKEYAM (Relative by Key) |
| **X'1434'** | RNDKEYAM (Random by Key) |
| **X'1406'** | CMBKEYAM (Combined Keyed) |
| **X'1405'** | CMBACCAM (Combined Access) |

The choice of access method can affect read performance. For more information about access methods, see “Access Methods” on page 18.

**AccIntList**
The value (ULONG) that specifies the access functions that will be used based on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **7-31** | Reserved flags |

**6** DDM_FAILONERROR (Fail-Errors)

Specifies the handling of media I/O errors.

This bit is the same as DosOpen with OpenMode bit FAIL_ON_ERROR.

**5** Reserved For Future Use

**4** DDM_WRITETHRU (File Write-Through)

The file is opened as follows:

- 0 — any data that is written to the file may be cached in memory and written to the media at a later time.
- 1 — any data that is written to the file may be cached in memory. However, the data is immediately written to the media synchronously with the request.

This bit is the same as DosOpen with OpenMode bit OPEN_FLAGS_WRITE_THROUGH.

**3** DDM_DELAI (Delete Record)

Specifies that the requester intends to delete records from the file. If DDM_DELAI is not specified, the DDMDeleteRec function is rejected with the INVRQSRM reply message.

This bit is the same as DosOpen with OpenMode bit OPEN_ACCESS_READWRITE.

**2** DDM_MODAI (Modify Record)

Specifies that the requester intends to modify existing records in the file. If the DDM_MODAI intent is not specified, the following functions are rejected with the INVRQSRM reply message.

- DDMTruncFile
- DDMModifyRec

This bit is the same as DosOpen with OpenMode bit OPEN_ACCESS_READWRITE.

**1** DDM_INSAI (Insert Record)

Specifies that the requester intends to insert records into the file. If the DDM_INSAI intent is not specified, the following functions are rejected with the INVRQSRM reply message.

- DDMInsertRecNum
- DDMInsertRecEOF
- DDMInsertRecKey

This bit is the same as DosOpen with OpenMode bit OPEN_ACCESS_READWRITE.

**0** DDM_GETAI (Get Record)

Specifies that the requester intends to retrieve records from the file. If DDM_GETAI is not specified, the DDMGetRec function is rejected with the INVRQSRM reply message.

If DDM_GETAI is not specified and DDM_NODATA is not set, the following functions are rejected with the INVRQSRM reply message.

- DDMGetRec
- DDMSetFirst
- DDMSetKey
- DDMSetKeyFirst
- DDMSetKeyLast
- DDMSetKeyNext
- DDMSetKeyPrevious
- DDMSetLast
- DDMSetMinus
- DDMSetRecNum
- DDMSetNextRec
- DDMSetNextKeyEqual
- DDMSetPlus
- DDMSetPrevious
- DDMSetUpdateKey
- DDMSetUpdateNum.

This bit is the same as DosOpen with OpenMode bit OPEN_ACCESS_READONLY (if no other access intent is specified along with GETAI).

**FileShare**

Specifies the value (USHORT) for the concurrent users with which the requester is willing to share the file. The valid values are:

**X'0001'** DDM_NOSHARE (None). This value allows no concurrent users.

This bit is the same as DosOpen with OpenMode bit OPEN_SHARE_DENYREADWRITE.

**X'0002'** DDM_READERS (Readers). This value allows sharing with concurrent users who only intend to read records from the file.

This bit is the same as DosOpen with OpenMode bit OPEN_SHARE_DENYWRITE.

**X'0003'** DDM_UPDATERS (Updaters). This value allows sharing with concurrent users who intend to update records in the file.

This bit is the same as DosOpen with OpenMode bit OPEN_SHARE_DENYNONE.

**Note:** The combination of the AccIntList and the FileShare value that are specified determines what implicit lock is obtained on the file.

**EABuf**
The pointer (PBYTE) to the file's EA data to be returned by DDMOpen or NULL. See “Extended Attributes” on page 5 for more information on the format of this buffer.

**(reserved)**
This pointer (PBYTE) is reserved for future use and must be specified as NULL.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ACCATHRM | X'1230' | Not Authorized to Access Method |
| ACCINTRM | X'1266' | Access Intent List Error |
| ACCMTHRM | X'1231' | Invalid Access Method |
| ADDRRM | X'F212' | Address Error |
| FILATHRM | X'123B' | Not Authorized to File |
| FILDMGRM | X'125A' | File Damaged |
| FILIUSRM | X'120D' | File in Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| FILSNARM | X'120F' | File Space Not Available |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INTATHRM | X'125C' | Not Authorized to Open Intent for Named File |
| INVFLGRM | X'F205' | Invalid Flags |
| OPNMAXRM | X'1244' | Concurrent Opens Exceeds Maximum |
| PRMNSPRM | X'1251' | Parameter Not Supported |
| RSCLMTRM | X'1233' | Target Resource Limits Reached |

## Remarks

Once the connection is established, access method commands can flow between the source and target systems.

The target server uses both AccessMethod and AccIntList to determine the access method that is required by the user. If the required support is not available in the target server, the function is rejected with the ACCMTHRM reply message.

The DDM architecture permits the DDM server to promote a user-specified lower-level access method class to a file to a higher-level access method class. All subsequent access to this file are processed as though the promoted access method class has been specified by the user. The promotion values for record-oriented access methods are described in “Access Methods” on page 18.

The AccIntList is used to limit the use of valid functions in an access method.

The FileShare value indicates the type of concurrent users with which the requester is willing to share the file while processing the file. This permits the requester to ensure that concurrency problems do not occur.

In the local VSAM file system, to process a keyed file via an associated alternate index file, it is only necessary for the user to issue a DDMOpen for the alternate index file. Issuing a subsequent DDMOpen for another alternate index (of the same keyed file) or for the keyed file itself, is considered *concurrent use* by the local VSAM file system. Concurrent use requires that the AccIntList and FileShare parameters of the DDMOpen functions be compatible. For example, if an alternate index file is opened with `AccIntList=MODAI` and `FileShare=Readers`, any subsequent DDMOpen function issued for another alternate index of the same keyed file requires `AccIntList=GETAI` and `FileShare=Updaters`. Otherwise, the subsequent DDMOpen will fail. (See “Locking (for Local VSAM File System Only)” for more information.)

When the file is opened, the cursor is set to the BOF position.

An example of requesting Extended Attributes (EAs) is provided on page 5.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor is created and moved to the beginning of the file.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The CSRPOSST (Cursor Position Status) parameter on the reply message determines the cursor position.

## Locking (for Local VSAM File System Only)

DDMOpen does the following:

1. Acquires a file lock on the file. For keyed and alternate index files, an equivalent file lock is placed on the keyed file and each of its associated index files. This occurs when the command is issued for the keyed file or for any of its associated alternate index files. The type of lock that is acquired is dependent on the values of the AccIntList and FileShare parameters. Table 16 on page 134 specifies the type of file lock the DDMOpen function acquires.

   For keyed and alternate index files, an equivalent file lock is placed on the keyed file and each of its associated index files. This occurs when the function is issued for the keyed file or any of its associated alternate index files.

2. Acquires only one file lock on the file. This file lock is not released until the file is closed.

   For keyed and alternate index files, only one lock per file is acquired. The file locks are not released until the file is closed.

3. If the function ends with a reply message that has a severity code of ERROR or higher, then:

   - For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
   - Severe Termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

## DDMOpen

*Table 16. File Locks Obtained by DDMOpen for Record Files*

| | **File Access Intents (AccIntList)** | |
|---|---|---|
| **File Sharing (FileShare)** | **GETAI Only** | **MODAI, DELAI, INSAI** |
| None | GETNONLK | MODNONLK |
| Reader | GETGETLK | MODGETLK |
| Updater | GETMODLK | (See Note) |

**Note:** In this case, the file is being opened so that both the requester and concurrent users can update the file. (This is referred to as "opened for multiple updaters" elsewhere in this document.) For the files where the local VSAM file system supports implicit record locks, a MODMODLK lock is acquired. Otherwise, a MODGETLK file lock is acquired.

## Exceptions

| **This Causes the Function to be Rejected** | **With This Reply Message** |
|---|---|
| If the user attempts to open a file without setting at least one of the following bits in AccIntList:<br>• GETAI<br>• INSAI<br>• MODAI<br>• DELAI | ACCINTRM |
| The target server does not support the access method specified by AccessMethod and AccIntList. | ACCMTHRM |
| DDMOpen is issued against a keyed file or any of its associated indexes and the associated indexes have recorded, in DDM_BASCHGDT, the last-change date/time for the base file that is different from the current system last-change date/time (System Object Attribute). | FILDMGRM |
| The file lock cannot be acquired because of a lock conflict. | FILIUSRM |
| The user attempts to open a file with an access intent (specified in AccIntList) for which the file is not allowed. | INTATHRM |
| The file lock cannot be acquired because of insufficient lock manager resources or because of an implementation file lock maximum. | RSCLMTRM |

| **This Causes a Reply Message to be Generated with SRVCOD = X'04' for each out-of-sync file in the file object and the Function Continues** | **With This Reply Message** |
|---|---|
| If the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file.<br>If the file was opened for write access, DDMClose will re-synchronize the file-change date and time unless a higher severity condition prevents it from doing so. | FILDMGRM |

## DDMQueryFileInfo (Get a File's Information)

This function returns information for a specific file.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMQueryFileInfo (HDDMFILE       FileHandle,
                         ULONG          FileInfoLevel,
                         PBYTE          FileInfoBuf,
                         ULONG          FileInfoBufSize
                         );
```

### Parameters

**FileHandle**
The handle (HDDMFILE) of the open file.

**FileInfoLevel**
The level (ULONG) of file information that is required.

Level 0x00000001 is the only defined level. This is the same as DosQueryFileInfo, ulFileInfoLevel bit (FILE_STANDARD).

Level 0x00000001 returns a subset of the EA information for the file. On input, FileInfoBuf maps to an EAOP2 structure. fpGEA2List points to a GEA2 list defining the attribute names whose values are returned. fpFEA2List points to a data area where the relevant FEA2 list is returned. The length field of this FEA2 list is valid, giving the size of the FEA2 list buffer. oError is ignored.

On output, FileInfoBuf is unchanged because the buffer pointed to by fpFEA2List is the one that is filled in with the returned information.

**FileInfoBuf**
The pointer (PBYTE) to the storage area where the system returns the requested level of file information. Refer to “Extended Attributes” on page 5 for more information on the format of this buffer.

**FileInfoBufSize**
The length (ULONG) of the FileInfoBuf.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| CMDCHKRM | X'1254' | Command Check |
| FILIUSRM | X'120D' | File in Use |
| HDLNFNRM | X'1257' | File Handle Not Found |
| LENGTHRM | X'F211' | Field Length Error |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

This function is similar to the OS/2 DosQueryFileInfo command.

An example of requesting Extended Attributes (EAs) is provided on page 5.

When requesting information on the variable-length EAs (ALTINDLS and KEYDEF), it is possible for the user to provide inadequate buffer space in the FileInfoBuf parameter. If this is the case, the function is rejected with the LENGTHRM reply message and a server diagnostic code of 0004 (Extended Attribute reply buffer too small). If the buffer that is provided was at least 4 bytes long, it contains the required buffer length. This buffer length should be used to create a FileInfoBuf of FileInfoBufSize that is large enough to contain the requested list of EAs.

File information, where applicable, is at least as accurate as the most recent DDMClose, DDMForceBuffer, or DDMSetFileInfo.

## Effect on Cursor Position

There is no effect on the cursor position.

## Locking (for Local VSAM File System Only)

For the local VSAM file system on AIX, the file needs to be opened for DDMQueryFileInfo. The level of locking in effect is the same as what was specified in the DDMOpen call for the file.

For the local VSAM file system on OS/2, the locking behaviour is the same as that for DOSQueryFileInfo. See *OS/2 WARP Control Program Programming Reference*.

## Record File Attributes by File Class

Refer to Table 11 on page 39.

## DDMQueryPathInfo (Get File or Subdirectory Information)

This function returns information for a specific file or subdirectory.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMQueryPathInfo (PSZ              PathName,
                         ULONG            PathInfoLevel,
                         PBYTE            PathInfoBuf,
                         ULONG            PathInfoBufSize
                         );
```

### Parameters

**PathName**
The pointer (PSZ) to the full path name of the file or subdirectory.

**PathInfoLevel**
The level (ULONG) of path information that is required.

Level 0x00000001 is the only defined level. This is the same as DosQueryPathInfo, ulFileInfoLevel bit (FILE_STANDARD).

Level 0x00000001 returns a subset of the EA information for the file. On input, PathInfoBuf maps to an EAOP2 structure. fpGEA2List points to a GEA2 list defining the attribute names whose values are returned. fpFEA2List points to a data area where the relevant FEA2 list is returned. The length field of this FEA2 list is valid, giving the size of the FEA2 list buffer. oError is ignored.

On output, PathInfoBuf is unchanged since the buffer pointed to by fpFEA2List is the one that is filled in with the returned information.

**PathInfoBuf**
The pointer (PBYTE) to the storage area where the system returns the requested level of path information. Refer to “Extended Attributes” on page 5 for more information on the format of this buffer.

**PathInfoBufSize**
The length (ULONG) of PathInfoBuf.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| CMDCHKRM | X'1254' | Command Check |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| LENGTHRM | X'F211' | Field Length Error |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

This function is similar to the OS/2 DosQueryPathInfo command.

An example of requesting Extended Attributes (EAs) is provided on page 5.

When requesting information on the variable-length EAs (.DDM_ALTINDLS and .DDM_KEYDEF), it is possible for the user to provide inadequate buffer space in the PathInfoBuf parameter. If this is the case, the function is rejected with the LENGTHRM reply message and a server diagnostic code of 0004 (Extended Attribute reply buffer too small). If the buffer that is provided was at least 4 bytes long, it contains the required buffer length. This buffer length should be used to create a PathInfoBuf of PathInfoBufSize that is large enough to contain the requested list of EAs.

## Effect on Cursor Position

There is no effect on the cursor position.

## Locking (for Local VSAM File System Only)

For the OS/2 local VSAM file system, the file locking rules are the same as for DOSFindFirst. These rules do not permit access to the file attributes if the file is already opened by another process. See *OS/2 WARP Control Program Programming Reference*.

For the AIX local VSAM file system, two processes can call this API concurrently.

## Exceptions

| This Causes a Reply Message to be Generated with SRVCOD = X'04'. The Function Continues | With This Reply Message |
|---|---|
| If the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file.<br>DDMQueryPathInfo re-synchronizes the file-change date and time if the file is not open to another process unless a higher severity condition prevents it from doing so. | FILDMGRM |

## Record File Attributes by File Class

Refer to Table 11 on page 39.

## DDMRename (Rename File)

This function changes the name of an existing file.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMRename (PSZ           FileName,
                  PSZ           NewFileName
                  );
```

### Parameters

**FileName**
The pointer (PSZ) to the name of the record-oriented file to be renamed.

**NewFileName**
The pointer (PSZ) to the new file name.

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ACCATHRM | X'1230' | Not Authorized to Access Method |
| DRCATHRM | X'1237' | Not Authorized to Directory |
| DRCFULRM | X'1258' | Directory Full |
| EXSCNDRM | X'123A' | Existing Condition |
| FILATHRM | X'123B' | Not Authorized to File |
| FILDMGRM | X'125A' | File Damaged |
| FILIUSRM | X'120D' | File in Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| FILSNARM | X'120F' | File Space Not Available |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVRQSRM | X'123C' | Invalid Request |
| OPNMAXRM | X'1244' | Concurrent Opens Exceeds Maximum |
| PRMNSPRM | X'1251' | Parameter Not Supported |
| RSCLMTRM | X'1233' | Target Resource Limits Reached |

## Remarks

Naming that directory as part of the new file name (NewFileName) can move a file to a different directory.

## Effect on Cursor Position

There is no effect on the cursor position.

## Locking (for Local VSAM File System Only)

The DDMRename function:

1. Attempts to obtain a MODNONLK lock on the file.

   If the MODNONLK lock is obtained, the function is processed (successfully or unsuccessfully). If the MODNONLK lock is not obtained, the function is rejected with the FILIUSRM reply message.

2. Releases the MODNONLK lock it obtained on the file.

If the function ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

## Exceptions

| This Causes | This Reply Message to be Returned |
|---|---|
| The new name for the file is the same as the existing name for the file. | EXSCNDRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The new file cannot be entered into the directory because the directory is full. | DRCFULRM |
| The requester has the named file open. | FILIUSRM |

## DDMRename

| **This Causes a Reply Message to be Generated with SRVCOD = X'04' for each out-of-sync file in the file object. The Function Continues** | **With This Reply Message** |
|---|---|
| If the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file.<br>DDMRename re-synchronizes the file-change date and time unless a higher severity condition prevents it from doing so. | FILDMGRM |

## DDMSetBOF (Set Cursor to Beginning of File)

This function sets the cursor to the beginning-of-file (BOF) position of the file.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetBOF (HDDMFILE       FileHandle
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| HDLNFNRM | X'1257' | File Handle Not Found |

### Remarks

DDMSetBOF sets the cursor to the BOF position in the file to allow relative accesses (for example, DDMSetNextRec, DDMSetPlus, and DDMSetKeyNext) to be performed. Any attempt to retrieve, insert, or modify a record at this file position is rejected.

If the hold cursor indicator of the cursor is on, it is set off by this function.

Resets any key limits that were set on a keyed file.

### Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor is moved to the BOF position of the file.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The CSRPOSST (Cursor Position Status) parameter on the reply message determines the cursor position.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If the file was opened for multiple updaters and the requester currently has a SHRRECLK lock on a record in the file, the SHRRECLK lock is released.

If the function ends with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The DTALCKST (Data Lock Status) parameter on the reply message determines the state of the record locks.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is invalid. | HDLNFNRM |

## Example

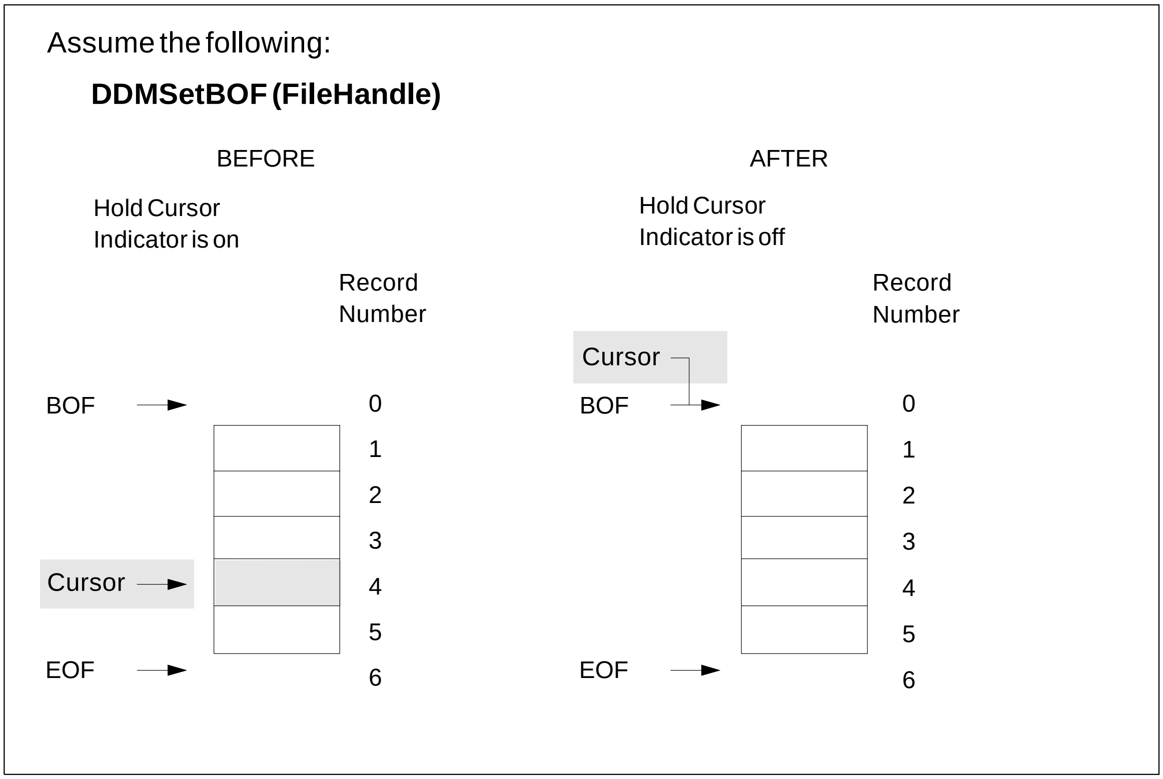


*Figure 23. DDMSetBOF Function*

## DDMSetEOF (Set Cursor to End of File)

This function sets the cursor to the end-of-file (EOF) position of the file.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetEOF (HDDMFILE        FileHandle
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| HDLNFNRM | X'1257' | File Handle Not Found |

### Remarks

The cursor position is defined by each file class.

The cursor is placed at the EOF position to allow relative accesses (for example DDMSetPrevious, DDMSetMinus, and DDMSetKeyPrevious) to be performed.

If the hold cursor indicator of the cursor is turned on, it is set off by this function.

Resets any key limits that were set on a keyed file.

### Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor is moved to the EOF position of the file.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

### Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If the file was opened for multiple updaters and the requester currently has a SHRRECLK lock on a record in the file, the SHRRECLK lock is released.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is not invalid. | HDLNFNRM |

## Example

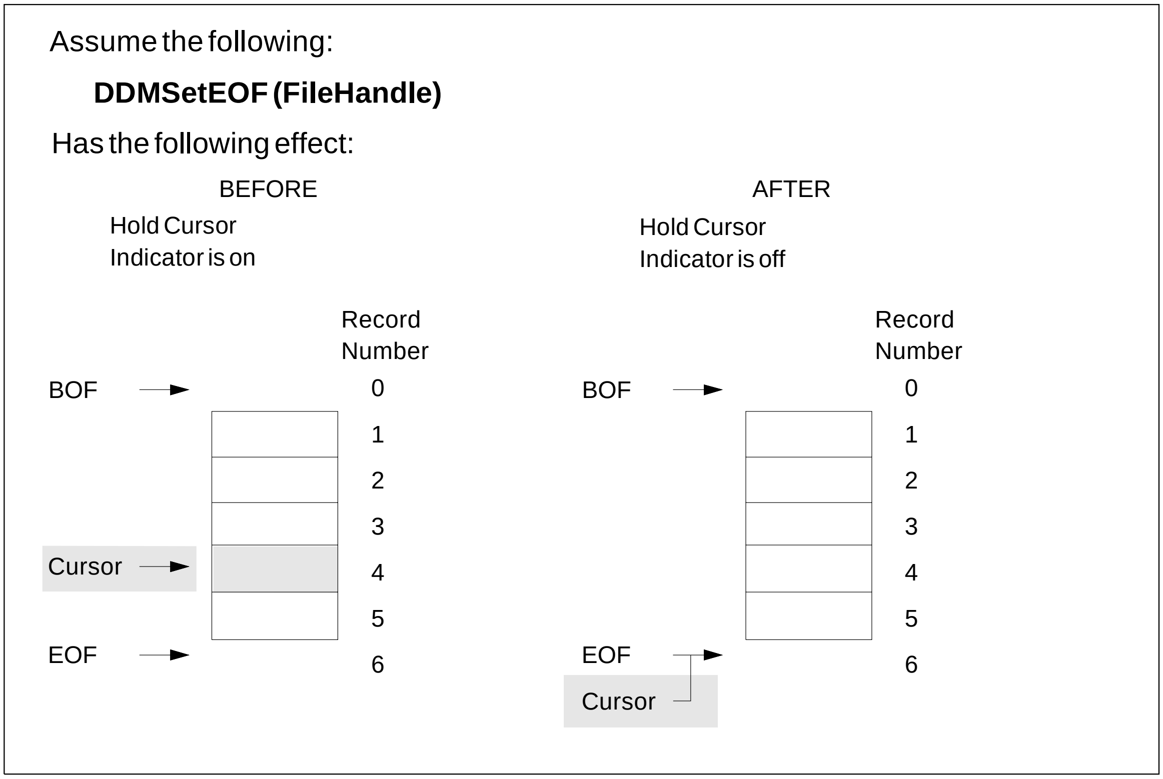


*Figure 24. DDMSetEOF Function*

## DDMSetFileInfo (Set File Information)

This function specifies information for a file or a directory. File information support is specific to the DDM server implementation and is dependent on the operating system.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetFileInfo (HDDMFILE        FileHandle,
                       ULONG           FileInfoLevel,
                       PBYTE           FileInfoBuf,
                       ULONG           FileInfoBufSize
                       );
```

## Parameters

**FileHandle**
The handle (HDDMFILE) of the open file.

**FileInfoLevel**
The level (ULONG) of file/directory information being defined.

Level 0x00000001 information is the only defined level. This is the same as DosSetFileInfo, ulFileInfoLevel bit (FILE_STANDARD).

Level 0x00000001 file information sets a series of EA name/value pairs. On input, FileInfoBuf maps to an EAOP2 structure. fpGEA2List is ignored. fpFEA2List points to a data area where the relevant FEA2 list is to be found. oError is ignored.

On output, fpGEA2List is unchanged. fpFEA2List is unchanged as is the area pointed to by fpFEA2List. If an error occurred during the set, oError is the offset of the FEA2 where the error occurred. The return code is the error code corresponding to the condition generating the error. If no error occurred, oError is undefined.

**FileInfoBuf**
The pointer (PBYTE) to the storage area where the system gets the file information. Refer to “Extended Attributes” on page 5 for more information on the format of this buffer.

**FileInfoBufSize**
The length (ULONG) of FileInfoBuf.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| CMDCHKRM | X'1254' | Command Check |
| HDLNFNRM | X'1257' | File Handle Not Found |
| LENGTHRM | X'F211' | Field Length Error |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

This function is similar to the DosSetFileInfo command.

An example of requesting Extended Attributes (EAs) is provided on page 5.

## Effect on Cursor Position

There is no effect on the cursor position.

## Locking (for Local VSAM File System Only)

For the OS/2 local VSAM file system, the locking behaviour is the same as for DOSSetFileInfo. See *OS/2 WARP Control Program Programming Reference*.

For the AIX local VSAM file system, an exclusive lock is requested for the file.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is not invalid. | HDLNFNRM |

## Record File Attributes by File Class

These are modifiable record file attributes.

Refer to Table 12 on page 40.

When the FILINISZ EA is changed, it has no effect on the current space already allocated to the file.

When the DELCP EA of an alternate index file is changed, the DELCP of the base file and all other indexes is also changed.

When the GETCP EA of an alternate index file is changed, the GETCP of the base file and all other indexes are also changed.

When the INSCP EA of an alternate index file is changed, the INSCP of the base file and all other indexes are also changed.

When the MODCP EA of an alternate index file is changed, the MODCP of the base file and all other indexes are also changed.

## DDMSetFirst (Set Cursor to First Record)

This function sets the cursor to the first record of the file and optionally returns the record, record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetFirst (HDDMFILE         FileHandle,
                    ULONG            AccessFlags,
                    PDDMRECORD       RecordBuf,
                    ULONG            RecordBufLen
                    );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | DDM_ALLREC (All Records, Active and Inactive) |
| **3** | Reserved flag |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats are found in “Examples” on page 155.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| ENDFILRM | X'120B' | End of File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record In Use |
| RECNFNRM | X'1225' | Record Not Found |

## Remarks

The DDM_ALLREC bit flag is used to determine the first record of a file. If DDM_ALLREC is not set, the cursor is set to the first active record in the file. Otherwise the cursor is set to record 1 in the file. For direct files, DDM_ALLREC must be set off.

As an option, DDMSetFirst can:

- Set the hold cursor indicator (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

Key limits are reset after completion of function.

If DDM_KEYVALFB flag is set and the file type is not keyed, the flag is ignored.

## DDMSetFirst

*Table 17. DDMSetFirst (DDM_NODATA or DDM_ALLREC) Decision Table*

| **If the DDMSetFirst function is issued:**<br>**When initial system states are:** | | | | | |
|---|---|---|---|---|---|
| Record State | I | I | I | A | A |
| DDM_ALLREC | F | T | T | * | * |
| DDM_NODATA | * | F | T | F | T |
| **The final system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | F | T4 | F | F |
| RECINA (returned) | F | T | F | F | F |
| RECORD (returned) | F | F | F | T | F |
| CURSOR (returned) | F | T | T | T | T |
| Repeat table after bypassing record | T | F | F | F | F |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| ***** | **Either TRUE or FALSE** |

## Effect on Cursor Position

**Normal completion (SVRCOD of 0 or 4)**
The cursor is moved to record number 1 if DDM_ALLREC is set. The cursor is moved to the first active record in the file if DDM_ALLREC is not set.

**Error termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec, DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, or DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with the RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes a Reply Message to be Generated and the Function Continues | With This Reply Message |
|---|---|
| DDM_ALLREC and DDM_NODATA are active and an inactive record is read. | RECINARM |

| This Causes the Function to be Terminated | With This Reply Message |
|---|---|
| Access flag DDM_NODATA is not set and the file was opened without GETAI. | INVRQSRM |
| The RecordBuf is not large enough to hold the returned record. | LENGTHRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| DDM_RECNBRFB or DDM_KEYVALFB is set or DDM_NODATA is not set and RecordBuf doesn't contain an address. | ADDRRM |
| The file handle is not valid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |

## DDMSetFirst

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified.<br>DDM_ALLREC is set and the file is a direct file. | INVRQSRM |
| The record is damaged (not an active or inactive record). | RECDMGRM |
| A record lock cannot be obtained. | RECIUSRM |
| Bypassing inactive records is requested (DDM_ALLREC is off) and the file only contains inactive records.<br>The file does not contain any records.<br>**Note:** The cursor position is not changed. | RECNFNRM |

## Examples

Assume the following:

```
AccessFlags  =  0x00000010  ;   /*  DDM__ALLREC=ON  */
```

**DDMSetFirst (FileHandle, AccessFlags, RecordBuf, RecordBufLen)**

Has the following effect:

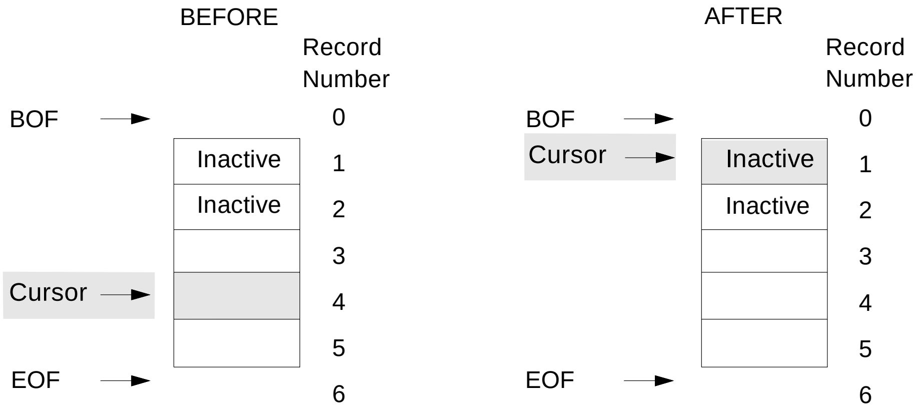
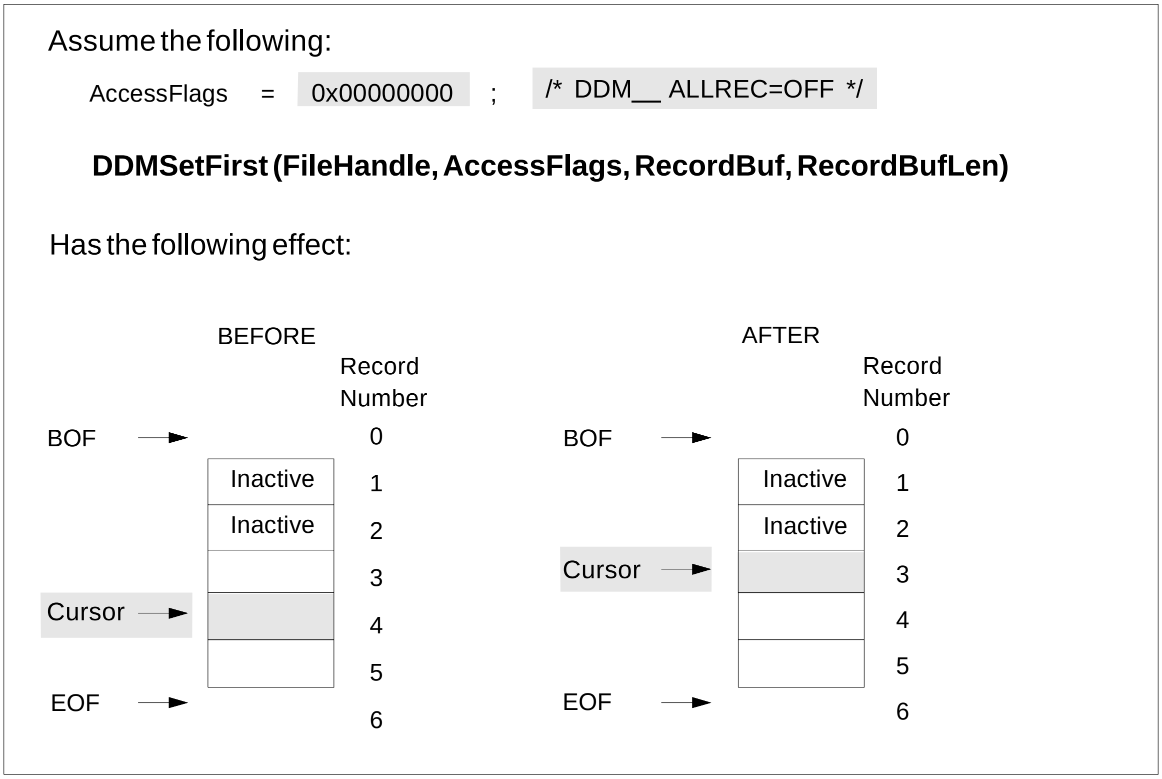


*Figure 25. DDMSetFirst Function with DDM_ALLREC Set*



Assume the following:

AccessFlags = 0x00000000 ; /* DDM__ ALLREC=OFF */

**DDMSetFirst (FileHandle, AccessFlags, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 26. DDMSetFirst Function with DDM_ALLREC Not Set*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| LL | CP | Data |
|---|---|---|

**Field** **Description**

**LL** The length (ULONG) of the record buffer from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length.

**X'144A'** Indicates that the following data is record data (RECORD).

**X'142D'** Indicates that the following data is a ULONG length of an inactive record (RECINA).

**Data** Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length.

**X'144A'** Indicates that the following data is record data (RECORD).

**X'142D'** Indicates that the following data is a ULONG length of an inactive record (RECINA).

**Data** Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | CP | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **CP** | The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length.<br>**X'144A'** Indicates that the following data is record data (RECORD).<br>**X'142D'** Indicates that the following data is a ULONG length of an inactive record (RECINA). |

**Data** Either record data or the length (ULONG) of the inactive record.

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | CP | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length.

- **X'144A'** Indicates that the following data is record date (RECORD).
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetKey (Set Cursor by Key)

This function positions the cursor based on the key value and relational operator specified, and optionally returns the record, record number, and record key.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetKey (HDDMFILE        FileHandle,
                  ULONG           AccessFlags,
                  PDDMOBJECT      KeyValBuf,
                  CODEPOINT       RelOpr,
                  PDDMRECORD      RecordBuf,
                  ULONG           RecordBufLen,
                  );
```

## Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
Specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | Reserved flag |
| **3** | Reserved flag |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on access flags, see Chapter 5, “VSAM API Flags” on page 401.

**KeyValBuf**
Pointer to the buffer which contains the key to which the cursor should be moved. The format of the key value buffer upon invocation of the function is:

| | | |
|---|---|---|
| LL | X'1115' | Key Value |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the key value description (from the beginning of LL to the end of Key Value). |

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**RelOpr**
Specifies the relational test that should be used to test the specified key value against the file index key values. Valid values are:

**X'1445'** KEYAE (Key After or Equal)

Specifies that the relational test between the specified key value and the index key values is *after or equal to*. *After* is towards the end of file in the key sequence.

**X'1446'** KEYAF (Key After)

Specifies that the relational test between the specified key value and the index key values is *after*. *After* is towards the end of file in the key sequence.

**X'1447'** KEYEQ (Key Equal)

Specifies that the relational test between the specified key value and the index key values is *equal to*.

**X'144B'** KEYBE (Key Before or Equal)

Specifies that the relational test between the specified key value and the index key values is *before or equal to*. *Before* is towards the beginning of file in the key sequence.

**X'144C'** KEYBF (Key Before)

Specifies that the relational test between the specified key value and the index key values is *before*. *Before* is towards the beginning of file in the key sequence.

These values are described in detail on page 163.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 167.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ACCATHRM | X'1230' | Not Authorized to Access Method |
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| DRCATHRM | X'1237' | Not Authorized to Directory |
| FILATHRM | X'123B' | Not Authorized to File |
| FILIUSRM | X'120D' | File in Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| FILSNARM | X'120F' | File Space Not Available |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYLENRM | X'122D' | Invalid Key Length |
| LENGTHRM | X'F211' | Field Length Error |
| OBJNSPRM | X'1253' | Object Not Supported |
| OPNMAXRM | X'1244' | Concurrent Opens Exceeds Maximum |
| PRMNSPRM | X'1251' | Parameter Not Supported |
| RECDMGRM | X'1249' | Record Damaged |
| RECNFNRM | X'1225' | Record Not Found |
| RSCLMTRM | X'1233' | Target Resource Limits Reached |

## Remarks

The cursor can be moved to the key value that is equal to, after, after or equal to, before, or before or equal to the specified key value. This function is only valid for keyed and alternate index files. The following list describes how this function sets the cursor for specific values for the RelOpr parameter.

**Value** — **The Cursor Is Set by Key Sequence to:**

**KEYEQ** The first record in the file that has a key equal to the key specified in the key value buffer.

**KEYAE** The first record in the file that has a key after or the last record in the file that has a key equal to the key specified in the key value buffer. If there is more than one record that has a key equal to the specified key, the cursor is set to the last record with an equal key. If there is no record with an equal key and there are multiple records that have a key equal to the next key in sequence, the cursor is set to the first of these records.

**KEYAF** The first record in the file that has a key after the key specified in key value buffer.

**KEYBE** The first record of the file that has a key equal to the key specified in key value buffer. If no equal key is found, the cursor, by key sequence, is set to the last record of the file with a key before the key specified in key value buffer.

**KEYBF** The last record in the file with a key before the key specified in key value buffer.

If the key value specified in key value buffer is shorter than the file record keys, a generic search is performed. Only the first record of all records satisfying the generic search can be accessed with this function. DDMSetKeyNext can be used to access additional records that satisfied the generic search.

If the key value specified in key value buffer has duplicate entries in the file (duplicate keys), only the first or last record, depending upon the value of RelOpr, of all records having the duplicate key value can be accessed with this function. See "DDMSetKeyNext (Set Cursor to Next Record in Key Sequence)" on page 204 or "DDMSetKeyPrevious (Set Cursor to Previous Record in Key Sequence)" on page 222 for accessing additional records with the same key value.

As an option, DDMSetKey can:

- Set the hold cursor indicator (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

## Effect on Cursor Position

**Normal completion (SVRCOD of 0 or 4)**
The cursor is moved to the record that satisfies the relational operator specification.

**Error termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.

- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, or DDMSetUpdateNum functions).

If the record lock is not obtained, the DDMSetKey function is rejected with the RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## DDMSetKey

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is not invalid. | HDLNFNRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents. | INVRQSRM |
| The key length specified for KEYVAL is larger than the key length used to build the index.<br>**Note:** The cursor position is not changed. | KEYLENRM |
| The file does not contain any records or a record does not exist that satisfies RelOpr.<br>**Note:** The cursor position is not changed. | RECNFNRM |

## Examples

With the following Key Value Buffer:

```
KeyValBuf      LL:  8
               CP:  0x1115
            Value:  'BB'
```

Assume the following:

```
RelOpr        =  0x1447      ;   /* KEYEQ */
AccessFlags   =  0x00000000  ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

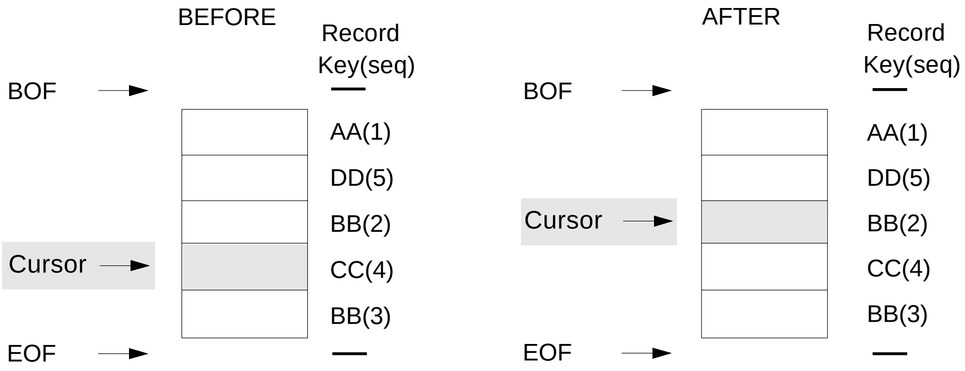
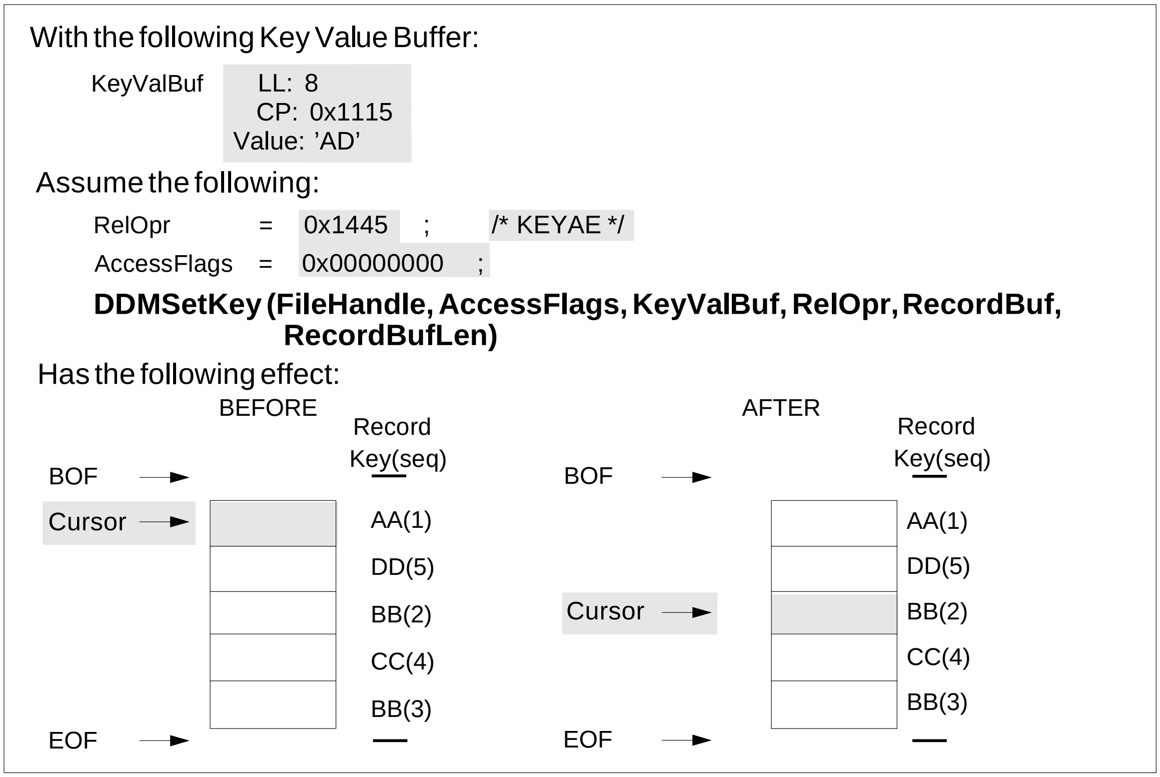


*Figure 27. DDMSetKey Function with RelOpr Set to KEYEQ*



With the following Key Value Buffer:

```
KeyValBuf     LL:  8
              CP:  0x1115
           Value:  'AD'
```

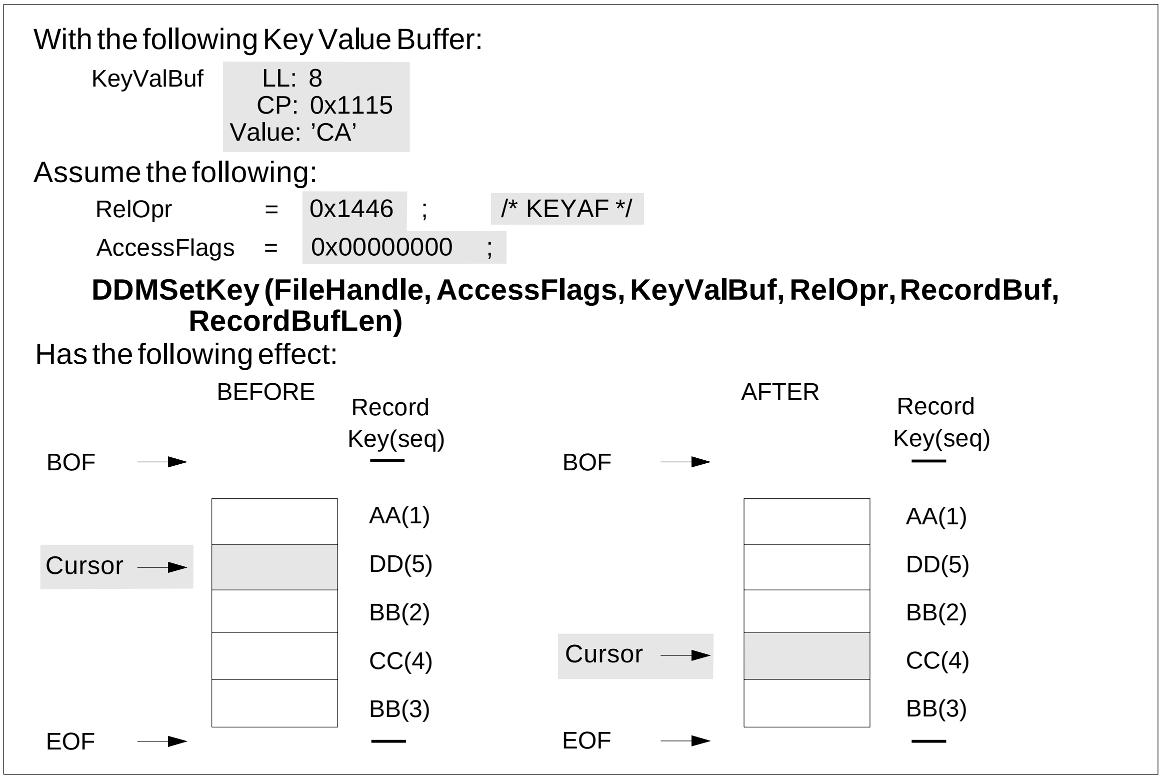
Assume the following:

```
RelOpr       =  0x1445     ;     /* KEYAE */
AccessFlags  =  0x00000000  ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 28. DDMSetKey Function with RelOpr Set to KEYAE*



With the following Key Value Buffer:

```
KeyValBuf     LL:  8
              CP:  0x1115
           Value:  'CA'
```

Assume the following:

```
RelOpr        =   0x1446   ;       /* KEYAF */
AccessFlags   =   0x00000000   ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 29. DDMSetKey Function with RelOpr Set to KEYAF*

With the following Key Value Buffer:

```
KeyValBuf      LL:  8
               CP:  0x1115
            Value: 'DB'
```

Assume the following:

```
RelOpr        =  0x144B  ;        /* KEYBE */
AccessFlags   =  0x00000000   ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

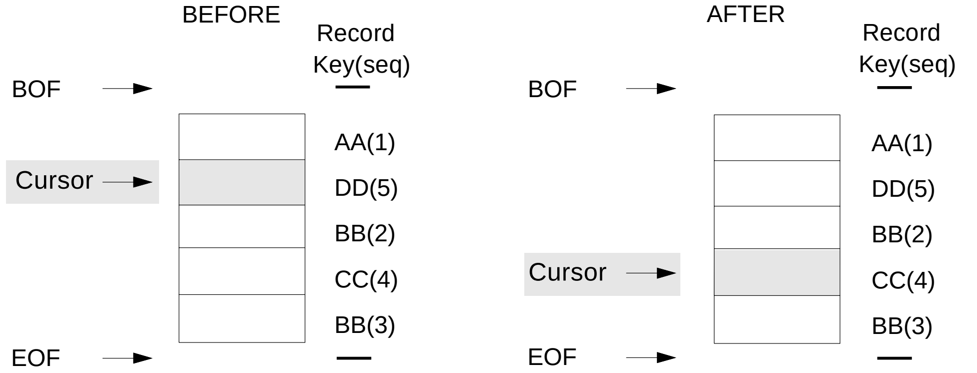
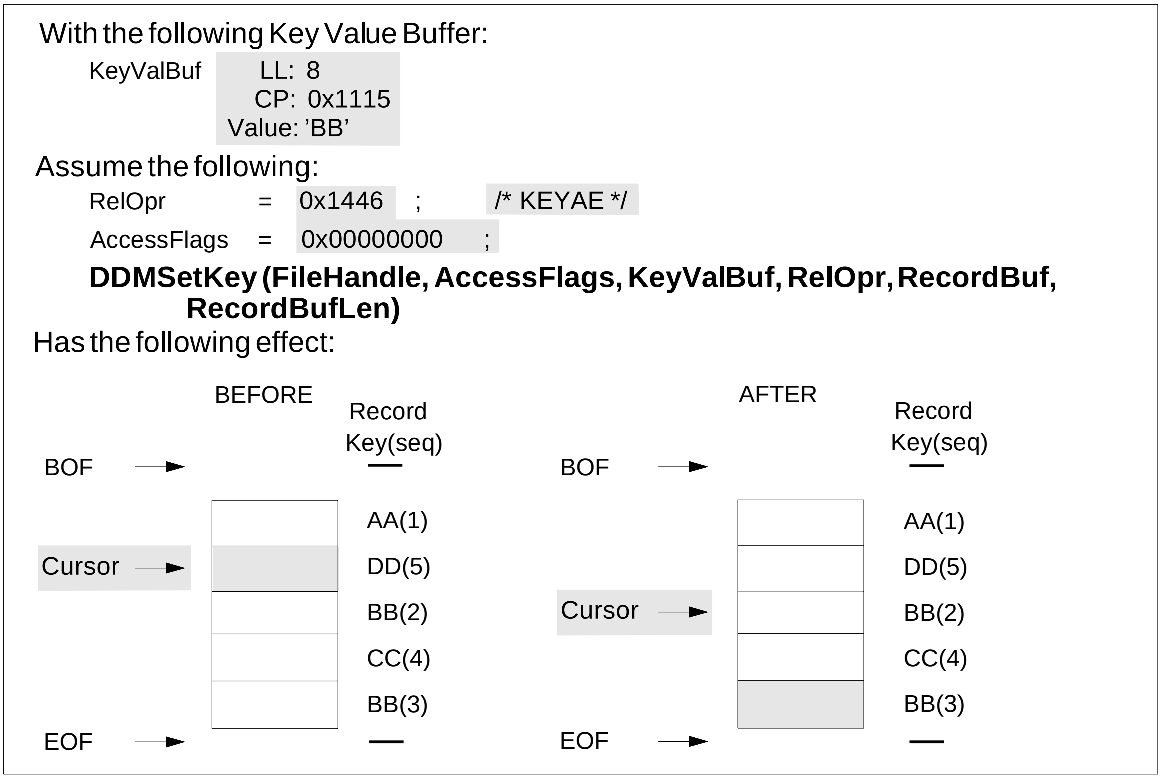


*Figure 30. DDMSetKey Function with RelOpr Set to KEYBE*



With the following Key Value Buffer:

| | |
|---|---|
| KeyValBuf | LL: 8<br>CP: 0x1115<br>Value: ’BB’ |

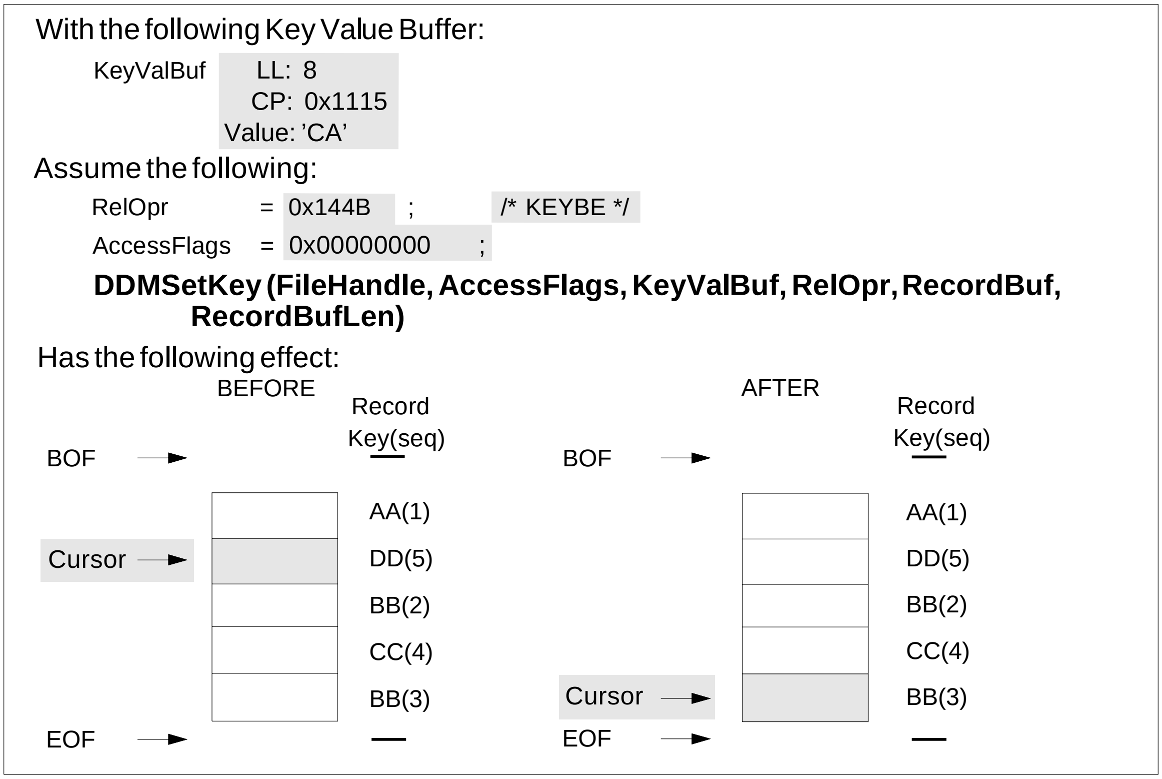
Assume the following:

```
RelOpr       =  0x1446   ;      /* KEYAE */
AccessFlags  =  0x00000000   ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 31. DDMSetKey Function with RelOpr Set to KEYAE*



With the following Key Value Buffer:

```
KeyValBuf      LL:  8
               CP:  0x1115
            Value: 'CA'
```

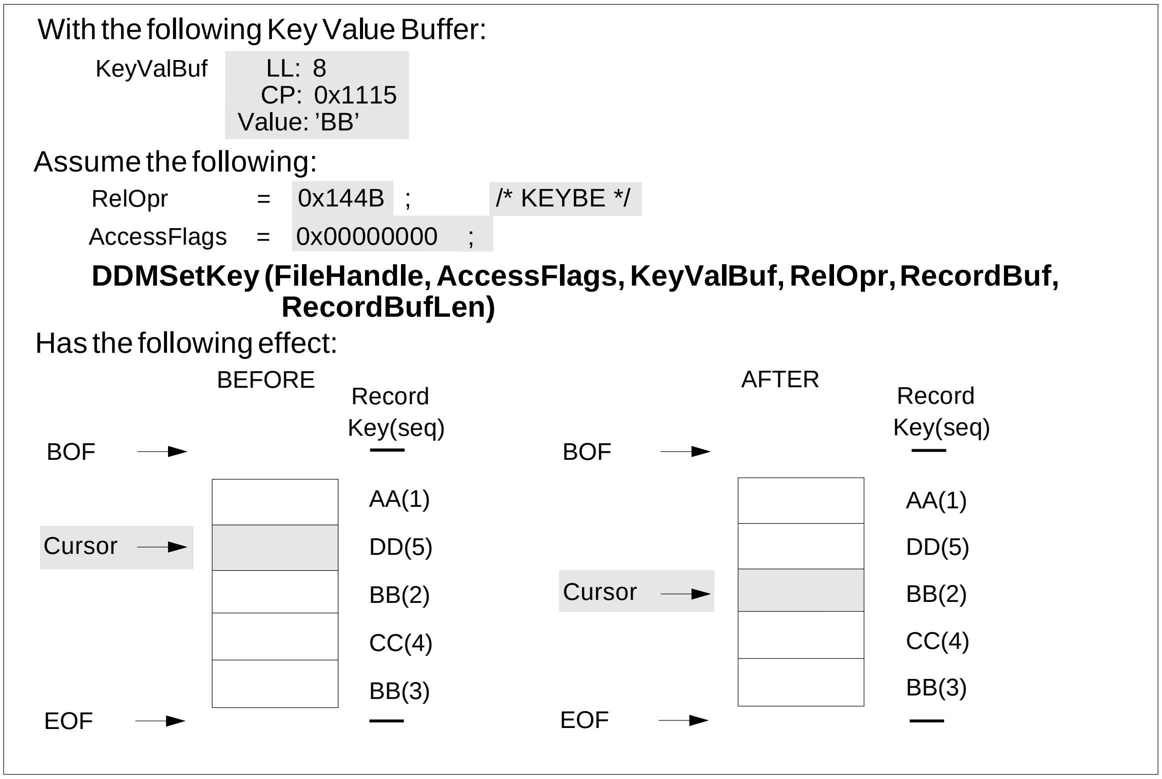
Assume the following:

```
RelOpr         =  0x144B     ;          /* KEYBE */
AccessFlags    =  0x00000000      ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 32. DDMSetKey Function with RelOpr Set to KEYBE*



With the following Key Value Buffer:

```
KeyValBuf     LL:  8
              CP:  0x1115
          Value: 'BB'
```

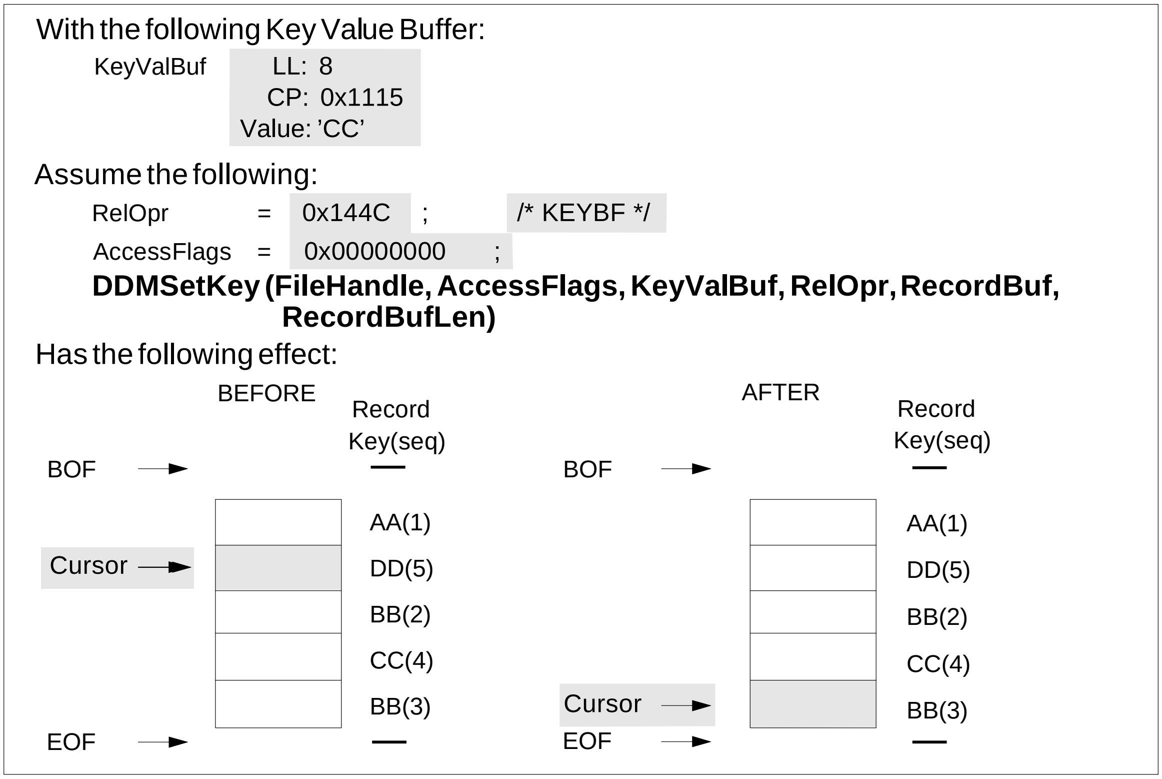
Assume the following:

```
RelOpr       =  0x144B  ;        /* KEYBE */
AccessFlags  =  0x00000000   ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 33. DDMSetKey Function with RelOpr Set to KEYBE*



With the following Key Value Buffer:

```
KeyValBuf      LL:  8
               CP:  0x1115
            Value: 'CC'
```

Assume the following:

```
RelOpr       =  0x144C ;        /* KEYBF */
AccessFlags  =  0x00000000  ;
```

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 34. DDMSetKey Function with RelOpr Set to KEYBF*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record buffer from the beginning of LL to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'144A' | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. A value of X'FFFFFFFF' for RN indicates that the record number of the first record in the record attribute list is not known. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). A value of X'FFFFFFFF' for RN indicates that the record number is not known. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L3** | The length (ULONG) from the beginning of L3 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

## DDMSetKeyFirst (Set Cursor to First Record in Key Sequence)

This function sets the cursor to the first record in key sequence and optionally returns the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetKeyFirst (HDDMFILE         FileHandle,
                       ULONG            AccessFlags,
                       PDDMRECORD       RecordBuf,
                       ULONG            RecordBufLen
                       );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **6–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | Reserved flag |
| **3** | Reserved flag |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 181.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| FILATHRM | X'123B' | Not Authorized to File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| KEYLENRM | X'122D' | Invalid Key Length |
| LENGTHRM | X'F211' | Field Length Error |
| OBJNSPRM | X'1253' | Object Not Supported |
| RECDMGRM | X'1249' | Record Damaged |
| RECIUSRM | X'124A' | Record in Use |
| RECNFNRM | X'1225' | Record Not Found |

## Remarks

As an option, DDMSetKeyFirst can:

- Set the hold cursor indicator (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor is moved to the first record according to the index key sequence.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

DDMSetKeyFirst does the following:

- If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:
  - The record is updated (DDMModifyRec or DDMDeleteRec).
  - The cursor is moved to a different record.

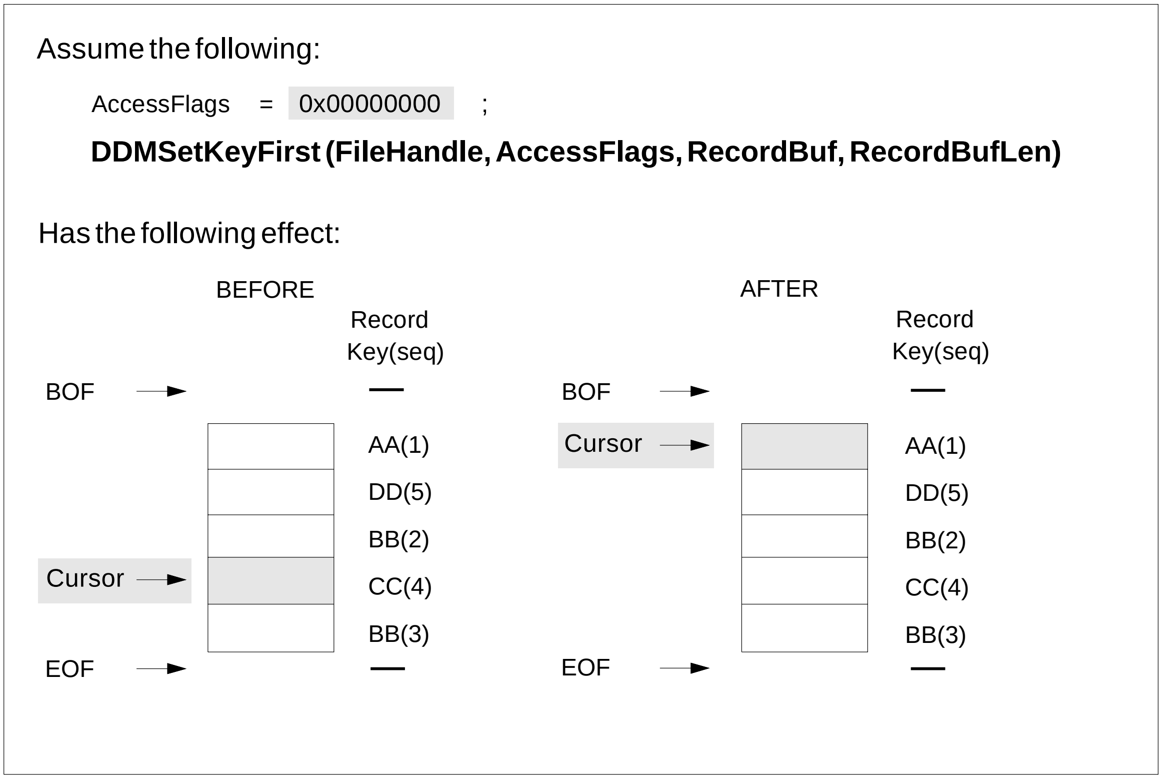
  - The file is closed.
  - The DDMForceBuffer function is issued.
  - The DDMUnLockRec function is issued.
  - Any function is issued that references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).
- If the record lock is not obtained, the function is rejected with the RECIUSRM reply message.
- If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.
- If the function terminates with a reply message that has a severity code of ERROR or higher, then:
  - For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
  - For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is not invalid. | HDLNFNRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents. | INVRQSRM |
| The record lock cannot be obtained. | RECIUSRM |
| The file does not contain any records.<br>**Note:** The cursor position is not changed. | RECNFNRM |

## Examples

## DDMSetKeyFirst



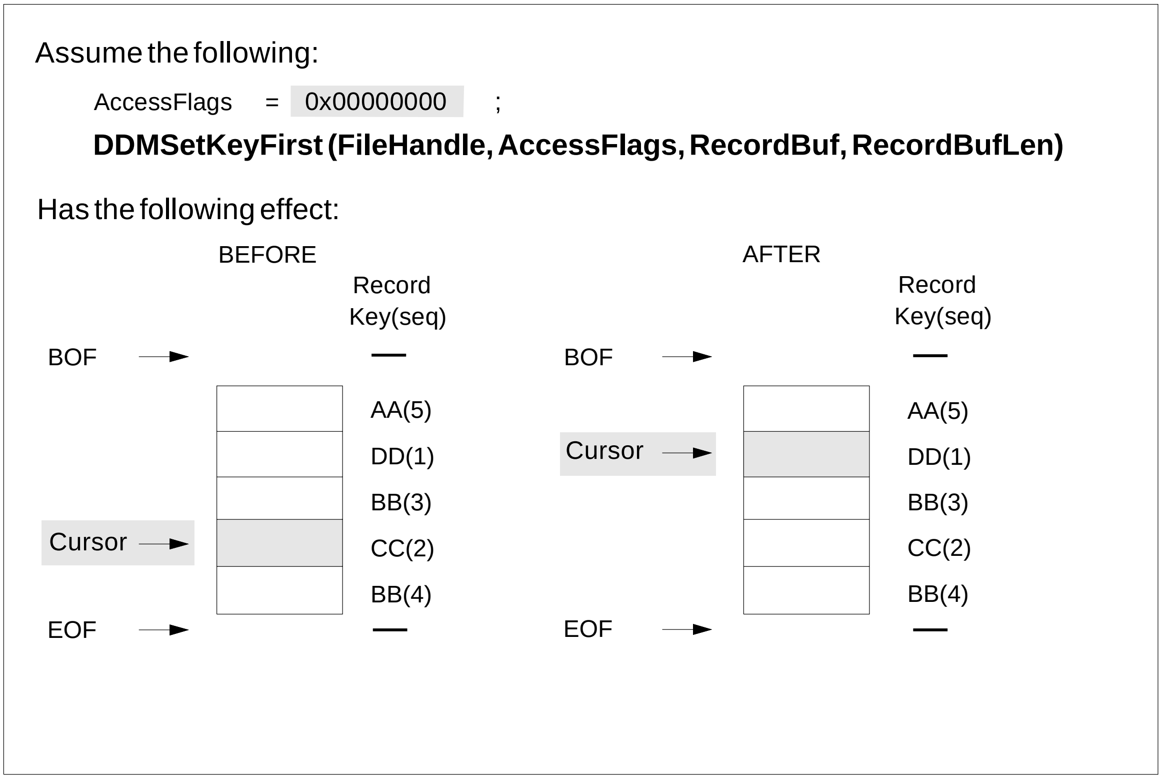
Assume the following:

AccessFlags = 0x00000000 ;

**DDMSetKeyFirst (FileHandle, AccessFlags, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 35. DDMSetKeyFirst Function for Ascending Sequence*



Assume the following:

```
AccessFlags = 0x00000000 ;
DDMSetKeyFirst (FileHandle, AccessFlags, RecordBuf, RecordBufLen)
```

Has the following effect:

*Figure 36. DDMSetKeyFirst Function for Descending Sequence*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| LL | X'144A' | Data |
|---|---|---|

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record buffer from the beginning of LL to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. A value of X'FFFFFFFF' for RN indicates that the record number of the first record in the record attribute list is not known. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). A value of X'FFFFFFFF' for RN indicates that the record number is not known. |

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

## DDMSetKeyFirst

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list (from the beginning of LL to the end of Data). |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L3** | The length (ULONG) from the beginning of L3 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |
|---|---|---|---|---|---|---|---|

**Field** **Description**

**LL** The length (ULONG) of the record attribute list (from the beginning of LL to the end of KEY).

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetKeyLast (Set Cursor to Last Record in Key Sequence)

This function sets the cursor to the last record of the file in key sequence order and optionally returns the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetKeyLast (HDDMFILE      FileHandle,
                      ULONG         AccessFlags,
                      PDDMRECORD    RecordBuf,
                      ULONG         RecordBufLen
                      );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **3–4** | Reserved flags |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 191.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | address error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| ENDFILRM | X'120B' | End of File |
| FILATHRM | X'123B' | Not Authorized to File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECIUSRM | X'124A' | Record in Use |
| RECNFNRM | X'1225' | Record Not Found |

## Remarks

If the file permits duplicate keys and the last record in the file has a duplicate key, the cursor is set to the last record of the duplicates in key sequence.

As an option, DDMSetKeyLast can:

- Set the hold cursor indicator on (DDM_HLDCSR).
- Return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**

The cursor is moved to the last record in the index key sequence.

**Error Termination (SVRCOD of 8)**

The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**

The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record, if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (for example, DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.

- Any function is issued that references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with the RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is invalid. | HDLNFNRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents. | INVRQSRM |
| The record lock cannot be obtained. | RECIUSRM |
| The file does not contain any records.<br>**Note:** The cursor position is not changed. | RECNFNRM |

## Examples

Assume the following:

AccessFlags = 0 ;

**DDMSetKeyLast (FileHandle, AccessFlags, RecordBuf, RecordBufLen)**

Has the following effect:

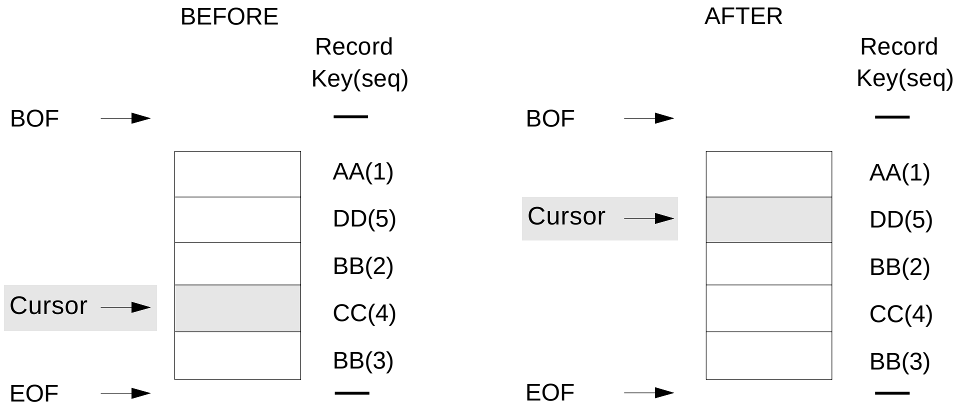
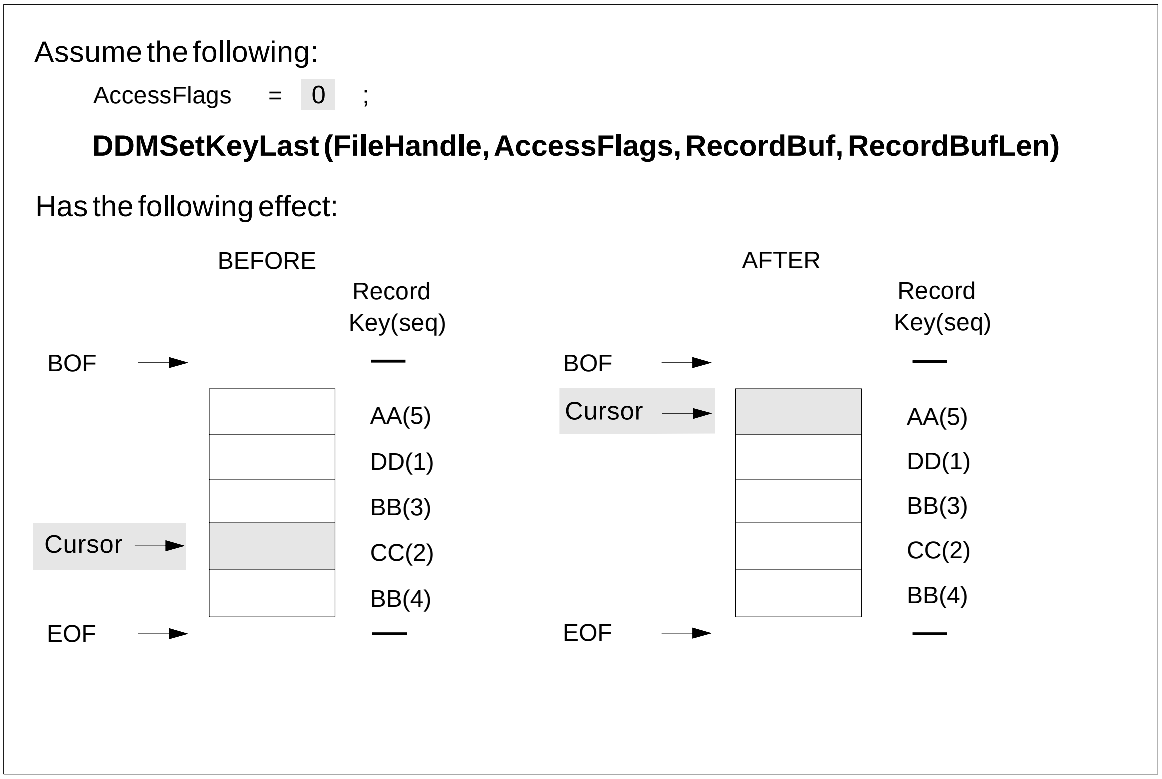


*Figure 37. DDMSetKeyLast Function for Ascending Sequence*

## DDMSetKeyLast



Assume the following:

AccessFlags = 0 ;

**DDMSetKeyLast (FileHandle, AccessFlags, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 38. DDMSetKeyLast Function for Descending Sequence*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record buffer from the beginning of LL to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**

Nothing is returned.

---

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'144A' | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. A value of X'FFFFFFFF' for RN indicates that the record number of the first record in the record attribute list is not known. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

---

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**

DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). A value of X'FFFFFFFF' for RN indicates that the record number is not known. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L3** | The length (ULONG) from the beginning of L3 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetKeyLimits (Set Key Limits)

This function sets the limits of the key values for subsequent DDMSetKeyNext and DDMSetNextKeyEqual functions.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetKeyLimits (HDDMFILE        FileHandle,
                        PDDMOBJECT      LowKeyLim,
                        PDDMOBJECT      HiKeyLim
                        );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**LowKeyLim**
The pointer (PDDMOBJECT) to the key buffer for the lower key value limit. The format of the low key limit buffer upon invocation of the function is:

| | | |
|---|---|---|
| LL | X'1130' | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the key value description from the beginning of LL to the end of the key value. This field may be set to 6 and no key value need be provided. This has the special meaning of first key value of the file.

**X'1130'** — The value (CODEPOINT) indicating that the following data is a key value, representing a low key limit.

**Data** — The key value (BYTE) for a record. The key value can be a maximum of 255 bytes.

**HiKeyLim**
The pointer (PDDMOBJECT) to the key buffer for the higher key value limit. The format of the high key limit buffer upon invocation of the function is:

| | | |
|---|---|---|
| LL | X'112F' | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the key value description from the beginning of LL to the end of the key value. This field may be set to 6 and no key value need be provided. This has the special meaning of last key value of the file.

**X'112F'** The value (CODEPOINT) indicating that the following data is a key value, representing a high key limit.

**Data** The key value (BYTE) for a record. The key value can be a maximum of 255 bytes.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| ENDFILRM | X'120B' | End of File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVRQSRM | X'123C' | Invalid Request |
| KEYLENRM | X'122D' | Invalid Key Length |
| OBJNSPRM | X'1253' | Object Not Supported |

## Remarks

The DDMSetKeyLimits function is only valid for files with ascending keys.

The DDMSetKeyLimits function:

- Establishes the key limits and associates them with the active cursor.
- Sets the cursor to the record position of the lower limit or the first key after the low key limit if it is not in the file.
- Sets the hold cursor indicator to the on value so the first DDMSetKeyNext or DDMSetNextKeyEqual function remains at the first record within the limits.

When key limits have been established, the DDMSetKeyNext or DDMSetNextKeyEqual function only operates within the defined limits.

DDMSetKeyNext or DDMSetNextKeyEqual sets the cursor, in key sequence, to the next record that is within the bounds of the key limits. If the cursor is already positioned at the highest key limit, the function is terminated with the ENDFILRM reply message, the key limits are reset, and the cursor is set to the EOF position.

The key limits remain in effect until one of the following occurs:

- The file is closed by a DDMClose function or termination of communications.
- A cursor positioning function other than DDMSetKeyNext or DDMSetNextKeyEqual is performed. This includes the following functions:

  DDMSetBOF
  DDMSetEOF
  DDMSetFirst
  DDMSetKey
  DDMSetKeyFirst
  DDMSetKeyLast
  DDMSetKeyPrevious
  DDMSetLast
  DDMSetMinus

DDMSetRecNum
DDMSetNextRec
DDMSetPrevious

- A DDMInsertRec*xxx* function with the DDM_UPDCSR bit in the AccessFlags set on is performed.
- An ENDFILRM reply message is returned from a DDMSetKeyNext or DDMSetNextKeyEqual function.
- A DDMSetKeyLimits function specifies new limits.

When the key limits are reset, they are logically reset with a low key limit value of beginning of file and high key limit value of end of file. The cursor is not directly affected by resetting the key limits, but its position may be changed by the function that resets the key limits.

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor is moved to the first record in the file with a key value equal to or greater than the low key limit (LowKeyLim) in the index key sequence. If an ENDFILRM reply message results, the cursor is set to the end of file.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If the file was opened for multiple updaters and the requester currently has a SHRRECLK lock on a record in the file, the SHRRECLK lock is released.

If the DDMSetKeyLimits function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

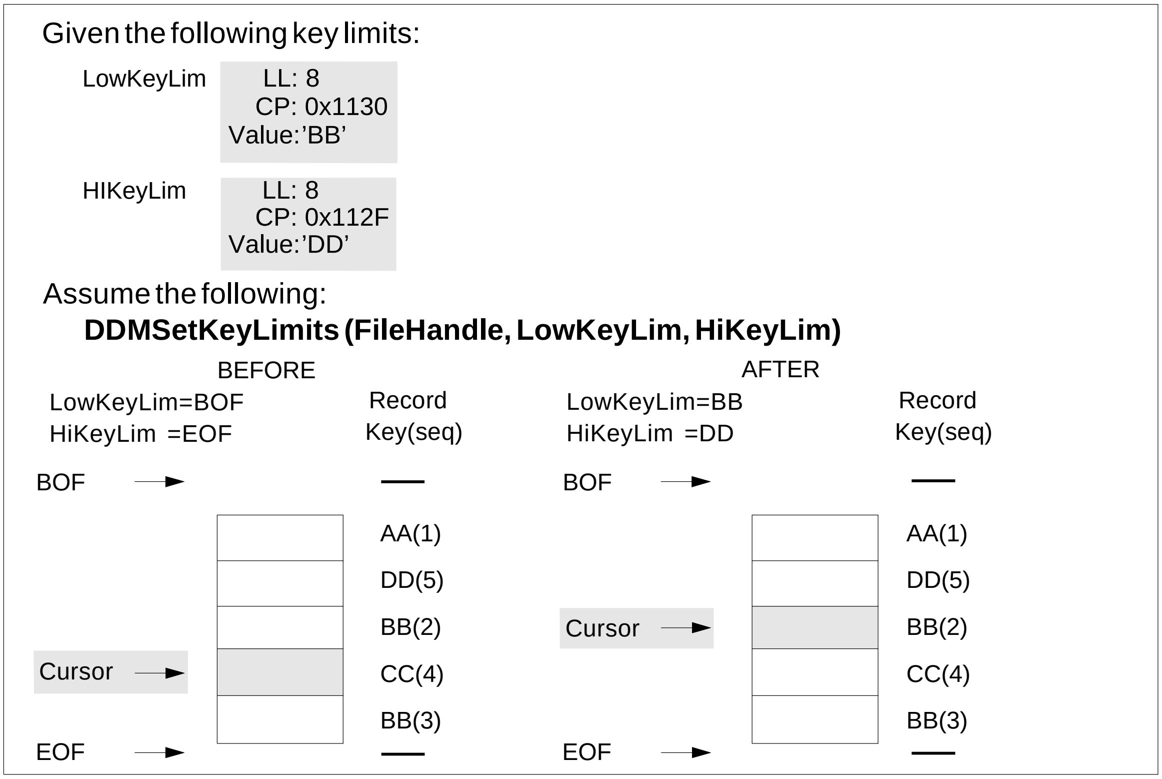
## DDMSetKeyLimits

## Exceptions

| This Causes | This Reply Message to be Returned |
|---|---|
| The LowKeyLim specified is after the last key.<br>The HiKeyLim specified is before the first key. | ENDFILRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is not invalid. | HDLNFNRM |
| The HiKeyLim specifies a key value that is before the LowKeyLim.<br>The file was created with a key (or composite key) whose parts are not all ascending. | INVRQSRM |
| Either the HiKeyLim or LowKeyLim parameter specifies a partial key. | KEYLENRM |

## Examples



Given the following key limits:

Assume the following:

**DDMSetKeyLimits (FileHandle, LowKeyLim, HiKeyLim)**

*Figure 39. DDMSetKeyLimits Function*

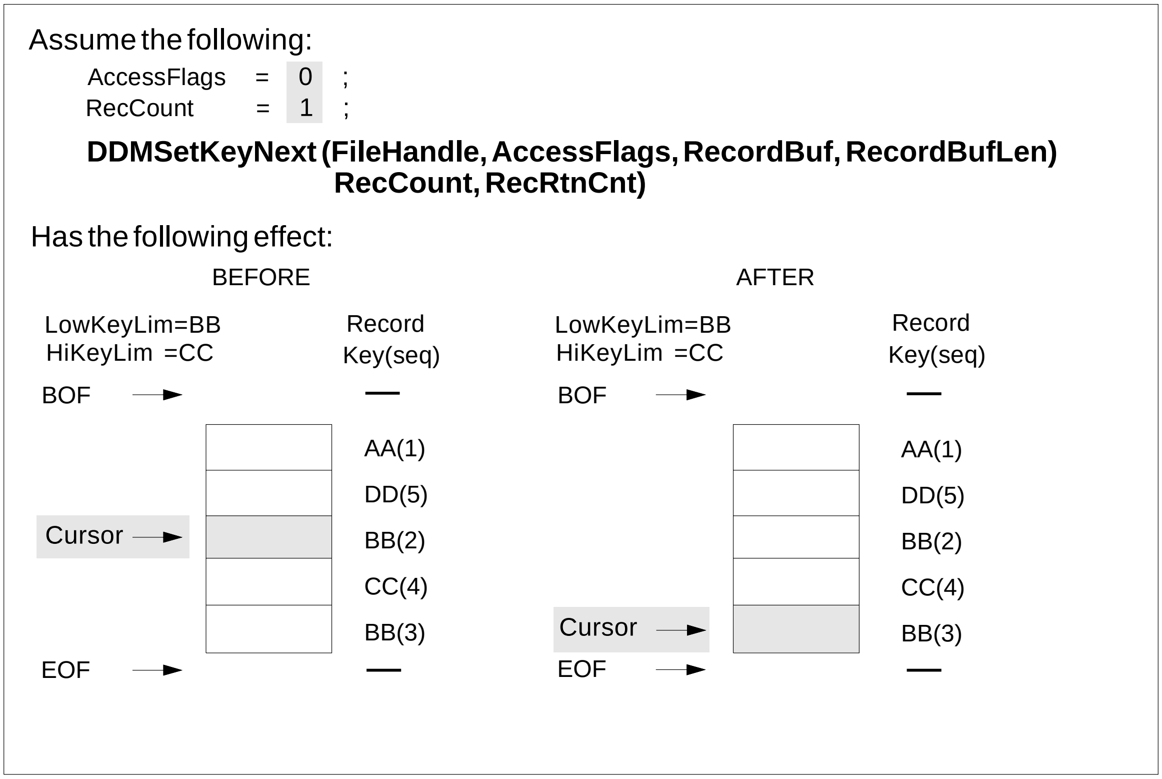
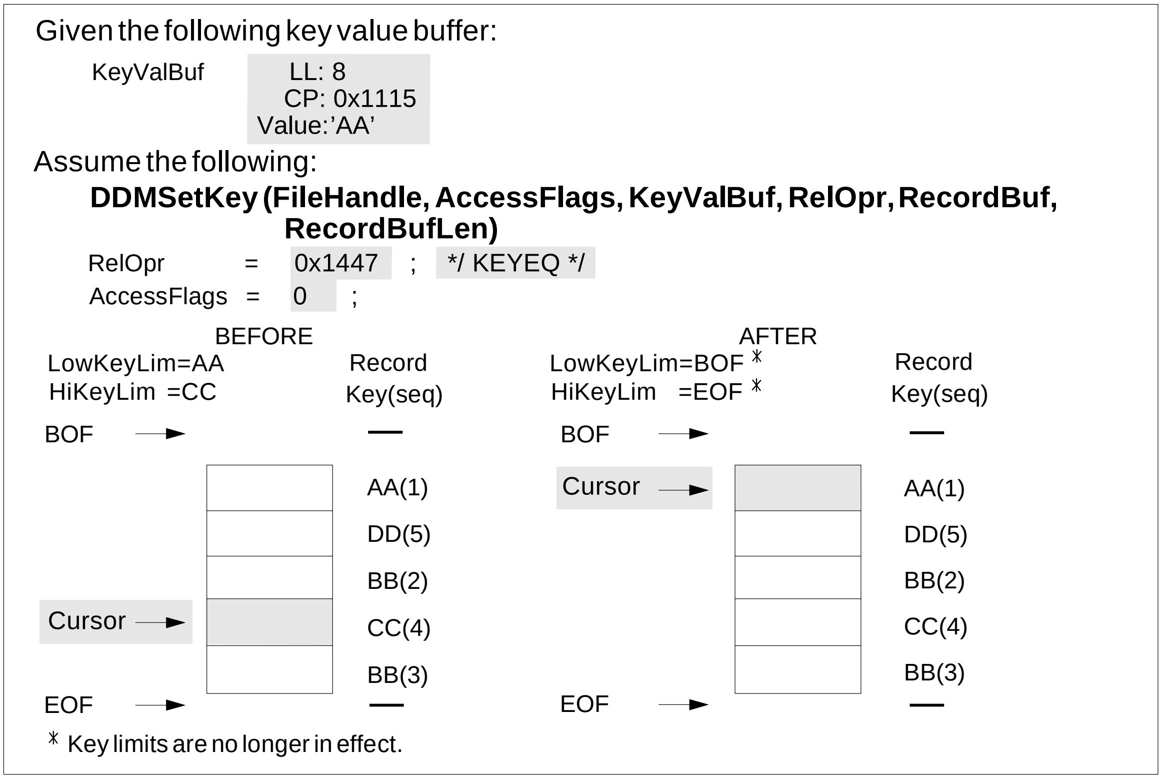


*Figure 40. DDMSetKeyNext Function with Key Limits Set*



Given the following key value buffer:

```
KeyValBuf      LL: 8
               CP: 0x1115
            Value:'AA'
```

Assume the following:

**DDMSetKey (FileHandle, AccessFlags, KeyValBuf, RelOpr, RecordBuf, RecordBufLen)**

```
RelOpr       =  0x1447  ;  */ KEYEQ */
AccessFlags  =  0       ;
```

⁎ Key limits are no longer in effect.

*Figure 41. Resetting Limits with DDMSetKey Function*

## DDMSetKeyNext (Set Cursor to Next Record in Key Sequence)

This function moves the cursor to the next record of the file in key sequence order and optionally returns the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetKeyNext (HDDMFILE        FileHandle,
                      ULONG           AccessFlags,
                      PDDMRECORD      RecordBuf,
                      ULONG           RecordBufLen,
                      ULONG           RecCount,
                      PULONG          RecRtnCnt
                      );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | DDM_BYPDMG (Bypass Damaged Record) |
| **5** | DDM_NODATA (No Record Data Returned) |
| **3–4** | Reserved flags |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 209.

**RecordBufLen**
The length (ULONG) of the record buffer.

**RecCount**
Specifies the number (ULONG) of records requested.

**RecRtnCnt**
The pointer (PULONG) to the count of the records actually returned. When RECAL (Record Attribute List) parameters are specified in RecordBuf and RECCNT is specified within the RECAL, the RecRtnCnt parameter (ULONG) reflects the RECCNT number of duplicate records. Therefore, if RecordBuf contained 25 data records, one of which included a RECAL with RECCNT having a value of 150, the value of RecRtnCnt would be 175.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| ENDFILRM | X'120B' | End of File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

The cursor is set to the next record in key sequence even if that record has a key equal to the key of the current record.

If key limits have been established (see “DDMSetKeyLimits (Set Key Limits)” on page 197), DDMSetKeyNext sets the cursor to the next record in key sequence, as long as that record has a key value which is before or equal to the value specified by the high key limit parameter on the DDMSetKeyLimits function. If the cursor is currently at the high key limit, the function is terminated with the ENDFILRM reply message, the cursor is set to EOF, and the key limits are reset (unspecified value).

As an option, DDMSetKeyNext can:

- Specify whether more than one record is being requested (RecCount).
- Set the hold cursor indicator to on (DDM_HLDCSR).
- Specify whether damaged records should be bypassed (DDM_BYPDMG).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

If the hold cursor indicator in the cursor is set to on, the DDM_HLDCSR bit in AccessFlags is FALSE, and the record is active, the cursor remains at its current position. For all other conditions, the cursor is updated.

If RecCount specifies a value greater than 1, multiple records are sent to the source agent. RecCount specifies the number of times the DDMSetKeyNext function is to be performed. This moves the cursor to the last record processed by the DDMSetKeyNext function. If RecCount specifies a number and DDM_NODATA is set, the cursor is still updated but no records are sent; this is not an error.

If RecCount specifies a number greater than the remaining records in the file, the remaining records are sent to the source agent, the cursor position is changed to EOF, and an ENDFILRM reply message is sent.

If the DDM_BYPDMG bit of AccessFlags is set, any damaged record encountered by the DDMSetKeyNext function sends a RECDMGRM reply message, updates the cursor, and decreases RecCount by one. This allows the maximum number of undamaged records to be sent to the source system.

## Effect on Cursor Position

**Normal completion (SVRCOD of 0 or 4)**

The cursor is moved to the next record in the index key sequence or remains in the same position in the current record based on:

- The hold cursor indicator in the cursor
- The DDM_HLDCSR flag
- Whether the record is active.

If the ENDFILRM reply message results, the cursor is set to the end of file.

**Error termination (SVRCOD of 8)**

The cursor position is the same as before the function was issued. If RecCount is greater than 1, the cursor position is the same as before the last iteration of the function.

**Severe termination (SVRCOD of 16 or higher)**

The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, then the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (for example, DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.

- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

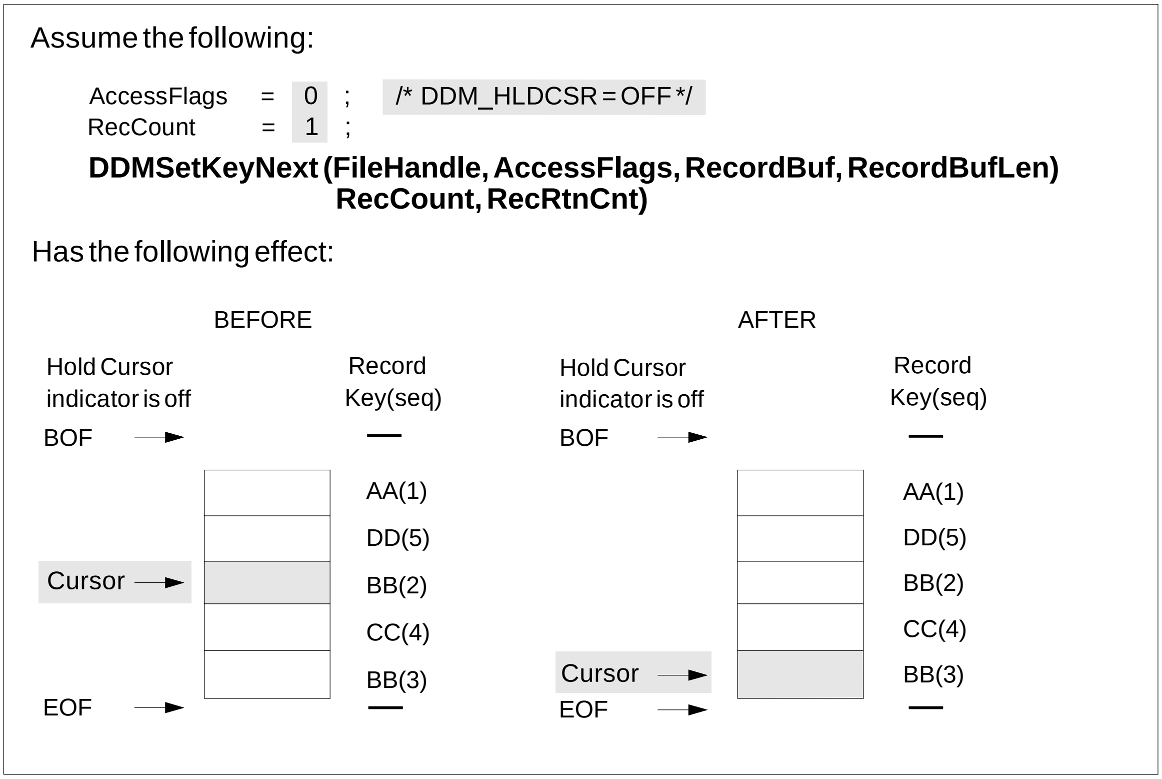
If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued, or if RecCount is greater than 1, the record locks are the same as before the last iteration of the function.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to be Rejected | With this Reply Message |
|---|---|
| The file does not contain any records initially after a DDMCreateRecFile.<br>The file does not contain any records beyond the current cursor position.<br>The cursor had previously been set to an inactive record.<br>The file does not contain any records beyond the current cursor position, within the limits set by the DDMSetKeyLimits function.<br>RecCount specifies a number greater than the number of records remaining in the file. | ENDFILRM |
| The file handle is invalid. | HDLNFNRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents. | INVRQSRM |
| The record lock cannot be obtained. | RECIUSRM |

## Examples



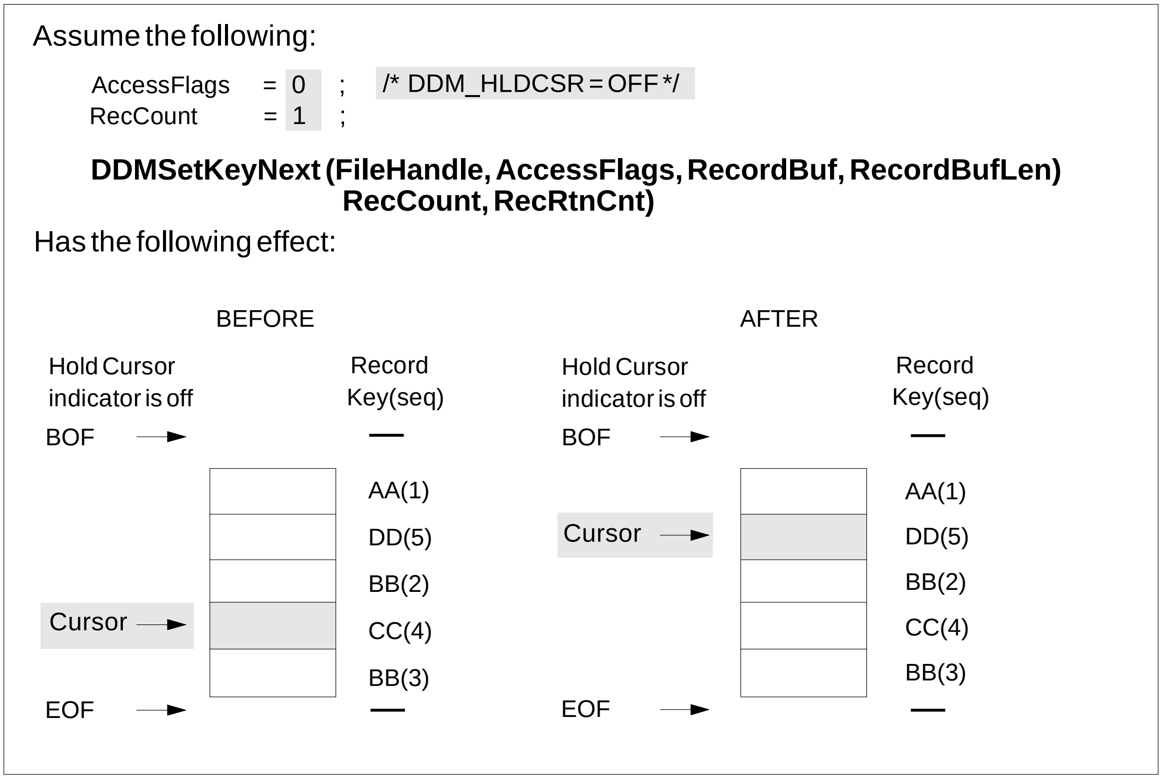
Assume the following:

```
AccessFlags   =  0 ;   /* DDM_HLDCSR = OFF */
RecCount      =  1 ;
```

**DDMSetKeyNext (FileHandle, AccessFlags, RecordBuf, RecordBufLen) RecCount, RecRtnCnt)**

Has the following effect:

*Figure 42. DDMSetKeyNext Function with Duplicate Key Values*



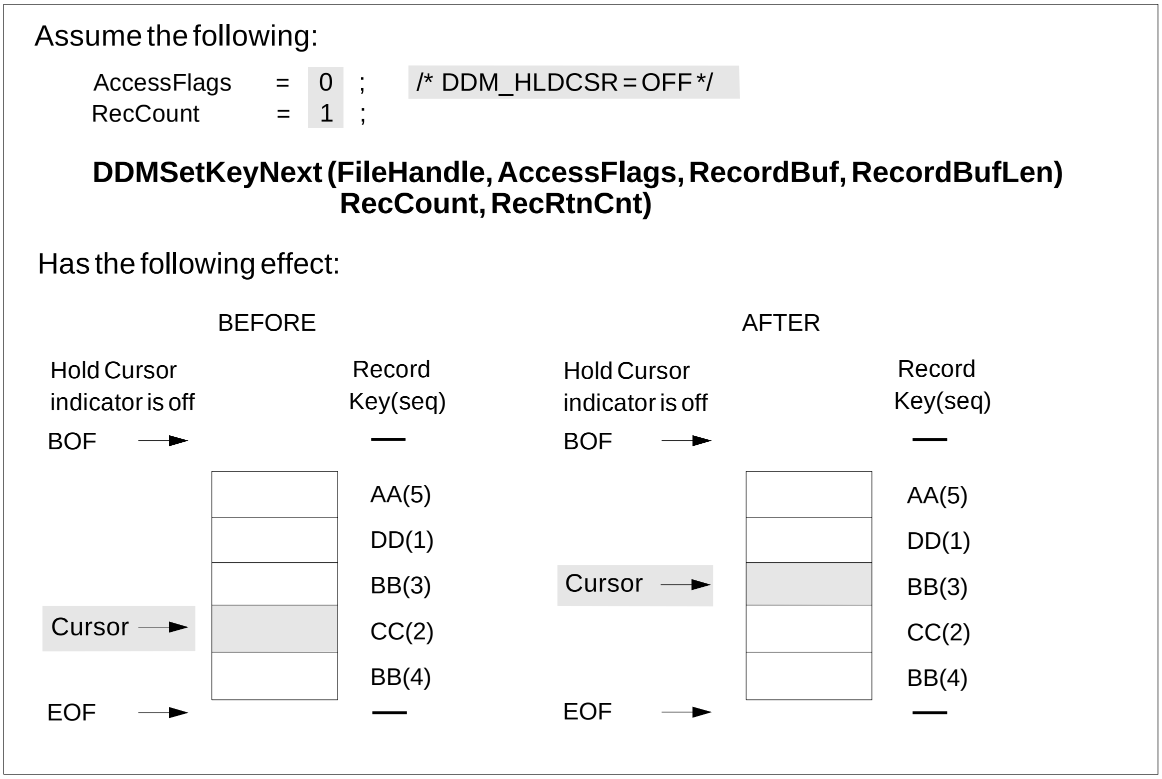
Assume the following:

```
AccessFlags   = 0  ;   /* DDM_HLDCSR = OFF */
RecCount      = 1  ;
```

**DDMSetKeyNext (FileHandle, AccessFlags, RecordBuf, RecordBufLen)
RecCount, RecRtnCnt)**

Has the following effect:

*Figure 43. DDMSetKeyNext Function for Ascending Sequence*



Assume the following:

```
AccessFlags    =  0  ;    /* DDM_HLDCSR = OFF */
RecCount       =  1  ;
```

**DDMSetKeyNext (FileHandle, AccessFlags, RecordBuf, RecordBufLen) RecCount, RecRtnCnt)**

Has the following effect:

*Figure 44. DDMSetKeyNext Function for Descending Sequence*

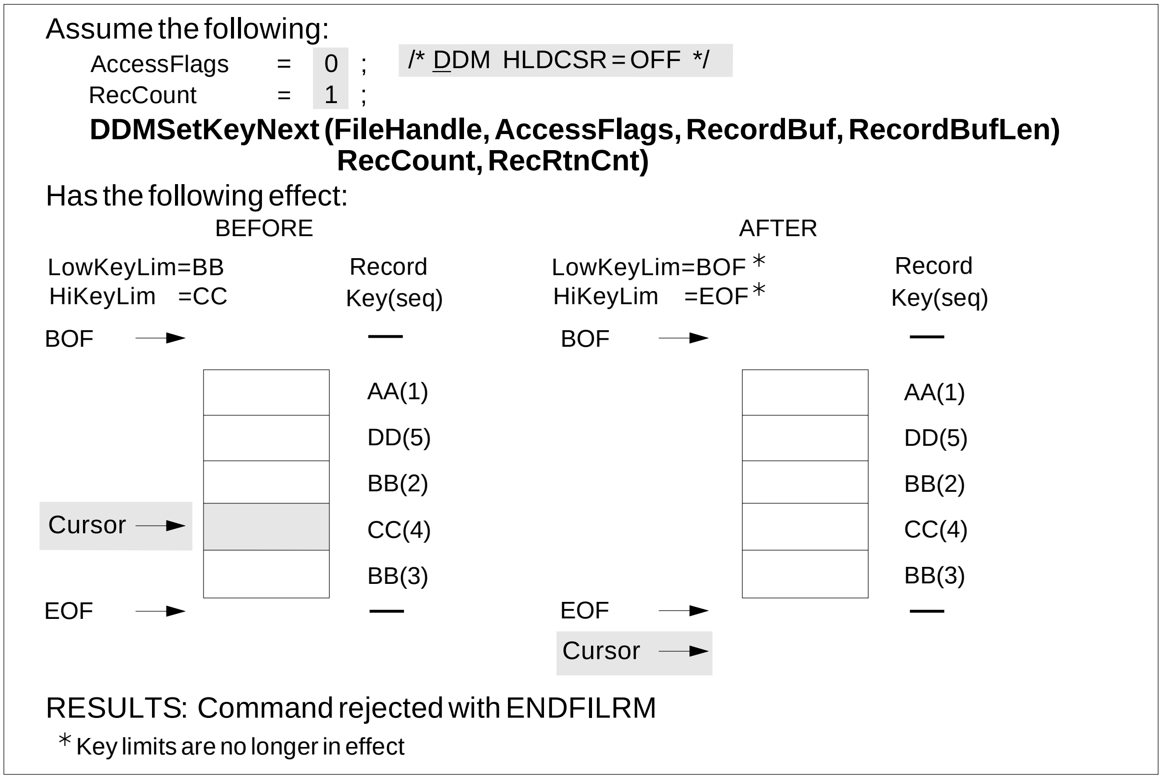
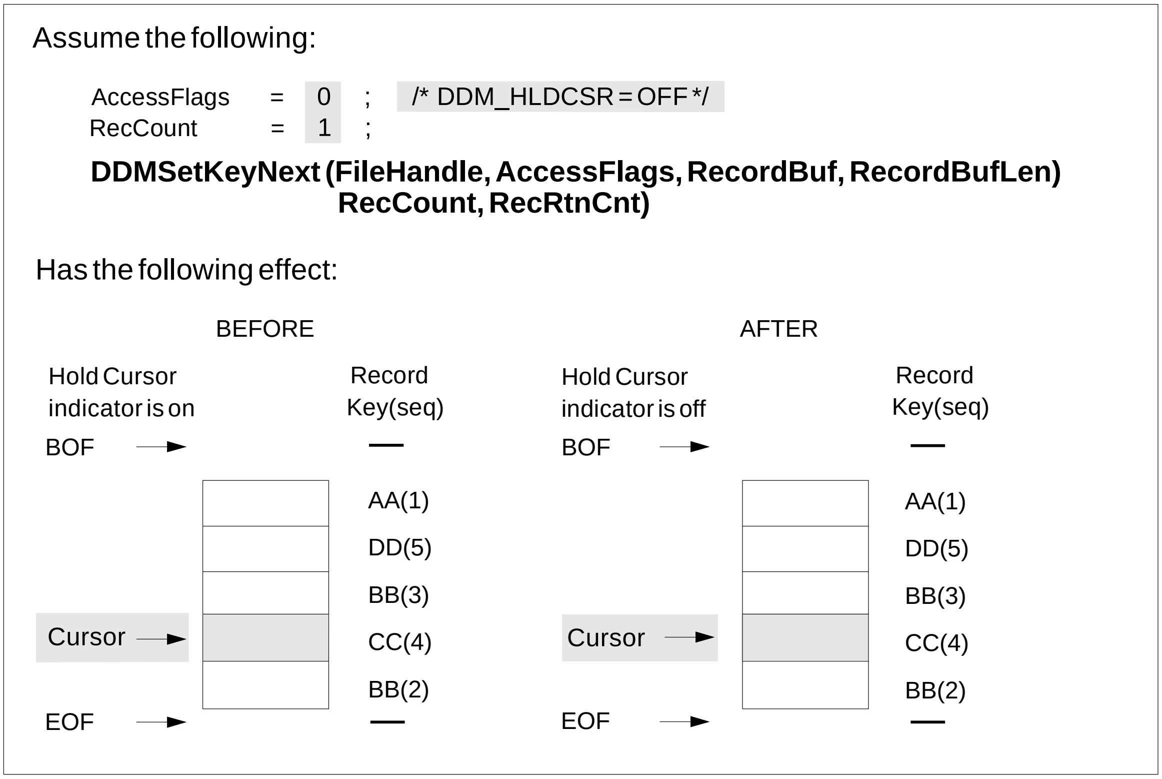


*Figure 45. DDMSetKeyNext Function with Key Limits Set*



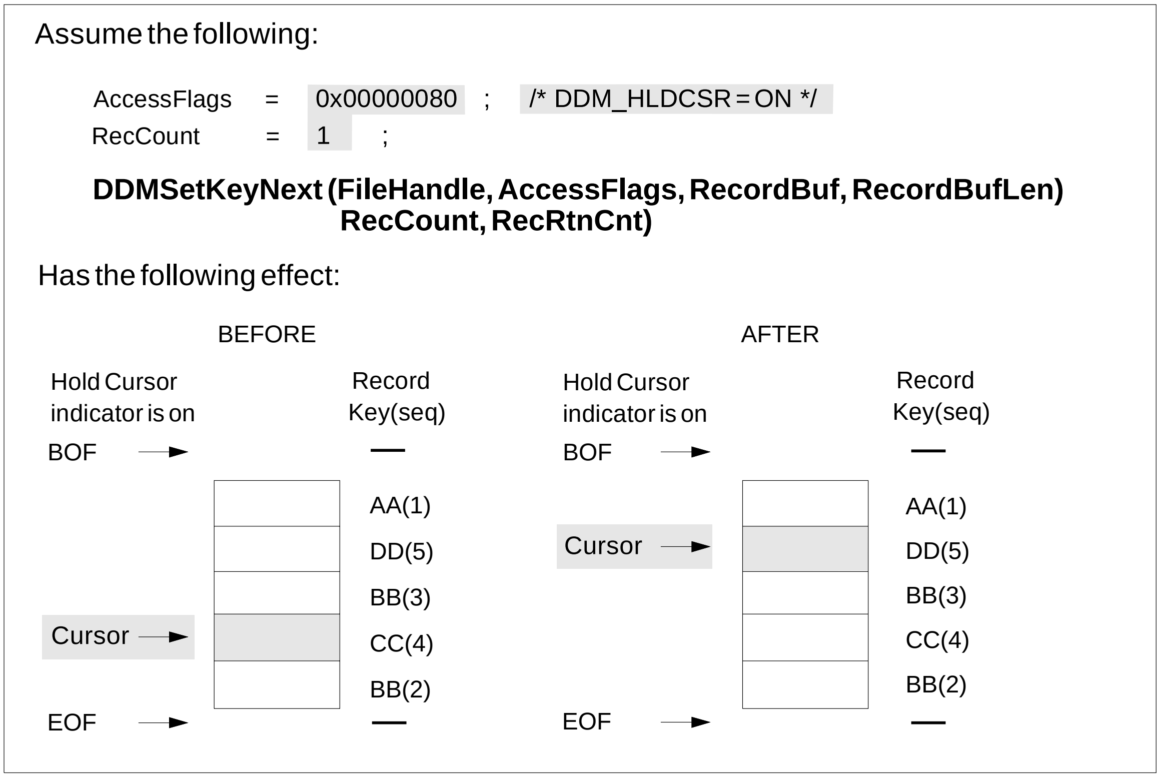
Assume the following:

```
AccessFlags   =  0  ;   /* DDM_HLDCSR = OFF */
RecCount      =  1  ;
```

**DDMSetKeyNext (FileHandle, AccessFlags, RecordBuf, RecordBufLen) RecCount, RecRtnCnt)**

Has the following effect:

*Figure 46. DDMSetKeyNext Function with Hold Cursor Initially On*



Assume the following:

```
AccessFlags   =   0x00000080  ;   /* DDM_HLDCSR = ON */
RecCount      =   1      ;
```

**DDMSetKeyNext (FileHandle, AccessFlags, RecordBuf, RecordBufLen)
RecCount, RecRtnCnt)**

Has the following effect:

*Figure 47. DDMSetKeyNext Function with Hold Cursor Initially On*

Assume the following:

```
AccessFlags   =   0x00000080   ;   /* DDM_HLDCSR = ON */
RecCount      =   1            ;
```

**DDMSetKeyNext (FileHandle, AccessFlags, RecordBuf, RecordBufLen)
RecCount, RecRtnCnt)**

Has the following effect:

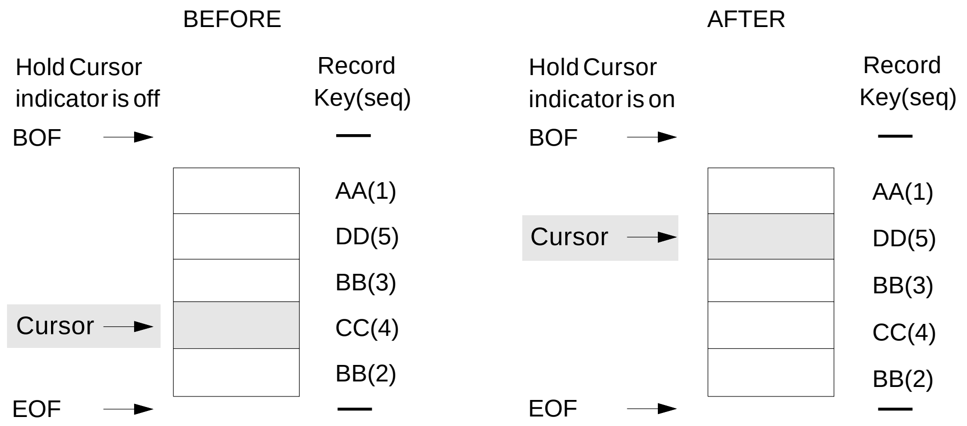


*Figure 48. DDMSetKeyNext Function with Hold Cursor Initially Off*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'144A' | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of the record data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RC. |
| **X'111A'** | The value (CODEPOINT) indicating that the following data is a record count. The RC parameter is used to indicate the number of duplicate records. It provides a shorthand way of specifying N records, where N>1, without replicating the record's contents. |
| **RC** | The number (ULONG) of duplicate records in the record attribute list.<br>**Note:** RC is not included unless identical, consecutive records are being returned. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**Note:** RECCNT is not included unless identical, consecutive records are being returned.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

When RC and RN are both specified, the record number specified by RN applies to the first occurrence of the record and each subsequent record has a record number one greater than the previous record.

A value of X'FFFFFFFF' for RN indicates that the record number of the first record in the record attribute list is not known.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG). A value of X'FFFFFFFF' for RN indicates that the record number is not known.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**Note:** RECCNT is not included unless identical, consecutive records are being returned.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of the record key value.

**X'1430'** The value (CODEPOINT) indicating that the following key is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following key is a key count. The RC parameter is used to indicate the number of duplicate keys. It provides a shorthand way of specifying N keys, where N>1, without replicating the key's contents.

**Note:** RC is not included unless identical, consecutive keys are being returned.

**RC** The number (ULONG) of duplicate keys in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

| | | | | | |
|---|---|---|---|---|---|
| L3 | X'1115' | KEY | L4 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**Note:** RECCNT is not included unless identical, consecutive records are being returned.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L3** The length (ULONG) from the beginning of L3 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L4** The length (ULONG) from the beginning of L4 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetKeyPrevious (Set Cursor to Previous Record in Key Sequence)

This function moves the cursor to the previous record of the file in key sequence and optionally returns the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetKeyPrevious (HDDMFILE       FileHandle,
                          ULONG          AccessFlags,
                          PDDMRECORD     RecordBuf,
                          ULONG          RecordBufLen,
                          ULONG          RecCount,
                          PULONG         RecRtnCnt
                          );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **3–4** | Reserved flags |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 226.

**RecordBufLen**
The length (ULONG) of the record buffer.

**RecCount**
Specifies the number (ULONG) of records requested.

**RecRtnCnt**

The pointer (PULONG) to the count of the records actually returned. When RECAL (Record Attribute List) parameters are specified in RecordBuf and RECCNT is specified within the RECAL, the RecRtnCnt parameter (ULONG) reflects the RECCNT number of duplicate records. Therefore, if RecordBuf contained 25 data records, one of which included a RECAL with RECCNT having a value of 150, the value of RecRtnCnt would be 175.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| ENDFILRM | X'120B' | End of File |
| FILATHRM | X'123B' | Not Authorized to File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECIUSRM | X'124A' | Record in Use |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

If the file contains records with duplicate keys, the cursor is set to the previous record with the same or next key in the key sequence.

As an option, DDMSetKeyPrevious can:

- Set the hold cursor indicator to on (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

If RecCount gives a value greater than 1, multiple records are sent to the source agent. RecCount requests that the DDMSetKeyPrevious function be performed the number of times specified by RecCount. This moves the cursor to the last record processed by the DDMSetKeyPrevious function.

If RecCount gives a number greater than the remaining records in the file, the remaining records are sent to the source agent, the cursor position is changed to BOF, and an ENDFILRM reply message is sent.

## Effect on Cursor Position

**Normal completion (SVRCOD of 0 or 4)**
The cursor is moved to the previous record in the index key sequence. If an ENDFILRM reply message results, the cursor is moved to the beginning of file.

**Error termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (for example, DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function issued references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

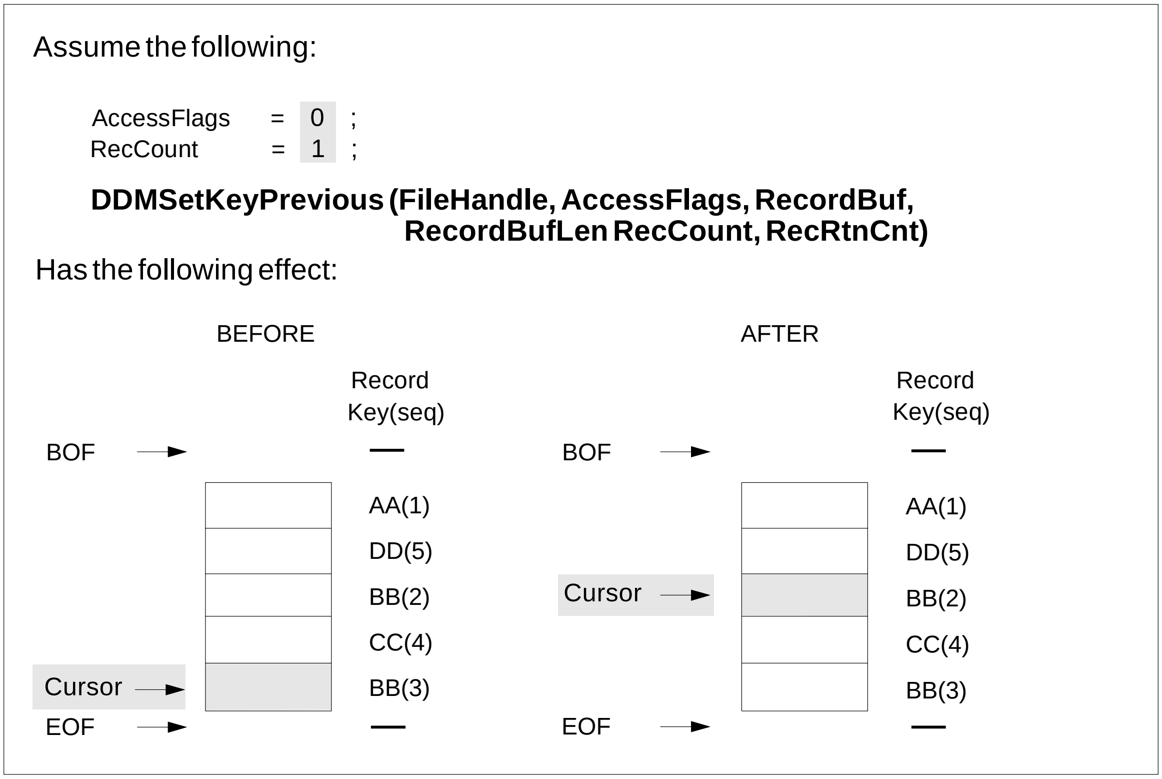
If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is invalid. | HDLNFNRM |
| The file does not contain any records initially after a DDMCreateRecFile.<br>**Note:** The cursor position is set to BOF.<br>The file does not contain any records before the current cursor position.<br>**Note:** The cursor position is set to BOF.<br>RecCount specifies a number greater than the number of records remaining in the file. | ENDFILRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents. | INVRQSRM |
| The record lock cannot be obtained. | RECIUSRM |

## Examples



Assume the following:

```
AccessFlags    =  0  ;
RecCount       =  1  ;
```

**DDMSetKeyPrevious (FileHandle, AccessFlags, RecordBuf,
RecordBufLen RecCount, RecRtnCnt)**

Has the following effect:

*Figure 49. DDMSetKeyPrevious Function with Duplicate Key Values*

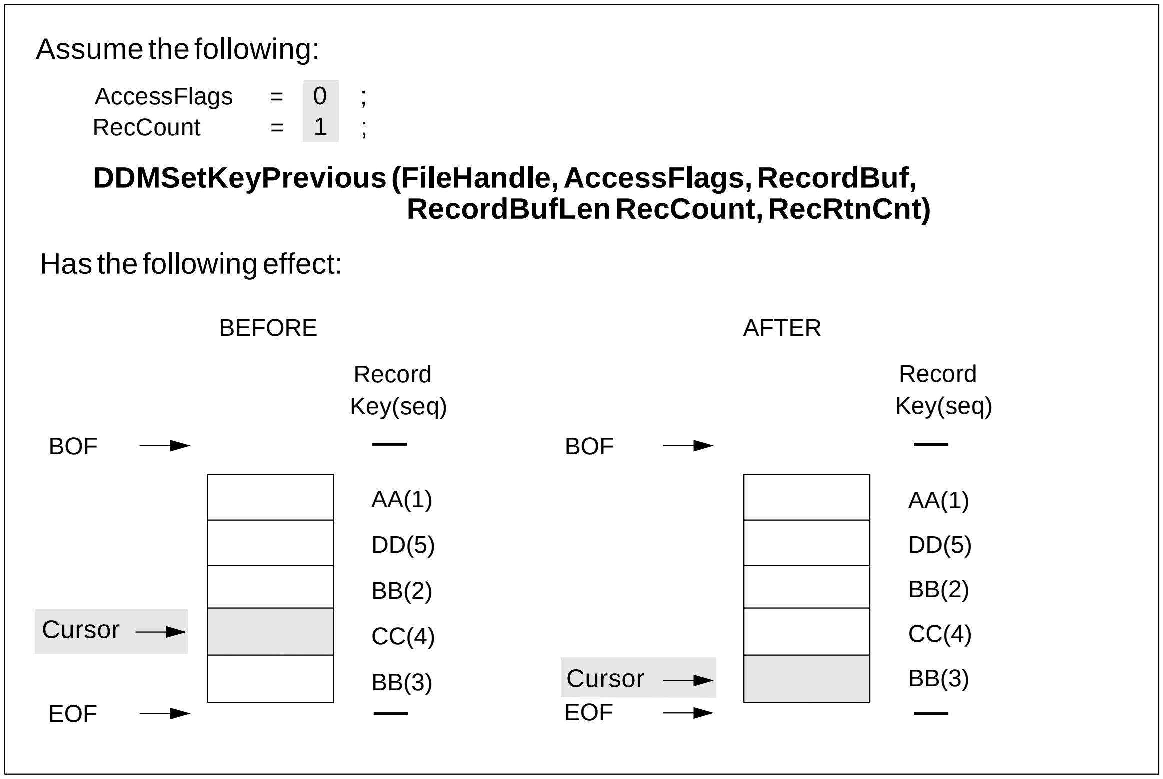
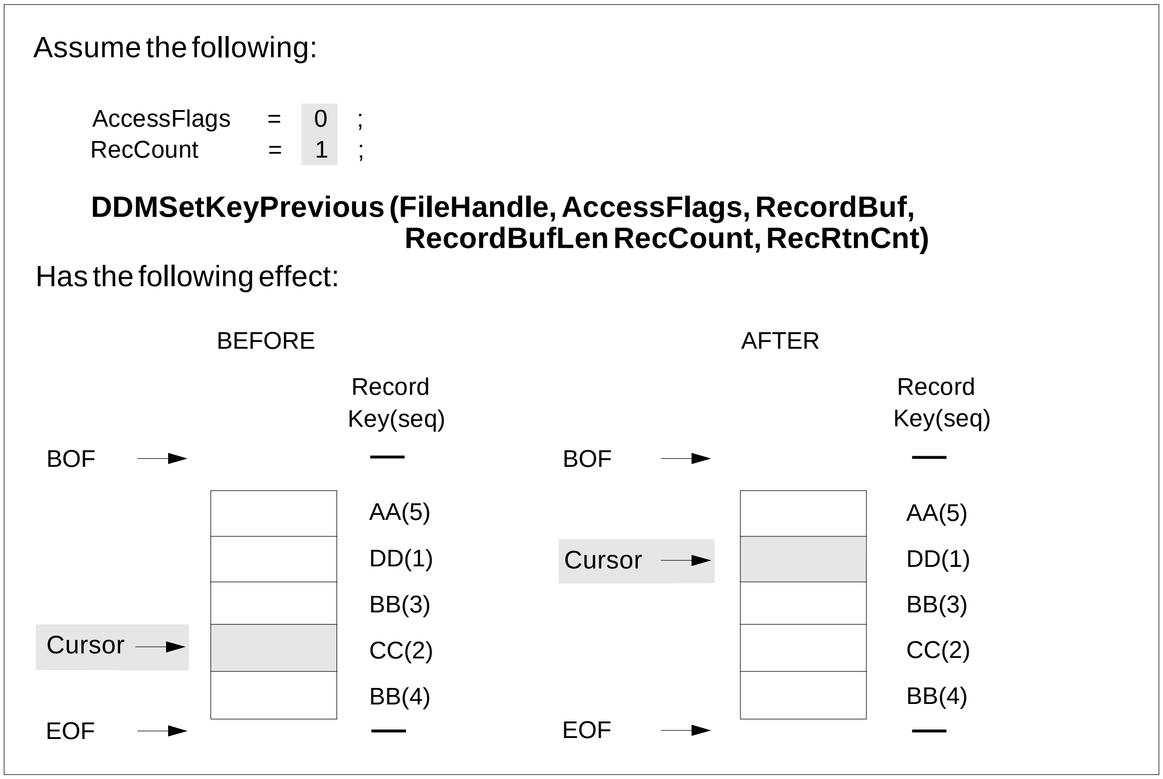


*Figure 50. DDMSetKeyPrevious Function for Ascending Sequence*



Assume the following:

```
AccessFlags   =  0  ;
RecCount      =  1  ;
```

**DDMSetKeyPrevious (FileHandle, AccessFlags, RecordBuf, RecordBufLen RecCount, RecRtnCnt)**

Has the following effect:

*Figure 51. DDMSetKeyPrevious Function for Descending Sequence*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of the record data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count. The RC parameter is used to indicate the number of duplicate records. It provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**Note:** RC is not included unless identical, consecutive records are being returned.

**L2** The length (ULONG) from the beginning of L2 to the end of data.

**X'144A'** The value (CODEPOINT) indicating that the following data is a record data.

**Data** The record data.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

## DDMSetKeyPrevious

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**Note:** RECCNT is not included unless identical, consecutive records are being returned.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

When RC and RN are both specified, the record number specified by RN applies to the first occurrence of the record and each subsequent record has a record number one greater than the previous record.

A value of X'FFFFFFFF' for RN indicates that the record number of the first record in the record attribute list is not known.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG). A value of X'FFFFFFFF' for RN indicates that the record number is not known.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**Note:** RECCNT is not included unless identical, consecutive records are being returned.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of the record key value.

**X'1430'** The value (CODEPOINT) indicating that the following key is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following key is a key count. The RC parameter is used to indicate the number of duplicate keys. The RC parameter provides a shorthand way of specifying N keys, where N>1, without replicating the key's contents.

**Note:** RC is not included unless identical, consecutive keys are being returned.

**RC** The number (ULONG) of duplicate keys in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

| | | | | | |
|---|---|---|---|---|---|
| L3 | X'1115' | KEY | L4 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**Note:** RECCNT is not included unless identical, consecutive records are being returned.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L3** The length (ULONG) from the beginning of L3 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L4** The length (ULONG) from the beginning of L4 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetLast (Set Cursor to Last Record)

This function sets the cursor to the last record of the file and optionally returns the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetLast (HDDMFILE         FileHandle,
                   ULONG            AccessFlags,
                   PDDMRECORD       RecordBuf,
                   ULONG            RecordBufLen
                   );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | DDM_ALLREC (All Records, Active or Inactive) |
| **3** | Reserved flag |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 239.

**RecordBufLen**
The length (ULONG) of the record buffer.

## DDMSetLast

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| ENDFILRM | X'120B' | End of File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |
| RECNFNRM | X'1225' | Record Not Found |

## Remarks

The DDM_ALLREC bit flag is used to determine the last record of the file. If DDM_ALLREC is not set, the cursor is set to the last active record in the file. Otherwise, the cursor is set to the last record in the file (the record preceding EOF). For direct files, DDM_ALLREC must be set off.

As an option, DDMSetLast can:

- Set the hold cursor indicator to on (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

Any key limits set are reset when the function completes.

If DDM_KEYVALFB flag is set and the file type is not keyed, the flag is ignored.

*Table 18. DDMSetLast (DDM_NODATA or DDM_ALLREC) Decision Table*

**If the DDMSetLast function is issued:**

**When initial system states are:**

| Record State | I | I | I | A | A |
|---|---|---|---|---|---|
| DDM_ALLREC | F | T | T | * | * |
| DDM_NODATA | * | F | T | F | T |
| **The final system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | F | T4 | F | F |
| RECINA (returned) | F | T | F | F | F |
| RECORD (returned) | F | F | F | T | F |
| CURSOR (returned) | F | T | T | T | T |
| Repeat table after bypassing record | T | F | F | F | F |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| ***** | **Either TRUE or FALSE** |

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**

The cursor is moved to the last record position in the file if DDM_ALLREC is set on. The cursor is moved to the last active record in the file if DDM_ALLREC is set to off.

**Error Termination (SVRCOD of 8)**

The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**

The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (for example, DDMModifyRec or DDMDeleteRec.)
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

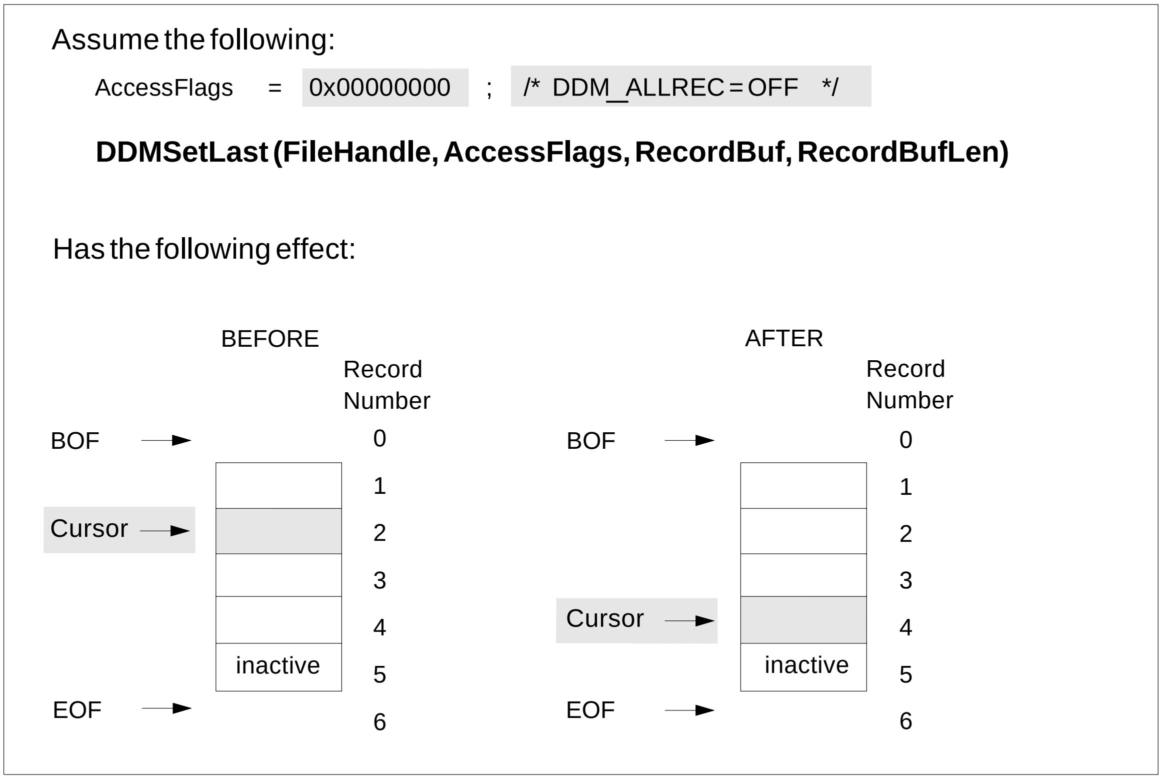
| **This Causes a Reply Message to be Generated and the Function Continues** | **With This Reply Message** |
|---|---|
| DDM_ALLREC and DDM_NODATA are active and an inactive record is read. | RECINARM |

| **This Causes the Function to be Terminated** | **With This Reply Message** |
|---|---|
| Accessflag DDM_NODATA is not set and the file was opened without GETAI. | INVRQSRM |
| The RecordBuf is not large enough to hold the returned record. | LENGTHRM |

| **This Causes the Function to be Rejected** | **With This Reply Message** |
|---|---|
| DDM_RECNBRFB or DDM_KEYVALFB is set or DDM_NODATA is not set and RecordBuf doesn't contain an address. | ADDRRM |
| The file handle is not valid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified.<br>DDM_ALLREC is set and the file is a direct file. | INVRQSRM |
| The record is damaged (not an active or inactive record). | RECDMGRM |
| A record lock cannot be obtained. | RECIUSRM |
| Bypassing inactive records is requested (DDM_ALLREC is off) and the file only contains inactive records.<br>The file does not contain any records initially after a DDMCreateRecFile.<br>**Note:** The cursor position is not changed. | RECNFNRM |

## Examples



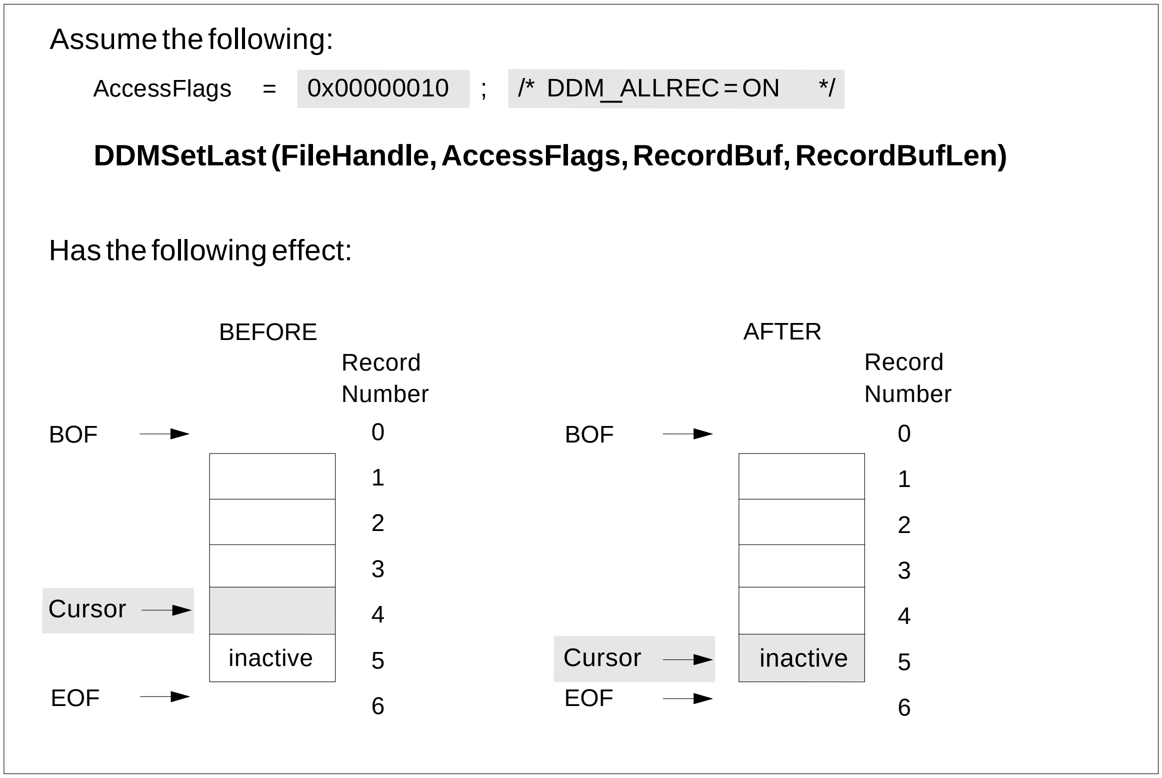
Assume the following:

```
AccessFlags   =  0x00000000  ;  /* DDM_ALLREC = OFF  */
```

**DDMSetLast (FileHandle, AccessFlags, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 52. DDMSetLast DDM_ALLREC Set Off for Sequential File*



Assume the following:

AccessFlags = 0x00000010 ; /* DDM_ALLREC = ON */

**DDMSetLast (FileHandle, AccessFlags, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 53. DDMSetLast DDM_ALLREC Set On for Sequential File*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| LL | CP | Data |
|---|---|---|

**Field** **Description**

**LL** The length (ULONG) of the record buffer from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length.

**X'144A'** Indicates that the following data is record data (RECORD).

**X'142D'** Indicates that the following data is a ULONG length of an inactive record (RECINA).

**Data** Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length.

**X'144A'** Indicates that the following data is record data (RECORD).

**X'142D'** Indicates that the following data is a ULONG length of an inactive record (RECINA).

**Data** Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | CP | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **CP** | The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length. |
| **Data** | Either record data or the length (ULONG) of the inactive record. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY | L3 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is record data or a ULONG length inactive record length.

**X'144A'** Indicates that the following data is record data (RECORD).

**X'142D'** Indicates that the following data is a ULONG length of an inactive record (RECINA).

**Data** Either record data or the length (ULONG) of the inactive record.

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetMinus (Set Cursor Minus)

This function sets the cursor to the record number of the file indicated by the cursor, minus the number of record positions specified by the CsrDisp (Cursor Displacement) parameter. This function can also return the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetMinus (HDDMFILE       FileHandle,
                    ULONG          AccessFlags,
                    ULONG          CsrDisp,
                    PDDMRECORD     RecordBuf,
                    ULONG          RecordBufLen
                    );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **9–31** | Reserved flags |
| **8** | DDM_ALWINA (Allow Cursor on Inactive Record) |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | Reserved flag |
| **3** | DDM_RTNINA (Return Inactive Record) |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**CsrDisp**
Specifies the cursor displacement (ULONG) in the negative direction.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Example” on page 249.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |
| RECNBRRM | X'1224' | Record Number Out of Bounds |

## Remarks

The type of the records in the file (active or inactive) bypassed by DDMSetMinus has no effect on the cursor positioning.

As an option, DDMSetMinus can:

- Specify whether the cursor can be set to an inactive record position (DDM_ALWINA).
- Set the hold cursor indicator on (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether inactive records should be returned (DDM_RTNINA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

Any key limits set are reset when the function completes.

If DDM_KEYVALFB flag is set and the file type is not keyed, the flag is ignored.

*Table 19. DDMSetMinus (DDM_ALWINA, DDM_RTNINA, or DDM_NODATA) Decision Table*

**If the DDMSetMinus function is issued:**

**When initial system states are:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Record State | I | I | I | I | I | A | A |
| DDM_ALWINA | T | T | T | F | F | * | * |
| DDM_RTNINA | T | * | F | * | * | * | * |
| DDM_NODATA | F | T | F | F | T | F | T |
| **The final system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | T4 | T4 | T8 | T8 | F | F |
| RECINA (returned) | T | F | F | F | F | F | F |
| RECORD (returned) | F | F | F | F | F | T | F |
| CURSOR (changed) | T | T | T | F | F | T | T |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| **T8** | **TRUE with SVRCOD (Error)** |
| ***** | **Either TRUE or FALSE** |

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**

The cursor is positioned to the record position CsrDisp records prior to where the cursor was positioned before the DDMSetMinus function was issued.

**Error Termination (SVRCOD of 8)**

The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**

The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

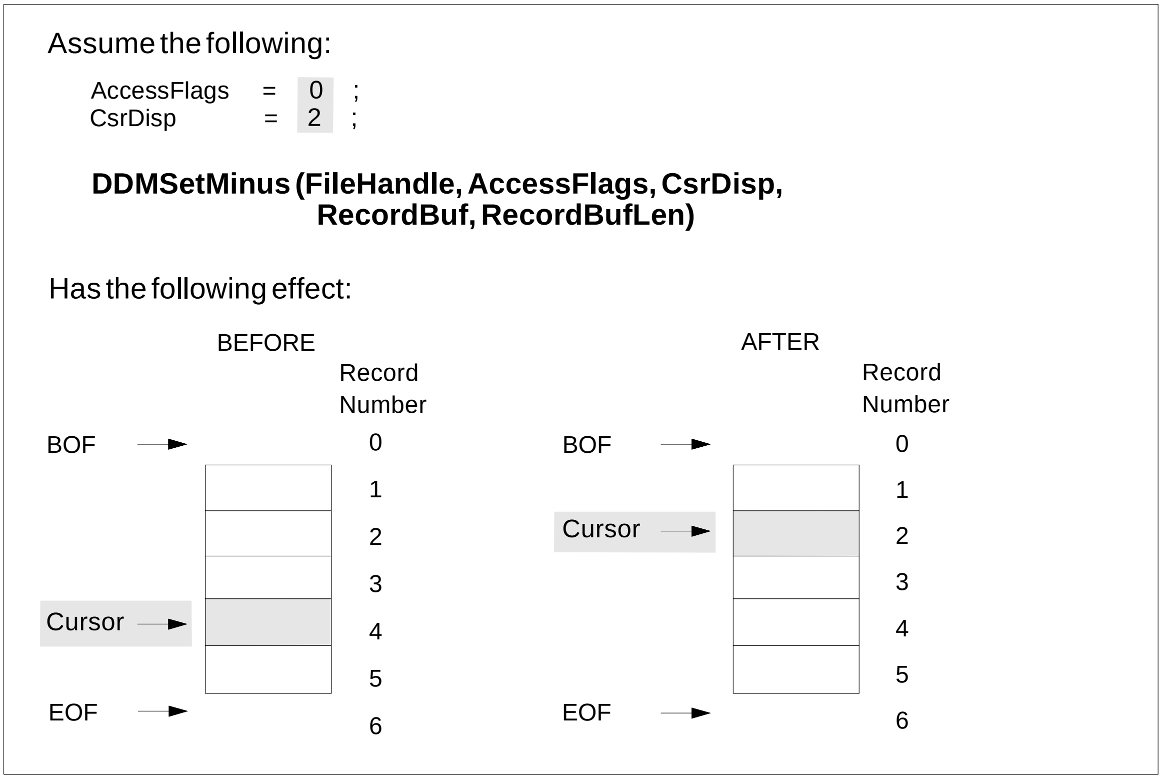
## Exceptions

| **This Causes the Function to Continue and Return** | **This Reply Message** |
|---|---|
| An inactive record is read and DDM_ALWINA is active, and DDM_RTNINA is not set or DDM_NODATA is set. | RECINARM |

| **This Causes the Function to be Rejected** | **With This Reply Message** |
|---|---|
| DDM_RECNBRFB or DDM_KEYVALFB is set, or DDM_NODATA is not set, and RecordBuf doesn't contain an address. | ADDRRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified.<br>Access flag DDM_NODATA is not set and the file was opened without GETAI. | INVRQSRM |
| RecordBuf is not large enough to hold the returned record. | LENGTHRM |
| The record is damaged (not an active or inactive record). | RECDMGRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The record is inactive and the cursor is not allowed to be set to an inactive record position (DDM_ALWINA is not set).<br>**Note:** The cursor is not changed. | RECINARM |
| The record lock cannot be obtained. | RECIUSRM |
| The CsrDisp value places the cursor prior to the first record in the file.<br>**Note:** The cursor position does not change.<br>The file contains no records after a DDMCreateRecFile.<br>**Note:** The cursor position does not change.<br>The cursor is placed outside the bounds of the file; before BOF in a sequential file, and past the physical boundary in a direct file. | RECNBRRM |

## Example



Assume the following:

```
AccessFlags   =  0  ;
CsrDisp       =  2  ;
```

```
DDMSetMinus (FileHandle, AccessFlags, CsrDisp,
             RecordBuf, RecordBufLen)
```

Has the following effect:

*Figure 54. DDMSetMinus Function*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | CP | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the record buffer from the beginning of LL to the end of Data.

**CP** — The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** — Indicates that the following data is record data.
- **X'142D'** — Indicates that the following data is a ULONG length of an inactive record.

**Data** — Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | CP | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** — The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG).

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** Either record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY | L3 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** Either record data or the length (ULONG) of the inactive record.

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** — **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetNextKeyEqual (Set Cursor to Next Record with Equal Key)

The DDMSetNextKeyEqual function moves the cursor to the next record in the key sequence. This happens only if the key field of that record has a value that equals the value specified in KeyValBuf (Key Value Buffer) parameter. This function can also return the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetNextKeyEqual (HDDMFILE        FileHandle,
                           ULONG           AccessFlags,
                           PDDMOBJECT      KeyValBuf,
                           PDDMRECORD      RecordBuf,
                           ULONG           RecordBufLen
                           );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **3–4** | Reserved flags |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**KeyValBuf**
Pointer to the buffer which contains the key to which the cursor should be moved. The format of the key value buffer upon invocation of the function is:

| | | |
|---|---|---|
| LL | X'1115' | Key Value |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the key value description from the beginning of LL to the end of Key Value. |

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 259.

**RecordBufLen**
The length (ULONG) of the record buffer. The record buffer length should be the same size as the largest possible record plus the number of bytes required for the RECAL (Record Attribute List).

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| ENDFILRM | X'120B' | End of File |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECNFNRM | X'1225' | Record Not Found |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

Generic keys can be specified in KeyValBuf.

If the key value of the next key in the key sequence is not equal to the value specified by KeyValBuf, an ENDFILRM reply message is returned and the cursor is moved to EOF. The requester must reposition the cursor before another DDMSetNextKeyEqual function can be requested.

The cursor remains at its current position if the key value of the current record in key sequence is equal to the value specified by the key value buffer and:

- The hold cursor indicator in the cursor is set to on.
- The DDM_HLDCSR bit in AccessFlags is FALSE.
- The record is active.

For all other conditions, the cursor is updated.

As an option, DDMSetNextKeyEqual can:

- Set the hold cursor indicator to on (DDM_HLDCSR).
- Return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

If key limits have been established DDMSetNextKeyEqual sets the cursor to the next record if it equals the specified key value, and the key value of the record is before or equal to the value specified by high key limit on DDMSetKeyLimits. If the next record is after the high key limit, the function is rejected with an ENDFILRM reply message and the cursor is set to the EOF position of file. See "DDMSetKeyLimits (Set Key Limits)" on page 197.

If the hold cursor indicator in the cursor is set to on, the DDM_HLDCSR bit in AccessFlags is FALSE, and the record is active, the cursor remains at its current position. For all other conditions, the cursor is updated.

## Effect on Cursor Position

**Normal completion (SVRCOD of 0 or 4)**
The cursor is moved to the selected record, or remains in the current record based on the hold cursor indicator in the cursor, DDM_HLDCSR bit in AccessFlags, and whether the record is active. If an ENDFILRM reply message results, the cursor is moved EOF.

**Error termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if it is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

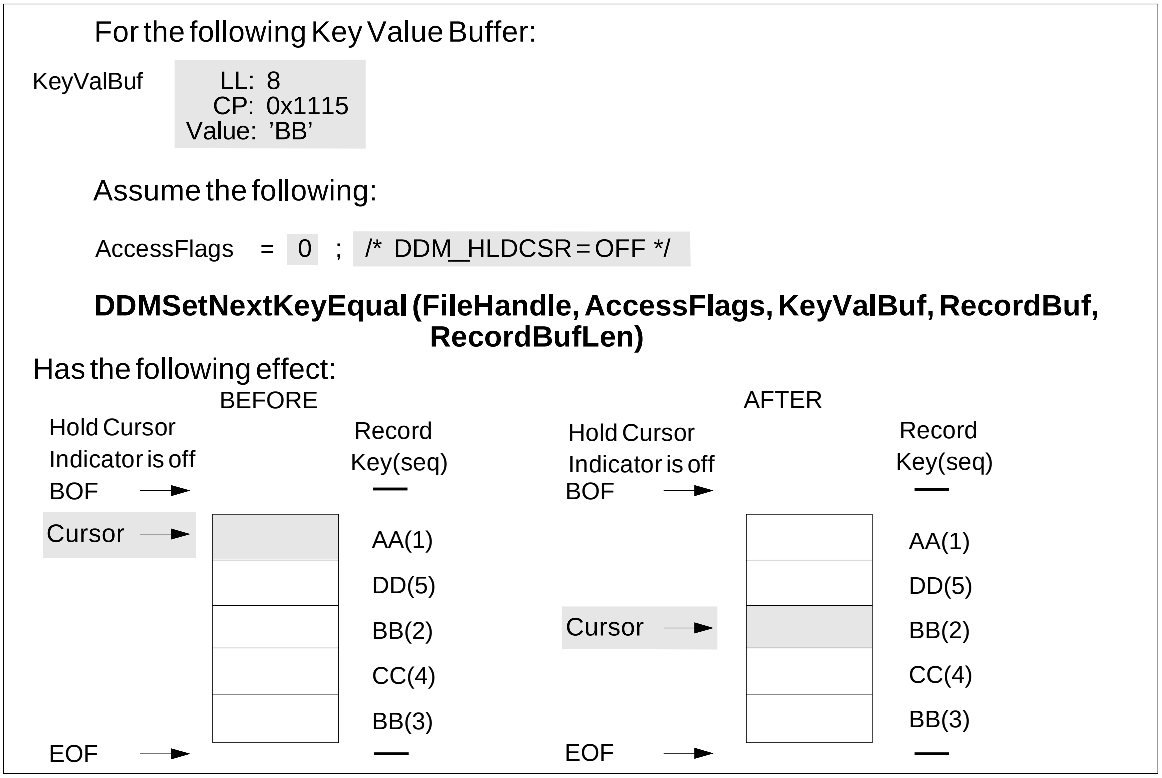
- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes | This Reply Message to be Returned |
|---|---|
| The key field of the next record in key sequence is not equal to the key value specified by the KeyValBuf parameter. | ENDFILRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file does not contain any records beyond the current cursor position, within the limits set by the DDMSetKeyLimits function.<br>The cursor had previously been set to an inactive record.<br>**Note:** The cursor is positioned to EOF. | ENDFILRM |
| The file handle is invalid. | HDLNFNRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents. | INVRQSRM |
| The record lock cannot be obtained. | RECIUSRM |
| The file does not contain any records initially after a DDMCreateRecFile.<br>**Note:** The cursor position is not changed. | RECNFNRM |

## Examples



For the following Key Value Buffer:

```
KeyValBuf     LL:  8
              CP:  0x1115
           Value:  'BB'
```

Assume the following:

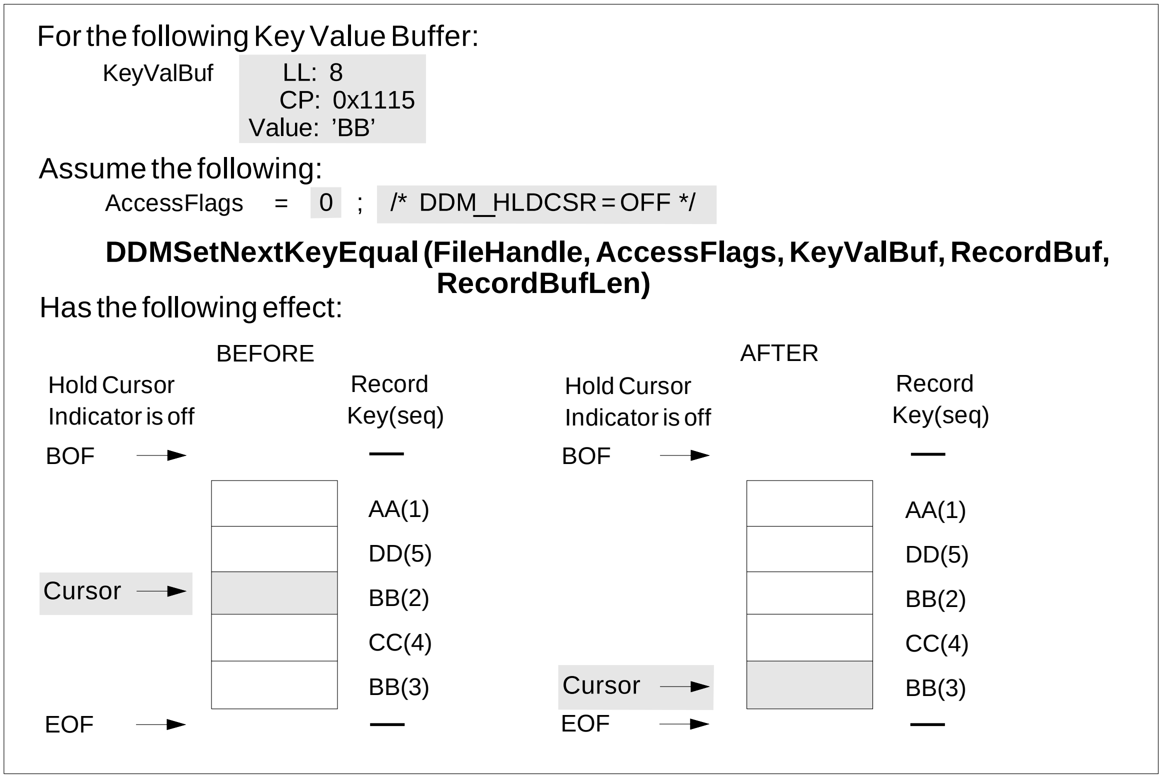
```
AccessFlags  =  0  ;  /* DDM_HLDCSR = OFF */
```

**DDMSetNextKeyEqual (FileHandle, AccessFlags, KeyValBuf, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 55. DDMSetNextKeyEqual to Access First Duplicate Key. From the current cursor position, the next record in the key sequence is examined for a key value of BB. The cursor is moved to that record and the record is returned.*

## DDMSetNextKeyEqual



For the following Key Value Buffer:

```
KeyValBuf      LL:  8
               CP:  0x1115
            Value:  'BB'
```

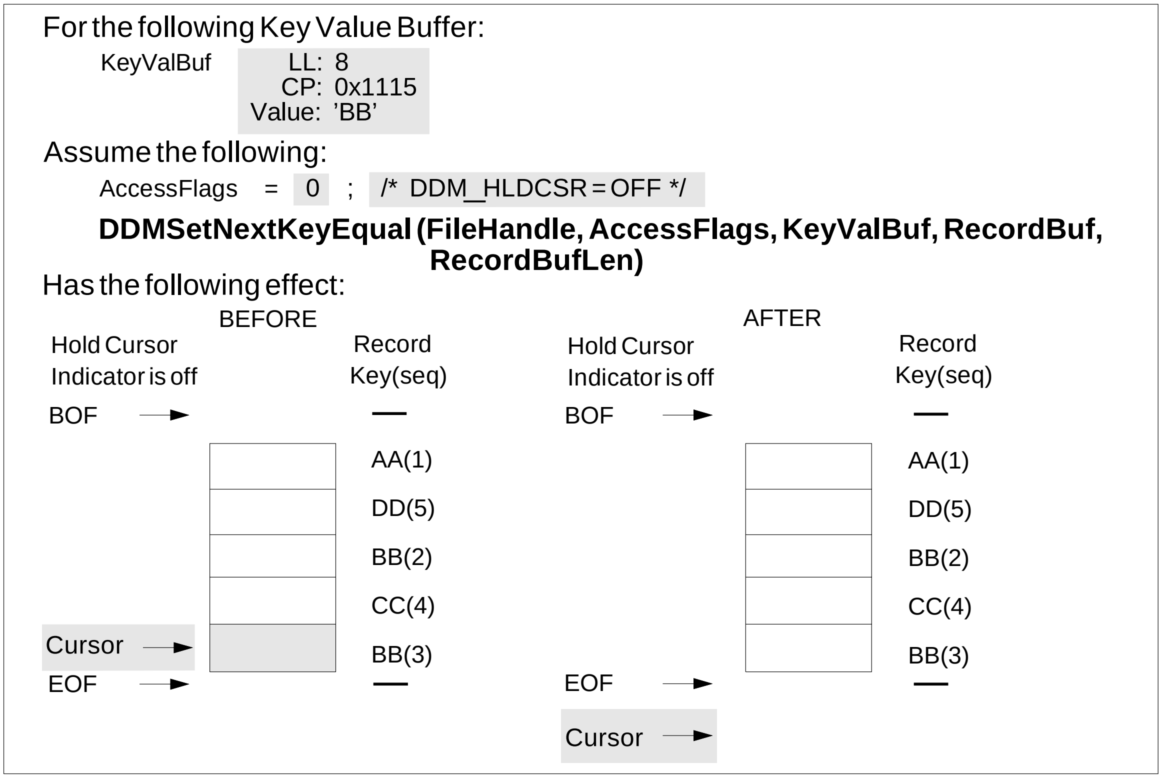
Assume the following:

```
AccessFlags   =  0  ;  /* DDM_HLDCSR = OFF */
```

**DDMSetNextKeyEqual (FileHandle, AccessFlags, KeyValBuf, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 56. DDMSetNextKeyEqual to Access the Next Duplicate Key. From the current cursor position, within a set of records with duplicate keys, the next record in key sequence is examined for a key value of BB. The cursor is positioned at that record and the record is returned.*



For the following Key Value Buffer:

```
KeyValBuf      LL:  8
               CP:  0x1115
            Value:  'BB'
```

Assume the following:

```
AccessFlags   =  0  ;  /* DDM_HLDCSR = OFF */
```

**DDMSetNextKeyEqual (FileHandle, AccessFlags, KeyValBuf, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 57. DDMSetNextKeyEqual to Access Past the Last Duplicate Key. From the current cursor position, at the last record in a set of records with duplicate keys, the next record in the key sequence is examined for a key value of BB. This record does not contain a key field of BB. The cursor is set to EOF, and ENDFILRM is returned.*

## DDMSetNextKeyEqual

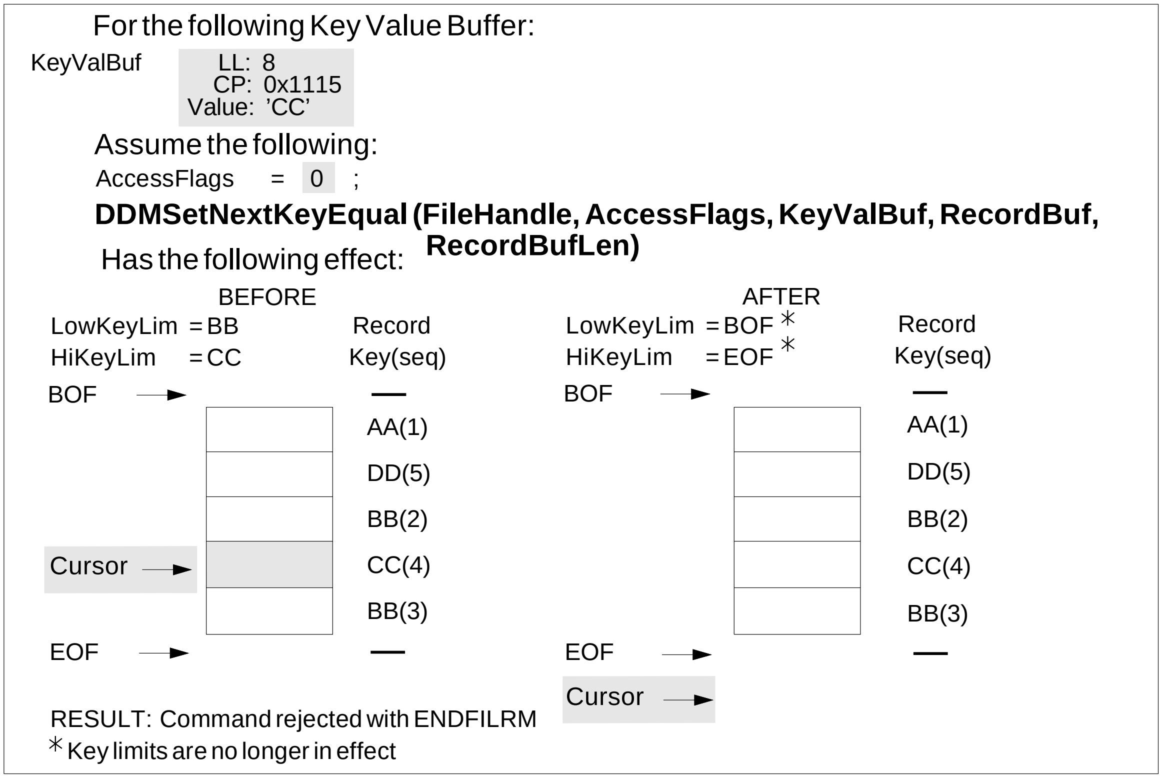
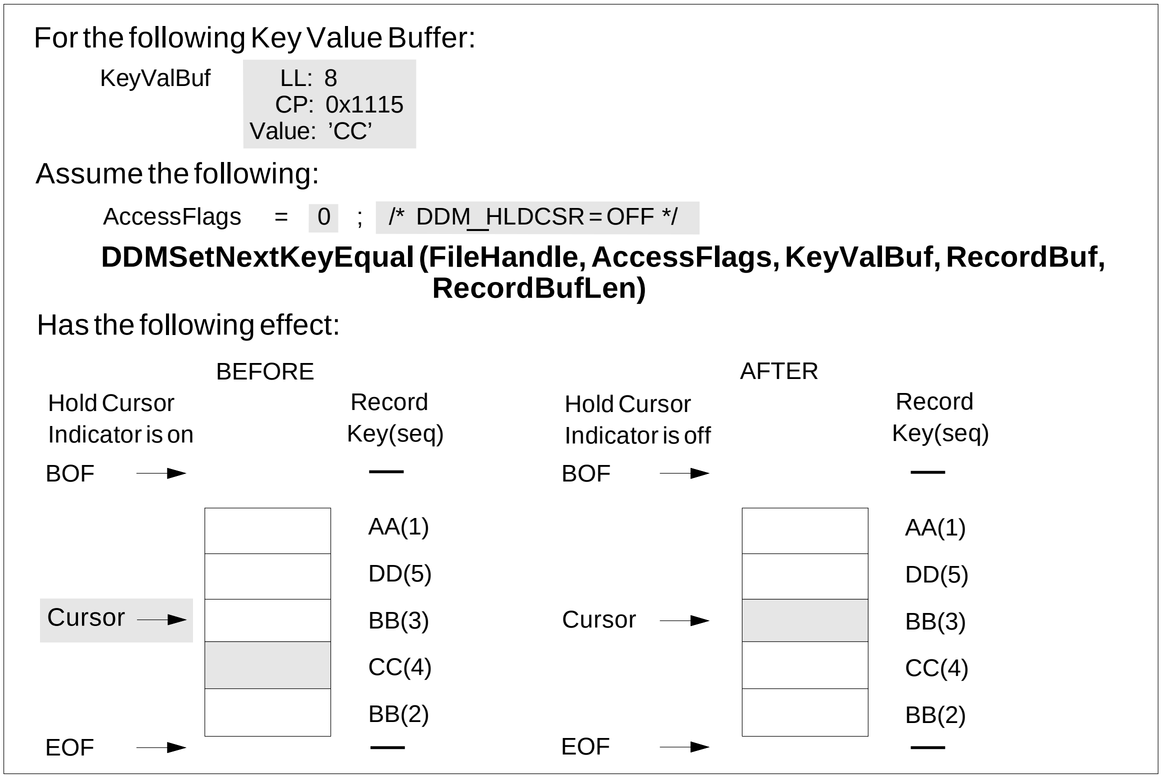


*Figure 58. DDMSetNextKeyEqual Function with Key Limits Set. If key limits have been established (see DDMSetKeyLimits), the DDMSetNextKeyEqual command sets the cursor to the next record if it equals the specified key value, and the key value of the record is before or equal to the value specified by High Key Limit on DDMSetKeyLimits. If the next record is after the High Key Limit limit, the command is rejected with ENDFILRM and the cursor is set to the end of file.*



For the following Key Value Buffer:

KeyValBuf LL: 8 CP: 0x1115 Value: 'CC'

Assume the following:

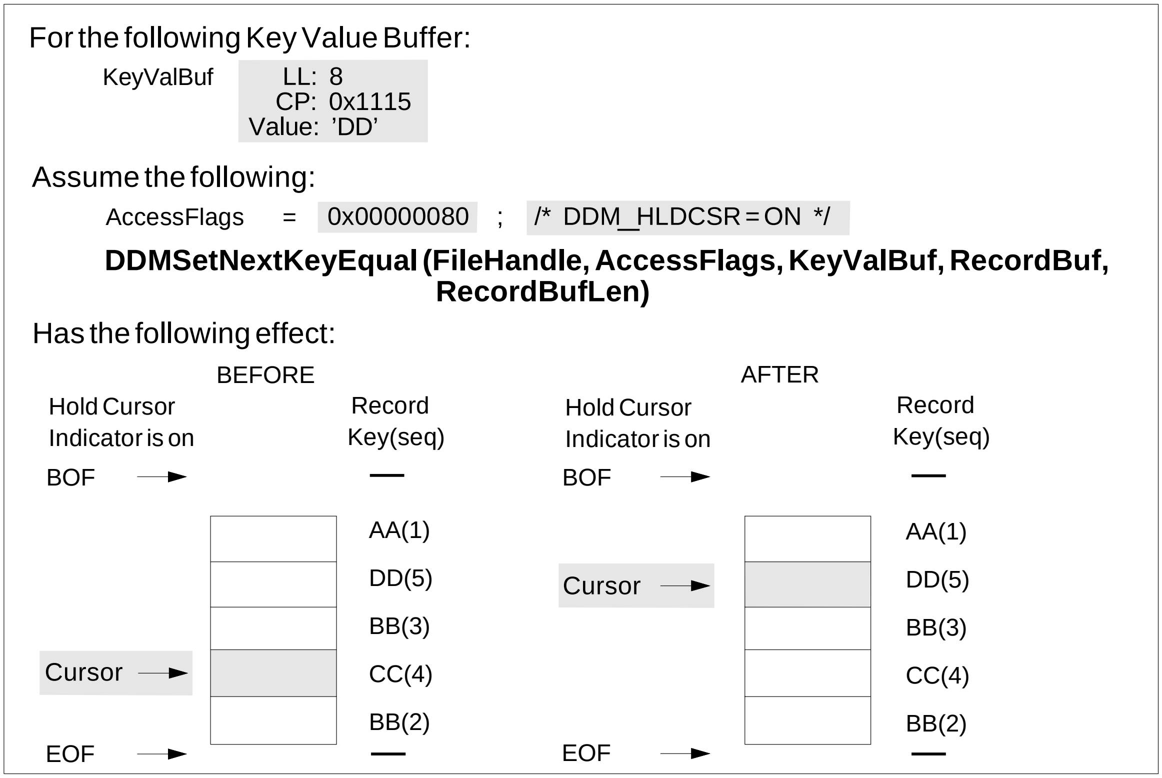
```
AccessFlags   =  0  ;  /* DDM_HLDCSR = OFF */
```

**DDMSetNextKeyEqual (FileHandle, AccessFlags, KeyValBuf, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 59. DDMSetNextKeyEqual Function with Hold Cursor Initially On. If the hold cursor indicator in the cursor is set to on, the HLDCSR bit in the Access Flags is FALSE, and the record is active, the cursor remains at its current position. For all other conditions, the cursor is updated.*

## DDMSetNextKeyEqual



For the following Key Value Buffer:

```
KeyValBuf     LL:  8
              CP:  0x1115
           Value:  'DD'
```

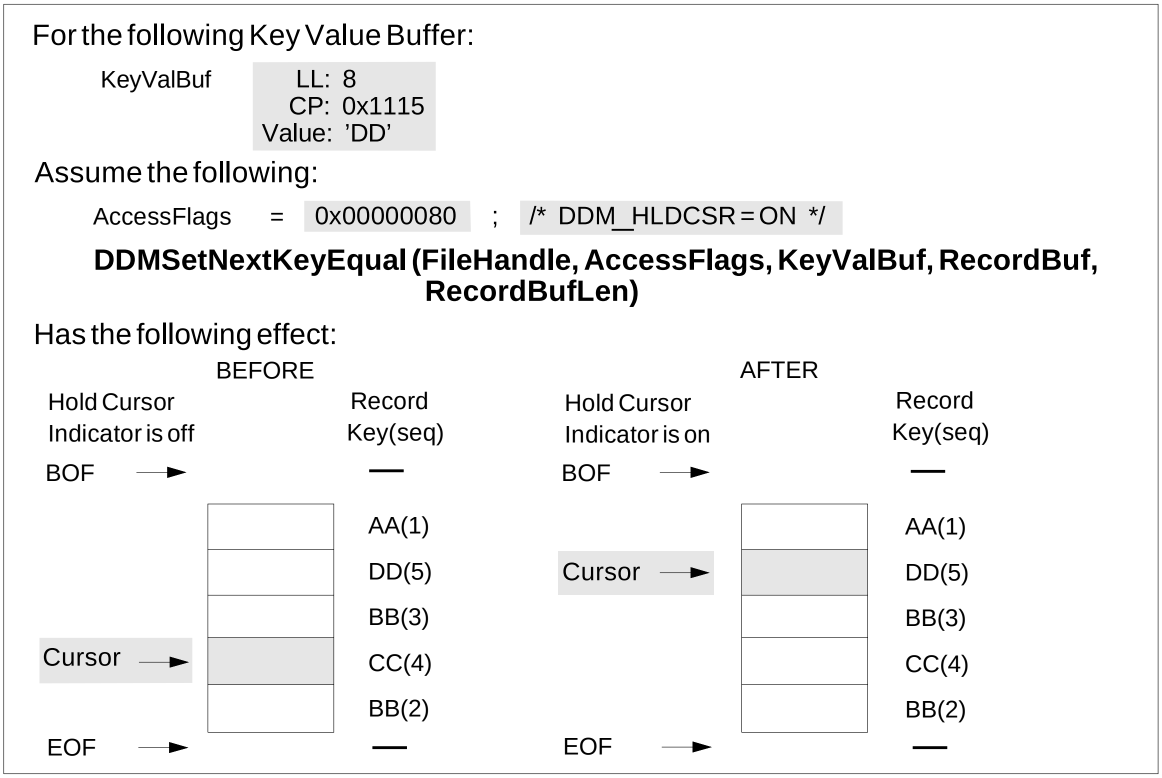
Assume the following:

```
AccessFlags   =   0x00000080  ;   /* DDM_HLDCSR = ON */
```

**DDMSetNextKeyEqual (FileHandle, AccessFlags, KeyValBuf, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 60. DDMSetNextKeyEqual function with Hold Cursor Initially On*



For the following Key Value Buffer:

KeyValBuf

| | |
|---|---|
| LL: | 8 |
| CP: | 0x1115 |
| Value: | 'DD' |

Assume the following:

```
AccessFlags  =  0x00000080  ;  /* DDM_HLDCSR = ON */
```

**DDMSetNextKeyEqual (FileHandle, AccessFlags, KeyValBuf, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 61. DDMSetNextKeyEqual function with Hold Cursor Initially Off*

## DDMSetNextKeyEqual

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record buffer from the beginning of LL to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |

**RN** The record number (ULONG) of the record in the record attribute list. A value of X'FFFFFFFF' for RN indicates that the record number of the first record in the record attribute list is not known.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG). A value of X'FFFFFFFF' for RN indicates that the record number is not known.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of the key value.

| | |
|---|---|
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**X'144A'** The value (CODEPOINT) indicating that the following data is record data.

**Data** The record data.

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetNextRec (Set Cursor to Next Record)

This function sets the cursor to the record that has a record number one greater than the current cursor position and optionally returns the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetNextRec (HDDMFILE        FileHandle,
                      ULONG           AccessFlags,
                      PDDMRECORD      RecordBuf,
                      ULONG           RecordBufLen,
                      ULONG           RecCount,
                      PULONG          RecRtnCnt
                      );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | DDM_BYPDMG (Bypass Damaged Records) |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | DDM_ALLREC (All Records, Active and Inactive) |
| **3** | Reserved flag |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Examples” on page 278.

**RecordBufLen**
The length (ULONG) of the record buffer.

**RecCount**
Specifies the number (ULONG) of records requested.

**RecRtnCnt**
The pointer (PULONG) to the count of the records actually returned. When RECAL (Record Attribute List) parameters are specified in RecordBuf and RECCNT is specified within the RECAL, the RecRtnCnt parameter (ULONG) reflects the RECCNT number of duplicate records. Therefore, if RecordBuf contained 25 data records, one of which included a RECAL with RECCNT having a value of 150, the value of RecRtnCnt would be 175.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| ENDFILRM | X'120B' | End of File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

If inactive records are to be bypassed (DDM_ALLREC not set), the cursor is set to the next active record that has a record number greater than the current cursor position. For direct files, the only valid specification for DDM_ALLREC is DDM_ALLREC not set.

As an option, DDMSetNextRec can:

- Specify whether more than one record should be returned (RecCount).
- Set the hold cursor indicator on (DDM_HLDCSR).
- Specify whether damaged records should be bypassed (DDM_BYPDMG).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

If DDM_HLDCSR in AccessFlags is FALSE, the cursor remains at its current position when the hold cursor indicator in the cursor was previously set and either the record is active, or the record is inactive and DDM_ALLREC in AccessFlags is TRUE. Under all other conditions, the cursor is updated. This decision process is illustrated in Table 20 on page 274.

If RecCount specifies a value greater than 1, multiple records are sent to the requestor. RecCount specifies the number of times that the DDMSetNextRec function be performed, with the following exceptions:

- For all iterations of the function except the last iteration, the RECINARM is not sent. All other reply messages resulting from the iteration of the function are sent.
- For the last iteration of the function, any reply message resulting from the last iteration of the function, including RECINARM, is sent.

This moves the cursor to the last record processed by the DDMSetNextRec function. Bypassed records (as a result of DDM_ALLREC not being set) are *not* counted to satisfy RecCount. If RecCount specifies a number and DDM_NODATA is set, no records are sent.

If the RecCount specifies a number greater than the remaining records in the file:

- The remaining records are sent to the source agent.
- The cursor position is changed.
- A ENDFILRM reply message is sent.

If DDM_BYPDMG is set, any damaged record encountered by the DDMSetNextRec function:

- Sends a RECDMGRM reply message.
- Updates the cursor.
- Is counted to satisfy RecCount.

This allows the maximum number of undamaged records to be sent to the source system.

If DDM_KEYVALFB flag is set and the file type is not keyed, the flag is ignored.

*Table 20. DDMSetNextRec (DDM_ALLREC or DDM_NODATA) Decision Table (Part 1 of 2)*

**If the DDMSetNextRec function is issued, two decision tables are processed sequentially starting with Decision Table 1:**

**Decision Table 1: DDM_HLDCSR / DDM_ALLREC**

**When initial system states are:**

| | | | | | | |
|---|---|---|---|---|---|---|
| hldcsr indicator in cursor | T | T | T | T | F | F |
| DDM_HLDCSR | T | F | F | F | T | F |
| Record State | * | A | I | I | * | * |
| DDM_ALLREC | * | * | F | T | * | * |
| **The next system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| hldcsr indicator in cursor set | T | F | F | F | T | F |
| move cursor to next record | Y | N | Y | N | Y | Y |
| go to Table 21 on page 275 | Y | Y | Y | Y | Y | Y |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| ***** | **Either TRUE or FALSE** |
| **Y** | **YES** |
| **N** | **NO** |

*Table 21. DDMSetNextRec (DDM_ALLREC or DDM_NODATA) Decision Table (Part 2 of 2)*

**Decision Table 2: DDM_ALLREC / DDM_NODATA**

**When the system states are:**

| Record State | I | I | I | A | A |
|---|---|---|---|---|---|
| DDM_ALLREC | F | T | T | * | * |
| DDM_NODATA | * | F | T | F | T |
| **The next system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | F | T4 | F | F |
| RECINA (returned) | F | T | F | F | F |
| RECORD (returned) | F | F | F | T | F |
| cursor position saved | F | T | T | T | T |
| move cursor to next record and repeat Table 2 | T | F | F | F | F |
| DDMSetNextRec complete | N | Y | Y | Y | Y |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| ***** | **Either TRUE or FALSE** |
| **Y** | **YES** |
| **N** | **NO** |

## Effect on Cursor Position

### Normal Completion (SVRCOD of 0 or 4)

The cursor position is determined in two steps: step 1 determines the first record to be considered, step 2 determines if the contents of the record are acceptable to the user.

Step 1. The cursor remains at the current record if:

- The hold indicator in the cursor is on, DDM_HLDCSR is off, and the record is active.
- The hold indicator in the cursor is on, DDM_HLDCSR is off, the record is inactive, and DDM_ALLREC is on.

Otherwise, the cursor is advanced to the next record. The cursor may be advanced more than one record. See Table 20 on page 274 for an illustration of this step.

Step 2. If DDM_ALLREC is off, and the record is inactive, the cursor is advanced until it points to an active record.

Otherwise, the cursor is pointing to the correct record.

Step 3. If an ENDFILRM results from the advancing of the cursor, the cursor is moved to EOF.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued. If RecCount is greater than 1, the cursor position is the same as before the last iteration of the function.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, then the access method acquires an implicit SHRRECLK on the record if it is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (for example, DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, or DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

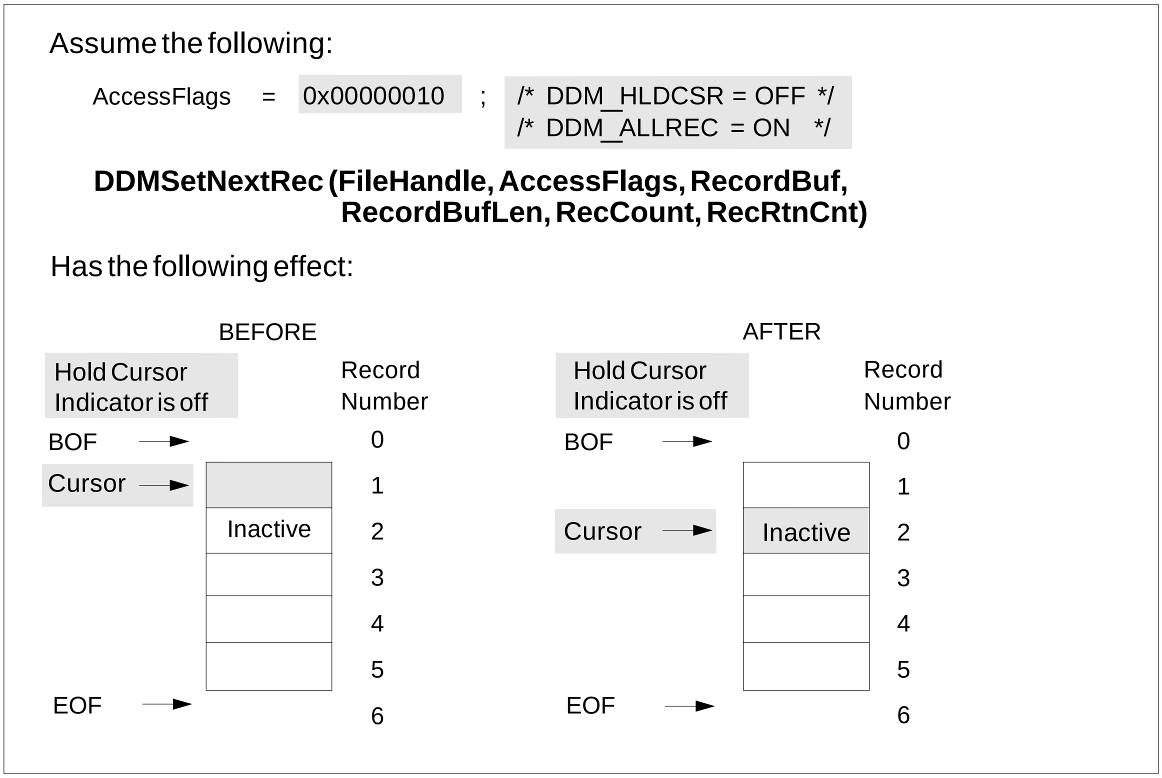
- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued. If RecCount is greater than 1, the record locks are the same as before the last iteration of the function.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to Continue and Returns | This Reply Message |
|---|---|
| DDM_ALLREC is not set and the cursor is at the last active record. | ENDFILRM |
| The record is damaged and DDM_BYPDMG flag is set. | RECDMGRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| Any data is to be returned and RecRtnCnt has not been specified.<br>DDM_RECNBRFB or DDM_KEYVALFB is set, or DDM_NODATA is not set, and RecordBuf doesn't contain an address. | ADDRRM |
| The cursor is already positioned at EOF.<br>If one of the following conditions is true about the file:<br>• It does not contain any records initially after a DDMCreateRecFile.<br>• It does not contain any records beyond the current cursor position.<br>• It does not contain any active records beyond the current cursor position when DDM_ALLREC is not set.<br>**Note:** The cursor position is changed to EOF. | ENDFILRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified as one of the access intents.<br>DDM_ALLREC(TRUE) is specified for a direct file.<br>The DDM_NODATA flag is not set and the file was opened without GETAI. | INVRQSRM |
| The RecordBuf is not large enough to hold the returned record. | LENGTHRM |
| The record is damaged (record not active or inactive). | RECDMGRM |
| The record is inactive and DDM_NODATA is set. | RECINARM |
| The record lock cannot be obtained. | RECIUSRM |
| The RecCount is not greater than 0. | VALNSPRM |

## Examples



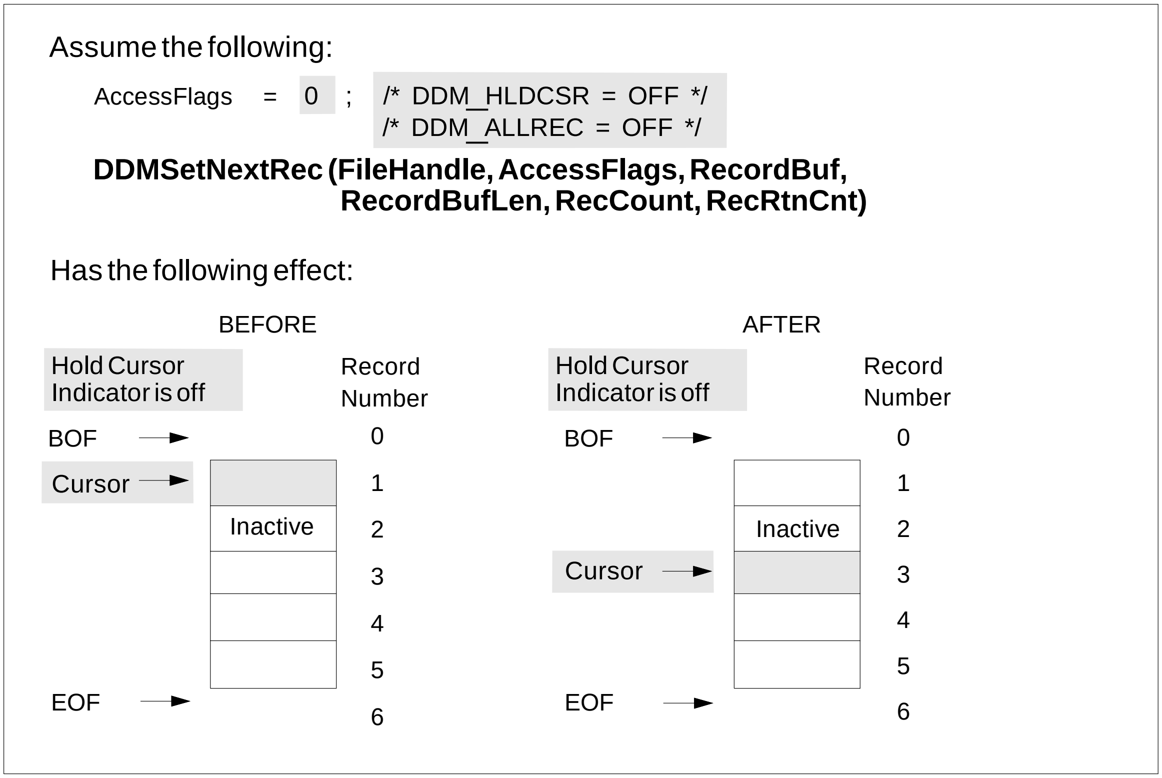
Assume the following:

```
AccessFlags   =   0x00000010   ;   /*  DDM_HLDCSR = OFF  */
                                   /*  DDM_ALLREC  = ON   */
```

**DDMSetNextRec (FileHandle, AccessFlags, RecordBuf,
RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

*Figure 62. DDMSetNextRec Function with DDM_ALLREC Set*



Assume the following:

```
AccessFlags   =  0  ;  /* DDM_HLDCSR = OFF */
                       /* DDM_ALLREC = OFF */
```

**DDMSetNextRec (FileHandle, AccessFlags, RecordBuf,
RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

*Figure 63. DDMSetNextRec Function with DDM_ALLREC Not Set*

Assume the following:

```
AccessFlags   =  0  ;  /*  DDM_HLDCSR = OFF  */
                       /*  DDM_ALLREC  = OFF  */
```

**DDMSetNextRec (FileHandle, AccessFlags, RecordBuf,
RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

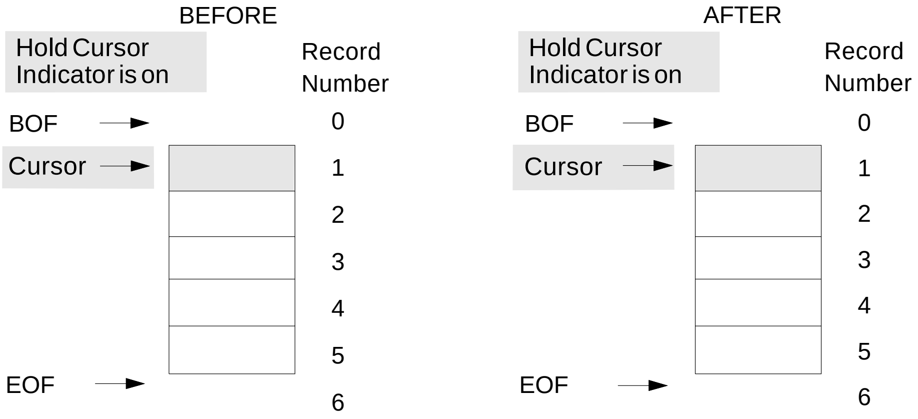
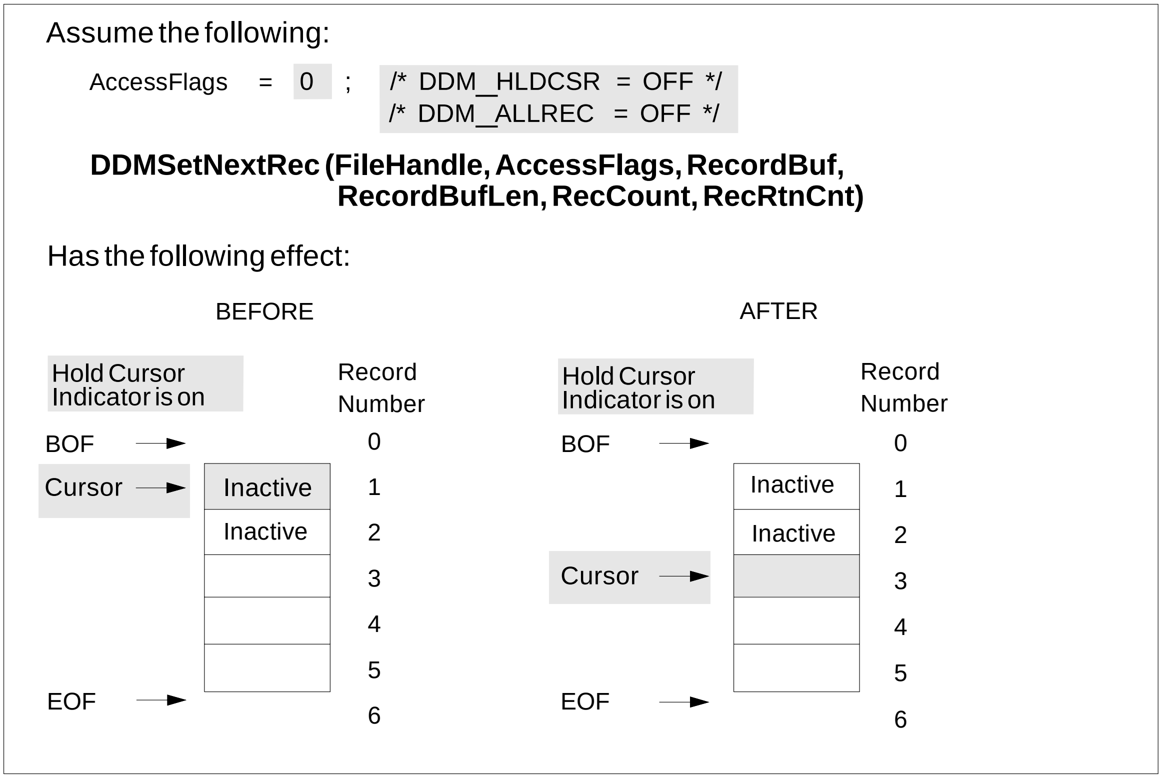


*Figure 64. DDMSetNextRec Function with Hold Cursor Initially On*



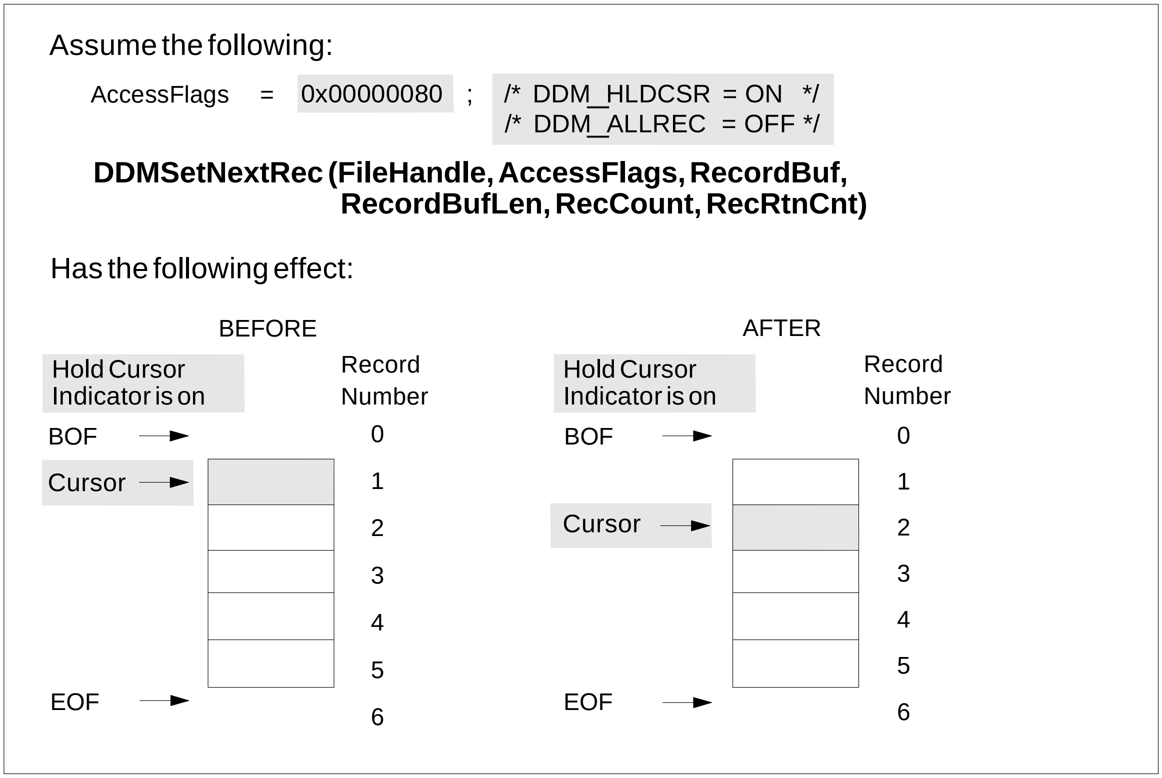
Assume the following:

```
AccessFlags   =  0  ;   /* DDM_HLDCSR  = OFF */
                        /* DDM_ALLREC  = OFF */
```

**DDMSetNextRec (FileHandle, AccessFlags, RecordBuf,
RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

*Figure 65. DDMSetNextRec Function with Hold Cursor Initially On*



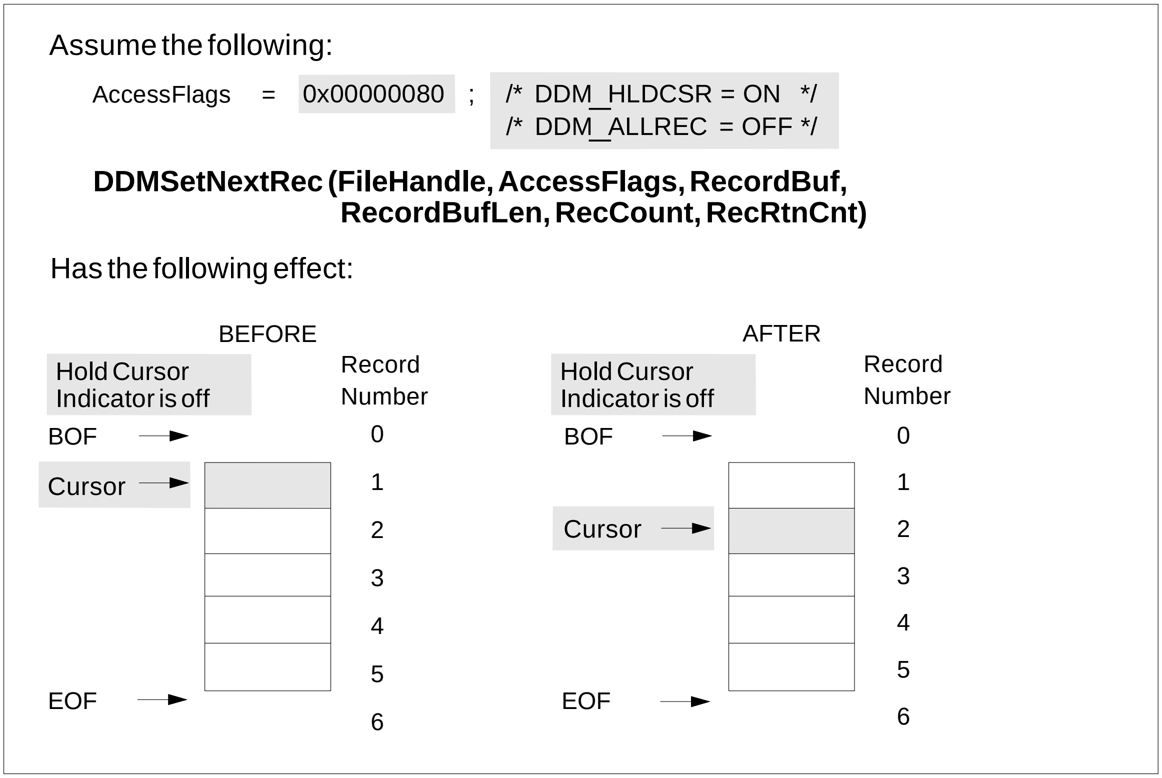
Assume the following:

```
AccessFlags   =  0x00000080  ;  /*  DDM_HLDCSR  = ON   */
                                /*  DDM_ALLREC  = OFF */
```

**DDMSetNextRec (FileHandle, AccessFlags, RecordBuf,
RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

*Figure 66. DDMSetNextRec Function with Hold Cursor Initially On*


Assume the following:

```
AccessFlags   =  0x00000080 ;  /* DDM_HLDCSR = ON  */
                               /* DDM_ALLREC = OFF */
```

**DDMSetNextRec (FileHandle, AccessFlags, RecordBuf, RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

*Figure 67. DDMSetNextRec Function with Hold Cursor Initially Off*

These are examples of RecordBuf data formats:

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of the record data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count. The RC parameter is used to indicate the number of duplicate records. It provides a shorthand way of specifying N record where N>1, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**Note:** RC is not included unless identical, consecutive records are being returned.

**L2** The length (ULONG) from the beginning of L2 to the end of data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**

Nothing is returned.

---

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN | L3 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list. When RC and RN are both specified, the record number specified by RN applies to the first occurrence of the record and each subsequent record has a record number one greater than the previous record.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG).

---

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY | L3 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list (from the beginning of LL to the end of Data).

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of the record key value. |
| **X'1430'** | The value (CODEPOINT) indicating that the following key is a record attribute list (RECAL). |
| **L1** | The length (ULONG)from the beginning of L1 to the end of RC. |
| **X'111A'** | The value (CODEPOINT) indicating that the following key is a key count. The RC parameter is used to indicate the number of duplicate keys. It provides a shorthand way of specifying N keys, where N>1, without replicating the key's contents.<br>**Note:** RC is not included unless identical, consecutive keys are being returned. |
| **RC** | The number (ULONG) of duplicate keys in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

| | | | | | |
|---|---|---|---|---|---|
| L3 | X'1115' | KEY | L4 | CP | Data |

## DDMSetNextRec

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records (where N>1) without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L3** The length (ULONG) from the beginning of L3 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L4** The length (ULONG) from the beginning of L4 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

## DDMSetPathInfo (Set File or Directory Information)

This function specifies information for a file or a directory.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetPathInfo (PSZ            PathName,
                       ULONG          PathInfoLevel,
                       PBYTE          PathInfoBuf,
                       ULONG          PathInfoBufSize
                       );
```

### Parameters

**PathName**
The pointer (PSZ) to the full path name of the file or subdirectory.

**PathInfoLevel**
The level (ULONG) of the file or directory information being defined.

Level 0x00000001 information is the only defined level. This is the same as DosSetPathInfo, ulFileInfoLevel bit (FILE_STANDARD).

Level 0x00000001 file information sets a series of EA name/value pairs. On input, PathInfoBuf maps to an EAOP2 structure. fpGEA2List is ignored. fpFEA2List points to a data area where the relevant FEA2 list is to be found. oError is ignored.

On output, fpGEA2List is unchanged. fpFEA2List is unchanged as is the area pointed to by fpFEA2List. If an error occurred during the set, oError is the offset of the FEA2 where the error occurred. The API return code is the error code corresponding to the condition generating the error. If no error occurred, oError is undefined.

**PathInfoBuf**
The pointer (PBYTE) to the storage area where the system gets the file information. Refer to “Extended Attributes” on page 5 for more information on the format of this buffer.

**PathInfoBufSize**
The length (ULONG) of PathInfoBuf.

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| CMDCHKRM | X'1254' | Command Check |
| FILIUSRM | X'120D' | File In Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| LENGTHRM | X'F211' | Field Length Error |

| Message ID | Code Point | Message Title |
|---|---|---|
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

This function is similar to the DosSetPathInfo command.

An example of requesting Extended Attributes (EAs) is provided on page 5.

## Effect on Cursor Position

There is no effect on the cursor position, because the file is not open.

## Locking (for Local VSAM File System Only)

For theOS/2 local VSAM file system, the locking behaviour is the same as that of DOSSetPathInfo. See *OS/2 WARP Control Program Programming Reference*.

For the AIX local VSAM file system, an exclusive lock is requested for the file.

## Exceptions

| **This Causes a Reply Message to be Generated with SRVCOD = X'04' for each out-of-sync file in the file object and the Function Continues** | **With This Reply Message** |
|---|---|
| If the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file.<br>DDMSetPathInfo re-synchronizes the file-change date and time if the file is not open to another process unless a higher severity condition prevents it from doing so. | FILDMGRM |

## Record File Attributes by File Class

These are modifiable record file attributes.

Refer to Table 12 on page 40.

When the FILINISZ EA is changed, it has no effect on the current space already allocated to the file.

When the DELCP EA of an alternate index file is changed, the DELCP of the base file and all other indexes is also changed.

When the GETCP EA of an alternate index file is changed, the GETCP of the base file and all other indexes is also changed.

When the INSCP EA of an alternate index file is changed, the INSCP of the base file and all other indexes is also changed.

## DDMSetPathInfo

When the MODCP EA of an alternate index file is changed, the MODCP of the base file and all other indexes is also changed.

## DDMSetPlus (Set Cursor Plus)

This function sets the cursor to the record number of the file indicated by the cursor, plus the number of record positions specified by the CsrDisp (Cursor Displacement) parameter. This function can also return the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetPlus (HDDMFILE        FileHandle,
                   ULONG           AccessFlags,
                   ULONG           CsrDisp,
                   PDDMRECORD      RecordBuf,
                   ULONG           RecordBufLen
                   );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **9–31** | Reserved flags |
| **8** | DDM_ALWINA (Allow Cursor on Inactive Record) |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | Reserved flag |
| **3** | DDM_RTNINA (Return Inactive Record) |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | !DDM_RECNBRFB (Record Number Feedback) |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**CsrDisp**
Specifies the cursor displacement (ULONG) in the positive direction.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Example” on page 297.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |
| RECNBRRM | X'1224' | Record Number Out of Bounds |

## Remarks

The type of the records in the file (active or inactive) bypassed by DDMSetPlus has no effect on the cursor positioning.

As an option, DDMSetPlus can:

- Specify whether the cursor can be set to an inactive record position (DDM_ALWINA).
- Set the hold cursor indicator on (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether inactive records should be returned (DDM_RTNINA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

Any key limits set are reset when function completes.

If DDM_KEYVALFB flag is set and the file type is not keyed, the flag is ignored.

*Table 22. DDMSetPlus (DDM_ALWINA, DDM_RTNINA, or DDM_NODATA) Decision Table*

| **If the DDMSetPlus function is issued:**<br>**When initial system states are:** | | | | | | | |
|---|---|---|---|---|---|---|---|
| Record State | I | I | I | I | I | A | A |
| DDM_ALWINA | T | T | T | F | F | * | * |
| DDM_RTNINA | T | * | F | * | * | * | * |
| DDM_NODATA | F | T | F | F | T | F | T |
| **The final system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | T4 | T4 | T8 | T8 | F | F |
| RECINA (returned) | T | F | F | F | F | F | F |
| RECORD (returned) | F | F | F | F | F | T | F |
| CURSOR (changed) | T | T | T | F | F | T | T |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| **T8** | **TRUE with SVRCOD (Error)** |
| ***** | **Either TRUE or FALSE** |

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**

The cursor is positioned to the record position that is beyond its original position by the number of records specified by CsrDisp.

**Error Termination (SVRCOD of 8)**

The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**

The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if it is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

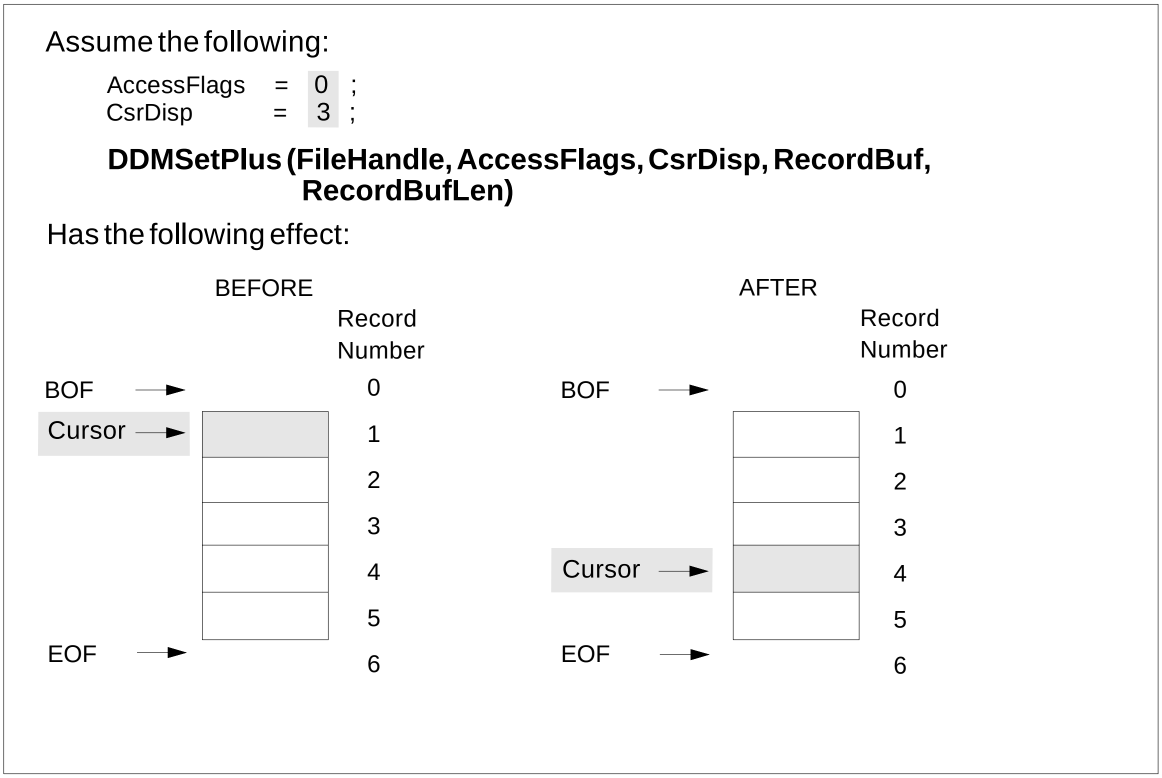
## Exceptions

| This Causes the Function to Return and Continue | With This Reply Message |
|---|---|
| An inactive record is read and DDM_ALWINA is active, when DDM_RTNINA is not set or DDM_NODATA is set. | RECINARM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| DDM_RECNBRFB or DDM_KEYVALFB is set, or DDM_NODATA is not set and RecordBuf doesn't contain an address. | ADDRRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified.<br>Access flag DDM_NODATA is not set and the file was opened without GETAI. | INVRQSRM |
| RecordBuf is not large enough to hold the returned record. | LENGTHRM |
| The record is damaged (not an active or inactive record). | RECDMGRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The record is inactive and the cursor is not allowed to be set to an inactive record position (DDM_ALWINA is not set).<br>**Note:** The cursor is not changed. | RECINARM |
| The record lock cannot be obtained. | RECIUSRM |
| The CsrDisp would cause the cursor to be placed outside the bounds of the file.<br>**Note:** The cursor position is not changed.<br>The file does not contain any records initially after a DDMCreateRecFile.<br>**Note:** The cursor position is not changed. | RECNBRRM |

## Example



Assume the following:

```
AccessFlags  =  0 ;
CsrDisp      =  3 ;
```

**DDMSetPlus (FileHandle, AccessFlags, CsrDisp, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 68. DDMSetPlus Function*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record buffer from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

| | | |
|---|---|---|
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). | |
| **RN** | The record number (ULONG) of the record in the record attribute list. | |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. | |
| **CP** | The value (CODEPOINT) indicating that the following is either record data or an inactive record length. | |
| | **X'144A'** | Indicates that the following data is record data. |
| | **X'142D'** | Indicates that the following data is a ULONG length of an inactive record. |
| **Data** | The record data or the length (ULONG) of the inactive record. | |

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**

DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). |

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | CP | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | CP | Data |

**Field** Description

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** Description

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetPrevious (Set Cursor to Previous Record)

This function sets the cursor to the record that has a record number 1 less than the current cursor position and optionally returns the record, the record number, and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetPrevious (HDDMFILE         FileHandle,
                       ULONG            AccessFlags,
                       PDDMRECORD       RecordBuf,
                       ULONG            RecordBufLen,
                       ULONG            RecCount,
                       PULONG           RecRtnCnt
                       );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **8–31** | Reserved flags |
| **7** | DDM_HLDCSR  (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA  (No Record Data Returned) |
| **4** | DDM_ALLREC  (All Records, Active and Inactive) |
| **3** | Reserved flag |
| **2** | DDM_KEYVALFB  (Key Value Feedback) |
| **1** | DDM_RECNBRFB  (Record Number Feedback) |
| **0** | DDM_UPDINT  (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. See “Examples” on page 308.

**RecordBufLen**
The length (ULONG) of the record buffer.

**RecCount**
Specifies the number (ULONG) of records requested.

**RecRtnCnt**
The pointer (PULONG) to the count of the records actually returned. When Record Attribute List (RECAL) parameters are specified in RecordBub and RECCNT is specified within the RECAL, the RecRtnCnt parameter (ULONG) reflects the RECCNT number of duplicate records. Therefore, if RecordBuf contained 25 data records, one of which included a RECAL with RECCNT having a value of 150, the value of RecRtnCnt would be 175.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| ENDFILRM | X'120B' | End of File |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

If inactive records are bypassed (DDM_ALLREC not set), the cursor is set to the next active record whose record number is less than the current cursor position. For direct files, DDM_ALLREC must be false or a INVRQSRM reply will be sent.

As an option, DDMSetPrevious can:

- Set the hold cursor indicator to on (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).
- Place an update intent on the record (DDM_UPDINT).

If RecCount specifies a value greater than 1, multiple records are sent to the requester. RecCount
specifies the number of times DDMSetPrevious is to be performed, with the following exceptions:

- For all iterations of the function except the last iteration, the RECINARM is not sent. All other reply messages resulting from the iteration of the function are sent.
- For the last iteration of the function, any reply message resulting from the last iteration of the function, including RECINARM, is sent.

This moves the cursor to the last record processed by DDMSetPrevious. Bypassed records (as a result of the DDM_ALLREC bit not being set) are *not* counted in RecCount. If RecCount specifies a number and DDM_NODATA is set, no records are returned.

If RecCount specifies a number greater than the remaining records in the file:

- The remaining records are sent to the requestor.
- The cursor position is changed.
- A ENDFILRM reply message is sent.

If DDM_KEYVALFB flag is set and the file type is not keyed, the flag is ignored.

*Table 23. DDMSetPrevious (DDM_ALLREC or DDM_NODATA) Decision Table*

**If the DDMSetPrevious function is issued:**

**When initial system states are:**

| | | | | | |
|---|---|---|---|---|---|
| Record State | I | I | I | A | A |
| DDM_ALLREC | F | T | T | * | * |
| DDM_NODATA | * | F | T | F | T |
| **The final system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | F | T4 | F | F |
| RECINA (returned) | F | T | F | F | F |
| RECORD (returned) | F | F | F | T | F |
| CURSOR (changed) | F | T | T | T | T |
| Repeat table after bypassing record | T | F | F | F | F |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| ***** | **Either TRUE or FALSE** |

## Effect on Cursor Position

### Normal Completion (SVRCOD of 0 or 4)

One of the following occurs:

- If DDM_ALLREC is set, the cursor is moved to the previous record in the file.
- If DDM_ALLREC is not set, the cursor is moved to the previous active record in the file
- If an ENDFILRM reply message results, the cursor is moved to BOF.

### Error Termination (SVRCOD of 8)

The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if it is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions)

If the record lock is not obtained, the function is rejected with RECIUSRM.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to Return and Continue | With This Reply Message |
|---|---|
| The following are true:<br>• The record is inactive.<br>• The DDM_NODATA flag is set.<br>• The DDM_ALLREC flag is set.<br>**Note:** If DDM_ALLREC is not set, this record is bypassed and the cursor is set to the previous record, as shown in Figure 70 on page 309. | RECINARM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| DDM_RECNBRFB or DDM_KEYVALFB is set, or DDM_NODATA is not set, and RecordBuf doesn't contain an address.<br>Any data is to be returned and RecRtnCnt does not contain an address. | ADDRRM |
| The cursor is set to BOF in the following cases:<br>• The file does not contain any records initially after a DDMCreateRecFile.<br>• The file does not contain any records before the current cursor position (or any inactive records when DDM_ALLREC is set).<br>**Note:** Any time the ENDFILRM is returned, the hold cursor indicator is set to OFF in the cursor regardless of the value specified for the DDM_HLDCSR flag. | ENDFILRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI specified.<br>DDM_ALLREC(TRUE) is specified for a direct file.<br>DDM_NODATA is not set and the file was opened without GETAI. | INVRQSRM |
| The RecordBufLen value is not large enough to contain the number of records that are returned. | LENGTHRM |
| The record is damaged (record not active or inactive). | RECDMGRM |
| The record lock cannot be obtained. | RECIUSRM |
| The RecCount is not greater than 0. | VALNSPRM |

## Examples

Assume the following:

```
AccessFlags   =  0x00000010  ;   /* DDM_ALLREC = ON */
RecCount      =  1           ;
```

**DDMSetPrevious (FileHandle, AccessFlags, RecordBuf, RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

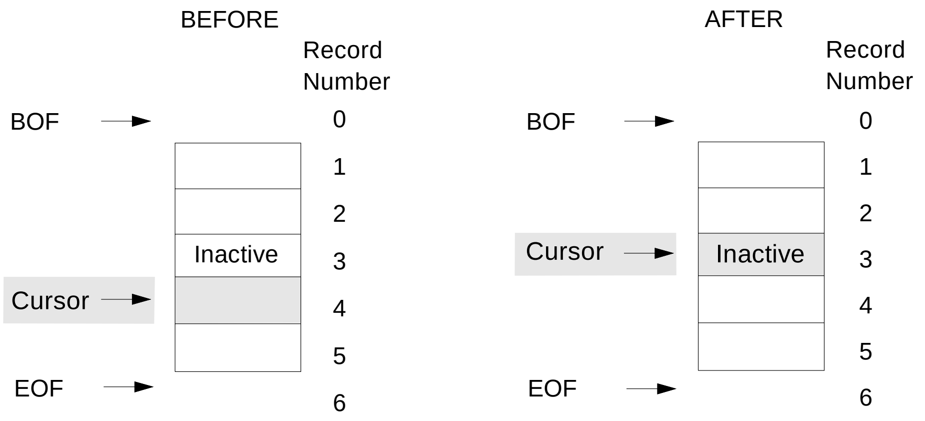
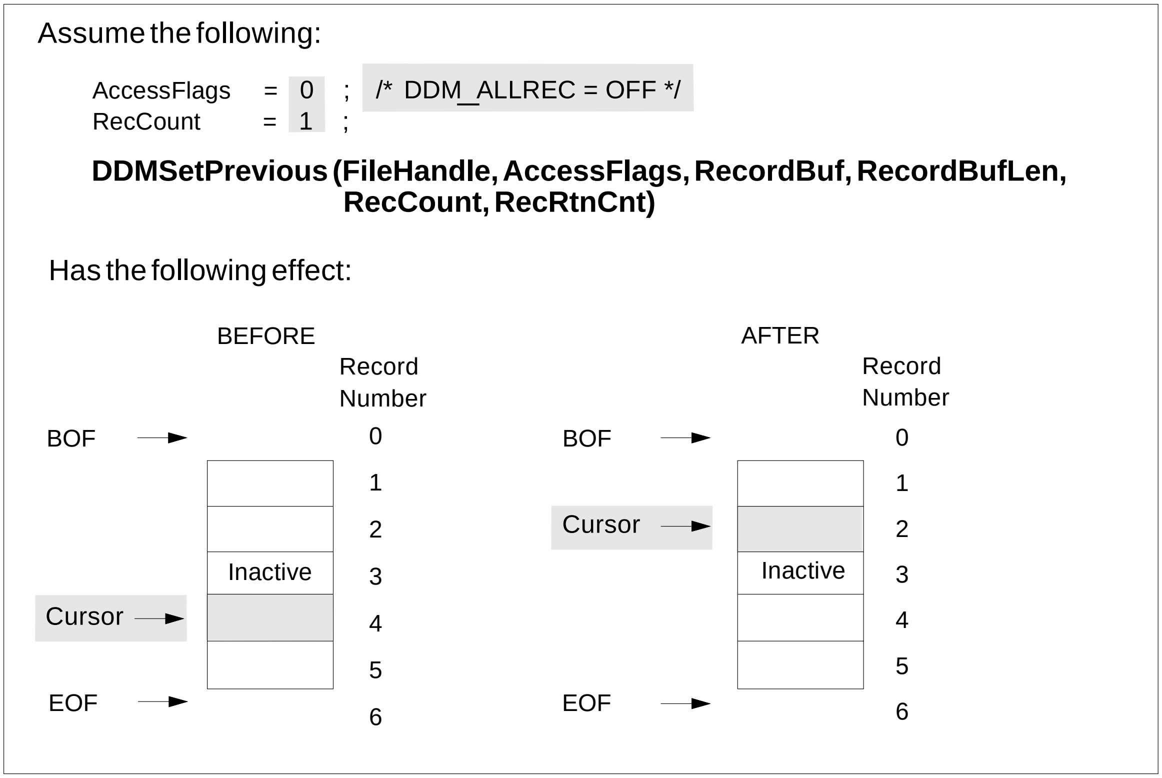


*Figure 69. DDMSetPrevious Function with DDM_ALLREC Set to On*



Assume the following:

```
AccessFlags   = 0  ;  /* DDM_ALLREC = OFF */
RecCount      = 1  ;
```

**DDMSetPrevious (FileHandle, AccessFlags, RecordBuf, RecordBufLen, RecCount, RecRtnCnt)**

Has the following effect:

*Figure 70. DDMSetPrevious Function with DDM_ALLREC Not Set*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**
DATA FORMAT

| LL | X'1430' | L1 | X'111A' | RC | L2 | CP | Data |
|---|---|---|---|---|---|---|---|

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of the record data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count. The RC parameter is used to indicate the number of duplicate records. It provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**Note:** RC is not included unless identical, consecutive records are being returned.

**L2** The length (ULONG) from the beginning of L2 to the end of data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

| | | |
|---|---|---|
| L3 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list. When RC and RN are both specified, the record number specified by RN applies to the first occurrence of the record and each subsequent record has a record number one greater than the previous record.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

**AccessFlags**

DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**

DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG).

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L3** The length (ULONG) from the beginning of L3 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** Indicates that the following data is record data.
- **X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

If RecCount is greater than one, the RecordBufLen must be provided in the record attribute list (RECAL).

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of the record key value.

**X'1430'** The value (CODEPOINT) indicating that the following key is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following key is a key count. The RC parameter is used to indicate the number of duplicate keys. It provides a shorthand way of specifying N keys, where N>1, without replicating the key's contents.

**RC** The number (ULONG) of duplicate keys in the record attribute list.

**Note:** RC is not included unless identical, consecutive keys are being returned.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

---

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

## DDMSetPrevious

| | | | | | |
|---|---|---|---|---|---|
| L3 | X'1115' | KEY | L4 | CP | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** — The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** — The length (ULONG) from the beginning of L1 to the end of RC.

**X'111A'** — The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, without replicating the record's contents.

**RC** — The number (ULONG) of duplicate records in the record attribute list.

**L2** — The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** — The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** — The record number (ULONG) of the record in the record attribute list.

**L3** — The length (ULONG) from the beginning of L3 to the end of the key value.

**X'1115'** — The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** — The record key value.

**L4** — The length (ULONG) from the beginning of L4 to the end of Data.

**CP** — The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

- **X'144A'** — Indicates that the following data is record data.
- **X'142D'** — Indicates that the following data is a ULONG length of an inactive record.

**Data** — The record data or the length (ULONG) of the inactive record.

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

## DDMSetRecNum (Set Cursor to Record Number)

This function sets the cursor to the record of the file specified by RecordNumber and optionally returns the record and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetRecNum (HDDMFILE        FileHandle,
                     ULONG           AccessFlags,
                     RECNUM          RecordNumber,
                     PDDMRECORD      RecordBuf,
                     ULONG           RecordBufLen
                     );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **9–31** | Reserved flags |
| **8** | DDM_ALWINA (Allow Cursor on Inactive Record) |
| **7** | DDM_HLDCSR (Hold Cursor Position) |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | Reserved flag |
| **3** | DDM_RTNINA (Return Inactive Record) |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | Reserved flag |
| **0** | DDM_UPDINT (Update Intent) |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordNumber**
Specifies the record number (ULONG) of the record to which the cursor should be moved.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Example” on page 320.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |
| RECNBRRM | X'1224' | Record Number Out of Bounds |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

As an option, DDMSetRecNum can:

- Specify whether the cursor can be set to an inactive record position (DDM_ALWINA).
- Set the hold cursor indicator on (DDM_HLDCSR).
- Not return the requested record (DDM_NODATA).
- Specify whether inactive records should be returned (DDM_RTNINA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Place an update intent on the record (DDM_UPDINT).

If DDM_KEYVALFB flag is set and the file type is not keyed, the flag is ignored.

*Table 24. DDMSetRecNum (DDM_ALWINA, DDM_RTNINA, or DDM_NODATA) Decision Table*

**If the DDMSetRecNum function is issued:**

**When initial system states are:**

| Record State | I | I | I | I | I | A | A |
|---|---|---|---|---|---|---|---|
| DDM_ALWINA | T | T | T | F | F | * | * |
| DDM_RTNINA | T | * | F | * | * | * | * |
| DDM_NODATA | F | T | F | F | T | F | T |
| **The final system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | T4 | T4 | T8 | T8 | F | F |
| RECINA (returned) | T | F | F | F | F | F | F |
| RECORD (returned) | F | F | F | F | F | T | F |
| CURSOR (changed) | T | T | T | F | F | T | T |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| **T8** | **TRUE with SVRCOD (Error)** |
| ***** | **Either TRUE or FALSE** |

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor is moved to the record specified by RecordNumber.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If DDM_UPDINT(TRUE) is specified and the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if the record is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).

- The cursor is moved to a different record.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with the RECIUSRM reply message.

If DDM_UPDINT(TRUE) is specified and the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

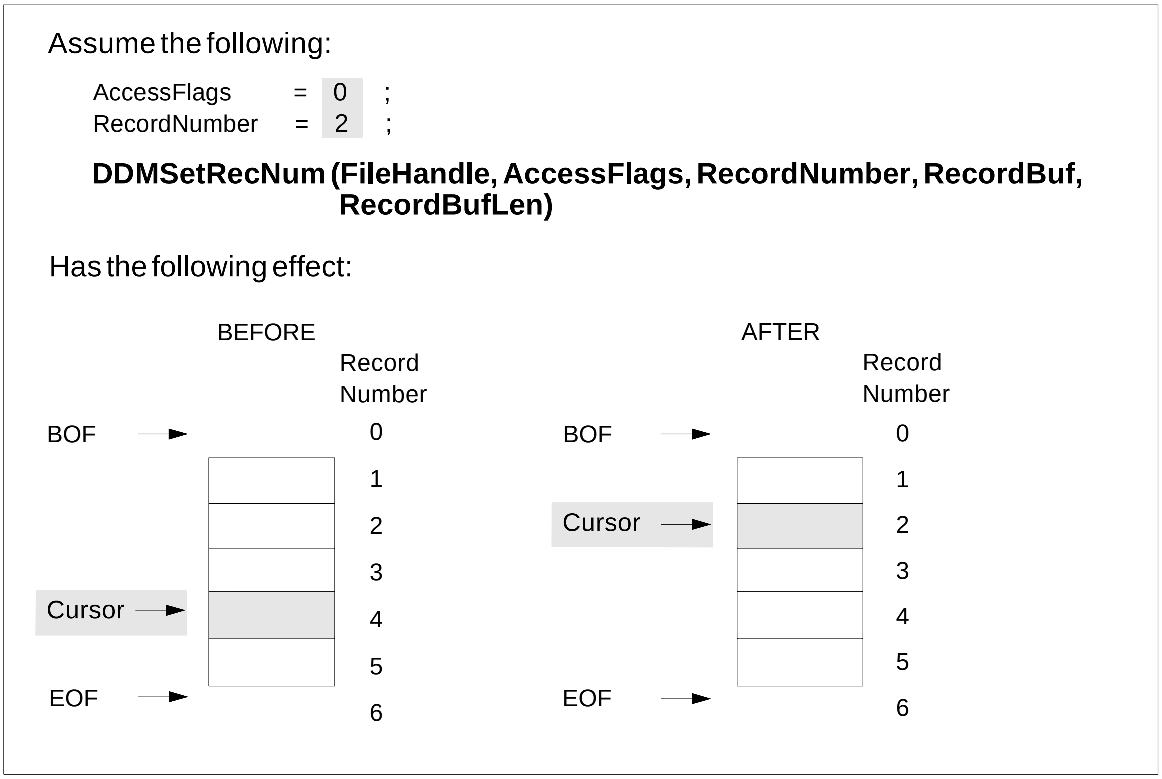
## Exceptions

| This Causes the Function to Return and Continue | With This Reply Message |
|---|---|
| The record is inactive and the DDM_ALWINA flag is set on, and either DDM_RTNINA is set off or DDM_NODATA is set on. | RECINARM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| If DDM_KEYVALFB is set or DDM_NODATA not set, RecordBuf does not contain a valid address. | ADDRRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |
| DDM_UPDINT(TRUE) is specified and the file was opened without DELAI or MODAI.<br>DDM_NODATA is not set and the file was opened without GETAI. | INVRQSRM |
| The record is damaged (not an active or inactive record). | RECDMGRM |
| The record is inactive and the DDM_ALWINA flag is set off.<br>**Note:** The cursor position is not changed. | RECINARM |
| The record lock cannot be obtained. | RECIUSRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The specified record number (RecordNumber) is outside the bounds of the file.<br>**Note:** File boundaries are discussed in DDMInsertRecNum on page 102.<br>**Note:** The cursor position is not changed. | RECNBRRM |

## Example



Assume the following:

```
AccessFlags    =  0  ;
RecordNumber   =  2  ;
```

**DDMSetRecNum (FileHandle, AccessFlags, RecordNumber, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 71. DDMSetRecNum Function*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) and & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| LL | CP | Data |
|---|---|---|

**Field** **Description**

**LL** The length (ULONG) of the record buffer from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) and DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) and DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) of the field from the beginning of L1 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L2** The length (ULONG) of the field from the beginning of L2 to the end of the key value.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) and DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetUpdateKey (Set Update Intent by Key Value)

This function places an update intent on the record having a key value equal to the key value specified in KeyValBuf (Key Value Buffer). This function can also return the record, the record number, and record key.

## Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetUpdateKey (HDDMFILE        FileHandle,
                        ULONG           AccessFlags,
                        PDDMOBJECT      KeyValBuf,
                        PDDMRECORD      RecordBuf,
                        ULONG           RecordBufLen
                        );
```

## Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **6–31** | Reserved flags |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | Reserved flag |
| **3** | Reserved flag |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **1** | DDM_RECNBRFB (Record Number Feedback) |
| **0** | Reserved flag |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**KeyValBuf**
The pointer (PDDMOBJECT) to the key value buffer for the key of the record on which update intent is placed. The format of the key value buffer upon invocation of the function is:

| | | |
|---|---|---|
| LL | X'1115' | Key Value |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the key value description from the beginning of LL to the end of Key Value. |

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Example” on page 327.

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the response from the beginning of LL to the end of record data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| KEYLENRM | X'122D' | Invalid Key Length |
| KEYVALRM | X'1240' | Invalid Key Value |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECIUSRM | X'124A' | Record in Use |
| RECNFNRM | X'1225' | Record Not Found |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

Partial key values are valid for the DDMSetUpdateKey function. The first record selected receives the update intent.

If the key value specified in key value buffer has duplicate entries in the file (duplicate keys), the first record, in key sequence, of all records with the duplicate key value will have the update intent placed on it.

As an option, DDMSetUpdateKey can:

- Not return the requested record (DDM_NODATA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).
- Specify whether the record number should be returned (DDM_RECNBRFB).

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is the same as before the function was issued.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if it is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- A DDMGetRec with DDM_UPDINT(TRUE) is issued.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function issued references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

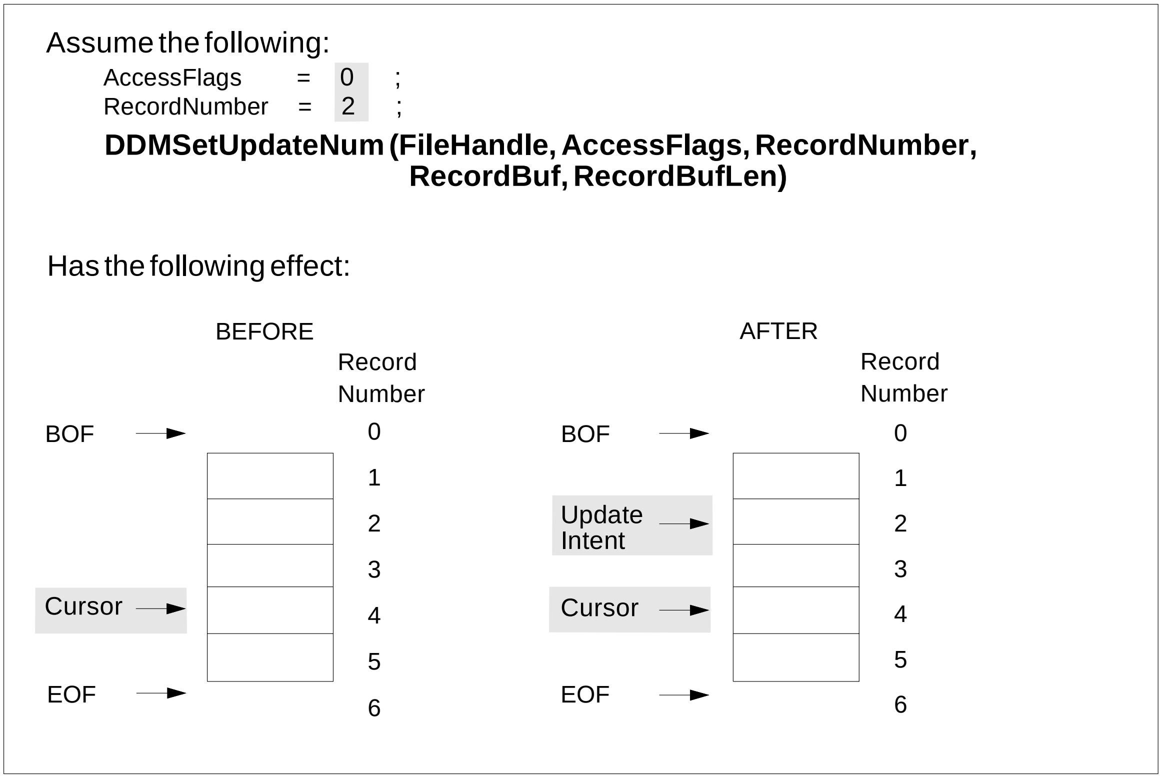
- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## DDMSetUpdateKey

## Exceptions

| **This Causes the Function to be Rejected** | **With This Reply Message** |
|---|---|
| If DDM_KEYVALFB or DDM_RECNBRFB is set, or DDM_NODATA not set, and RecordBuf does not contain a valid address. | ADDRRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |
| The file was opened without DELAI or MODAI specified.<br>The access method is not valid for this function.<br>DDM_NODATA is not set and the file was opened without GETAI. | INVRQSRM |
| The key length specified for the key value is larger than the key length used to build the index. | KEYLENRM |
| The record lock cannot be obtained. | RECIUSRM |
| The file does not contain any records initially after a DDMCreateRecFile<br>A record does not exist with a key value equal to the value contained in KeyValBuf. | RECNFNRM |
| RecordNumber is invalid. | VALNSPRM |

## Example



Assume the following:

```
AccessFlags    =  0  ;
RecordNumber   =  2  ;
DDMSetUpdateNum (FileHandle, AccessFlags, RecordNumber,
                 RecordBuf, RecordBufLen)
```

Has the following effect:

*Figure 72. DDMSetUpdateKey Function*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record buffer from the beginning of LL to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. A value of X'FFFFFFFF' for RN indicates that the record number of the first record in the record attribute list is not known. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'111D' | RN |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG). A value of X'FFFFFFFF' for RN indicates that the record number is not known. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

| | | |
|---|---|---|
| LL | X'1115' | KEY |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) from the beginning of LL to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**

DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

| | | |
|---|---|---|
| L3 | X'144A' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. |
| **X'1430'** | The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL). |
| **L1** | The length (ULONG) from the beginning of L1 to the end of RN. |
| **X'111D'** | The value (CODEPOINT) indicating that the following data is a record number (RECNBR). |
| **RN** | The record number (ULONG) of the record in the record attribute list. |
| **L2** | The length (ULONG) from the beginning of L2 to the end of the key value. |
| **X'1115'** | The value (CODEPOINT) indicating that the following data is a key value (KEYVAL). |
| **KEY** | The record key value. |
| **L3** | The length (ULONG) from the beginning of L3 to the end of Data. |
| **X'144A'** | The value (CODEPOINT) indicating that the following data is record data. |
| **Data** | The record data. |

**AccessFlags**

DDM_KEYVALFB(TRUE) & DDM_RECNBRFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**

DATA FORMAT

|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111D' | RN | L2 | X'1115' | KEY |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of KEY.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L2** The length (ULONG) from the beginning of L2 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMSetUpdateNum (Set Update Intent by Record Number)

This function places an update intent on the record of the file that is indicated by the RecordNumber parameter and optionally returns the record and record key.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMSetUpdateNum (HDDMFILE        FileHandle,
                        ULONG           AccessFlags,
                        RECNUM          RecordNumber,
                        PDDMRECORD      RecordBuf,
                        ULONG           RecordBufLen
                        );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **9–31** | Reserved flags |
| **8** | !DDM_ALWINA (Allow Update Intent on Inactive Record) |
| **7** | Reserved flag |
| **6** | Reserved flag |
| **5** | DDM_NODATA (No Record Data Returned) |
| **4** | Reserved flag |
| **3** | DDM_RTNINA (Return Inactive Record) |
| **2** | DDM_KEYVALFB (Key Value Feedback) |
| **0–1** | Reserved flags |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**RecordNumber**
Specifies the record number (ULONG) of the record on which update intent is placed.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer for the returned data. The format of the returned data in the buffer depends on the bit settings in AccessFlags. Examples of the returned data formats can be found in “Example” on page 336.

**RecordBufLen**
The length (ULONG) of the record buffer.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flag |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record in Use |
| RECNBRRM | X'1224' | Record Number Out of Bounds |

## Remarks

As an option, DDMSetUpdateNum can:

- Specify whether an update intent can be placed on an inactive record position (DDM_ALWINA).
- Not return the requested record (DDM_NODATA).
- Specify whether inactive records should be returned (DDM_RTNINA).
- Specify whether the record key value should be returned (DDM_KEYVALFB).

## Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is the same as before the function was issued.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

## Locking (for Local VSAM File System Only)

Record locks apply only to OS/2 local VSAM files on the client OS/2 workstation. For other local VSAM files, locking occurs at the file level.

If the file was opened for multiple updaters, the access method acquires an implicit SHRRECLK on the record if it is not already locked by the requester with a SHRRECLK lock. The SHRRECLK record lock is released when:

- The record is updated (DDMModifyRec or DDMDeleteRec).
- The cursor is moved to a different record.
- A DDMGetRec with DDM_UPDINT(TRUE) is issued.
- The file is closed.
- The DDMForceBuffer function is issued.
- The DDMUnLockRec function is issued.
- Any function issued references a record other than the one currently pointed to by the cursor (for example, the DDMInsertRecEOF, DDMInsertRecKey, DDMInsertRecNum, DDMSetUpdateKey, and DDMSetUpdateNum functions).

If the record lock is not obtained, the function is rejected with a RECIUSRM reply message.

If the file was *not* opened for multiple updaters, an update intent is placed on the record, but the access method does *not* acquire any record locks.

If the function terminates with a reply message that has a severity code of ERROR or higher, then:

- For error termination (SVRCOD of 8): The record locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the record locks is determined by the DTALCKST (Data Lock Status) parameter on the reply message.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| If DDM_KEYVALFB or DDM_RECNBRFB is set, or DDM_NODATA is not set, and RecordBuf does not contain a valid address. | ADDRRM |
| The file handle is invalid. | HDLNFNRM |
| Any reserved bits in AccessFlags are set. | INVFLGRM |
| The file was opened without DELAI or MODAI specified.<br>The file was opened with a GETAI access intent and DDM_NODATA(FALSE) was specified. | INVRQSRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The RecordBufLen value is not large enough to contain the number of records that are returned. | LENGTHRM |
| The record position is inactive and an update intent is not allowed to be set to an inactive record position (DDM_ALWINA not set). | RECINARM |
| The record lock cannot be obtained. | RECIUSRM |
| The specified record number (RecordNumber) is outside the bounds of the file.<br>**Note:** The cursor position is not changed. | RECNBRRM |

*Table 25. DDMSetUpdateNum (DDM_ALWINA, DDM_RTNINA, or DDM_NODATA) Decision Table*

**If the DDMSetUpdateNum function is issued:**

**When initial system states are:**

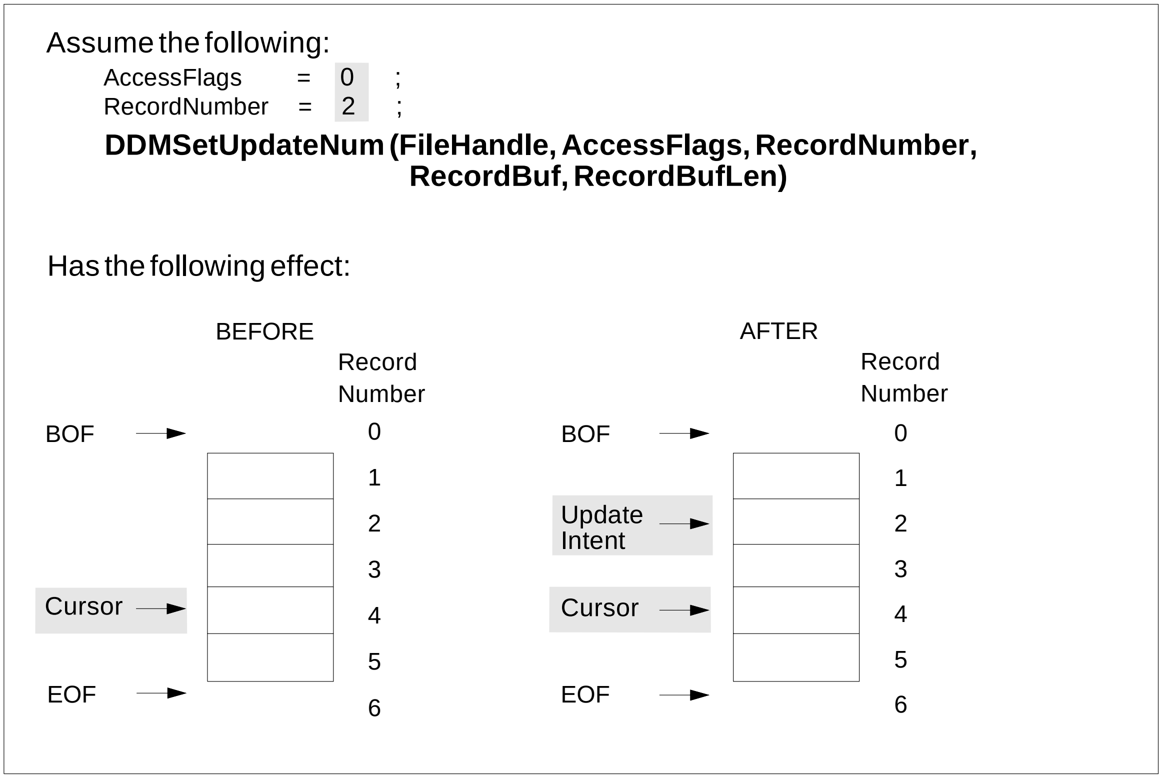
| Record State | I | I | I | I | I | A | A |
|---|---|---|---|---|---|---|---|
| DDM_ALWINA | T | T | T | F | F | * | * |
| DDM_RTNINA | T | * | F | * | * | * | * |
| DDM_NODATA | F | T | F | F | T | F | T |
| **The final system states are:** | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | ↓ |
| RECINARM (returned) | F | T4 | T4 | T8 | T8 | F | F |
| RECINA (returned) | T | F | F | F | F | F | F |
| RECORD (returned) | F | F | F | F | F | T | F |
| CURSOR (changed, see note) | F | F | F | F | F | F | F |

**Legend**

| | |
|---|---|
| **A** | **Active** |
| **I** | **Inactive** |
| **T** | **TRUE (On)** |
| **F** | **FALSE (Off)** |
| **T4** | **TRUE with SVRCOD (Warning)** |
| **T8** | **TRUE with SVRCOD (Error)** |
| ***** | **Either TRUE or FALSE** |

**Note:** The cursor position does not change.

## Example



Assume the following:

```
AccessFlags    =  0  ;
RecordNumber   =  2  ;
```

**DDMSetUpdateNum (FileHandle, AccessFlags, RecordNumber, RecordBuf, RecordBufLen)**

Has the following effect:

*Figure 73. DDMSetUpdateNum Function*

These are examples of RecordBuf data formats:

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| LL | CP | Data |
|---|---|---|

**Field** **Description**

**LL** The length (ULONG) of the record buffer (from the beginning of LL to the end of Data).

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(FALSE) & DDM_NODATA(TRUE)

**RecordBuf**
Nothing is returned.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_NODATA(FALSE)

**RecordBuf**
DATA FORMAT

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'1115' | KEY | L2 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data.

**X'1430'** The value (CODEPOINT) indicating that the following data is a record attribute list (RECAL).

**L1** The length (ULONG) from the beginning of L1 to the end of the key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

**L2** The length (ULONG) from the beginning of L2 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of the inactive record.

---

**AccessFlags**
DDM_KEYVALFB(TRUE) & DDM_NODATA(TRUE)

**RecordBuf**
DATA FORMAT

## DDMSetUpdateNum

| LL | X'1115' | KEY |
|---|---|---|

**Field** **Description**

**LL** The length (ULONG) from the beginning of LL to the end of the Key value.

**X'1115'** The value (CODEPOINT) indicating that the following data is a key value (KEYVAL).

**KEY** The record key value.

## DDMTruncFile (Move EOF to Current Cursor Position)

This function moves EOF to the current cursor position.

The records starting at the current cursor position and ending at the old EOF are eliminated.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMTruncFile (HDDMFILE         FileHandle
                    );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| FILIUSRM | X'120D' | File in Use |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVRQSRM | X'123C' | Invalid Request |

### Remarks

This function is only valid for sequential files.

This function physically shortens the file by the number of records eliminated. Any data in these records is permanently lost.

### Effect on Cursor Position

After this function is successfully completed, the cursor is set to the new EOF.

### Locking (for Local VSAM File System Only)

The file must be opened with MODNONLK.

### Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file was not opened with MODNONLK. | FILIUSRM |
| The file handle is invalid. | HDLNFNRM |
| A direct, keyed, or alternate index file is accessed.<br>MODAI access intent was not specified when the file was opened. | INVRQSRM |

## Example

Assume the following is executed at cursor position 27:

**DDMTruncFile (FileHandle)**

Has the following effect:

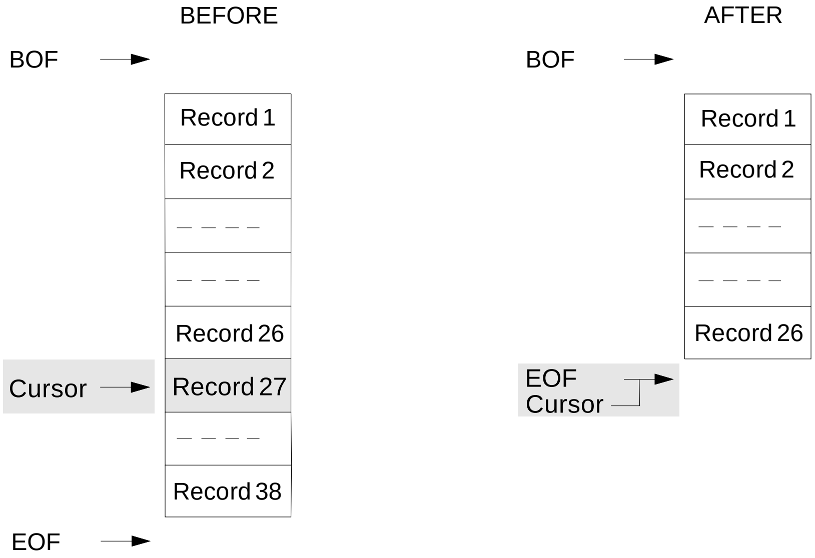


*Figure 74. DDMTruncFile Function*

## DDMUnLoadFileFirst (Unload Records from File)

This function unloads records from a file and transfers them to the requester's buffers.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMUnLoadFileFirst (PSZ           FileName,
                           PHDDMLOAD     UnLoadHandle,
                           ULONG         AccessFlags,
                           PULONG        Flags,
                           PDDMRECORD    RecordBuf,
                           ULONG         RecordBufLen,
                           CODEPOINT     UnloadOrder,
                           PULONG        RecCount
                           );
```

### Parameters

**FileName**
The pointer (PSZ) to the name of the record-oriented file to be unloaded to the requester's buffers.

**UnLoadHandle**
The pointer (PHDDMLOAD) to the location where the system returns a handle value that is to be used with a subsequent corresponding DDMUnLoadFileNext function.

**AccessFlags**
The AccessFlags (ULONG) specify the action to be taken depending on whether the bit flag is set. The bit flags are:

| Bit | Meaning |
|---|---|
| **7–31** | Reserved flags |
| **6** | DDM_BYPDMG  (Bypass Damaged Records) |
| **4–5** | Reserved flags |
| **3** | DDM_RTNINA  (Return Inactive Record) |
| **0–2** | Reserved flags |

For detailed information on the access flags, see Chapter 5, “VSAM API Flags” on page 401.

**Flags**
The pointer (PULONG) to the bit flags parameter. The bit flags are:

| Bit | Meaning |
|---|---|
| 1–31 | Reserved flags |
| 0 | DDM_MOREDATA flag.<br>The system sets this bit upon return from DDMUnLoadFileFirst if the record buffer is not large enough to hold all of the target file's |

existing records. This flag bit notifies the user to issue a subsequent DDMUnLoadFileNext in order to continue the unload function. When the DDM_MOREDATA flag bit is off, the system has completed the unload of the entire file and a NULL value is returned for UnLoadHandle.

**RecordBuf**
The pointer (PDDMRECORD) to the record buffer. The returned record buffer can contain the following objects:

RECORD
RECAL

These objects can be in mixed order and can be repeated. The format of the record buffer upon return of the function is:

| | | |
|---|---|---|
| LL | CP | Data |

**Field** Description

**LL** The length (ULONG) of the record description from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following data is either record data or a RECAL (Record Attribute List) containing a record number and record data.

**X'144A'** Indicates that the following data is record data.

**X'1430'** Indicates that the following data is a RECAL (Record Attribute List). A RECAL object is returned when inactive records have been encountered. This is not used when unloading in key order.

If CP is a record attribute list, the format of Data is:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LL | X'111A' | RC | L3 | X'111D' | RN | L4 | CP | Data |

**Field** Description

**L2** The length (ULONG) from the beginning of L2 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate inactive records, where N≥1.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L3** The length (ULONG) from the beginning of L3 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L4** The length (ULONG) from the beginning of L4 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of an inactive record.

If CP is record data, the format is RECORD.

**RecordBufLen**
The length (ULONG) of the record buffer.

**UnloadOrder**
(CODEPOINT) Specifies the order in which the function processes the records in the file. The valid values are:

**RNBORD** Record Number Order (X'145E')

**KEYORD** Key Order Processing (X'145D')

**RecCount**
The count (ULONG) of the record descriptions in the record buffer.

The number of record descriptions (record data and inactive record lengths) should be the same number as indicated in the record count. When a RECAL (Record Attribute List) is specified in RecordBuf and RECCNT of N is specified within the RECAL, the RecCount parameter reflects the N duplicate records. Therefore, if RecordBuf contained 10 data records and a RECAL, and RECCNT had a value of 100, the value of RecCount would be 110.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| ENDFILRM | X'120B' | End of File |
| FILATHRM | X'123B' | Not Authorized to File |
| FILDMGRM | X'125A' | File Damaged |
| FILIUSRM | X'120D' | File in Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |
| VALNSPRM | X'1252' | Parameter Value Not Supported |

# DDMUnLoadFileFirst

## Remarks

The DDMUnLoadFileFirst function unloads the records of the file in the order specified by UnloadOrder. If the file is not an alternate index or keyed file, then the specified value of UnloadOrder is ignored and the records are unloaded in record number order.

- To unload in record number order:
  1. The DDMUnLoadFileFirst function unloads records from a file in a sequence order that begins with the first record and proceeds through the remainder of the file.
  2. If the DDM_RTNINA flag is not set, inactive records are not returned. A Record Attribute List (RECAL) is placed in the RecordBuf that includes the record number (RECNBR) of the next active record in the file. The RECAL also includes the active record.
  3. If inactive records are to be returned, a RECAL object that includes a RECCNT object is placed in the RecordBuf. RECCNT contains the number of duplicate inactive records. RECAL also includes the inactive records.
- To unload in key order:
  1. The DDMUnLoadFileFirst function unloads records from a file beginning with the first record in the key sequence and proceeding sequentially through the file in key order.
  2. If the DDM_RTNINA flag is set, then it is ignored for this unload order.
- For all unload orders:

  The RecCount is the actual number of records sent on each request; it does not include inactive records that are not returned. The RecCount permits the requester to verify that the total number of records sent is correct. If the total RecCount does not match, the requester can re-issue the DDMUnLoadFileFirst function. Before issuing DDMUnloadFileFirst, the requester must first close UnLoadHandle by issuing a DDMUnLoadFileNext function with the DDM_CLOSEUNLOAD bit set.

The user can specify that damaged records be bypassed. For each record bypassed, a RECDMGRM reply message with a warning (SVRCOD of 4) is returned. Bypassed damaged records are *not* counted as part of the RecCount.

Multiple DDMUnLoadFileFirst functions may be issued on the same file without issuing the corresponding DDMUnLoadFileNext close functions. Each DDMUnLoadFileFirst function returns a unique unload handle. This allows more than one unload cursor to be active at the same time on the same file.

If an error condition is encountered, do not use the file handle in a DDMUnLoadFileNext.

## Effect on Cursor Position

There is no effect on the cursor position.

## Locking (for Local VSAM File System Only)

DDMUnLoadFileFirst attempts to:

1. Obtain a GETGETLK lock on the file.

   If the GETGETLK lock is obtained, the DDMUnLoadFileFirst is processed (successfully or unsuccessfully).

   If the GETGETLK lock is not obtained, the DDMUnLoadFileFirst is rejected with a FILIUSRM reply message.
2. Release the GETGETLK it obtained on the file if the DDM_MOREDATA flag is not active. If the DDM_MOREDATA flag is active, the lock is released by the DDMUnLoadFileNext function, provided the Close UnloadFile flag is set.

If the function terminates with a reply message that has a severity code of ERROR or higher then:

- For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

## Exceptions

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file that the records are loaded into is a non-VSAM file. | ACCATHRM |
| The RecordBuf address is NULL.<br>The address for the Flags is not valid. | ADDRRM |
| The file to be unloaded is empty. | ENDFILRM |
| The file has already been opened by DDMOpen or DDMLoadFileFirst (DDM_CHAIN flag on). | FILIUSRM |
| Any of the reserved bits are set in AccessFlags. | INVFLGRM |
| UnLoadHandle is not specified. | INVRQSRM |
| The RecordBufLen value is not large enough for at least 1 record. | LENGTHRM |
| UnloadOrder parameter does not contain a correct value. | VALNSPRM |

## DDMUnLoadFileFirst

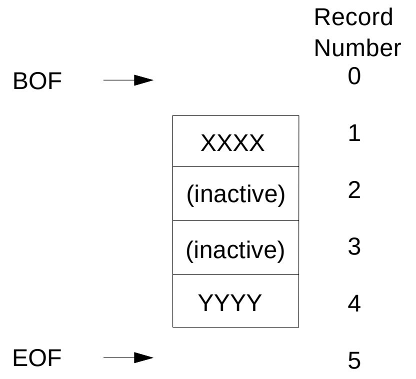
| This Causes a Reply Message to be Generated with SRVCOD = X'04' for each out-of-sync file in the file object.  The Function Continues | With This Reply Message |
|---|---|
| If the file-change date and time recorded by the VSAM API is not the same as that recorded by the file system, either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file.<br>DDMUnLoadFileFirst and DDMUnLoadFileNext will not re-synchronize the file-change date and time during close processing. | FILDMGRM |

## Examples

Assume the following:

```
AccessFlags   =  0x00000008  ;  /* DDM_RTNINA = TRUE */
UnloadOrder   =  0x145E  ;
```

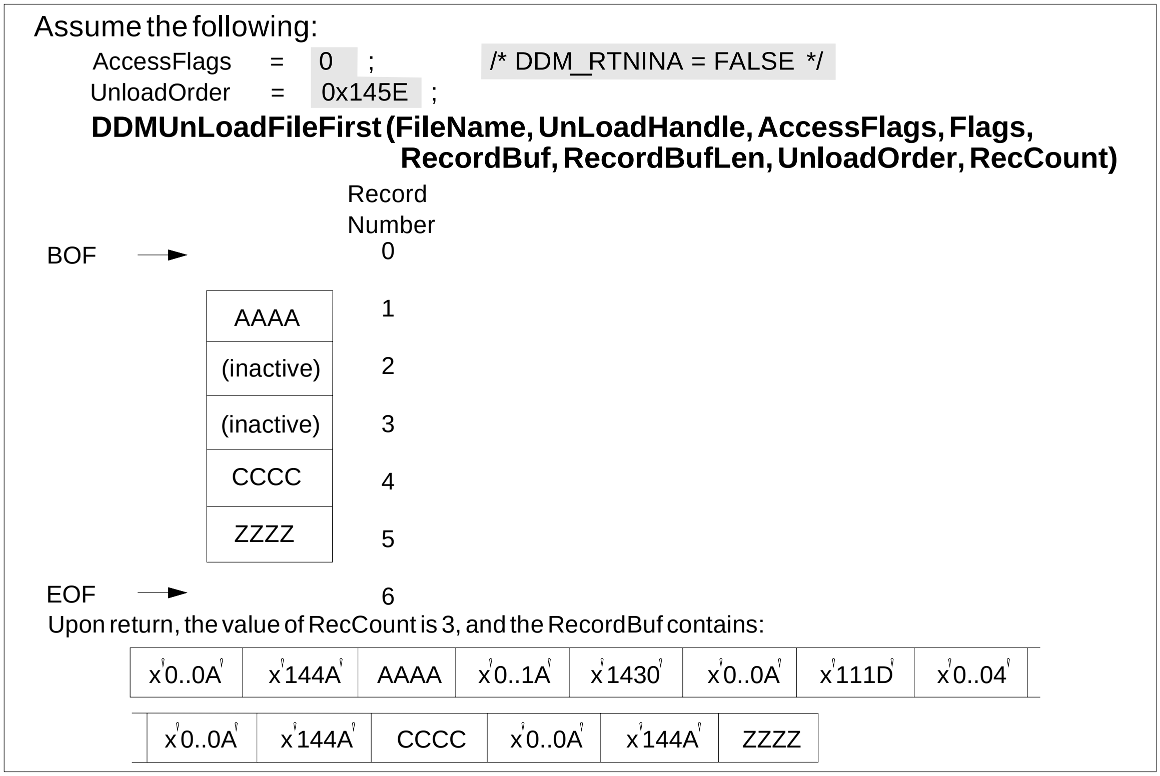
**DDMUnLoadFileFirst (FileName, UnLoadHandle, AccessFlags, Flags, RecordBuf, RecordBufLen, UnloadOrder, RecCount)**



Upon return, the value of RecCount is 4, and the RecordBuf contains:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| x'0..0A' | x'144A' | XXXX | x'0..1A' | x'1430 | x'0..0A' | x'111A' | x'0..02' |
| x'0..0A' | x'142D' | x'0..04' | x'0..0A' | x'144A' | YYYY | | |

*Figure 75. DDMUnLoadFileFirst Function When Returning Active or Inactive Records*



Assume the following:

```
AccessFlags   =  0      ;        /* DDM_RTNINA = FALSE */
UnloadOrder   =  0x145E ;
DDMUnLoadFileFirst (FileName, UnLoadHandle, AccessFlags, Flags,
                    RecordBuf, RecordBufLen, UnloadOrder, RecCount)
```

Upon return, the value of RecCount is 3, and the RecordBuf contains:

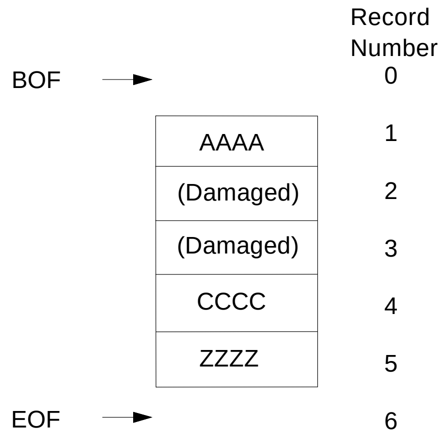
|  |  |  |  |  |  |  |  |
|---|---|---|---|---|---|---|---|
| x'0..0A' | x'144A' | AAAA | x'0..1A' | x'1430' | x'0..0A' | x'111D' | x'0..04' |
| x'0..0A' | x'144A' | CCCC | x'0..0A' | x'144A' | ZZZZ |  |  |

*Figure 76. DDMUnLoadFileFirst Function Skipping Inactive Records*

Assume the following:

```
AccessFlags   =   0x00000040   ;   /* DDM_BYPDMG = TRUE */
```

**DDMUnLoadFileFirst (FileName, UnLoadHandle, AccessFlags, Flags, RecordBuf, RecordBufLen, UnloadOrder, RecCount)**

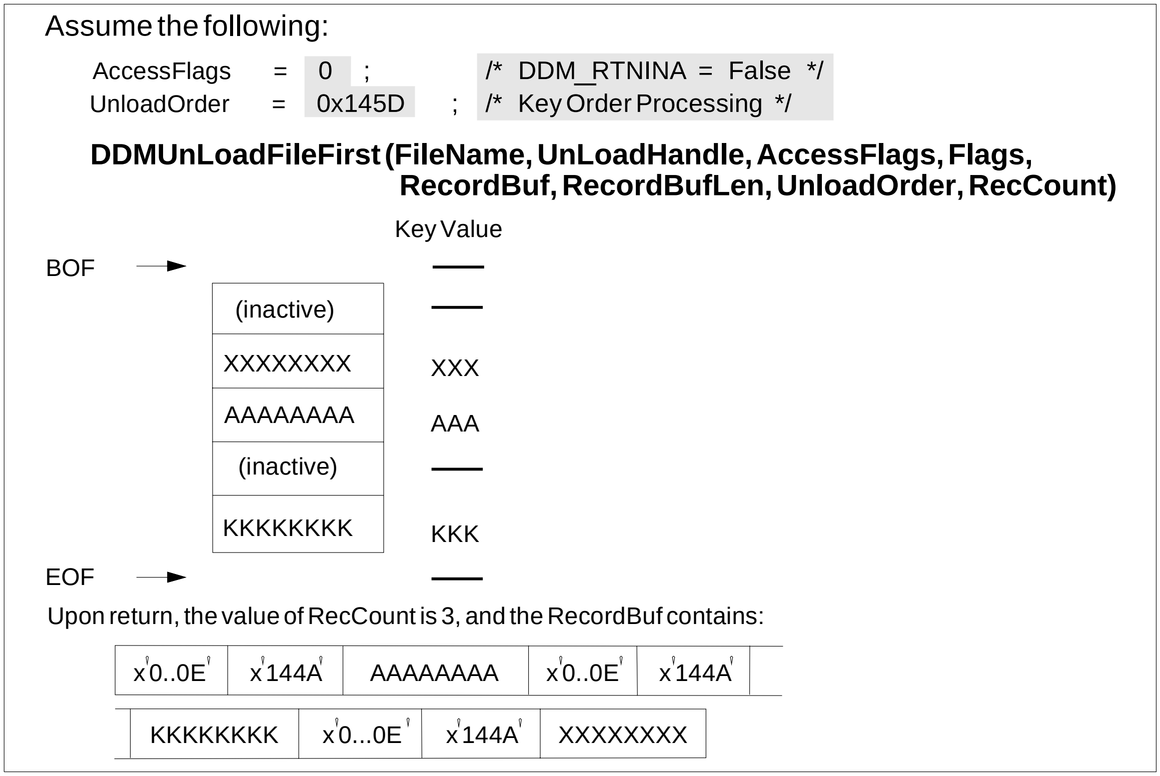


Upon return, the RecCount value is 3, and the RecordBuf contains:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| x'0..0A' | x'144A' | AAAA | x'0..0A' | x'144A' | CCCC | x'0...0A' | x'144A' | ZZZZ |

In addition, two reply messages are sent, one for each damaged record encountered. The reply message is RECDMGRM. The reply messages contain the record numbers of the damaged records.

*Figure 77. DDMUnLoadFileFirst Function Skipping Damaged Records*



Assume the following:

```
AccessFlags   =  0      ;   /* DDM_RTNINA = False */
UnloadOrder   =  0x145D ;   /* Key Order Processing */
```

**DDMUnLoadFileFirst (FileName, UnLoadHandle, AccessFlags, Flags,
RecordBuf, RecordBufLen, UnloadOrder, RecCount)**

Upon return, the value of RecCount is 3, and the RecordBuf contains:

| | | | | |
|---|---|---|---|---|
| x'0..0E' | x'144A' | AAAAAAAA | x'0..0E' | x'144A' |
| KKKKKKKK | x'0...0E' | x'144A' | XXXXXXXX | |

*Figure 78. DDMUnLoadFileFirst Function Unloading in Key Order*

## DDMUnLoadFileNext (Unload Records from File)

This function unloads records from a target server file and transfers them to the requester.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMUnLoadFileNext (HDDMLOAD      UnLoadHandle,
                          ULONG         Flags,
                          PULONG        UnloadFlags,
                          PDDMRECORD    RecordBuf,
                          ULONG         RecordBufLen,
                          PULONG        RecCount
                          );
```

### Parameters

**UnLoadHandle**
The handle value (HDDMLOAD) returned previously to the requester in a corresponding DDMUnLoadFileFirst function.

**Flags**
The bit flags (ULONG) parameter. The bit flags are:

| Bit | Meaning |
|---|---|
| **2–31** | Reserved flags |
| **1** | DDM_CLOSEUNLOAD flag.<br>The user has the option of setting this flag bit and notifying the system to terminate UnLoadHandle based chaining (for the DDM_MOREDATA flag) and de-allocate UnLoadHandle based system resources for this UnLoadFile function. This flag provides the user with a way of prematurely terminating the unload file operation quickly without having to wait until the entire file has been unloaded.<br>When this flag is set, no records will be unloaded and the UnloadFlags and RecCount will not be set. |
| **0** | Reserved flag. |

**UnloadFlags**
The pointer (PULONG) to the bit unload flags parameter. The bit flags are:

| Bit | Meaning |
|---|---|
| **1–31** | Reserved flags |

**0** DDM_MOREDATA flag.

The system sets this bit upon return from DDMUnLoadFileNext, if the record buffer is not large enough to hold all of the target file's existing records. This flag bit notifies the user to issue a subsequent DDMUnLoadFileNext in order to continue the unload file function. When the DDM_MOREDATA flag bit is off, the system has completed the unload of the entire file and has de-allocated all previously allocated system resources based on UnLoadHandle. No user-initiated action is required to terminate this function.

**RecordBuf**

The pointer (PDDMRECORD) to the record buffer. The returned record buffer can contain the following objects:

RECORD
RECAL

These objects can be in mixed order and can be repeated. The format of the record buffer upon return of the function is:

| | | |
|---|---|---|
| LL | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record description from the beginning of LL to the end of Data.

**CP** The value (CODEPOINT) indicating that the following data is either record data or a record attribute list containing a record number and record data.

**X'144A'** Indicates that the following data is record data.

**X'1430'** Indicates that the following data is a record attribute list.

A RECAL object is returned when inactive records have been encountered. This is not used when unloading in key order.

- If CP is a record attribute list, the format of DATA is:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LL | X'111A' | RC | L3 | X'111D' | RN | L4 | CP | Data |

**Field** **Description**

**L2** The length (ULONG) from the beginning of L2 to the end of RC.

**X'111A'** The value (CODEPOINT) indicating that the following data is a record count (RECCNT). The RECCNT parameter is used to indicate the number of duplicate inactive records, where N≥1.

**RC** The number (ULONG) of duplicate records in the record attribute list.

**L3** The length (ULONG) from the beginning of L3 to the end of RN.

**X'111D'** The value (CODEPOINT) indicating that the following data is a record number (RECNBR).

**RN** The record number (ULONG) of the record in the record attribute list.

**L4** The length (ULONG) from the beginning of L4 to the end of Data.

**CP** The value (CODEPOINT) indicating that the following is either record data or an inactive record length.

**X'144A'** Indicates that the following data is record data.

**X'142D'** Indicates that the following data is a ULONG length of an inactive record.

**Data** The record data or the length (ULONG) of an inactive record.

- If CP is record data, the format is record.

The number of record descriptions (record data and inactive record lengths) should be the same as the number indicated in the record count.

**RecordBufLen**
The length (ULONG) of the record buffer.

**RecCount**
The count (ULONG) of the record descriptions in the record buffer.

The number of record descriptions (record data and inactive record lengths) should be the same number as indicated in the record count. When a RECAL (Record Attribute List) is specified in RecordBuf and RECCNT of N is specified within the RECAL, the RecCount parameter reflects the N duplicate records. Therefore if RecordBuf contained 10 data records and a RECAL, with RECCNT having a value of 100, the value of RecCount would be 110.

## Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| ADDRRM | X'F212' | Address Error |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INVFLGRM | X'F205' | Invalid Flags |
| INVRQSRM | X'123C' | Invalid Request |
| LENGTHRM | X'F211' | Field Length Error |
| RECDMGRM | X'1249' | Record Damaged |

## DDMUnLoadFileNext

| Message ID | Code Point | Message Title |
|---|---|---|
| VALNSPRM | X'1252' | Parameter Value Not Supported |

## Remarks

DDMUnLoadFileNext starts unloading records for the position in the file that was current from a previous DDMUnLoadFileNext or DDMUnLoadFileFirst function.

DDMUnLoadFileNext unloads the records of the file in the order specified by the UnloadOrder parameter of the originating DDMUnLoadFileFirst function. If the file is not an alternate index or keyed file, the specified value of the originating DDMUnLoadFileFirst UnloadOrder parameter is ignored and the records are unloaded in record number order. DDM_RTNINA and DDM_BYPDMG flags that were set in DDMUnLoadFileFirst are saved and used in the function.

- To load in record number order:
  1. DDMUnLoadFileNext unloads records from a file in sequence order specified by the originating DDMUnLoadFileFirst.
  2. If the originating access flag DDM_RTNINA was not set, inactive records are not returned. A RECAL (Record Attribute List) is placed in the RecordBuf that includes the record number (RECNBR) of the next active record in the file. The RECAL also includes the active record.
  3. If inactive records are to be returned, a RECAL object that includes a RECCNT object is placed in the RecordBuf. RECCNT contains the number of duplicate inactive records. RECAL also includes the inactive records.
- To unload in key order:
  1. DDMUnLoadFileNext unloads records from a file beginning with the first record in the key sequence and proceeding sequentially through the file in key order.
  2. If the originating access flag DDM_RTNINA was set, then it is ignored for this unload order.
- For all unload orders:
  1. RecCount is the actual number of records transferred for each request; it does not include inactive records that are not returned. RecCount lets the requester verify that the total number of records transferred is correct.
  2. If the total record count does not match, the requester can optionally close the UnLoadHandle by issuing a DDMUnLoadFileNext function with the DDM_CLOSEUNLOAD flag set and start a new unload file operation by issuing a DDMUnLoadFileFirst function.

If an error condition is encountered, do not use the file handle in a DDMUnLoadFileNext.

## Effect on Cursor Position

There is no effect on the cursor position because the file is not open.

## Locking (for Local VSAM File System Only)

DDMUnLoadFileNext releases the GETGETLK lock that was obtained by DDMUnLoadFileFirst on the file if no more data is to be unloaded or the DDM_CLOSEUNLOAD flag is set.

If DDMUnLoadFileNext terminates with a reply message that has a severity code of ERROR or higher then:

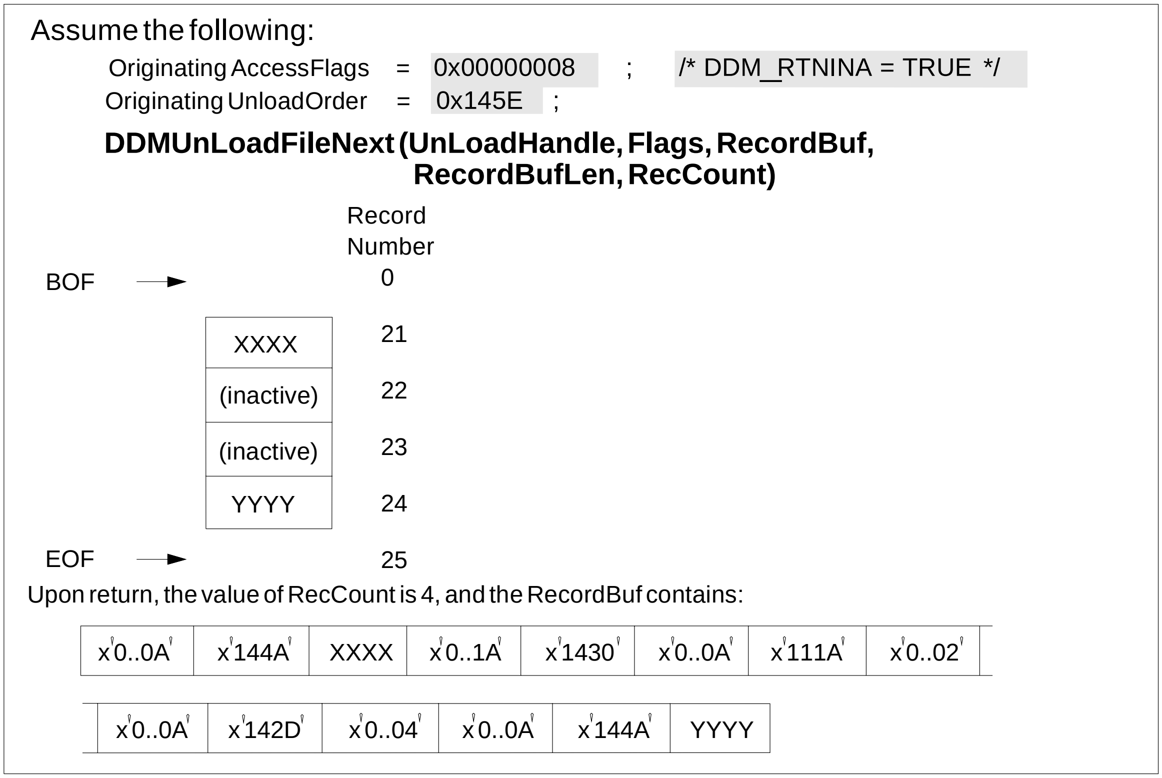
- For error termination (SVRCOD of 8): The file locks are the same as before the function was issued.
- For severe termination (SVRCOD of 16 or higher): The state of the file locks may not be the same as before the function was issued.

## Exceptions

| **This Causes the Function to be Rejected** | **With This Reply Message** |
|---|---|
| The RecordBuf address is NULL.<br>The address for the Flags is not valid. | ADDRRM |
| The handle from DDMUnLoadFileFirst is not used as the handle for a DDMUnLoadFileNext. | HDLNFNRM |
| Any of the reserved bits in AccessFlags are set. | INVFLGRM |

| **This Causes the Function to be Terminated** | **With This Reply Message** |
|---|---|
| The RecordBufLen value is not large enough for at least 1 record. | LENGTHRM |

## Examples



Assume the following:

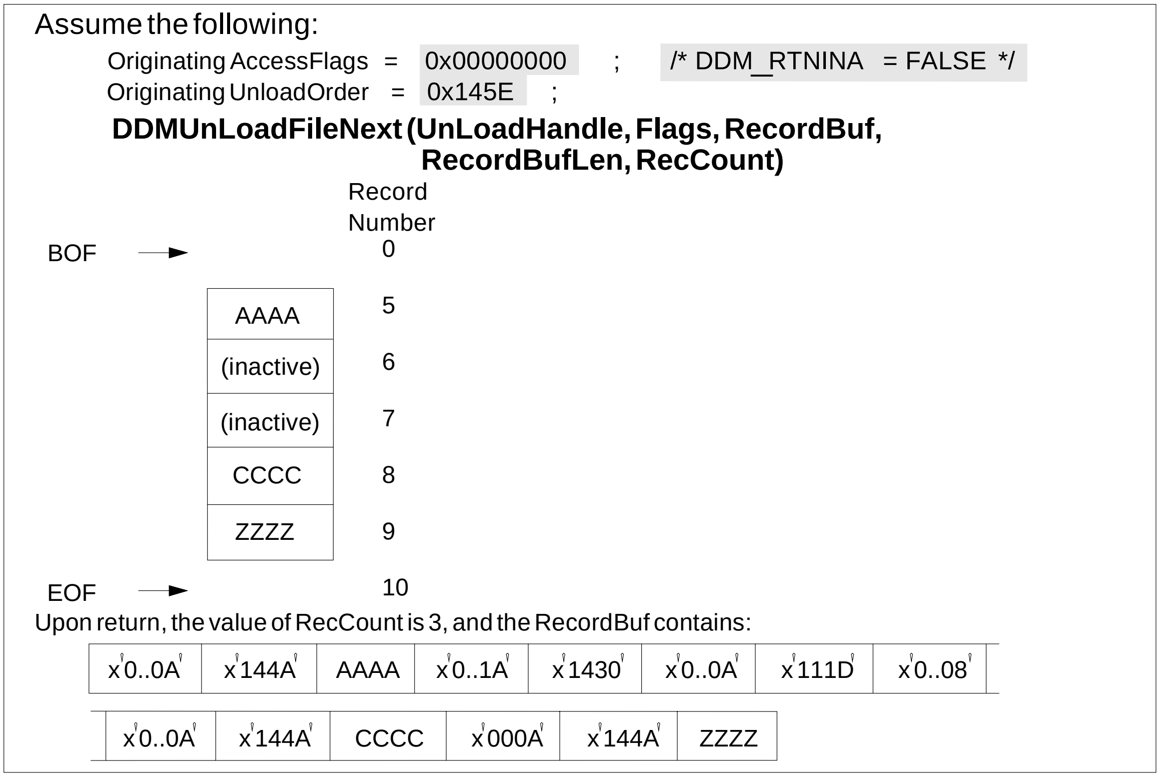
```
Originating AccessFlags  =  0x00000008    ;    /* DDM_RTNINA = TRUE */
Originating UnloadOrder  =  0x145E   ;
```

**DDMUnLoadFileNext (UnLoadHandle, Flags, RecordBuf,
RecordBufLen, RecCount)**

Upon return, the value of RecCount is 4, and the RecordBuf contains:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| x'0..0A' | x'144A' | XXXX | x'0..1A' | x'1430' | x'0..0A' | x'111A' | x'0..02' |
| x'0..0A' | x'142D' | x'0..04' | x'0..0A' | x'144A' | YYYY | | |

*Figure 79. DDMUnLoadFileNext Function*



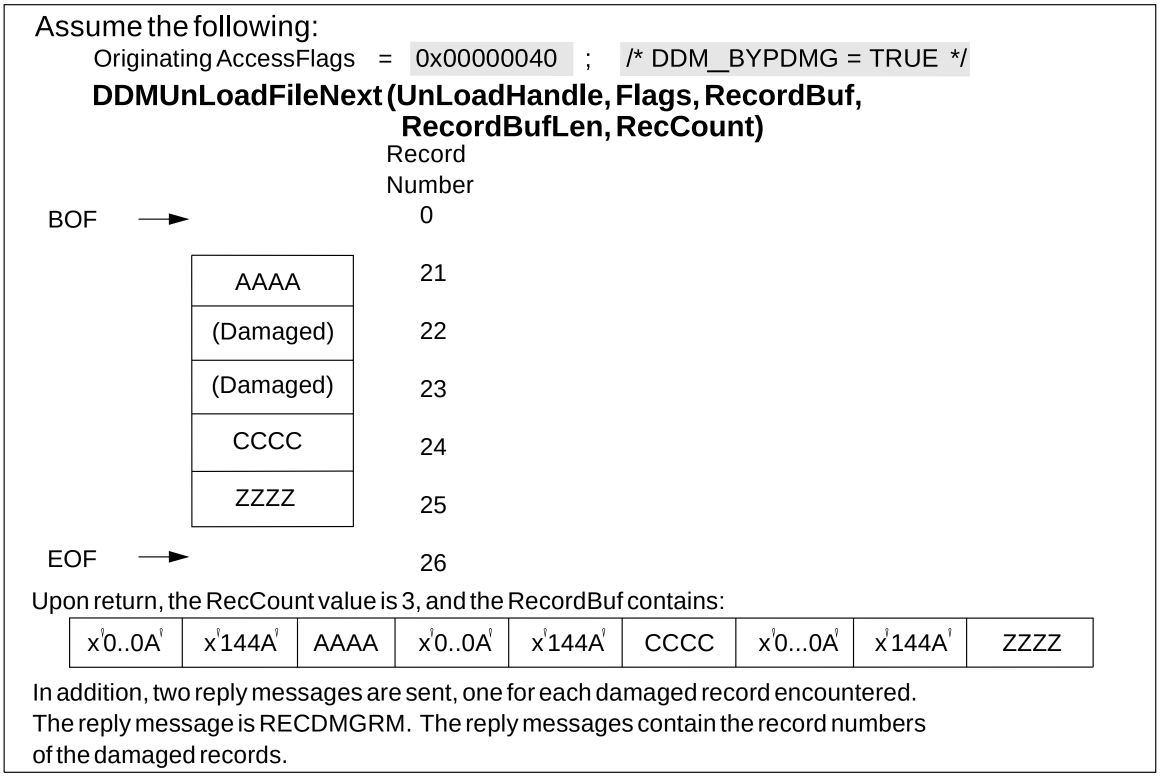
Assume the following:

```
Originating AccessFlags  =  0x00000000  ;   /* DDM_RTNINA  = FALSE */
Originating UnloadOrder  =  0x145E  ;
```

**DDMUnLoadFileNext (UnLoadHandle, Flags, RecordBuf, RecordBufLen, RecCount)**

Upon return, the value of RecCount is 3, and the RecordBuf contains:

*Figure 80. DDMUnLoadFileNext Function Skipping Inactive Records*



Assume the following:

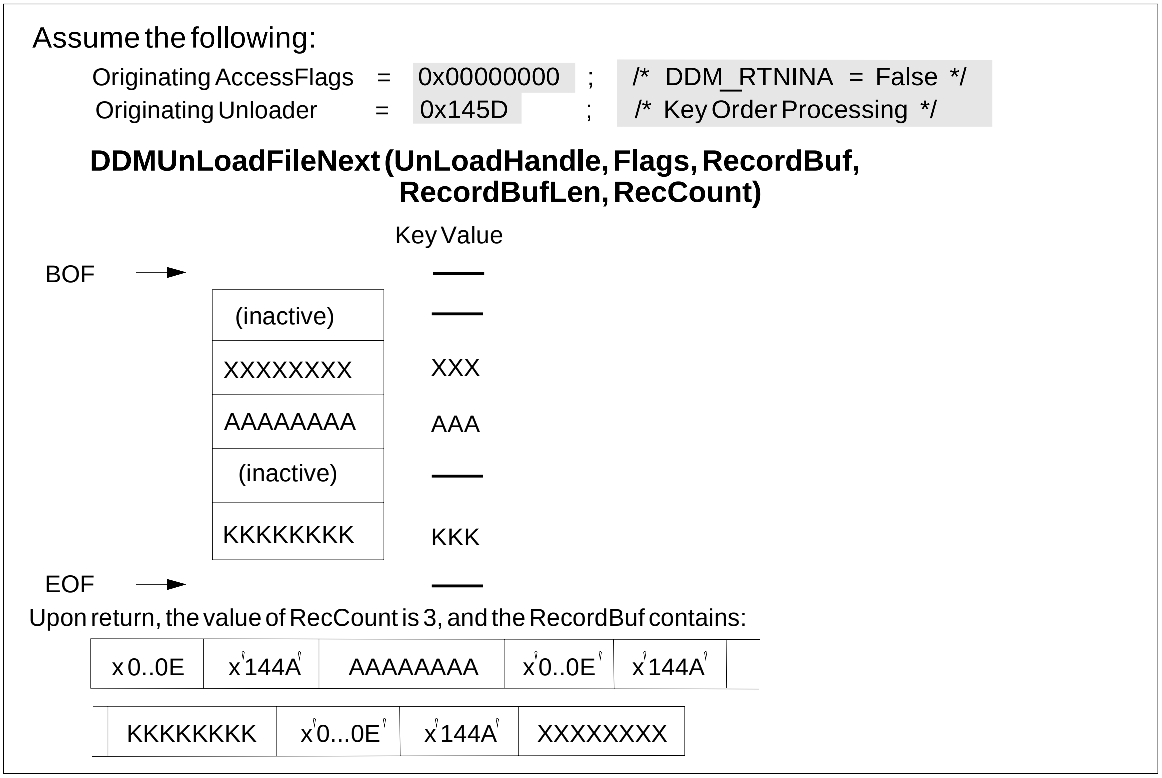
```
Originating AccessFlags   =  0x00000040  ;   /* DDM_BYPDMG = TRUE */
DDMUnLoadFileNext (UnLoadHandle, Flags, RecordBuf,
                   RecordBufLen, RecCount)
```

Upon return, the RecCount value is 3, and the RecordBuf contains:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| x'0..0A' | x'144A' | AAAA | x'0..0A' | x'144A' | CCCC | x'0...0A' | x'144A' | ZZZZ |

In addition, two reply messages are sent, one for each damaged record encountered. The reply message is RECDMGRM. The reply messages contain the record numbers of the damaged records.

*Figure 81. DDMUnLoadFileNext Function Skipping Damaged Records*



Assume the following:

```
Originating AccessFlags  =  0x00000000  ;   /*  DDM_RTNINA  = False  */
Originating Unloader     =  0x145D      ;   /*  Key Order Processing  */
```

**DDMUnLoadFileNext (UnLoadHandle, Flags, RecordBuf, RecordBufLen, RecCount)**

Upon return, the value of RecCount is 3, and the RecordBuf contains:

*Figure 82. DDMUnLoadFileNext Function Unloading in Key Order*

## DDMUnLockRec (Unlock Implicit Record Lock)

This function releases any implicit record lock (that is, an update intent) currently held by the cursor.

### Syntax

```
#include dub.h  /* Required for all platforms */

APIRET DDMUnLockRec (HDDMFILE         FileHandle
                    );
```

### Parameters

**FileHandle**
The file handle (HDDMFILE) obtained from DDMOpen.

### Returns

| Message ID | Code Point | Message Title |
|---|---|---|
| EXSCNDRM | X'123A' | Existing Condition |
| HDLNFNRM | X'1257' | File Handle Not Found |

### Remarks

The DDM architecture requires that an "update intent" be set for a record before the record can be deleted or modified.

For the AIX local VSAM file system, DDMUnLockRec releases the update intent (if any) currently in place. However, concurrent data access control is done at the file level (that is, record locking is not supported).

### Effect on Cursor Position

**Normal Completion (SVRCOD of 0 or 4)**
The cursor position is not changed.

**Error Termination (SVRCOD of 8)**
The cursor position is the same as before the function was issued.

**Severe Termination (SVRCOD of 16 or higher)**
The cursor position is determined by the CSRPOSST (Cursor Position Status) parameter on the reply message.

### Exceptions

| This Causes the Function to Terminate Normally | With This Reply Message |
|---|---|
| The user requests to release the implicit record lock and the cursor does not hold a record lock.<br>**Note:** If this condition cannot be detected, the function terminates normally. | EXSCNDRM |

| This Causes the Function to be Rejected | With This Reply Message |
|---|---|
| The file handle is invalid. | HDLNFNRM |

# Chapter 4. VSAM API Common Parameters

This chapter provides detailed information about the common parameters of reply messages, data buffers, and EAs.

The parameters are listed in alphabetical order. Each parameter is described in three parts: purpose, code point, and structure. A code point is a hexadecimal value that uniquely identifies the class of a DDM object. The parameter name is also the name of the pre-defined constant for the code point of the parameter. Each common parameter is a DDM object whose generic structure is defined by the DDMOBJECT type:

| | | |
|---|---|---|
| LL | CP | Data |

**LL** Indicates the total length (ULONG) of the data description from the beginning of the length field to the end of Data.

**CP** Indicates the code point of the parameter.

**Data** Indicates the objects contained in the parameter.

## ACCINTLS (Access Intent List)

**Purpose** Specifies the file access intentions of the requester. One or more file access intents may be returned. The same value should not be returned more than once in the list.

**Code Point** The code point for this parameter is X'1134'.

**Structure**

| | | |
|---|---|---|
| LL | X'1134' | Data |

**Field** **Description**

**LL** The length (ULONG) of the data description from the beginning of LL to the end of Data.

**X'1134'** The value (code point) indicating that the following data is an access intent list.

**Data** A list of access intent values (code point):

**X'140B'** DELAI (Delete Record Access Intent)

**X'1416'** GETAI (Get Record Access Intent)

**X'1417'** INSAI (Insert Record Access Intent)

**X'1428'** MODAI (Modify Record Access Intent)

## ACCMTHCL (Access Method Class)

**Purpose** Specifies the class of the access method to be opened for file access.

**Code Point** The code point for this parameter is X'114E'.

**Structure**

| | | |
|---|---|---|
| LL | X'114E' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the data description from the beginning of this length field to the end of Data. |
| **X'114E'** | The value (code point) indicating that the following data names the class of the access method. |
| **Data** | The value (code point) specifying the access method class: dl tsize=15. |
| **X'140B'** | DELAI (Delete Record Access Intent) |
| **X'1416'** | GETAI (Get Record Access Intent) |
| **X'1417'** | INSAI (Insert Record Access Intent) |
| **X'1428'** | MODAI (Modify Record Access Intent) |

## ACCMTHLS (Access Method List)

**Purpose** Specifies the access methods that can be used to access the records of a file.

When returned by DDMQueryFileInfo or DDMQueryPathInfo, only those access methods supported are listed. If no access method classes are specified, the records of the file cannot be accessed.

**Code Point** The code point for this parameter is X'1402'.

**Structure**

| | | |
|---|---|---|
| LL | X'1402' | Data |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the data description from the beginning of this length field to the end of Data. |

**X'1402'** The value (code point) indicating that the following data is a list of the access methods.

**Data** The values (code point) specifying the access methods:

**X'1433'** RELRNBAM (Relative by Record Number Access Method)

**X'1435'** RNDRNBAM (Random by Record Number Access Method)

**X'1407'** CMBRNBAM (Combined Record Number Access Method)

**X'1432'** RELKEYAM (Relative by Key Access Method)

**X'1434'** RNDKEYAM (Random by Key Access Method)

**X'1406'** CMBKEYAM (Combined Keyed Access Method)

**X'1405'** CMBACCAM (Combined Access Access Method)

## ALCINISZ (Allocate Initial Extent)—DFM Only

**Purpose** Specifies whether storage is to be allocated for the initial extent of a file at the time the file is created. The value can be:

**TRUE** Indicates the initial extent should be allocated.

**FALSE** Indicates the initial extent should NOT be allocated.

**Note:** The value specified in the ALCINISZ parameter is considered a preference. The target system can choose to ignore this parameter.

**Code Point** The code point for this parameter is X'1154'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'1154' | Status |

**Field** **Description**

**X'00000007'** The length (ULONG) of the attribute description (from the beginning of this length field to the end of data).

**X'1154'** The value (code point) indicating that the following data is the initial file size.

**Status** The 1-byte status of ALCINISZ. The value can be:

**X'F1'** Indicates a value of TRUE.

**X'F0'** Indicates a value of FALSE.

## ALTINDLS (Alternate Index List)

**Purpose** Specifies a list of alternate index file names associated for a base file. The base file can only be a keyed file.

**Code Point** The code point for this parameter is `X'144E'`.

**Structure**

| | | |
|---|---|---|
| LL | X'144E' | Data |

**Field** **Description**

**LL** The length (ULONG) of the data description from the beginning of LL to the end of Data.

**X'144E'** The value (code point) indicating that the following data is a list of alternate index file names.

**Data** A list of alternate index file names. The maximum file name length is defined by the underlying file system driver.

| | | | | | |
|---|---|---|---|---|---|
| LL | X'1103' | Filename | LL | X'1103' | Filename |

| | | | |
|---|---|---|---|
| ... | LL | X'1103' | Filename |

**LL** The length (ULONG) from the beginning of LL to the end of the file name.

**X'110E'** The value (code point) indicating that the following data is a file name.

**Filename** An ASCII string containing the file name and ending with a null character.

## BASFILNM (Base File)

**Purpose** Specifies the name of the file upon which an alternate index file is based.

The base file cannot be an alternate index file. The base file can *only* be a keyed file.

A DDM file name is an unarchitected string of characters. DDM assumes that a name provided by the user to the source system DDM is in the format required by the target system data manager for locating the file. The named string can contain qualifiers for libraries, catalogs, members, instances, or other levels of identification for the file.

**Code Point** The code point for this parameter is X'1103'.

**Structure**

| | | |
|---|---|---|
| LL | X'1103' | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the data description from the beginning of LL to the end of Data. |
| **X'1103'** | The value (code point) indicating that the following data is a base file name. |
| **Data** | The base file name. |

## BASMGMNM (Base Management Class Name)

**Purpose** Specifies the name of the management class for the base file in a reply message.

**Code Point** The code point for this parameter is X'11D3'.

**Structure**

| | | |
|---|---|---|
| LL | X'11D3' | Name |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of this data description from the beginning of LL to the end of Name. |
| **X'11D3'** | The value (code point) indicating that the following information is the base management class name. |
| **Name** | The character string of up to 16 characters. |

## BASSTGNM (Base Storage Class Name)

**Purpose** Specifies the name of the storage class for the base file in a reply message.

**Code Point** The code point for this parameter is X'11D4'.

**Structure**

| | | |
|---|---|---|
| LL | X'11D4' | Name |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of this data description from the beginning of LL to the end of Name. |
| **X'11D4'** | The value (code point) indicating that the following information is the base storage class name. |
| **Name** | The character string of up to 16 characters. |

## CODPNT (Code Point Attribute)

**Purpose** Specifies a value that is a DDM-architected code point.

**Code Point** The code point for this parameter is X'000C'.

**Structure**

| | | |
|---|---|---|
| X'0008' | X'000C' | Code Point |

| **Field** | **Description** |
|---|---|
| **X'0008'** | The length (ULONG) of the code point description (from the beginning of this length field to the end of the code point). |
| **X'000C'** | The value (code point) indicating that the following information is a code point. |
| **Code Point** | The code point. |

## CSRPOSST (Cursor Position Status)

**Purpose** Specifies the status of the cursor in a reply message.

If the severity code is at least ERROR:

- The cursor position is the same as before the function that caused the reply message that carried this parameter.
- If the function was DDMInsertRecNum, DDMInsertRecEOF, DDMInsertRecKey, DDMSetNextRec, or DDMSetKeyNext with

RecCount greater than 1, the cursor position is the same as before the function iteration that caused the reply message.

A value of TRUE (X'F1') indicates that the cursor position is the same as before the function was issued or before the function iteration in error. TRUE is the only valid value if the severity code is ERROR.

A value of FALSE (X'F0') indicates that the cursor position may not be the same as before the function was issued, or before the function iteration in error, or that the current cursor position is unknown.

If the severity code is SC_NO_ERROR or SC_WARNING, the value of this parameter is ignored. The cursor status is as specified for the function that returned the reply message with a severity code of SC_NO_ERROR or SC_WARNING.

**Code Point** The code point for this parameter is X'115B'.

**Structure**

| | | |
|---|---|---|
| X'0007' | X'115B' | Status |

| **Field** | **Description** |
|---|---|
| **X'0007'** | The length (ULONG) of the data description from the beginning of this length field to the end of Status. |
| **X'115B'** | The value (code point) for cursor position status. |
| **Status** | The 1-byte cursor position status:<br>**X'F1'** Denotes TRUE.<br>**X'F0'** Denotes FALSE.<br>**Note:** This value is always X'F1'. |

## DATE (Date and Time)

**Purpose** A date and time can be specified for the required level of resolution. The optional data terms (for example, seconds) can be specified only if the preceding terms (for example, minutes) are also specified.

Dates and times are determined by the calendar and clock of the originator of the date/time stamp. Dates are specified according to the Gregorian calendar. Times are specified according to the military clock.

**Code Point** The code point of this term is X'000F'.

**Structure**

| | | |
|---|---|---|
| LL | X'000F' | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the data description from the beginning of LL to the end of Data.

**X'000F'** — The value (code point) indicating that the following is date and time data.

**Data** — The date and time data.

**Field** — Description

**Year** — The year:

- Character digit string
- LENGTH 4
- Minimum value is 0000
- Maximum value is 9999.

**Month** — The month in the year:

- Character digit string
- LENGTH 2
- Enumerated values for this parameter:
  - **00** (Month is unknown or special meaning is being conveyed that is server dependent.)
  - **01** (Month of January)
  - **02** (Month of February)
  - **03** (Month of March)
  - **04** (Month of April)
  - **05** (Month of May)
  - **06** (Month of June)
  - **07** (Month of July)
  - **08** (Month of August)
  - **09** (Month of September)
  - **10** (Month of October)
  - **11** (Month of November)
  - **12** (Month of December)

**Day** — The day of the month:

- Character digit string
- LENGTH 2
- Minimum value is 00
- Maximum value is 31.
- A value of 00 means the day is unknown or special meaning is being conveyed that is server dependent.

**Hour** The hour of the day:

- Character digit string
- LENGTH 2
- Minimum value is 00
- Maximum value is 23
- 00 is midnight, 06 is 6 a.m., 12 is noon, and 18 is 6 p.m.

**Minute** The minute of the hour:

- Character digit string
- LENGTH 2
- Minimum value is 00
- Maximum value is 59.

**Second** The second of the minute:

- Character digit string
- LENGTH 2
- Minimum value is 00
- Maximum value is 59.

## DELCP (Record Deletion Capability)

**Purpose** Specifies whether records can be deleted from the file.

**Code Point** The code point for this parameter is X'111B'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'111B' | Status |

**Field** **Description**

**X'00000007'** The length (ULONG) of the data description from the beginning of this length field to the end of Status.

**X'111B'** The value (code point) indicating that the following data is the record deletion capability.

**Status** The 1-byte status of DELCP.

**X'F1'** Denotes TRUE.
**X'F0'** Denotes FALSE.

## DFTREC (Default Record)

**Purpose** The default record is used to initialize a file when it is created. The length of the record data must be at least 1 and not greater than 4096.

**Code Point** The code point for this parameter is X'142B'.

**Structure**

| | | |
|---|---|---|
| LL | X'142B' | Default Record Data |

**Field** — **Description**

**LL** — The length (ULONG) of the buffer from the beginning of this length field to the end of Default Record Data.

**X'142B'** — The value (code point) indicating that the following data is the default record data.

**Default Record Data** — The contents of the default record data are replicated or truncated to match the record length of the file. This means that a value of X'00' causes the file to be initialized with records consisting of all zeroes. A value of ‘ABC’ would initialize a file with 10-byte records with ‘ABCABCABCA’ as the initialization record.

If the file is created with initially-varying-length records or with variable-length records, the initialized records have a length equal to RecLen.

If DFTINAIN record initialization was requested when the file was created, the Default Record Data field will be null, and the LL field will be X'00000006'.

## DTACLSNM (Data Class Name)

**Purpose** — Specifies the name of the data class that applies to a file or directory. For the target system, a data class specifies a set of allocation attributes to create a file or directory.

**Code Point** — The code point for this parameter is X'1121'.

**Structure**

| | | |
|---|---|---|
| LL | X'1121' | Name |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of this data description from the beginning of LL to the end of Name. |
| **X'1121'** | The value (code point) indicating that the following information is the data class name. |
| **Name** | The character string of up to 16 characters. |

## DTALCKST (Data Lock Status)

**Purpose** Specifies the status of the locks held on the records of a file.

If the severity code is ERROR or higher, this parameter indicates whether the locks are:

- the same as before the function that caused the reply message which carried this parameter, or
- the same as before the function iteration that caused the reply message, if the function was:

  DDMInsertRecNum<br>
  DDMInsertRecEOF<br>
  DDMInsertRecKey<br>
  DDMSetNextRec<br>
  DDNSetKeyNext with RecCount greater than 1.

A value of TRUE indicates that the locks are the same as before the function was issued, or before the function iteration in error. TRUE is the only valid value if the severity code is ERROR.

A value of FALSE indicates either:

The record locks are not the same as they were before the function was issued,
The record locks are not the same as they were before function iteration in error, or
The current lock status in unknown.

If the severity code is SC_NO_ERROR or SC_WARNING, the value of this parameter is ignored. The data locks are as specified for the function that returned the reply message with a severity code of SC_NO_ERROR or SC_WARNING.

**Code Point** The code point for this parameter is X'115C'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'115C' | Status |

| Field | Description |
|---|---|
| **X'00000007'** | The length (ULONG) of the data description from the beginning of this length field to the end of Status. |
| **X'115C'** | The value (code point) indicating that the following data is the data lock status. |
| **Status** | The 1-byte status of the data locks on the file.<br>**X'F1'** Denotes TRUE.<br>**X'F0'** Denotes FALSE.<br>**Note:** This value is always X'F1'. |

## EOFNBR (End of File Record Number)

**Purpose** The record number of the EOF position of the file.

**Code Point** The code point of this term is X'110B'.

| | | |
|---|---|---|
| X'0000000A' | X'110B' | EOF Number |

| Field | Description |
|---|---|
| **X'0000000A'** | The length (ULONG) of the reply message object from the beginning of this length field to the end of EOF Number. |
| **X'110B'** | The value (code point) for the EOF record number object. |
| **EOF Number** | The ULONG EOF number. |

## ERRFILNM (Error File Name)

**Purpose** The error file name is the name of a file, other than the one the function is directly accessing, that caused the error. For example, modification of a record of a file may fail because an alternate index file built over the file does not allow keys to be updated. In this case, the name of the alternate index file would be specified as the error file name.

**Code Point** The code point for this parameter is X'1126'.

**Structure**

| | | |
|---|---|---|
| LL | X'1126' | Error File Name |

**Field** **Description**

**LL** The length (ULONG) of this data description from the beginning of LL to the end of the Error File Name.

**X'1126'** The value (code point) indicating the following data is the error file name.

**Error File Name** The file name.

## FILBYTCN (File Byte Count)

**Purpose** The file byte count is the total number of bytes currently allocated to a file. The bytes are counted in 1K (1024) byte units. The byte count is rounded to the next higher 1K byte value (for example, 1027 bytes requires a 2K byte value). The minimum value for this parameter is 0.

**Code Point** The code point for this parameter is X'1139'.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'1139' | Count |

**Field** **Description**

**X'0000000A'** The length (ULONG) of the attribute description (from the beginning of this length field to the end of Count).

**X'1139'** The value (code point) indicating that the following data is the file byte count.

**Count** The total number of bytes currently allocated to the file. The value of Count is specified in a ULONG.

## FILCHGDT (File Change Date)—DFM Only

**Purpose** The change date of a file is the target system date on which certain operations occurred, such as:

- The file was created
- A record was processed by a DDMModifyRec, DDMInsertRec, or DDMDeleteRec command
- The file was renamed
- The attributes were changed

The file change date can be updated either as each change occurs to the file, or when the file is closed following such a change. This is dependent on the DDM server implementation.

**Code Point** The code point of this term is X'113A'.

**Structure**

| | | |
|---|---|---|
| LL | X'113A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the attribute description from the beginning of LL to the end of Data.

**X'113A'** The value (code point) indicating that the following data is the file change date.

**Data** Date and time data, rounded down to the even second. See “DATE (Date and Time)” on page 369 for the format of date and time data.

## FILCLS (File Class)

**Purpose** Specifies the class of a file.

**Code Point** The code point for this parameter is X'1110'.

**Structure**

| | | |
|---|---|---|
| X'00000008' | X'1110' | Data |

**Field** **Description**

**X'00000008'** The length (ULONG) of the data description from the beginning of this length field to the end of Data.

**X'1110'** The value (code point) indicating that the following data is the file class value.

**Data** A file class value (USHORT) that can have the following values:

| | |
|---|---|
| **ALTINDF** | Alternative Index File (X'1423') |
| **DIRFIL** | Direct File (X'140C') |
| **KEYFIL** | Keyed File (X'141E') |
| **SEQFIL** | Sequential File (X'143B') |

## FILCRTDT (File Creation Date)

**Purpose** The creation date of a file is the date on which a DDMCreate*xxx* function created the file.

**Code Point** The code point of this term is X'1108'.

**Structure**

|  |  |  |
|---|---|---|
| LL | X'1108' | Data |

**Field** — **Description**

**LL** — The length (ULONG) of the attribute description from the beginning of LL to the end of Data.

**X'1108'** — The value (code point) indicating that the following data is the file creation date.

**Data** — Date and time data, rounded down to the even second. See “DATE (Date and Time)” on page 369 for the format of date and time data.

## FILHDD (File Hidden)

**Purpose** Specifies whether the file was created with the FILE_HIDDEN attribute.

**FALSE** — Files or subdirectories with an attribute of FILHDD(TRUE) are not considered a match.

**TRUE** — Files or subdirectories with an FILHDD attribute value of TRUE or FALSE are considered a match.

**Code Point** The code point for this parameter is X'1132'.

**Structure**

|  |  |  |
|---|---|---|
| X'00000007' | X'1132' | Status |

**Field** — **Description**

**X'00000007'** — The length (ULONG) of the data description from the beginning of this length field to the end of Status.

**X'1132'** — The value (code point) indicating that the following data is the hidden file attribute.

**Status** — The 1-byte status of FILHDD.

| | |
|---|---|
| **X'F1'** | Denotes TRUE. |
| **X'F0'** | Denotes FALSE. |

## FILINISZ (Initial File Size)

**Purpose** Specifies the preferred initial file size in records. The maximum initial size is determined by the target system, and the value specified can be rounded up or down to the next unit of allocation.

The value is expressed in the number of record positions preferred for the initial file size. The RecLen (Record Length) parameter on the DDMCreateRecFile function is used to compute the amount of storage requested.

Note that the value specified in the FILINISZ parameter is considered a preference. The target system can choose to implement another value.

**Code Point** The code point for this parameter is X'113C'.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'113C' | Size |

**Field** **Description**

**X'0000000A'** The length (ULONG) of the attribute description (from the beginning of this length field to the end of Data).

**X'113C'** The value (code point) indicating that the following data is the initial file size.

**Size** The initial file size in records:

- The value is specified in a ULONG.
- Minimum value is 0, which means that the file exists but has no space allocated to it.
- The value of X'FFFFFFFF' means that the file is of unlimited size.

## FILNAM (File Name)

**Purpose** A VSAM API file name is an unarchitected string. A VSAM API assumes that a name provided by the user to the DDM source server is in the format required by the target server for creating or locating the file. The named string can contain qualifiers for directories, libraries, catalogs, members, instances, or other levels of identification of the file.

The target agent validates the file name according to its own rules for naming. This can be done before or after attempting to use the specified file name.

No semantic meaning is assigned to file names.

**Code Point** The code point for this parameter is X'110E'.

**Structure**

| | | |
|---|---|---|
| LL | X'110E' | File Name |

**Field** **Description**

**LL** The length (ULONG) of this data description from the beginning of LL to the end of File Name.

**X'110E'** The value (code point) indicating that the following information is the file name.

**File Name** The file name. The maximum file name length is defined by the underlying file system driver.

## FILPRT (File Protected)

**Purpose** Specifies whether the file is protected. DDMDelete cannot be used on a protected file.

Having a protected file attribute does not prevent a file from being opened with access intents of MODAI, DELAI, or INSAI. Nor does this attribute prevent DDMModifyRec, DDMDeleteRec, or DDMInsertRec*xxx* function from being performed. These functions are controlled by the file capabilities attributes: MODAI, DELAI, or INSAI.

The value of TRUE indicates that the file is protected from file management functions that would change the entire contents of the file.

The value of FALSE indicates that the file is not protected from file management functions that would change the entire contents of the file.

**Code Point** The code point for this parameter is X'112A'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'112A' | Status |

**Field** **Description**

**X'00000007'** The length (ULONG) of the data description from the beginning of this length field to the end of Status.

**X'112A'** The value (code point) indicating that the following data is the file protect attribute.

**Status** The 1-byte status of FILPRT.

**X'F1'** Denotes TRUE.
**X'F0'** Denotes FALSE. (This is the default value.)

## FILSIZ (File Size)

**Purpose** The size of a file is determined by the total number of record positions allocated to the file. This includes all active and inactive records between the BOF and the EOF plus all allocated record positions between the EOF and the end of the last allocated extent. This attribute does not apply to files with variable-length records.

**Code Point** The code point for this parameter is `X'110F'`.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'110F' | Data |

**Field** **Description**

**X'0000000A'** The length (ULONG) of the attribute description from the beginning of this length field to the end of Data.

**X'110F'** The value (code point) for this attribute.

**Data** A ULONG binary number:

- The value is specified in a ULONG.
- Minimum value is 0.

## FILSYS (System File)

**Purpose** Specifies whether the file was created with the FILE_SYSTEM attribute.

**Code Point** The code point for this parameter is `X'1133'`.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'1133' | Status |

**Field** **Description**

**X'00000007'** The length (ULONG) of the data description from the beginning of this length field to the end of Status.

**X'1133'** The value (code point) indicating that the following data is the system file attribute.

**Status** The 1-byte status of FILSYS.

| | |
|---|---|
| **X'F1'** | Denotes TRUE. |
| **X'F0'** | Denotes FALSE. |

## GETCP (File Get Capability)

**Purpose** Specifies whether the contents of a file can be read by DDMGetRec, DDMSET*xxx* with NODATA(FALSE), or DDMUnLoadFile*xxxx*.

If the file is not get-capable, a DDMGetRec, DDMSET*xxx* with NODATA(FALSE), or DDMUnLoadFile*xxxx* is rejected with an INVRQSRM reply message.

**Code Point** The code point for this parameter is X'1191'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'1191' | Status |

**Field** **Description**

**X'00000007'** The length (ULONG) of the data description from the beginning of this length field to the end of Status.

**X'1191'** The value (code point) indicating that the following data is the file get capability

**Status** The 1-byte status of GETCP.

**X'F1'** Denotes TRUE.
**X'F0'** Denotes FALSE.

## INSCP (File Insert Capability)

**Purpose** Specifies whether data records can be inserted into the file by a DDMInsertREC*xxx* or DDMLoadFile*xxxx* function.

If the file is not insert-capable, an insert function DDMInsertRec*xxx* (an insert function) or DDMLoadFile*xxxx* is rejected with an INVRQSRM reply message.

**Code Point** The code point for this parameter is X'1192'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'1192' | Status |

**Field** **Description**

**X'00000007'** The length (ULONG) of the data description (from the beginning of this length field to the end of Status).

**X'1192'** The value (code point) indicating that the following data is the file insert capability.

**Status** The 1-byte status of INSCP.

| | |
|---|---|
| **X'F1'** | Denotes TRUE. |
| **X'F0'** | Denotes FALSE. |

## KEYDEF (Key Definition)

**Purpose** The key of a record consists of one or more fields that define an ordering of the records for relative or random access. Key fields are defined in terms of their length and displacement in the record.

Composite keys can be expressed by repeating the KEYFLDDF (Key Field Definition) parameter as many times as necessary. The first KEYFLDDF specifies the most significant part of the key and the last KEYFLDDF specifies the least significant part of the key. The total of all key lengths in a composite key cannot exceed 255 bytes, which is the maximum length key definition.

For a description of the errors that can be detected by target systems in a definition of the keys of a file, see “KEYDEFRM (Invalid Key Definition)” on page 448 and “KEYDEFCD (Key Definition Error Code).”

**Code Point** The code point for this parameter is X'1114'.

**Structure**

| | | |
|---|---|---|
| LL | X'1114' | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the data description from the beginning of LL to the end of Data. |
| **X'1114'** | The value (code point) indicating that the following data is a key definition. |
| **Data** | A list of one or more key field definitions (KEYFLDDF). |

## KEYDEFCD (Key Definition Error Code)

**Purpose** Specifies the condition for which the KEYDEFRM reply message was returned.

**Code Point** The code point for this parameter is X'1164'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'1164' | Data |

**Field** **Description**

**X'00000007'** The length (ULONG) of the data description from the start of this length field to the end of Data.

**X'1164'** The value (code point) indicating that the following data is a key definition error code.

**Data** A 1-byte value specifying the key definition error code:

- **X'01'** The specified key does not fall within the record boundaries.

- **X'02'** The target system does not support composite keys or the number of composite keys specified.

- **X'03'** The total length of the specified key or composite key exceeds the maximum key length supported by the target system. The maximum length key supported in the local VSAM file system is 255 bytes.

- **X'04'** The target system does not support overlapping fields. For example, if key field A begins in position 10 for a key length of 10, it is not possible to specify a key field B that overlaps positions 10 through 19.

- **X'05'** The target system does not allow a key field to be defined over multiple record fields when the record fields are defined in a target system data dictionary.

- **X'06'** The target system does not allow a key field to be defined for a part of a record field.

- **X'07'** The target does not allow a key field to be specified for non-character record fields, such as an encoded integer or floating point field.

- **X'08'** The target system does not support the specified key sequence for the specified key data class.

- **X'09'** The target system does not support the specified key data class.

## KEYDUPCP (Duplicate Keys Capability)

**Purpose** Specifies whether or not duplicate keys are allowed in a file.

**Code Point** The code point for this parameter is X'113D'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'113D' | Data |

**Field** **Description**

**X'00000007'** The length (ULONG) of the data description from the beginning of this length field to the end of Data.

**X'113D'** The value (code point) that indicates whether duplicate keys are allowed.

**Data** A 1-byte value:

**X'F0'** Duplicate keys are not allowed.
**X'F1'** Duplicate keys are allowed.

## KEYFLDDF (Key Field Definition)

**Purpose** The key field defines the location, length, data class, and ordering of a single record key.

**Code Point** The code point for this parameter is X'140F'.

**Structure**

| | | | | | |
|---|---|---|---|---|---|
| X'00000010' | X'140F' | Keyseq | Keycls | Keylen | Keydsp |

| | |
|---|---|
| KeyLen | KeyDisp |

**Field** **Description**

**X'00000010'** The length (ULONG) of the data description from the beginning of this length field to the end of Data.

**X'140F'** The value (code point) indicating that the following data is a key field definition.

**Keyseq** A value (USHORT) specifying the key sequence:

**X'1420'** Ascending Key Sequence
**X'1421'** Descending Key Sequence

**Keycls** A value (USHORT) specifying the key class:

**X'0044'** The key field is a byte string.

**Keylen** A value (USHORT) specifying the key length.

**Keydsp** The displacement (ULONG) of the start of the key field in the record. If multiple KEYFLDDF (Key Field Definitions) are provided, the fields are concatenated to form a combined key. The maximum length key is 255 bytes.

## KEYVAL (Key Value)

**Purpose** Specifies the value of a record key.

**Code Point** The code point for this parameter is X'1115'.

**Structure**

| | | |
|---|---|---|
| LL | X'1115' | Data |

**Field** **Description**

**LL** The length (ULONG) of the data description from the beginning of this length field to the end of Data.

**X'1115'** The value (code point) that indicates the following is a key value.

**Data** The key value (BYTE) for a record. The key value can be up to 255 bytes. If the record is inactive, the key value is set to X'00'.

## LSTACCDT (Last Access Date)—DFM Only

**Purpose** The last access date is the target system date on which the file was last accessed by operations such as a record DDMDeleteRec, DDMModifyRec, or DDMInsertRec command.

The last access date can be updated either as these commands are performed or when the file is closed following one of these commands. This is dependent on the DDM server implementation.

**Code Point** The code point of this term is X'1113'.

**Structure**

| | | |
|---|---|---|
| LL | X'1113' | Data |

**Field** **Description**

**LL** The length (ULONG) of the attribute description from the beginning of LL to the end of Data.

**X'1113'** The value (code point) indicating that the following data is the last access date of the file.

**Data** Date and time data, rounded down to the even second. See “DATE (Date and Time)” on page 369 for the format of date and time data.

## LSTARCDT (Last Archived Date)—DFM Only

**Purpose** The last archive date is the date on which the file was last archived by the target system.

**Code Point** The code point of this term is X'118A'.

**Structure**

| | | |
|---|---|---|
| LL | X'118A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the attribute description from the beginning of LL to the end of Data.

**X'118A'** The value (code point) indicating that the following data is the last archive date of the file.

**Data** Date and time data, rounded down to the even second. See “DATE (Date and Time)” on page 369 for the format of date and time data.

## MAXARNB (Maximum Active Record Number)

**Purpose** The maximum active record number is the highest record number at which an active record is stored in a file.

**Code Point** The code point of this term is X'1159'.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'1159' | RecordNumber |

**Field** **Description**

**X'0000000A'** The length (ULONG) of the attribute reply data.

**X'1159'** The value (code point) indicating that the following data is the maximum active record number.

**RecordNumber** The ULONG maximum active record number.

## MAXOPN (Maximum Number of Files Opened)

**Purpose** Specifies the maximum number of times the same file can be opened concurrently by the same agent.

**Code Point** The code point of this term is X'1157'.

**Structure**

| | | |
|---|---|---|
| X'00000008' | X'1157' | MaxNumOpn |

| Field | Description |
|---|---|
| **X'00000008'** | The length (ULONG) of the reply message object (for OPNMAXRM). |
| **X'1157'** | The value (code point) indicating that the following data is the MAXOPN object. |
| **MaxNumOpn** | The maximum number (USHORT) of concurrent opens allowed. |

## MGMCLSNM (Management Class Name)

**Purpose** Specifies the name of the management class that applies to a file or directory. The format of a management class is unarchitected. A management class specifies the target system policies related to when and how often the file or directory is to be backed up, saved, or archived.

**Code Point** The code point for this parameter is X'1140'.

**Structure**

| | | |
|---|---|---|
| LL | X'1140' | Name |

| Field | Description |
|---|---|
| **LL** | The length (ULONG) of the data description from the beginning of LL to the end of name. |
| **X'1140'** | The value (code point) indicating that the following is a management class name. |
| **Name** | Character string up to 16 bytes. |

## MODCP (File Modify Capability)

**Purpose** Specifies whether the contents of a file can be modified by a DDMModifyRec or DDMTruncFile function.

If the file is not modify-capable, a DDMModifyRec or DDMTruncFile function is rejected with an INVRQSRM reply message.

**Code Point** The code point for this parameter is X'1166'.

**Structure**

| | | |
|---|---|---|
| X'00000007' | X'1166' | Status |

| **Field** | **Description** |
|---|---|
| **X'00000007'** | The length (ULONG) of the data description from the beginning of this length field to the end of Status. |
| **X'1166'** | The value (code point) indicating that the following data is the file modify capability. |
| **Status** | The 1-byte status of MODCP.<br>**X'F1'** Denotes TRUE.<br>**X'F0'** Denotes FALSE. |

## NEWFILNM (New File Name)

**Purpose** Specifies the new name to be assigned to a file that was invalid.

The names of files in the VSAM APIs are unarchitected strings of characters with no semantic meaning. A VSAM API assumes that a name provided by the user to the source DDM server is in the format required by the target system data manager for creating or locating the file. The name string can contain qualifiers for libraries, catalogs, members, instances, or other levels of identification for the file.

**Code Point** The code point of this parameter is X'114F'.

**Structure**

| | | |
|---|---|---|
| LL | X'114F' | NewFilNam |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the reply message object for NEWNAMRM (Invalid New File Name) reply message from the beginning of this length field to the end of NewFilNam. |
| **X'114F'** | The value (code point) indicating that the following data is the new file name object. |
| **NewFilNam** | The name of the new file. The maximum file length is determined by the underlying file system. |

## RECAL (Record Attribute List)

**Purpose** Specifies a list of attributes of a record as an ordered collection.

A Record Attribute List is used when transmitting more than one attribute of the record (for example, record number or key value and the record itself) as a single unit.

The RECCNT parameter is used to indicate the number of duplicate records.

The elements of a RECAL must be specified in the order in which they are listed in the format of this parameter. If an optional parameter is not included, the order of the remaining variables must be maintained.

If RECNBR and RECCNT are both specified, the record number specified by RECNBR applies to the first occurrence of the record, and each subsequent record has a record number of 1 greater than the previous record.

**Note:** The returned Record Attribute List structure is contiguous.

**Code Point** The code point for this parameter is X'1430'.

**Structure**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| LL | X'1430' | L1 | X'111A' | RC | L2 | X'111D' | RN |

| | | | | | |
|---|---|---|---|---|---|
| L3 | X'1115' | KEY | L4 | CP | Data |

**Field** **Description**

**LL** The length (ULONG) of the record attribute list from the beginning of LL to the end of Data. This field is not checked.

**X'1430'** The value (code point) indicating that the following data is a RECAL.

**L1** The length (ULONG) from the beginning of L1 to the end of RC. This field is not checked.

**X'111A'** The value (code point) indicating that the following data is a record count. The RECCNT parameter is used to indicate the number of duplicate records. RECCNT provides a shorthand way of specifying N records, where N>1, and not replicating the record's contents.

**RC** The number (ULONG) of duplicate records in the RECAL (RECCNT).

**L2** The length (ULONG) from the beginning of L2 to the end of RN. This field is not checked.

**X'111D'** The value (code point) indicating that the following data is a record number.

**RN** The record number (ULONG) of the record in the RECAL (RECNBR).

**L3** The length (ULONG) from the beginning of L3 to the end of the key value.

**X'1115'** The value (code point) indicating that the following data is a key value.

**KEY** The record key value (KEYVAL).

**L4** The length (ULONG) from the beginning of L4 to the end of Data.

**CP** The value (code point) indicating that the following is either record data or an inactive record length.

> **X'144A'** Indicates that the following data is record data (RECORD).
>
> **X'142D'** Indicates that the following data is a ULONG of an inactive record (RECINA).

**Data** The record data or the length (ULONG) of the inactive record.

## RECCNT (Record Count)

**Purpose** Specifies the number of records:

- Loaded by a DDMLoadFile*xxxx* function.
- Unloaded by a DDMUnLoadFile*xxxx* function.
- Initialized when creating a record-oriented file with the DFTRECOP parameter specified on the DDMCreateRecFile function.
- Retrieved by a DDMSET*xxx* function.

When specified in a reply message, RECCNT specifies the number of records successfully inserted in a file by an DDMInsertRec*xxx* function with a Record Count parameter value greater than 1 or by a DDMLoadFile*xxxx* function.

When used with a RECAL, RECCNT specifies the number of times the contents of the record attribute list is repeated. This provides an efficient way to send multiple copies of the same records.

**Code Point** The code point for this parameter is X'111A'.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'111A' | Count |

**Field** **Description**

**X'0000000A'** The length (ULONG) of the data description from the beginning of this length field to the end of Count.

**X'111A'** The value (code point) indicating the following data is the record count.

**Count** The number of records successfully returned or inserted:

- The value in count is specified in a ULONG.
- Minimum value is 0.

## RECINA (Inactive Record)

**Purpose** Represents file record positions at which a record has never been inserted or at which a previously active record has been deleted. The data value of an inactive record is the required length of any record to be inserted at the record position.

**Code Point** The code point of this term is X'142D'.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'142D' | Data |

**Field** **Description**

**X'0000000A'** The length (ULONG) of the data description from the beginning of this length field to the end of Data.

**X'142D'** The value (code point) indicating that the following data is the inactive record length.

**Data** The required length of any record to be inserted at the record position. The value of an inactive record is specified in a ULONG.

If the special value of -1 is present, this variable-length record has not had a previous value and it can store any length record up to the maximum allowed by the file.

## RECLEN (Record Length)

**Purpose** The length of the user data in all of the records in files of fixed-length records.

The maximum length of the user data in the records in files of variable-length records or initially-variable-length records.

**Code Point** The code point of this term is X'111C'.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'111C' | Data |

| **Field** | **Description** |
|---|---|
| **X'0000000A'** | The length (ULONG) of the attribute description from the beginning of this length field to the end of Data. |
| **X'111C'** | The value (code point) indicating that the following data is the record length. |
| **Data** | The record length:<br>• The value of Data is specified in a ULONG.<br>• Minimum value is 1.<br>• Maximum value is 64,000. |

## RECLENCL (Record Length Class)

**Purpose** Specifies the type of record length that records in a file can have.

If a record length class that is not supported is specified, the record length class can be promoted to a record class that is supported. The record length class cannot be demoted. The promotion scheme for record length classes is:

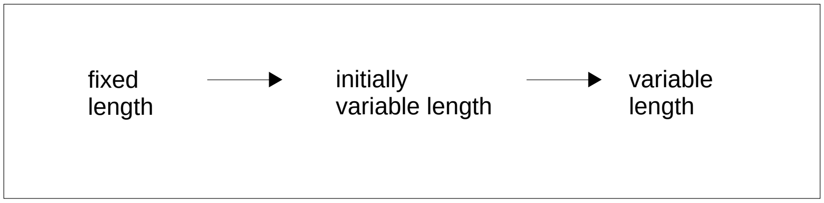


*Figure 83. Record Length Class Promotion*

**Code Point** The code point of this term is X'1142'.

**Structure**

| | | |
|---|---|---|
| X'00000008' | X'1142' | RLC |

**Field** **Description**

**X'0000008'** The length (ULONG) of the attribute description from the beginning of this length field to the end of record length class (RLC).

**X'1142'** The value (code point) indicating that the following is a record length class.

**RLC** A value (code point) specifying the record length class. Valid code points are:

| Code Point | Description |
|---|---|
| **X'142E'** | Fixed-length record (This is the default value.) |
| **X'142F'** | Initially-variable-length record |
| **X'1431'** | Variable-length record |

## RECNBR (Record Number)

**Purpose** A record number identifies a record at a specific position of the file. Record positions are numbered starting with 1.

**Code Point** The code point of this term is X'111D'.

**Structure**

| | | |
|---|---|---|
| X'0000000A' | X'111D' | RecordNumber |

**Field** **Description**

**X'0000000A'** The length (ULONG) of the data description from the start of length field to the end of RecordNumber.

**X'111D'** The value (code point) indicating that the following data is a record number.

**RecordNumber** The record number that is being returned:

- The value is specified in a ULONG.
- Minimum value is 1.
- The maximum value is target system dependent.
- The value of X'FFFFFFFF' means the actual record number is not known.

## RECORD (Record)

**Purpose** Records are the basic unit of data stored in a record-oriented file. They are the basic unit of transfer between requesters and files. A record consists of a record header followed by the record data. This type of record object is also known as an active record.

**Code Point** The code point of this parameter is X'144A'.

**Structure**

| | | |
|---|---|---|
| LL | X'144A' | Data |

**Field** **Description**

**LL** The length (ULONG) of the data description from the beginning of LL to the end of Data.

**X'144A'** The value (code point) indicating that the following is record data.

**Data** Encoded information.

## RTNCLS (File Retention Class)

**Purpose** Specifies the file retention as temporary or permanent.

**Code Point** The code point for this parameter is X'1148'.

**Structure**

| | | |
|---|---|---|
| X'00000008' | X'1148' | Data |

**Field** **Description**

**X'00000008'** The length (ULONG) of the data description from the beginning of this length field to the end of Data.

**X'1148'** The value (code point) indicating that the following data is the file retention class.

**Data** A value (code point) specifying the retention class:

**X'143E'** A temporary file.
**X'142A'** A permanent file.

## SRVDGN (Server Diagnostic Information)

**Purpose** Specifies diagnostic information in reply messages that is defined by the responding server. This information can be logged or otherwise used to support problem determination. The contents of this parameter are unarchitected. A maximum of 255 bytes can be sent, but only a server-determined minimum amount of information should be returned.

**Code Point** The code point for this parameter is X'1153'.

**Structure**

|  |  |  |
|---|---|---|
| LL | X'1153' | Data |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of this data description from the beginning of LL to the end of Data. |
| **X'1153'** | The value (code point) indicating that the following is server diagnostic information. |
| **Data** | The diagnostic information. This data is in the format of the server system that generated the reply message. |

## STGCLSNM (Storage Class Name)

**Purpose** Specifies the name of a storage class that applies to a file or directory. The format of a storage class is unarchitected. A storage class specifies the target system policies related to the types and speeds of the storage devices that the file or directory can be allocated to.

**Code Point** The code point for this parameter is X'1141'.

**Structure**

|  |  |  |
|---|---|---|
| LL | X'1141' | Name |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of the data description from the beginning of LL to the end of name. |
| **X'1141'** | The value (code point) indicating that the following is a storage class name. |
| **Name** | Character string up to 16 bytes. |

## SVRCOD (Severity Code)

**Purpose**

Indicates the severity of a condition detected during the execution of a function.

In addition to being in the reply message data, the value is returned in the EAX register after every function.

**Code Point**

The code point of this term is X'1149'.

**Structure**

| | | |
|---|---|---|
| X'00000008' | X'1149' | Severity |

**Field** — **Description**

**X'00000008'**
The length (ULONG) of this data description from the beginning of this length field to the end of Severity.

**X'1149'**
The value (code point) indicating the following is the severity class.

**Severity**
A ULONG value specifying the severity code.

**X'0000'** **SC_NO_ERROR (Information Only Severity Code)**

Specifies that a reply message contains information only and does not describe any problem condition.

**X'0004'** **SC_WARNING (Warning Severity Code)**

Specifies that a reply message constitutes the warning of a potential problem in the processing of a request.

Further processing of a function depends on the specifications of the specific function, the error condition, and the environment in which it is being executed.

**X'0008'** **SC_ERROR (Error Severity Code)**

Specifies that an error condition was detected in the processing of a function. All effects of the condition have been reversed or prevented. For example, any effects on cursor positioning or locks obtained or released have been reversed.

Further processing of a function depends on the architected specifications of that function, the error condition, and the environment in which it is being executed. For example, a FILE NOT FOUND error always causes a function to be terminated, but a DUPLICATE FILE error terminates processing of a DDMCreateRecFile function only if specified by the duplicate file option parameter.

**X'0010'** **SC_SEVERE (Severe Error Severity Code)**

Specifies that a severe error has occurred during the execution of the function. It was not possible to prevent or reverse all changes to objects affected by the function. For example, record locks or cursor position may have been lost.

It is possible to send further functions to the affected objects.

**X'0020'** **SC_ACCESSDAMAGE (Access Damage Severity Code)**

Specifies that damage has occurred to the target agent's ability to access a file as it is currently opened. It is not possible to make further use of that access path, but it may be possible to access other opened files or other objects.

To recover from access damage, it is necessary to close and reopen the file.

**X'0040'** **SC_PERMDAMAGE (Permanent Damage Severity Code)**

Specifies that damage has occurred to the state or value of permanent objects of the server. Recovery from permanent damage may require special action that cannot be called through DDM functions; for example, loading a backup file.

Further processing of the function depends on the architected specifications of that request, the permanent damage condition, and the environment in which it is being executed. For example, it may be possible to continue processing with other undamaged resources.

**X'0080'** **SC_SESSIONDAMAGE (Session Damage Severity Code)**

Specifies that damage has occurred to the target server's ability to continue the communication session. It is not possible to make further use of the current session, but it may be possible to use other available communication sessions.

To recover from session damage, it is necessary to terminate the current session and establish a new session.

## SYNERRCD (Syntax Error Code)

**Purpose** Specifies the condition that caused termination of data stream parsing. The following code points might be returned:

| | |
|---|---|
| **X'01'** | Data Stream Structure (DSS) header length less than or equal to 6. |
| **X'02'** | DSS header length does not match the number of bytes of data found. |
| **X'03'** | DSS header C-byte not X'D0'. |
| **X'04'** | DSS header f-bytes not recognized or not supported. |
| **X'05'** | DSS continuation specified but not found. |
| **X'06'** | DSS chaining specified but no DSS found. |
| **X'07'** | Object length less than 4. |
| **X'08'** | Object length does not match the number of bytes of data found. |
| **X'09'** | Object length greater than maximum allowed. |
| **X'0A'** | Object length less than minimum required. |
| **X'0B'** | Object length not allowed (for example, if a value must be a multiple of 1 word long but an odd number of bytes is sent). |
| **X'0C'** | Incorrect large object length field (see DSS). |
| **X'0D'** | Object code point index not supported. |
| **X'0E'** | Required object not found. |
| **X'0F'** | Too many function data objects sent. |
| **X'10'** | Mutually exclusive objects present. |
| **X'11'** | Too few function data objects sent. |

**X'12'** Duplicate object present.
**X'13'** Invalid request correlator specified.
**X'14'** Required value not found.
**X'15'** Reserved value not allowed.
**X'16'** DSS continuation less than or equal to 2.
**X'17'** Objects not in required order.
**X'18'** DSS chaining bit not b'1' but DSSFMT bit3 set to b'1'.
**X'19'** Previous DSS indicated current DSS has the same request correlator but the request correlators are not the same.
**X'1A'** DSS chaining bit not b'1' but error continuation requested.
**X'1B'** Mutually exclusive parameter values specified.
**X'1D'** Code point is not a valid function.

**Code Point** The code point of this term is X'114A'.

**Structure**

| | | |
|---|---|---|
| X'0007' | X'114A' | Byte |

| **Field** | **Description** |
|---|---|
| **X'0007'** | The length (ULONG) of the reply message object (from the start of this length field to the end of Byte). |
| **X'114A'** | The value (code point) for the syntax error code object. |
| **Byte** | The syntax error code as listed above (1-byte). |

## TITLE (A Brief Description)

**Purpose** A brief description of the file stored in EAs.

**Code Point** The code point of this parameter is X'0045'.

**Structure**

| | | |
|---|---|---|
| LL | X'0045' | Title |

| **Field** | **Description** |
|---|---|
| **LL** | The length (ULONG) of this data description from the beginning of this length field to Title. |
| **X'0045'** | The value (code point) indicating the following is the title. |
| **Title** | Character string up to 255 bytes. |

# Chapter 5. VSAM API Flags

This chapter provides information about each bit flag in each of the ULONG parameters: AccessFlags and CreateFlags.

Each flag parameter section provides three basic kinds of information about bits:

1. A description of what the flag parameter does
2. An overview of all ULONG bit masks associated with the flag parameter
3. A detailed description of each bit associated with the flag parameter, which includes:
   - A brief explanation of each bit
   - The bit number
   - Bit values.

The bit flags may be set individually or in appropriate combinations by using the bitwise inclusive OR operator (|).

Throughout this publication, these bits are referred to by their bit mask names as defined in DUBCALLS.H.

For more detailed information on each of these bits, see the individual bit names. The individual bit names in the following section are arranged in bit number order.

Bit value:

TRUE, set to 1, ON, or B'1', all have the same meaning.

FALSE, set to 0, OFF, and B'0', all have the same meaning.

## AccessFlags (Access Flags)

**Purpose** Access Flags specify the action to be taken depending on whether the bit flag is set. Not all of the flags are valid on all functions. Flags that are not valid on a particular function are marked as reserved when describing that function. Reserved bits must be set to zero (B'0') or an invalid parameter error occurs.

**Bit Mask Names and Descriptions**

The total list of bit flags is:

| **Bit Mask Name** | **Description** |
|---|---|
| **Reserved** | (Bits 12–31) |
| **DDM_HLDUPD** | Hold Update Intent (Bit 11) |
| **DDM_UPDCSR** | Update Cursor (Bit 10) |
| **DDM_INHMODKY** | Inhibit Modified Key (Bit 9) |
| **DDM_ALWINA** | Allow Cursor on Inactive Record (Bit 8) |
| **DDM_HLDCSR** | Hold Cursor Position (Bit 7) |
| **DDM_BYPDMG** | Bypass Damaged Record (Bit 6) |

| | |
|---|---|
| **DDM_NODATA** | No Record Data Returned (Bit 5) |
| **DDM_ALLREC** | All Records, Active and Inactive (Bit 4) |
| **DDM_RTNINA** | Return Inactive Record (Bit 3) |
| **DDM_KEYVALFB** | Key Value Feedback (Bit 2) |
| **DDM_RECNBRFB** | Record Number Feedback (Bit 1) |
| **DDM_UPDINT** | Update Intent (Bit 0) |

## DDM_HLDUPD (Hold Update Intent)

**Purpose** Specifies whether the currently held update intent and record lock, if any, should be released.

**Bit number** Bit 11 of the AccessFlags word.

**Bit value** A bit value of TRUE indicates that the update intent should not be released.

A bit value of FALSE indicates that the update intent is released. In this case, systems that cannot hold locks on two records can reject the function with a VALNSPRM reply message.

## DDM_UPDCSR (Update Cursor)

**Purpose** Specifies whether the cursor is to be updated to point to the record inserted in the file by the function.

When multiple records are being inserted in a file, the cursor points to the last record inserted when DDM_UPDCSR is set.

**Bit number** Bit 10 of the AccessFlags word.

**Bit value** A bit value of TRUE allows the cursor to be updated.

A bit value of FALSE does not allow the cursor to be updated.

## DDM_INHMODKY (Inhibit Modified Keys)

**Purpose** Specifies whether the key value of an existing record can be modified by the DDMModifyRec function.

The inhibit modified keys bit is only effective when the file is opened with the RELKEYAM, RNDKEYAM, CMBKEYAM, or CMBACCAM access methods. This bit is ignored if the file is opened with any other access method.

**Bit number** Bit 9 of the AccessFlags word.

**Bit value** A bit value of FALSE permits key fields to be modified if the file permits key fields to be modified.

A bit value of TRUE indicates that key fields cannot be modified. An attempt to modify a key field results in the DDMModifyRec function being rejected with a KEYUSIRM reply message.

## DDM_ALWINA (Allow Cursor to Be Set to Inactive Record)

**Purpose**
Specifies whether the cursor can be set to point to an inactive record or whether the DDMSetUpdateNum function can set an update intent on an inactive record.

**Bit number**
Bit 8 of the AccessFlags word.

**Bit value**
A bit value of TRUE allows the cursor to point to an inactive record and specifies that the DDMSetUpdateNum function can set an update intent on an inactive record.

A bit value of FALSE specifies that the cursor is not allowed to point to an inactive record and that the DDMSetUpdateNum function is *not* allowed to set an update intent on an inactive record.

## DDM_HLDCSR (Hold Cursor Position)

**Purpose**
Causes the hold cursor indicator to be set ON or OFF for the cursor. The hold cursor indicator is used by the following functions to determine whether the cursor should be moved to the next record or remain at the current record position:

| Function | Described on page: |
|---|---|
| DDMSetKey | 161 |
| DDMSetKeyFirst | 179 |
| DDMSetKeyLast | 188 |
| DDMSetKeyNext | 204 |
| DDMSetKeyPrevious | 222 |
| DDMSetLast | 235 |
| DDMSetMinus | 245 |
| DDMSetNextKeyEqual | 255 |
| DDMSetNextRec | 271 |
| DDMSetPlus | 293 |
| DDMSetPrevious | 303 |
| DDMSetRecNum | 316 |

**Bit number**
Bit 7 of the AccessFlags word.

**Bit value**
A bit value of TRUE means that the hold cursor indicator in the cursor is set on. If the hold cursor indicator is already on, it remains on.

A bit value of FALSE means that the hold cursor indicator in the cursor is set off. If the hold cursor indicator is already off, it remains off.

## DDM_BYPDMG (Bypass Damaged Records)

**Purpose**
The bypass damaged records bit specifies whether processing is to continue if damaged records are detected for the DDMSetKeyNext, DDMSetNextRec, and DDMUnLoadFile*xxxx* functions.

**Bit number**
Bit 6 of the AccessFlags word.

**Bit value** A bit value of TRUE bypasses damaged records.

A bit value of FALSE does not bypass damaged records.

## DDM_NODATA (No Record Data Returned)

**Purpose** Indicates whether the record, where the cursor is set, is to be returned.

**Bit number** Bit 5 of the AccessFlags word.

**Bit value** A bit value of TRUE indicates that the record, where the cursor is set, is not to be returned.

A bit value of FALSE indicates that the record, where the cursor is set, is to be returned. This is the default value.

## DDM_ALLREC (All Records, Active and Inactive)

**Purpose** Specifies whether inactive records are to be bypassed when using one of the DDMSet*xxx* functions to set the cursor.

**Bit number** Bit 4 of the AccessFlags word.

**Bit value** A bit value of TRUE does not bypass inactive records.

A bit value of FALSE bypasses inactive records.

## DDM_RTNINA (Return Inactive Record)

**Purpose** Specifies whether an inactive record can be returned if the cursor is set to an inactive record and the record selected by the cursor is to be returned.

**Bit number** Bit 3 of the AccessFlags word.

**Bit value** A bit value of TRUE indicates that an inactive record can be returned.

A bit value of FALSE indicates that an inactive record cannot be returned. This is the default value.

## DDM_KEYVALFB (Key Value Feedback)

**Purpose** Specifies whether the key value of the record is to be returned to the requester. If the record is inactive, a null key value (length = 4) is returned.

The local VSAM file system ignores this parameter when the file is opened with the RELRNBAM, RNDRNBAM, or CMBRNBAM access method or the file is not keyed.

**Bit number** Bit 2 of the AccessFlags word.

**Bit value** A bit value of TRUE indicates the key value of the record is returned.

A bit value of FALSE indicates the key value of the record is not returned.

## DDM_RECNBRFB (Record Number Feedback)

**Purpose**

Specifies whether the record number of the record is to be returned to the requester.

**Bit number**

Bit 1 of the AccessFlags word.

**Bit value**

A bit value of TRUE indicates the record number is returned.

A bit value of FALSE indicates the record number is not returned.

## DDM_UPDINT (Update Intent)

**Purpose**

Allows a requester to indicate that the user intends to modify the record. This can be specified when the cursor is moved to the record (DDMSet*xxx*) or when the record at the current cursor position is read (DDMGetRec). An update intent must be placed on a record before a DDMModifyRec or DDMDeleteRec function can be performed for the record. An update intent can also be placed on a record by the DDMSetUpdateKey and DDMSetUpdateNum functions.

Update intent is necessary so that a requester can perform operations on a record without interference from concurrent users. For information about the interaction of update intent and sharing and locking files, see “Record Locking (Implementation is Dependent on the Server)” on page 25.

The update intent for the record lasts until one of the following occurs:

- The record is modified (DDMModifyRec).
- The record is deleted (DDMDeleteRec).
- The cursor is moved to a different record. All cursor movement DDMSet*xxx* functions are considered to have moved the cursor even if the result of normal completion of the DDMSet*xxx* function leaves the cursor position the same as before the DDMSet*xxx* function was called.
- A DDMInsertRecNum, DDMSetUpdateKey, or DDMSetUpdateNum function for a different record is issued.
- A DDMInsertRecEOF or DDMInsertRecKey function with DDM_HLDUPD (FALSE) specified for a different record is issued.
- A DDMUnLockRec function is issued.
- A DDMGetRec function with update intent is issued.
- The file is closed.

Once the update intent for a record is removed, a new update intent must be placed on the record before a DDMModifyRec or DDMDeleteRec function can be performed for the record. Two consecutively issued DDMModifyRec functions result in the rejection of the second DDMModifyRec function with UPDINTRM because the first DDMModifyRec function removed the update intent for the record.

**Bit number**
Bit 0 of the AccessFlags word.

**Bit value**
A bit value of 1 (TRUE) indicates that the requester intends to modify or delete the record and, therefore, an update intent is to be placed on the record. If the file was opened for multiple modifications, an implicit (exclusive access) lock is placed on the record. Record locking is dependent on the remote server. See the appropriate documentation.

For the local VSAM file system, record locks apply only to OS/2 local VSAM files on the client OS/2 workstation.

A bit value of 0 (FALSE) indicates that the requester does not intend to modify or delete the record.

## CopyFlags (Copy Flags)

**Purpose**
Copy Flags specify the action to be taken depending on whether the bit flag is set. Not all of the flags are valid on all functions. Flags that are not valid on a particular function are marked as reserved when describing that function. Reserved bits must be set to zero (B'0') or an invalid parameter error occurs.

**Bit Names and Descriptions**
The total list of bit flags is:

| Bit Name | Description |
|---|---|
| **Reserved** | (bits 13-31) |
| **DDM_ACCORD** | Access Order (Key versus record order processing) (bit 12) |
| **Reserved** | (bits 7-11) |
| **DDM_BYPDMG** | Bypass Damaged Records (bit 6) |
| **Reserved** | (bit 5) |
| **DDM_BYPINA** | Bypass Inactive Records (Not applicable to direct files) (bit 4) |
| **Reserved** | (bits 0-3) |

Throughout this document, these bits are referred to by name.

For more detailed information on each of these bits, see the individual bit names. The individual bit names in the following section are arranged in bit number order.

**Bit value** An individual bit is referred to as TRUE, set to 1, ON, or B'1', all of which have the same meaning.

An individual bit can also be referred to as FALSE, set to 0, OFF, and B'0', all of which have the same meaning.

## DDM_BYPINA (Bypass Inactive Records)

**Purpose** Specifies whether inactive records are to be bypassed.

**Bit number** Bit 4 of the CopyFlags word.

**Bit value** A bit value of TRUE indicates inactive records are to be bypassed.

A bit value of FALSE indicates inactive records are not to be bypassed.

## DDM_BYPDMG (Bypass Damaged Records)

**Purpose** Specifies whether damaged records are to be bypassed.

**Bit number** Bit 6 of the CopyFlags word.

**Bit value** A bit value of TRUE indicates damaged records are to be bypassed and that processing continues when the data record is damaged.

A bit value of FALSE indicates damaged records are not to be bypassed and that processing does not continue when a data record is damaged.

## DDM_ACCORD (Access Order)

**Purpose** Specifies the order in which the records of the file are processed.

**Bit number** Bit 12 of the CopyFlags word.

**Bit value** A bit value of TRUE specifies key order processing.

A bit value of FALSE specifies record number order processing.

# CreateFlags (Create Flags)

**Purpose** Create Flags specify the action to be taken depending on whether the bit flag is set. Not all of the flags are valid on all functions. Those flags not valid on a particular function are marked as reserved in the section describing that function. Reserved bits must be set to 0 (B'0') or an invalid parameter error occurs.

**Bit Mask Names and Descriptions**

The total list of bit flags is:

| Bit Mask Name | Description |
|---|---|
| **Reserved** | (Bits 10–31) |
| **DDM_FILPRT** | Specifies Protected File (Bit 9) |
| **DDM_FILSYS** | Specifies System File (Bit 8) |

| | |
|---|---|
| **DDM_FILHDD** | Specifies Hidden File (Bit 7) |
| **DDM_MODCP** | Allows Modify Record Capability (Bit 6) |
| **DDM_INSCP** | Allows Insert Record Capability (Bit 5) |
| **DDM_GETCP** | Allows Get Record Capability (Bit 4) |
| **DDM_INIEX** | Inhibit Initial Extent (Bit 3) |
| **DDM_DELCP** | Allows Record Deletion (Bit 2) |
| **DDM_TMPFIL** | Temporary File (Bit 1) |
| **DDM_ALDUPKEY** | Allows Duplicate Keys (Bit 0) |

## DDM_FILPRT (Protected File)

**Purpose**

Specifies whether the file is protected. A protected file is protected from the DDMDelete function.

If the DDMDelete function is attempted against a protected file, the function is rejected with an INVRQSRM reply message.

A protected file does not prevent a file from being opened with access intents of MODAI, DELAI, or INSAI. Nor does a protected file prevent DDMModifyRec, DDMDeleteRec, or DDMInsertRec*xxx* functions from being performed. These functions are controlled by the file capabilities attributes: DDM_MODCP, DDM_DELCP, and DDM_INSCP.

**Bit number**

Bit 9 of the CreateFlags word.

**Bit value**

A value of TRUE indicates that the file is protected from file management functions that would change the entire contents of the file.

A value of FALSE indicates that the file is not protected from file management functions that would change the entire contents of the file. This is the default value.

## DDM_FILSYS (System File)

**Purpose**

DDM_FILSYS(TRUE) indicates that the file was created with the FILE_SYSTEM attribute. A system file is the same as a non-system file in all respects except for the processing done during a directory search or scan in which the FILE_SYSTEM attribute is used to determine whether a file or subdirectory should be considered a match.

**Bit number**

Bit 8 of the CreateFlags word.

**Bit value**

A value of TRUE indicates that the file was created with the FILE_SYSTEM attribute.

A value of FALSE indicates that the file was not created with the FILE_SYSTEM attribute.

## DDM_FILHDD (Hidden File)

**Purpose** DDM_FILHDD(TRUE) indicates that the file was created with the FILE_HIDDEN attribute. A hidden file is the same as a non-hidden file in all respects except for the processing done during a directory search or scan in which the FILE_HIDDEN attribute is used to determine whether a file or subdirectory should be considered a match.

**Bit number** Bit 7 of the CreateFlags word.

**Bit value** A value of TRUE indicates that the file is hidden.

A value of FALSE indicates that the file is not hidden.

## DDM_MODCP (Allow Modify Record Capability)

**Purpose** The allow modify record capability bit specifies whether the data records of a file can be modified by a DDMModifyRec or DDMTruncFile function. If the file is not modify-capable, a DDMModifyRec function is rejected with an INVRQSRM reply message.

**Bit number** Bit 6 of the CreateFlags word.

**Bit value** A value of TRUE indicates that the data records of a file can be modified.

A value of FALSE indicates that the data records of a file cannot be modified and that requests to modify the file are rejected.

## DDM_INSCP (Allow Insert Record Capability)

**Purpose** The allow insert record capability bit specifies whether the data records can be inserted into the file by either:

DDMInsertRec*xxx*, or
DDMLoadFile*xxx*

If the file is not insert-capable these functions are rejected with an INVRQSRM reply message.

**Bit number** Bit 5 of the CreateFlags word.

**Bit value** A value of TRUE indicates that data records can be inserted into the file.

A value of FALSE indicates that data records cannot be inserted into the file and that the request is rejected.

## DDM_GETCP (Allow Get Record Capability)

**Purpose** The get record capability bit specifies whether the contents of a file can be read by either:

DDMGetRec,
DDMSet*xxx* with DDM_NODATA(FALSE), or
DDMUnloadFile*xxx.*

If the file is not get-capable, these functions are rejected with an INVRQSRM reply message.

**Bit number** Bit 4 of the CreateFlags word.

**Bit value** A value of TRUE indicates that the contents of a file can be read by the requester.

A value of FALSE indicates that the contents of a file cannot be read by the requester and the request is rejected.

## DDM_INIEX (Inhibit Initial Extent)

**Purpose** Specifies whether storage is to be allocated for the initial extent of a file when the file is created.

**Bit number** Bit 3 of the CreateFlags word.

**Bit value** A bit value of TRUE indicates that storage is not allocated for the initial extent of the file when the file is created.

A bit value of FALSE indicates that storage is allocated for the initial extent of the file when the file is created.

## DDM_DELCP (Allow Record Deletion)

**Purpose** Specifies whether records may be deleted from the file being created.

**Bit number** Bit 2 of the CreateFlags word.

**Bit value** A bit value of TRUE indicates that records may be deleted from the file.

A bit value of FALSE indicates that records may not be deleted from the file.

## DDM_TMPFIL (Temporary File)

**Purpose** Specifies whether the file being created is a permanent or temporary file.

**Bit number** Bit 1 of the CreateFlags word.

**Bit value** A bit value of TRUE indicates that the file being created is a *temporary* file. A temporary file only exists until:

1. The file is deleted.
2. Communications with the target are terminated.

Temporary files operate exactly like permanent files while they exist.

A bit value of FALSE indicates that the file being created is a permanent file. A permanent file exists until it is explicitly deleted. Termination of communications does *not* affect the existence of a permanent file.

## DDM_ALDUPKEY (Allow Duplicate Keys)

**Purpose**
specifies whether duplicate keys are allowed for a file at the time the file is created.

**Bit number**
Bit 0 in the Create Flags word.

**Bit value**
A bit value of TRUE indicates that duplicate keys are allowed for the file being created.

A bit value of FALSE indicates that duplicate keys are not allowed.

# Chapter 6. VSAM API Reply Messages

This chapter provides detailed information about reply messages. Each reply message is accompanied by a brief explanation of the message, its code point, and its structure, which is defined by parameters.

For information about the parameters returned by the reply messages, see Chapter 4, "VSAM API Common Parameters" on page 363.

## Reply Message Interface

A reply message is returned to the sender of a function to provide the sender with information about some condition that occurred during the processing of the function. A single function can generate several reply messages.

When a VSAM API function returns a non-zero return code, a DDMGetReplyMessage function should be issued immediately to obtain the reply messages. The Reply Message queue for a thread is cleared every time a new VSAM API function is issued. Therefore, the DDMGetReplyMessage must be issued before making any other VSAM API function call under this thread to avoid losing the reply messages corresponding to the function that returned the non-zero code.

All reply messages contain a severity code parameter that characterizes the severity of the condition reported. In addition, each reply message may define specific additional parameters to be returned with the message.

## Reply Message Structure

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LL | CP | LL | CP | DATA | LL | CP | DATA | LL | CP | DATA |

The first length field (4 bytes) indicates the total length of the reply message, and the first code point (2 bytes) is the code point of the reply message which follows.

Subsequent length fields (4 bytes) are for the objects contained in the reply message. The code point words (2 bytes) indicate what data follows.

All length fields represent the length of the data, the code point, and the length field itself.

For information on how to get access to the reply message, see the "DDMGetReplyMessage (Get Reply Message)" on page 83.

Each reply message has a list of the data that may accompany it. Each data item is tagged with one of two possible return conditions:

- Distributed FileManager returns this information.
- The target server decides whether this information is returned.

# Reply Messages

The DDM server is responsible for translating file system exceptions to the DDM-architected reply messages as described in this chapter.

If there is no reply message to which the condition can be translated, the DDM server replies with a CMDCHKRM reply message, which might contain the file system return code.

Mixed-case file names might be converted to upper-case file names. Therefore, any reply messages that contain a filename may not reflect the case that was used as input to the API.

## Reply Messages

These VSAM API reply messages are returned by the local VSAM file system. There might be other reply messages returned by other DDM server implementations. See the documentation for your DDM server.

The VSAM reply messages are listed alphabetically in the following table:

*Table 26 (Page 1 of 2). VSAM Reply Messages Listed Alphabetically*

| Message ID | Code Point | Message Title |
|---|---|---|
| ACCATHRM | X'1230' | Not Authorized to Use Access Method |
| ACCINTRM | X'1266' | Access Intent List Error |
| ACCMTHRM | X'1231' | Invalid Access Method |
| ADDRRM | X'F212' | Address Error |
| AGNPRMRM | X'1232' | Permanent Agent Error |
| BASNAMRM | X'1234' | Invalid Base File Name |
| CLSDMGRM | X'125E' | File Closed with Damage |
| CMDCHKRM | X'1254' | Command Check |
| COMMRM | X'F207' | Communications Error |
| CSRNSARM | X'1205' | Cursor Not Selecting a Record Position |
| CVTNFNRM | X'F202' | Conversion Table Not Found |
| DDFNFNRM | X'F201' | Data Description File Not Found |
| DFTRECRM | X'1204' | Default Record Error |
| DRCATHRM | X'1237' | Not Authorized to Directory |
| DRCFULRM | X'1258' | Directory Full |
| DTARECRM | X'1206' | Invalid Data Record |
| DUPFILRM | X'1207' | Duplicate File Name |
| DUPKDIRM | X'1208' | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | Duplicate Key Same Index |
| DUPRNBRM | X'120A' | Duplicate Record Number |
| ENDFILRM | X'120B' | End of File Condition |
| EXSCNDRM | X'123A' | Existing Condition |
| FILATHRM | X'123B' | Not Authorized to File |
| FILDMGRM | X'125A' | File Damaged |
| FILERRRM | X'F216' | File Error |
| FILFULRM | X'120C' | File Is Full |
| FILIUSRM | X'120D' | File In Use |
| FILNAMRM | X'1212' | Invalid File Name |
| FILNFNRM | X'120E' | File Not Found |
| FILSNARM | X'120F' | File Space Not Available |

*Table 26 (Page 2 of 2). VSAM Reply Messages Listed Alphabetically*

| Message ID | Code Point | Message Title |
|---|---|---|
| FILTNARM | X'121E' | File Temporarily Not Available |
| FUNATHRM | X'121C' | Not Authorized to Function |
| FUNNSPRM | X'1250' | Function Not Supported |
| HDLNFNRM | X'1257' | File Handle Not Found |
| INTATHRM | X'125C' | Not Authorized to Open Intent for Named File |
| INVFLGRM | X'F205' | Invalid Flag |
| INVRQSRM | X'123C' | Invalid Request |
| KEYDEFRM | X'123D' | Invalid Key Definition |
| KEYLENRM | X'122D' | Invalid Key Length |
| KEYUDIRM | X'1201' | Key Update Not Allowed by Different Index |
| KEYUSIRM | X'123F' | Key Update Not Allowed by Same Index |
| KEYVALRM | X'1240' | Invalid Key Value |
| LENGTHRM | X'F211' | Field Length Error |
| NEWNAMRM | X'124F' | Invalid New File Name |
| OBJNSPRM | X'1253' | Object Not Supported |
| OPNMAXRM | X'1244' | Concurrent Opens Exceeds Maximum |
| PRCCNVRM | X'1245' | Conversational Protocol Error |
| PRMNSPRM | X'1251' | Parameter Not Supported |
| RECDMGRM | X'1249' | Record Damaged |
| RECINARM | X'1259' | Record Inactive |
| RECIUSRM | X'124A' | Record In Use |
| RECLENRM | X'1215' | Record Length Mismatch |
| RECNAVRM | X'126F' | Record Not Available |
| RECNBRRM | X'1224' | Record Number Out Of Bounds |
| RECNFNRM | X'1225' | Record Not Found |
| RSCLMTRM | X'1233' | Resource Limits Reached on Target System |
| SRCLMTRM | X'F210' | Resource Limits Reached in Source System |
| SYNTAXRM | X'124C' | Data Stream Syntax Error |
| TRGNSPRM | X'125F' | Target Not Supported on Target System |
| UPDCSRRM | X'124D' | Update Cursor Error |
| UPDINTRM | X'124E' | No Update Intent on Record |
| VALNSPRM | X'1252' | Parameter Value Not Supported |
| XLATERM | X'F203' | Translation Error |

The VSAM reply messages are listed in code point order in the following table:

*Table 27 (Page 1 of 2). VSAM Reply Messages Listed in Code Point Order*

| Code Point | Message ID | Message Title |
|---|---|---|
| X'1201' | KEYUDIRM | Key Update Not Allowed by Different Index |
| X'1204' | DFTRECRM | Default Record Error |
| X'1205' | CSRNSARM | Cursor Not Selecting a Record Position |
| X'1206' | DTARECRM | Invalid Data Record |
| X'1207' | DUPFILRM | Duplicate File Name |
| X'1208' | DUPKDIRM | Duplicate Key Different Index |
| X'1209' | DUPKSIRM | Duplicate Key Same Index |
| X'120A' | DUPRNBRM | Duplicate Record Number |
| X'120B' | ENDFILRM | End of File Condition |
| X'120C' | FILFULRM | File Is Full |
| X'120D' | FILIUSRM | File In Use |
| X'120E' | FILNFNRM | File Not Found |

## Reply Messages

*Table 27 (Page 2 of 2). VSAM Reply Messages Listed in Code Point Order*

| Code Point | Message ID | Message Title |
|---|---|---|
| X'120F' | FILSNARM | File Space Not Available |
| X'1212' | FILNAMRM | Invalid File Name |
| X'1215' | RECLENRM | Record Length Mismatch |
| X'121C' | FUNATHRM | Not Authorized to Function |
| X'121E' | FILTNARM | File Temporarily Not Available |
| X'1224' | RECNBRRM | Record Number Out Of Bounds |
| X'1225' | RECNFNRM | Record Not Found |
| X'122D' | KEYLENRM | Invalid Key Length |
| X'1230' | ACCATHRM | Not Authorized to Use Access Method |
| X'1231' | ACCMTHRM | Invalid Access Method |
| X'1232' | AGNPRMRM | Permanent Agent Error |
| X'1233' | RSCLMTRM | Resource Limits Reached on Target System |
| X'1234' | BASNAMRM | Invalid Base File Name |
| X'1237' | DRCATHRM | Not Authorized to Directory |
| X'123A' | EXSCNDRM | Existing Condition |
| X'123B' | FILATHRM | Not Authorized to File |
| X'123C' | INVRQSRM | Invalid Request |
| X'123D' | KEYDEFRM | Invalid Key Definition |
| X'123F' | KEYUSIRM | Key Update Not Allowed by Same Index |
| X'1240' | KEYVALRM | Invalid Key Value |
| X'1244' | OPNMAXRM | Concurrent Opens Exceeds Maximum |
| X'1245' | PRCCNVRM | Conversational Protocol Error |
| X'1249' | RECDMGRM | Record Damaged |
| X'124A' | RECIUSRM | Record In Use |
| X'124C' | SYNTAXRM | Data Stream Syntax Error |
| X'124D' | UPDCSRRM | Update Cursor Error |
| X'124E' | UPDINTRM | No Update Intent on Record |
| X'124F' | NEWNAMRM | Invalid New File Name |
| X'1250' | FUNNSPRM | Function Not Supported |
| X'1251' | PRMNSPRM | Parameter Not Supported |
| X'1252' | VALNSPRM | Parameter Value Not Supported |
| X'1253' | OBJNSPRM | Object Not Supported |
| X'1254' | CMDCHKRM | Command Check |
| X'1257' | HDLNFNRM | File Handle Not Found |
| X'1258' | DRCFULRM | Directory Full |
| X'1259' | RECINARM | Record Inactive |
| X'125A' | FILDMGRM | File Damaged |
| X'125C' | INTATHRM | Not Authorized to Open Intent for Named File |
| X'125E' | CLSDMGRM | File Closed with Damage |
| X'125F' | TRGNSPRM | Parameter Not Supported on Target System |
| X'1266' | ACCINTRM | Access Intent List Error |
| X'126F' | RECNAVRM | Record Not Available |
| X'F201' | DDFNFNRM | Data Description File Not Found |
| X'F202' | CVTNFNRM | Conversion Table Not Found |
| X'F203' | XLATERM | Translation Error |
| X'F205' | INVFLGRM | Invalid Flag |
| X'F207' | COMMRM | Communications Error |
| X'F210' | SRCLMTRM | Resource Limits Reached in Source System |
| X'F211' | LENGTHRM | Field Length Error |
| X'F212' | ADDRRM | Address Error |
| X'F216' | FILERRRM | File Error |

## ACCATHRM (Not Authorized to Use Access Method)

**Purpose**
The requester is not authorized to use the specified access method.

**Code Point**
The code point for this term is X'1230'.

**Structure**
See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**ACCMTHCL** Access method class

- Code point is X'114E'.
- Enumerated values for this parameter are:

| | | |
|---|---|---|
| X'1433' | RELRNBAM | (Relative by record number access method) |
| X'1435' | RNDRNBAM | (Random by record number access method) |
| X'1407' | CMBRNBAM | (Combined record number access method) |
| X'1432' | RELKEYAM | (Relative by key access method) |
| X'1434' | RNDKEYAM | (Random by key access method) |
| X'1406' | CMBKEYAM | (Combined keyed access method) |
| X'1405' | CMBACCAM | (Combined access access method) |

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## ACCINTRM (Access Intent List Error)

**Purpose**
Indicates that the access-intent-list parameter in the DDMOpen function is in error for one of the following reasons:

- The file does not support the requested access intent.
- The file access capability specified on DDMCreateRecFile does not support the requested access intent.

For more information, see “DDMOpen (Open File)” on page 129.

**Code Point**
The code point for this term is X'1266'.

## Reply Messages

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## ACCMTHRM (Invalid Access Method)

**Purpose**

Indicates that the function failed because the specified access method was in error. This can happen because:

- The specified access method class is not supported.
- The access method class specified is not a defined access method class.

**Code Point**

The code point for this term is X'1231'.

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code |
| **ACCMTHCL** | Access method class<br>• Code point is X'114E'.<br>• Enumerated values for this parameter are: |

| | | |
|---|---|---|
| X'1433' | RELRNBAM | (Relative by record number access method) |
| X'1435' | RNDRNBAM | (Random by record number access method) |
| X'1407' | CMBRNBAM | (Combined record number access method) |
| X'1432' | RELKEYAM | (Relative by key access method) |
| X'1434' | RNDKEYAM | (Random by key access method) |
| X'1406' | CMBKEYAM | (Combined keyed access method) |

| | | |
|---|---|---|
| X'1405' | CMBACCAM | (Combined access access method) |

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## ADDRRM (Address Error)

**Purpose** A buffer address of zero was specified when a non-zero value was expected.

**Code Point** The code point for this term is X'F212'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **16** | Severe Error Severity Code |

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **0001** | Record Buffer |
| **0002** | Key Buffer |
| **0003** | GEA (Get Extended Attribute Buffer) |
| **0004** | Record Number Buffer |
| **0005** | Get Extended Attribute Reply or Set Extended Attribute Buffer |
| **0006** | Record Count Buffer or Returned Record Count Buffer |
| **0007** | File Name or Title |
| **0008** | File Handle |
| **0009** | Flags Buffer |
| **0010** | Default Record Buffer |
| **0011** | Feedback Buffer |

## Reply Messages

### AGNPRMRM (Permanent Agent Error)

**Purpose** The function requested could not be completed because of a permanent error condition detected at the target system.

**Code Point** The code point for this term is X'1232'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **16** Severe Error Severity Code
  **32** Access Damage Severity Code
  **64** Permanent Damage Severity Code

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

### BASNAMRM (Invalid Base File Name)

**Purpose** The base file name is not a valid target system file name.

**Code Point** The code point for this term is X'1234'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**BASFILNM** Base file

- Code point is X'1103'.
- VSAM returns this information.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## CLSDMGRM (File Closed with Damage)

**Purpose** The file was closed as requested by the DDMClose function, but the file was damaged. That is, the file does not contain all the data of the file in the state required by DDM architecture.

If the target system blocks data for storage, the damage can result from failing to write the last block of data being processed to permanent storage.

Other reasons for this condition may also exist, as defined by the target system.

**Code Point** The code point for this term is X'125E'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **64** Permanent Damage Severity Code

**FILNAM** File name

- Code Point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## CMDCHKRM (Command Check)

**Purpose** An error occurred in a non-DDM related operating system support function that could not be mapped to an existing DDM error reply message.

**Code Point** The code point for this term is X'1254'.

## Reply Messages

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **0** | Information Only Severity Code |
| **4** | Warning Severity Code |
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |
| **32** | Access Damage Severity Code |
| **64** | Permanent Damage Severity Code |
| **128** | Session Damage Severity Code |

SVRCOD can also contain an operating system error code. If the error code is from the operating system, SRVDGN is 2.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Value is X'F1' (TRUE) if the data locks are the same as before the failure.
- Value is X'F0' (FALSE) if the data locks are not the same as before the failure.

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Value is X'F1' (TRUE) if the cursor position is the same as before the function iteration that caused the reply message. TRUE is the only valid value if the severity code is **ERROR**.
- Value is X'F0' (FALSE) if the cursor position is not the same as before the function iteration that caused the reply message or is that the current cursor position is unknown.
- The target server determines whether this information is returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

- Required for requests to insert multiple records in a file.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- Returned.
- The target server determines whether this information is returned.
- Enumerated value(s) for this parameter are:

**1** FileShare parameter on the DDMOpen was promoted to NON because the file is remote over the LAN (for local VSAM file system only).

**2** An operating system error occurred and cannot be mapped to a reply message. The SVRCOD contains the value for the condition the operating system detected.

## COMMRM (Communications Error)

**Purpose** A problem was encountered communicating with a target system. The requestor is not authorized to use the specified access method.

**Code Point** The code point for this term is X'F207'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

**16** Severe Error Severity Code

**SVRDGN** Server diagnostic information

- Code point is X'1153'.
- Returned.
- SOURCE DDM network enumerated value(s) for this parameter. See Table 28 on page 424.

The table below shows the hexadecimal (Hex) and decimal (Dec) values for COMMRM.

## Reply Messages

*Table 28 (Page 1 of 3). SRVDGN Values for COMMRM*

| Dec | Hex | Mnemonic | Possible Causes |
|---|---|---|---|
| 1 | 1 | APPC_NOT_ACTIVE | DFM cannot access the remote system. The possible causes are:<br>• The network services have not been started.<br>• The network link has not been started.<br>• The specified APPC LU is not an LU accessible on the network. |
| 2 | 2 | COMM_ENV_NOT_STARTED | STRTDFMC has not been successfully executed (OS/2 only). |
| 3 | 3 | CONV_UNEXP_ENDED | A conversation with a target system has ended unexpectedly. Possible causes:<br>• A problem on the network<br>• A problem in the target system<br>• A problem in the network access software<br>• A problem in the operating system |
| 4 | 4 | INSUFF_LOCAL_RESOURCES | Local resources are not sufficient.<br>Most likely, the stack size of the application is too small. |
| 5 | 5 | INTERNAL_ERROR_IN_DFMCM | An internal error has occurred in the record access communications manager component of DFM. Contact your service representative. |
| 6 | 6 | NO_SESSION_AVAILABLE | DFM tried to allocate a conversation with the remote system, but no session was available. Possible causes:<br>• The network access software configuration conflicts with the DFM configuration data.<br>• The network access link is not active.<br>• A cable problem exists.<br>• The target system is not active.<br>• The session limit is exceeded. |
| 7 | 7 | PCS_ROUTER_ERROR | An internal error has occurred in the stream access communication manager component of DFM (OS/2 only). Contact your service representative. |
| 8 | 8 | TDDM_NOT_FOUND | An application requested record access to a file on a target system, but CONFIG.DFM contains no DFM_TARGET entry for that target system. |

*Table 28 (Page 2 of 3). SRVDGN Values for COMMRM*

| Dec | Hex | Mnemonic | Possible Causes |
|---|---|---|---|
| 9 | 9 | TDDM_UNEXP_ENDED | The DFM target server has unexpectedly terminated the conversation. The most likely cause is the program that implements the DDM target server contains an error. Contact the supplier of the DDM target server. |
| 10 | A | TGT_ISSUED_SEND_ERROR | The DFM target server has issued the SEND_ERROR verb when it was not expected by DFM. |
| 11 | B | UNKNOWN_COMM_ERROR | DFM tried to communicate with a target system, but an unknown return code from the network access software occurred. Contact your service representative. |
| 12 | C | SRVDGN_DFMINIT_FAILURE | Unable to initialize the DFM control blocks from the binary configuration file *dfmcfg.dfm*. Ensure that the *dfmcfg.dfm* file is accessible and valid by issuing **dfmcfg -c** from the session where the application was started (for Windows only). |
| 13 | D | SRVDGN_INVALID_SECURITY_MODE | An unknown security mode was assigned to a server system. The DFM binary configuration file has most likely been corrupted. Recreate the DFM configuration file with the **dfmcfg** command (for Windows only). |
| 14 | E | SRVDGN_INVALID_SECURITY_NONE | A security mode violation was detected for the remote system. The security mode, either specified explicitly in the DFM configuration or by default if not explicitly specified is PROGRAM. The **dfmlogon** command was not issued for the server system. Remember if you do not explicitly specify the security mode for a server system in the DFM configuration file, the default is PROGRAM. Issue the **dfmlogon** command to define logon information for the server system (for Windows only). |
| 15 | F | SRVDGN_INVALID_SECURITY_ PROGRAM | A security mode violation was detected. The **dfmlogon** command was issued for the server system. However, either the password or the user ID, or both, were not specified (for Windows only). |
| 17 | 11 | SRVDGN_INVALID_UNC_PATHNAME | The specification of a remote file for DFM to access has an not valid UNC format (for Windows only). |

*Table 28 (Page 3 of 3). SRVDGN Values for COMMRM*

| Dec | Hex | Mnemonic | Possible Causes |
|---|---|---|---|
| 18 | 12 | BAD_ENV | A problem with the runtime environment has caused a fatal error. One or both of the following files cannot be loaded or is corrupted: *dfmmain.dll* and *dfmext.dll* (for Windows only). |
| 19 | 13 | SRVDGN_INVALID_SECURITY_ SERVER | The remote server determined that security information is not valid. The possible causes are (for Windows only):<br>• The specified type of security access is not acceptable.<br>• The user ID is invalid.<br>• The user ID and password combination is not valid. |
| 20 | 14 | SRVDGN_INVALID_TPN_SERVER | The remote system does not support the SNA registered DDM server transaction program, or the DDM server is not active. |
| 21 | 15 | SRVDGN_INVALID_PARAMETER | The remote system LU name is not valid (cannot be found on the network), or the mode name is not valid for the remote system, or the LU name/mode name combination is not valid. Note, some network access software requires specification of LU name/mode name combinations at configuration time. |

## CSRNSARM (Cursor Not Selecting a Record Position)

**Purpose** The function failed because the cursor is not presently selecting a record position. The cursor is either at the BOF or EOF position, or its position is unknown.

**Code Point** The code point for this term is X'1205'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code |

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

**8** Error Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## CVTNFNRM (Conversion Table Not Found)

**Purpose** The specified character conversion table was not found. No character translation is performed. This reply message is returned when DFM/2 tries to access a conversion table for a character-to-character field conversion. The conversion table to be loaded depends on the code page IDs related to the from-character field and the to-character field (OS/2 only).

**Code Point** The code point for this term is X'F202'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code

**FILNAM** Conversion Table File name

- Code point is X'110E'.
- Returned.

## DDFNFNRM (Data Description File Not Found)

**Purpose** The named Data Description File was not found. No translation is performed during the current function request. This reply message is returned when DFM/2 tries to load the data description information for a remote file and it could not find the related DDF file, as specified in the MAPFMT entry of the DFM/2 configuration file (OS/2 only).

### Reply Messages

**Code Point** The code point for this term is X'F201'

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data. the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code |
| **FILNAM** | Data Description File Name<br>• Code point is X'110E'.<br>• Returned. |

## DFTRECRM (Default Record Error)

**Purpose** The request to initialize a file could not be completed because the default record does not meet the target server's criteria. For example, default inactive record initialization cannot be done on sequential files that do not have delete capability.

**Code Point** The code point for this term is X'1204'.

**Structure** See the description at the beginning of this section for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code<br>**16** Severe Error Severity Code |
| **FILNAM** | File name<br>• Code point is X'110E'.<br>• Information is returned if available. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## DRCATHRM (Not Authorized to Directory)

**Purpose** The user is not authorized to access or update the directory that is specified or implied by a file name.

**Code Point** The code point for this term is X'1237'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## DRCFULRM (Directory Full)

**Purpose** The directory specified or implied by a file name is full and does not have space for the file being created or renamed.

**Code Point** The code point for this term is X'1258'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**FILNAM** File name

- Code point is X'110E'.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## DTARECRM (Invalid Data Record)

**Purpose** A record to be inserted in a file cannot contain a data value that specifies an inactive record to the local data management on the target system.

## Reply Messages

An inactive record can not be inserted into a non-delete-capable file.

If it is necessary to insert an inactive record into a delete-capable file, send RECINA.

**Code Point** The code point for this term is X'1206'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code
  **32** Access Damage Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.
- For alternate index files, this is the base file name.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.
- Required for requests to insert multiple records in a file.

**RECNBR** Record number

- Code point is X'111D'.
- Information is returned if available.
- This is the record number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## DUPFILRM (Duplicate File Name)

**Purpose**
An attempt to create or rename a file failed because it duplicates an existing file name. The target system does not allow duplicates.

**Code Point**
The code point for this term is X'1207'.

**Structure**
See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |

**FILNAM** File name

- Code point is X'110E'.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code Point is X'1153'.
- No information is returned.

## DUPKDIRM (Duplicate Key Different Index)

**Purpose**
The function was not completed because the record sent contains a field that duplicates a key in an index different than the one being used to access the file. The other index does not allow duplicate key records.

The target returns the name of the file(s) in which the duplicate key would occur (ERRFILNM).

**Code Point**
The code point for this term is X'1208'.

**Structure**
See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |

## Reply Messages

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**ERRFILNM** Error file name

- Code point is X'1126'.
- Returned.
- Only one Error File Name is required. Additional Error File Names may be specified if they are known.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Returned for requests to insert multiple records in a file. In other cases, the DDM server determines whether this information is returned.

**RECNBR** Record number

- Code point is X'111D'.
- The DDM server determines whether this information is returned.
- This is the record number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## DUPKSIRM (Duplicate Key Same Index)

**Purpose** The function was not completed because the record duplicates a key in the index being used to access the file. This index does not allow duplicate key records.

**Code Point** The code point for this term is X'1209'.

## Reply Messages

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **4** Warning (duplicate record found). Indicates that the API access completed successfully and notifies the caller that the record being returned has a duplicate key. This condition was previously flagged as an error.

  **8** Error Severity Code

  **16** Severe Error Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Returned for requests to insert multiple records in a file. In other cases, the DDM server determines whether this information is returned.

**RECNBR** Record number

- Code point is X'111D'.
- This is the record number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## DUPRNBRM (Duplicate Record Number)

**Purpose** A record cannot be inserted at a record position that is occupied by an active record.

**Code Point** The code point for this term is X'120A'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code<br>**16** Severe Error Severity Code |
| **CSRPOSST** | Cursor position status<br>• Code point is X'115B'.<br>• Returned. |
| **DTALCKST** | Data lock status<br>• Code point is X'115C'.<br>• Returned. |
| **FILNAM** | File name<br>• Code point is X'110E'.<br>• Returned. |
| **RECCNT** | Record count<br>• Code point is X'111A'.<br>• Minimum value is 0.<br>• Returned for requests to insert multiple records in a file. In other cases, the DDM server determines whether this information is returned. |
| **RECNBR** | Record number<br>• Code point is X'111D'. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## ENDFILRM (End of File)

**Purpose**

It is not possible to retrieve a record that is outside the BOF, EOF, or some specified file limit with the following functions:

| Function | Limits |
|---|---|
| **DDMSetNextRec** | Always the last and first record positions, respectively, in the file. |
| **DDMSetPrevious** | Always the last and first record positions, respectively, in the file. |
| **DDMSetKeyPrevious** | The first record, in key sequence, of the file. |
| **DDMSetKeyNext** | The last record, in key sequence, of the file, or the high key limit established by a DDMSetKeyLimits function. |
| **DDMSetNextKeyEqual** | The last record (in key sequence) of the file, the high key limit established by a DDMSetKeyLimits function, or the key value specified by the KEYVAL parameter on the DDMSetNextKeyEqual function. |

**Code Point**

The code point for this term is X'120B'.

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **4** Warning Severity Code

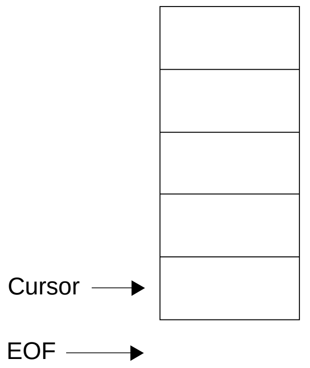
**FILNAM** File name

- Code point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

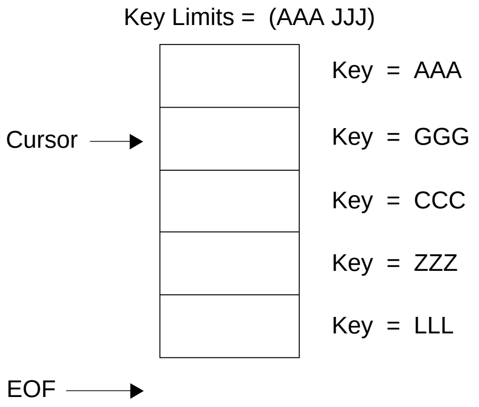
- Code point is X'1153'.
- No information is returned.

**Examples:**



A DDMSetNextRec with NODATA not set would result in an ENDFILRM.

*Figure 84. DDMSetNextRec ENDFILRM*



A DDMSetKeyNext command with NODATA parameter not set would result in an ENDFILRM.

*Figure 85. DDMSetKeyNext ENDFILRM*

## EXSCNDRM (Existing Condition)

**Purpose**

A request was made that would have resulted in a condition that already exists.

For example:

- A request to create a file when a file by that name already exists.
- A request to unlock a record that is not locked.
- A request to delete a file that cannot be found.
- A request to delete a record that is already deleted.
- A request to rename a file to the same name.

**Code Point**

The code point for this term is X'123A'.

**Structure**

See "Reply Message Structure" on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**4** Warning Severity Code |
| **FILNAM** | File name<br>• Code point is X'110E'.<br>• Information is returned if available. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## FILATHRM (Not Authorized to File)

**Purpose**

The user is not authorized to perform the requested function on the file being accessed.

**Code Point**

The code point for this term is X'123B'.

## Reply Messages

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code |
| **FILNAM** | File name<br>• Code point is X'110E'.<br>• Returned. |
| **RECCNT** | Record count<br>• Code point is X'111A'.<br>• Minimum value is 0.<br>• Information is returned if available. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• Enumerated value(s) for this parameter:<br>**0** The operating system denied access to the file.<br>**1** Access attempt to byte stream file with VSAM API. Byte stream is not a supported record type. |

## FILDMGRM (File Damaged)

**Purpose**

The file may be damaged. Some of the indications of a damaged file in the local VSAM file system are:

- The file-change date and time recorded by a VSAM API is not the same as the file-change date and time recorded by the file system. The function continues processing (SVRCOD=4).

  Either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file. The local VSAM file system resynchronizes the file-change date and time if it can get write access to the file, unless a higher severity condition prevents it from doing so. Re-synchronizing the date and time corrects only this particular file-damaged condition, but the file may still be damaged. To verify that the file is not damaged, use DDMCopyFile or DDMUnLoadFileFirst with

AccessFlags=DDM_BYPDMG|DDM_RTNINA and inspect the result.

- An index file is not consistent with its base file. The function is rejected (SVRCOD=16).

  The file-change date and time recorded by the VSAM API for the base file is not the same as the base file's file-change date and time that was recorded as an attribute of the index file. Either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has replaced a base file or an index file without replacing all of the files in the file object. The local VSAM file system does not resynchronize the file-change date and time.

Both of the above conditions can exist at the same time for the same index file, causing two FILDMGRM reply messages to be returned, one for SVRCOD=4 followed by one for SVRCOD=16.

**Code Point** The code point for this term is X'125A'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **4** | Warning Severity Code |
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |
| **32** | Access Damage Severity Code |
| **64** | Permanent Damage Severity Code |

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.

**RECNBR** Record number

- Code point is X'111D'.
- This is the record number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.
- Enumerated value for this parameter:
  **1** Either an aborted DDM application has left the file in an inconsistent state or a non-DDM application has changed the file.

## FILFULRM (File Is Full)

**Purpose** A file is full when a record cannot be added to the end of the file because:

- All record positions in the file have been filled and the file is not extendable.
- All record positions in the file have been filled and the file has been extended the maximum number of times.
- There are not enough bytes available in the file to insert the record and the file is not extendable, or the maximum number of extents have already been made. For example, if there are 45 bytes of space available in the file and an attempt is made to insert a record of 150 bytes, a FILFULRM reply message results.

**Code Point** The code point for this term is X'120C'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |
| **32** | Access Damage Severity Code |

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**RECNBR** Record number

- Code point is X'111D'.
- This is the number of the record being operated on by the function.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## FILIUSRM (File in Use)

**Purpose** The named file is locked by another user at a level that prevents the requested function from obtaining the locks it requires.

**Code Point** The code point for this term is X'120D'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## FILNAMRM (Invalid File Name)

**Purpose** The file name specified on the function is not a valid target system file name.

**Code Point** The code point for this term is X'1212'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**FILNAM** File name

- Code point is X'110E'.
- Returned.
- This is the file name that is in error.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## FILNFNRM (File Not Found)

**Purpose** The named file (specified on the function) cannot be found on the target system.

**Code Point** The code point for this term is X'120E'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**FILNAM** File name

- Code point is X'110E'.
- Returned.
- This is the file name that is in error.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## FILSNARM (File Space Not Available)

**Purpose** The file cannot be created or extended because the operating system does not have sufficient space available.

**Code Point** The code point for this term is X'120F'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |
| **32** | Access Damage Severity Code |

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## FILTNARM (File Temporarily Not Available)

**Purpose** The target system has temporarily made the file unavailable to all users. Either the file is damaged and must be repaired before further use, or a target system process, such as disk compression, prevents immediate use.

**Code Point** The code point for this term is X'121E'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code
  **32** Access Damage Severity Code
  **64** Permanent Damage Severity Code

**FILNAM** File name

- Code Point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## FUNATHRM (Not Authorized to Function)

**Purpose** The user is not authorized to perform the requested function.

**Code Point** The code point for this term is X'121C'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## FUNNSPRM (Function Not Supported)

**Purpose** The function specified is not recognized or not supported for the specified target object.

**Code Point** The code point for this term is X'1250'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**CODPNT** Code point attribute

- Code point is X'000C'.
- Returned.
- Specifies the code point of the function not supported.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## HDLNFNRM (File Handle Not Found)

**Purpose** The file handle specified is not known or if the handle from DDMLoadFileFirst or DDMUnLoadFileFirst is not used as the handle for a DDMLoadFileNext or DDMUnLoadFileNext, this reply message will be returned.

**Code Point** The code point for this term is X'1257'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

**8** Error Severity Code

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- Handle number is returned.

## INTATHRM (Not Authorized to Open Intent for Named File)

**Purpose** The user is not authorized to open the file with the specified processing intent. This message is returned by servers that validate the user's authorization to access a file when the file is opened. Servers can allow the file to be opened without validation of the requester's specified intents if authorizations are subsequently validated for each function used to access an opened file.

**Code Point** The code point for this term is X'125C'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**ACCINTLS** Access intent list

- Code point is X'1134'.
- Specifies the access intents for which the requester is not authorized.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## INVFLGRM (Invalid Flag)

**Purpose** One or more reserved bits have been set in a flag word.

**Code Point** The code point for this term is X'F205'.

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**16** Severe Error Severity Code |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'<br>• Returned.<br>• Reflects the reserved bits that had been set on. |

## INVRQSRM (Invalid Request)

**Purpose**

A request can be invalid for one of the following reasons:

- There is conflict with a user-specified attribute of the file, such as:
  - The function issues a request to delete a record from a non-delete-capable file.
  - The function violates the access intents specified when the file was opened.
- The requester attempted to delete a file that is the base file for some alternate index files.
- The requested function is supported by the access method but not by the file class to which the access method is opened.
- A DDMSetKeyLimits function was issued for a file that was created with keys such that all parts of the key are not ascending.
- A DDM_ALLREC bit was set on a DDMSetNextRec, DDMSetPrevious, DDMSetFirst, or DDMSetLast function for a direct file.
- An alternate index file was specified as the base file of an alternate index file on the DDMCreateAltIndex function.
- The value of LowKeyLim is after the value of HiKeyLim on a DDMSetKeyLimits function.
- An attempt was made to delete or clear a protected file.
- A DDMTruncFile function:

  - For file opened for read only (GETAI, but not MODAI)
  - For a read-only-file (GETCP, but not MODCP).
- The requester attempted to create an alternate index file with a path qualifier that was different than the path qualifier of the base file.

**Code Point** The code point for this term is X'123C'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- Information is returned if available.
- Enumerated value(s) for this parameter:

  **15** The file is protected.

## KEYDEFRM (Invalid Key Definition)

**Purpose** The key definition is invalid for the reason specified by the KEYDEFCD parameter.

**Code Point** The code point for this term is X'123D'.

**Structure**

See "Reply Message Structure" on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code |
| **FILNAM** | File name<br>• Code point is X'110E'.<br>• Returned. |
| **KEYDEFCD** | Key definition error code<br>• Code point is X'1164'.<br>• Returned. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## KEYLENRM (Invalid Key Length)

**Purpose**

Specifies that the key value provided on a function is not the length required by the requested function.

This can be caused by:

- Specifying a partial key on a function that requires full keys.
- Specifying a key length greater than the maximum length key supported by the target system.
- Specifying a record key value whose length is greater than the defined key length of the file.

**Code Point**

The code point for this term is X'122D'.

**Structure**

See "Reply Message Structure" on page 413 for the general structure of reply message data.

| Parameter | Description |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code<br>**16** Severe Error Severity Code |

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## KEYUDIRM (Key Update Not Allowed by Different Index)

**Purpose** A different file does not allow its key value (of the record being modified) to be changed.

**Code Point** The code point for this term is X'1201'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**ERRFILNM** Error file name

- Code point is X'1126'.
- Returned.
- Repeatable.
- Only 1 error file name is required. Additional error file names may be specified if they are known.

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## KEYUSIRM (Key Update Not Allowed by Same Index)

**Purpose**
The file index being used to access the file does not allow the key value (of the record being modified) to be changed.

**Code Point**
The code point for this term is X'123F'.

**Structure**
See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD**
Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  - **8** Error Severity Code
  - **16** Severe Error Severity Code

**CSRPOSST**
Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST**
Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM**
File name

- Code point is X'110E'.
- Returned.

**SRVDGN**
Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## KEYVALRM (Invalid Key Value)

**Purpose**

Specifies that the key value provided on a function or a record is not valid.

This can be caused by:

- Specifying a variable-length record that does not contain all of the fields for the defined file key.
- Specifying a key that is not valid for the target server.

**Code Point**

The code point for this term is X'1240'.

**Structure**

See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**KEYVAL** Key value in error

- Code point is X'1115'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Returned for requests to insert multiple records in a file.

**RECNBR** Record number

- Code point is X'111D'.
- This is the number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## LENGTHRM (Field Length Error)

**Purpose** A field was found with incorrect length.

**Code Point** The code point for this term is X'F211'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **4** Warning Severity Code
  **16** Severe Error Severity Code

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- Returned.
- Enumerated value(s) for this parameter:

**0001** **Maximum Record Length Exceeded**
The maximum record length the local VSAM file system supports is 65,000 bytes. The maximum record length Distributed FileManager/MVS supports is 32 000 bytes.

**0002** **Record Buffer Too Small**
If the buffer is at least 4 bytes long, and no records have been placed in the buffer, the first 4 bytes contain the length of the record that did not fit.

**0003** **Key Definition Buffer Too Small**
If the buffer is at least 4 bytes long, the first 4 bytes contain the required length of the buffer in order for the key definition information to fit.

**0004** **Extended Attribute Reply Buffer Too Small**

If the buffer is at least 4 bytes long, the first 4 bytes contain the required length.

**0005** **Extended Attribute Input Buffer Length Error**

**0007** **Default Record Buffer Length Error**

The default record buffer is outside the allowable limits.

## NEWNAMRM (Invalid New File Name)

**Purpose** The new file name is not a valid target system file name.

**Code Point** The code point for this term is X'124F'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**NEWFILNM** New file name

- Code point is X'114F'.
- This is the file name that is in error.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## OBJNSPRM (Object Not Supported)

**Purpose** The object specified as data in a buffer is not recognized or not supported for the function associated with the object. Only active and inactive records are recognized.

OBJNSPRM is also returned if an object is found in a valid collection that is part of a buffer (such as the RECAL collection) that is not valid for that collection.

**Code Point** The code point for this term is X'1253'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

| **Parameter** | **Description** |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code<br>**16** Severe Error Severity Code |
| **CODPNT** | Code point attribute<br>• Code point is X'000C'.<br>• Returned.<br>• This is the code point of the object that is not supported. |
| **RECCNT** | Record count<br>• Code point is X'111A'.<br>• Minimum value is 0.<br>• Information is returned if available. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## OPNMAXRM (Concurrent Opens Exceeds Maximum)

**Purpose** The number of concurrent DDMOpen functions to the same file exceeds the target server maximum.

**Code Point** The code point for this term is X'1244'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

| **Parameter** | **Description** |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code |
| **FILNAM** | File name<br>• Code point is X'110E'.<br>• Returned. |

**MAXOPN** Maximum number of files opened

- Code point is X'1157'.
- Specifies the maximum number of opens to the same file.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## PRCCNVRM (Conversational Protocol Error)

**Purpose** A conversational protocol error occurred.

**Code Point** The code point for this term is X'1245'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

  **16** Severe Error Severity Code

  **128** Session Damage Severity Code

**PRCCNVCD** Conversational protocol error code

- Code point is X'113F'.
- Returned.
- Enumerated value(s) for this parameter:

  **0001** RPYDSS received by target communication manager

  **0002** Multiple DSSs sent without chaining or multiple DSS chains sent

  **0003** OBJDSS sent when not allowed

  **0004** The next correlation identifier was not ascending

  **0005** The request correlation identifier of OBJDSS and RPYDSS are not equal

  **0006** EXCSAT was not the first function after the connection was established

**RECCNT** Recode count

- Code point is X'111A'
- Minimum value is 0
- Information is returned if available

**SVRDGN** Server diagnostic information

- Code point is X'1153'
- No information is returned.

## PRMNSPRM (Parameter Not Supported)

**Purpose** The parameter specified is not recognized or not supported for the associated function.

**Code Point** The code point for this term is X'1251'.

**Structure** See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

  **8** Error Severity Code

**CODPNT** Code point attribute

- Code point is X'000C'.
- Returned.
- Specifies the code point of the parameter not supported.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RECDMGRM (Record Damaged)

**Purpose** A record in the file is damaged and cannot be accessed. A damaged record is one in which the Code point is not an active or inactive record.

Damaged records can be bypassed as an option of the following functions:

DDMSetKeyNext
DDMSetNextRec
DDMUnloadFileFirst
DDMUnLoadFileNext

## Reply Messages

See “DDM_BYPDMG (Bypass Damaged Records)” on page 403.

RECDMGRM is returned with a severity code of WARNING for every damaged record that is bypassed. The record number of the bypassed record is also returned. If damaged records cannot be bypassed, this message is returned with a severity code of ERROR or greater.

**Code Point** The code point for this term is X'1249'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **4** | Warning Severity Code |
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |
| **32** | Access Damage Severity Code |
| **64** | Permanent Damage Severity Code |

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**RECNBR** Record number

- Code point is X'111D'.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RECINARM (Record Inactive)

**Purpose**

RECINARM is returned with the following severity codes:

| SVRCOD | Reason |
|---|---|
| **X'0004'** | This is returned when a DDMSet*xxx* function has moved the cursor to an inactive record. |
| **X'0008' or higher** | This is returned when the record is inactive, and the function cannot be executed. |

**Code Point**

The code point for this term is X'1259'.

**Structure**

See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **4** | Warning Severity Code |
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RECIUSRM (Record in Use)

**Purpose**

The record cannot be locked or accessed. This happens because another user has the record locked at a level that prevents the record from being locked or accessed by other users.

**Code Point**

The code point for this term is X'124A'.

**Structure**

See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- OPTIONAL.
- Information is returned if available.

**RECNBR** Record number

- Code point is X'111D'.
- Information is returned if available.
- This is the number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RECLENRM (Record Length Mismatch)

**Purpose** The length of a data record does not match the length of the current record position.

If the record class is fixed and the record to be inserted is an active record, the length of the record object must be equal to the length of the record object header (length and code point) plus the length of the record object data. See “RECORD (Record)” on page 394 for more information.

If the record to be inserted is an inactive record, the record length represented by the inactive record must be the same as the length defined for a record in the file. (See “RECINA (Inactive Record)” on page 391 for more information.)

**Code Point** The code point for this term is X'1215'

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**RECNBR** Record number

- Code point is X'111D'.
- Information is returned if available.
- This is the number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RECNAVRM (Record Not Available)

**Purpose**

The requested record cannot be retrieved because it is not available to the file.

**Code Point**

The code point for this term is X'126F'.

### Reply Messages

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RECNBRRM (Record Number Out of Bounds)

**Purpose**

The specified record number is outside the boundaries of the file. For a definition of file boundaries, see “DDMInsertRecNum (Insert by Record Number)” on page 100.

**Code Point**

The code point for this term is X'1224'.

**Structure**

See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**RECNBR** Record number

- Code point is X'111D'.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RECNFNRM (Record Not Found)

**Purpose** The cursor cannot be positioned because a record that satisfies the absolute or relative positioning parameters of a function does not exist.

**Code Point** The code point for this term is X'1225'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:
  **8** Error Severity Code
  **16** Severe Error Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## RSCLMTRM (Resource Limits Reached on Target System)

**Purpose** The requested function could not be completed because of insufficient target server resources. Examples of resource limits are:

- The target agent has insufficient memory to keep track of more open files.
- The lock manager cannot obtain another lock.
- The communication manager's send or receive buffer overflowed.
- The MAX_SEND_LIMIT in a TARGET_SYSTEM statement of the DFM configuration file is set to a low value.

**Code Point** The code point for this term is X'1233'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated value(s) for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |
| **32** | Access Damage Severity Code |
| **64** | Permanent Damage Severity Code |
| **128** | Session Damage Severity Code |

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- The target server determines whether this information is returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- The target server determines whether this information is returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned when the FILNAM parameter is specified for the function. In other cases, the target server determines whether this information is returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Information is returned if available.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## SRCLMTRM (Resource Limit Reached in Source System)

**Purpose** Some resource has reached its limit in the source system.

**Code Point** The code point for this term is X'F210'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'
- Returned.
- Enumerated value(s) for this parameter:

  **16** Severe Error Severity Code

**SRVDGN** Server diagnostic information

- Code point is X'1153'
- No information is returned.

## SYNTAXRM (Data Stream Syntax Error)

**Purpose** The data sent to the target agent does not conform to the structural requirements of DDM architecture. The target agent terminated parsing of the Data Stream Structure (DSS) when the condition specified by the Syntax Error Code parameter was detected.

**Code Point** The code point for this term is X'124C'.

## Reply Messages

**Structure** See the description at the beginning of this section for the general structure of reply message data.

| **Parameter** | **Description** |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated value(s) for this parameter:<br>**8** Error Severity Code |
| **SYNERRCD** | Syntax error code<br>• Code point is X'114A'.<br>• Returned. |
| **RECCNT** | Record count<br>• Code point is X'111A'.<br>• Minimum value is 0.<br>• Information is returned if available. |
| **CODPNT** | Code point attribute<br>• Code point is X'000C'<br>• Returned.<br>• Specifies the code point of the object that caused the syntax error. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## TRGNSPRM (Parameter Not Supported on Target System)

**Purpose** The parameter specified cannot be supported on the target system.

**Code Point** The code point for this term is X'125F'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

| **Parameter** | **Description** |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated values for this parameter:<br>**8** Error Severity Code |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## UPDCSRRM (Update Cursor Error)

**Purpose** The cursor cannot be updated to point to the last record inserted in the file.

This error can be sent only if the function set the UPDCSR bit flag for the Access Flags parameter.

**Code Point** The code point for this term is X'124D'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated values for this parameter:

| | |
|---|---|
| **8** | Error Severity Code |
| **16** | Severe Error Severity Code |

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**RECCNT** Record count

- Code point is X'111A'.
- Minimum value is 0.
- Returned for requests to insert multiple records in a file.

**RECNBR** Record number

- Code point is X'111D'.
- Information is returned if available.
- This is the number of the record being operated on by the function.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## UPDINTRM (No Update Intent on Record)

**Purpose**

The record cannot be updated for one of the following reasons:

- An update intent has *not* been placed on the record by the requester.
- The update intent may have been removed because of a previous function issued by the requester.

**Code Point**

The code point for this term is X'124E'.

**Structure**

See "Reply Message Structure" on page 413 for the general structure of reply message data.

**Parameter** **Description**

**SVRCOD** Severity code

- Code point is X'1149'.
- Returned.
- Enumerated values for this parameter:
  - **8** Error Severity Code
  - **16** Severe Error Severity Code

**CSRPOSST** Cursor position status

- Code point is X'115B'.
- Returned.

**DTALCKST** Data lock status

- Code point is X'115C'.
- Returned.

**FILNAM** File name

- Code point is X'110E'.
- Returned.

**SRVDGN** Server diagnostic information

- Code point is X'1153'.
- No information is returned.

## VALNSPRM (Parameter Value Not Supported)

**Purpose**

The parameter value specified is not recognized or not supported for the named parameter.

The function parameter in error is returned as a parameter in this message.

**Code Point**

The code point for this term is X'1252'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

| **Parameter** | **Description** |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated values for this parameter:<br>**8** Error Severity Code |
| **CODPNT** | Code point attribute<br>• Code point is X'000C'.<br>• Returned.<br>• Return the code point of the parameter whose value is not supported. |
| **RECCNT** | Record count<br>• Code point is X'111A'.<br>• Minimum value is 0.<br>• Required for requests to insert multiple records in a file. |
| **SRVDGN** | Server diagnostic information<br>• Code point is X'1153'.<br>• No information is returned. |

## XLATERM (Translation Error)

**Purpose** An error occurred during translation of a record or field. The record or field is not translated. This reply message is returned when DFM tries to convert a record from source into target format, or vice versa, by using the data description sequences.

**Code Point** The code point for this term is X'F203'.

**Structure** See “Reply Message Structure” on page 413 for the general structure of reply message data.

| **Parameter** | **Description** |
|---|---|
| **SVRCOD** | Severity code<br>• Code point is X'1149'.<br>• Returned.<br>• Enumerated values for this parameter:<br>**4** Warning Severity Code<br>**8** Error Severity Code<br>**16** Severe Error or Severity Code |

**SVRDGN** Server diagnostic information

- Code point is X'1153'.
- Returned.
- Enumerated values for this parameter:

  **0001** Rounding error

  **0002** Truncation error

  **0006** Possible causes:

  - CDRASRV environment variable not set (Windows or AIX only).
  - CDRA conversion table not available.

  **0101** Range error

  **0102** Untranslated data

  **0103** Modification intent, but the view does not cover the entire base record (reduced view)

  **0104** A partial numeric key field cannot be translated

  Other server diagnostic values might be returned. See *SMARTdata UTILITIES Data Description and Conversion*.

# Part 2. DFM for OS/2

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# Chapter 7. Introduction to the Distributed FileManager for OS/2

DFM for OS/2 enables an OS/2 application program to use byte-stream and record-oriented access methods to access remote file data. DFM for OS/2 uses the Distributed Data Management (DDM) protocol as specified in the DDM architecture to communicate with the remote target systems.

DDM consists of two parts:

- **DFM** - Distributed FileManagement
- **DRDA** - Distributed Relational Data Base Access

DFM for OS/2 supports the DFM part of the architecture. DRDA is handled by the DataBase Manager.

DFM facilitates data connectivity between systems that have heterogeneous architectures. DFM defines how application programs running on one system retrieve, add, update, and delete data records from files that reside on other systems. It does this in a manner that makes the remote access transparent to the application program. To accomplish these tasks, DFM constructs a data stream that both systems can understand by using a set of standardized file models and access methods.

DFM uses Application Programming Interfaces (APIs) to access remote files. The types of APIs supported are described in “Types of APIs Supported by DFM” on page 475. DFM also provides support for data description and data conversion for remote record access.

The data description and conversion is done using a subset of IBM’s A Data Language (ADL). ADL is a formal specification that provides programmers with a means of describing and converting data exported by other programs written for a different machine architecture or a different programming language. For more information on ADL, see *Distributed Data Management: Specifications for A Data Language*.

This chapter introduces DFM for OS/2 and its relationship with the Distributed Data Management architecture. It explains the concepts and terms that you need to know to understand DFM for OS/2 and also describes how DFM for OS/2 works.

## OS/2 as a DFM Source System

The objective of DFM for OS/2 is to allow OS/2 applications to access data stored on any DDM Target system.

Together with the local file Application Programming Interfaces (APIs) on OS/2, DFM for OS/2 provides local and remote transparent application access to distributed files and directories. Figure 86 on page 474 shows how DFM for OS/2 processes requests for data.

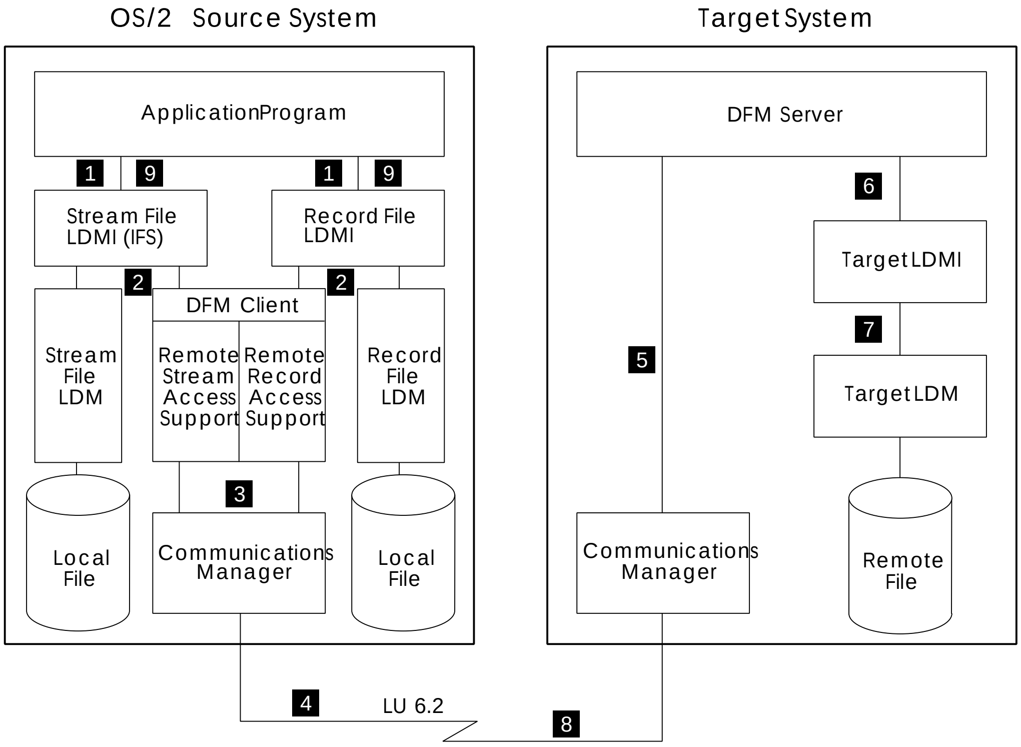


*Figure 86. Overview of DFM for OS/2 Processing*

The **target system** is the system where the data resides. The **source system** contains the application that is accessing data on the target system.

**1** An application program issues a Stream, a Directory, or a VSAM API request.

**2** Request processing begins with the routing of the request to a Local Data Management Interface (LDMI). The LDMI determines whether the requested data is in a local or a remote system. This is determined by whether the drive letter part of the file name used in an API call has already been assigned to a remote system.

**Record Files** If the data is in a remote system, the LDMI, which is also referred to as the VSAM Router,invokes DFM for OS/2. If the data is in the local system, the LDMI directs the request to the VSAM Local Data Manager (LDM) for record files.

**Stream Files** If the data is in a remote system, the OS/2 Installable File System (IFS) router directs the request to DFM for OS/2. If the data is in the local system, the stream-file LDMI directs the request to the stream-file LDM. In OS/2, the LDM is one of the installed file system drivers (FSDs), for example, the High Performance File System (HPFS). An FSD is installed at OS/2 startup time if a related “IFS” statement is found in the CONFIG.SYS file.

**Directories** Requests for directory information are handled in the same way as requests for stream file data.

**3** DFM for OS/2 processes the request and passes it to the Communications Manager.

**4** The  Communications Manager/2 transmits the request to the target system.

**5** The target system's Communications Manager receives the request and forwards it to the DFM server.

**6** The DFM server processes the request for remote data and invokes the appropriate target LDMI.

**7** The LDMI invokes the LDM, which retrieves the requested data and sends it back to the server.

**8** The DFM server builds a reply data stream and transmits it back to the source system.

**9** DFM for OS/2 passes the reply back to the application program.

## Types of APIs Supported by DFM

DFM for OS/2 supports the following types of application programming interfaces, allowing access to file data on remote systems:

- The VSAM application programming interface for accessing file data by record.

  DFM for OS/2 supports sequential, direct, keyed, and alternate index access to remote record files.

- The stream file application programming interface provided by OS/2 for accessing file data in a continuous stream of bytes.

  Stream files contain strings of bytes that can be accessed according to their relative position within the file.  OS/2 provides this API using the Installable File System (IFS) router.

- The directory application programming interface commands provided by OS/2 for accessing directory information. The IFS Router also handles the directory API requests.

DFM for OS/2 transforms the application programming interface commands into DDM requests.

DFM for OS/2 can access data on any target system on which a Distributed FileManager server is installed.  Whether a certain application programming interface command can be used by an application to access the data depends on the capabilities of the Distributed FileManager server.

## DFM File Models

DFM supports the following types of files:

**Sequential** The records in this type of file are arranged in the chronological order in which they were placed in the file.

**Direct** The records in this type of file have an application-defined relationship between the record content and the position at which the record is stored. The record number of each record shows the original position of the record within the file.

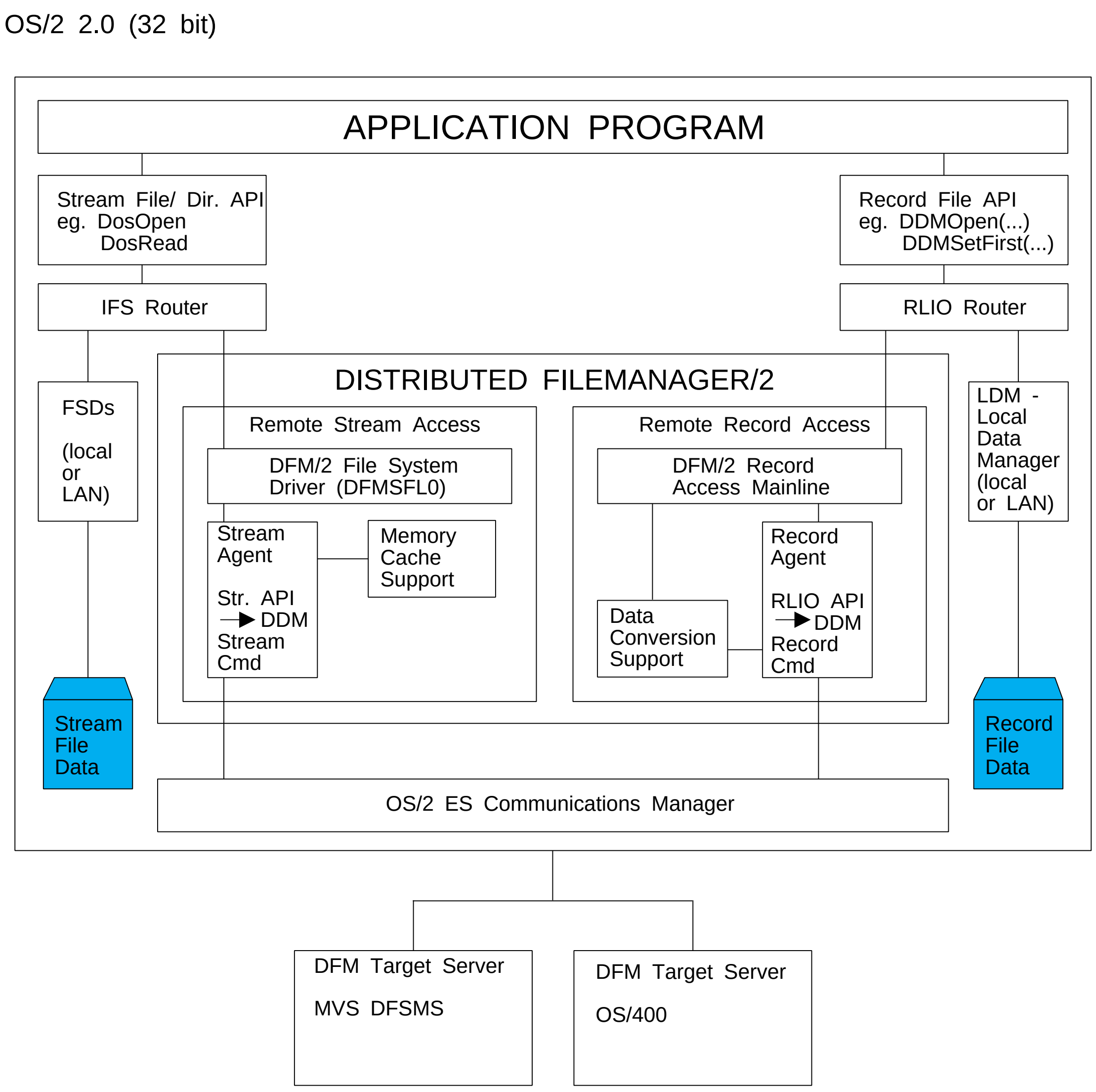
**Keyed** A key index stores the location of records in this type of file. By using the key index, users can access each record in the file.

**Alternate index** This type of file supports keyed forms of access to records of a base file. A base file is an existing file over which an alternate index is built. The records of the base file are also the records of the alternate index file. The record contents of the base file are not duplicated in the alternate index file.

**Stream File** This type of file contains a string of bytes that can be accessed according to their relative position within the file.

## Internal Structure of DFM for OS/2

Figure 87 shows the location of DFM for OS/2 within OS/2 and its internal structure. It gives a detailed description of how DFM for OS/2 works under OS/2 2.0.



OS/2 2.0 (32 bit)
APPLICATION PROGRAM
Stream File/ Dir. API eg. DosOpen DosRead
Record File API eg. DDMOpen(...) DDMSetFirst(...)
IFS Router
RLIO Router
FSDs (local or LAN)
DISTRIBUTED FILEMANAGER/2
LDM - Local Data Manager (local or LAN)
Remote Stream Access
DFM/2 File System Driver (DFMSFL0)
Stream Agent
Str. API → DDM Stream Cmd
Memory Cache Support
Remote Record Access
DFM/2 Record Access Mainline
Data Conversion Support
Record Agent
RLIO API → DDM Record Cmd
Stream File Data
Record File Data
OS/2 ES Communications Manager
DFM Target Server
MVS DFSMS
DFM Target Server
OS/400

*Figure 87. DFM for OS/2 Running Under OS/2 2.0*

The Remote Stream Access Support and the Remote Record Access Support parts of Figure 87 are explained in more detail in the following sections.

## Remote Stream Access Support

The Remote Stream Access Support of DFM for OS/2 handles the stream and directory API requests for remote data. Figure 88 shows the Remote Stream Access Support connections of DFM for OS/2.

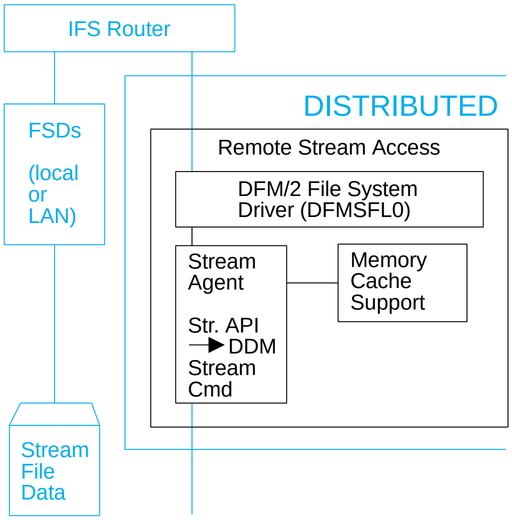


*Figure 88. Remote Stream Access Support*

The File System Driver DFMSFL0 accepts the stream and directory API commands and transmits them to the Stream Agent.

The Stream Agent translates the API requests into the DDM-defined syntax and analyzes the retrieved DDM replies.

Figure 87 also shows the Memory Cache support. This component reads bytes ahead of the actual read API requests or performs a deferred write if possible to reduce line traffic.

## Remote Record Access Support

Figure 89 shows the Remote Record Access Support connections of DFM for OS/2.

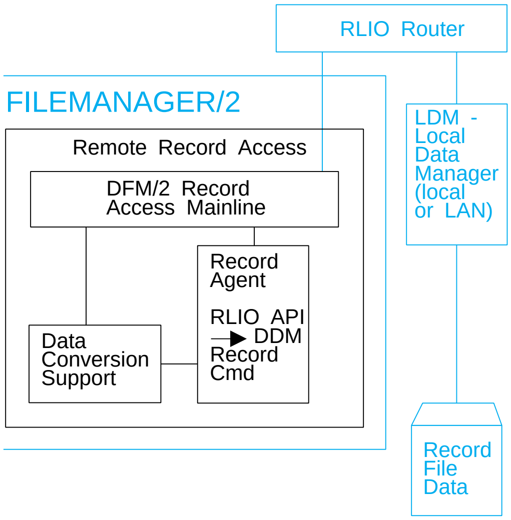


*Figure 89. Remote Record Access Support*

The DFM for OS/2 Remote Record Access Support is delivered as a Dynamic Link Library (DLL) file (EHNSDDM.DLL). This DLL accepts the VSAM requests from the VSAM Router.

The DFM for OS/2 Remote Record Access Support also provides a component for Data Conversion of records before they are sent to the target system or after they have been received from it.

## How DFM for OS/2 is Connected to Target Systems

The relationship between an API request and a DFM Server is defined by the drive letter of the target system. Figure 90 shows how two OS/400 systems and two MVS/ESA systems can be used to access data. (Multiple drive letters can also be assigned to the same target system.) Each target system is assigned to an OS/2 drive letter.

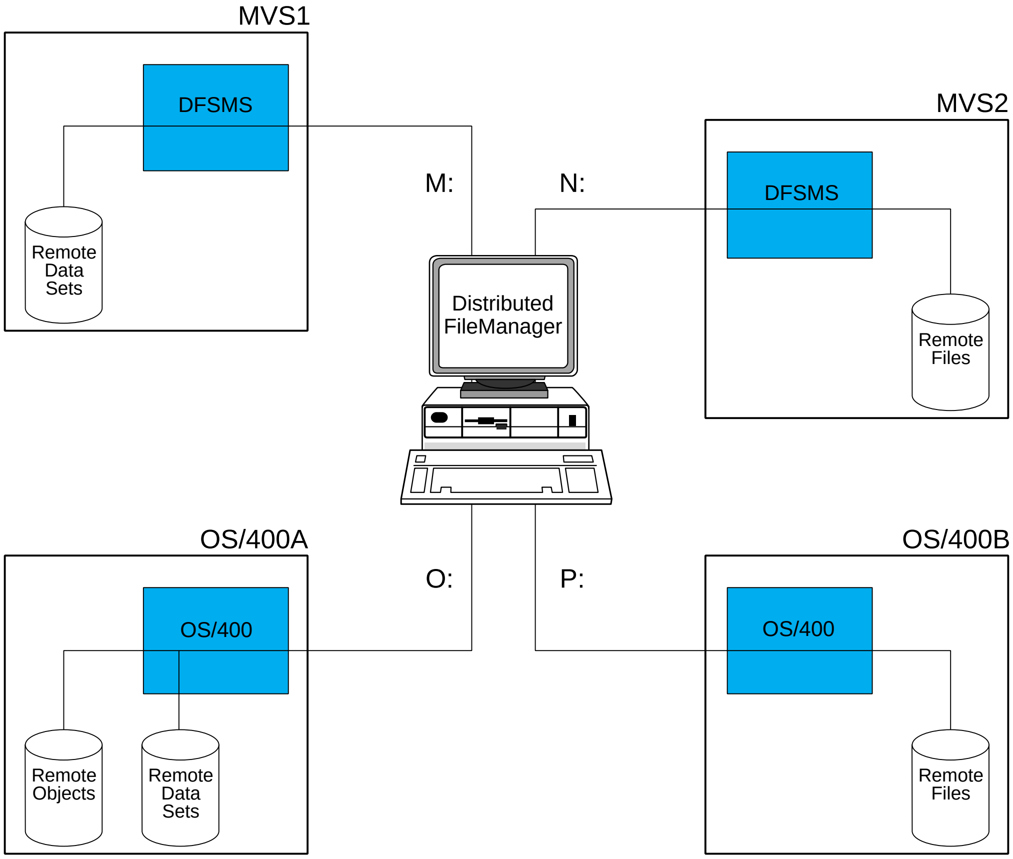


*Figure 90. DFM Servers Accessed by DFM for OS/2*

For example, if an application wants to access a dataset named PAYROLL on the OS/400 target system, and the drive letter **O:** has previously been assigned to that target system, the application can use the file specification **O:PAYROLL** to identify the file in an API command.

# Chapter 8. DFM for OS/2 Administrative Activities

DFM for OS/2 provides administrative commands that are necessary either to start the basic support functions or to exploit some additional features. For example, translating a data description using IBM's A Data Language (ADL) into the internal format required by DFM for OS/2.

Certain administration tasks must be performed to prepare an OS/2 system for DFM for OS/2. The DFM for OS/2 administrator can create a basic set of DFM for OS/2 administration files for this purpose:

- A DFM for OS/2 configuration file
- A DFM for OS/2 startup procedure
- If required, one or more ADL data description files for remote files that should be converted according to the needs of a certain application program

Samples of each of these administration files are delivered with DFM for OS/2.

DFM for OS/2 must be installed according to the instructions in the *Installation Guide*. The administrator must ensure that the appropriate administration files are on each OS/2 system that uses DFM for OS/2.

This chapter contains an overview of the DFM for OS/2 administrative tasks.

**Required Activities**
These are divided as follows:

- Initial activities that need to be performed once before you work with DFM for OS/2. These are described under "Before You Work with DFM for OS/2."
- Startup activities that are performed once after you have started your OS/2 system. These are described under "Startup Activities" on page 483.

Once the required activities are completed, you can use the Remote Stream Access Support of DFM for OS/2.

**Optional Activities**
If you want to use the DFM for OS/2 Remote Record Access Support and its features, you must perform the additional activities described in "Optional Activities" on page 484.

## Before You Work with DFM for OS/2

The following are the initial activities that need to be performed on each OS/2 system when DFM for OS/2 is installed for the first time.

1. Install DFM for OS/2 on the OS/2 system.

If you will use DFM to access MVS files you must also install DFSMS/MVS Version 1.2.0 or later.

2. Connect the OS/2 system to the potential DFM target systems.

   For each OS/2 system, this involves:

   - Installing the required adapter cards
   - Installing the Communications Manager/2.
   - Defining the target systems in the Communications Manager configuration files. DFM for OS/2 uses the SNA LU6.2 protocol for communicating with target systems. See the *Communications Manager Configuration Guide: SNA Network Definitions* for details about Communications Manager configuration. Required definitions are:

     – Local Node characteristics
     – Partner LU definitions
     – Mode definition and connections.

     Definitions must be created so that they match the definitions in the SNA network and enable the Communications Manager/2 to establish sessions with the desired partner LUs. DFM for OS/2 uses APPC support of Communications Manager as follows:

     – Only one local LU is supported by DFM for OS/2
     – Only one MODENAME is supported by DFM for OS/2
     – Multiple Partner LUs are supported by DFM for OS/2.

     If a connection to multiple partner LUs is required, the SNA network should be set up so that:

     – All partner LUs can use the same mode name that is used by DFM for OS/2.

     – The local LU used by DFM for OS/2 is an independent LU that is capable of parallel sessions.

     See the *ES OS/2 Communication Manager Configuration Guide* for more information.

   - The OS/2 user needs the necessary authorizations on the target system to access the remote file data.

     When DFM for OS/2 is started with the STRTDFMC command, the user is prompted to enter a user ID and password for each target system specified in the CONFIGDFM. The target system administrators are responsible for obtaining the necessary authorizations.

**CAUTION**

> DFM for OS/2 uses this user ID and password to access the remote system until either the OS/2 system is shutdown or the STRTDFMC command is invoked again. If the password on the remote system is changed during this time, all subsequent requests fail and a communication reply message is returned. Depending on the security features of the remote system, the user's password may also be revoked if the expired password is used several times by DFM for OS/2.
>
> To avoid these complications, you should invoke STRTDFMC immediately after the password change and before the next API request for remote data is executed.

**Note:** Authorization is also required if the remote file the user wants to access is protected by security features, for example, Resource Access Control Facility (RACF), on the remote system.

3. Create a DFM for OS/2 configuration file.

   For each OS/2 system, a DFM for OS/2 configuration file has to be created containing at least one DFM_TARGET statement for each partner LU alias the user wants to access using DFM for OS/2.

   See Chapter 10, "Working with the Configuration File" on page 491 for details.

DFM for OS/2 supports up to eight target systems.

## Startup Activities

To start DFM for OS/2 on an OS/2 system, the user has to perform some startup activities. To support the end-user, the administrator can prepare and deliver a set of base administration files. The following describes the activities the user has to perform once OS/2 has been started.

1. Start the Communications Manager/2.

   The Communications Manager must be started ("START CM") before DFM for OS/2 can be started. See the *ES OS/2 Communication Manager User's Guide* for more information.

2. Start the DFM for OS/2 communication environment.

   DFM for OS/2 provides the command STRTDFMC to establish the necessary resources for communicating with the target systems defined in the DFM for OS/2 configuration file CONFIGDFM.

   STRTDFMC can be executed at OS/2 startup time or when DFM for OS/2 is started.

   See Chapter 9, "Starting and Stopping DFM for OS/2" on page 487 for details.

3. Assign drive letters to the remote systems.

DFM for OS/2 provides several interfaces for assigning OS/2 drive letters to remote systems:

- The DFMDRIVE batch interface is typically used at OS/2 startup time to define the drive letters for the commonly used target systems.
- The interactive DFMDRIVE end-user interface can be used to change drive letter assignments or define additional assignments.
- DFM for OS/2 also provides an application programming interface to allow an application program to define the drive letter assignments for the files accessed in this application.

See Chapter 11, “Assigning and Releasing Drive Letters” on page 499 for details.

After the successful assignment of a drive letter to a DFM target system, the user is able to use this drive in the same way as any other OS/2 drive letter.[1] The OS/2 commands and APIs that can be supported depend on the capabilities of the DFM server. Certain DFM servers might not support certain DDM stream and directory commands. For example, an OS/2 DIR command might not be processed.

You can create a command file, for example called STARTDFM.CMD, to perform steps 1 to 3 in this list each time the OS/2 system is started. A sample command file STARTDFM.CMD is delivered with DFM for OS/2. Add the command STARTDFM to your STARTUP.CMD file to invoke STARTDFM.CMD. See Figure 91 on page 487 for details.

Once the tasks have being successfully performed, the OS/2 user can use OS/2 commands and applications that access remote stream file and directory data. For example, a worksheet program on OS/2 can now save its data on a drive letter that has been assigned to OS/400 where PC Support/400 is installed.

## Optional Activities

The following chapters describe the optional features available with DFM for OS/2, and how to use them. In general, these features are part of Remote Record Access Support. File name mapping and tailoring your DFM for OS/2 system are features of both Remote Record Access Support and Remote Stream Access Support.

### Features of Remote Record Access Support

The following are features of Remote Record Access Support:

- Starting the Remote Record Access Support Function

  To access remote file data in a record oriented manner by using a VSAM application, the user has to start the Remote Record Access Support function of

[1] There are some limitations for “DFM drive letters”. These are described in Appendix B, “OS/2 Commands Not Supported by DFM for OS/2” on page 563.

DFM for OS/2 first by using STRTDFMR. This command can also be included in the STARTDFM.CMD file.

See Chapter 9, “Starting and Stopping DFM for OS/2” on page 487 for details.

- Stop working with remote record files

  Use STOPDFMR to release resources consumed by the Remote Record Access Support.

  See “Stopping the DFM for OS/2 Remote Record Access Support” on page 488 for details.

- Preparing data conversion

  To exploit the data conversion feature of the DFM for OS/2 Remote Record Access Support, a data description has to be created using IBM’s A Data Language (ADL). See “Creating an ADL Data Description” on page 519 for details.

  The ADL descriptions are translated into the DFM for OS/2 internal Data Description File (DDF) format using the ADLTRANS utility of DFM for OS/2. See “Translating an ADL File into a DDF File” on page 533 for details.

  The CONFIGDFM statement FILE_DESCRIPTOR_MAP is used to describe the relationship between a remote record file and the created DDF files. See Chapter 13, “Converting Record File Data” on page 517 for details.

- Controlling tracing of DFM for OS/2 events

  The command DFMTRACE can be used to start and stop tracing of DFM for OS/2 events and to control the printing of collected trace entries.

  Refer to “The Internal Trace Facility” on page 546 for details.

## Global DFM for OS/2 Features

File name mapping and tailoring your DFM for OS/2 system are features of both Remote Record Access Support and Remote Stream Access Support:

- Do your own file name mapping.

  Although the remote file name can be directly used in an application, it is also possible to map the name used in the application to the actual file name on the remote system using the File Name Mapping Exit provided by DFM for OS/2. The exit program that implements the mapping algorithm of your installation has to be created as an OS/2 Dynamic Link Library (DLL).

  Refer to Chapter 14, “Writing a File Name Mapping Exit Program” on page 541 for a description of how to write an exit program.

- Tailor your DFM for OS/2 system.

  The DFM for OS/2 configuration file CONFIG.DFM is the main administration file to tailor DFM for OS/2 on an OS/2 system.

  For a detailed description of these parameters, see Chapter 10, “Working with the Configuration File” on page 491.

# Chapter 9. Starting and Stopping DFM for OS/2

You can include all necessary startup activities for DFM for OS/2 in a command file that runs at OS/2 startup time. A sample command file, STARTDFM.CMD, shown in Figure 91, is provided with the installation. The STRTDFMR line works only if STRTDFMC has been successfully run previously.

```
REM
REM Start DFM/2 Communication Environment
    and the Remote Stream Access Support
REM STRTDFMC E:\DAS\CONFIG.DFM
REM
REM Start DFM/2 Remote Record Access Support
STRTDFMR E:\DAS\CONFIG.DFM
REM
REM Assign drive letter(s) to remote system(s)
CALL DFMDRIVE ASSIGN W: //MVSESA
CALL DFMDRIVE ASSIGN X: //OS400
```

*Figure 91. Sample STARTDFM.CMD File*

You can also include the following commands in the STARTUP.CMD file of your system:

```
START CM
REM ... Wait until ES 1.0 Communications Manager is active ...
CALL CMWAIT
CALL STARTDFM
```

*Figure 92. Sample Statements for the OS/2 STARTUP.CMD File*

## Starting the DFM for OS/2 and Remote Stream Access Support

To make the target systems that you want to access known to DFM for OS/2, use the command **STRTDFMC**. This command starts the DFM for OS/2 communication environment and the Remote Stream Access Support functions. It has the following syntax:

**STRTDFMC [***configuration-file-specification* **[/Q | -Q] |**
**/HELP | -HELP]**

The parameters have the following meaning:

*configuration-file-specification*
Specifies the fully qualified file name of the configuration file. If no file name is specified, DFM for OS/2 searches the current directory for the file named CONFIG.DFM.

**/Q or -Q**
Suppresses the product banner message.

**/HELP or -HELP**
Displays help for the command syntax.

## Starting the DFM for OS/2 Remote Record Access Support

You start the DFM for OS/2 Remote Record Access Support component using the STRTDFMR command as follows:

```
STRTDFMR [configuration-file-specification [/Q | -Q]
          | /HELP | -HELP]
```

The parameters have the following meaning:

*configuration-file-specification*
Specifies the fully qualified file name of the configuration file. If no file name is specified, DFM for OS/2 searches the current directory for the file named CONFIG.DFM.

**/Q or -Q**
Suppresses the product banner message.

**/HELP or -HELP**
Displays help for the command syntax.

This command can only be run if the STRTDFMC command has already been successfully executed.

**Note:** To avoid inconsistent target definitions, you should use the same configuration file for both STRTDFMC and STRTDFMR.

## Stopping the DFM for OS/2 Remote Record Access Support

You stop the DFM for OS/2 Remote Record Access Support component and freeall system resources acquired by the STRTDFMR command using the following command:

```
STOPDFMR [/Q | -Q | /HELP | -HELP]
```

The parameters have the following meaning:

**/Q or -Q**
Suppresses the product banner message.

**/HELP or -HELP**
Displays help for the command syntax.

If a Remote Record Access Support application is still active, the Remote Record Access Support component waits until the application is finished.

## Stopping the DFM for OS/2 Remote Stream Access Support

Once Remote Stream Access Support is started, a background process is activated that cannot be stopped with a regular DFM for OS/2 command. However, the following situations can occur that require that the Remote Stream Access Support to stop:

- You are working with several Communications Manager configurations and want to stop the current Communications Manager configuration and start a different one. In this case, the background process of the Remote Stream Access Support still holds some resources of the previous invocation of the Communications Manager and it is not possible to start the second CM configuration.
- You install a new release of DFM for OS/2 while DFM for OS/2 is still active. In this case, the background process for the Remote Stream Access Support (DFMSFL3.EXE) is in use and cannot be replaced through the installation process.

You can stop Remote Stream Access Support two ways:

1. Shut down and restart your PC. When you restart your PC, do not start DFM for OS/2.
2. Execute “DFMDRIVE RELEASE *” to release all drive letter assignments and then stop the following processes (if they are running):
   - DFMSFL3.EXE
   - CMGRRTR.EXE

   Shut down Remote Stream Access Support this way only if you are familiar with the utilities required to stop OS/2 processes.

# Chapter 10. Working with the Configuration File

The DFM for OS/2 configuration file is the main interface for tailoring DFM for OS/2. The configuration file is used by STRTDFMC.EXE to define the communication environment, and STRTDFMR.EXE to define the resources for the Remote Record Access Support component.

Only the REMOTE_LU parameter of the DFM_TARGET keyword is required. All other parameters are optional. Comment lines are identified by a colon (:) in the first column.

The following describes how to specify values for parameters in the DFM for OS/2 configuration file.

## Conversation Control

DFM for OS/2 requires one DFM_TARGET keyword for each partner LU alias in the configuration file. At least one DFM_TARGET keyword must be specified in the configuration file. DFM for OS/2 only communicates with target systems having a corresponding DFM_TARGET keyword in the configuration file.

The syntax of the DFM_TARGET keyword is:

```
►►──DFM_TARGET──(──REMOTE_LU (partner_LU_alias)─────────────────────────►

►──┬────────────────────────────┬──┬────────────────────┬───────────────►
   │               ┌─HOLD────┐  │  └─DESCRIPTION (text)─┘
   └─CONVERSATION──┤         ├──┘
                   └─RELEASE─┘

►──┬────────────────────────────────┬──┬──────────────────┬──);──────►◄
   └─MAX_SEND_LIMIT (numeric_value)─┘  └─USERID (user-id)─┘
```

The parameters have the following meaning:

**REMOTE_LU (***partner-LU-alias***)**
Specifies the LU ID of the target system. The partner LU alias must match the Partner LU alias as defined to Communications Manager. See the *Communication Manager Configuration Guide: SNA Network Definitions, Partner LU Definitions* for details. The partner LU that is referenced by this alias must be known in the network and must be set up to support the LU 6.2 protocol.

**CONVERSATION(HOLD | RELEASE)**
Specifies the duration of the LU 6.2 conversation that DFM for OS/2 uses for communication with that target system.

**HOLD** DFM for OS/2 deallocates the conversation when the owning application program stops. Specifying the HOLD parameter reduces the response time of the target server.

**RELEASE** DFM for OS/2 deallocates the conversation when the last file on the target system has been closed. Specifying the RELEASE parameter maximizes the number of conversations available to you.

**Note:** This parameter applies only to conversations that use VSAM requests.

**DESCRIPTION (***text***)**
Specifies a string of up to 40 characters that can be used to identify the remote system. This value is displayed by the DFMDRIVE graphical user interface as a description of the remote system.

**MAX_SEND_LIMIT (***numerical-value***)**
Specifies in bytes the maximum buffer size that can be sent to the partner LU. The value of this parameter is an integer between 256 to 32767. The default value is 4096.

The MAX_SEND_LIMIT value is used by DFM for OS/2 to allocate a buffer where DDM data streams are built before they are:

- Sent to a target system
- Received from the target LU.

No DDM object (such as a DDM record) that is larger than specified on the MAX_SEND_LIMIT parameter can be sent by DFM for OS/2 to a partner LU or received by DFM for OS/2 from a partner LU. A **Resource Limits Reached** reply message is returned if an attempt is made to send an object that is larger than MAX_SEND_LIMIT. It is recommended that the MAX_SEND_LIMIT value specified be at least 16 bytes larger than the length of the largest record you want to process.

**Note:** This parameter applies to VSAM related conversations only.

To comply with the paged address space of OS/2 Version 2.0, use multiples of 4096 when specifying MAX_SEND_LIMIT to avoid wasted storage.

**USERID (***user-id***)**
Specifies the user ID for the remote LU.

After starting the communication environment with the STRTDFMC command, you are asked to supply logon information for each target system. If you have specified a value for the USERID parameter in the configuration file, you only need to supply the password for this user ID. Otherwise, you must supply both a user ID and a password.

## Local LU Profile

```
►►──LOCAL_LU── (local_LU_alias)──;──────────────────────────────────►◄
```

The parameter has the following meaning:

**LOCAL_LU (***local-LU-alias***)**
Specifies the name of the local LU alias.

The local LU alias must match the alias name that has been configured in the Communication Manager. Depending on the configuration, this corresponds either to the local node alias name or to the alias name for a local LU definition.

**Note:** Only one LOCAL_LU keyword is allowed in the configuration file.

## Default DFM Target System

```
►►──DEFAULT_DFM_TARGET── (partner-LU-alias)──;──────────────────────►◄
```

The parameter has the following meaning:

**DEFAULT_DFM_TARGET (***partner-LU-alias***)**
Specifies the name of the default target system.

This is the default name for drive letter assignment if no target system is specified. The name must match the partner LU alias name of a DFM_TARGET keyword in the configuration file. See "Conversation Control" on page 491 for more details.

If you do not specify a value for this parameter, the first system started becomes the default.

**Note:** Only one DEFAULT_DFM_TARGET keyword is allowed in the configuration file.

## Mode Name

```
►►──MODE_NAME── (mode-name)──;──────────────────────────────────────►◄
```

The parameter has the following meaning:

**MODE_NAME (***mode-name***)**
Specifies the mode name to be used by DFM for OS/2.

The mode name is used by SNA to specify the session parameters between a pair of LUs. Before it can be used, it must be configured for OS/2 Communications Manager. See the *ES OS/2 Communication Manager Configuration Guide: SNA Network Definitions, Mode Definitions* for details.

The mode name must also be known to the partner LU. In a subarea network, a MODEENT macro in the appropriate VTAM logmode table is used to identify the Mode Name. In OS/400, a CRTMODD CL- command is used.

If no value is specified, the default mode QPCSUPP is used. This mode name is also used by the 5250 Workstation feature, as well as by OS/400 PC Support.

If a mode name different from QPCSUPP is used, STRTDFMC cannot perform authorization checks before a conversation is established.

**Note:** Only one MODE_NAME keyword is allowed in the configuration file. If the MODE_NAME is configured for ES 1.0 Communications Manager, the maximum Request Unit (RU) size parameter can have significant impact on performance. The RU size should be the maximum value that fits into the hardware buffer of the communications adapter. For example, to achieve the optimum performance, RU size should be set to:

- 1500 bytes if using an Ethernet adapter
- 1920 bytes if using an IBM Token-Ring Adapter or Token-Ring Adapter/A
- 15360 bytes if using a Token-Ring 16/4 Adapter

The values you specify should match the values in the mode definition of the partner LU.

## Default Coded Character Set

```
►►──DEFAULT_CCSID──(default-coded-character-set-id)──────────────────►◄
```

The parameter has the following meaning:

**DEFAULT_CCSID(***default-coded-character-set-id***)**

Specifies the default coded character set for remote record file data. It is used for conversion of character data if no coded character set is specified in the ADL base sequence description. For more information, see “Creating an ADL Data Description” on page 519.

A Coded Character Set ID (CCSID) consists of up to five decimal digits. Leading zeros can be omitted. For example, 00500 can be specified as 500.

If you do not specify a value for this parameter, DFM for OS/2 uses the CCSID of the international Latin-1 character set (00500) as the default.

**Note:** Only one DEFAULT_CCSID keyword is allowed in the configuration file.

## Data Conversion Control for Remote Record Access Support

Data conversion for remote record file data is controlled with the FILE_DESCRIPTOR_MAP keyword. Record data of a target file with an appropriate FILE_DESCRIPTOR_MAP keyword is converted as described in the BASE_DDF and VIEW_DDF files that are specified in this entry. If no FILE_DESCRIPTOR_MAP keyword is found for a target file, the data contained in the file is not converted.

The syntax of the FILE_DESCRIPTOR_MAP keyword is: File Descriptor Map

```
►►──FILE_DESCRIPTOR_MAP──(──REMOTE_LU (partner-LU-alias)──────────────►
►──TARGET_FILENAME (remote-filename)──────────────────────────────────►
►──BASE_DDF (base_descriptor-filename)────────────────────────────────►
►──VIEW_DDF (view_descriptor-filename)──);────────────────────────────►◄
```

The parameters have the following meaning:

**REMOTE_LU (***partner-LU-alias***)**
Specifies the name of the OS/2 Communication Manager partner LU alias for identifying the DFM target system where the remote file is located. The name must match the partner LU alias name of a DFM_TARGET keyword in the configuration file.

**TARGET_FILENAME (***remote-filename***)**
Specifies the name of the remote file for conversion. The name is in the format used by the application. If the File Name Mapping Exit is used, this name may differ from that used by the target system.

The remote file name may be specified with a wildcard character, for example, DDMRR*. An asterisk in a file name indicates that any combination of characters can occupy that position in the name. A question mark in a file name indicates that any single character can occupy that position in the name. All separators must be specified in the file name.

Wildcard examples:

***** all names

***nam**
names like abcnam or cdenam

***.*nam**
names like gdm.os2nam or abc.attnam

***.nam***
names like dos.namjohn

**ab?.nam**
names like abc.nam

**Note:** The remote file name parameter is case sensitive and must match the case of the file name passed to the target server.

**BASE_DDF (***base-descriptor-filename***[.DDF])**
Specifies the name of the data description file containing the base sequence description. The data description file is the DFM for OS/2 file that was produced by the ADLTRANS conversion program. It contains the base description of the record layout for the target files in a DFM for OS/2 internal format.

*base-descriptor-filename* must be a fully qualified name. If no path or drive letter is specified, DFM for OS/2 searches for the DDF file in the current directory.

**VIEW_DDF (***view-descriptor-filename***[.DDF])**

Specifies the name of the data description file containing the view sequence description. The data description file is the DFM for OS/2 file produced by the ADLTRANS conversion program. It contains the view description of the local file in a DFM for OS/2 internal format. This is the record layout of the application's view of the target data.

*view-descriptor-filename* must be a fully qualified name. If no path or drive letter is specified, DFM for OS/2 searches for the DDF file in the current directory.

## Default Conversion Tables for Remote Stream Access Support

The optional DEFAULT_CONVERSION_TABLE keyword can be used to specify the default conversion tables for ASCII-to-EBCDIC and EBCDIC-to-ASCII character conversion. All filenames exchanged with a DFM target system are converted using these tables. The DEFAULT_CONVERSION_TABLE parameter has no influence on the conversion of record data according to the record descriptors specified in the FILE_DESCRIPTOR_MAP parameter. See Chapter 13, "Converting Record File Data" on page 517 for details.

**Note:** Only one DEFAULT_CONVERSION_TABLE keyword is allowed in the configuration file.

The syntax of the DEFAULT_CONVERSION_TABLE keyword is:

```
►►──DEFAULT_CONVERSION_TABLE──(───────────────────────────────────────►

►──ASCII_TO EBCDIC (conversion-table-filename)────────────────────────►

►──────────────────────────────────────────────────────────);─────────►◄
   └─EBCDIC_TO_ASCII (conversion-table-filename)─┘
```

The parameters have the following meaning:

**[ASCII_TO_EBCDIC(***conversion-table-filename***)]**

Specifies the name of a file that contains the ASCII to EBCDIC conversion table to be used by DFM for OS/2 stream-file applications.

**[EBCDIC_TO_ASCII(***conversion-table-filename***)]**

Specifies the name of a file that contains the EBCDIC to ASCII conversion table to be used by DFM for OS/2 stream-file applications.

If you do not specify names for the conversion tables, DFM for OS/2 takes the combination of the currently used code page and the code page 500 (EBCDIC).

## Tracing for Remote Record Access Support

Use the TRACE_BUFFER keyword to define the size of the buffer to be used for trace entries.

```
►►──TRACE_BUFFER── (integer)──────────────────────────────────────►◄
```

the parameter has the following meaning:

**(*integer*)**

Specifies the size of the internal trace buffer memory in kilobytes. The default value is 64KB. The DFM for OS/2 trace is used in wrap-around mode overwriting the oldest entries when the buffer is full. The minimum size is 1KB and the maximum size is 1000KB.

**Note:** Only one TRACE_BUFFER keyword is allowed in the configuration file. Memory is allocated when the DFMTRACE **ON** command is used for the first time. See Chapter 15, “What to Do if an Error Occurs in DFM for OS/2” on page 545 for more information on tracing.

# Chapter 11. Assigning and Releasing Drive Letters

To be able to work with files on a target system, you must first assign a drive letter on your workstation for the files on that system.

The DFM for OS/2 program DFMDRIVE provides two user interfaces and an application programming interface for assigning and releasing DFM for OS/2 drive letters. You can assign drive letters to all files on a target system or to a specific directory on a target system, release drive letters that you previously assigned, and display the status of all drive letters managed by DFM for OS/2. Up to eight drive letters can be assigned to remote systems.

**Command-Line Interface**
The command-line interface lets you assign and release drive letters by entering the appropriate function and values on the command input line. Commands can be included in a batch file to allow for automatic assignment of all target servers, for example, at OS/2 start-up time.

**Graphical User Interface**
The graphical user interface displays the target systems available for assigning drive letters. The directories available for drive letter assignment can also be listed.

**Application Programming Interface**
The DosFsAttach API function call lets you assign or release a drive letter to a target system or to a set of files on the target system at program execution time.

The term *directory* is used in a general way. It specifies a set of files on a target system that are organized logically in hierarchical collection levels. Each level has a directory name assigned. The definition of the level depends on the target system.

## Using the Command-Line Interface

The command-line interface provides a quick way of setting up drive letters. It is invoked using the command DFMDRIVE followed by a function and its values. The command-line interface is used either to assign a new drive letter or to release an existing drive letter.

Table 29 shows the format of the command-line interface commands.

*Table 29 (Page 1 of 2). Command-Line Interface Commands*

| Command | Description |
|---|---|
| [*drive*][*path*]DFMDRIVE {-\|/}HELP | Display help about the DFM for OS/2 user interface. |
| [*drive*][*path*]DFMDRIVE *function* {-\|/}HELP | Display help about a DFM for OS/2 user interface function. |

*Table 29 (Page 2 of 2). Command-Line Interface Commands*

| Command | Description |
|---|---|
| [*drive*][*path*]DFMDRIVE *function* [*values*] | Invoke a DFM for OS/2 user interface function. |

The parameters have the following meaning:

*drive*
The drive letter of the drive where DFMDRIVE is located.

*path*
The path to the directory where DFMDRIVE is located.

*function*
Is one of the following:

**ASSIGN** Assign a drive letter to a target system or to a set of files that reside on a target system.

**RELEASE** Release drive letters that you previously assigned with the ASSIGN function.

**SETPARM** Set parameter list which is to be passed to a previously assigned target system.

**STATUS** Display the assigned DFM for OS/2 drive letters.

**HELP**
Display help information.

*values*
Specify the values required for the function.

**Note:** The drive letter and path information is only necessary if DFMDRIVE is neither in the current directory and drive nor in a specified search path.

## Assigning Drive Letters

If the target system is Distributed FileManager/MVS, in addition to a directory (PDS or PDSE) name, a high-level data set name qualifier can be specified. In this case, all access to the drive is to be assumed to be prefixed by the specified qualifier. If no qualifier is provided, all access will have an implicit prefix assigned to it. The implicit prefix is the current MVS user ID.

If the target server supports a parameter list attached to the file name, it is possible to specify that parameter list while assigning the drive. For example, Distributed FileManager/MVS supports Stream Data Conversion when the string “,TEXT” is attached to file names. The parameter list (which is meaningful to the target server) can be specified at the time the drive is assigned by appending it to the directory or path name. If you do not want to limit the drive assignment to a specific path but want to specify a parameter list to apply to all files on the target system, you can use the single character backslash (\) to mean all files accessed on the target system followed by the parameter list.

To assign a drive letter, use the following command:

**DFMDRIVE ASSIGN [***drive***] [***directory[,parmlist]***] [//***sysname***]**

*drive*

The drive letter to be assigned. If no drive letter is specified, the next available drive letter is used.

*directory[,parmlist]*

The directory or path is specified to qualify a subset of files to which you want to assign a drive. Whether and how a directory or path can be specified depends on the target system. A backslash prefix to the directory or path name is optional. The directory or path is limited to a maximum of 63 characters.

If the directory or path is not specified, the drive letter is assigned to all target files or folders on the target system.

An optional parameter list can be appended to the directory or path by specifying a comma followed by the parameter list. The parameter list can have a maximum of 63 characters.

If you want to specify a parameter list for all files on the target system, you can substitute a backslash (\) as a place holder for the directory or path name followed by the comma and parameter list.

There are two syntactical techniques for expressing the *directory,parmlist* operand. You can enclose the entire *directory,parmlist* string with quotation marks. For example, to indicate a directory assignment with one parameter, enter:

```
"IBMUSER,TEXT"
```

which is identical to:

```
"\IBMUSER,TEXT"
```

To indicate all target files with one parameter, enter:

```
"\,TEXT"
```

To indicate a directory assignment combined with a series of parameters, enter:

```
"IBMUSER,PC_CCSID(437),TEXT"
```

To indicate all files with a series of parameters, enter:

```
"\,PC_CCSID(437),TEXT"
```

Alternatively, you can omit the quotation marks if you prefix the directory (or path) with a backslash (\) or substitute a backslash for a directory (or path) to mean all files. For example, to indicate a directory assignment with one parameter, enter:

```
\IBMUSER,TEXT
```

To indicate a series of parameters, enter:

```
\IBMUSER,PC_CCSID(437),TEXT
```

To indicate all files with one parameter, enter:

```
\,TEXT
```

To indicate all files with a series of parameters, enter:

```
\,PC_CCSID(437),TEXT
```

**Note:** The DFMDRIVE SETPARM command can be used to set or reset the parameter list after the DFMDRIVE ASSIGN command completes.

*sysname*
The system name of the target system. The name of the partner LU alias defined in an OS/2 Communications Manager profile. The // is required in front of the system name. If no sysname is specified, the default target system is used.

***Examples of DFMDRIVE ASSIGN:***

| **Commands** | **Explanation** |
|---|---|
| DFMDRIVE ASSIGN | Assigns the next available drive to all target files of the default target system |
| DFMDRIVE ASSIGN */HELP* | Displays help for DFMDRIVE ASSIGN |
| DFMDRIVE ASSIGN S: | Assigns drive S to all target files of the default target system |
| DFMDRIVE ASSIGN S: FLD1 | Assigns drive S to directory FLD1 of the default target system |
| DFMDRIVE ASSIGN S: \,TEXT | Assigns drive S to all target files of the default target system and attaches the parameter list ",TEXT" to all file names passed to the target system. |
| DFMDRIVE ASSIGN S: "IBMUSER,PC_CCSID(437),TEXT" //S1 | Assigns drive S to files with the high level qualifier IBMUSER on the target system named S1 (MVS only). It also attaches the parameter list ",PC_CCSID(437)" to all file names in the directory or path IBMUSER passed to S1. |
| DFMDRIVE ASSIGN S: "IBMUSER,HOST_CCSID(500),TEXT" //S1 | Assigns drive S to files with the high level qualifier IBMUSER on the target system named S1 (MVS only). It also attaches the parameter list ",HOST_CCSID(500)" to all file names in the directory or path IBMUSER passed to S1.<br>The HOST_CCSID parameter is not used to override an explicit CCSID associated with a |

file; it is only used to tag new files or to access files that have no CCSID set. See your DFM server documentation for more information about parameter processing.

## Releasing Drive Letters

To release a drive letter, use the following command:

```
DFMDRIVE RELEASE drive
```

*drive* The drive letter to release. For example, specify **f:** to release drive letter **f**. Specify an asterisk (*) to release all drive letters.

### *Examples of DFMDRIVE RELEASE:*

| **Commands** | **Explanation** |
|---|---|
| DFMDRIVE RELEASE /HELP | Displays help for DFMDRIVE RELEASE |
| DFMDRIVE RELEASE S: | Releases drive S |
| DFMDRIVE RELEASE * | Releases all drive letters |

## Setting Drive Parameter Lists

If the target system supports a parameter list attached to the file names, it is possible to specify that parameter list after the drive is assigned by using the DFMDRIVE SETPARM command.

The parameter list character string length limit is 63 characters when using DFMDRIVE SETPARM.

**Note:** The parameter list specified by DFMDRIVE SETPARM completely replaces any parameter list specified by the DFMDRIVE ASSIGN command or an earlier DFMDRIVE SETPARM command for a particular drive.

To set a drive parameter list, use the following command:

```
DFMDRIVE SETPARM drive parmlist
```

*drive* The drive which has been previously assigned with the DFMDRIVE ASSIGN command. Specify asterisk (*) to set the same parameter list for all assigned drives for which the target system accepts parameter lists. (The original status is unchanged for those drives which do not accept parameter lists.)

*parmlist* The parameter list to be passed to the target system.

***Examples of DFMDRIVE SETPARM:***

| **Commands** | **Explanation** |
|---|---|
| DFMDRIVE SETPARM S: TEXT | Sets the parameter list for drive S to “TEXT.” |
| DFMDRIVE SETPARM S: PC_CCSID(437),TEXT,LF | Sets the parameter list for drive S to “PC_CCSID(437),TEXT,LF.” |
| DFMDRIVE SETPARM * PC_CCSID(437),TEXT,LF | Sets the parameter list for all assigned drives which accept parameter lists to “PC_CCSID(437).” |

### Displaying the Status of All Drive Letters

To show the current drive assignments, use the following command:

```
DFMDRIVE STATUS
```

The status panel contains the following information:

**Drive** Lists all drive letters that are assigned.

**System Name** Shows the target system assigned to the drive letter.

**Assignment** The drive letter assignment:

**(All target files)**
An OS/2 drive letter assigned to all files of a target system.

**directory**
The qualifier used as a common prefix for all file names accessed with the assigned drive letter.

The command-line interface provides one status screen. The status screen displays the assigned drive letters, the system names, and the directories assigned to the drive letters.

### Command-Line Interface Help Screens

The command-line interface provides help screens that describe and show examples of the DFM for OS/2 commands.

## Using the Graphical User Interface

The graphical user interface consists of a set of windows that enable you to:

- Display currently assigned drive letters and their assignments
- Assign new drive letters
- Release assigned drive letters
- Display lists with system names, directory names, and directory descriptions
- Access help information to assist you when setting up drive letters.

The graphical user interface conforms to Common User Access* 1989 (CUA*) standards.

## Starting the Graphical User Interface

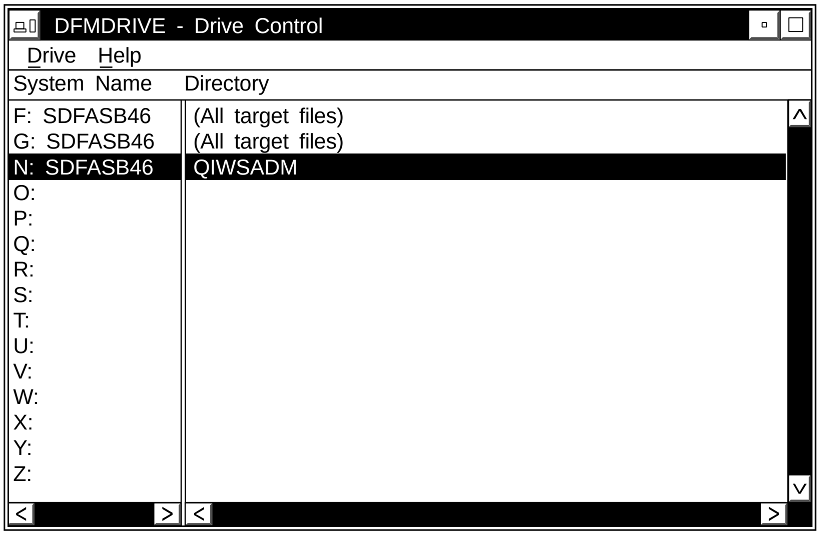
Before you can use the graphical user interface to assign a drive letter, you first have to start the DFM for OS/2 communication environment with the STRTDFMC command. See Chapter 10, “Working with the Configuration File” on page 491 for details.

You can start the graphical user interface by either:

1. Entering **DFMDRIVE** at the OS/2 command prompt.
2. Double-clicking on the DFMDRIVE icon.

### DFM for OS/2 DFMDRIVE - Drive Control Window

The **DFMDRIVE - Drive Control** window shown in Figure 93 is displayed when DFMDRIVE is started.



| System Name | Directory |
|---|---|
| F: SDFASB46 | (All target files) |
| G: SDFASB46 | (All target files) |
| N: SDFASB46 | QIWSADM |
| O: | |
| P: | |
| Q: | |
| R: | |
| S: | |
| T: | |
| U: | |
| V: | |
| W: | |
| X: | |
| Y: | |
| Z: | |

*Figure 93. DFMDRIVE - Drive Control Window*

All the drive letters available for DFM for OS/2 are displayed. If a drive letter is already assigned to a target system or to a target and a directory, the partner LU alias names and directory names are also displayed. The following information is displayed:

**System name**
Shows the drive letters you can assign. If a drive letter has been assigned to a remote system, the partner LU alias name of the remote system is also displayed.

**Directory**
Shows either the string “(All target files)” if a drive letter is assigned to all files on a target system or the explicitly assigned directory name is shown.

In Figure 93, for example, the system **SDFASB46** is assigned to the drive letter **N:**. The drive letters not in use are also listed, for example, drive letter **O:**.

The options shown in Figure 94 are available from the **Drive** pull-down.

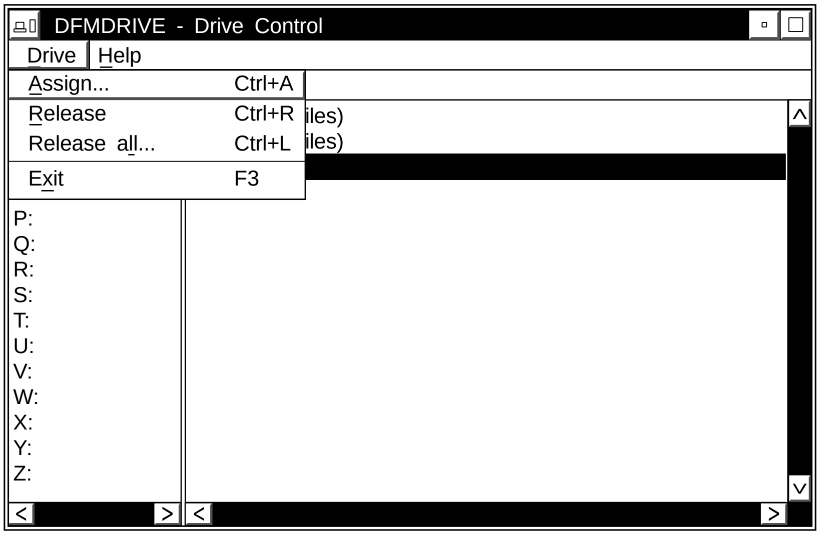


*Figure 94. Drive Pull-down*

**Assign...** Assigns a drive letter to a target system that contains the files you want to use.

**Note:** A drive letter must already be selected on the **DFMDRIVE - Drive Control window** before **Assign...** can be selected.

**Release** Releases an assigned drive letter from a target system and its directories.

If a drive letter is selected that is not assigned to a system, or if no drive letters are assigned, the action is greyed. Otherwise, the DFM for OS/2 **DFMDRIVE - Drive Control** window (Figure 93 on page 505) is displayed with updated information.

**Release all...** Release all assigned drive letters from target systems and their directories. Before releasing any drive letters, DFM for OS/2 asks you for confirmation. It then returns to the DFM for OS/2 **DFMDRIVE - Drive Control** window (Figure 93 on page 505). This action is shown grayed to indicate that it cannot be selected if no drive letters are assigned.

**Exit** Use **Exit** to return to OS/2.

*Accelerator Keys:* You can use the following accelerator keys on the drive pull-down:

**Ctrl+A** Assign
**Ctrl+R** Release

**Ctrl+L** Release all
**F3** Leave Drive Pull-down.

Figure 95 shows the options available from the **Help** pull-down. See “Getting Help” on page 511 for more information.

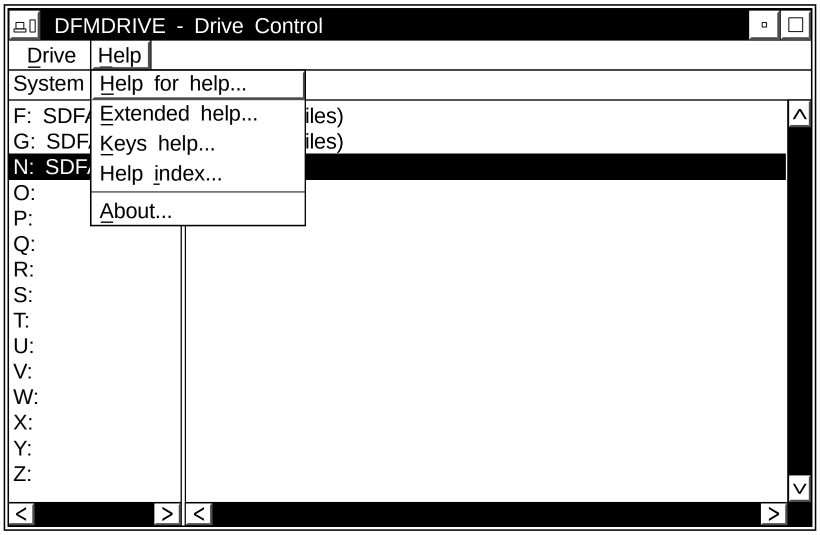


*Figure 95. Help Pull-down*

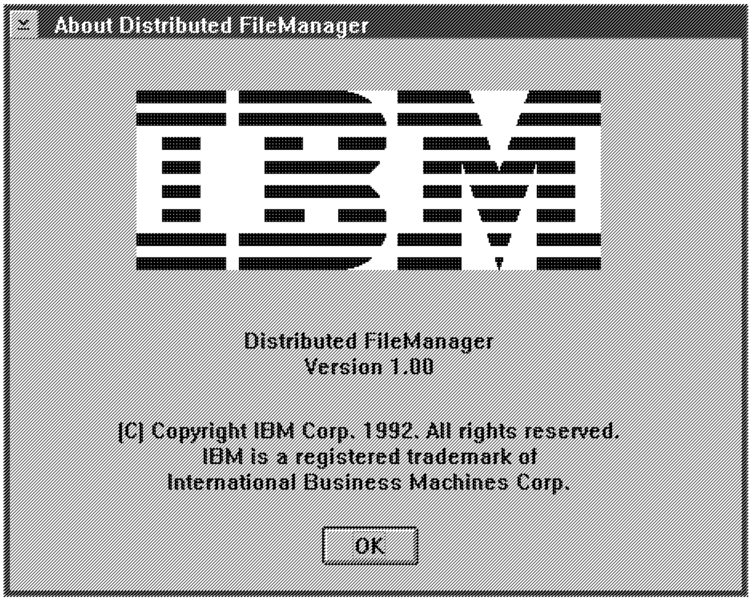
**Help for help...** To obtain information about how to use the help facility.

**Extended help...** To display information about the contents of the DFMDRIVE window that you requested help from. See Figure 99 on page 512.

**Keys help...** To display information describing the key assignments of DFMDRIVE.

**Help index...** To display an alphabetic list of all the help index entries. Selecting an item from the list displays the help for that item.

**About...** To display the DFM for OS/2 logo window.



Distributed FileManager
Version 1.00

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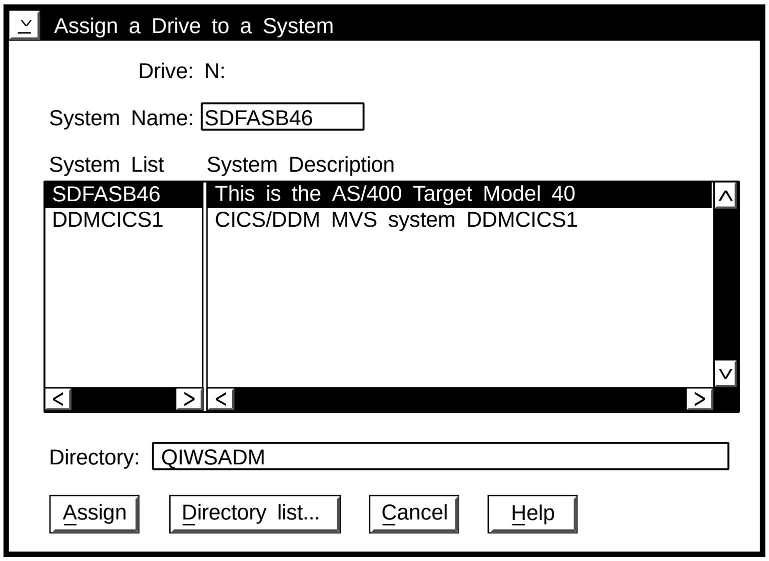
*Figure 96. The “About” Logo Window*

## Assigning a Drive Letter

To assign a drive letter, select:

1. A drive letter from the list displayed in the **DFMDRIVE - Drive Control window.**
2. Select **Assign...** from the **Drive** pull-down menu. Only one drive letter can be selected from the list at a time.

Figure 97 is displayed when **Assign...** is selected.



Assign a Drive to a System

Drive: N:

System Name: SDFASB46

| System List | System Description |
|---|---|
| SDFASB46 | This is the AS/400 Target Model 40 |
| DDMCICS1 | CICS/DDM MVS system DDMCICS1 |

Directory: QIWSADM

*Figure 97. Assign a Drive to a System*

The **Assign a Drive to a System** window (Figure 97) lets you assign a drive letter to a target system containing the files you want to use. If the drive letter is already assigned, use this window to reassign an already selected drive letter to a different target system. If you select one of the systems listed on the window, its name is displayed in the System Name field.

The following information is shown on the **Assign a Drive To a System** window:

**Drive**
The current drive letter that you are working with. This is the drive letter that you are currently assigning to a target system.

**System Name**
The system that you want to assign to that drive letter.

**System List**
Shows the target systems that can be selected for assignment.

**System Description**
Shows a description for the target system, if one has been created in the DFM for OS/2 configuration file (keyword DFM_TARGET, parameter DESCRIPTION).

**Directory**
The directory or path on the target server system that you want to assign to the selected drive letter. For example, in Figure 97, the directory QIWSADM is assigned to drive letter N: in the system SDFASB46.

An optional parameter list prefixed by a comma can be appended to the path (directory) name. When appending a parameter list to the path name either:

- Enclose the entire *path,parmlist* string with quotation marks or
- Prefix the path name with a backslash.

A single backslash used as the path name indicates all files on the target system.

The following push buttons are available:

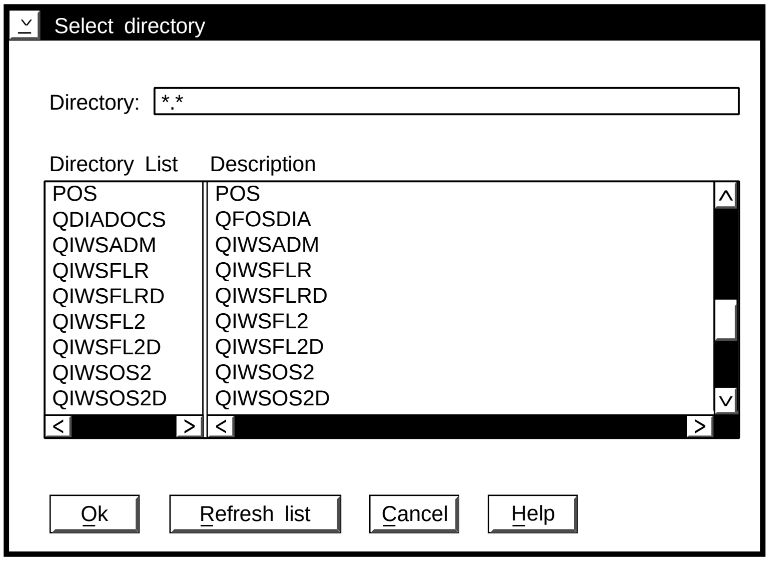
Assign    Assigns a target system to a drive letter.

Directory list...    Displays a list of the directories available. The window shown in Figure 98 is displayed.

Cancel    Closes the window displayed.

Help    Displays help information for the window displayed.

You can select a target system that you want to assign a drive letter to or select **Directory list...** to display a list of directories available on a target system. You can specify specific files that you want to use on the specific target system using the directory list. The window shown in Figure 98 is displayed when the **Directory list...** push button is selected.



Directory: *.*

| Directory List | Description |
|---|---|
| POS | POS |
| QDIADOCS | QFOSDIA |
| QIWSADM | QIWSADM |
| QIWSFLR | QIWSFLR |
| QIWSFLRD | QIWSFLRD |
| QIWSFL2 | QIWSFL2 |
| QIWSFL2D | QIWSFL2D |
| QIWSOS2 | QIWSOS2 |
| QIWSOS2D | QIWSOS2D |

*Figure 98. Select Directory Window*

The following information is displayed:

**Directory List**    Shows the directories you can assign.

**Description** Contains the description corresponding to the directory name. The description field can be up to 44 characters in length. Whether a description is given depends on the target system.

The following push buttons are available:

| | |
|---|---|
| Ok | Confirms that you want to use the directory selected. |
| Refresh list | Refreshes the list displayed. |
| Cancel | Closes the window displayed. |
| Help | Displays the help for the window displayed. |

You can select a specific directory on a target system from the list displayed, and then press the **OK** push button to confirm your selection. The **Assign a Drive to a System** window is redisplayed. If you have selected a specific directory or set of files, their names are displayed in the **Directory** field. To assign the drive letter to the target system, you now press the **Assign** push button. The **DFMDRIVE - Drive Control** window is displayed and the target system you selected is assigned to the drive letter selected.

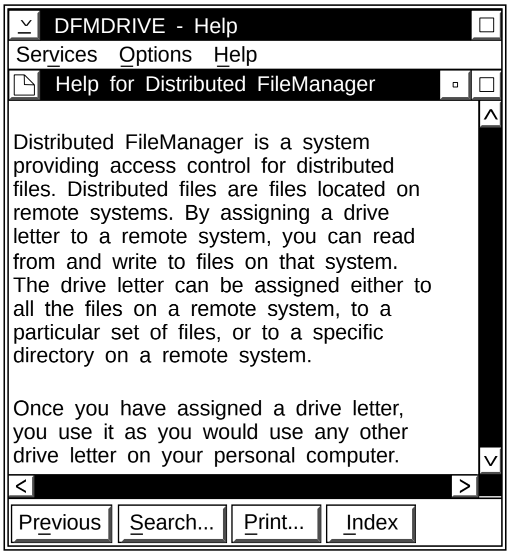
**Note:** The use of global substitution characters, wildcards, for example, * and ?, in the directory field depends on the target system.

## Getting Help

To obtain help information for DFM for OS/2:

- Select the type of help you require from the **Help** pull-down menu
- Press **F2** when the cursor is on a field
- Use the **Help** push button.

Figure 99 shows the help displayed when **Extended help...** is selected from the Help pull-down.



Distributed FileManager is a system providing access control for distributed files. Distributed files are files located on remote systems. By assigning a drive letter to a remote system, you can read from and write to files on that system. The drive letter can be assigned either to all the files on a remote system, to a particular set of files, or to a specific directory on a remote system.

Once you have assigned a drive letter, you use it as you would use any other drive letter on your personal computer.

*Figure 99. Help for Distributed FileManager*

## Using the Application Programming Interface

If the application programmer wants to assign and release the drive letters for DFM for OS/2 in the program itself, the DosFsAttach API can be used.

### Procedure Declaration

The API is provided using the OS/2 DosFsAttach function call. The return code is in the AX register returned from the call. Figure 100 shows the format of the call.

```
PUSH@   ASCIIZ  Device Name
PUSH@   ASCIIZ  FSD Name
PUSH@   OTHER   Data Buffer
PUSH    WORD    Data Buffer Length
PUSH    WORD    Operation Flag
PUSH    DWORD   0
Call    DOSFSATTACH
```

*Figure 100. Format of DosFsAttach Function Call*

The parameters have the following meaning:

**Device Name**
Pointer to a drive letter followed by a colon in ASCIIZ format.

**FSD Name**
Pointer to the ASCIIZ string DFMSFL0.

**Data Buffer**
Pointer to the data buffer.

**Data Buffer Length**
Length of the data buffer. The data buffers for the Assign and Release action are described in Table 30 and Table 31.

**Operation Flag**
The operation you want performed.

**0** Assign
**1** Release

**0** Reserved parameter. Must be set to 0. This is a double word.

## Data Buffer Structures

Table 30 shows assign buffer formats.

*Table 30. Assign Buffer Format*

| Offset | Length | Value | Description |
|---|---|---|---|
| 0 | 2 | 6 | Number of parameters. Must be set to 6. |
| 2 | 3 | | Return code qualifier. This is an ASCIIZ string. The value in this field is only valid if the return code in AX is X'58'. |
| 5 | 9 | | Name of the host system. This is an ASCIIZ string. |
| 14 | * | | Path name (maximum 63 characters). This is an ASCIIZ string. |

Table 31 shows release buffer formats.

*Table 31. Release Buffer Format*

| Offset | Length | Value | Description |
|---|---|---|---|
| 0 | 2 | | Number of parameters. |
| 2 | 3 | | Return code. This is an ASCIIZ string. |

## Return Codes

Table 32 shows the possible values of the return code in AX on the DosFsAttach call.

*Table 32. Return Codes in AX on the DosFsAttach Call*

| Return Code | Description | Explanation |
|---|---|---|
| X'00' | NO_ERROR | No error. |
| X'03' | ERROR_PATH_NOT_FOUND | The specified path was not found. |
| X'05' | ERROR_ACCESS_DENIED | Not authorized to specify path. |
| X'08' | ERROR_NOT_ENOUGH_MEMORY | Not enough memory available. |
| X'0F' | ERROR_INVALID_DRIVE | The specified drive is not valid. |
| X'15' | ERROR_NOT_READY | Shared folders function has not been started. |
| X'1F' | ERROR_GENERAL_FAILURE | Communications error occurred. |
| X'55' | ERROR_ALREADY_ASSIGNED | Drive is already assigned. |
| X'58' | ERROR_NET_WRITE_FAULT | See Table 33 for a list of the values of the return code qualifiers. |
| X'7C' | ERROR_INVALID_LEVEL | The specified operation flag is not valid. |
| X'8E' | ERROR_BUSY_DRIVE | Drive is being used by another program. |
| X'FC' | ERROR_INVALID_FSD_NAME | The FSD name is not correct or not found. |
| X'FD' | ERROR_INVALID_PATH | The specified path is not valid |

Table 33 shows return code qualifiers.

*Table 33. Return Code Qualifiers*

| Return Code | Description |
|---|---|
| X'5A' | Cannot allocate adequate resources to attach drive. |
| X'5B' | Version levels for host and PC program do not match. |
| X'5C' | System name is not correct or system is not active. |
| X'5D' | Communications manager is not active. |
| X'5E' | PC Support router is not active. |
| X'5F' | Local LU specified in CONFIG.PCS file is incorrect. |

# Chapter 12. Exploiting the DFM for OS/2 Caching Facility for Stream Files

This chapter describes how you use the DFM for OS/2 caching facility.

## About Memory Caching

The Remote Stream Access Support of DFM for OS/2 provides memory caching with read-ahead and write-behind mechanisms for byte-stream files. Where possible, local bytestream API requests are satisfied with data available from the memory buffer.

## DFM for OS/2 Memory Caching of Remote Stream Files

DFM for OS/2 provides memory caching for stream files. Stream files can be cached for either reading or writing. Since a single cache is used for each file, caching is limited to either read or write caching. For example, if writes are being cached and a read for the same file is requested, the write cache is sent to the system, and a request is sent to read data from the system.

With read caching, more data is obtained from the server than the application requests. If the read can be cached, at least twice as much data as the application requested is read from the target system and placed into cache. On subsequent reads, the request is satisfied with the data in the cache instead of retrieving the data from the server. Performance is improved if the application makes small sequential reads. If the application shows a tendency of doing random reads, DFM for OS/2 stops caching.

With write caching, the application's write data is stored in the cache buffer until the cache is full or until a random write is made. The data is then sent to the server. If the application makes many sequential writes, performance is improved.

A single large buffer is sent to the target system when the cache is cleared. This reduces the number of requests sent to the target system for processing.

Files can only be cached in the following situations:

- To cache a read request, the file must be opened with a sharing mode of deny read/write or it must be opened for read access with a sharing mode of deny write. The locality flags must not be random when the file is opened.
- To cache a write request, the file must be opened with a sharing mode of deny read/write. The locality flags must not be random when the file is opened.

# Chapter 13. Converting Record File Data

This chapter describes the types of data conversion supported by DFM for OS/2 and how you can exploit these features. A brief description of the ADL data description language is included here.

## When to Use Data Conversion

Sharing remote record file data with other applications running in heterogeneous environments requires data conversion. Data written by different applications in alien operating systems can normally not be used directly from local workstation applications without data conversion.

**Note:** If the remote system is used as a file server only, the OS/2 data is saved without the need for sharing the data and data conversion is not required. In addition, there are target systems with the same character sets and data types as the local OS/2 system.

DFM for OS/2 provides the following types of data conversion functions:

- **Character Code Point Conversion**

  To access character data created by a host application for use with a workstation application, you may want to convert the received records from the EBCDIC code page used on the host to the ASCII code page that can be used by your application. This type of conversion is called character code point conversion. See “How to Exploit Conversion of Character Data” on page 534 for a detailed description of the necessary activities to exploit character code point conversion.

- **Record Field Sequence Conversion**

  To define a selection of fields or change the sequence order of the fields from a remote file, you need the record field sequence conversion function of DFM for OS/2. “Record Field Sequence Conversion” on page 536 contains an example.

- **Data Type Conversion**

  Use data type conversion to access a certain field of a remote record and use it with a different data type than it is actually stored. For example, data type conversion is necessary if a field *A* from the host record is described as having the data type “zoned decimal numeric” but the application wants to view this field as data type “binary”.

  See “Data Type Conversion” on page 537 for a description of the possible data type conversions.

DFM for OS/2 can perform the data conversion in both directions. The data can be converted:

- As it is stored on the target system to a view required by the local application.
- From the format provided by the local application into the actual layout of the remote file.

## How to Use DFM for OS/2 Data Conversion

To use data conversion, you:

1. Describe the Data

   DFM for OS/2 supports the IBM A Data Language (ADL). You can describe your data by creating an ADL file containing the ADL data description for a file or for a view to a file.

   To define a data conversion, you need to create two ADL files containing data descriptions:

   **Base sequence** Contains the description of the record file as it is stored on the remote system.

   **View sequence** Contains the description of the workstation application's view of the remote record file.

   **Note:** There exists a permanent restriction for ADL statements that describe keyed records. The ADL statements must explicitly describe the key field or fields. For example, if a record consists completely of character data, one field is the key field and the remainder of the record is data. You must code the key description statement separately from the description for the remainder of the record.

2. Translate the ADL files into a DFM for OS/2 internal format called Data Description File (DDF). This translation can be performed explicitly using the DFM for OS/2 ADL translation utility (ADLTRANS) or implicitly when starting DFM for OS/2. See "Translating an ADL File into a DDF File" on page 533 for more information.

3. Create a FILE_DESCRIPTOR_MAP entry in the CONFIG.DFM to specify that the two Data Description Files apply to one or more files on a remote DFM target system. For more information about the FILE_DESCRIPTOR_MAP entry, see "Data Conversion Control for Remote Record Access Support" on page 494.

4. The descriptions are activated when the Remote Record Access Support function is started using STRTDFMR.

   The .DDF files that contain the base sequence and view sequence are loaded by DFM for OS/2 when the following conditions are satisfied:

   a. A FILE_DESCRIPTOR_MAP entry for the remote file specifying the associated .DDF files exists in the DFM for OS/2 configuration file.

   b. DFM for OS/2 accesses a remote file as specified in the FILE_DESCRIPT OR_MAP entry, using one of the following functions:

      DDMLoadFileFirst
      DDMOpen
      DDMUnLoadFileFirst
      DDMQueryPathInfo
      DDMCreateRecFile.

      For specific information on these VSAM functions, see Chapter 3, "VSAM API Functions" on page 45.

Each time a workstation exchanges record data with the remote file, DFM for OS/2 converts the data to correspond with the two descriptions.

If either the ADL data descriptions cannot be translated into the DDF format or if you receive a reply message when performing a data conversion function, you should analyze whether the error can be avoided by modifying the ADL source statements and repeat steps 1 to 2 on page 518. See “Analyzing Conversion Errors” on page 537 for a description of the possible conversion error situations.

## Creating an ADL Data Description

ADL is an IBM description language that provides programmers with a means of describing and converting data exported by programs so that it can be easily imported by other programs written for either a different machine architecture or a different programming language, or both.

DFM for OS/2 supports a subset of the ADL syntax for describing fixed record formats with a maximum length of 32000 bytes.

You can use an editor to write the ADL statements into ASCII files for the base and view sequence. The ADL file names should have the file extension “.ADL”.

Figure 101 and Figure 102 show the ADL syntax used for a data description for an example employee file. The sequence **EmplRecB** represents the remote file’s layout of the file:

| | | | | | |
|---|---|---|---|---|---|
| EMPNBR | LASTNAME | INITIALS | ADDRESS | AGE | HATSIZE |

The sequence **EmplRecV** represents the source application’s view of the same file:

| | | | | |
|---|---|---|---|---|
| LASTNAME | INITIALS | EMPNBR | AGE | HATSIZE |

```
/* Start of sample ADL file for a base sequence */
DECLARE
 BEGIN;
   letters:
     SUBTYPE OF CHAR LENGTH(20) CCSID(500);
   EmplRecB:
     SEQUENCE
     BEGIN;
      EmpNbr: ZONED PRECISION(6) SCALE(0) ZONENC(X'F');
      LastName: letters;
      Initials: letters LENGTH(2);
      Address: letters;
      Age: BINARY PRECISION(4) BYTRVS(FALSE) SCALE(0) RADIX(10);
      HatSize: PACKED PRECISION(5) SCALE(3);
     END;
  END;
/* End of sample ADL file for a base sequence */
```

*Figure 101. Example ADL Base Sequence Description*

```
/* Start of sample ADL file for a view sequence */
DECLARE
 BEGIN;
  letters:
    SUBTYPE OF CHAR LENGTH(20) CCSID(437);
  EmplRecV:
    SEQUENCE
    BEGIN;
    LastName: letters;
    Initials: letters LENGTH(2);
      EmpNbr: ZONED PRECISION (6) SCALE(0) ZONENC(X'3');
    Age: BINARY BYTRVS(TRUE) PRECISION(9) SCALE(0) RADIX(10);
    HatSize: PACKED PRECISION(5) SCALE(3);
    END;
 END;
/* End of sample ADL file for a view sequence */
```

*Figure 102. Example ADL View Sequence Description*

Figure 101 and Figure 102 contain examples showing the structures of ADL source files. You must specify the same field names in both sequences to define that data conversion should take place between the base format and the view of the field.

## General ADL Rules

The following rules apply to the ADL source specifications:

- ADL key words are specified in uppercase.
- ADL input is created by building one DECLARE statement.
- *Identifier*s can be one to ten characters and are case sensitive. Valid *identifiers* consist of a sequence of upper or lower case letters, numbers, and the special characters '_', '%', '&', and '?'. Each identifier must be unique within one ADL source file. ADL keywords must not be specified as identifiers.

- The attributes of data declarations can be specified once in any order. Certain attributes must be specified for specific types.
- Comments can be specified in ADL text space. They consist of the character sequence /* followed by the body of the comment and a terminator consisting of the character sequence */. The character sequence */ must appear at the end of a comment.

## ADL Statements

The following contains explanations for the various ADL statements.

The syntax is partly given in Backus Naur Form (BNF) type format. The names in <> denote grammar non-terminal symbols[2] that must be replaced by the *right-hand-side-* part of the corresponding grammar rule.

***DECLARE Statement:*** Specifies the descriptions of a set of data values.

An ADL text file consists of one DECLARE statement.

**Format**

```
<declare_statement>::=
DECLARE
BEGIN;
<opt_subtype_statem_list>
  identifier: SEQUENCE
   BEGIN;
   <data_declaration_list>
END;
END;
```

***SUBTYPE Statement:*** Declares a SUBTYPE of an ADL type and a collection of its attributes.

**Format**

```
<subtype_statement> ::=
<subtype_identifier> : SUBTYPE OF <type> ;
```

Rules:

- SUBTYPE statements are derived by applying the rules for <opt_subtype_statement_list>.

[2] *non-terminal* represents syntactical notions. The start symbol of a BNF grammer that is a non-terminal symbol is used to derive a final program source that consists of ‘terminal” symbols only by applying production rules. Each non-terminal symbol is replaced by the symbols of the appropriate production rule.

- If the SUBTYPE statement refers to a predefined subtype identifier, the attributes must be consistent. The list of attributes may be empty.
- If the SUBTYPE instance is specified, the referenced SUBTYPE must not result in a loop of SUBTYPE references.
- Nested SUBTYPEs can result in a loop and should not be used. See also “ADL Data Declarations” for valid data declarations.
- The identifier of a SUBTYPE can be used in a SEQUENCE that follows as a data declaration of a field. When the SUBTYPE identifier is encountered, it is replaced by the definition values it defines.
- The attributes list of a defined SUBTYPE may be empty, for example, if the current SUBTYPE statement is referring to an existing subtype identifier. At the point of the final data declaration, all required attributes must be available.

Examples: In Figure 103, the data declaration for `LastName` contains the identifier “character” which has been declared as a subtype. The declared attributes (LENGTH(1) CCSID(500) also automatically apply to `LastName`. Any explicit specification of a type, for example, LENGTH(20) for `LastName`, overwrites the setting from the SUBTYPE definition. The data declaration for `LastName` is CHAR LENGTH(20) CCSID(500).

```
DECLARE
  BEGIN;
   character: SUBTYPE OF CHAR LENGTH(1) CCSID(500);
   integer: SUBTYPE OF BINARY BYTRVS(TRUE) PRECISION(4) RADIX (10);
   Address: SEQUENCE
   BEGIN;
     EmpNbr: ZONED PRECISION(6) SCALE(0) ZONENC(X'F');
     LastName: character LENGTH(20);
     Children: integer;
   END;
  END;
```

*Figure 103. Example Data Declaration*

## ADL Data Declarations

Data declarations are derived by applying the rules for <data_declaration_list>.

**Format**

```
<data_declaration_list> ::= <data_declaration>
                        |   <data_declaration_list> <data_declaration>

<data_declaration>      ::= identifier : <type> ;
```

The following ADL data types are derived using <type> rules.

***ASIS Data Declaration:*** Declares an instance of the ASIS type. The actual type of this data is unknown. A field is declared as an ASIS field if either its type cannot be expressed by other ADL terms or if its data value is not to be converted.

**Format**

```
ASIS
    LENGTH(integer)
    UNITLEN(8)
```

Rules:

1. LENGTH and UNITLEN are required attributes.
2. The *integer* value of the LENGTH attribute must be specified as a decimal value in the range of 1 to 32000. The unit of measurement is in bytes.
3. The value for UNITLEN must be 8.

Example: This example declares `hello` to be a 5-byte field in which no conversions are to take place.

```
hello: ASIS LENGTH(5) UNITLEN(8);
```

***BINARY Data Declaration:*** Declares an instance of the BINARY type that is a fixed-point, binary encoded numeric field.

1. A fixed-point, binary-encoded number is represented as a bit string as shown in Figure 104.

X: BINARY BYTRVS(FALSE) PRECISION(9) SCALE(0) RADIX(10);

is represented by the 32-bit, binary field:

```
s p p p p p p p p p p p p p p p p p p p p p p p p p p p p p p p
```

The bits are labeled:

s = sign bit - 1 bit
p = bits in which the significant digits of the value are stored as an integer.
31 bits are required to represent a value up to $2^{31}$

*Figure 104. Layout of a Signed BINARY Field*

The first bit of the signed number represents the sign, and the remaining bits represent the binary encoding of the number. Positive numbers are represented in true binary notation with the sign bit set to zero. Negative numbers are represented in two's complement notation with a one in the sign bit position.

2. Binary scaling is calculated with a radix of 10, and the scaling factor is specified as a power of 10. The scale value specifies the number of decimal digits to the right

of the decimal point. The actual value of a fixed-point number is given by the formula:

```
Actual_Value = Store_Value * 10**(-SCALE)
```

**Format**

```
BINARY
      PRECISION (integer)
      RADIX (10)
      BYTRVS (<bool>)
      SCALE (integer)
```

Rules:

1. PRECISION and RADIX are required attributes. The value for RADIX must be 10.
2. The PRECISION attribute specifies the maximum number of decimal digits that can be encoded in a BINARY field.
3. The *integer* PRECISION value must be in the range of 1 to 9.
4. TRUE and FALSE are the valid values for the BYTRVS attribute.
5. If BYTRVS(TRUE) is specified, the field is encoded in byte-reversed order.
6. The *integer* SCALE value must be in the range of 0 to 9. The value 0 is assumed if the SCALE attribute is omitted.
7. A SCALE of less than 0 is not supported. The maximum value of SCALE is determined by the values for PRECISION in Table 34.
8. Size of the binary number is determined by the values for PRECISION in Table 34.

*Table 34. PRECISION Values for Determining Field Size*

| PRECISION (digits) | Field Size (bits) | max SCALE value |
|---|---|---|
| 1 - 4 | 16 | 4 |
| 5 - 9 | 32 | 9 |

Examples: In the following examples, the bits of a BINARY field are defined by: `s = sign bit` and `p = precision bit`.

Signed BINARY field:

X: BINARY BYTRVS(TRUE) PRECISION(4) SCALE(0) RADIX(10);

```
bit   │p│p│p│p│p│p│p│p│s│p│p│p│p│p│p│p│
      │1│1│1│1│0│0│0│0│1│1│1│1│1│1│1│1│
```

```
Field Low Bound     = -32768
Field High Bound    = 32767
Scale Factor        = 10**(-0) = 1
Stored Value        = X'F0FF'
Byte-Reversed Value = X'FFF0' = -16
Actual Value        = -16 * 1 = -16
```

This declaration represents the BINARY number `9.999`.

```
BINARY BYTRVS(FALSE) PRECISION(4) SCALE(3) RADIX(10);
```

Stored value:

| | |
|---|---|
| 27 | 0F |

***CHAR Data Declaration:*** Declares an instance of the CHAR type which is a fixed-length string of characters.

**Format**

```
CHAR
     LENGTH (integer)
     CCSID (integer)
```

Rules:

1. The LENGTH attribute is a required attribute, its *integer* value must be in the range 1 to 32000. The unit of measurement is bytes.
2. The Coded Character Set Identifier (CCSID) or code page of a field is defined by the IBM Character Data Representation Architecture (CDRA).

   If the CCSID attribute is specified, it applies only to the field value being described and not to the attributes of the field being declared. See “How to Exploit Conversion of Character Data” on page 534 for more details.
3. The range of the valid *integer* values for the CCSID attribute is 0 to 65535.
4. The hierarchy of CCSID attributes is as follows:
   a. <data declaration statement>
   b. The CCSID of the environment.
5. If the CCSID(0000) is specified for a lower level entity in the hierarchy, the CCSID attribute is inherited from the next higher level of the hierarchy.
6. If the CCSID(65535) is specified, the encoding of a character string is not defined and no data conversion occurs.
7. If no CCSID attribute is defined, DFM for OS/2 obtains the related code page for a field through DOSQueryCP for source system. For the target system, the default code page 500 is used. See “How to Exploit Conversion of Character Data” on page 534 for details.

Examples:

1. This example declares *lastname* to be a character string of length 20 that is encoded as defined by CCSID 500.

   ```
   lastname: CHAR LENGTH(20) CCSID(500);
   ```

2. This example declares `poem` to be a character string in CCSID 437:

   ```
   poem: CHAR LENGTH(40) CCSID(437);
   ```

***FLOAT Data Declaration:*** Declares an instance of the FLOAT type, a floating-point numeric field.

A **floating-point number** is a bit string characterized by the three components:

- Sign
- Signed exponent
- Significand.

A floating-point number is represented in storage in one of the formats specified by the <FORM attribute>. Its numerical value, V, may be derived from its stored representation as follows:

```
e = C-b
V = (S*(B**e))*((-1)**s)
```

The terms of these expressions are defined as follows:

**Term** — **Definition**

**Sign (s)** — The high-order bit in the stored representation of the number. The value of the number is considered to be positive or negative depending on whether the sign is zero or one respectively.

**Exponent (e)** — The component of a floating-point number that normally signifies the integer power to which the **base** is raised in determining the value of the represented number. The exponent is not stored directly. It is converted first to a **characteristic**.

**Base (B)** — The number to which the exponent is applied when determining the numerical value of a floating-point number. The base used depends on the format.

**Characteristic (C)** — The sum of the exponent and a constant (**bias**) chosen to make the range of the stored representation. The characteristic is stored in the bits immediately following the sign. The length of the characteristic depends on the format.

**Bias (b)** — A constant that is added to the exponent to create the unsigned characteristic is stored to represent the exponent. The bias used depends on the format.

**Significand (S)** The component of a floating-point number specifying the value to be multiplied by the base raised to the power of the exponent. The length and interpretation of the significand depends on the format.

Different formats of the FLOAT data type accommodate either binary or hexadecimal representations of floating-point numbers.

HEXADECIMAL Formats:

In hexadecimal floating-point numbers, the significand consists of an implicit leading zero bit to the left of its implied binary point and a fraction field to the right. The significand is stored following the characteristic in the representation of the number.

A value that is stored in the significand can be normalized to represent it with the greatest precision possible for a given format. Normalization is done by taking the value in hexadecimal form and shifting left or right until the first digit to the right of the hexadecimal point is nonzero and all digits to the left of the hexadecimal are zero. The exponent is reduced by the number of hexadecimal digits that were shifted left or increased by the number of hexadecimal digits that were shifted right. The result is stored in the significand.

Up to three leftmost bits of the significand of a normalized hexadecimal floating-point number may be zeroes, since the nonzero test applies to the entire leftmost hexadecimal digit. Thus, the guaranteed binary precision is three less than the maximum binary precision.

There are two values that represent zero: +0 and -0. A true zero is a floating-point number with a zero sign, characteristic, and significand.

There are three formats of hexadecimal floating-point numbers:

*Table 35. Hexadecimal Floating-Point Numbers*

| <form> values | Format | Sign | Character-istic | Bias | Significand | Length |
|---|---|---|---|---|---|---|
| FH32 | single | 1 bit | 7 bits | 64 | 6 hex digits | 32 bits |
| FH64 | double | 1 bit | 7 bits | 64 | 14 hex digits | 64 bits |
| FH128 | extended | 1 bit | 7 bits | 64 | 28 hex digits | 128 bits |

Single precision hexadecimal floating-point numbers, FORM(FH32), are represented as follows:

```
┌────┬──────────────┬───────────┐
│sign│characteristic│significand│
└────┴──────────────┴───────────┘
0    1              8          31
```

Double precision hexadecimal floating-point numbers, FORM(FH64), are represented as follows:

```
┌─────┬───────────────┬────────────┐
│sign │characteristic │significand │
└─────┴───────────────┴────────────┘
0     8               8           63
```

Extended precision hexadecimal floating-point numbers, FORM(FH128), are represented as follows:

```
┌─────┬───────────────┬─────────────────────────┐
│     │high—order     │leftmost 14 hex digits of│
│sign │characteristic │28 hex digit significand │
└─────┴───────────────┴─────────────────────────┘
0     1               8                        63
┌─────┬───────────────┬─────────────────────────┐
│     │low—order      │rightmost 14 hex digits of
│sign │characteristic │28 hex digit significand │
└─────┴───────────────┴─────────────────────────┘
64    65            72                        127
```

The characteristic and sign of the high-order part are the characteristic and sign of the extended floating-point number. If the high-order part is normalized, the extended number is considered normalized. When an extended floating-point number is operated on, the sign of the low-order part is set to the same as that of the high-order part, and unless the result is a true 0, the characteristic of the low-order part is made 14 less than that of the high-order part. If the subtraction of 14 from the high-order part is less than zero, the low-order characteristic is made 128 larger than the correct value. When an extended floating-point field is initialized, the low-order part may be set to a true zero if the low-order significand is zero. The preceding guarantees that both parts of the extended floating-point field are valid long floating-point numbers and can each be used as a long floating-point field.

BINARY Formats:

In binary floating-point numbers, the significand consists of an explicit or implicit integer bit to the left of its implied binary point and fraction bits to the right. The significand is stored following the characteristic in the representation of the number.

A value is normalized in order to represent it with the greatest precision possible for a given format. Normalization is done by taking the value in binary form and shifting left or right until a single binary one is to the left of the binary point. The exponent is reduced by the number of bits shifted left or increased by the number of bits shifted right. The resulting normalized significand is stored according to the format.

A denormalized value occurs when a normalized value would require an exponent value smaller than the minimum exponent for the format. In this case, the value is shifted left until the exponent equals the minimum exponent for the format. The resulting denormalized significand is stored according to the format of the number. The integer bit is zero and the stored significand may have leading zeroes. The characteristic is set to zero to signal that this number is denormalized.

There are two values which represent zero: +0 and -0.

There are two formats for binary floating-point numbers:[3]

*Table 36. Binary Floating-Point Numbers*

| <form> values | Format | Sign | Characteristic | Bias | Significand | Length |
|---|---|---|---|---|---|---|
| FB32 | single | 1 bit | 8 bits | 127 | 23 bits | 32 bits |
| FB64 | double | 1 bit | 11 bits | 1023 | 52 bits | 64 bits |

Single precision binary floating-point numbers, FORM(FB32), are represented as follows:

```
 +------+----------------+------------+
 | sign | characteristic | significand|
 +------+----------------+------------+
 0      1                9           31
```

In the single format, the integer bit of the significand is implicit and not stored. The implied binary point is to the left of the first bit of the stored significand.

Double precision binary floating-point numbers, FORM(FB64), are represented as follows:

```
 +------+----------------+------------+
 | sign | characteristic | significand|
 +------+----------------+------------+
 0      1               12           63
```

In the double format, the integer bit of the significand is implicit and not stored. The implied binary point is to the left of the first bit of the stored significand.

**Format**

```
FLOAT
      FORM (<form>)
      BYTRVS (<bool>)
```

Rules:

1. FORM is a required attribute. It specifies the form of a floating point number. See Table 37 on page 530 for the valid FORM values.
2. TRUE and FALSE are the valid values for the BYTRVS attribute.

[3] The single and double forms are defined by the *IEEE Standard for Binary Floating-Point Arithmetic, ANSI/IEEE Std 754-1985*. The extended form is defined by the *Intel 387*$^{\text{TM}}$ *DX User's Manual, Programmer Reference*. The extended form is equivalent to the double extended format of the *IEEE Standard for Binary Floating-Point Arithmetic, ANSI/IEEE 754-1985*.

3. The value for BYTRVS must be TRUE if a field is encoded in byte-reversed order.
4. The precision values that can be achieved by the different forms are displayed in Table 37.

*Table 37. FORM Values*

| <**form**> | **Value** |
|---|---|
| FH32 | 24 binary digits |
| FH64 | 56 binary digits |
| FH128 | 112 binary digits |
| FB32 | 24 binary digits |
| FB64 | 53 binary digits |

Examples:

1. A normalized single precision hexadecimal 32-bit FLOAT field:

```
x : FLOAT FORM(FH32) BYTRVS(FALSE);
The stored value of x is x'41600000'
6.0 is stored as a normalized FLOAT number.
s = sign = 0
C = characteristic = x'41' = 65
e = exponent       = C - bias = 65 - 64 =1
S = significand    = x'600000' = 0.375
x = (-1)**0 * 0.375 * 16**1 = 6.0
```

2. A normalized single precision binary FLOAT field:

```
x : FLOAT FORM(FB32) BYTRVS(TRUE);
The stored value of x is x'0000C040'
The byte reversed value of x is x'40C00000' = 6.0
s = sign = 0
C = characteristic = b'10000001' = x'81' = 129
e = exponent       = C - bias = 129 - 127 = 2
since 0 < C < 255 then the number is normalized
S = significand    = b'10000000000000000000000' = 1 +0.5 = 1.5
x = (-1)**0 * 1.5 * 2**2 = 1 * 1.5 * 4 = 6.0
```

***PACKED Data Declaration:*** Declares an instance of a packed decimal field.

A packed decimal field is a sequence of 4-bit strings representing decimal digits (0-9) followed by an optional 4-bit sign position. If required, the field is extended on the left to a multiple of 8-bit length.

A packed decimal field is represented as a sequence of 8-bit bytes consisting of an optional sign position and a sequence of hexadecimal representations of decimal digits.

**Note:** All DFM for OS/2 packed numbers are signed.

**Format**

```
PACKED
      PRECISION (integer)
      SCALE (integer)
```

Rules:

1. The PRECISION attribute is required. Its *integer* value must be in the range of 1 to 31. It specifies the maximum number of a significant digit or of significant digits in a PACKED field. However, if the PRECISION value is even, the number of digits stored in a PACKED field may be one greater than the PRECISION value.
2. The *integer* SCALE value must be less than or equal to the number of significant digits. It specifies the number of decimal digits to the right of the decimal point when the number is in base 10 representation. If SCALE is omitted, a value of zero is assumed.
3. Numbers are stored in PACKED fields as integers. The actual value depends on SCALE as defined by:

   ```
   Actual_Value = Stored_Integer_Value*(10**(-SCALE))
   ```

Examples: In the following examples, the half-bytes of a PACKED field are defined by: `s = sign digit` and `p = precision digit`.

A packed decimal field with PRECISION and SCALE:

```
X: PACKED PRECISION(7) SCALE(2);

byte    0       1       2       3

    | p | p | p | p | p | p | p | s |


Where p is x'0' to x'9' and s is sign
Hexadecimal digits A, C, E and F represent a plus sign,
while B and D represent a minus sign.
Number Stored:

byte    0       1       2       3

    | 0   0 | 0   0 | 0   1 | 7   C |

Value = 0000017 * 0.01 = 0.17
```

This declaration represents the PACKED number `123.45`.

```
PACKED PRECISION(6) SCALE(2);
```

Stored value:

| | | |
|---|---|---|
| 12 | 34 | 5F |

This example declares `weight` to be a PACKED field represented with 6 significant decimal digits.

```
weight: PACKED PRECISION(6) SCALE(0);
```

### *ZONED Data Declaration*

**Format**

```
ZONED
      PRECISION (integer)
      SCALE (integer)
      ZONENC (<zonenc>) ;
```

Rules:

1. The PRECISION attribute is required. Its *integer* value must be in the range of 1 to 31.
2. The length of a ZONED field in bits is PRECISION attribute *8. It defines the maximum number of significant digits in a ZONED field.
3. The SCALE attribute is optional. Its valid *integer* values must be in the range of 0 to 31. A default value of 0 is assumed if the SCALE attribute is missing.
4. SCALE specifies the number of decimal digits to the right of the decimal point when the number is in base 10 representation.
5. The ZONENC attribute is required. Valid <zonenc> values are X'3' or X'F'. It specifies the encoding of the zone portion of ZONED field for all bytes except the sign.
6. The minimum alignment of a ZONED field is byte alignment.

Declares an instance of the ZONED type that is a zoned decimal numeric field.

1. A zoned decimal field is a sequence of bytes each containing a representation of a decimal digit (0-9) in its right-most 4 bits, and each normally containing a zone encoding in its left-most 4 bits. The zone encoding normally causes the byte to print as a numeric character. For example, the digit 9 could be encoded as X'F9', representing the value X'9' and would print as the character 9 in CCSID(500).
2. The representation of the sign is defined in place of the ZONE portion of the *right-most digit*. A hex X'A', X'C', X'E' or X'F' is used for positive numbers and a X'B' or X'D' for negative numbers.
3. The maximum number of significant digits in a ZONED field is specified by the PRECISION attribute.

Examples: In the following examples, the half-bytes of a ZONED field are defined by: `z = zone half-byte` and `p = precision half-byte`.

ZONED with precision and a X'F' zone.

```
X: ZONED PRECISION(4)  ZONENC (X'F');
```

```
byte    0       1       2       3
    ┌───┬───┬───┬───┬───┬───┬───┬───┐
    │ z │ p │ z │ p │ z │ p │ s │ p │
    └───┴───┴───┴───┴───┴───┴───┴───┘
```

```
z=X'F'
s=X'A' X'C' X'E' or X'F' for positive
or X'B' or X'D' for negative
```

This declaration represents the ZONED number `32.10` with a precision of 4 significant digits.

```
ZONED ZONENC(X'F') PRECISION(4) SCALE(2)
```

Stored value:

| | | | |
|---|---|---|---|
| F3 | F2 | F1 | F0 |

`X` is a ZONED field that can be printed as an EBCDIC number.

```
  X: ZONED PRECISION(3) ZONENC(X'F') SCALE(0);
```

Likewise, the preferred sign zone encoding in ASCII is:

```
  X'3' for unsigned and positive
  X'7' for negative
```

`Y` is a ZONED field that can be printed as an ASCII number.

```
  Y: ZONED PRECISION(3) ZONENC(X'3') SCALE(0);
```

## Translating an ADL File into a DDF File

You use the ADLTRANS utility to translate an ADL data description file into a file containing the DFM for OS/2 internal DDF format. This translation is performed only if the syntax of the ADL data description file is correct. Otherwise, a message is displayed identifying the failing statements.

ADLTRANS uses the following conventions:

- The input file to ADLTRANS that contains the ADL statements for record descriptions must have the extension ".ADL".
- The output file of ADLTRANS that contains the DFM for OS/2 internal format of these descriptions has by default the same file name as the associated input file with the extension ".DDF".
- The output file of ADLTRANS is written into the same directory as the input file unless a fully qualified file name is specified using the **/O** option.

## Explicit ADL Translation

You invoke the ADL translation utility using the following command:

```
ADLTRANS [adl_filename[.ADL][/Q|-Q]
          [/O|-O ddf_filename] |
          [/HELP|-HELP]
```

The parameters have the following meaning:

*adl_filename*
Is the file name of the ADL file to be translated into a data description file. The file name is either a fully qualified file name or a file in the current working directory. It must have the extension ".ADL".

**/Q or -Q**
Suppress the product banner message.

**/O or -O** *ddf_filename***[.DDF]**
Specify the name of the output data description file. The file name is either a fully qualified file name or a file in the current working directory. If the file name is not specified, the output is written to the file *ddf_filename*.DDF.

**/HELP or -HELP**
Display help for the command syntax. All other parameters are ignored if this is specified.

**Note:** If you created a new DDF file while running your DFM for OS/2 system and the conditions specified in "How to Use DFM for OS/2 Data Conversion" are satisfied, the new file is used for data conversion.

## Implicit ADL Translation

If ADLTRANS is not called to translate an ADL file, DFM for OS/2 detects this when STRTDFMR.EXE is invoked. DFM for OS/2 performs the ADL translation utility implicitly for each file satisfying the following conditions:

1. The file is defined in the DFM for OS/2 configuration file with BASE_DDF and VIEW_DDF entries.
2. The .DDF file does not exist or is older than the .ADL file.

Automatic ADL translation can be suppressed if there is no FILE_DESCRIPTOR_MAP entry in the CONFIG.DFM

## How to Exploit Conversion of Character Data

Character code point conversion of file data applies to the DFM for OS/2 Remote Record Access Support only. Stream file data cannot be converted using DFM for OS/2.

To convert a character field or an entire record from a host code page to a workstation code page or from a workstation code page to a host code page, you have to specify the related Coded Character Set ID (CCSID) for both the base and view field.

Figure 105 shows a base sequence specifying an EBCDIC Code Page with the CCSID 500.

```
/* ADL description for a remote record encoded in an EBCDIC code page */
DECLARE
 BEGIN;
   BaseRec:
     SEQUENCE
     BEGIN;
       Field1: CHAR LENGTH(80) CCSID(500);
     END;
  END;
```

*Figure 105. Base Sequence Specifying an EBCDIC Code Page*

Figure 106 shows a view sequence specifying an ASCII code page 437.

```
/* ADL description for a local view encoded in an ASCII code page */
DECLARE
 BEGIN;
  ViewRec:
    SEQUENCE
    BEGIN;
       Field1: CHAR LENGTH(80) CCSID(437);
    END;
 END;
```

*Figure 106. View Sequence Specifying an ASCII Code Page*

In the example shown in Figure 105 and Figure 106, the data in the file on the target system is stored using the EBCDIC code page 500 (International Latin-1), and the application uses the ASCII code page 437 (PC Base) to view this data. The entire record with the length of 80 can then be converted from code page 500 to code page 437 and from code page 437 to code page 500.

To use the default setting being used by DFM for OS/2, you can omit the CCSID in the data descriptions for a character field. If you omit the CCSID for a field of the local view, DFM for OS/2 defaults the value to the code page specified for your OS/2 system or process. If you omit the CCSID for a field of the base description, DFM for OS/2 uses the value specified with the DEFAULT_CCSID keyword in the CONFIG.DFM. If there is no DEFAULT_CCSID specified in the CONFIG.DFM file, CCSID 500 is assumed.

## Conversion Tables for Character Code Point Conversion

DFM for OS/2 uses conversion tables to convert between code pages. A conversion table is a file that translates the numeric value of a character in one code page to the numeric representing the character in another code page.

The CCSID specified in the data description is directly related to the Code Page Global Identifier (CPGID) that is used to determine the required conversion table.[4]

Table 38 lists the pairs of CPGIDs most commonly used.

**Note:** The CCSID and the CPGID are identical in these cases.

*Table 38. DFM for OS/2 Conversion Tables*

| **EBCDIC CPGID** | **ASCII CPGID** | | | | |
|---|---|---|---|---|---|
| | **00437**<br>**USA** | **00850**<br>**Latin-1** | **00860**<br>**Portugal** | **00863**<br>**Canada** | **00865**<br>**Denmark**<br>**Norway** |
| 00037 USA, Canada | • | • | • | • | • |
| 00273 Austria, Germany | • | • | • | • | • |
| 00277 Denmark, Norway | • | • | • | • | • |
| 00278 Finland, Sweden | • | • | • | • | • |
| 00280 Italy | • | • | • | • | • |
| 00284 Spain | • | • | • | • | • |
| 00285 UK | • | • | • | • | • |
| 00297 France | • | • | • | • | • |
| 00500 International Latin-1 | • | • | • | • | • |
| 00871 Iceland | • | • | • | • | • |

For every bullet in Table 38, there are two conversion tables, EBCDIC-to-ASCII and ASCII-to-EBCDIC, that are automatically loaded when DFM for OS/2 needs the tables for the first time.

Any other CDRA defined conversion table delivered with DFM for OS/2 in the sub-directory \CONVTABL of the DFM for OS/2 system directory can be used for character conversion. A complete list of supported pairs of CPGIDs is shown in Appendix A, “CDRA Character Conversion Tables for Remote Record Access Support.”

DFM for OS/2 Version 1.00 supports only single byte to single byte conversion.

## Record Field Sequence Conversion

The base description and the view description normally describe the same set of fields which are ordered in the same sequence in both descriptions. You can define a modified view to the remote record file:

[4] DFM for OS/2 maps a CCSID into the related CPGID according to the IBM Character Data Representation Architecture. If no mapping is found, DFM for OS/2 uses the given CCSID as the CPGID.

- The sequence of fields can differ between the base description and the view description
- The view description can select a subset of the fields from the base description.

The sample ADL descriptions contained in Figure 101 and Figure 102 show the two record field sequence conversion possibilities. The view rearranged the sequence of fields in the base sequence and omitted one of the base fields ('Address').

If you are using a view with less fields than being described in the base description, read-only access to the remote file is permitted. Any attempt to open a file with either a modify or an insert access intent is rejected.

## Data Type Conversion

Figure 107 lists the data type conversions provided by DFM for OS/2. For example, the field “ZIP” is defined in the base sequence description as having the data type PACKED. You can define a view sequence containing the same field name “ZIP” that is associated with data type BINARY.

| | ASIS | BINARY | CHAR | FLOAT | ZONED | PACKED |
|---|---|---|---|---|---|---|
| ASIS | O | O | O | O | O | O |
| BINARY | O | X | - | X | X | X |
| CHAR | O | - | X | - | - | - |
| FLOAT | O | X | - | X | X | X |
| PACKED | O | X | - | X | X | X |
| ZONED | O | X | - | X | X | X |

**ASIS** is an unknown type,
**BINARY** is a fixed point, binary encoded numeric field,
**CHAR** is a fixed length string of characters,
**FLOAT** is a floating point field,
**PACKED** is a packed decimal numeric field,
**ZONED** is a zoned decimal numeric field.

*Figure 107. DFM for OS/2 Data Type Conversion Table*

```
 X  = Valid combination, conversion is performed.
 O  = Valid combination, no conversion is performed.
'-' = Invalid combination, untranslatable data.
```

## Analyzing Conversion Errors

Figure 107 shows which data types are compatible. Data conversion is only attempted for compatible combinations. Even when the data types are compatible, errors can occur in conversion. These are dependent on the actual data value in the field to be converted. See Table 39 for details.

If an error occurs during data conversion, DFM for OS/2 returns a XLATERM, Translation Error Reply Message. The server diagnostic value returned with this reply message indicates the kind of detected problem. See “XLATERM (Translation Error)” on page 469 for an explanation of the returned reply message information.

**Note:** If you are working with VSAM using a High Level Language compiler (for example, PL/1, C or COBOL), the VSAM reply messages returned to the application program are dependent on the application program.

*Table 39 (Page 1 of 2). Conversion Errors*

| ***Server Diagnostic Information*** | ***Condition Detected*** | ***DFM for OS/2 Result*** |
|---|---|---|
| 0001 | Rounding warning.<br>This is detected when there are more significant digits in the decimal portion of the input field than are allowed in the output number. | If the first digit that does not fit in the output field is greater than or equal to five, one is added to the number. This is termed **rounding-up**. If the first digit that does not fit in the output field is less than five, the number is unchanged. This is termed **rounding-down**.<br>**Note:** A condition can occur in which the number would otherwise be incremented, rounded up, but that number is already at its maximum value. If the number was incremented, a range error would occur. In this case, the number is left unchanged, rounded-down. |
| 0002 | Truncation warning.<br>Occurs in character code point conversions when there is more data than allowed in the output field. | Data is truncated on the right and the maximum amount of data possible is placed in the output field. |
| 0101 | Range error.<br>This occurs when there are more significant digits in the whole portion of the input number than are allowed in the output number. The data does not fit in the specified output field. | For range errors, the data that is placed into the field is the maximum value possible for that field length and scaling factor specification if the value of the number is positive. If the number was negative, the minimum value is used.<br>For floating point numbers, this error occurs when the exponent cannot fit. It is either too large or too small for the output format. In this case, the maximum value if it is too large, or minimum value if it is too small, is placed in the output field.<br>In cases in which the data is being sent to a target system, this record and all that follow are not sent to the target. If the data is in the process of being received, the application can determine whether to accept the record. |

*Table 39 (Page 2 of 2). Conversion Errors*

| ***Server Diagnostic Information*** | ***Condition Detected*** | ***DFM for OS/2 Result*** |
|---|---|---|
| 0102 | Untranslatable data found in input field.<br>This can only occur in fields of type PACKED and ZONED. | The data is converted into the output field in the correct format. The value of the data in that byte or half-byte remains untranslatable.<br>`EXAMPLE:`<br>`  ZONED to PACKED`<br>`    '3A' -> 'A'`<br>If data is being sent to a target system, this and following records are not sent to the target. If the data is being received by the workstation, the application can determine whether to accept the record. |
| 0103 | If file is opened with MODCP or INSCP and the fields in the view description of the record are not equal to the fields in the base description. | If file is opened with MODCP or INSCP, the records are not sent to the target. |
| 0104 | Partial Key.<br>A partial numeric key field cannot be translated. | If a key definition field is not so long as the record field, defined in the view of base description of the record and the data type is not ASIS or CHARACTER, the record will not be sent to the target, and DFM for OS/2 returns this reply message to the application. |

Table 40 shows additional situations in which padding occurs in the output fields:

*Table 40. Padding Situations*

| ***Condition Detected*** | ***DFM for OS/2 Result*** |
|---|---|
| Padding of numeric fields.<br>This is necessary if the length of the output field is greater than the length of the input field. This may be a padding of leading zeros before the decimal point or trailing zeros after the decimal point. | The extra bytes in the output field are automatically padded with zeros of the appropriate date type. An exception is BINARY data in twos-complement form which is padded with `X'FF'` to ensure sign integrity. No message is sent to the user. |
| Padding of character fields.<br>The length of the output field is greater than that of the input field. | The extra bytes in the output field are padded with nulls (X'00'). No message is sent to the user. |
| Padding in fields without conversion.<br>The length of the output field is greater than that of the input field. | The extra bytes are padded with nulls (X'00') regardless of data type. |

# Chapter 14. Writing a File Name Mapping Exit Program

This chapter describes potential reasons for name mapping and how to develop a user exit program for it. A sample exit is supplied with DFM for OS/2. You can modify it according to your requirements or write your own exit using the interface conventions described.

Although DFM for OS/2 accepts file or directory access commands to a remote DFM server using the target system file names, you may find it useful to map file names when data is transferred between the client and the server.

If you want to use OS/2 syntax for file and path specifications, including "\" and ".", in your application, you may need to convert this name into the target syntax, for example, an MVS PDSE name.

## Using the Name Mapping User Exits

Before DFM for OS/2 sends data containing a directory or file name to the target system, it calls the user exit **DFM_Map_to_Server** if available in the dynamic link library EHNXNMP. The exit is called for each file name that is included in the DFM for OS/2 data stream before it is translated from ASCII to EBCDIC.

After DFM for OS/2 has received data containing a directory or file name from the target system, it calls the user exit **DFM_Map_to_Client,** if it is available in the dynamic link library EHNXNMP. The exit is invoked for each directory or file name found in the data after the name has been translated from EBCDIC to ASCII.

## Writing A Name Mapping User Exit

**DFM_Map_to_Server** and **DFM_Map_to_Client** are invoked with a pointer to the name mapping exit interface control block, DFM_MAP_CB.

### DFM_Map_to_Server Syntax

```
command   DFM_Map_to_Server(PDFM_MAP_CB pMapCB);
```

| Parameter | Description |
|---|---|
| **pMapCB** | Pointer to the File Name Mapping Exit interface structure described in "Structure of DFM_MAP_CB." |

***Returns:*** The return in the EAX register is ignored by DFM for OS/2.

### DFM_Map_to_Client Syntax

```
command   DFM_Map_to_Client(PDFM_MAP_CB pMapCB);
```

| Parameter | Description |
|---|---|
| **pMapCB** | Pointer to the File Name Mapping Exit interface structure described in "Structure of DFM_MAP_CB." |

***Returns:*** The return in the EAX register is ignored by DFM for OS/2.

## Structure of DFM_MAP_CB

Figure 108 shows the structure of the interface control block for the name mapping user exit functions.

```
typedef struct
  {
    char            SrvClsName[9];
    char            LU_Name[9];
    char            InFileName[256];
    char            OutFileName[256];
  } DFM_MAP_CB, * PDFM_MAP_CB ;
```

*Figure 108. Structure of DFM_MAP_CB*

**Parameter** **Description**

SrvClsName
Zero terminated ASCII string. It contains the value of the DDM parameter SRVCLSNM as received from the target system. This value identifies the DFM server class name of the remote system. The following server class names for file servers have been defined for the IBM operating systems and subsystems:

| | |
|---|---|
| 'Q36' | DDM file server on System/36 |
| 'Q38' | DDM file server on System/38 |
| 'QCICS' | CICS DDM file server on CICS/MVS and CICS/VSE |
| 'QAS' | DDM file server on OS/400 |
| 'QMVS' | DDM file server on MVS |
| 'QCMS' | DDM file server on VM/CMS |
| 'QFS' | Enhanced PC Support/400 target server |
| 'Q4680' | DDM file server on a 4680 store system. |

Maximum length is 8 characters plus a trailing zero. The File Name Mapping Exit program can use this information to choose a different mapping algorithm for each target operating system.

LU_Name
Zero terminated ASCII string specifying the partner LU alias name, under which the target system is known to the OS/2 ES Communications Manager. Maximum length is 8 characters plus a trailing zero.

InFileName
Zero terminated ASCII string containing the original directory or file name. Maximum length is 255 characters plus a trailing zero.

OutFileName — Zero terminated ASCII string that contains the mapped directory or file name. Maximum length is 255 characters plus a trailing zero. This parameter is initially set with zeroes. It contains the fully qualified file name without a preceding drive letter.

You must follow the following convention when writing your own user exits:

- The user exit function must be provided in a 32-Bit DLL with the name EHNXNMP.
- The exit must be programmed with system linkage convention.
- The string OutFileName must not exceed 255 characters and have a zero termination.
- No name mapping is performed if DFM for OS/2 detects that the:
  - OutFileName is not modified
  - Requested exit function is not available in the DLL
  - Returned name is not valid.

**Note:** If any error occurs in the name mapping exit, the entire DFM for OS/2 can be affected.

## Special Considerations for OS/400 DFM File Servers

If the target system is an AS/400 and if a stream file or a directory API function has been called, the following name changes are carried out before the user exit is invoked:

- If DFM for OS/2 communicates with an enhanced PC Support/400 target system:
  - The path name always starts with **/**
  - All **** are changed to **/**.
- For other OS/400 systems:
  - The path name always starts with **/**
  - All **** are changed to **/**
  - A suffix of FMS is appended to the file name.

# Chapter 15. What to Do if an Error Occurs in DFM for OS/2

This chapter explains how to find and report problems within DFM for OS/2.

## Handling Problems in DFM for OS/2

If a problem occurs when you are using DFM for OS/2, use the following steps to find out what is causing the problem, whether a correction or a circumvention exists, and how to report a problem to IBM if no correction or circumvention exists.

1. **Initial Evaluation**

   Determine which system component is causing the problem. If DFM for OS/2 is causing the problem, identify the components involved. For example, Remote Stream Access Support, Remote Record Access Support, or one of the administration commands. How to do this is described in “Initial Evaluation of a DFM for OS/2 Problem.”

2. **Submit an APAR**

   If you cannot solve the problem, report the problem to an IBM Support Center specialist using an authorized program analysis report (APAR). How to do this is described in “Submitting an APAR” on page 548.

## Initial Evaluation of a DFM for OS/2 Problem

This section describes the error recording facilities in DFM for OS/2. These facilities can help you in an initial evaluation of a problem.

### Messages

All DFM for OS/2 components issue messages if they detect an error to inform you about the problem and about possible corrective actions. The destination of the messages depends on the DFM for OS/2 component that issued them. For example:

- Remote Stream Access Support

  The messages are displayed in pop-up windows on the screen.

- Remote Record Access Support

  This API support uses the new IBM First Failure Support Technology (FFST/2). By default FFST/2 routes the messages to the screen using STDOUT. In addition they are logged into an FFST/2 message file. You can use the FFST/2 utilities to check whether DFM for OS/2 Remote Record Access Support has issued a message and what the explanation for this message is. See the *ES OS/2 Problem Determination Guide for the System Coordinator* for details.

- Administration Commands, for example, ADLTRANS, STRTDFMC.

  All DFM for OS/2 administration commands route their messages for display on the screen using STDOUT. The messages are prefixed with “EHN” followed by a four-digit number, for example, EHN0132. To see additional help for the message or hints for corrective action, you should try the OS/2 HELP facility. To use it, you type HELP EHN0132 on the command line.

## The Internal Trace Facility

To activate DFM for OS/2 tracing you:

1. Define the level of VSAM trace events you want to collect
2. Start DFMTRACE
3. Run the application program causing the error
4. Stop DFMTRACE
5. Create an ASCII file that contains the trace entries.

You can send either a paper copy of the file or the file itself to your IBM service personnel.

You can also activate a Communication Manager Trace to trace the communication events. See the *ES OS/2 Communication Manager User's Guide* for details.

## Defining the Level of the VSAM Trace Events

When trace is turned on, DFM for OS/2 will be traced. However, one additional step is required to turn on the tracing for VSAM. In each session in which you want to trace VSAM, set the environment variable, RLIOTRACELEVEL, to a value from 0 to 7 inclusive. If you want to trace VSAM in all sessions at the same trace level, it might be more convenient to set RLIOTRACELEVEL in your CONFIG.SYS file. The type of tracing for each level is as follows:

**SET RLIOTRACELEVEL=0:** Stop the VSAM trace
**SET RLIOTRACELEVEL=1:** Trace the DDM API parameters only
**SET RLIOTRACELEVEL=2:** Trace the HEAP only
**SET RLIOTRACELEVEL=3:** Trace locking only
**SET RLIOTRACELEVEL=4:** Trace the DDM API parameters and the HEAP only
**SET RLIOTRACELEVEL=5:** Trace the DDM API parameters and locking only
**SET RLIOTRACELEVEL=6:** Trace the HEAP and locking only
**SET RLIOTRACELEVEL=7:** Trace everything.

**Note:** If the RLIOTRACELEVEL is set to an invalid value, everything in RLIO is traced.

## Starting DFMTRACE

To start DFMTRACE:

1. Go to an OS/2 window or full-screen
2. At the prompt, enter:

   ```
   DFMTRACE ON
   ```

The DFM for OS/2 memory trace is activated. The collected entries are stored in memory. The available size for the trace memory is defined in the TRACE_BUFFER parameter of the CONFIG.DFM file.

**Note:** If you are tracing a VSAM function and have not installed DFM for OS/2, you do not have a CONFIG.DFM file. The default TRACE_BUFFER size is 64k.

## Stopping DFMTRACE

To stop DFM for OS/2 tracing:

1. Go to an OS/2 window or full-screen
2. Enter:

   ```
   DFMTRACE OFF
   ```

No additional trace entries are collected until you restart DFMTRACE.

## Printing the Trace Entries to a File

To print the entries of a collected trace to the file, TRACE.OUT:

1. Go to an OS/2 Window or Full Screen.
2. At the prompt, enter:

   ```
   DFMTRACE /P trace.out
   ```

You can:

- Omit the filename to view the trace entries on the screen
- Specify the number of the trace entries to be displayed or stored. In this case, enter:

  ```
  DFMTRACE /P trace.out /N <number>
  ```

  where <number> can be any number from 1 to 999 999.

If you do not specify a number, all collected trace entries are either displayed or written to a specified file.

**Note:** If an existing filename is used, DFMTRACE overwrites the existing information. Printing the trace entries to a file stops DFMTRACE implicitly.

The layout of the trace entries is shown in Figure 109.

```
---------------------------- Begin of Trace Output -----------------------------
 . . .
--------------------------------------------------------------------------------
DRIVE: Z TGT: SDFASB46 PID: 00419 TID: 0002 DATE: 03/25/1992 TIME: 16:02:59.47
TITLE: Send Buffer                         LENGTH: 00102  MOD: EHNZSCMI ID: 01
188806D3: 0066 D001 0001 0060 1041 0008 1147 D8D6 | .f..... .A...G..
188806E3: E2F2 0054 1404 1403 0004 1411 0004 1423 | ...T...........#
188806F3: 0004 1405 0004 1406 0004 1407 0004 1444 | ...............D
18880703: 0001 1476 0000 1458 0001 1457 0001 140C | ...v...X...W....
18880713: 0004 141E 0004 1422 0001 1432 0004 1433 | ......."...2...3
18880723: 0004 1434 0004 1435 0004 1440 0001 143B | ...4...5...@...;
18880733: 0004 143C 0001                          | ...<..
--------------------------------------------------------------------------------
 . . .
--------------------------------------------------------------------------------
DRIVE: Z TGT: SDFASB46 PID: 00419 TID: 0001 DATE: 03/25/1992 TIME: 16:03:02.56
TITLE: RC                                  LENGTH: 00004  MOD: EHNZDEAL ID: 02
18883E36: 0000 0000                               | ....
----------------------------- End of Trace Output ------------------------------
```

*Figure 109. Layout of Trace Entries*

Each trace entry is numbered to identify where the trace point was taken in a particular module. The trace entry number is shown as the ID value in the header line.

A trace entry consists of the following:

- If known, the drive letter assigned to the addressed target system
- Partner LU alias of the addressed target system
- Current OS/2 process ID
- Current OS/2 thread ID
- Date and time of the trace entry
- Title of the trace entry
- Length of the trace entry in decimal
- Module name
- ID of the trace entry point within a module.

Each line of the trace entry consists of the following:

- A pointer to the traced data area
- The trace entry data in hexadecimal format
- The readable trace entry data.

## Submitting an APAR

To describe the problem as precisely as possible, include all the available diagnostic information in the authorized program analysis report (APAR) and send it to your IBM Support Center.

You should include the following information in the APAR:

- A trace of the DFM for OS/2 component resulting in the error

- The administration files of DFM for OS/2 (for example, CONFIG.DFM, STARTDFM.CMD) or any used ADL files
- The source of the application program that caused the error.

# Chapter 16. Information for the Application Programmer

This section lists the VSAM APIs supported by DFM for OS/2 and provides information about DFM Reply Messages and error processing.

## VSAM API commands

The following list shows all the VSAM APIs supported by DFM for OS/2. These APIs are described in Part 1 of this publication. Also in the VSAM reference is the information returned to the caller of the API for error conditions.

| Function Call | Description |
|---|---|
| **DDMClose** | Close File |
| **DDMCreateAltIndex** | Create Alternate Index File |
| **DDMCreateRecFile** | Create Record File |
| **DDMDelete** | Delete File |
| **DDMDeleteRec** | Delete Record |
| **DDMForceBuffer** | Commit a File's Cached Information |
| **DDMGetRec** | Retrieve a Record |
| **DDMGetReplyMessage** | Returns reply messages for prior DDM calls |
| **DDMInsertRecEOF** | Insert a Record at End of File |
| **DDMInsertRecKey** | Insert a Record by Key Value |
| **DDMInsertRecNum** | Insert a Record by Record Number |
| **DDMLoadFileFirst** | Load First Record into a File |
| **DDMLoadFileNext** | Load Next Record into a File |
| **DDMModifyRec** | Modify Record |
| **DDMOpen** | Open a File |
| **DDMQueryFileInfo** | Retrieve Information about a File |
| **DDMQueryPathInfo** | Retrieve Information about a File or Directory |
| **DDMRename** | Rename a File |
| **DDMSetBOF** | Set Cursor to Beginning of File |
| **DDMSetEOF** | Set Cursor to End of File |
| **DDMSetFileInfo** | Set Information about a File |
| **DDMSetFirst** | Set Cursor to First Record in File |
| **DDMSetKey** | Set Cursor by Key |
| **DDMSetKeyFirst** | Set Cursor to First Record in Key Sequence |

| | |
|---|---|
| **DDMSetKeyLimits** | Set Key Limits |
| **DDMSetKeyLast** | Set Cursor to Last Record in Key Sequence |
| **DDMSetKeyNext** | Set Cursor to Next Record in Key Sequence |
| **DDMSetKeyPrevious** | Set Cursor to Previous Record in Key Sequence |
| **DDMSetLast** | Set Cursor to Last Record in File |
| **DDMSetMinus** | Set Cursor Minus |
| **DDMSetNextKeyEqual** | Set Cursor to Next Record with Equal Key |
| **DDMSetNextRec** | Set Cursor to Next Record |
| **DDMSetPathInfo** | Set a File's or a Directory's Information |
| **DDMSetPlus** | Set Cursor Plus |
| **DDMSetPreviousRec** | Set Cursor to Previous Record |
| **DDMSetNextKeyEqual** | Set Cursor to Next Record with Equal Key |
| **DDMSetRecNum** | Set Cursor to Record Number |
| **DDMSetUpdateKey** | Set Update Intent by Key |
| **DDMSetUpdateNum** | Set Update Intent by Record Number |
| **DDMUnloadFileFirst** | Unload First Record from File |
| **DDMUnloadFileNext** | Unload Next Record from File |
| **DDMUnLockRec** | Unlock Implicit Record Lock |

## DFM Reply Messages and Error Processing

When DFM receives notice of an error condition by the server system in response to a file access request, it does not issue an error message. However, it does return an error code to the caller and can make the DFM Reply Message structure accessible. Within this structure, the type of error is encoded in a two-byte hexadecimal value called a code point. Depending on the specific reply message and the server implementation, more “server diagnostic” information in addition to the error codepoint can be returned. Table 41 on page 554 lists the DFM Reply Message names alphabetically, its hexadecimal code point, decimal code point equivalents, and a short description of the DFM access request feedback.

The choice of programming language used by the application programmer dictates the amount of detailed knowledge of Reply Messages required for error processing when accessing files on the server system. Likewise, the choice of programming language dictates the amount of detailed Reply Message information available.

### The C Programmer

The C programmer can use the VSAM API DDMGetReplyMessage following a VSAM API call to solicit the specific error Reply Message. Part 1 of this publication documents this interface and the Reply Message structure as well as a detailed discussion of many, but not all, Reply Messages.

## The COBOL Programmer

The COBOL programmer can code programs based on the standardized COBOL returned file status values. If the COBOL runtime library invokes the VSAM APIs on behalf of the application program to do remote file access, it must map the Reply Message meaning to the most appropriate standardized COBOL file status. The IBM VisualAge COBOL product for the workstation provides for a second file status field which the COBOL programmer can optionally choose to define to provide program access to the specific DFM error. This is simply done by defining the second file status with a minimum length of six bytes. The fifth and sixth bytes in the field contains a binary decimal representation of the Reply Message codepoint. (The first four bytes are a decimal number indicating the total length of the Reply Message structure.)

The following examples from a COBOL program:

- Associates the second file status FILE8-STATUS with FILE1
- Shows a sample definition for FILE8-STATUS which contains the Reply Message
- Illustrates a DISPLAY of the COBOL file status and DFM Reply Message values.

For simplicity purposes, the DFM Reply Message displays as a decimal number. Note, before running the program, the environment variable DDDIRECT is set to assign a specific file name, for example:

```
SET DDDIRECT=V:\USER1.DDM.KEYFILE
```

```
 INPUT-OUTPUT SECTION.
 FILE-CONTROL.
    SELECT FILE1 ASSIGN TO DDDIRECT
    ORGANIZATION IS INDEXED
    ACCESS MODE IS DYNAMIC
    RECORD KEY IS EMP-NAME
    FILE STATUS IS FILE1-STATUS FILE8-STATUS.
 .
 .
 WORKING STORAGE SECTION.
 01  FILE1-STATUS.
     05  FILE1-STATUS-A    PIC X.
     05  FILE1-STATUS-B    PIC X.
 01  FILE8-STATUS.
     05  FILE8-STATUS-LEN  COMP PIC S9(8).
     05  FILE8-STATUS-CP   COMP PIC S9(4).
 .
 .
 PROCEDURE DIVISION.
 OPEN INPUT FILE1.
 IF FILE1-STATUS NOT EQUAL TO GOOD-STATUS THEN
    DISPLAY "Error opening INPUT file.  Status code = ",
            FILE1-STATUS, " Dataname-8 = " FILE8-STATUS-CP
 .
```

Because the file does not exist on the server, the “OPEN INPUT FILE1” fails: The following is the output from such a run:

```
Error opening INPUT file. Status code = 35 Dataname-8 = 4622
```

Table 41 lists DFM Reply Message names, hexadecimal code points, decimal code point equivalents, and a short description of the DFM error. The COBOL file status value contained in FILE1-STATUS is 35 which means “An OPEN statement with the INPUT, I-O, or EXTEND phrase was attempted on a non-optional file that was not present.” The decimal equivalent of the DFM Reply Message codepoint value contained in the FILE8-STATUS-CP is 4622. This decimal value can be found in Table 41 in the row for Reply Message FILNFNRM with hexadecimal codepoint X'120E' and meaning “File Not Found.”

## The PL/I Programmer

The PL/I programmer sets the file name environment variable “dd:” followed by the generic file name coded in the program and its specific real file name. To trigger DFM remote access of files, the access method specification of *amthd(remote)* must be set with the file name. An example of setting the environment variable is as follows, the key being the AMTHD keyword.

```
set dd:infile=v:\edwards.io600.dat,amthd(remote)
```

In the above statement, the file name in the PL/I program is *infile* and the real file name is **edwards.io600.dat**. The real file is on an MVS system to which the v drive letter has has been assigned by DFMDRIVE. called **mvs2**. To continue this example, suppose the user ID for whom the remote file access is being attempted is RACF prohibited from accessing the file. The server system will return an error when the OPEN request is made to indicate it could not OPEN the file on behalf of the user. PL/I reports the PL/I return code (Subcode1) and the hexadecimal DFM Reply Message value (Subcode2) in an error message. The following is the output from such a run:

```
IBM0265I  ONCODE=0099  The UNDEFINEDFILE condition was raised
          because the file could not be opened
          Subcode1=00024  Subcode2=123B  ( FILE= or ONFILE= F).
   At offset +00000145 in procedure with entry CIO627B
```

Table 41 lists DFM Reply Message names, hexadecimal code points, decimal code point equivalents, and a short description of the error. The hexadecimal *Subcode2* value in the example above of 123B corresponds to the row for Reply Message FILATHRM, decimal value 4667, and meaning “Not Authorized to File.”

The commonly encountered DFM Reply Messages are listed alphabetically in Table 41.

*Table 41 (Page 1 of 4). DFM Reply Messages*

| Reply Message ID | Hexadecimal | Decimal | Message Title |
|---|---|---|---|
| ACCATHRM | X'1230' | 4656 | Not Authorized to Use Access Method |
| ACCINTRM | X'1266' | 4710 | Access Intent List Error |
| ACCMTHRM | X'1231' | 4657 | Invalid Access Method |

*Table 41 (Page 2 of 4). DFM Reply Messages*

| Reply Message ID | Hexadecimal | Decimal | Message Title |
|---|---|---|---|
| ADDRRM | X'F212' | 61970 | Address Error |
| AGNPRMRM | X'1232' | 4658 | Permanent Agent Error |
| BASNAMRM | X'1234' | 4660 | Invalid Base File Name |
| CHGFATRM | X'1261' | 4705 | Change File Attributes Rejected |
| CLSDMGRM | X'125E' | 4702 | File Closed with Damage |
| CMDCHKRM | X'1254' | 4692 | Command Check |
| CMDCMPRM | X'124B' | 4683 | Command Processing Complete |
| CMDNSPRM | X'1250' | 4688 | Command Not Supported |
| COMMRM | X'F207' | 61959 | Communications Error |
| CSRNSARM | X'1205' | 4613 | Cursor Not Selecting a Record Position |
| CVTNFNRM | X'F202' | 61954 | Conversion Table Not Found |
| DCLCNFRM | X'1220' | 4640 | Declare Conflict |
| DCLNAMRM | X'1256' | 4694 | Invalid Declared Name |
| DCLNFNRM | X'1257' | 4695 | Declared Name Not Found |
| DDFNFNRM | X'F201' | 61953 | Data Description File Not Found |
| DFTRECRM | X'1204' | 4612 | Default Record Error |
| DRCATHRM | X'1237' | 4663 | Not Authorized to Directory |
| DRCFULRM | X'1258' | 4696 | Directory Full |
| DTARECRM | X'1206' | 4614 | Invalid Data Record |
| DUPDCLRM | X'1255' | 4693 | Duplicate Declared Name |
| DUPFILRM | X'1207' | 4615 | Duplicate File Name |
| DUPKDIRM | X'1208' | 4616 | Duplicate Key Different Index |
| DUPKSIRM | X'1209' | 4617 | Duplicate Key Same Index |
| DUPRNBRM | X'120A' | 4618 | Duplicate Record Number |
| ENDFILRM | X'120B' | 4619 | End of File Condition |
| EXSCNDRM | X'123A' | 4666 | Existing Condition |
| FILATHRM | X'123B' | 4667 | Not Authorized to File |
| FILDMGRM | X'125A' | 4698 | File Damaged |
| FILERRRM | X'F216' | 61974 | File Error |
| FILFULRM | X'120C' | 4620 | File Is Full |
| FILIUSRM | X'120D' | 4621 | File In Use |
| FILNAMRM | X'1212' | 4626 | Invalid File Name |
| FILNFNRM | X'120E' | 4622 | File Not Found |
| FILNOPRM | X'1211' | 4625 | File Not Open |
| FILOLORM | X'121D' | 4637 | File Open Lock Option Changed |

*Table 41 (Page 3 of 4). DFM Reply Messages*

| Reply Message ID | Hexadecimal | Decimal | Message Title |
|---|---|---|---|
| FILSNARM | X'120F' | 4623 | File Space Not Available |
| FILTNARM | X'121E' | 4638 | File Temporarily Not Available |
| FUNATHRM | X'121C' | 4636 | Not Authorized to Function |
| FUNNSPRM | X'1250' | 4688 | Function Not Supported |
| HDLNFNRM | X'1257' | 4695 | File Handle Not Found |
| INTATHRM | X'125C' | 4700 | Not Authorized to Open Intent for Named File |
| INVFLGRM | X'F205' | 61957 | Invalid Flag |
| INVRQSRM | X'123C' | 4668 | Invalid Request |
| KEYDEFRM | X'123D' | 4669 | Invalid Key Definition |
| KEYLENRM | X'122D' | 4653 | Invalid Key Length |
| KEYMODRM | X'1260' | 4704 | Key Value Modified After Cursor Was Last Set |
| KEYUDIRM | X'1201' | 4609 | Key Update Not Allowed by Different Index |
| KEYUSIRM | X'123F' | 4671 | Key Update Not Allowed by Same Index |
| KEYVALRM | X'1240' | 4672 | Invalid Key Value |
| LENGTHRM | X'F211' | 61969 | Field Length Error |
| MGRLVLRM | X'1210' | 4624 | Manager Level Conflict |
| NEWNAMRM | X'124F' | 4687 | Invalid New File Name |
| OBJNSPRM | X'1253' | 4691 | Object Not Supported |
| OPNCNFRM | X'1242' | 4674 | Open Conflict Error |
| OPNMAXRM | X'1244' | 4676 | Concurrent Opens Exceeds Maximum |
| PRCCNVRM | X'1245' | 4677 | Conversational Protocol Error |
| PRMNSPRM | X'1251' | 4689 | Parameter Not Supported |
| RECCNTRM | X'125B' | 4699 | Record Count Mismatch |
| RECDMGRM | X'1249' | 4681 | Record Damaged |
| RECINARM | X'1259' | 4697 | Record Inactive |
| RECIUSRM | X'124A' | 4682 | Record In Use |
| RECLENRM | X'1215' | 4629 | Record Length Mismatch |
| RECNAVRM | X'126F' | 4719 | Record Not Available |
| RECNBRRM | X'1224' | 4644 | Record Number Out Of Bounds |
| RECNFNRM | X'1225' | 4645 | Record Not Found |
| RSCLMTRM | X'1233' | 4659 | Resource Limits Reached on Target System |
| STRDMGRM | X'1268' | 4712 | Stream Damaged |

*Table 41 (Page 4 of 4). DFM Reply Messages*

| **Reply Message ID** | **Hexadecimal** | **Decimal** | **Message Title** |
|---|---|---|---|
| SUBSTRRM | X'1265' | 4709 | Invalid Substream |
| SRCLMTRM | X'F210' | 61968 | Resource Limits Reached in Source System |
| SYNTAXRM | X'124C' | 4684 | Data Stream Syntax Error |
| TRGNSPRM | X'125F' | 4703 | Target Not Supported |
| UPDCSRRM | X'124D' | 4685 | Update Cursor Error |
| UPDINTRM | X'124E' | 4686 | No Update Intent on Record |
| VALNSPRM | X'1252' | 4690 | Parameter Value Not Supported |
| XLATERM | X'F203' | 61955 | Translation Error |

# Appendix A. CDRA Character Conversion Tables for Remote Record Access Support

The following table shows the CPGID‘s for each country.

| | |
|---|---|
| USA, Canada | 00037 |
| Canada, US ASCII | 00256 |
| Austria, Germany | 00273 |
| Denmark, Norway | 00277 |
| Finland, Sweden | 00278 |
| Italy | 00280 |
| Spain | 00284 |
| UK | 00285 |
| Japanese Katakana | 00290 |
| France | 00297 |
| Arabic | 00420 |
| Greek | 00423 |
| Hebrew | 00424 |
| USA | 00437 |
| Belgium, Canada (AS/400), Switzerland, International Latin-1 | 00500 |
| Greek/Latin (ISO 8859-7) | 00813 |
| International Latin 1 (ISO 8859-1) | 00819 |
| Korean Host SB | 00833 |
| Simplified Chinese Host SB | 00836 |
| Thailand, extended Host SB | 00838 |
| International Latin-1 | 00850 PC |
| Greek | 00851 PC |
| Latin-2 Multilingual | 00852 PC |
| Cyrillic | 00855 PC |
| Hebrew | 00856 PC |
| Turkey | 00857 PC |
| Portugal | 00860 PC |
| Iceland | 00861 PC |
| Canada | 00863 PC |
| Arabic | 00864 PC |
| Denmark, Norway | 00865 PC |
| Urdu | 00868 PC |
| Greek | 00869 PC |
| Latin-2 | 00870 |
| Iceland | 00871 |
| Greek | 00875 |
| Turkey/Latin 3 Multilingual | 00905 |
| Urdu | 00918 |
| Turkey | 00920 |
| ROECE Cyrillic Multilingual | 1025 |
| Turkey | 1026 |
| Japanese Latin | 1027 |
| Japanese PC | 1041 |
| Simplified Chinese PC | 1042 |
| Traditional Chinese PC | 1043 |

*Figure 110. Supported CDRA Code Page IDs*

Figure 111 contains a matrix list of the supported pairs of PC-EBCDICs.

| PC<br>EBCDIC | 0850 | 0860 | 0863 | 0865 | 0851 | 0852 | 0861 | 0855 | 0857 | 0864 | 0856 | 0868 | 1041 | 1042 | 1043 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0037 | * | * | * | * |  |  |  |  |  |  |  |  |  |  | * |
| 0273 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0277 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0278 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0280 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0284 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0285 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0297 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0500 | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |
| 0871 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0437 | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0290 |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  |
| 0836 |  |  |  |  |  |  |  |  |  |  |  |  |  | * |  |
| 1027 |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  |
| 0423 |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |
| 0875 |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |
| 0870 |  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |
| 0819 | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1025 |  |  |  |  |  |  |  | * |  |  |  |  |  |  |  |
| 1026 |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |
| 0420 |  |  |  |  |  |  |  |  |  | * |  |  |  |  |  |
| 0424 |  |  |  |  |  |  |  |  |  |  | * |  |  |  |  |
| 0918 |  |  |  |  |  |  |  |  |  |  |  | * |  |  |  |
| 0905 |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |

*Figure 111. Supported Pairs of EBCDIC - PC Code Page IDs*

Figure 112 shows a list of the support pairs of EBCDIC - EBCDIC code page IDs.

| EBCDIC<br>EBCDIC | 0037 | 0273 | 0277 | 0278 | 0280 | 0284 | 0285 | 0297 | 0500 | 0871 | 0437 | 0290 | 0833 | 0836 | 0838 | 1027 | 0423 | 0869 | 0875 | 0256 | 0870 | 0819 | 1025 | 1026 | 0920 | 0420 | 0424 | 0918 | 0813 | 0905 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0037 |  | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0273 | * |  | * | * | * | * | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0277 | * | * |  | * | * | * | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0278 | * | * | * |  | * | * | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0280 | * | * | * | * |  | * | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0284 | * | * | * | * | * |  | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0285 | * | * | * | * | * | * |  | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0297 | * | * | * | * | * | * | * |  | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0500 | * | * | * | * | * | * | * | * |  | * | * | * | * | * | * | * |  | * | * |  |  | * |  |  |  |  |  |  |  |  |
| 0871 | * | * | * | * | * | * | * | * | * |  | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0437 | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0290 | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0833 | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0836 | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0838 | * | * | * | * | * | * | * | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1027 | * | * | * | * | * | * | * | * | * | * |  | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0423 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |  |  |
| 0869 |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |  | * |  | * | * |  |  |  |  |  |  |  |  | * |  |
| 0875 |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  | * |  |
| 0256 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  | * |  |  |  |  |  |  |  |  |  |
| 0870 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |
| 0819 |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1026 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  |  |  | * |
| 0920 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |
| 0813 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0905 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | * |  |  |  |  |  |  |

*Figure 112. Supported Pairs of EBCDIC - EBCDIC Code Page Ids*

Figure 113 contains a list of the supported pairs of PC - PC code page IDs.

| PC<br>PC | 0850 | 0860 | 0863 | 0865 | 0851 | 0852 | 0861 | 0855 | 0857 | 0864 | 0856 | 0868 | 1041 | 1042 | 1043 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0850 |  | * | * | * |  | * | * |  | * |  |  |  |  |  |  |
| 0860 | * |  | * | * |  |  |  |  |  |  |  |  |  |  |  |
| 0863 | * | * |  | * |  |  |  |  |  |  |  |  |  |  |  |
| 0865 | * | * | * |  |  |  |  |  |  |  |  |  |  |  |  |
| 0852 | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0861 | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 0857 | * |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

*Figure 113. Supported Pairs of PC - PC Code Page Ids*

# Appendix B. OS/2 Commands Not Supported by DFM for OS/2

DFM for OS/2 does not support OS/2 commands that:

- Perform disk or drive-oriented functions
- Perform direct sector I/O to an OS/2 formatted disk.

You cannot use the OS/2 commands shown in Table 42:

*Table 42 (Page 1 of 2). OS/2 Commands Not Supported by the Stream-File Component*

| Command | Description | Reasons Not Supported |
|---|---|---|
| BACKUP (to root of System/36 system drive) | Saves files for later retrieval. | The BACKUP command creates a directory as part of its processing. The System/36 does not support creating directories at the root level of a system drive. Because of this, the BACKUP command should not be run from the root level of a System/36 system drive. |
| CHKDSK (Check Disk) | Analyzes the directories, files, and the file allocation table on a drive. | CHKDSK cannot analyze directories, files, and file allocation tables on drives assigned to remote systems because directories and files are not stored in OS/2 format on the target system, and file allocation tables do not exist as known to the OS/2 operating system. Also, CHKDSK performs sector reads to the disk drive. |
| DELETE (folders) | Deleting folders | MVS does not support the deleting of folders. However, files can be deleted. |
| DISKCOMP (Compare Diskettes Only) | Compares the contents of two diskettes. | DISKCOMP does not work on drives assigned to remote systems. Also, DISKCOMP performs sector reads to the disk drive. |
| DISKCOPY (Copy Diskette Only) | Copies the contents of one diskette to another diskette. | DISKCOPY does not work on drives assigned to remote systems. Also, DISKCOPY performs sector reads to the disk drive. |
| FDISKPM (Hard Disk Setup) | Prepares a PC hard disk for use by the OS/2 operating system. | FDISKPM does not access any other drive. |
| FORMAT | Initializes the disk in a designated drive. | FORMAT is not appropriate for drives assigned to remote systems since disk I/O is controlled by the remote system. |
| JOIN | Logically connects a drive to a directory on another drive to produce a single directory structure. | JOIN is not directly supported by the OS/2 operating system, but is supported in the OS/2 DOS compatibility mode. |
| RECOVER | Recovers files from disks with defective sectors. | RECOVER performs sector reads to the disk drive. |
| RENAME (Renaming Folders) | Renaming folders when connected to System/36 is not supported. MVS does not support the renaming of folders. | System/36 and MVS do not support the renaming of folders. Files can be renamed. |
| SUBST (Substitute) | Allows you to use a different drive specifier to refer to another drive or path. | SUBST is not directly supported by the OS/2 operating system, but is supported in the OS/2 DOS compatibility mode. |

*Table 42 (Page 2 of 2). OS/2 Commands Not Supported by the Stream-File Component*

| Command | Description | Reasons Not Supported |
|---|---|---|
| SYS (System) | Transfers the OS/2 hidden system files from one drive to another. | Because of OS/2 restrictions on where operating system files may be placed on a disk, SYS must use sector I/O on the drive. Since a PC cannot be started from a drive assigned to a target system, you cannot place the operating system files on these drives. |

## Target System Restrictions for Remote Stream Access

| Description | Maximum length in bytes |
|---|---|
| Complete path name | 128 |
| Path assigned to a drive letter | 63 |
| System description | 40 |
| Search argument | 63 |
| File names | 63 |
| File name description | 44 |

Before DFM for OS/2 assigns a drive letter to a target system, it checks whether you have authorization to access the target system using the OS/2 communication manager mode QPCSUPP. The QPCSUPP mode must be specified for the target system.

If the target is MVS, avoid using stream-oriented editors and commands such as copy on record files. To do so will result in the loss of the original record boundaries and a subsequent inability to process the files with MVS applications.

New PDS members cannot be created through stream-oriented OS/2 commands. New PDSE members can be created but they will only be created as stream files.

The data of stream files is not converted.

# Appendix C. ADL Subset Supported by DFM for OS/2

The following describes the ADL subset supported by DFM for OS/2 in BNF.

Start symbol for the grammar is <declare_statement>.

An empty clause is indicated by <>. The *integer* and *identifier* terminal symbols are described in the "General ADL Rules" on page 520 or in more detail in the rules paragraph for a specific type or attribute.

```
<ASIS_attributes_list>      ::= <ASIS_attribute>
                               |   <ASIS_attributes_list> <ASIS_attribute>


<ASIS_attribute>            ::= LENGTH ( integer )
                               |   UNITLEN ( 8 )

<attributes_list>           ::= <ASIS_attributes_list>
                               |   <BINARY_attributes_list>
                               |   <CHAR_attributes_list>
                               |   <FLOAT_attributes_list>
                               |   <PACKED_attributes_list>
                               |   <ZONED_attributes_list>

<BINARY_attributes_list> ::= <BINARY_attribute>
                               |   <BINARY_attributes_list> <BINARY_attribute>

<BINARY_attribute>          ::= BYTRVS ( <bool> )
                               |   PRECISION ( integer )
                               |   SCALE ( integer )
                               |   RADIX ( 10 )

<bool>                      ::= TRUE
                               |   FALSE

<CHAR_attributes_list>      ::= <CHAR_attribute>
                               |   <CHAR_attributes_list> <CHAR_attribute>

<CHAR_attribute>            ::= LENGTH ( integer )
                               |   CCSID ( integer )

<data_declaration_list>     ::= <data_declaration>
                               |   <data_declaration_list> <data_declaration>

<data_declaration>          ::= identifier : <type> ;
```

*Figure 114 (Part 1 of 3). ADL Subset Supported by DFM for OS/2*

```
<declare_statement>        ::=  DECLARE
                                 |   BEGIN;
                                 |      <opt_subtype_statem_list>
                                 |      identifier :
                                 |      BEGIN;
                                 |        <data_declaration_list>
                                 |      END;
                                 |   END;


<field>                     ::= ASIS     <ASIS_attributes_list>
                              |   BINARY  <BINARY_attributes_list>
                              |   CHAR     <CHAR_attributes_list>
                              |   FLOAT    <FLOAT_attributes_list>
                              |   PACKED  <PACKED_attributes_list>
                              |   ZONED    <ZONED_attributes_list>


<FLOAT_attributes_list>    ::= <FLOAT_attribute>
                              |   <FLOAT_attributes_list> <FLOAT_attribute>


<FLOAT_attribute            ::= BYTRVS ( <bool> )
                              |   FORM ( <form> )


<form>                      ::= FH32
                              |   FH64
                              |   FH128
                              |   FB32
                              |   FB64

<opt_attributes_list>       ::= <>
                              |   <attributes_list>


<PACKED_attributes_list> ::= <PACKED_attribute>
                              |   <PACKED_attributes_list> <PACKED_attribute>


<PACKED_attribute>         ::= PRECISION ( integer )
                              |   SCALE ( integer )


<ZONED_attributes_list>    ::= <ZONED_attribute>
                              |   <ZONED_attributes_list> <ZONED_attribute>
```

*Figure 114 (Part 2 of 3). ADL Subset Supported by DFM for OS/2*

```
<ZONED_attribute>          ::= PRECISION ( integer )
                             |   SCALE ( integer )
                             |   ZONENC ( <zonenc> )


<zonenc>                   ::= X'3'
                             |   X'F'


<opt_subtype_statem_list>    ::= <>
                                 |   <subtype_statem>
                                 |   <opt_subtype_statem_list> <subtype_statem>


<subtype_statem>             ::= <subtype_identifier> : SUBTYPE OF <type> ;


<subtype>                    ::= <subtype_identifier> <opt_attributes_list>


<subtype_identifier>         ::= identifier


<type>                       ::= <field>
                                 |   <subtype>
```

*Figure 114 (Part 3 of 3). ADL Subset Supported by DFM for OS/2*

# Appendix D. The Convert Utility for Local VSAM Files Version 1.0

The purpose of this user interface is to convert local VSAM files for OS/2 created by local VSAM version 1.0 to a format compatible with local VSAM version 1.1 and above.

For users currently using keyed files under VSAM version 1.0, the following utility is available to assist you in converting your version 1.0 data to version 1.1. Use the following command to invoke the utility:

```
<dubcvrt 'path\filename'>

where  path is the directory which contains the 1.0
       file needed for conversion, and

       filename is the name of the 1.0 file you
       are converting to 1.1
```

The utility function issues a message to indicate that the file has been converted successfully.

A copy of the original 1.0 data file is saved in the following directory:

```
x:\rliov01
where  x is the drive where the 1.0 source file is located.
```

If an error occurs during the conversion, the appropriate reply message is issued followed by:

```
Error: Conversion failed for <filename>.
```

The data located in *x:\rliov01* is copied to the original source directory, and the files in *\rliov01* will be deleted.

# Appendix E.  Programming Extended Attributes in VSAM APIs

The following example from a C program illustrates how extended attribute information can be prepared for a VSAM API.  The particular APIs used are DDMSetPathInfo and DDMQueryPathInfo.  It is assumed that a sequential file already exists and the file name coded in the C application has its value in SeqFN.

See “Extended Attributes” on page 5 for an overview of extended attributes used by the VSAM APIs and the relationship of the DOS-based EAOP2, GEA2List, and FEA2List structures.

```
/*-------------------------------------------------------------------------
--                       SYMBOLIC CONSTANTS
--------------------------------------------------------------------------*/
#define FILCLS_NAME ".DDM_FILCLS"
#define DELCP_NAME ".DDM_DELCP"                                 /*@W0A*/
#define TITLE_NAME ".DDM_TITLE"                                 /*@W0C*/
#define TitleString "Title String"                              /*@W0C*/
#define FILCLS_SIZE sizeof(OBJLENGTH) + (2 * sizeof(CODEPOINT)) /*@W0M*/
#define DELCP_SIZE sizeof(OBJLENGTH) + sizeof(CODEPOINT) + 1    /*@W0M*/
#define TITLE_SIZE sizeof(OBJLENGTH) + sizeof(CODEPOINT) + strlen(TitleString)
                                                               /*@W0C*/
  .
  .
  .

    /* OS/2 extended attribute structures */
    EAOP2 Eaop;              /* EA structure for DDMQueryPathInfo @W0C*/
    EAOP2 Eaop2;             /* EA structure for DDMSetPathInfo   @W0C*/
    PFEA2 pFEA;              /* Pointer to FEA2 list entry        @W0C*/
    PGEA2 pGEA;              /* Pointer to GEA2 list entry        @W0C*/
    INT   FEASize;           /* Tally size of FEA2 list area      @W0C*/
    INT   GEASize;           /* Tally size of GEA2 list area      @W0C*/
    INT   FEA2Size;          /* Tally size of second FEA2 list    @W0C*/

    ULONG Remainder;          /* Holds remainder-byte offset calc @W0A*/
    LONG  i;                  /* Controls FEA2 WHILE loop         @W0A*/
       .
       .
       .
```

*Figure 115 (Part 1 of 11). Example of C Program using Extended Attributes*

```
/*************************************************************@W0A*/
/*  Prepare and execute a DDMQueryPathInfo call to query a    @W0A*/
/*  file's Extended Attributes.                               @W0A*/
/*************************************************************@W0A*/
/* The DDM call to query a file's extended attributes is      @W0A*/
/* based on the OS/2 extended attributes model.  As such, the @W0A*/
/* calls to DDMQueryFileInfo and DDMQueryPAthInfo must pass a @W0A*/
/* pointer to an EAOP2 structure which, in turn, contains     @W0A*/
/* pointers to the GEA2LIST area and the FEA2LIST area.       @W0A*/
/* The GEA2LIST area contains a header and variable length    @W0A*/
/* GEA2 list entries.  Each list entry identifies one EA      @W0A*/
/* being queried.  The FEA2LIST area is where the returned    @W0A*/
/* information will be set.                                   @W0A*/
/*                                                            @W0A*/
/* The EAOP2, FEA2LIST, GEA2LIST, FEA2 and GEA2 are defined   @W0A*/
/* in DUBDEFS.H which is included by DUB.H. The format of the @W0A*/
/* values which can be returned are documented in the VSAM    @W0A*/
/* API Reference manual in the "VSAM API Common Parameters"   @W0A*/
/* chapter.                                                   @W0A*/

/* Steps:                                                     @W0A*/
/*  1. Calculate the sizes of the GEA2LIST and FEA2LIST areas @W0A*/
/*  2. Do the GEA2LIST + FEA2LIST malloc + set EAOP2 pointers @W0A*/
/*  3. Fill in the GEA2LIST area                              @W0A*/
/*  4. Fill in the FEA2LIST area                              @W0A*/
/*  5. Issue the DDMQueryPathInfo                             @W0A*/
/*  6. Extract DDM attribute data from the FEA2LIST area      @W0A*/
/*  7. Free the GEA2LIST and FEA2LIST areas                   @W0A*/

/*-------------------------------------------------------------------
-- Set up for DDMQueryPathInfo:                                @W0M
--
-- Build an extended attribute GEA2LIST area with two GEA2     @W0C
-- list entries specifying the DELCP and FILCLS EAs.  The      @W0C
-- attributes queried and structure content match those in     @W0C
-- the "Extended Attributes" section of the VSAM API Reference @W0C
-- manual.                                                     @W0C
--
--------------------------------------------------------------------*/
/******************** STEP 1 *********************************@W0A*/
/*  1. Calculate the sizes of the GEA2LIST and FEA2LIST areas @W0A*/
/******************** STEP 1 *********************************@W0A*/
/*                                                            @W0A*/
/* First calculate size of GEA2LIST area to be passed.        @W0A*/
/* The GEA2LIST header  : ULONG-Length of GEA2 list area      @W0A*/
/*                        (pointed to by fpGEA2LIST in EAOP2  @W0A*/
/* The GEA2 list entry  : ULONG-oNextEntryOffset,             @W0A*/
/*                      : UCHAR-cbName (len of name)          @W0A*/
/*                      : CHAR-szName[1] (char .DDM_xxx)      @W0A*/
/* Note  1: GEA2 list entries must start on 4 byte boundaries @W0A*/
/*       2: The cbName does not count null string terminator  @W0A*/
/*       3: Last entry is identified by oNextEntryOffset=0    @W0A*/
```

Figure 115 (Part 2 of 11). Example of C Program using Extended Attributes

```
/* Calculate the GEA2LIST area size                           @W0A*/

/* GEA2 list area begins with the GEA2LIST header             @W0A*/
GEASize = sizeof(Eaop.fpGEA2List->cbList);                  /*@W0A*/
/* Each attribute to be queried needs a GEA2 list entry       @W0A*/
/* Add on size for first GEA2 list entry - .DDM_DELCP         @W0A*/
/*  DELCP_NAME is defined as:  ".DDM_DELCP"                   @W0A*/
GEASize = GEASize
        + sizeof(Eaop.fpGEA2List->list[0].oNextEntryOffset)
        + sizeof(Eaop.fpGEA2List->list[0].cbName)
        + strlen(DELCP_NAME)
        + 1;                      /* + null string terminator @W0A*/
/* GEAOffset entry must be on 4 byte boundary                 @W0A*/
Remainder = GEASize % 4;                                    /*@W0A*/
if (Remainder != 0)                                         /*@W0A*/
  GEASize=GEASize + (4-Remainder);                          /*@W0A*/
/* Now add on next GEA2 list entry  - .DDM_FILCLS             @W0A*/
/*  FILCLS_NAME is defined as:  ".DDM_FILCLS"                 @W0A*/
GEASize = GEASize
        + sizeof(Eaop.fpGEA2List->list[0].oNextEntryOffset)
        + sizeof(Eaop.fpGEA2List->list[0].cbName)
        + strlen(FILCLS_NAME)
        + 1;                      /* + name string terminator @W0A*/
/* This is last GEA2 list entry so the 4 byte boundary rule   @W0A*/
/* does not apply. i.e. you don't need to pad this entry.    @W0A*/

/* Now calculate size of FEA2LIST area to hold returned info. @W0A*/
/* The FEA2LIST header: ULONG-Length of FEA2 list area        @W0A*/
/*                      (pointed to by fpFEA2LIST in EAOP2    @W0A*/
/* The FEA2 list entry: ULONG-oNextEntryOffset,               @W0A*/
/*                    : UCHAR-fEA    (flag       )            @W0A*/
/*                    : UCHAR-cbName (len of name)            @W0A*/
/*                    : USHORT-cbValue (len of value)         @W0A*/
/*                    : CHAR-szName[1] (char .DDM_xxx)        @W0A*/
/*                    : followed by DDMOBJECT encoded value   @W0A*/
/* Note  1: FEA2 list entries start on 4 byte boundaries      @W0A*/
/*       2: The cbName does not count null string terminator  @W0A*/
/*       3: Last entry is identified by oNextEntryOffset=0    @W0A*/
/*       4: A cbValue of 0 means value field is null          @W0A*/

/* Calculate the FEA2LIST area size                           @W0A*/
/* FEA2LIST area begins with the FEA2LIST header              @W0A*/
FEASize = sizeof(Eaop.fpFEA2List->cbList);                  /*@W0A*/

/* Add on size for returned FEA2 list entry - .DDM_DELCP      @W0A*/
/*  DELCP_NAME is defined as:  ".DDM_DELCP"                   @W0A*/
/*  DELCP_SIZE is defined as:                                 @W0A*/
/*             sizeof(OBJLENGTH) + sizeof(CODEPOINT) + 1      @W0A*/
FEASize = FEASize
        + sizeof(Eaop.fpFEA2List->list[0].oNextEntryOffset)
        + sizeof(Eaop.fpFEA2List->list[0].fEA)
        + sizeof(Eaop.fpFEA2List->list[0].cbName)
        + sizeof(Eaop.fpFEA2List->list[0].cbValue)
        + strlen(DELCP_NAME)
        + 1                       /* + null string terminator  W0A*/
        + DELCP_SIZE;                                       /*@W0A*/
```

*Figure 115 (Part 3 of 11). Example of C Program using Extended Attributes*

```
/* FEAOffset entry must be on 4 byte boundary                 @W0A*/
Remainder = FEASize % 4;                                    /*@W0A*/
if (Remainder != 0)                                         /*@W0A*/
  FEASize=FEASize + (4-Remainder);                          /*@W0A*/
/* Add on size for returned FEA2 list entry - .DDM_FILCLS     @W0A*/
/*  FILCLS_NAME is defined as:  ".DDM_FILCLS"                 @W0A*/
/*  FILCLS_SIZE is defined as:                                @W0A*/
/*              sizeof(OBJLENGTH) + (2 * sizeof(CODEPOINT))   @W0A*/
FEASize = FEASize
        + sizeof(Eaop.fpFEA2List->list[0].oNextEntryOffset)
        + sizeof(Eaop.fpFEA2List->list[0].fEA)
        + sizeof(Eaop.fpFEA2List->list[0].cbName)
        + sizeof(Eaop.fpFEA2List->list[0].cbValue)
        + strlen(FILCLS_NAME)
        + 1                       /* + null string terminator @W0A*/
        + FILCLS_SIZE ;
/* Order of returned attributes is up to server so allow for  @W0A*/
/* each returned entry to be on a 4 byte boundary.            @W0A*/
Remainder = FEASize % 4;                                    /*@W0A*/
if (Remainder != 0)                                         /*@W0A*/
  FEASize=FEASize + (4-Remainder);                          /*@W0A*/

/* Note, we have calculated the minimum FEA2LIST size to hold @W0A*/
/* the returned information.  We are permitted to pass a much @W0A*/
/* bigger buffer for the FEA2LIST if we wish so we could have @W0A*/
/* skipped doing a precise FEA2LIST size calcuation. However, @W0A*/
/* if we pass too small a FEA2LIST area, we will get a        @W0A*/
/* LENGTHRM error reply message.                              @W0A*/
/******************** STEP 2 *********************************@W0A*/
/*  2. Do the GEA2LIST + FEA2LIST malloc + set EAOP2 pointers @W0A*/
/******************** STEP 2 *********************************@W0A*/
/*                                                            @W0A*/
/* The call to DDMQueryPathInfo will include a pointer to the @W0A*/
/* EAOP2 structure (locally defined as Eaop) and it has       @W0A*/
/* pointers to the GEA2LIST and FEA2LIST areas.               @W0A*/
/*                                                            @W0A*/
/* The EAOP2 struct: PGEA2LIST-fpGEA2List (ptr to GEA2LIST)   @W0A*/
/*                 : PFEA2LIST-fpFEA2List (ptr to FEA2LIST)   @W0A*/
/*                 : ULONG-oError                             @W0A*/

/* OK, now do the mallocs for GEA2LIST and FEA2LIST areas and @W0A*/
/* put the pointers in the EAOP2 structure.                   @W0A*/
if ((Eaop.fpFEA2List = (PFEA2LIST)malloc(FEASize)) == NULL)
{  printf("Out of memory\n");
   CleanUp(SeqFN,DirFN,KeyFN,AltFN,KeyFN2);
   return(1);
}
if ((Eaop.fpGEA2List = (PGEA2LIST)malloc(GEASize)) == NULL)
{  printf("Out of memory\n");
   CleanUp(SeqFN,DirFN,KeyFN,AltFN,KeyFN2);
   return(1);
}

Eaop.oError = 0L;
```

*Figure 115 (Part 4 of 11). Example of C Program using Extended Attributes*

```
/******************** STEP 3 *********************************@W0A*/
/*  3. Fill in the GEA2LIST area                              @W0A*/
/******************** STEP 3 *********************************@W0A*/
/* Initialize the GEA2LIST area                               @W0A*/
memset(&(Eaop.fpGEA2List->cbList),'\0',GEASize);            /*@W0A*/

/* OK now start filling in the GEA2LIST area detail           @W0A*/
/* Fill in the GEA2 header which has the area length          @W0A*/
Eaop.fpGEA2List->cbList = GEASize;
/* The GEA2LIST struct: ULONG-cbList (len of GEA2 area  )     @W0A*/
/*                      GEA2-list[1] (orient first entry)     @W0A*/
/* The pGEA pointer will point to the specific GEA2 list      @W0A*/
/* entry on which we are working.  Use the GEA2LIST structure @W0A*/
/* definition to orient to the first list entry.              @W0A*/
pGEA = (PGEA2)(&(Eaop.fpGEA2List->list[0]));

/* Fill out the first GEA2 list entry - DELCP_NAME            @W0A*/
pGEA->cbName = (CHAR)(strlen(DELCP_NAME));                  /*@W0A*/
strcpy(pGEA->szName, DELCP_NAME);                           /*@W0A*/

/* Calculate size for first GEA2 list entry - .DDM_DELCP      @W0A*/
pGEA->oNextEntryOffset =
                  sizeof(pGEA->oNextEntryOffset)
                + sizeof(pGEA->cbName)
                + pGEA->cbName +1;                          /*@W0A*/

/* The next GEA2 list entry must begin on 4 byte boundary     @W0A*/
Remainder = pGEA->oNextEntryOffset % 4;                     /*@W0A*/
if (Remainder != 0)                                         /*@W0A*/
  pGEA->oNextEntryOffset = pGEA->oNextEntryOffset + (4-Remainder);
                                                            /*@W0A*/

/* Now move the GEA list entry pointer for the next list entry@W0A*/
  pGEA = (PGEA2)((PBYTE)pGEA + pGEA->oNextEntryOffset);     /*@W0A*/

/* Set up the next GEA2 list entry - .DDM_FILCLS             @W0A*/
pGEA->cbName = (CHAR)(strlen(FILCLS_NAME));                /*@W0A*/
strcpy(pGEA->szName, FILCLS_NAME);                         /*@W0A*/

/* This GEA2 list entry is the last in this request.  So     @W0A*/
/* set the NextEntryOffset to 0 to indicate this is last     @W0A*/
/* list entry.                                               @W0A*/
pGEA->oNextEntryOffset = 0L;
/******************** STEP 4 *********************************@W0A*/
/*  4. Fill in the FEA2LIST area                              @W0A*/
/******************** STEP 3 *********************************@W0A*/
/* Initialize the FEA2LIST area                               @W0A*/
memset(&(Eaop.fpFEA2List->cbList),'\0',FEASize);            /*@W0A*/

/* Fill in the FEA2LIST header which has the area length     @W0A*/
Eaop.fpFEA2List->cbList = FEASize;

/* The remainder of the FEA2LIST area is untouched.  It will  @W0A*/
/* contain the returned EA FEA2 list entries from the         @W0A*/
/* DDMQueryPathInfo call.                                     @W0A*/
```

*Figure 115 (Part 5 of 11). Example of C Program using Extended Attributes*

```
/******************** STEP 5 *********************************@W0A*/
/*  5. Issue the DDMQueryPathInfo                             @W0A*/
/******************** STEP 5 *********************************@W0A*/
/*---------------------------------------------------------------------
-- Query a file to get .DDM_DELCP and .DDM_FILCLS EA.         @W0C
-- Then display the returned EAs.                             @W0C
---------------------------------------------------------------------*/
SevCode = DDMQueryPathInfo
          (SeqFN,                           /* PathName        */
           1UL,                             /* PathInfoLevel   */
           (PBYTE)&Eaop,                    /* PathInfoBuf     */
           (ULONG)sizeof(EAOP2)             /* PathInfoBufSize */
          );
if (SevCode == SC_NO_ERROR)
{  printf("\n\nSuccessful DDMQueryPathInfo call to file %s\n",SeqFN);
  /******************** STEP 6 *******************************@W0A*/
  /*  6. Extract DDM attribute data from the FEA2LIST area    @W0A*/
  /******************** STEP 6 *******************************@W0A*/
  /* OK, we got a good return code, so it is time to look at  @W0A*/
  /* the FEA2LIST area which now holds the returned info.     @W0A*/

   /* Initialize the pFEA pointer to first FEA2 entry        @W0A*/
   pFEA = (PFEA2)(&(Eaop.fpFEA2List->list[0]));

  /* The local i variable will govern the WHILE loop which    @W0A*/
  /* follows.  It counts the number of bytes remaining in     @W0A*/
  /* the FEA2LIST.  When the last FEA2 list entry is          @W0A*/
  /* encountered, it is set to zero to stop the WHILE loop.   @W0A*/
  /* If it goes negative, something went wrong while          @W0A*/
  /* navigating around the FEA2 entries, stop the WHILE loop. @W0A*/

  i = (Eaop.fpFEA2List->cbList - sizeof(Eaop.fpFEA2List->cbList));
  while ( i > 0)
    {   /* while more FEA2 list entries to process            @W0A*/

      /* Temporarily set pAttValue to beginning szName which  @W0A*/
      /* is the .DDMxxx attribute name.                       @W0A*/
      pAttValue = (PDDMOBJECT)((PBYTE)&pFEA->szName);

      /* Now move pAttValue past the .DDMxxx attribute to    @W0A*/
      /* the value field by adding the number given in cbName@W0A*/
      /* plus one for the string terminating null character. @W0A*/
      pAttValue = (PDDMOBJECT)((PBYTE)pAttValue +
                                pFEA->cbName + 1);   /*@W0A*/

      /* The value field is in PDDMOBJECT format.            @W0A*/
      /* The PDDMOBJECT: OBJLENGTH-cbObject (len obj-4 byte) @W0A*/
      /*               : CODEPOINT-cpObject (codept-2 byte)  @W0A*/
      /*               : BYTE-pData[1]      (data value)     @W0A*/

      /* We are expecting only 2 specific attributes back    @W0A*/
      if (!memcmp(&(pFEA->szName[0]),FILCLS_NAME,
                              sizeof(FILCLS_NAME)))  /*@W0A*/
        {      /* yes, this is the returned FILCLS attribute @W0A*/
```

*Figure 115 (Part 6 of 11). Example of C Program using Extended Attributes*

```
    /* DUBCODPT.H (inc by DUB.H) defines SEQFIL, etc.  @W0A*/
    if (pFEA->cbValue == 0)
     {  /* a cbValue of zero means value field is null @W0A*/
       printf("The .DDM_FILCLS attribute "
                       "for %s is null. \n",         /*@W0C*/
                       SeqFN);
     }  /* a cbValue of zero means value field is null @W0A*/
    else
     {                              /* value returned  @W0A*/
      switch (*(PCODEPOINT)pAttValue->pData)         /*@W0C*/
       { case SEQFIL:
                      printf("The .DDM_FILCLS attribute  "
                      "for %s is SEQFIL. \n",SeqFN); /*@W0C*/
                      break;
         case DIRFIL:
                      printf("The .DDM_FILCLS attribute  "
                      "for %s is DIRFIL. \n",SeqFN); /*@W0C*/
                      break;
         case KEYFIL:
                      printf("The .DDM_FILCLS attribute  "
                      "for %s is KEYFIL. \n",SeqFN); /*@W0C*/
                      break;
         case ALTINDF:
                      printf("The .DDM_FILCLS attribute  "
                      "for %s is ALTINDF. \n",       /*@W0C*/
                       SeqFN);
                       break;
         default:      printf("The .DDM_FILCLS attribute "
                       "for %s is invalid. \n",      /*@W0C*/
                       SeqFN);
                      break;
      }                             /* end switch      @W0C*/
     }                              /* value returned  @W0A*/
  }      /* yes, this is the returned FILCLS attribute @W0A*/
else  if (!memcmp(&(pFEA->szName[0]),DELCP_NAME,
          sizeof(DELCP_NAME)) )                      /*@W0A*/
  {   /* yes, this is the returned DELCP attribute     @W0A*/
    if (pFEA->cbValue == 0)
     {  /* a cbValue of zero means value field is null @W0A*/
       printf("The .DDM_DELCP  attribute "
                       "for %s is null. \n",      /*@W0C*/
                       SeqFN);
     }  /* a cbValue of zero means value field is null @W0A*/
    else
     {                              /* value returned  @W0A*/
      if (*(PCODEPOINT)pAttValue->pData == 0xf1)     /*@W0C*/
        printf("The .DDM_DELCP attribute for %s is TRUE. \n",
                       SeqFN);                       /*@W0C*/
      else
        printf("The .DDM_DELCP attribute for %s is FALSE.\n",
                       SeqFN);                       /*@W0C*/
     }                              /* value returned  @W0A*/
  }   /* yes, this is the returned DELCP attribute      W0A*/
else                                                 /*@W0A*/
  printf("unexpected EA returned for %s \n",
                       SeqFN);
```

*Figure 115 (Part 7 of 11). Example of C Program using Extended Attributes*

```
      /* Now move to the next entry in the FEA              @W0A*/
      if (pFEA->oNextEntryOffset > 0)
        {  /* the next entry is not the last entry          @W0A*/
           i = i - pFEA->oNextEntryOffset;                /*@W0A*/
           pFEA = (PFEA2)((PBYTE)pFEA + pFEA->oNextEntryOffset);
                                                          /*@W0A*/
        }  /* the next entry is not the last entry          @W0A*/
      else
        {  /* this was last entry-terminate WHILE           @W0A*/
            i = 0;                                        /*@W0A*/
        }  /* this was last entry-terminate WHILE           @W0A*/
    }   /* while more FEA entries to process                @W0A*/
}
else
{  printf("Error in DDMQueryPathInfo call to file %s\n",SeqFN);
   printf("Severity code = %u\n",SevCode);
   ReplyMsg();
   CleanUp(SeqFN,DirFN,KeyFN,AltFN,KeyFN2);
   return(SevCode);
}
/******************** STEP 7 *********************************@W0A*/
/*  7. Free the GEA2LIST and FEA2LIST areas                   @W0A*/
/******************** STEP 7 *********************************@W0A*/
free(Eaop.fpFEA2List);
free(Eaop.fpGEA2List);
/*************************************************************@W0A*/
/*  Prepare and execute a DDMSetPathInfo call to set a file's @W0A*/
/*  Extended Attribute.                                       @W0A*/
/*************************************************************@W0A*/
/* The DDM call to set a file's extended attributes is        @W0A*/
/* based on the OS/2 extended attributes model.  As such, the @W0A*/
/* calls to DDMSetPathInfo must pass a pointer to an EAOP2    @W0A*/
/* structure which, in turn, contains a pointer to the        @W0A*/
/* FEA2LIST area which contains the attributes values.        @W0A*/
/*                                                            @W0A*/
/* The EAOP2, FEA2LIST, GEA2LIST, FEA2 and GEA2 are defined   @W0A*/
/* in DUBDEFS.H which is included by DUB.H. The format of the @W0A*/
/* values which can be returned are documented in the VSAM    @W0A*/
/* API Reference manual in the "VSAM API Common Parameters"   @W0A*/
/* chapter.                                                   @W0A*/
/*                                                            @W0A*/
/* Steps:                                                     @W0A*/
/*  1. Calculate the size of the required FEA2LIST area       @W0A*/
/*  2. Do the FEA2LIST malloc and set the EAOP2 pointer       @W0A*/
/*  3. Fill in the FEA2LIST area                              @W0A*/
/*  4. Issue the DDMSetPathInfo                               @W0A*/
/*  5. Free the FEA2LIST area                                 @W0A*/
/*---------------------------------------------------------------------
-- Set up for DDMSetPathInfo:
--
-- Build an extended attribute FEA2LIST area with one FEA2     @W0C
-- list entry to specify the TITLE extended attribute.         @W0C
--------------------------------------------------------------------*/
```

*Figure 115 (Part 8 of 11). Example of C Program using Extended Attributes*

```
/******************** STEP 1 *********************************@W0A*/
/*  1. Calculate the size of the required FEA2LIST area       @W0A*/
/******************** STEP 1 *********************************@W0A*/
/* Now calculate size of FEA2 list area to hold returned info.@W0A*/
/* The FEA2LIST header: ULONG-Length of FEA2LIST area         @W0A*/
/*                      (pointed to by fpFEA2LIST in EAOP2)   @W0A*/
/* The FEA2 list entry: ULONG-oNextEntryOffset,               @W0A*/
/*                    : UCHAR-fEA    (flag       )            @W0A*/
/*                    : UCHAR-cbName (len of name)            @W0A*/
/*                    : USHORT-cbValue (len of value)         @W0A*/
/*                    : CHAR-szName[1] (char .DDM_xxx)        @W0A*/
/*                    : followed by DDMOBJECT encoded value   @W0A*/
/* Note  1: FEA2 list entries start on 4 byte boundaries      @W0A*/
/*       2: The cbName does not count null string terminator  @W0A*/
/*       3: Last entry is identified by oNextEntryOffset=0    @W0A*/
/* Calculate the FEA2LIST area size                           @W0A*/

/* FEA2LIST area begins with the FEA2LIST header              @W0A*/
FEA2Size = sizeof(Eaop2.fpFEA2List->cbList);                /*@W0A*/

/* Now add on an FEA2 list entry - .DDM_TITLE                 @W0A*/
/*  TITLE_NAME is defined as:  ".DDM_TITLE"                   @W0A*/
/*  TitleString if defined as  "Title String"                 @W0A*/
/*  TITLE_SIZE is defined as:                                 @W0A*/
/*             sizeof(OBJLENGTH) + sizeof(CODEPOINT)          @W0A*/
/*                               + strlen(TitleString);       @W0A*/
FEA2Size = FEA2Size
         + sizeof(Eaop2.fpFEA2List->list[0].oNextEntryOffset)
         + sizeof(Eaop2.fpFEA2List->list[0].fEA)
         + sizeof(Eaop2.fpFEA2List->list[0].cbName)
         + sizeof(Eaop2.fpFEA2List->list[0].cbValue)
         + strlen(TITLE_NAME)
         + 1                      /* + null string terminator @W0A*/
         + TITLE_SIZE;                                      /*@W0C*/

/******************** STEP 2 *********************************@W0A*/
/*  2. Do the FEA2LIST malloc and set the EAOP2 pointer       @W0A*/
/******************** STEP 2 *********************************@W0A*/
/*                                                            @W0A*/
/* The call to DDMSetPathInfo will include a pointer to the   @W0A*/
/* EAOP2 structure (locally defined as Eaop2) and it has      @W0A*/
/* pointers to the GEA2LIST and FEA2LIST areas.               @W0A*/
/*                                                            @W0A*/
/* The EAOP2 struct: PGEA2LIST-fpGEA2List (ptr to GEA2LIST)   @W0A*/
/*                 : PFEA2LIST-fpFEA2List (ptr to FEA2LIST)   @W0A*/
/*                 : ULONG-oError                             @W0A*/
if ((Eaop2.fpFEA2List = (PFEA2LIST)malloc(FEA2Size)) == NULL)
{  printf("Out of memory\n");
   CleanUp(SeqFN,DirFN,KeyFN,AltFN,KeyFN2);
   return(1);
}
/* Since this is a DDMSetPathInfo call, there is no GEA2LIST  @W0A*/
Eaop2.fpGEA2List = NULL;                                    /*@W0M*/
Eaop2.oError = 0L;                                          /*@W0A*/
```

*Figure 115 (Part 9 of 11). Example of C Program using Extended Attributes*

```
/******************** STEP 3 *********************************@W0A*/
/*  3. Fill in the FEA2LIST area                               @W0A*/
/******************** STEP 3 *********************************@W0A*/

/* Initialize the FEA2LIST area                                @W0A*/
memset(&(Eaop2.fpFEA2List->cbList),'\0',FEA2Size);          /*@W0A*/

/* Fill in the FEA2LIST header which has list area length     @W0A*/
Eaop2.fpFEA2List->cbList = FEA2Size;

/* The pFEA pointer will point to the specific FEA2 entry    @W0A*/
/* on which we are working.  Use the FEA2LIST structure      @W0A*/
/* definition to orient to the first list entry.             @W0A*/
pFEA = Eaop2.fpFEA2List->list;

/* Fill out the first and only FEA2 list entry - TITLE      @W0A*/
pFEA->fEA = 0;
pFEA->cbName = (CHAR)(strlen(TITLE_NAME));                /*@W0C*/
pFEA->cbValue = TITLE_SIZE;                               /*@W0A*/
strcpy(pFEA->szName,TITLE_NAME);                          /*@W0C*/
/* Now set pAttValue ptr past the .DDMxxx attribute to       @W0A*/
/* the value field by adding the number given in cbName      @W0A*/
/* plus one for the string terminating null character.       @W0A*/
 pAttValue = (PDDMOBJECT)((PBYTE)&pFEA->szName +
                                      pFEA->cbName + 1);   /*@W0A*/

/* The value field is in PDDMOBJECT format.            @W0A*/
/* The PDDMOBJECT: OBJLENGTH-cbObject (len obj-4 byte) @W0A*/
/*                 CODEPOINT-cpObject (codept-2 byte)  @W0A*/
/*                 BYTE-pData[1]      (data value)     @W0A*/

pAttValue->cbObject =  TITLE_SIZE;                   /*@W0A*/

/* DUBCODPT.H (included by DUB.H) TITLE codepoint=0x0045 @W0A*/
pAttValue->cpObject =  TITLE;
strcpy(pAttValue->pData,TitleString);

/* This FEA2 entry is the last in this request.  So set the @W0A*/
/* NextEntryOffset to 0 to indicate this is the last entry. @W0A*/
pFEA->oNextEntryOffset = 0L;                              /*@W0A*/
```

*Figure 115 (Part 10 of 11). Example of C Program using Extended Attributes*

```
/******************** STEP 4 *********************************@W0A*/
/*  4. Issue the DDMSetPathInfo                              @W0A*/
/******************** STEP 4 *********************************@W0A*/
SevCode = DDMSetPathInfo
          (SeqFN,                       /* PathName        */
           1UL,                         /* PathInfoLevel   */
           (PBYTE)&Eaop2,               /* PathInfoBuf     */
           (ULONG)sizeof(EAOP2)         /* PathInfoBufSize */
          );
if (SevCode == SC_NO_ERROR)
   printf("\nSuccessful DDMSetPathInfo call to file %s\n",SeqFN);
else
{  printf("Error in DDMSetPathInfo call to file %s\n",SeqFN);
   printf("Severity code = %u\n",SevCode);
   ReplyMsg();
   CleanUp(SeqFN,DirFN,KeyFN,AltFN,KeyFN2);
   return(SevCode);
}
/******************** STEP 5 *********************************@W0A*/
/*  5. Free the FEA2LIST area                                 @W0A*/
/******************** STEP 5 *********************************@W0A*/
free(Eaop2.fpFEA2List);                                     /*@W0A*/
   .
   .
   .
```

*Figure 115 (Part 11 of 11). Example of C Program using Extended Attributes*

# Glossary

This glossary defines many of the terms and abbreviations used in this manual. If you do not find the term you are looking for, refer to the index or to the *Dictionary of Computing*, SC20-1699.

**abend**. Abnormal end of task.

**access method**. The part of the DDM architecture which accepts commands to access and process the records of a file.

**ADL**. A Data Language

**ADSM**. ADSTAR Distributed Storage Manager.

**alternate index file**. A file that has a different key path over a base file. The base file can be a keyed, direct, or sequential file.

**API**. Application Programming Interface

**CCS**. Common Communication Support.

**CCSID**. Coded character set identifier.

**CDRA**. Character Data Representation Architecture.

**CM**. Communications Manager

**complete path name**. The specifications for a file which includes the drive, directories, filename and file extension.

**data conversion**. A set of programs that convert data according to defined data descriptions. For example, characters can be converted from EBCDIC to ASCII, and numeric data can be converted from System /370 packed decimal to IEEE floating point or ASCII character (or vice versa).

**data description**. Specification of the layout of data. The data description of data stored in a file can be viewed as a file attribute.

**data security**. The protection of data against unauthorized disclosure, transfer, modifications or destruction, whether accidental or intentional.

**data set**. The major unit of data storage and retrieval. It consists of a collection of data in one of several prescribed arrangements which is described by control information that the system has access to.

**data stream**. All data transmitted through a data channel in a single read or write operation.

**DD&C**. Data Description and Conversion; architecture extension to DDM.

**DDM**. Distributed Data Management; an SAA CCS architecture. A set of interfaces that gives users access to data files that reside on remote systems connected by a communication network. The DDM interfaces enable an application program to retrieve, add, update and delete data records in a file existing on a remote system. The DDM interfaces can be used to communicate between systems that have different architectures.

**deadlock**. Unresolved contention for the use of a resource. Each element in a process is waiting for an action by, or a response from, the other.

**DFM**. Distributed FileManager.

**DFM client**. Translates requests from the source system for access to file data on a remote system into a standard architected DDM request.

**DFM server**. A DFM component that accepts a remote request to access data and translates this request into a data management request on the target system.

**direct file**. A file that contains records that have a relationship between the contents of the record and the record position at which the record is stored.

**distributed data management (DDM)**. Architecture for accessing distributed data located in files and distributed relational databases.

**distributed file management (DFM)**. Strategy for a set of programming facilities that implement the file aspects of the DDM architecture on those systems which represent the SAA environments.

**DRBA**. Distributed relational data base access.

**FSD**. File System Driver.

**HPFS**. High Performance File System.

**IFS**. Installable File System.

**independent LU**. A logical unit (LU) that is not controlled by a System Network Architecture (SNA) host system.

**intersystem communication**. Communication between different systems by means of SNA facilities.

**keyed file**. A file organization that supports keyed forms of access to the records of the file.

**LAN**. Local area network.

**Local area network**. LAN

**LDM**. Local data management.

**LDMI**. Local data management interface.

**local file**. A file that resides on the same system as the application program that is accessing it.

**LU**. Logical unit.

**protocol**. A set of rules to be followed by communication systems.

**RACF**. Resource Access Control Facility. An external security management facility.

**record**. The basic unit of data stored in a file and transferred between DDM source and target servers.

**record file**. Record files consist of data fields organized into records that can be accessed as a set of bytes.

**remote file**. A file that resides on a system other than the system where the application program requesting access to the file resides.

**Remote Record Access Support**. DFM function that allows applications to access remote file data. function is to allow byte stream applications to access remote file data.

**SAA**. Systems Application Architecture

**SAA data**. Data on SAA systems that is subject to remote access and management using SAA DDM protocols.

**SCM**. Source communications manager. The DDM layer responsible for interfacing with the local communications facilities. It coordinates the sending and receiving of data on the source system.

**sequential file**. A file in which records are arranged in exactly the same sequence as they were stored into the file.

**SNA**. Systems Network Architecture.

**source system**. A system that requests access to data on another system. It is the "source" of the request.

**Stream Agent**. The DDM program responsible for transformation of data between the stream oriented API requests and the DDM byte requests.

**stream file**. Stream files contain strings of bytes that can be accessed according to their relative position within the file.

**Systems Network Architecture (SNA)**. The description of the logical structure, formats, protocols, and operational sequences for transmitting information units through and controlling the configuration and operation of networks.

**target system**. The system that contains data that is being accessed by another system.

**target system data**. Data considered to be owned and maintained according to the rules and functions prescribed by the data manager on the target system.

**TP**. Transaction Program

**user exit**. A point in an IBM-supplied program at which a user-exit routine may be given control.

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