2200

2200/VSE Local Communications Option
Programmer's Reference Guide
SOFTWARE
2200/VS TERM/V DISK, REV: 2:00 731-8001A 360K
2200/VS ACCESS SUB DISK REV 2:00 731-8012A 360K
VS CONTROL/MCODE VOL:2258 REV 2.00 DISK1 735-9333A 360K
VS CONTROL/MCODE VOL:2258 REV 2.00 DISK2 735-7011 360K
2200

2200/VS
Local Communications
Option Programmer’s
Reference Guide

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</tbody>
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The Wang 2200/VS Local Communications Option (LCO) enables Wang 2200 users to emulate up to four VS workstations and store and access files on a connected VS system. This guide provides information on programming requirements for accessing the Wang 2200/VS LCO filing services. The primary audience for this document is the Wang 2200 programmer. Experience with programming on a Wang 2200 system is recommended for all users.

Chapter 1 provides background information on the Wang 2200/VS LCO and serves as an introduction to the guide.

Chapter 2 explains programming requirements for accessing VDISK files (2200 disk image files) stored on a VS system.

Chapter 3 explains programming requirements for accessing native DMS files stored on a VS.

Chapter 4 explains the functions of the DMS access subroutines.

Appendix A contains additional information on return codes, the Extended File Sharing header, file attribute information, and the create and alt-key parameters.

Additional information on the Wang 2200/VS LCO is available in the following Wang publications:

- 2200/VS Local Communications Options User's Guide (715-0564)
- 2200 BASIC-2 Disk Reference Manual (700-4081)
- 2200 BASIC-2 Error Codes Booklet (700-7170)
- 2200 BASIC-2 Language Reference Manual (700-4080)
- 2200 Introductory Guide (700-4613)
- VS Data Management System Reference (800-1124-01)
- VS File Management Utilities Reference
CHAPTER 1
INTRODUCTION

1.1 OVERVIEW

The 2200/VS Local Communications Option (LCO) is a data communications hardware (the 2258 controller) and software option that enables a Wang 2200MVP, -LVP, or Micro-VP system to communicate with a Wang VS computer system. The 2200/VS LCO enables you to perform the following functions:

- Log on to the VS and run VS application programs that do not require the downloading of microcode to a VS workstation.
- Run 2200 application programs that store data to and retrieve data from 2200 disk-image files (VDISKs) stored on the VS system.
- Run 2200 application programs that store data to and retrieve data from native VS Data Management System (DMS) files by using subroutines provided with the 2200/VS LCO package.

This programmer's reference guide explains the programming requirements for accessing VDISKs and native DMS files stored on the VS system with new and existing programs. For more information on using VS Workstation Emulation and Filing Services utilities, refer to the 2200/VS Local Communications Option User's Guide.

1.2 2200/VS LCO FILING SERVICES

The Filing Services utilities of the 2200/VS LCO package enables a 2200 user to access (create, read, and write) VS DMS files through existing and new 2200 BASIC-2 application programs. The VS DMS files are stored on an attached VS system. The VS Data Management System manages all disk file space, and services all file I/O requests on the VS system.
The 2200/VS LCO enables you to store and access information on a VS system in the following forms:

- VDISK
- Native VS DMS files

VDISKS are 2200 disk-image files that are stored on a VS system connected to a 2200 system through the 2200/VS LCO. A VDISK acts like a disk platter to the attached 2200 and enables you to access information stored at the VDISK address as records, files, or sectors.

You create VDISKS on the VS using utilities provided with the 2200/VS LCO software. VDISKS can be shared with other 2200 systems equipped with the 2200/VS LCO package. VDISKS can also be accessed by the VS system. However, you would have to alter the VS application programs to use the files stored on VDISK. How you access VDISKS from an attached 2200 is explained in Chapter 2 of this guide.

Native VS DMS files are formatted by the VS DMS. DMS filing services supports several different file types, including: consecutive, relative, and indexed files. Native DMS files can be accessed both by VS application programs and by other 2200 systems attached to the VS and equipped with the 2200/VS LCO package.

To access native DMS files you must use the DMS access subroutines included with the 2200/VS LCO package. How you access Native DMS files is explained in Chapter 3 of this guide.
CHAPTER 2
2200 VDISK ACCESS

2.1 INTRODUCTION

Using the 2200/VS LCO package to access information stored on an attached VS system through a VDISK is just like using any other 2200 disk facility.

First you must create the VDISKs and assign them disk addresses using the Filing Services utilities that come with the 2200/VS LCO software. For more information on the VDISK Filing Services utilities, refer to the 2200/VS Local Communications Options User's Guide.

Once you create a 2200 VDISK on the VS, you can use it like any other formatted disk with existing or new 2200 BASIC-2 application programs to write data to and read data from the VDISK.

VDISKs can be opened in Exclusive, Read Only, or Shared mode. In Exclusive mode, VDISKs can only be used by the 2200 system they were opened on. In Shared mode they can be shared with other 2200 systems that are equipped with the 2200/VS LCO package. Read-Only mode is a form of Shared mode, except that the VDISKs are write protected. VDISKs can also be accessed by VS application programs; however, it is not recommended.

When the VDISKs are opened, any user on an attached 2200 can run an application program and access the disks. The 2258 controller responds to the disk address it receives from the application program and passes filing requests to the VS Filing Services program. When the application program is finished processing, you can then run another 2200 application program.
2.2 USING VDISKS

You can use VDISKS with both new and existing BASIC-2 application programs. To access VDISKS, you must know which ones are available. You can use the View VDISK function (included in the 2200/VS LCO File Services utilities) to view a list of available VDISKS. Once you know which VDISKS are available, you can alter existing programs (if necessary) or create new ones to access the VDISKS.

2.2.1 Using VDISK With Existing 2200 Programs

Using VDISKS with existing 2200 BASIC-2 programs should require little or no change to the application programs, except in the following cases:

- If the disk address is hard-coded in the BASIC-2 application program.
- If the BASIC-2 application program and its data file share the same disk address.
- If the program contains a disk address verification program that does not recognize the VDISK addressing scheme.

What To Do When the Disk Address Is Hard-Coded

If the disk address is hard-coded in the application program, you can go through the program and change all references to the disk address to the new VDISK address.

For example, if the disk address was hard-coded in the program as follows:

10 SELECT #5 320

You could go through the program and change every occurrence of 320 to an existing VDISK address. You can write the example above as follows:

10 SELECT #5 D31

In this example, 320 is changed to D31, specifying a valid VDISK address.

You can also substitute a variable for the disk address and have the program request the address from the user at runtime. You can then assign to the variable the value received from the user.
What To Do When the Program and Data Files Share the Same Disk

When the program and data files are stored on the same disk, it may not be advisable to use VDISK for performance reasons (refer to Section 2.3).

However, if the data file is sufficiently large to warrant the use of VDISK, you can follow the suggestions in the previous section and hard-code the changes or request the user to input the disk address. In this case, it would be advisable to separate the application program from the data file and store only the data files on the VDISK.

For more information, refer to the appropriate BASIC-2 reference and disk manuals.

What To Do When Verification Procedures Do Not Recognize the Address

If a program contains a disk verification routine that does not recognize the disk addressing scheme used for VDISK, update the verification routine to allow valid VDISK addresses. The valid ranges of addresses for VDISK are as follows:

- DXO through DXF
- DY0 through DYF

The possible values for X are 1, 2, or 3. You set the value for X in the 2258 controller itself. The value of Y is dependent on the value you assigned to X as follows:

- If X is 1, then Y must be 5.
- If X is 2, then Y must be 6.
- If X is 3, then Y must be 7.

For more information on how to set the address, refer to the 2200/VS Local Communications Options User’s Guide.

2.2.2 Submitting Programs That Access VDISK

Before you can access a file stored on VDISK, you must make certain that the following procedures have been implemented:

- The VDISK has been created using the VDISK utilities.
- The 2200 is actively connected to the VS (the attach procedure has been run).
- The program you submit has or requests a valid VDISK address.
For more information on how to create VDISKs and how to run the attach program, refer to the 2200/VS Local Communications Options User's Guide. Once you have implemented these procedures, you can submit programs to access VDISK.

2.3 VDISK PERFORMANCE CONSIDERATIONS

VDISK performance is strongly affected by the following components of the 2200/VS LCO software package:

- 2258 firmware
- VS serial I/O processor

2258 Firmware

The 2258 firmware can handle up to four separate tasks; however, only one of these tasks can be assigned to VS Filing Services. The method for attaching to VS Filing Services is described in the 2200/VS Local Communications Options User's Guide. Once the VS Filing Services task is active, all 2200 partitions (up to 16) can invoke VS Filing Services through the task.

It is important to remember that the 2258 controller can receive requests from any of the 16 possible 2200 partitions and that these requests are handled similarly to 2200 disk requests. As a result, the more requests that are channeled to the VS through a single 2258 controller, the slower the response time experienced by each individual partition.

VS Serial I/O Processor

The VS serial I/O processor (SIOP) handles requests in a serial manner, one request at a time. Each file request requires both a transmission to the SIOP and a response from the SIOP. Since the SIOP handles these requests in a serial manner and since the 2258 controller must handle requests for all partitions, VDISK performance can be adversely affected by the number of requests being processed at any given time.

VDISK performance can also be adversely affected by opening VDISKs in Shared mode. Since VDISKs are actually VS files, response time can be reduced by the additional overhead in the VS system associated with shared files.

When you open VDISKs in Exclusive mode, the disks are open to all partitions on the same 2200. You should only open VDISKs in Shared mode when the VDISK must be shared with another 2200 or when it must be accessed through another 2258 controller on the same 2200.
As the number of VDISKs opened in Shared mode increases, disk commands execute more slowly. When a disk command is executed, the 2258 firmware uses VS DMS commands to lock each VDISK opened in Shared mode. The VDISKs are locked to prevent other 2258 controllers from accessing the VDISK.

If there are many VDISKs open in Shared mode, the locking procedure can add significantly to the processing time required to execute each disk command.

2.4 IMPROVING VDISK PERFORMANCE

To improve VDISK performance, you can implement the following recommendations:

- Use VDISK only to store large data files for data-intensive programs and for backup storage of program files.
- Do not load programs off VDISK, particularly programs that use program overlays.
- Do not use VDISK to store program-required files, such as screen or message files.
- Avoid opening VDISKs in Shared mode. However, if you must use VDISKs in Shared mode, you may improve performance by bracketing each string of disk commands with a $OPEN and a $CLOSE to reduce processing by the 2258 controller for files opened in Shared mode.
- In large systems or where heavy use of the 2258 data link is expected, using multiple 2258 controllers for VDISK access might increase throughput proportionally. By adding additional 2258 controllers to a single system you can off-load some of the traffic to the additional controllers.

Note that because of the 2200 disk addressing scheme you are limited to a maximum of three 2258 controllers on a single system for VDISK purposes. You can, however, add additional 2258 controllers either for native DMS access or add more terminals for VS Workstation Emulation. Adding additional 2258 controllers might also improve VDISK performance in large systems.
• The 2258 controllers support utilities enable you to define multiple VDISK maps that assign 2200 platter addresses to an equivalent number of 2200 disk image files. In certain cases you may improve performance by picking a specific VDISK map for a particular application. Once the application is run, you can then return the VDISK map to your normal processing configuration. However, it is recommended that you maintain one VDISK map throughout each session whenever possible.

2.5 MOVING EXISTING 2200 FILES TO VDISK

To move existing 2200 files to VDISK, use the Move Files utility. You access the Move Files utility from the System Utilities menu. For more information on how to use the Move Files utility, refer to the 2200 Introductory Guide.
CHAPTER 3
NATIVE DMS ACCESS

3.1 INTRODUCTION

The 2200/VS LCO package enables you to create and access files on the attached VS system directly from your BASIC-2 application programs. To create and access native DMS files using the 2200/VS LCO, you must use the DMS access subroutines that come with the 2200 package. Files created in this manner are referred to as native DMS files because they are managed by the VS DMS.

Native DMS files can be accessed by BASIC-2 application programs on any 2200 system attached to the VS and equipped with the 2200/VS LCO package. Native DMS files can also be accessed by VS application programs.

The 2200 LCO software supports the following DMS file types: consecutive, indexed, and relative.

Consecutive

Consecutive file types allow you to access records sequentially and read records on disk directly by record sequence number. Records can only be added at the end of the file and cannot be deleted. This structure is appropriate for most data entry and batch update applications. Consecutive files are supported for all types of I/O devices and are used for specialized purposes, such as printer files and system-maintained journals.

Indexed

Indexed file types allow you to access records through a key field that contains unique data values. Indexed files can only be created and stored on disk storage devices. This structure supports sequential record retrieval, and rapid nonsequential retrieval of single records from disk files by key value. You can add, update, or delete records by specifying the primary key value of the desired record. DMS supports both primary key and alternate key indexed files.
Relative

Relative files contain sequential, fixed length record slots and can only be created and accessed on disk storage devices. Relative files allow you to access records either sequentially or directly by record sequence number. You can add, update, or delete records within a relative file. However, you must preallocate space for adding records. Deleting records does not reduce the size of the file. You should choose a relative file structure if speed of access and ability to modify and delete existing records is a major consideration. Relative files are not supported on the VS-50 or VS-80 computers.

Note: Relative files cannot be opened in Shared mode.

For more information about DMS file structures, refer to the VS Data Management System Reference.

3.2 BRIEF DESCRIPTION OF THE DMS ACCESS SUBROUTINES

Table 3-1 lists the DMS access subroutines available, provides a description of each subroutine, and lists the subroutine's corresponding function number.

Table 3-1. DMS Access Subroutines

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Function Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL OPEN</td>
<td>Opens any DMS file</td>
<td>'101</td>
</tr>
<tr>
<td>GENERAL CLOSE</td>
<td>Closes any DMS file</td>
<td>'102</td>
</tr>
<tr>
<td>CONSECUTIVE READ</td>
<td>Reads a consecutive record</td>
<td>'103</td>
</tr>
<tr>
<td>CONSECUTIVE WRITE</td>
<td>Writes a consecutive record</td>
<td>'104</td>
</tr>
<tr>
<td>CONSECUTIVE REWRITE</td>
<td>Rewrites a consecutive record</td>
<td>'105</td>
</tr>
<tr>
<td>CONSECUTIVE SKIP</td>
<td>Skips a specified number of consecutive records</td>
<td>'106</td>
</tr>
<tr>
<td>CONSECUTIVE LOCK</td>
<td>Locks a consecutive file</td>
<td>'107</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Function Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSECUTIVE UNLOCK</td>
<td>Unlocks a consecutive file</td>
<td>'108</td>
</tr>
<tr>
<td>INDEXED READ</td>
<td>Reads an indexed file</td>
<td>'109</td>
</tr>
<tr>
<td>INDEXED READ NEXT</td>
<td>Reads the next record in an indexed file</td>
<td>'110</td>
</tr>
<tr>
<td>INDEXED WRITE</td>
<td>Writes to an indexed file</td>
<td>'111</td>
</tr>
<tr>
<td>INDEXED REWRITE</td>
<td>Rewrites an indexed record to a file</td>
<td>'112</td>
</tr>
<tr>
<td>INDEXED DELETE</td>
<td>Deletes an indexed record from a file</td>
<td>'113</td>
</tr>
<tr>
<td>INDEXED FIND</td>
<td>Finds a specified indexed record in an indexed file</td>
<td>'114</td>
</tr>
<tr>
<td>INDEXED LOCK</td>
<td>Locks an indexed file</td>
<td>'115</td>
</tr>
<tr>
<td>INDEXED UNLOCK</td>
<td>Unlocks an indexed file</td>
<td>'116</td>
</tr>
<tr>
<td>RELATIVE READ</td>
<td>Reads a record form a relative file</td>
<td>'117</td>
</tr>
<tr>
<td>RELATIVE WRITE</td>
<td>Writes a record to a relative file</td>
<td>'118</td>
</tr>
<tr>
<td>RELATIVE REWRITE</td>
<td>Rewrites a record to a relative file</td>
<td>'119</td>
</tr>
<tr>
<td>RELATIVE DELETE</td>
<td>Deletes a relative record from a relative file</td>
<td>'120</td>
</tr>
<tr>
<td>BLOCK READ</td>
<td>Reads a block of data from a block file</td>
<td>'121</td>
</tr>
<tr>
<td>BLOCK WRITE</td>
<td>Writes a block of data to a block file</td>
<td>'122</td>
</tr>
</tbody>
</table>
The DMS access subroutines also provide functions for creating, deleting, and renaming files and for getting file attributes. These subroutines are called the DMS catalog functions. Table 3-2 provides a brief description of these functions.

Table 3-2. DMS Catalog Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Function Description</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATE FILE</td>
<td>Creates a DMS file</td>
<td>'200</td>
</tr>
<tr>
<td>DELETE FILE</td>
<td>Deletes a DMS file</td>
<td>'201</td>
</tr>
<tr>
<td>RENAME FILE</td>
<td>Renames a DMS file</td>
<td>'202</td>
</tr>
<tr>
<td>GET FILE ATTRIBUTES</td>
<td>Retrieves the value of one or more attributes groups associated with the opened file</td>
<td>'203</td>
</tr>
</tbody>
</table>

Refer to Chapter 4 of this guide for a detailed description of the DMS access subroutines and DMS catalog functions listed above.

3.3 HOW TO USE THE DMS ACCESS SUBROUTINES

The DMS access subroutines are stored in the following files that are included with the 2200/VS LCO software:

VSACCESS0 This file contains the GENERAL OPEN and GENERAL CLOSE subroutines. This file also includes the subroutine used to communicate all requests to the 2200 LCO controller.

VSACCESS1 This file contains all the subroutines that deal with consecutive DMS files.

VSACCESS2 This file contains all the subroutines that deal with indexed DMS files.

VSACCESS3 This file contains all the subroutines that deal with relative DMS files.

VSACCESS4 This file contains all the subroutines that enable you to access DMS files in block mode.

VSACCESS9 This file contains the DMS catalog functions.
To use the DMS access subroutines, perform the following steps:

1. Copy the files containing the required DMS access subroutines into your BASIC-2 application program. Usually you are required to copy VSACCESS0 and one other file into your program to open and close files and to handle all other file processing.

   Note: When you copy the DMS access subroutines into your program, be certain they do not overlay lines of code in your program.

2. Once you have copied the DMS access subroutines into your program, you access the subroutines by writing a GOSUB ' to the specific function you want to perform.

   For example, if you are working with existing consecutive files, you copy VSACCESS0 and VSACCESS1 into your program. The subroutines in VSACCESS0 allow you to open and close. The subroutines in VSACCESS1 allow you to perform other functions, such as reading and writing to and from the file.

   The following statement is an example of how you code a GOSUB ' to perform a GENERAL OPEN:

   0100 GOSUB '101 (N$, T$, M$)

   The variables (N$, T$, and M$) pass the name and organization of the file, and the mode the file is to be opened in to the subroutine.

3.4 DMS ACCESS PROGRAMMING REQUIREMENTS AND PERFORMANCE CONSIDERATIONS

To use the DMS access subroutines, you must copy the required files into your program.

To save space, copy only the files required by the program. For example, if your program uses only existing indexed files, you need only to copy in VSACCESS0 and VSACCESS2. If your program uses more than one file type, you have to copy more modules into your program.

If your program also creates, renames, or deletes files, you also have to copy in the DMS catalog functions VSACCESS9.
Once you have copied the DMS access subroutines into your program, you can save the program with the SR parameter. Saving the program with the SR parameter removes the REM statements from the program, thus saving you partition space.

3.4.1 Submitting Programs That Access Native DMS Files

Before you can access a native DMS file, you must make certain that the following procedures have been implemented:

- The 2200 is actively connected to the VS (that the attach procedure has been run).
- The program contains the required DMS access subroutines.

For more information on how to run the attach program, refer to the 2200/VS Local Communications Options User's Guide. Once you have implemented these procedures, you can submit programs from the 2200 to access native DMS files stored on the VS.

3.5 GENERAL NOTES ON THE DMS ACCESS SUBROUTINES

This section provides background on and general information common to all the DMS access subroutines.

3.5.1 Variables Reserved by the DMS Access Subroutines

All the variables used by the DMS access subroutines start with the letter V. If you have any variables in your programs that begin with the letter V, you can either change the variable in your program or change the variable in the DMS access subroutine.

Table 3-3 lists the variables used by the DMS access subroutines and provides a brief explanation of their purpose.

3-6 Native DMS Access
<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Length (in bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V$</td>
<td>Holds the file name.</td>
<td>32</td>
</tr>
<tr>
<td>V0</td>
<td>Is a work variable for the CONSECUTIVE SKIP subroutine. Holds the number of records to be skipped.</td>
<td>8</td>
</tr>
<tr>
<td>V0$</td>
<td>Holds the return code. Return codes are explained in Appendix A.</td>
<td>2</td>
</tr>
<tr>
<td>V1</td>
<td>Is a work variable.</td>
<td>8</td>
</tr>
<tr>
<td>V1$</td>
<td>Holds the file organization identifier.</td>
<td>1</td>
</tr>
<tr>
<td>V2</td>
<td>Is a work variable.</td>
<td>8</td>
</tr>
<tr>
<td>V2$</td>
<td>Holds the open mode identifier.</td>
<td>1</td>
</tr>
<tr>
<td>V3</td>
<td>Holds the key position for indexed files.</td>
<td>8</td>
</tr>
<tr>
<td>V3$</td>
<td>Holds the hold option identifier.</td>
<td>1</td>
</tr>
<tr>
<td>V4</td>
<td>Holds the key path for indexed files.</td>
<td>8</td>
</tr>
<tr>
<td>V4$</td>
<td>Holds the alternate mask for indexed files.</td>
<td>2</td>
</tr>
<tr>
<td>V5</td>
<td>Holds the key length for indexed files.</td>
<td>8</td>
</tr>
<tr>
<td>V5$</td>
<td>Holds the search criteria for the INDEXED FIND subroutine.</td>
<td>2</td>
</tr>
<tr>
<td>V6</td>
<td>Holds the time out value in seconds for hold option.</td>
<td>8</td>
</tr>
<tr>
<td>V6$</td>
<td>Holds the key value for indexed files.</td>
<td>6</td>
</tr>
</tbody>
</table>

(continued)
### Table 3-3. Variables Used by the DMS Access Subroutines (continued)

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Description</th>
<th>Length (in bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V7</td>
<td>Holds the number of records to read.</td>
<td>8</td>
</tr>
<tr>
<td>V7$</td>
<td>Holds the Extended File Sharing (EFS) header.</td>
<td>32</td>
</tr>
<tr>
<td>V8$</td>
<td>Is a work scalar variable.</td>
<td>16</td>
</tr>
<tr>
<td>V8$()</td>
<td>Is a work array.</td>
<td>256</td>
</tr>
<tr>
<td>V9$</td>
<td>Holds the file identifier number.</td>
<td>2</td>
</tr>
<tr>
<td>V9$()</td>
<td>Is the data buffer array for reading in information form the file.</td>
<td>4096</td>
</tr>
</tbody>
</table>

### 3.5.2 Using Variables or Literals for Input Parameters

The DMS access subroutines enable you to pass input parameters in the form of variables or literals. For example, a GOSUB ' to perform a CONSECUTIVE WRITE can be written as follows:

3000 DIM H1$32, D$50, H$2  
3005 H$=V9$: V9$ is the file identifier received from the OPEN  
3010 H1$ = V7$: REM V7$ is the EFS header received from the OPEN  
3020 D$ = "This statement is written to the file as a record."  
3030 GOSUB '104 (H$, H1$, D$)

This statement can also be written with a literal for D$ as follows:

3000 GOSUB '104 (H$, V7$, "This is written to the file as one record.")

In this example, a literal is used for the data buffer parameter.
**Note:** In the example above, the DMS access subroutine variable (V7$), which stores the External File Sharing (EFS) information, is used to specify this information in the GOSUB ' call to the CONSECUTIVE WRITE subroutine. You can only use the DMS access subroutines variables within your GOSUB ' statements if your program has only one file open at a time. Otherwise, you must assign the values stored in the DMS access subroutine variables to other variables within your program, and pass the appropriate variables to the DMS access subroutines.

### 3.6 MOVING FILES FROM THE 2200 TO THE VS

To use the 2200/VS LCO software package to move files from the 2200 to the VS, you need to write a utility program to perform the following tasks:

1. Open the 2200 file.

2. Create the file on the VS, if the file does not exist on the VS. To create a file on the VS, you can include the CREATE FILE subroutine in your utility program or you can use the CREATE utility provided on the VS. For more information, refer to the detailed description of the CREATE FILE subroutine in Chapter 4 of this guide.

Use the GENERAL OPEN (GOSUB '101) DMS access subroutine, to open the file, if the file already exists on the VS.

3. Read a record from the 2200 file using 2200 disk access statements.

4. Write a record to the VS using the appropriate DMS access subroutine.

5. Repeat steps 3 and 4 until all the records are written to the VS file.

6. Close the VS file using the GENERAL CLOSE DMS access subroutine (GOSUB '102).

7. Close the 2200 file.

Once you write the utility program, you must follow the procedures for submitting programs to access DMS files provided in this chapter.
3.7 MOVING FILES FROM THE VS TO THE 2200

To use the 2200/VS LCO software package to move files from the VS to the 2200, you need to write a utility program to perform the following tasks:

1. Open the DMS file on the VS using the GENERAL OPEN (GOSUB '101) DMS access subroutine.

2. Read the file using the appropriate DMS access subroutine (either consecutive, indexed, relative, or block).

3. Use the DATA SAVE DC OPEN statement, if the file does not exist on the 2200 system.

   Use the DATA LOAD DC OPEN statement, if the file already exists on the 2200 system.

4. Write the file to the 2200 using the familiar 2200 BASIC-2 statements.

Once you have written the utility program, you must follow the procedures for submitting programs to access DMS files provided in this chapter.

3.8 SAMPLE PROGRAMS

There are three sample programs included on the VSACCESS diskette shipped with the 2200/VS LCO software package. The sample programs use the DMS access subroutines to create, access and write records to and from native DMS files. Each program deals with a different file type, either consecutive, relative, or indexed. The following list provides the name of the files containing the sample programs:

- TESTCON1 -- Deals with consecutive files
- TESTREL1 -- Deals with relative files
- TESTIDX1 -- Deals with indexed files

Once you have the software installed, you can display these files on your terminal, or print them out, to get a better idea of how to use the DMS access subroutines.
CHAPTER 4
DMS ACCESS SUBROUTINES

4.1 INTRODUCTION

This section provides a detailed description of the DMS Access Subroutines. The description of each subroutine includes the following information:

General Form -- This section shows the general format of the GOSUB' statement used and includes a description of the required input parameters.

Purpose -- This section explains the function the subroutine performs.

Returns -- This section explains information returned by the subroutine.

Example -- This section provides an example of how the subroutine is used.

General Notes -- This section is also included for certain subroutines to provide additional information.
4.2 NOTES ON THE GENERAL FORM SECTION

In the General Form section, these basic rules of syntax are followed.

1. Symbols must be included in your BASIC-2 statements exactly as they appear in the General Form of the statement:

   - Uppercase letters: a through Z
   - Comma: ,
   - Double quotation marks: "
   - Parentheses: ()
   - Pound sign: #
   - Slash: /

2. Lowercase letters and words in the General Form of a statement represent items whose values must be assigned by the programmer. For example, if the lowercase word "name" appears in a General Form, the programmer must substitute a specific file name (such as "PROG1"), or an alphanumeric variable containing the name, in the actual statement. Similarly, where the lowercase letter n appears, the programmer must substitute an actual file number (from 0 to 64) or a variable containing a file number.

3. All information that appears between parentheses must be included in the GOSUB' statements.

4. Blanks (spaces) are used to improve readability and are meaningless.

5. The sequence that the terms are listed in must be followed.

Note: The 2258 interface subroutine, '199 uses the device table designator #3. The user should include the statement, "SELECT #3/(communications address plus 3)" in the program accessing DMS subroutines. Refer to page 2-6 of the 2200/VS Local Communication Option User's Guide for further information.
GENERAL OPEN

General Form
GOSUB '101 (file-name, org, mode)

where

file-name is the name of the file. The file name can include the //SYSTEM/VOLUME/LIBRARY/Filename. The file name can also be written as //VOLUME/LIBRARY/Filename. The SYSTEM, LIBRARY, and FILENAME can each be up to 8 characters in length. The VOLUME can be up to 6 characters in length.

org is the organization of the file. The valid file organization parameters and their meanings follow:

- C - Consecutive file
- I - Indexed file
- R - Relative file
- B - Block Access Method

mode is the mode the file is opened in. The valid mode parameters and their meanings follow:

- R - Read-only access
- S - Shared access
- X - Exclusive access
- E - Extended access

Purpose
The GENERAL OPEN ('101) subroutine enables you to open any DMS file. The subroutine enables you to specify the file name, including the system, the volume, the library, and actual name of the file. The library, volume, and file name are required; the system name is optional. The GENERAL OPEN subroutine also enables you to specify the file type (Indexed, Consecutive, or Relative) and the access mode (Read-Only, Shared, Exclusive, or Extended.)

Notes: Relative files cannot be opened in Shared mode.

If the mode specified is "Shared" for a consecutive file, the file is opened in "Shared I/O" mode.
**Returns**

The GENERAL OPEN subroutine returns the following information:

- **V0$** is the return code. Refer to Appendix A for more information.
- **V1** is the length of valid data in **V9$()** array (the file data field).
- **V7$** is the EFS header information for the file indicated by **V9$** (the file identifier). Refer to Appendix A for more information.
- **V9$** is the file identifier assigned to the file.
- **V9$(** is an array of 64 or 75 bytes that contains file attribute information. Refer to Appendix A for more information.

**Example (GENERAL OPEN)**

```
10 DIM N$32, T$1, M$1
20 N$="//SYSNAM/ANYVOL/ANYLIB/Filename": T$="I", M$="S"
30 GOSUB '101 (N$, T$, M$)
40 IF V0$=HEX(FF) THEN 60
50 STOP "ERROR IN OPEN"
60 H$=V9$: REM V9$ is the file identifier
```

In this example, variables are used to represent the name, org, and mode parameters. This example could have been written as follows:

```
10 GOSUB '101 ("//ANYVOL/ANYLIB/Filename","I", "S")
20 IF V0$=HEX(FF) THEN 40
30 STOP "ERROR IN OPEN"
40 REM Good general open. Continue processing.
50 H$=V9$: REM V9$ is the file identifier
```

In the examples above, the specified files are opened. In the second example, the system name is replaced with a slash (/).
GENERAL CLOSE

**General Form**

GOSUB '102 (file-id, efs)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

**Purpose**

The GENERAL CLOSE ('102) subroutine enables you to close any DMS file that had been previously opened for I/O functions. You must specify the file identifier assigned to the file.

Attempting to close a file that was not previously opened by an OPEN statement causes a recoverable program error at runtime.

**Returns**

The GENERAL CLOSE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

- V1 is the length of valid data in V9$() array (the file data field).

- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

- V9$() is an array containing 3 bytes and should be HEX(00).

**Example** (GENERAL CLOSE)

```
10 H1$=V7$:REM V7$ is the EFS header.
20 H$=V9$: REM V9$ is the file identifier
30 GOSUB '102 (H$,H1$)
40 IF V0$=HEX(FF) THEN 60
50 STOP "ERROR IN CLOSE"
60 ...
```

In this example, a variable (H$) is used to represent the file identifier and the EFS information (H1$).
CONSECUTIVE READ

General Form
GOSUB '103 (file-id , efs , hold , time)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS information for the specified file.

hold indicates the hold option and can be either "H", which holds the record for exclusive processing, or " ", which allows other programs to access the record.

time is the amount of time in seconds the system waits if the record is being held by another user. The time parameter must be zero, unless the file is opened in Shared mode. Specifying a value of zero indicates that the system waits indefinitely.

Purpose
The CONSECUTIVE READ ('103) subroutine enables you to read the next consecutive record in a specified file. The file must have previously been opened.

Returns
The CONSECUTIVE READ subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

- V9$() contains eight bytes of status information and the data read from the file. Refer to the CONSECUTIVE READ General Notes section for more information.
**General Notes**

In the CONSECUTIVE READ subroutine, the V9$(\) array is used to store status information and the data read from the file. The first eight bytes of the array are used to store the status information. Table 4-1 describes the status information.

**Table 4-1. CONSECUTIVE READ Status Information**

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Contains internal processing information. This value should always be equal to 01.</td>
</tr>
<tr>
<td>02 and 03</td>
<td>Contain the number of records read.</td>
</tr>
<tr>
<td>04 and 05</td>
<td>Contain the number of bytes in the byte block.</td>
</tr>
<tr>
<td>06</td>
<td>Contains the data block ID. This value should always be equal to 01.</td>
</tr>
<tr>
<td>07 and 08</td>
<td>Contains the number of bytes read. The value of these two bytes can be up to 64K.</td>
</tr>
</tbody>
</table>

The remaining bytes of the array (starting at the ninth byte) are used to store the data read from the file. If you know the length of the records read, you know how many bytes of V9$(\) are used to store the data. If you do not know the length of the records in the file, or the file contains variable length records, you can use the VAL function on the 7th and 8th bytes of the V9$(\) array to get the length of the data read. Refer to the following example for more information.

The V9$(\) array is originally dimensioned to hold 4,096 bytes of information (including the status information). However, you can decrease the size of the array depending on your needs.
Example (CONSECUTIVE READ)
10 DIM C1$5,N1$30,B1$3,WS8
20 H$=V9$;H1$=V7$:T=25
30 WS=HEX(A005A01EA0035205)
40 GOSUB '103 (H$, H1$, "H", T)
40 IF V0$=HEX(FF) THEN 60 ELSE 50
50 STOP "ERROR IN READ"
60 $UNPACK (F=W$) STR(V9$(),9,VAL(STR(V9$(),7,2),2)) TO C1$,N1$,B1$,A1

In this example, the next consecutive record is read. If the record is being held by another user, the system waits 25 seconds before an error occurs.

In line 60 the VAL function is used on the seventh and eighth bytes of the V9$() array to determine the number of bytes read.
CONSECUTIVE WRITE

General Form
GOSUB '104 (file-id, efs, data)

where

file-id    is an alphanumeric variable that represents the file identifier assigned to the file.

efs       is an alphanumeric variable that represents the EFS header information for the file indicated by V9$ (the file identifier).

data      can be either an alphanumeric literal or an array designator. If a literal string is used, the information must be enclosed in double quotation marks.

Purpose
The CONSECUTIVE WRITE ('104) subroutine enables you to write the next sequential record to a specified consecutive file.

To write the information contained in more than one variable to a file at one time, you can use the $PACK statement (or some other appropriate BASIC-2 statement) to pack the information into a single variable.

Returns
The CONSECUTIVE WRITE subroutine returns the following information:

• V0$ is the return code. Refer to Appendix A for more information.

• V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

• V9$() contains the following five bytes of status information:
  - Byte 01 contains internal status information. This value should always be equal to 01.
  - Bytes 02 and 03 contain the number of bytes written.
  - Bytes 04 and 05 contain the number of bytes in the byte block and should be HEX(0000).
Example (CONSECUTIVE WRITE)

10 DIM C1$5, H1$30, B1$3, W$8, D$43, H$2, H1$32
20 H$=V9$; H1$=V7$
30 W$=HEX(A005A01EA0035205)
40 $PACK (F=W$) D$ FROM C1$, H1$, B1$, A1
50 GOSUB '104 (H$, H1$, D$)
60 IF V0$=HEX(FF) THEN 80
70 STOP "ERROR IN WRITE"
80 ...

In this example, the data held in the variable D$ is written to the file specified by H$.

Note: Since 2200 will not be able to compute the length of a variable length record with trailing spaces, the users should implicitly pass the length of the record to the CONSECUTIVE WRITE subroutine by ending the record with a non-space dummy character.
CONSECUTIVE REWRITE

General Form
GOSUB '105 (file-id, efs, len, data)

where

file-id is an alphanumerical variable that represents the file identifier assigned to the file.

efs is an alphanumerical variable that represents the EFS header information for the file indicated by V9$ (the file identifier).

len indicates the length of the record to be rewritten. The value of the len parameter must match the record length exactly, including trailing spaces.

data can be either an alphanumerical literal or an array designator. If a literal string is used the information must be enclosed in double quotation marks.

Purpose

The CONSECUTIVE REWRITE ('105) subroutine enables you to overwrite an existing record in a consecutive file. The record must have been previously read with the HOLD option.

To write the information contained in more than one variable to a file at one time using the REWRITE subroutine, you can use the $PACK statement to pack the information into a single variable or some other appropriate BASIC-2 statement.

Returns

The CONSECUTIVE REWRITE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.
• V9$() contains the following three bytes of status information:

- Byte 01 contains the number of words in the word block that should be equal to HEX(00).
- Bytes 02 and 03 contain the number of bytes in the byte block that should be equal to HEX(0000).

Example (CONSECUTIVE REWRITE)
10 DIM C1$, N1$30, B1$3, W$8, D$43, H$2, H1$32
20 W$=HEX(A005A01EA0035205)
30 $PACK (F=W$) D$ FROM C1$, N1$, B1$, A1$
40 GOSUB '105 (H$, H1$, 43, D$)
50 IF VO$ = HEX(FF) THEN 70
60 STOP "ERROR IN REWRITE"
70 ...
CONSECUTIVE SKIP

General Form
GOSUB '106 (file-id, efs, nnnnnnnnn)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

nnnnnnnn is the number of records to skip; nnnnnnnnn must be between \(2^{32} = -2^{32}\).

Purpose
The CONSECUTIVE SKIP ('106) subroutine positions a consecutive file forward or backward a given number of records in the file. For example, if the first record of a file has been read, a SKIP value of 2 causes the next record read to be record 4. A SKIP value of -1 causes the same record to be reread by the next CONSECUTIVE READ ('103). A SKIP value of 0 is ignored.

Returns
The CONSECUTIVE SKIP subroutine returns the following information:

- \(V0\) is the return code. Refer to Appendix A for more information.
- \(V7\) is the EFS header information for the file indicated by \(V9\) (the file identifier). Refer to Appendix A for more information.
- \(V9()\) contains the following three bytes of status information:
  - Byte 01 contains the number of words in the word block that should be equal to HEX(00).
  - Bytes 02 and 03 contain the number of bytes in the byte block that should be equal to HEX(0000).

Example (CONSECUTIVE SKIP)
10 GOSUB '106 (H$, H1$, 30)
20 IF \(V0 = \text{HEX}(FF)\) THEN 50:STOP "ERROR IN SKIP"

In this example, the next 30 records in the specified file are skipped.
CONSECUTIVE LOCK

General Form
GOSUB '107 (file-id, efs, mode)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

mode is the mode the file is opened in. The following lists the valid mode parameters and their meanings:

- R - Read-only access
- S - Shared access
- X - Exclusive access
- E - Extended access

Purpose
The CONSECUTIVE LOCK ('107) subroutine enables you to have exclusive rights to a consecutive file. No other program can access the file until you unlock the file.

Returns
The CONSECUTIVE LOCK subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.
- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.
- V9$() contains the following three bytes of status information:
  - Byte 01 contains the number of words in the word block that should be equal to HEX(00).
  - Bytes 02 and 03 contain the number of bytes in the byte block that should be equal to HEX(0000).
Example (CONSECUTIVE LOCK)

10 H$=V9$
20 GOSUB '107 (H$, H1$, "X")
30 IF V0$=HEX(FF) THEN 50
40 STOP "ERROR IN LOCK"
50 REM File was locked successfully. Continue processing.

In this example, the "X" indicates the specified file is held for exclusive use. H1$ identifies the EFS header information.

Notes: The file LOCK is of limited use to users of the 2200/VS Local Communication Option accessing VS/DMS files. The VS/DMS functions are available to users of 2200 through the 2200 Server running as a foreground task on one of the VS workstation emulation windows. Since all users of 2200, attached to a particular 2258 controller, send their VS/DMS requests to this server, which in turn passes the requests to VS/DMS task, the VS fails to recognise that the DMS requests are from different users of 2200.

However, once a VS/DMS file is locked by a user on 2200 through one of the 2200 workstations, the file will not be available to other users logged on to VS until the file is unlocked. But the file can be shared for "dirty" read by other users on the VS as well as 2200.
CONSECUTIVE UNLOCK

General Form

GOSUB '108 (file-id, efs)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

Purpose

The CONSECUTIVE UNLOCK ('108) subroutine enables you to release a file from exclusive use so that other programs can access the file.

Returns

The CONSECUTIVE UNLOCK subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

- V9$() contains the following three bytes of status information:

  - Byte 01 contains the number of words in the word block that should be equal to HEX(00).

  - Bytes 02 and 03 contain the number of bytes in the byte block that should be equal to HEX(0000).

Example (CONSECUTIVE UNLOCK)

10 HS=V9$
20 GOSUB '108 (HS, H1$)
30 IF V0$=HEX(FF) THEN 50
40 STOP "ERROR IN UNLOCK"
50 REM Unlock was successful. Continue processing.

In this example, the specified file is released from exclusive use.
INDEXED READ

General Form
GOSUB '109 (file-id, efs, hold, time, key, length, value)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

hold indicates the hold option and can be either "H", which holds the record for exclusive processing or " ", which allows other programs to access the record.

time is the amount of time in seconds the system waits if the record is being held by another user. Specifying a value of zero (0) indicates that the system waits indefinitely. Nonzero values should be used only when the file is opened in Shared mode.

key is the key path, either the primary (0) or alternate key (1-16).

length is a numeric variable or expression that specifies the length of the key.

value is an alphanumeric variable or literal that indicates the value of the key.

Purpose
The INDEXED READ ('109) subroutine enables you to read an indexed file. The file must have previously been opened. You can use either a primary or alternate key. For more information, see the following General Notes section.

Returns
The INDEXED READ subroutine returns the following information:

- $V0$ is the return code. Refer to Appendix A for more information.
- $V1$ contains the length of data read (in bytes) in the $V9$() array.
- $V4$ is the alternate key mask.
- $V9$() the data read from the file.
General Notes
DMS allows a primary key and up to 16 alternate keys. In the INDEXED READ subroutine, the primary key is indicated by a 0 and the alternate keys are indicated by the numbers 1 through 16. An example of each is provided in the following example section.

The V9$( ) array is originally dimensioned to hold 4096 bytes of information (including the status information). However, you can decrease the size of the array depending on your needs.

Example (INDEXED READ)

10 DIM C1$5, N1$30, B1$3, W$8
20 W$=HEX(A005A01EA0035205)
30 C1$="00001"
40 GOSUB '109 (H$, H1$, "H", 0, 0, 5, C1$)
50 IF V0$=HEX(FF) THEN 70
60 STOP "ERROR IN INDEXED READ"
70 REM Successful indexed read. Continue processing
80 $UNPACK (F=W$) STR(V9$( ),1,V1) to K$,N1$,B1$,A1

In this example, the path is identified as the primary key by the zero (0) in the key parameter position. The key length is identified as 5 characters in length, and the value of the key is equal to the value of C1$. Note also that the hold option is used.

The following example shows how to indicate an alternate key.

10 DIM C1$5, N1$30, B1$3, W$8
20 W$=HEX(A005A01EA0035205)
30 C1$="00001"
40 GOSUB '109 (H$, H1$, "H", 0, 4, 5, C1$)
50 IF V0$=HEX(FF) THEN 70
60 STOP "ERROR IN INDEXED READ"
70 REM Successful indexed read. Continue processing
80 $UNPACK (F=W$) STR(V9$( ),1,V1) to K$,N1$,B1$,A1

In this example, the path is identified as the fourth alternate key by the four (4) in the key parameter position. The other parameter values remain the same.
INDEXED READ NEXT

**General Form**

GOSUB '110 (file-id, efs, hold, time)

**where**

- **file-id** is an alphanumeric variable that represents the file identifier assigned to the file.
- **efs** is an alphanumeric variable that represents the EFS header information for the specified file.
- **hold** indicates the hold option and can be either "H", which holds the record for exclusive processing or " ", which allows other programs to access the record.
- **time** is the amount of time in seconds the system waits if the record is being held by another user. Nonzero values should only be used when the file is opened in Shared mode.

**Purpose**

The INDEXED READ NEXT ('110) subroutine enables you to read an indexed file sequentially. The file must have previously been opened.

**Returns**

The INDEXED READ NEXT subroutine returns the following information:

- VO$ is the return code. Refer to Appendix A for more information.
- V1 contains the length of data read (in bytes) in V9$() array.
- V4$ is the alternate key mask.
- V9$() is the data read from the file.

**Example (INDEXED READ NEXT)**

```
10 DIM C1$5, H1$30, B1$3, W8, K1$1, K2$5
20 W$=HEX(A005A01EA0035205)
30 GOSUB '110 (H$, H1$, "H", 25)
40 IF VO$=HEX(FF) THEN 60
50 STOP "ERROR IN READ NEXT"
60 REM Successful READ NEXT. Continue processing
70 ...
```

In this example, the next record in the file indicated by H$ is read. If the record is being held by another user, the program waits 25 seconds before generating an error return code.
INDEXED WRITE

General Form
GOSUB '111 (file-id, efs, alt, data)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

alt represents the alternate key mask.

data can be an alphanumeric, an array designator, or a literal. If a literal string is used, the information must be enclosed in double quotation marks.

Purpose
The INDEXED WRITE ("111") subroutine enables you to write a keyed record to an indexed file.

To write the information contained in more than one variable to a file at one time using the WRITE subroutine, you can use the $PACK statement (or some other appropriate BASIC-2 statement) to pack the information into a single variable.

Returns
The INDEXED WRITE subroutine returns the following information:

• VO$ is the return code. Refer to Appendix A for more information.

Example (INDEXED WRITE)
10 DIM N1$30,B1$3,W$8,K1$1,K$5
20 W$=HEX(A005A01EA0035205)
30 PACK ( F=W$ ) D$ FROM C1$, N1$, B1$, A1$
40 GOSUB '111 (H$, H1$, H2$, D$)
40 IF VO$=HEX(FF) THEN 60
50 STOP "ERROR IN INDEXED READ"
60 REM Good indexed read. Continue processing.

Note: Since 2200 will not be able to compute the length of a variable length record with trailing spaces, the users should implicitly pass the length of the record to the INDEXED WRITE subroutine by ending the record with a non-space dummy character.
INDEXED REWRITE

General Form
GOSUB '112 (file-id, efs, alt, len, data)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

alt represents the alternate key mask.

len indicates the length of the record to be rewritten. The value of the len parameter must match the record length exactly, including trailing spaces.

data can be an alphanumeric variable, an array designator, or a literal. If a literal string is used, the information must be enclosed in double quotation marks.

Purpose
The INDEXED REWRITE ('112) subroutine enables you to overwrite an existing record in an indexed file. The rewritten record size is the same as that of the existing record.

To write the information contained in more than one variable to a file at one time using the REWRITE subroutine, you can use the $PACK statement (or some other appropriate BASIC-2 statement) to pack the information into a single variable.

Returns
The INDEXED REWRITE subroutine returns the following information:

• VO$ is the return code. Refer to Appendix A for more information.

General Notes
A record can be rewritten only if the record is read with the hold option equal to "H".

Example (INDEXED REWRITE)
10 DIM C1$,N1$30,B$3,W$8,D$43
20 W$=HEX(A005A01EA0035205)
30 $PACK ( F = W$ ) D$ FROM C1$, N1$, B1$, A1
40 GOSUB '112 (H$, H1$, H2$, 43, D$)
50 IF VO$=HEX(FF) THEN 70
60 STOP "ERROR IN INDEXED REWRITE"
70 ...
INDEXED DELETE

General Form
GOSUB '113 (file-id, efs)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

Purpose
The INDEXED DELETE ('113) subroutine enables you to delete a specific record from an indexed file.

Returns
The INDEXED DELETE subroutine returns the following information:

- VO$ is the return code. Refer to Appendix A for more information.

General Notes
A record can be deleted only if the record is read with the hold option equal to "H".

Example (INDEXED DELETE)
10 GOSUB '113 (H$, H1$)
20 IF VO$ = HEX(FF) THEN 40
30 STOP "ERROR IN INDEXED DELETE"
40 REM Indexed delete successful. Continue processing.

In this example, H$ identifies the file that the INDEXED DELETE subroutine operates on.
INDEXED FIND

General Form
GOSUB '114 (file-id, efs, select, post, path, length, value)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

select represents the selection criteria. The following values are valid entries for this parameter:

• "8080" indicates equal to
• "2080" represents greater than
• "6080" indicates greater than or equal to

post indicates the starting position of the key in the record.

path indicates either primary (0) or alternate key (1-16) path number.

length is a variable or numeric expression that specifies the length of the key.

value is a variable or an alpha or numeric expression that indicates the value of the key.

Purpose
The INDEXED FIND ('114) subroutine enables you to read an indexed file based on a comparison expressed in the select input parameter to the primary or alternate key.

Returns
The INDEXED FIND subroutine returns the following information:

• V0$ is the return code. Refer to Appendix A for more information.
• V1 contains the length of data read (in bytes) in the V9$( ) array.
• V4$ is the alternate key mask.
• V9$( ) is the data read from the file.
Example (INDEXED FIND)
10 DIM H$2, H$32, H$3$, K$5
20 K$= "00003": REM KEY VALUE
30 K1=12: REM KEY POSITION
40 K2=5: REM KEY LENGTH
50 K3=0: REM KEY PATH
60 H$3$=HEX(2080): REM FIND CRITERIA = GREATER THAN
70 REM FIND RECORD WITH A KEY VALUE GREATER THAN "00003"
80 GOSUB '114(H$, H$3$, H$3$, K1, K2, K3, K$)
90 IF VO$=HEX(FF) THEN 90
100 STOP "ERROR IN INDEXED FIND"
110 REM GOOD INDEXED FIND. CONTINUE PROCESSING."
120 ...

In this example, the selection criterion is set to greater than (2080). This value indicates that the next record read will have a primary key value greater than the value of Cl$. 
INDEXED LOCK

General Form
GOSUB '115 (file-id , efs , post , key , length , value)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

post represents the position in the record where the key starts.

key is the key path, either the primary (0) or alternate key (1-16).

length is a numeric variable or literal that specifies the length of the key.

value is an alphanumeric variable or an alphanumeric literal that indicates the value of the key.

Purpose
The INDEXED LOCK ('115) subroutine enables you to have exclusive rights to an indexed file. No other program can access the file until you unlock the file.

You can use either the primary or alternate key. Refer to the General Notes section for more information.

Returns
The INDEXED LOCK subroutine returns the following information:

• VO$ is the return code. Refer to Appendix A for more information.

General Notes
DMS allows a primary key and up to 16 alternate keys. In the INDEXED READ subroutine, the primary key is indicated by a 0, the alternate keys are indicated by the numbers 1 through 16.
Example (INDEXED LOCK)
10 H$ = V9$
20 GOSUB '115 (H$, H1$, P, K, L, K1$)
30 IF V0$=HEX(FF) THEN 50
40 STOP "ERROR IN LOCK"
50 REM Indexed file lock successful. Continue processing.
60 ...

Notes: The file LOCK is of limited use to users of 2200/VS Local Communication Option accessing VS/DMS files. The VS/DMS functions are available to users of 2200 through 2200 Server running as a foreground task on one of the VS workstation emulation windows. Since all users of 2200, attached to a particular 2258 controller, send their VS/DMS requests to this server, which in turn passes the requests to VS/DMS task, the VS fails to recognise that the DMS requests are from different users of 2200.

However, once a VS/DMS file is locked by a user on 2200 through one of the 2200 workstations, the file will not be available to other users logged on to the VS until the file is unlocked. But the file can be shared for "dirty" read by other users on the VS as well as 2200.
INDEXED UNLOCK

General Form
GOSUB '116 (file-id , efs)

where
file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

Purpose
The INDEXED UNLOCK ('116) subroutine enables you to release an indexed file so that other programs can access the file.

Returns
The INDEXED UNLOCK subroutine returns the following information:

• VO$ is the return code. Refer to Appendix A for more information.

Example (INDEXED UNLOCK)
10 H$ = V9$
20 GOSUB '116 (H$, H1$)
30 IF VO$=HEX(FF) THEN 50
40 STOP "ERROR IN UNLOCK"
50 REM Indexed file unlock successful. Continue processing.
60 ...
RELATIVE READ

General Form
GOSUB '117 (file-id, efs, hold, rec-num, number)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS information for the specified file.

hold indicates the hold option and can be either "H", which holds the record for exclusive processing or " ", which allows other programs to access the record.

rec-num is the relative number of the record to be read.

number is a numeric variable or expression indicating the number of relative records to be read.

Purpose
The RELATIVE READ ('117) subroutine enables you to read a specified record in a relative file. The file must have previously been opened.

Returns
The RELATIVE READ subroutine returns the following information:

• V0$ is the return code. Refer to Appendix A for more information.

• V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

• V9$() contains eight bytes of status information and the data read from the file. Refer to the General Notes section for more information.
General Notes
In the RELATIVE READ subroutine, the V9$( ) array is used to store status information and the data read from the file. The first eight bytes of the array are used to store the status information. Table 4-2 describes the status information.

Table 4-2. RELATIVE READ Status Information

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Contains the number of words in the word block. This value should always be equal to HEX(01).</td>
</tr>
<tr>
<td>02 and 03</td>
<td>Contain the number of records read.</td>
</tr>
<tr>
<td>04 and 05</td>
<td>Contain the number of bytes in the byte block.</td>
</tr>
<tr>
<td>06</td>
<td>Contains the data block ID. This value should always be equal to 01.</td>
</tr>
<tr>
<td>07 and 08</td>
<td>Contains the number of bytes read. The value of these two bytes can be up to 64K.</td>
</tr>
</tbody>
</table>

The remaining bytes of the array (starting at the ninth byte) are used to store the data read from the file. If you know the length of the records read, you know how many bytes of V9$ are used to store the data. If you do not know the length of the records in the file, or the file contains variable length records, you can use the VAL function on the seventh and eighth bytes of the V9$( ) array to get the length of the data read. Refer to the following example for more information.

The V9$( ) array is originally dimensioned to hold 4096 bytes of information (including the status information). However, you can decrease the size of the array depending on your needs.
Example (RELATIVE READ)

10 DIM C1$5,N1$30,B1$3,WS$8,H$2,H1$32
15 H$=V9$
20 WS$=HEX(A005A01EA0035205)
30 GOSUB '117 (H$, H1$, "H", 125, 1)
40 IF VS$=HEX(FF) THEN 60
50 STOP "ERROR IN RELATIVE READ"
60 REM Good relative read. Continue processing.
70 $UNPACK (F=WS$) Q$( ) to C1$, N1$, B1$ , A1

In this example, the 125th record of the specified file is read.
RELATIVE WRITE

General Form
GOSUB '118 (file-id, efs, number, data)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS information for the specified file.

number is a numeric variable or expression indicating the number of relative records to be read.

data can be an alphanumeric variable, an array designator, or a literal. If a literal string is used, the information must be enclosed in double quotation marks.

Purpose
The RELATIVE WRITE ('118) subroutine enables you to write the next record to a specified relative file.

To write the information contained in more than one variable to a file at one time, you can use the $PACK statement (or some other appropriate BASIC-2 statement) to pack the information into a single variable.

Returns
The RELATIVE WRITE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

- V9$() contains the following five bytes of status information:
  - Byte 01 contains the number of words in the word block. This value should always be equal to HEX(01).
  - Bytes 02 and 03 contain the number of bytes written.
  - Bytes 04 and 05 contain the number of bytes in the byte block and should be HEX(0000).
Example (RELATIVE WRITE)
10 DIM C1$, N1$, B1$, W$, D$, H$, H1$, 32
20 W$=HEX(A005A01EA0035205)
30$PACK (F=W$) D$ FROM C1$, N1$, B1$, A1
40 GOSUB '118 (H$, H1$, 1, D$)
50 IF V0$=HEX(FF) THEN 70
60 STOP "ERROR IN RELATIVE WRITE"
70 REM Good relative write. Continue processing.
80 ...

In this example, the value of D$ is written to the file as one record.
RELATIVE REWRITE

General Form
GOSUB '119 (file-id, efs, number, len, data)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

number represents the number of the relative record to be rewritten.

len indicates the length of the record to be rewritten. The value of the len parameter must match the record length exactly, including trailing spaces.

data can be an alphanumeric variable, an array designator, or a literal. If a literal string is used, the information must be enclosed in double quotation marks.

Purpose
The RELATIVE REWRITE ('119) subroutine enables you to overwrite an existing record in a relative file. The record must have been previously read with the HOLD option.

To write the information contained in more than one variable to a file at one time using the REWRITE subroutine, you can use the $PACK statement to pack the information into a single variable or some other appropriate BASIC-2 statement.

Returns
The RELATIVE REWRITE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

- V9$() contains the following three bytes of status information:
  - Byte 01 contains the number of words in the word block and should be equal to HEX(00).
  - Bytes 02 and 03 contain the number of bytes written and should be equal to HEX(0000).
Example (RELATIVE REWRITE)
.10 DIM C1$, N1$, 30, B1$, 3, WS8, DS43, HS2, H1$, 32
 20 WS$=HEX(A005A01EA0035205)
 30 $PACK (F=WS$) D$ FROM C1$, N1$, B1$, A1
 40 GOSUB '104 (H$, H1$, 5, 43, D$)
 50 IF VO$=HEX(FF) THEN 70
 60 STOP "ERROR IN REWRITE"
 70 REM Good relative rewrite. Continue processing.
 80 ...

In this example, the fifth relative record of the specified file is rewritten to the file.
RELATIVE DELETE

General Form
GOSUB '120 (file-id , efs , number)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

number represents the number of the relative record to be deleted.

Purpose
The RELATIVE DELETE ('120) subroutine enables you to delete a specific record from a relative file.

Returns
The RELATIVE DELETE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.
- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.
- V9$() contains the following three bytes of status information:
  - Byte 01 contains the number of words in the word block and should be equal to HEX(00).
  - Bytes 02 and 03 contain the number of bytes written and should be equal to HEX(0000).

Example (RELATIVE DELETE)

10 H$ = V9$ : H1$ = V7$  
20 GOSUB '120 (H$, H1$, 5)  
30 IF V0$=HEX(FF) THEN 50  
40 STOP "ERROR IN DELETE"  
50 REM Good relative record delete. Continue processing.  
60 ...

In this example, H$ indicates the file that the fifth relative record is deleted from.
BLOCK READ

General Form
GOSUB '121 (file-id, efs, block-num)

where

file-id is an alphanumeric variable that represents the file
identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS
header information for the specified file.

block-num represents the block number of the block to be read.

Purpose
The BLOCK READ ('121) subroutine enables you to read a 2K block of
information from a consecutive, indexed, or relative file.

Returns
The BLOCK READ subroutine returns the following information:

• V0$ is the return code. Refer to Appendix A for more information.

• V9$(,) contains the data read from the file. This array is 2048
bytes long.

General Notes
To use the BLOCK READ the file organization must be specified as Block
Access Method when the file is opened. The file cannot be opened in
Shared mode. Each block read contains 2048 bytes of data.

Example (BLOCK READ)
10 H$ = V9$:H1$ = V7$:B1=5
20 GOSUB '121 (H$, H1$, B1):REM Read block number 5.
30 IF V0$=HEX(FF) THEN 50
40 STOP "ERROR IN BLOCK READ"
50 REM Good block read. Continue processing.
60 ...

In this example, block number five of the specified file is read.
BLOCK WRITE

General Form
GOSUB '122 (file-id, efs, block-num, data)

where

file-id is an alphanumeric variable that represents the file identifier assigned to the file.

efs is an alphanumeric variable that represents the EFS header information for the specified file.

block-num represents the block number of the block to be written.

data can be either an alphanumeric literal or an array designator. If a literal string is used, the information must be enclosed in double quotation marks.

Purpose
The BLOCK WRITE ('122) subroutine enables you to write a 2K block of information to a consecutive, indexed, or relative file.

Returns
The BLOCK WRITE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

General Notes
To use the BLOCK READ the file organization must indicate Block Access Method when the file is opened. Each block contains 2048 bytes of data. When you use the BLOCK WRITE subroutine, you want to write approximately 2048 bytes of data to the file.

Example (BLOCK WRITE)
10 H$ = V9$:H1$ = V7$:B1=5
20 GOSUB '122 (H$, H1$, B1, D$):REM Write block number 5.
30 IF V0$=HEX(FF) THEN 50
40 STOP "ERROR IN BLOCK WRITE"
50 REM Good block write. Continue processing.
60 ...

In this example, block number five is written to the specified file.
CREATE FILE

General Form
GOSUB '200 (file-name, org, mode, opt-flag, create, alt-key)

where

file-name represents the name of the file. The file name can include the /SYSTEM/VOLUME/LIBRARY/Filename. The file name can also be written as /VOLUME/LIBRARY/Filename. The SYSTEM, LIBRARY, and FILENAME can be up to 8 characters in length. The VOLUME can be up to 6 characters in length.

org is the organization of the file. The following lists the valid file organization parameters and their meanings:

- C - Consecutive file
- I - Indexed file
- R - Relative file
- B - Block Access Method

mode is the mode the file is opened in. The following lists the valid mode parameters and their meanings:

- R - Read only access
- S - Shared access
- X - Exclusive access
- E - Extended access

opt-flag indicates whether the file is to be created as follows:

- C - Created
- T - Temporary
- O - Created and opened

create specifies the attribute data for the file. Refer to the following General Notes section for more information.

alt-key specifies the alternate key information if required. Refer to the following General Notes section for more information.
Purpose

The CREATE FILE (‘200) subroutine enables you to create a DMS file. The subroutine enables you to specify the file name, including the system, the library, and actual name of the file. The library, volume, and file name are required; the system name is optional. The CREATE FILE subroutine also enables you to specify the file type (indexed, consecutive, or relative,) and the access mode (Read-Only, Shared, Exclusive, or Extended).

Returns

The CREATE FILE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.

- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

- V9$() contains the following three bytes of status information:
  - Byte 01 contains the number of words in the word block that should be equal to HEX(00).
  - Bytes 02 and 03 contain the number of bytes in the byte block that should be equal to HEX(0000).

General Notes

You can use the VS CREATE utility to create and maintain data files. Through CREATE you can add, delete, modify, or examine data in the data files created using the utility. For more information on the CREATE utility, refer to the VS File Management Utilities Reference.

The create input parameter requires 40 bytes of information for consecutive, indexed, and relative files. If the file being created is an indexed file with one or more alternate keys, an additional eight bytes of information is required for each alternate key. This information is passed to the subroutine in the alt-key input parameter.

If the file being created does not contain an alternate key, the alt-key parameter should be set to spaces and must still be passed to the subroutine.

For more information on the contents of the create and alt-key parameters, refer to Appendix A.
Example (CREATE FILE)
10 DIM N$32, T$1, M$1, A$40, A1$8
20 N$="\SYSTEM\ANYVOL\ANYLIB\FILENAME"
30 T$="I"
40 M$="S"
50 GOSUB '200 (N$, T$, M$, "O", A$, A1$)
60 IF V0$=HEX(FF) THEN 80
70 STOP "ERROR IN CREATE"
80 REM Good file create. Continue processing.
90 ...

In this example, variables are used to represent the name, organization, mode, file attributes, and alternate key attribute data parameters. The opt-flag parameter value of "O" indicates that the file is created and opened.
DELETE FILE

General Form
GOSUB '201 (file-name)

where

file-name represents the name of the file. The file name can include the //SYSTEM/VOLUME/LIBRARY/FILENAME. The file name can also be written as
//VOLUME/LIBRARY/FILENAME. The SYSTEM, LIBRARY, and FILENAME can be up to 8 characters in length. The VOLUME can be up to 6 characters in length.

Purpose
The DELETE FILE ('201) subroutine enables you to delete any DMS file.

Returns
The DELETE FILE subroutine returns the following information:

• V0$ is the return code. Refer to Appendix A for more information.

• V1 is the length of valid data in the V9$( ) array.

• V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.

• V9$( ) contains three bytes of internal status information and should be equal to three HEX zeros (HEX(000000)).

Example (DELETE FILE)
10 DIM N$32
20 N$="//ANYVOL/ANYLIB/FILENAME"
30 GOSUB '201 (N$)
40 IF V0$=HEX(FF) THEN 60
50 STOP "ERROR IN DELETE FILE"
60 REM File successfully deleted. Continue processing.
70 ...

In this example, the file specified by N$ (//ANYVOL/ANYLIB/FILENAME) is deleted from the system.
RENAME FILE

General Form
GOSUB '202 (old-name, new-name)

where

old-name represents the name of the file as it currently exists on the system. The file name can include the //SYSTEM/VOLUME/LIBRARY/FILENAME. The file name can also be written as //VOLUME/LIBRARY/FILENAME. The SYSTEM, LIBRARY, and FILENAME can be up to 8 characters in length. The VOLUME can be up to 6 characters in length.

new-name represents the name of the file as it will be known to the system after the subroutine executes. The file name can include the //SYSTEM/VOLUME/LIBRARY/FILENAME. The file name can also be written as //VOLUME/LIBRARY/FILENAME. The SYSTEM, LIBRARY, and FILENAME can be up to 8 characters in length. The VOLUME can be up to 6 characters in length.

Purpose
The RENAME FILE ('202) subroutine enables you to rename any DMS file.

Returns
The RENAME FILE subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.
- V1 is the length of valid data in the V9$() array.
- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.
- V9$() contains three bytes of internal status information and should be equal to three HEX zeros (HEX(000000)).
Example (RENAME FILE)
10 DIM O#32, N$32
20 O$="\\OLDVOL/OLDLIB/OLDNAME"
30 N$="\\NEWVOL/NEWLIB/NEWNAME"
40 GOSUB '202 (O$, N$)
50 IF V0$=HEX(FF) THEN 70
60 STOP "ERROR IN RENAME FILE"
80 REM File successfully renamed. Continue processing.
70 ... 

In this example, the file specified by N$ (\\ANYVOL/ANYLIB/Filename) is deleted from the system.
GET FILE ATTRIBUTES

General Form
GOSUB '203 (file-name)

where

file-name represents the name of the file. The file name can include the //SYSTEM/VOLUME/LIBRARY/FILENAME. The file name can also be written as
///VOLUME/LIBRARY/FILENAME. The SYSTEM, LIBRARY, and FILENAME can be up to 8 characters in length. The VOLUME can be up to 6 characters in length.

Purpose
The GET FILE ATTRIBUTES ('203) subroutine enables you to retrieve the value of one or more attributes associated with the specified file. The file must be opened first.

Returns
The GET FILE ATTRIBUTES subroutine returns the following information:

- V0$ is the return code. Refer to Appendix A for more information.
- V1 is the length of valid data in V9$() array.
- V7$ is the EFS header information for the file indicated by V9$ (the file identifier). Refer to Appendix A for more information.
- V9$() contains the file attribute information returned. Refer to Appendix A for an explanation of the attributes returned.

Example (GET FILE ATTRIBUTES)

10 DIM N$32
20 N$="///ANYVOL/ANYLIB/FILENAME"
30 GOSUB '203 (N$)
40 IF V0$=HEX(FF) THEN 60
50 STOP "ERROR IN GET FILE ATTRIBUTES"
60 REM Good read on file attributes. Continue processing.
70 ...

In this example, the file attributes for the file
///ANYVOL/ANYLIB/FILENAME are returned and held in the V9$() array.
APPENDIX A
ADDITIONAL INFORMATION

A.1 INTRODUCTION

This appendix contains the following additional information on:

- The return codes
- The file attributes returned by subroutines, GENERAL OPEN and GET FILE ATTRIBUTE
- The create and alternate key input parameters for the CREATE FILE subroutine

A.2 RETURN CODES

The return codes generated by the DMS Access Subroutines are in HEX format. Table A-1 lists and explains the return codes generated by the DMS Access Subroutines.

The EFS header explained in Section A.3 provides additional information on the error.
Table A-1. Return Codes

<table>
<thead>
<tr>
<th>Return Decimal</th>
<th>Code Hex</th>
<th>Description</th>
<th>Recovery Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>00</td>
<td>Syntax error</td>
<td>Check your program for possible syntax error.</td>
</tr>
<tr>
<td>90</td>
<td>5A</td>
<td>2258 firmware error</td>
<td>Ensure the 2200/VS LCO task is operational and the DMS task has been assigned.</td>
</tr>
<tr>
<td>165</td>
<td>A5</td>
<td>Error in SMB block</td>
<td>Refer to Table A-3.</td>
</tr>
<tr>
<td>255</td>
<td>FF</td>
<td>Successful</td>
<td>Always check EFS header for any possible error.</td>
</tr>
</tbody>
</table>

A.3 EXTENDED FILE SHARING (EFS) HEADER

The DMS access subroutines use the Extended File Sharing (EFS) protocol to control file information. The EFS header is 32 bytes long. The DMS access subroutines store the EFS header in variable V7$.

Table A-2 describes the EFS header in detail.
<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
<th>Initial Value (in HEX)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 through 04</td>
<td>Contain header identification.</td>
<td>FF534D42</td>
</tr>
<tr>
<td>05</td>
<td>Mandatory; values other than HEX(FF) indicate error.</td>
<td>FF</td>
</tr>
<tr>
<td>06</td>
<td>Returns error class; refer to the section on Error Classes in this Appendix for further information.</td>
<td>0000</td>
</tr>
<tr>
<td>07</td>
<td>DMS Access Subroutines store the extended command code in this byte.</td>
<td>(Initialized by subroutine invoked.)</td>
</tr>
<tr>
<td>08 and 09</td>
<td>Returns two-byte error code; refer to the section on Error Codes for further information.</td>
<td>0000</td>
</tr>
<tr>
<td>10</td>
<td>Reserved for future use.</td>
<td>00</td>
</tr>
<tr>
<td>11 through 22</td>
<td>Reserved for future use.</td>
<td>All zeroes</td>
</tr>
<tr>
<td>23 and 24</td>
<td>Mandatory.</td>
<td>FFFF</td>
</tr>
<tr>
<td>25 and 26</td>
<td>Reserved for future use.</td>
<td>0000</td>
</tr>
<tr>
<td>27 and 28</td>
<td>Reserved for future use.</td>
<td>0000</td>
</tr>
<tr>
<td>29 and 30</td>
<td>These bytes are updated by the GENERAL OPEN subroutine with the User Identification number.</td>
<td>0000</td>
</tr>
<tr>
<td>31 and 32</td>
<td>Reserved for future use.</td>
<td>0000</td>
</tr>
</tbody>
</table>
A.3.1 Error Classes

The error class indicates which DMS Server task was invoked when the error occurred. Table A-3 lists and explains the values returned for the error classes.

<table>
<thead>
<tr>
<th>Error Class</th>
<th>Decimal</th>
<th>HEX</th>
<th>Explanation/Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td>07</td>
<td>07</td>
<td>Reserved for 2200SRV</td>
</tr>
<tr>
<td>08</td>
<td>08</td>
<td>08</td>
<td>Catalog server</td>
</tr>
<tr>
<td>09</td>
<td>09</td>
<td>09</td>
<td>File server</td>
</tr>
<tr>
<td>10</td>
<td>0A</td>
<td>10</td>
<td>WITA server</td>
</tr>
<tr>
<td>11</td>
<td>0B</td>
<td>11</td>
<td>Print server</td>
</tr>
<tr>
<td>12</td>
<td>0C</td>
<td>12</td>
<td>QLI server</td>
</tr>
<tr>
<td>13</td>
<td>0D</td>
<td>13</td>
<td>QLI:FORMATER server</td>
</tr>
<tr>
<td>14</td>
<td>0E</td>
<td>14</td>
<td>QUEUE:JOB server</td>
</tr>
<tr>
<td>15</td>
<td>0F</td>
<td>15</td>
<td>DMPACK server</td>
</tr>
<tr>
<td>20</td>
<td>14</td>
<td>20</td>
<td>User server</td>
</tr>
</tbody>
</table>
A.3.2 Error Codes

The error codes explain why the error has occurred. Table A-4 describes the error codes returned.

<table>
<thead>
<tr>
<th>Error Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>000 0000</td>
<td>Successful execution of requested function.</td>
</tr>
<tr>
<td>001 0001</td>
<td>Invalid function specified to the server.</td>
</tr>
<tr>
<td>002 0002</td>
<td>File not found or there is a duplicate file.</td>
</tr>
<tr>
<td>003 0003</td>
<td>Library not found.</td>
</tr>
<tr>
<td>004 0004</td>
<td>Too many files have been opened.</td>
</tr>
<tr>
<td>005 0005</td>
<td>The user has insufficient access rights.</td>
</tr>
<tr>
<td>006 0006</td>
<td>Invalid handle has been supplied.</td>
</tr>
<tr>
<td>007 0007</td>
<td>Server processing error.</td>
</tr>
<tr>
<td>008 0008</td>
<td>Insufficient space allocated to perform the function.</td>
</tr>
<tr>
<td>009 0009</td>
<td>VTOC error.</td>
</tr>
<tr>
<td>010 000A</td>
<td>The parameters passed are invalid for the function.</td>
</tr>
<tr>
<td>011 000B</td>
<td>Invalid file format.</td>
</tr>
<tr>
<td>012 000C</td>
<td>Open access mode specified is invalid.</td>
</tr>
<tr>
<td>013 000D</td>
<td>Disk space or extents error.</td>
</tr>
<tr>
<td>014 000E</td>
<td>Invalid function has been specified for I/O mode.</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Error Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>015 000F</td>
<td>Volume required is not mounted.</td>
</tr>
<tr>
<td>016 0010</td>
<td>Delete errors encountered.</td>
</tr>
<tr>
<td>017 0011</td>
<td>Invalid device specified.</td>
</tr>
<tr>
<td>018 0012</td>
<td>NODATA Read attempted on a file opened in Shared mode.</td>
</tr>
<tr>
<td>019 0013</td>
<td>Invalid function attempted on a Relative file or Write attempted on a Read-Only file.</td>
</tr>
<tr>
<td>020 0014</td>
<td>The file already exists.</td>
</tr>
<tr>
<td>021 0015</td>
<td>File possession conflict.</td>
</tr>
<tr>
<td>022 0016</td>
<td>Invalid key size specified.</td>
</tr>
<tr>
<td>023 0017</td>
<td>Invalid key value specified.</td>
</tr>
<tr>
<td>024 0018</td>
<td>Boundary violation has occurred.</td>
</tr>
<tr>
<td>025 0019</td>
<td>End of file.</td>
</tr>
<tr>
<td>026 001A</td>
<td>Invalid attempt to REWRITE a compressed record.</td>
</tr>
<tr>
<td>028 001C</td>
<td>Invalid alternate key specified.</td>
</tr>
<tr>
<td>029 001D</td>
<td>Invalid function specified for alternate indexed file.</td>
</tr>
<tr>
<td>030 001E</td>
<td>Permanent I/O error has occurred.</td>
</tr>
<tr>
<td>031 001F</td>
<td>Undefined position specified for READ NEXT function.</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Error Codes</th>
<th>Hex</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>032</td>
<td>0020</td>
<td>Disk problems encountered.</td>
</tr>
<tr>
<td>033</td>
<td>0021</td>
<td>Recovery problems encountered.</td>
</tr>
<tr>
<td>034</td>
<td>0022</td>
<td>File organization needs to be specified.</td>
</tr>
<tr>
<td>036</td>
<td>0024</td>
<td>Invalid WRITE issued to Relative or Read-Only file.</td>
</tr>
<tr>
<td>037</td>
<td>0025</td>
<td>Invalid function for a file opened in Shared mode.</td>
</tr>
<tr>
<td>038</td>
<td>0026</td>
<td>Invalid function for a file opened in non-Shared mode.</td>
</tr>
<tr>
<td>039</td>
<td>0027</td>
<td>Invalid function for PAM access method.</td>
</tr>
<tr>
<td>040</td>
<td>0028</td>
<td>The requested device is in use.</td>
</tr>
<tr>
<td>041</td>
<td>0029</td>
<td>The requested device is detached.</td>
</tr>
<tr>
<td>042</td>
<td>002A</td>
<td>Access denied.</td>
</tr>
<tr>
<td>043</td>
<td>002B</td>
<td>Invalid function sequence for Delete, BAM access method, and REWRITE on consecutive file.</td>
</tr>
<tr>
<td>044</td>
<td>002C</td>
<td>START WAIT has been issued when no I/O is pending.</td>
</tr>
<tr>
<td>045</td>
<td>002D</td>
<td>No wait was issued for previous I/O.</td>
</tr>
<tr>
<td>046</td>
<td>002E</td>
<td>Timeout on a shared resource wait.</td>
</tr>
<tr>
<td>047</td>
<td>002F</td>
<td>Indexed file is requested but FDR indicates it is not an indexed file.</td>
</tr>
<tr>
<td>048</td>
<td>0030</td>
<td>Relative files may not be compressed.</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Error Codes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>049</td>
<td>The file is locked by another task.</td>
</tr>
<tr>
<td>051</td>
<td>Read/Write issued to a file temporarily locked.</td>
</tr>
<tr>
<td>052</td>
<td>Invalid name.</td>
</tr>
<tr>
<td>054</td>
<td>File is already open.</td>
</tr>
<tr>
<td>055</td>
<td>OPEN in EXTENDED mode is invalid for indexed file, but the file may be created.</td>
</tr>
<tr>
<td>056</td>
<td>The file cannot be closed.</td>
</tr>
<tr>
<td>057</td>
<td>The record count is not updated during Close.</td>
</tr>
<tr>
<td>059</td>
<td>There is no space on SHARED block.</td>
</tr>
<tr>
<td>081</td>
<td>The server is paused.</td>
</tr>
<tr>
<td>096</td>
<td>Severe DMS errors encountered.</td>
</tr>
<tr>
<td>098</td>
<td>Task problems encountered; restart the task indicated by error class.</td>
</tr>
<tr>
<td>099</td>
<td>Nonspecific file system error encountered.</td>
</tr>
<tr>
<td>100</td>
<td>The system name cannot be parsed.</td>
</tr>
<tr>
<td>102</td>
<td>Length inconsistency, VS returned fewer bytes than expected.</td>
</tr>
</tbody>
</table>
A.4 FILE ATTRIBUTE INFORMATION

This section describes the file attribute information returned by the subroutine, GENERAL OPEN ('101) or GET FILE ATTRIBUTES ('203).

A.4.1 Attribute Structure for General Open

The structure of the file attribute information returned by GENERAL OPEN ('101) is shown in Table A-5.

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 and 02</td>
<td>Count of data bytes</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Mandatory data block identification</td>
<td>HEX(01)</td>
</tr>
<tr>
<td>04 and 05</td>
<td>Size of this data block</td>
<td></td>
</tr>
<tr>
<td>06 through 144</td>
<td>General file attribute data</td>
<td>Refer to Table A-7</td>
</tr>
<tr>
<td>145</td>
<td>Mandatory data block identification</td>
<td>HEX(01)</td>
</tr>
<tr>
<td>146 and 147</td>
<td>Size of this data block</td>
<td></td>
</tr>
<tr>
<td>148 onwards</td>
<td>Alternate key file attribute data</td>
<td>Refer to Table A-8</td>
</tr>
<tr>
<td></td>
<td>(8 bytes of information for each alternate key defined for the file)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Add a displacement of 6 bytes to the General File Attribute Data described in Table A-7.

Add a displacement of 148 bytes to the Alternate Key File Attribute Data described in Table A-8.
A.4.2 Attribute Structure for Get File Attributes

The structure of the file attribute information returned by GET FILE ATTRIBUTES ("203") is shown in Table A-6.

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Mandatory word counter</td>
<td>HEX(00)</td>
</tr>
<tr>
<td>02 and 03</td>
<td>Count of data bytes</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Mandatory data block identification</td>
<td>HEX(01)</td>
</tr>
<tr>
<td>05 and 06</td>
<td>Size of this data block</td>
<td></td>
</tr>
<tr>
<td>07 through 145</td>
<td>General file attribute data</td>
<td>Refer to Table A-7</td>
</tr>
</tbody>
</table>

Note: Add a displacement of 5 bytes to the General File Attribute Data described in Table A-7.
### A.4.3 Attribute Structure for General File Attributes

Table A-7 describes the general file attribute data returned by GENERAL OPEN ('101) as well as GET FILE ATTRIBUTES ('203).

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>The file organization: C for Consecutive, I for Indexed, A for alternate indexed, P for print, W for WP, O for object, R for Relative or B for Block.</td>
</tr>
<tr>
<td>02</td>
<td>The record type: F for fixed length records or V for variable length records.</td>
</tr>
<tr>
<td>03</td>
<td>The compression flag: Y indicates the file is compressed and N indicates the file is not compressed.</td>
</tr>
<tr>
<td>04</td>
<td>The file class: A-Z, #, $ or @.</td>
</tr>
<tr>
<td>05 through 08</td>
<td>The number of records in the file.</td>
</tr>
<tr>
<td>09 through 12</td>
<td>The size of the record.</td>
</tr>
<tr>
<td>13 through 16</td>
<td>The number of extents of disk space allocated.</td>
</tr>
<tr>
<td>17 through 20</td>
<td>The number of blocks used.</td>
</tr>
<tr>
<td>21 through 24</td>
<td>The number of blocks allocated for the file.</td>
</tr>
<tr>
<td>25 through 32</td>
<td>The identification of the creator of the file.</td>
</tr>
<tr>
<td>33 through 38</td>
<td>The date of creation (YYMMDD) of the file.</td>
</tr>
<tr>
<td>39 through 44</td>
<td>The date of modification (YYMMDD) of the file.</td>
</tr>
<tr>
<td>45 through 50</td>
<td>The date of expiration (YYMMDD) of the file.</td>
</tr>
<tr>
<td>51</td>
<td>Whether WP prologue sector is present; Y for yes N for no.</td>
</tr>
<tr>
<td>52 and 53</td>
<td>The position of primary key for the indexed file. This value is HEX(0000) for non-indexed file.</td>
</tr>
</tbody>
</table>

(continued)
Table A-7. General File Attribute Data (continued)

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>54 and 55</td>
<td>The length of the primary key for the indexed file. This value is HEX(0000) for a non-indexed file.</td>
</tr>
<tr>
<td>56 and 57</td>
<td>The number of alternate keys for the indexed file. An indexed file can have 1 to 16 alternate keys. This value is HEX(0000) for a non-indexed file.</td>
</tr>
<tr>
<td>58 and 59</td>
<td>The alternate key mask for the indexed file. This value is HEX(0000) for a non-indexed file.</td>
</tr>
<tr>
<td>60 through 85</td>
<td>Write access (W) for the different file classes (A-Z).</td>
</tr>
<tr>
<td>86 through 111</td>
<td>Read access (R) for the different file classes (A-Z).</td>
</tr>
<tr>
<td>112 through 137</td>
<td>Execute access (E) for the different file classes (A-Z).</td>
</tr>
<tr>
<td>138 and 139</td>
<td>Number of records in the last block.</td>
</tr>
</tbody>
</table>
A.4.4 Attribute Structure for Alternate Key File Attributes

Table A-8 describes the alternate key file attribute data returned by GENERAL OPEN ('101) subroutine.

Table A-8. Alternate Key File Attribute Data

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Y indicates records with duplicate alternate key values are allowed. N indicates duplicates are not allowed.</td>
</tr>
<tr>
<td>02</td>
<td>Y indicates the alternate key is compressed. N indicates the alternate key is not compressed.</td>
</tr>
<tr>
<td>03 and 04</td>
<td>The ordinal number of the alternate key ranges from 1 to 16.</td>
</tr>
<tr>
<td>05 and 06</td>
<td>The starting position of the alternate key.</td>
</tr>
<tr>
<td>07 and 08</td>
<td>The length in bytes of the alternate key.</td>
</tr>
</tbody>
</table>
A.5 CREATE FILE INFORMATION

This section describes the information required for the create input parameter and the alternate key input parameter for the CREATE FILE ('200) subroutine.

A.5.1 Create File Parameters

The create input parameter for the CREATE FILE ('200) requires 41 bytes of information. Table A-9 describes the create input parameter.

Table A-9. Create Input Parameter

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>The file organization: C for Consecutive, I for Indexed, R for Relative or B for Block.</td>
</tr>
<tr>
<td>02</td>
<td>The record type: F for fixed length records or V for variable length records.</td>
</tr>
<tr>
<td>03</td>
<td>The file class: A-Z, #, $ or @.</td>
</tr>
<tr>
<td>04</td>
<td>The compression flag: Y indicates the file is to be compressed and N indicates the file is not to be compressed.</td>
</tr>
<tr>
<td>05 through 08</td>
<td>The approximate number of records in the file.</td>
</tr>
<tr>
<td>09 through 12</td>
<td>The size of the record.</td>
</tr>
<tr>
<td>13 through 16</td>
<td>The number of blocks to be allocated for the file.</td>
</tr>
<tr>
<td>17 through 20</td>
<td>The size of the block.</td>
</tr>
<tr>
<td>21 through 26</td>
<td>The date of expiration (YYMMDD) of the file.</td>
</tr>
<tr>
<td>27</td>
<td>Whether WP prologue sector is present; Y for yes N for no.</td>
</tr>
<tr>
<td>28 and 29</td>
<td>The position of primary key for the indexed file. This value is HEX(0000) for non-indexed file.</td>
</tr>
<tr>
<td>30 and 31</td>
<td>The length of the primary key for the indexed file. This value is HEX(0000) for non-indexed file.</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 and 33</td>
<td>The number of alternate keys for the indexed file. An indexed file can have 1 to 16 alternate keys. This value is HEX(0000) for a non-indexed file.</td>
</tr>
<tr>
<td>34</td>
<td>Whether to take the created space. N indicates no.</td>
</tr>
<tr>
<td>35</td>
<td>For print files only; otherwise HEX(00). Indicates print form number. Print form numbers are established by the user site operations.</td>
</tr>
<tr>
<td>36 and 37</td>
<td>For print files only; otherwise HEX(0000). Indicates printer device number. Printer device numbers are established by the user site operations.</td>
</tr>
<tr>
<td>38</td>
<td>For print files only; otherwise HEX(00). Indicates print class. Print classes are established by the user site operations.</td>
</tr>
<tr>
<td>39</td>
<td>For print files only; otherwise HEX(00). Indicates number of copies to be printed.</td>
</tr>
<tr>
<td>40</td>
<td>For print files only; otherwise HEX(00). Indicates the status; either R for release or H for hold.</td>
</tr>
<tr>
<td>41</td>
<td>For print files only; otherwise HEX(00). Indicates the disposition; either R for release or H for hold.</td>
</tr>
</tbody>
</table>
A.5.2 Alternate Key Structure

An additional 8 bytes of information for each alternate key is required for the alt-key input parameter of the CREATE FILE ('200) subroutine. Table A-10 describes the alternate key input parameter for indexed files with alternate keys.

Table A-10. Alternate Key Input Parameter

<table>
<thead>
<tr>
<th>Byte(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Y indicates records with duplicate alternate key values are allowed. N indicates duplicates are not allowed.</td>
</tr>
<tr>
<td>02</td>
<td>Y indicates the alternate key is to be compressed. N indicates the alternate key is not to be compressed.</td>
</tr>
<tr>
<td>03 and 04</td>
<td>The ordinal number of the alternate key ranges from 1 to 16.</td>
</tr>
<tr>
<td>05 and 06</td>
<td>The starting position of the alternate key.</td>
</tr>
<tr>
<td>07 and 08</td>
<td>The length in bytes of the alternate key.</td>
</tr>
</tbody>
</table>
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