

**A Series  
Disk Subsystem  
Software  
Overview**

(Relative to the Mark 3.6 System Software Release)  
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## CONTENTS

<b>1</b>	<b>INTRODUCTION . . . . .</b>	<b>1</b>
	SCOPE OF THIS MANUAL . . . . .	2
	ORGANIZATION OF THIS MANUAL. . . . .	3
	RELATED DOCUMENTS. . . . .	5
<b>2</b>	<b>DISK SUBSYSTEM CONCEPTS. . . . .</b>	<b>7</b>
	THE DISK SUBSYSTEM . . . . .	7
	DISKS AND DISK PACKS . . . . .	8
	STRUCTURE OF DATA ON DISKS . . . . .	10
	FAMILIES AND MULTIDISK FAMILIES. . . . .	13
	DISK FILES . . . . .	16
	File Attributes. . . . .	16
	File Generations on Non-CATALOGING Systems . . . . .	18
	Resident and Nonresident Files . . . . .	20
	Temporary and Permanent Files. . . . .	20
	ACCESSING DISK FILES . . . . .	22
	The Pack Access Structure Table (PAST) . . . . .	23
	The File Access Structure Table (FAST) . . . . .	23
	The Process of Accessing Disk Files. . . . .	25
	Family Rebuilds. . . . .	27
	The Local Access Structure Table (LAST). . . . .	27
	Available Disk Tables. . . . .	28
<b>3</b>	<b>DISK INITIALIZATION AND OPERATION. . . . .</b>	<b>29</b>
	PREPARING A DISK FOR USE . . . . .	29
	TYPES OF DISKS USED ON A SERIES SYSTEMS. . . . .	31
	CREATING MULTIDISK FAMILIES. . . . .	32
	ON-LINE AND OFF-LINE DISKS . . . . .	33
	CONSOLIDATING DISK SPACE . . . . .	34
	THE USE OF OPERATOR DISPLAY TERMINAL COMMANDS. . . . .	35
<b>4</b>	<b>CATALOGING . . . . .</b>	<b>37</b>
	HOW CATALOGING FUNCTIONS . . . . .	38
	Catalog Components . . . . .	38
	File Generations on CATALOGING Systems . . . . .	39
	Examples of File Generation Selection. . . . .	44
	SETTING UP CATALOGING. . . . .	50
	USING CATALOGING . . . . .	51
	Entering Files Into the Catalog. . . . .	51
	Making Backup Copies of Cataloged Files. . . . .	52
	Accessing Cataloged Files. . . . .	52
	Removing Catalog Entries . . . . .	54
	Purging Catalog Backup Tapes . . . . .	54
	VOLUME LIBRARY HANDLING OF DISKS AND TAPES . . . . .	55
	Example of How Volumed Tapes Are Handled . . . . .	56
	Example of How Volumed Disks Are Handled . . . . .	59
	CATALOG REBUILDS . . . . .	61
	CREATING AND USING BACKUP COPIES OF THE CATALOG. . . . .	62
	Replacing the Current Catalog. . . . .	63

	Designating a New Catalog Family . . . . .	64
	REPLACING A DAMAGED VOLUMED DISK . . . . .	65
	IMPACT OF CATALOGING ON SYSTEM PERFORMANCE . . . . .	67
<b>5</b>	<b>PLANNING AND INSTALLATION.</b> . . . .	<b>69</b>
	SYSTEM FILE REQUIREMENTS . . . . .	70
	DISK FILE ALLOCATION . . . . .	73
	FAMILY SUBSTITUTION. . . . .	75
	EXAMPLE OF DISK FILE ALLOCATION. . . . .	78
	SYSTEM STARTUP . . . . .	80
<b>6</b>	<b>SAFETY MECHANISMS.</b> . . . .	<b>81</b>
	FLAT DIRECTORY DUPLICATION . . . . .	82
	CATALOG FILE DUPLICATION . . . . .	84
	MCP CODE FILE DUPLICATION. . . . .	85
	MONITORING DUPLICATION . . . . .	88
	COMPARISON OF DUPLICATION COMMANDS . . . . .	89
	MAKING ALTERNATE HALT/LOAD FAMILIES. . . . .	91
<b>7</b>	<b>MIRRORED DISK . . . . .</b>	<b>93</b>
	BENEFITS . . . . .	93
	REQUIREMENTS . . . . .	94
	OPTIONS. . . . .	94
	INITIATION . . . . .	94
	Creating Mirrors . . . . .	95
	Configuration Recommendations. . . . .	95
	I/O HANDLING . . . . .	95
	Read Operations. . . . .	96
	Write Operations . . . . .	96
	Audits . . . . .	97
	OPERATIONAL INFORMATION. . . . .	97
	Moving Packs Within a System . . . . .	97
	Moving Packs Between Systems . . . . .	98
	Off-Line Packs Returning On-line . . . . .	98
	Recovery . . . . .	100
	Mirror Deallocation. . . . .	101
	Transferring MCPs. . . . .	101
	Precautions. . . . .	102
<b>8</b>	<b>RECOVERY . . . . .</b>	<b>105</b>
	ISOLATING DEFECTIVE SECTORS. . . . .	107
	DAMAGED OR DESTROYED DISKS . . . . .	108
	Replacing a Base Pack. . . . .	108
	Replacing a Continuation Pack. . . . .	109
	MOVING DISKS TO ANOTHER DISK DRIVE . . . . .	110
	MOVING DATA TO ANOTHER DISK. . . . .	112
	DIRECTORY ERROR RECOVERY . . . . .	114
	FAMILY REBUILD ERRORS. . . . .	117
	Family Rebuilds for a New Base Pack or Halt/Load . . . . .	117
	Family Rebuilds Initiated by Your Installation . . . . .	118
	Family Rebuilds for Directory Error Recovery . . . . .	119
<b>9</b>	<b>SYSTEM MESSAGES.</b> . . . .	<b>121</b>

HOW TO LOCATE AND READ SYSTEM MESSAGES . . . . .	122
Metatokens That Appear in Messages . . . . .	122
Alphabetization of the Messages. . . . .	123
Reading Messages With Multiple Entries . . . . .	124
THE MESSAGES . . . . .	125
<b>GLOSSARY . . . . .</b>	<b>265</b>
<b>INDEX. . . . .</b>	<b>283</b>



1      INTRODUCTION

The disk subsystem on Burroughs A Series and B 5000/B 6000/B 7000 Series systems consists of various hardware devices and the software that controls the structure and operation of the disk subsystem. This manual emphasizes the software related to the disk subsystem on A Series systems. Discussion of hardware is limited to general concepts that are helpful in understanding the operation of the software, and cases where differences among Burroughs A Series and B 5000/B 6000/B 7000 Series systems affect the software's management of the disk subsystem.

## NOTE

The disk subsystem software is basically the same for all A Series and B 5000/B 6000/B 7000 Series systems. This manual uses the term "A Series system" to refer to all A Series and B 5000/B 6000/B 7000 Series systems unless there are differences among the systems that need to be mentioned.

**SCOPE OF THIS MANUAL**

This manual is intended for use by operations center managers, senior operators, and systems programmers to aid in setting up the disk subsystem and operating it efficiently.

The manual is designed to be used by both new and experienced users of Burroughs A Series systems. The sections "Disk Subsystem Concepts" and "Disk Initialization and Operation" explain the concepts, structure, and operation of the disk subsystem. If you are not familiar with Burroughs A Series systems, these sections introduce you to the subsystem. If you are an experienced user of A Series or B 5000/B 6000/B 7000 Series systems, these sections can help familiarize you with the terminology used in the manual.

The sections "Cataloging," "Planning and Installation," "Safety Mechanisms," and "Recovery" provide an overview of how to plan, install, and use the disk subsystem. These sections are designed so that they can be read independently of each other. Most procedures and operations in this manual are explained in general terms. The manual often does not explain the formal syntax of Operator Display Terminal (ODT) commands and Work Flow Language (WFL) statements. You can refer to the "Operator Display Terminal (ODT) Reference Manual" and the "Work Flow Language (WFL) Reference Manual" for this information. The on-line help text for Menu-Assisted Resource Control (MARC) also provides information about some subjects covered in this manual.

The section "System Messages" describes the system messages you can encounter during disk subsystem operations. These message descriptions are listed alphabetically and can be used as a reference tool. This section is helpful to site operators in daily system operation.



## Introduction

ORGANIZATION OF THIS MANUAL

This manual is divided into the following sections:

## 1 INTRODUCTION

This section introduces the manual. It explains the scope and structure of the manual, and lists related documents.

## 2 DISK SUBSYSTEM CONCEPTS

This section explains the components of the disk subsystem, the structure and functions of disks and disk packs, disk families, disk files, and disk file access. This section is intended for readers who are not familiar with disk concepts or Burroughs systems.

## 3 DISK INITIALIZATION AND OPERATION

This section explains how disks are prepared for use and how the disk subsystem is operated. This section expands upon the concepts presented in the previous section, including the following topics: the different types of disks used on Burroughs A Series and B 5000/B 6000/B 7000 Series systems, creation of multidisk families, consolidation of disk space, characteristics of an on-line disk, and an overview of Operator Display Terminal (ODT) commands.

## 4 CATALOGING

This section explains the system function CATALOGING, which keeps track of backup copies of files in the system. Topics covered include how CATALOGING works, how to set it up, how to make and use backup copies of the catalog file, how to replace a damaged disk on a CATALOGING system, and how CATALOGING affects system performance.

## 5 PLANNING AND INSTALLATION

This section explains how to allocate files for efficient system performance and ease of recovery from system problems. It also describes techniques for the startup of the system. This section can be used when you first install a system or when you want to improve the performance of a system that is already operating.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

## 6 SAFETY MECHANISMS

This section explains how to duplicate vital system files such as directories. It also describes how to make alternate Halt/Load families.

## 7 MIRRORED DISK

This section explains how to initiate the "mirrored disk" option, how to move mirrored sets within or between systems, and how to deallocate mirrored disks.

## 8 RECOVERY

This section explains how to correct problems caused by a damaged or destroyed disk, a faulty disk drive, disk I/O errors, or directory errors.

## 9 SYSTEM MESSAGES

This section lists system messages related to the operation of the disk subsystem. Each message is listed with an explanation of when and why it occurs, and suggested operator action.

## GLOSSARY

The glossary defines terms used in this manual.

## Introduction

RELATED DOCUMENTS

Document -----	Form No. -----
DMSII Utilities and Operations Guide	1163839
I/O Subsystem Reference Manual	1169984
Operator Display Terminal (ODT) Reference Manual	1169612
System Software Site Management Reference Manual	1170008
System Software Utilities Reference Manual	1170024
Work Flow Language (WFL) Reference Manual	1169802



## 2      DISK SUBSYSTEM CONCEPTS

This section provides an overview of disk subsystem concepts and terminology that are referred to throughout this manual. The section is intended for readers who are not familiar with disk concepts or Burroughs A Series systems. This section explains the following topics:

- the hardware and software that make up the disk subsystem
- disks and disk packs
- the structure of data on disks
- families and multidisk families
- disk files
- accessing disk files

### THE DISK SUBSYSTEM

The disk subsystem on Burroughs A Series systems consists of the following:

- the disk or disk pack media
- the disk drives, which are also called units or peripheral devices
- the disk drive controller, which controls the disk drive units and transfers information between the host system and the disk drive units
- the I/O controller, which provides the interface between the host system and the disk drive controller
- the software that controls the structure and operation of the disk subsystem and provides the structure for the information stored on the subsystem

DISKS AND DISK PACKS

A disk is a data storage device that consists of one or more circular metal plates that are often called platters. These platters rotate up to 60 times each second around a spindle that is mounted in a disk drive.

One or both faces of each platter are coated with a thin film of magnetic material, and data is recorded on the disk as magnetic changes in this material. Data on the platter is accessed by a disk drive component called the read/write head.

Data is stored on the platters in concentric circles that are called tracks. These tracks are very narrow and there can be hundreds of them per inch. All the tracks on a disk that have the same radius form a cylinder.

Disks can be divided into three main types that have different physical characteristics. The three types of disks are disk packs, head-per-track disks, and flexible diskettes. Flexible diskettes are rarely used on A Series systems and are not discussed further in this manual.

Various models of disks are available that have different capacities and performance capabilities, but Burroughs system software treats the models as logically identical.

Disk packs have multiple platters that are mounted on a central spindle. Disk packs have one or more movable read/write heads for each recording surface that move from track to track to access data. The movement of the read/write heads to the specified track is called a seek. Disk packs can be removable or nonremovable depending on the disk pack model. Nonremovable disk packs operate with smaller tolerances, so that tracks can be closer together and the disk pack can store more data.

Head-per-track disks have fixed read/write heads. Each track on each recording surface has one read/write head so that the read/write head does not need to be moved to the desired track.

## Disk Subsystem Concepts

Head-per-track disks are now seldom used. They were designed to speed up access to data by eliminating the "seek time" needed by the movable read/write heads on a disk pack. Advances in technology have greatly improved the speed of data access on disk packs, however, so that disk packs are more cost-effective. Disk packs are used on current Burroughs systems, and Burroughs system software treats head-per-track disks and disk packs as logically identical in almost all cases. Thus, it is not necessary to know whether a head-per-track disk or disk pack is being used on your system.

## NOTE

The term "disk" in this manual refers to both disk packs and head-per-track disks. The term "pack" is used in specific terms such as "base pack" that are used in system commands and messages.

STRUCTURE OF DATA ON DISKS

Disk tracks are physically divided into portions known as sectors. A sector is 30 words (180 bytes) long and is the smallest portion that can be read from or written onto a disk. Sectors are also called segments. Segments, as they refer to disk storage, are different from application program segments. This manual uses the term "sector" rather than "segment" to avoid confusion. Each sector on a disk has a unique address that the system uses to identify the sector's location.

When you create a disk file or add to it, the data is not necessarily stored in one contiguous series of sectors. Instead, the data is stored in portions called areas that each contain an equal number of sectors. An area is the contiguous group of sectors allocated for that portion of the file. An "area" is also referred to as a "row." The file attributes you specify refer to the term "area," while the Master Control Program (MCP) refers to the term "row" in its processing. An area is measured in terms of logical records, where a logical record is the amount of data that is accessed by the execution of one read or write statement in a program. A row is measured in terms of sectors. All the areas on a disk do not need to be the same size, but all the areas of a single file must be the same size. Figure 1 illustrates the structure of disk tracks and sectors.

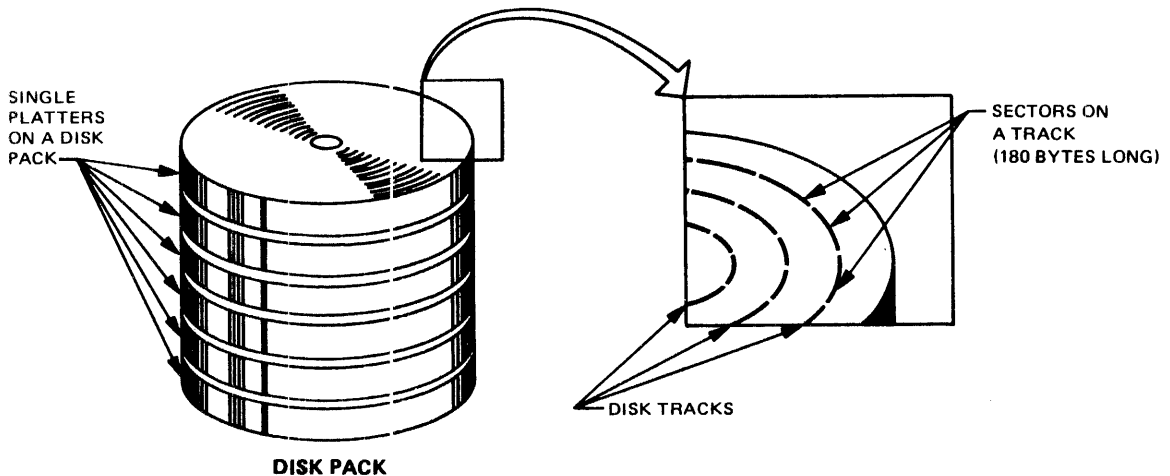


Figure 1. The Physical Structure of a Disk



## Disk Subsystem Concepts

The system accesses each area of a file by obtaining the physical address of the area from a special structure called the disk file header. Each disk file has a header, which also includes information such as the name of the file, the length of its records, its creation date, and so on. Figure 2 illustrates the structure of the disk file header.

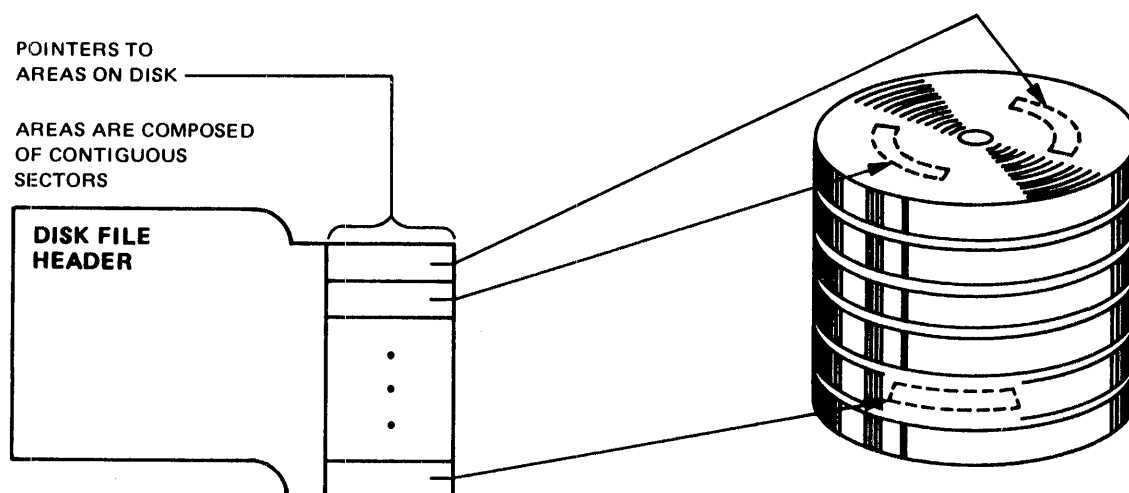


Figure 2. A Disk File Header

## DISK SUBSYSTEM SOFTWARE OVERVIEW

The disk file headers of all the permanent files on a disk are stored in a special file called the flat directory. When the system needs to access a file, it locates the disk file header in the flat directory for the appropriate disk and then uses the physical addresses in the header to access the individual areas of the file. The flat directory is also referred to as the system directory. Figure 3 illustrates the structure of the flat directory.

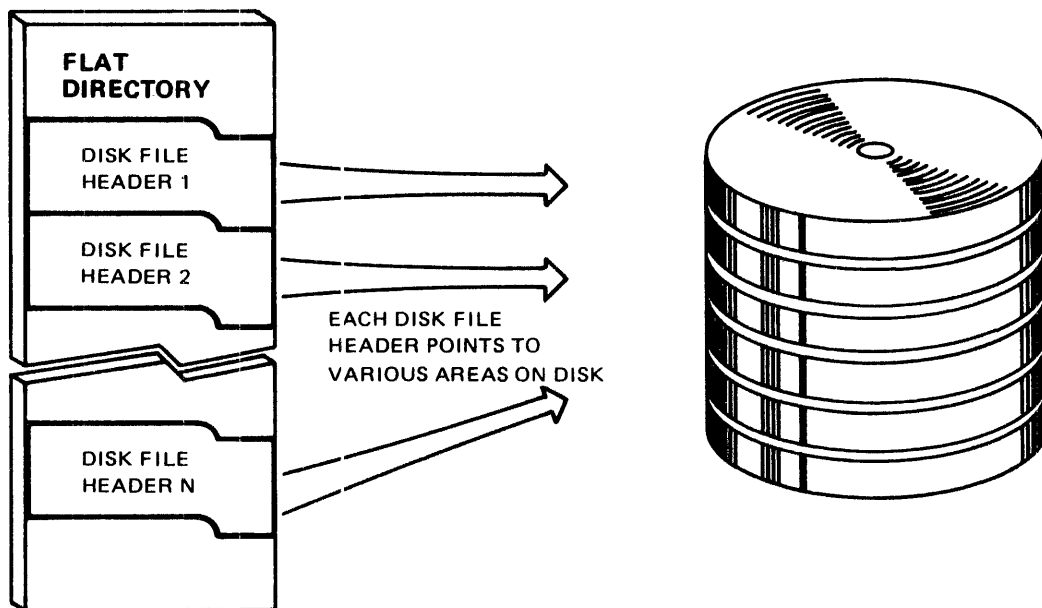


Figure 3. The Flat Directory

**FAMILIES AND MULTIDISK FAMILIES**

A family consists of one or more disks that are logically grouped together and treated as a single entity by the system. Each family has a family name, which can consist of up to 17 alphanumeric characters (letters and digits). When you access a file, you specify both the file name and the family name as "<file name> ON <family name>". The file name and the family name, when specified together, are called the file title.

The family name of a disk and other information about the disk is stored in a structure called the label. The label is stored on the first 28 sectors of the disk. The label also contains the serial number that your site assigns to the disk, and a pointer to the flat directory of the disk, if there is a flat directory. When a program needs to access or allocate a file, the system uses the family name to locate the disk that contains the file. The system uses the serial number to distinguish disks from each other when they are on-line. For more information about the label, family name, and serial number, refer to the section "Disk Initialization and Operation."

See also

Disk Initialization and Operation . . . . . 29

The flat directory is stored on only one member of the family, although other disks in the family can have duplicate copies of the flat directory. The family member that contains the flat directory that the system is currently using to access the family is called the base pack. Sometimes one disk is not large enough to store all the data you want to put on it. The system allows you to have several disks in a family so that files can be spread across all the members of the family. A family that consists of more than one disk is known as a multidisk family. Although a multidisk family can be mixture of different disk pack models, it cannot be a mixture of head-per-track disks and disk packs.

The first disk that you enter into a family is the base pack, and it will contain the flat directory for the family. Additional disks can be added to the family as continuation packs, and the system logically links the family members together so that they are treated as a single entity. A family can have up to 254 continuation packs. Continuation packs do not necessarily contain a flat directory file. Refer to the section "Disk Initialization and Operation" for information about how to create a multidisk family.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

The system will allocate different areas of a particular file on different members of the same family. You have the option of designating which family members are to receive areas of the file by using the FAMILYINDEX file attribute. Refer to the "I/O Subsystem Reference Manual" for more information about FAMILYINDEX. The system will never spread a file over disks that are in different families. Figure 4 illustrates the structure of a multidisk family.

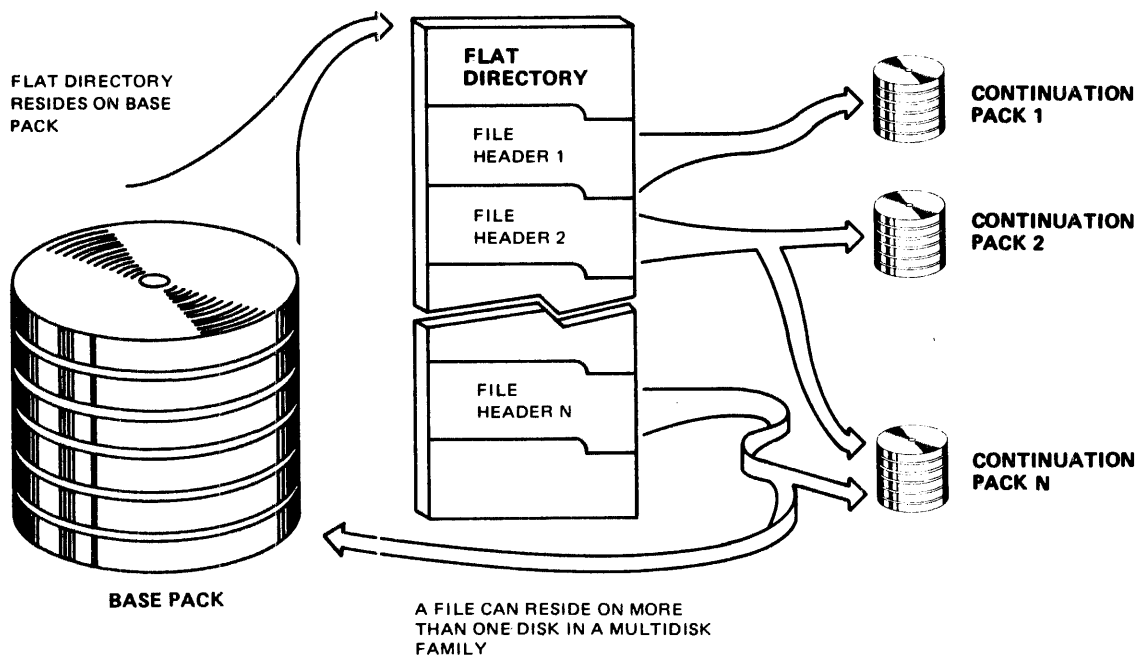


Figure 4. A Multidisk Family

It is important to remember that disks with the same family name are not necessarily in the same family. If you try to use a disk that has the same family name as another disk on the system and the two disks are not in the same family, the system issues an error message.

## Disk Subsystem Concepts

When the system needs to access a multidisk family, the base pack and any continuation pack that contains a copy of the flat directory must be on-line. If the file to be accessed is spread over several family members, continuation packs must be brought on-line when areas are needed that are stored on those continuation packs.

The system assigns each member of a family a family index number when it is first added to the family. The family index number is incremented by one for each new member. The initial base pack is assigned family index 1, the first continuation pack is assigned family index 2, and so on. Programs can use the FAMILYINDEX file attribute to distribute files or areas of files to particular disks in the family. There is no connection between a disk's serial number and its family index number.

The flat directory's file name is "SYSTEMDIRECTORY/<family index number>", where <family index number> is the three-digit family index number of the disk on which the flat directory is stored.

You can use the PER PK version of the PER (Peripheral Status) ODT command to examine the family name, serial number, and family index number of all the on-line disks on the system.

## DISK FILES

A disk file is a named collection of data that is stored on disk. All disk files have disk file headers that describe the file. The header contains the physical addresses of where the file is stored on the family and various file attributes. The header for a permanent file is stored in the flat directory of the family on which the file is stored; the header for a temporary file is stored in main memory.

### File Attributes

File attributes are specifications included with each file that define basic information about that file. Some of these attributes identify the file, while others describe the structure of the file. File attributes that identify the file include FILENAME, CYCLE, and VERSION. File attributes that describe the structure of the file include AREAS, AREALENGTH, BLOCKSIZE, and MAXRECSIZE. Many of the file attributes for a disk file are stored in the file's header.

When someone at your installation wants to create a new disk file, that person must decide what values to assign to file attributes. File attributes can be assigned either within a program or with file equations at compilation or execution time. The procedure explained here applies to files with fixed-length records.

1. Assign KIND the value DISK.
2. Assign FAMILYNAME the name of the family on which you want the file to be stored. The default value of FAMILYNAME is DISK. If you use family substitution, the family name can be changed to the family designated by the family specification. Refer to "Family Substitution" in the section "Planning and Installation" for more information on this subject.
3. Assign FILENAME the name you choose for the file.
4. Assign NEWFILE the value TRUE.
5. Assign FILEKIND the mnemonic value that describes the internal structure and purpose of the file. The default value of FILEKIND is DATA.
6. Assign FRAMESIZE a value of 4, 8, or 48 to indicate how many bits are to be transferred as one unit of data during an I/O operation. If you use a value of 4, data is transmitted in 4-bit units, which are equal to hexadecimal characters. If you use a value of 8, data is transmitted in one-byte units, which are equal to EBCDIC or ASCII characters. If you use the value 48, data is transmitted as full words (48 bits). Other file

## Disk Subsystem Concepts

attributes, such as AREALENGTH, BLOCKSIZE, and MAXRECSIZE are expressed in the units assigned in FRAMESIZE.

7. A logical record is the amount of data accessed by one execution of a read or write statement in a program. Determine how many words or characters each logical record is to contain and assign that value to MAXRECSIZE. The default value of MAXRECSIZE is 30 words, or 180 EBCDIC characters.
8. If your program accesses records sequentially, it can save I/O operation time by reading or writing several physically adjacent records in one block. The number of logical records accessed as one block is determined by the attribute BLOCKSIZE. The default value of BLOCKSIZE is the value of MAXRECSIZE, which means that only one logical record is accessed by each I/O operation. When determining the block size, keep in mind that if you use large blocks, the I/O operations are efficient, but you are tying up a large amount of main memory. On the other hand, if you use very small blocks, you must perform more I/O operations.
9. Determine the size, in FRAMESIZE units, that you want to allocate for each area of the file and assign that value to AREALENGTH. The default value of AREALENGTH is MAXRECSIZE multiplied by 1000 and then rounded up so that the value can be evenly divided by the value of BLOCKSIZE. Areas that are too small or too large have disadvantages. If the areas are too small, they limit the number of records in the file. If the areas are too large, it is more difficult for the system to find the contiguous disk sectors needed to store each area.

The AREAS attribute designates how many areas can be allocated for the file; the default value of AREAS is 20. When the file is created, the number of areas specified by AREAS is not automatically allocated. Instead, an entry is placed in the disk file header for each possible area. The system allocates an area to the file the first time a program attempts to read or write records that must be placed in that area. When an area is allocated, the system creates a pointer from the disk file header to the area.

If all the areas for a file have been allocated and you need to expand the file, the system increases the value assigned to AREAS and automatically allocates new areas if the attribute FLEXIBLE is assigned its default value of TRUE. A file can contain up to 1000 areas.

Once you have finished the above procedure to assign the various file attributes, you can open the file. When you open the file, the system creates a header for the file and stores the values of the various file attributes in the header. The system also enters values automatically for other file attributes, such as CREATIONDATE and CREATIONTIME. You

## DISK SUBSYSTEM SOFTWARE OVERVIEW

then can write records to the new file. When you have finished processing the file, you can close it so that it becomes a permanent file. The system then updates the values of certain file attributes, such as LASTRECORD, and places the header in the flat directory of the disk. Refer to "Temporary and Permanent Files" in this section for more information on this subject.

To access an existing permanent file, you do not need to reassign all the above attributes. If you assign the DEPENDENTSPECS file attribute the value TRUE before you access the file, you need to specify only the FILENAME, FAMILYNAME, and KIND; the file will retain certain previous attribute values.

There are many other file attributes that can be selected, and these attributes are also stored in the disk file header. Refer to the "I/O Subsystem Reference Manual" for more information about file attributes.

**File Generations on Non-CATALOGING Systems**

In certain application programs, it is convenient to create different generations of the same file, such as a new generation for each time the program runs. This section discusses generations for non-CATALOGING systems only. Refer to "File Generations On CATALOGING Systems" in the section "Cataloging" for more information about this subject.

There are two ways to differentiate the generations of a file on a non-CATALOGING system.

The first approach is to assign a different name to each generation. An example of this approach would be PAYABLE/001, PAYABLE/002, PAYABLE/003, and so on. All the generations can be on-line at once because they have different file names.

The second approach is to use the CYCLE and VERSION attributes to distinguish each generation. CYCLE and VERSION are integer values; the higher the value of CYCLE, and the higher the value of VERSION within that CYCLE, the better the genealogy of the generation is said to be, relative to other generations. Only one generation can be on-line at one time, because the file names are the same. If you do not assign values to CYCLE and VERSION, the default value is 1 for CYCLE and 0 for VERSION. You must assign CYCLE in order to use VERSION, but assigning VERSION is optional when you use CYCLE.



## Disk Subsystem Concepts

The following example illustrates how the system determines the genealogy of each generation when CYCLE and VERSION are used on a non-CATALOGING system. In this example, the first entry is the generation with the best genealogy and the last entry is the generation with the worst genealogy.

CYCLE	VERSION
-----	-----
4	0
3	3
3	2
2	3
2	2
2	1
2	0
1	5
1	0

CYCLE and VERSION function in the following manner when you try to access an existing file on non-CATALOGING systems:

- If you specify CYCLE and VERSION when you want to access the file, the system locates the generation that has that exact CYCLE and VERSION. If a file with the proper file name is not on-line or does not exist, the message "NO FILE" is displayed on the ODT. If a file with the proper file name, but the wrong CYCLE and VERSION, is on-line, the message "UNMATCHED GENEALOGY" is displayed on the ODT.
- If you specify CYCLE, but not VERSION, when you want to access the file, the system locates the generation with that exact CYCLE and the VERSION equal to 0. If the generation that is on-line does not have that CYCLE and VERSION, the message "UNMATCHED GENEALOGY" is displayed on the ODT. If no generation of the file is on-line, the message "NO FILE" is displayed on the ODT.
- If you do not specify CYCLE and VERSION when you want to access the file, the system locates the generation that is on-line. If no generation of the file is on-line, the message "NO FILE" is displayed on the ODT.

### Resident and Nonresident Files

Files are often referred to as "resident" or "nonresident." A file is resident if it is the primary copy of the file (as opposed to a backup copy) and it is stored on disk, regardless of whether the disk is on-line or not. A file is nonresident if it is stored only on a backup tape or if the file is a backup copy that is stored on another disk family. The terms "resident" and "nonresident" in this manual do not pertain to the file attribute RESIDENT.

### Temporary and Permanent Files

Disk files can be either temporary or permanent. A temporary file's header is not stored in the flat directory of the family on which the file is located. When a program closes a temporary file, the file's contents are deleted and the file's disk space is returned to the system. A file is permanent when it has an entry in the flat directory of the family on which the file is stored. When a program closes a permanent file, the file's contents remain stored on disk.

A temporary file is created when the NEWFILE file attribute is assigned the value TRUE and a program opens the file. The program can then write data in the file and access it if necessary. If steps are not taken to make the file permanent, the file's disk space is returned to the system when the file is closed.

A temporary file can be made permanent by the following program statements:

- In an ALGOL program, use the LOCK or CRUNCH options in the CLOSE statement that closes the file. Both options make the file permanent; CRUNCH also causes the unused portion of the last area of the file to be returned to the system.
- In a COBOL or COBOL74 program, use the LOCK, CRUNCH, or SAVE options in the CLOSE statement that closes the file. All three options make the file permanent; LOCK also marks the file so that it cannot be reopened during that execution of the program, while CRUNCH also causes the unused portion of the last area of the file to be returned to the system.

## Disk Subsystem Concepts

When a new file is opened, it is made permanent immediately by specifying one of the following file attributes:

- Assign the PROTECTION file attribute either the value SAVE or the value PROTECTED. When the file is opened, it becomes a permanent file.
- Assign the SENSITIVEDATA file attribute the value TRUE. When the file is opened, it becomes a permanent file.

Once a file is permanent, it remains permanent unless it is removed. A permanent file is removed when you do one of the following actions:

- Use the "REMOVE" WFL statement to remove the disk file header from the flat directory. If the file is not in use, its disk space is returned to the system immediately.
- In a COBOL, COBOL74, or ALGOL program, use the PURGE option in the CLOSE statement that closes the file.
- Create another permanent file with the same name in the same family. If the "OP+AUTORM" version of the OP (Options) ODT command has been specified, the system automatically removes the old file with the duplicated name from the family.

If a permanent file is removed while it is still being used by other programs, the file becomes a temporary file. It can still be used by the other programs that had already opened the file. The disk space is not returned to the system until the file is closed by the last program using it.

When a file is made permanent on a CATALOGING system, an entry for that file is placed in the catalog. If a permanent cataloged file is removed and there are no backup copies of the file, the catalog entry for the file is deleted. If a permanent cataloged file is removed and there are backup copies of the file, the file is marked in the catalog as being nonresident.

**ACCESSING DISK FILES**

Computer performance depends to a large degree upon the ability to efficiently perform I/O operations. Burroughs has developed a very efficient and reliable method for accessing disk files so that the system can operate at its full potential. This access method consists of two parts: the disk access structure used by the entire system, and the flat directory on each disk family. Refer to "Structure of Data on Disks" in this section for more information about the flat directory.

When the MCP needs to access a disk file, it uses the access structure to locate the disk file header of the file in the flat directory of the family on which the file is stored. There is one access structure for the entire system, and it consists of two parts: the Pack Access Structure Table (PAST) and the File Access Structure Table (FAST). The PAST contains pointers to the FAST. These pointers indicate where in the FAST the entry for a family's files are stored. The FAST contains a pointer to each disk file's header in the flat directory for that file's family.

The access structure is also called the catalog, but this manual refers to the term "access structure" to eliminate confusion between CATALOGING and non-CATALOGING systems. The access structure is stored on one family in the system that is known as the catalog family. You can designate the catalog family with the DL (Disk Location) ODT command.

The access structure functions differently on CATALOGING and non-CATALOGING systems. The access structure for a CATALOGING system contains entries for all available versions of the file. The access structure for a non-CATALOGING system contains only entries for the files that are currently on-line on the system. The file name of the access structure on non-CATALOGING systems is "SYSTEM/ACCESS/<family index number>". The file name of the access structure on CATALOGING systems is "SYSTEM/CATALOG/<family index number>". The <family index number> indicates which member of the catalog family contains the access structure.

The MCP constructs the access structure the first time the system is initialized so that the access structure contains entries for each family that is on-line at that time. Each time a family is brought on-line, entries for the family's files are entered into the access structure. When a family is removed with the CLOSE (Close Pack) or POWER (Power Up/Down) ODT command, references to its files are removed from the access structure unless it is a CATALOGING system and the family is volumed. Refer to the section "Cataloging" for more information about this subject.

## Disk Subsystem Concepts

**The Pack Access Structure Table (PAST)**

The Pack Access Structure Table (PAST) contains pointers into the File Access Structure Table (FAST). These pointers indicate where in the FAST the entry for each family is located. The PAST is not accessed each time the MCP needs to locate a disk file. Instead, the MCP reads the PAST entries into a table in main memory when the system is initialized. The MCP then can access the FAST directly.

Each time a family is brought on-line, the MCP checks the PAST to see if there is an entry for the family. If there is an entry but it is not up-to-date, or if the family is being brought on-line for the first time and thus does not have an entry, the MCP creates PAST and FAST entries for the family and stores the PAST entry in the MCP table.

**The File Access Structure Table (FAST)**

When the MCP needs to access a disk file, it uses the File Access Structure Table (FAST) to locate the disk file header in the flat directory of the appropriate family. The FAST is a sorted table that can be logically considered as a hierarchical tree structure. The FAST contains a pointer to the disk file header of each disk file on the system. This allows the MCP to read the FAST entry for the family and then use the pointer to quickly locate the disk file header in the unsorted flat directory. Figure 5 illustrates how the FAST corresponds to the flat directory of one family.

Using the FAST and flat directories to access files is not only efficient, but it provides a safety mechanism as well in case either the FAST or the flat directory experiences a problem.

The FAST is logically organized as a tree structure, so it is totally unusable if it experiences data corruption or some other problem at the highest levels of the tree structure. The system can circumvent the problem, however, by reconstructing the FAST entries for each family by reading that family's flat directory. Refer to "Family Rebuilds" in this section for more details about this subject.

The flat directory is an unsorted structure that is accessed randomly through the FAST. Thus, if there is a problem with a small portion of the flat directory, the problem is restricted to that portion and the rest of the flat directory can be successfully accessed.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

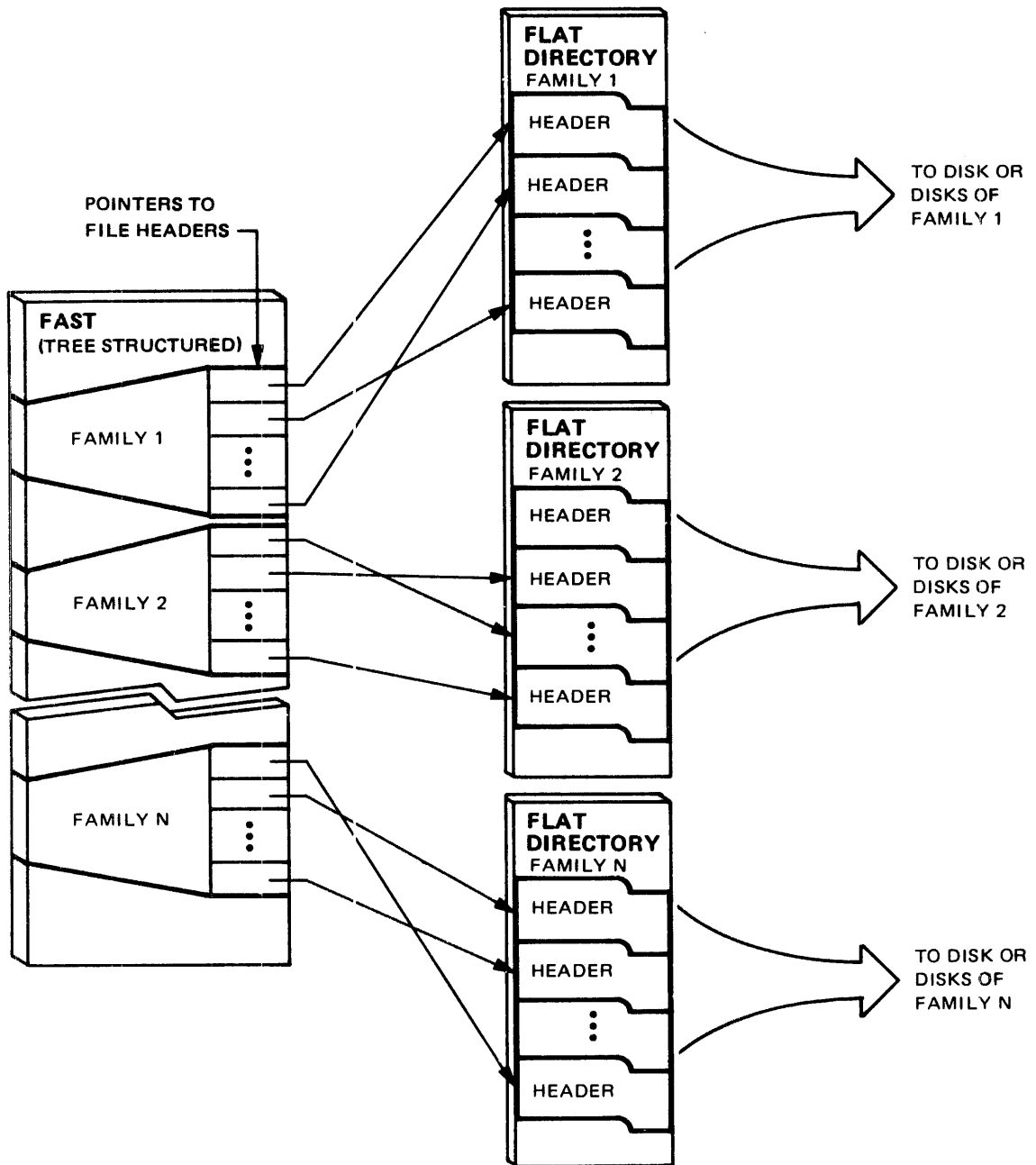


Figure 5. The File Access Structure Table (FAST)

**The Process of Accessing Disk Files**

When you access a disk file by specifying its file title (the file name and the family name), the following procedure occurs:

1. The MCP uses the family name to locate the proper family entry in the FAST.
2. The MCP reads the file entries for the family in the FAST and locates the pointer to the disk file header for the file with that file name.
3. The MCP reads the disk file header in the flat directory.
4. The MCP obtains from the header the physical disk addresses of the area or areas that contain the disk file.
5. The MCP accesses the file's data at those physical addresses.

Figure 6 illustrates how the components of the access structure and the flat directory allow efficient access of disk files.

DISK SUBSYSTEM SOFTWARE OVERVIEW

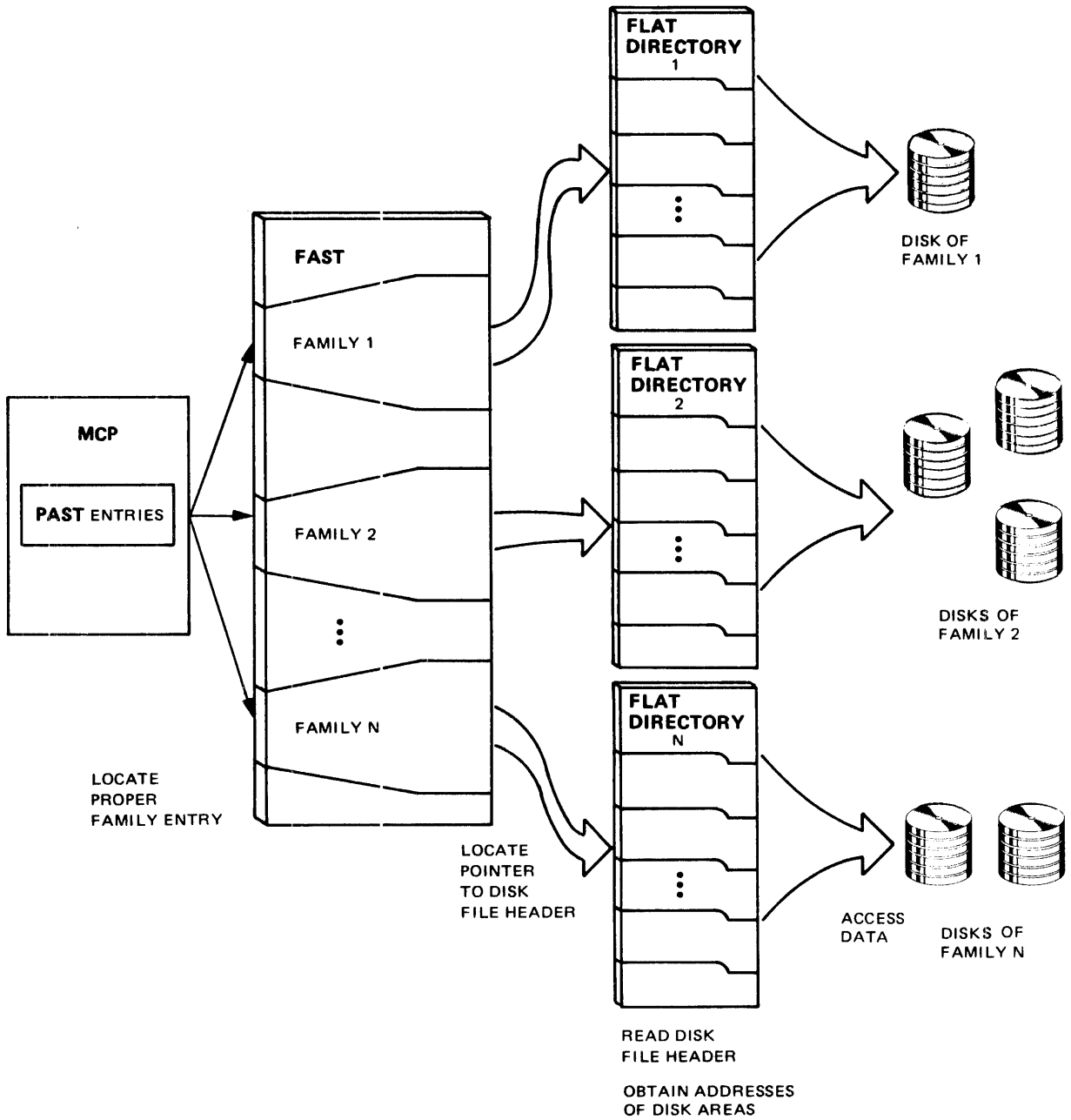


Figure 6. The Process of Accessing Disk Files



## Disk Subsystem Concepts

**Family Rebuilds**

The access structure is handled automatically by the MCP. The only time your installation is aware of the access structure is during the process known as family rebuilding. A family rebuild consists of the system constructing or reconstructing the FAST entries for a family by sequentially reading its flat directory.

Family rebuilds occur in the following situations:

- automatically when you bring a base pack on-line on a non-CATALOGING system and no Local Access Structure Table (LAST) is found on the base pack
- automatically to recover from certain directory errors when they occur
- when you use the RB (Rebuild Access) ODT command to initiate a rebuild

If during a family rebuild, two disk file headers are found with the same file name, the rebuild process bypasses the second file. If no operator action is taken, the second copy of the file cannot be accessed. However, if the first copy of the file is removed or renamed (using the "REMOVE" or "CHANGE" ODT commands), the next family rebuild will reveal the second copy of the file.

**The Local Access Structure Table (LAST)**

To eliminate the need for a family rebuild on a non-CATALOGING system each time a pack is brought on-line, the system uses the LAST to restore the FAST, instead of rebuilding the FAST from scratch. The LAST is written to the base pack whenever the base pack is closed (using the "CLOSE" ODT command), freed (using the "FREE" ODT command), or powered off (using the "PO" ODT command). When the pack is readied, the system attempts to restore the FAST from the LAST. If the restoration is successful, a family rebuild is not carried out.

The LAST, however, is NOT created in the following conditions:

- The system is a CATALOGING system.
- The pack is not write-enabled when CLOSED.
- The pack has no room for the LAST when the pack is CLOSED.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

- The pack is manually turned off without first entering the "CLOSE", "FREE", or "PO" ODT command.
- I/O errors are encountered during the creation of the LAST.
- The pack is mirrored.

**Available Disk Tables**

When a family rebuild occurs at Halt/Load time or when a family is brought on-line, the MCP needs to know what space is available on each disk. The MCP uses the available disk table in main memory to keep track of this unused disk space. The process of constructing or reconstructing the available disk table is called directory complementing. The MCP starts with the assumption that the entire disk is available and then reads the disk file headers in the flat directory. Each time the MCP reads a header, it removes the space allocated to that file from the available disk table. After the last header is read and processed, the remaining space on the disk is listed in the available disk table as being available for use. The available disk table is different from the Master Available Table (MAT), which contains pointers to the disk sectors that are available so that defective sectors are not used.

### 3      DISK INITIALIZATION AND OPERATION

This section describes the procedures for setting up and using disks and disk families. This section covers the following topics:

- preparing a disk for use
- the types of disks that can be used on A Series systems
- creating multidisk families
- characteristics of on-line disks
- consolidation of disk space
- the distinction between Operator Display Terminal (ODT) commands that treat the disk subsystem as a logical or physical entity

#### PREPARING A DISK FOR USE

Before a disk can be used for the first time, two procedures must be used to prepare it. The first is the Initialize, Verify, and Relocate (IVR) operation; the second is the RC (Reconfigure Disk) ODT command.

Before Burroughs ships a disk to a customer, it uses the IVR operation to write sector boundaries and the label on the disk. The IVR operation also creates the Master Available Table (MAT), which contains pointers to the disk sectors that are available. If a sector is defective, the IVR operation deletes the pointer to the bad sector so that it cannot be used. The MAT is different from the available disk table, which keeps track of unused disk space.

Although the IVR procedure is available on some systems, it should never be used except under the direction of your Burroughs field engineer.

Before your installation uses a disk, you must use the RC command to prepare the disk for system use. In the RC command, you specify the family name and serial number you want to assign to the disk. The family name and serial number are stored on the disk label. The OL (Display Labels and Paths) ODT command can be used to examine disk label information.

The family name can be up to 17 alphanumeric characters (letters and digits). When a program needs to access or allocate a file, the system uses the family name to locate the correct disk.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

The serial number is a six-digit number that you choose. The system uses the serial number to distinguish disks from each other. Installations can use serial numbers to give each disk a unique, permanent identification to aid in keeping track of disk use, as well as logging errors or other problems. Some installations use the serial number that is listed on the bottom of the disk by the manufacturer. Others choose a reference number such as the date that the disk was first used. Some installations give nonremovable disks the same serial number as the unit number of the disk drive on which the disk is mounted. The serial number of each on-line disk on a system must be unique, and it is suggested that serial numbers be assigned in a systematic fashion.

When you reconfigure a disk with the RC command or purge it with the PG (Purge) ODT command, any files on that disk are made permanently inaccessible. Care should be taken so that a disk is not reconfigured by accident. The RC command "OWNER" clause acts as a safety feature to ensure that you actually want to reconfigure the disk. When you first reconfigure the disk, you can assign to the OWNER clause any name of up to 14 alphanumeric characters. Then, if you ever try to reconfigure that disk again, the system displays a message on the ODT that specifies the value of OWNER and asks the operator if the reconfiguration is permissible.

## Disk Initialization and Operation

**TYPES OF DISKS USED ON A SERIES SYSTEMS**

Disks are logically organized in one of three ways to be used on Burroughs A Series systems: as native-mode disks, interchange disk packs, or Installation-Allocated Disk (IAD). When you use the RC command to reconfigure a disk, you have the option of designating the disk as an interchange disk pack or Installation-Allocated Disk. The default designation in the RC command is native-mode disk.

**Native-mode disk**

This disk is used on all A Series and B 5000/B 6000/B 7000 Series systems. A native-mode disk cannot be transferred from an A Series or B 5000/B 6000/B 7000 Series system to other Burroughs systems such as a B 1000 or B 2900/B 3900/B 4900 system. When this manual uses the term "disk," it is referring to native-mode disks unless otherwise indicated.

**Interchange disk pack**

This disk pack has a directory format that allows files to be transferred from a Burroughs A Series or B 5000/B 6000/B 7000 Series system to other Burroughs systems such as a B 1000 or B 2900/B 3900/B 4900 system. Interchange disk packs have many limitations and are not discussed further in this manual.

**Installation-Allocated Disk**

This is a special type of native-mode disk on which you designate the actual sectors where files are to be stored. IADs are not further discussed in this manual; refer to the "IADMAPPER" section of the "System Software Site Management Reference Manual" for more information about IAD.

**CREATING MULTIDISK FAMILIES**

A multidisk family consists of several disks that have the same family name and are logically linked together so that they are treated by the system as a single entity. Multidisk families allow much more data to be stored on one family than is possible with a single disk family. Different models of disk packs can be members of the same family, but a family cannot be a mixture of disk packs and head-per-track disks. For an overview of disk family concepts, refer to "Families and Multidisk Families" in the section "Disk Subsystem Concepts."

Assigning a disk the same family name as another disk that is already on-line to the system does not make the disks members of the same disk family. To create a multidisk family, you must use a special version of the RC command to logically connect the disks together. Keep in mind that the RC command makes any files that previously were on a disk inaccessible. Adding a continuation pack to an existing family does not harm the files on the family, however.

To create a multidisk family, perform the following steps:

1. Reconfigure the disk that you want to be the base pack of the family. The base pack contains the flat directory and must always be on-line when the family is accessed. The RC command syntax is

```
RC PK <unit number> NAME <family name>
```

where <unit number> is the unit number of the disk drive on which the base pack is mounted, and <family name> is the name that you want to call the family. The family name must be different from the name of any family that is on-line to the system.

2. Each time you want to add a continuation pack to the family, use the RC command with the following syntax:

```
RC PK <unit number> BP <serial number> NAME <family name>
```

where <unit number> is the unit number of the disk drive on which the continuation pack is mounted, <serial number> is the serial number of the base pack, and <family name> is the family name of the base pack. The base pack must be on-line when you reconfigure the continuation pack.

See also

Families and Multidisk Families . . . . . 13

## Disk Initialization and Operation

ON-LINE AND OFF-LINE DISKS

A disk is on-line to a particular system if all the following conditions are true:

- It is mounted on a unit that has been logically connected to the system with the ACQUIRE (Acquire Resource) ODT command.
- It is mounted on a unit that has not been reserved with the UR (Unit Reserved) ODT command.
- It is mounted on a unit that has not been made inaccessible to the system with the SV (Save) ODT command.
- It has not been logically detached from the system with the CLOSE (Close Pack) or FREE (Free Resource) ODT command.
- Its label and its flat directory (if it has one) have been read successfully. Refer to "Families and Multidisk Families" in the section "Disk Subsystem Concepts" for more information about the flat directory.

A disk is off-line to a particular system if any of the above criteria have not been met.

See also

Families and Multidisk Families . . . . . 13

**CONSOLIDATING DISK SPACE**

The files on a disk are often being added, expanded, or removed. As the disk is continually updated, it is not always possible to fit areas of new files between areas of other files; there may be only small areas available between in-use areas. If there is a large number of files on the disk, especially many small files, there may be a large number of these unused sectors scattered throughout the disk. The total number of available sectors may be large, but the system may not be able to use the sectors because contiguous groups of sectors are too small for an area of a file to be stored there. This situation is known as "checkerboarding."

You can use the SQUASH (Consolidate Disk Allocation) ODT command to consolidate files and increase the number of usable sectors. The SQUASH operation moves in-use areas of files to available sectors to reduce the fragmentation of files on the disk. Although the SQUASH operation helps to reduce the fragmentation, it does not eliminate it, and you may have to perform the SQUASH operation several times in a row to have a significant impact on checkerboarding.

When the SQUASH operation is performed on a multidisk family, the system consolidates areas on the base pack first, and then consolidates areas on each continuation pack. Areas are not moved from one family member to another.

The SQUASH operation is a time-consuming process, and it is suggested that it be used at night or some other time when system usage is minimal. The utility FILEDATA can be used to produce a listing that shows the checkerboarding for a disk; this listing shows the in-use portions of the disk and the unused space surrounding those portions. The DU (Disk Utilization) ODT command can also be used to examine the space that is available on a disk family. Refer to the section "FILEDATA" in the "System Software Utilities Reference Manual" for more information about FILEDATA. Refer to the "Operator Display Terminal (ODT) Reference Manual" for more information about the SQUASH and DU commands.



## Disk Initialization and Operation

**THE USE OF OPERATOR DISPLAY TERMINAL COMMANDS**

Operator Display Terminal (ODT) commands are used frequently to control the disk subsystem. Each command accesses the disk subsystem in one of two ways: the physical, operational sense or the logical, programmatic sense. This section explains how ODT commands handle the disk subsystem in both cases.

Commands that handle the disk subsystem in the physical sense are those that specify a disk by the unit number of the disk drive on which the disk is mounted. The family name of a disk is not used in these commands. Examples of these commands are CLOSE (Close Pack), MOVE (Move Pack), OL (Display Label and Paths), and RY (Ready).

Commands that handle the disk subsystem in the logical sense are those that specify a disk by its family name. The unit number of the disk drive on which the disk is mounted is not used in these commands. When you use these commands, you specify a family as a logical entity and do not need to know whether the disk is a member of a multidisk family or on which disk drives the family is mounted. Examples of these commands are DL (Disk Location), DU (Disk Utilization), and RB (Rebuild Access).

For more information about the specific syntax and usage of ODT commands, refer to the "Operator Display Terminal (ODT) Reference Manual."



#### 4      CATALOGING

All computer installations are concerned about protecting information that is stored in disk files. Many installations also want to keep extra copies of files in secure locations away from the site to prevent loss from fire or other accidents. Installations often make backup copies of disk files on magnetic tape for this reason, but keeping track of the backup copies of different versions of a file can be difficult. The CATALOGING option on Burroughs A Series systems can be used to keep track of backup copies of files in the system.

This section explains the following topics:

- how CATALOGING functions
- setting up CATALOGING
- using CATALOGING
- how volumed tapes and volumed disks are handled differently
- catalog rebuilds
- creating and using backup copies of the catalog
- replacing a damaged disk on a CATALOGING system
- the impact of CATALOGING on system performance

### HOW CATALOGING FUNCTIONS

The CATALOGING feature provides an automated method of locating where backup copies of disk files and tape files are stored. The system handles cataloged disk files and cataloged tape files similarly, but this section focuses on cataloged disk files. This manual uses the term "resident" to refer to the primary copy (as opposed to a backup copy) of a file that is stored on disk, regardless of whether the disk is on-line or not. A file is nonresident if it is stored only on a backup tape or if it is a backup copy of a file and is stored on another disk family. Only one version of a file can be resident at one time. In this manual, the terms "resident" and "nonresident" do not pertain to the file attribute RESIDENT.

This discussion of how CATALOGING works is divided into two parts: "Catalog Components" and "File Generations on CATALOGING Systems."

#### Catalog Components

The disk file access structure discussion ("Accessing Disk Files" in the section "Disk Subsystem Concepts") noted that CATALOGING systems store the access structure in the file SYSTEM/CATALOG/<family index number>. It also noted that the SYSTEM/CATALOG file stores other information that pertains to CATALOGING. SYSTEM/CATALOG contains three other structures: the volume library, the catalog, and an index for cataloged tape files.

The volume library is a component in SYSTEM/CATALOG that keeps track of all volumed disks and tapes used by the system. A volumed disk or tape is one that has been added to the volume library with the "VOLUME ADD" WFL statement. Note that disks and tapes often are referred to as volumes, whether they have been entered into the volume library or not. The volume library contains an entry for each volumed disk or tape family. There is only one entry for a multidisk family.

You can use the PV (Print Volume) ODT command to find out if a particular disk or tape is volumed. You can also use the utility LISTVOLUMELIB to generate a printer listing of all the volumes that are in the volume library.

The system uses a special structure called the Volume Access Structure Table (VAST) to access volume library entries. The system handles the VAST automatically. The only time you are aware of the VAST is when certain system messages refer to it.

## Cataloging

The bulk of SYSTEM/CATALOG is made up of the catalog, which stores information about the backup copies for cataloged files. A disk file is a cataloged file if the catalog keeps track of its backup copies or if the disk file is a new file and the catalog is to keep track of its backup copies. Cataloged files can be stored only on a disk that has been entered into the volume library. CATALOGING can keep track of the backup copies only if the copies are stored on a disk or tape that has been entered into the volume library.

### File Generations on CATALOGING Systems

You may want to keep one or two backup copies of a file. You may also want to retain older versions of a file for historical or developmental reasons. CATALOGING can be used to automatically keep track of these copies and versions.

The different copies of a file are referred to as the generations. The generation is determined by two file attributes, CYCLE and VERSION, and also the timestamp of the file. The system maintains the timestamp of each file automatically.

The CYCLE and VERSION file attributes are integer values that programs can use to distinguish each generation of a file. The higher the value of CYCLE, and the higher the value of VERSION within a particular CYCLE, the better the genealogy of the generation is said to be, relative to other generations of the file. If you do not assign values to CYCLE and VERSION, the default value is 1 for CYCLE and 0 for VERSION. CYCLE and VERSION can be used when you create a new file or access an existing file.

The timestamp is a system attribute for each file that the system maintains to show the last time the file was altered, including changes to its data, name, security status, and certain file attributes. If a file has never been altered, the timestamp shows the time and date the file was created.

When a new generation of a file is created and made permanent, the previous resident generation of the file is removed. If there are backup copies of the previous resident generation, an entry for that generation remains in the catalog. If there are no backup copies for the previous resident generation, its catalog entry is deleted.

When a new disk file is created, the MCP cannot check the contents of the file to see if it really is a new generation of an existing cataloged file or if it is a completely different file. The MCP checks only to see that both the file name and the family name are the same.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

This is important to remember if CYCLE and VERSION are not used and you copy a disk file to backup media and then remove the resident disk file. If you then create a different, unrelated file on the same family with the same name, the MCP automatically treats the new file as the newest generation of the other file that had the same file name.

CATALOGING allows you to keep track of up to seven different generations of a file and up to two backup copies of each generation. The CATALOGLEVELSET define that is compiled into the MCP specifies the catalog level. The catalog level determines how many generations your installation can have. The catalog level is assigned the value 3 when the MCP is shipped to your installation, which means that the catalog can keep track of four generations (including the resident generation). You can recompile the MCP with CATALOGLEVELSET equal to a value in the range 1 through 7. You can use the WM (What MCP) ODT command to find out what the catalog level is at your installation.

If the maximum number of generations has been reached and a new copy is added, the generation with the worst genealogy is deleted from the catalog. The system ARCHIVING function allows you to save information about older generations after they are deleted from the catalog.

If the USECATALOG file attribute is TRUE when an existing disk file (a file for which the NEWFILE file attribute is equal to FALSE) is to be accessed, the system locates the file through the catalog. The system by default accesses the generation with the best genealogy unless you specify a particular CYCLE and VERSION or use the GENERATION file attribute. GENERATION allows you to access a particular generation by specifying an integer value that designates that generation. The value of GENERATION can range from 0 for the generation with the best genealogy to the value of CATALOGLEVELSET minus 1 for the generation with the worst genealogy. The default value of GENERATION is 0. GENERATION is ignored if USECATALOG is FALSE when the file is accessed.

## Cataloging

CYCLE and VERSION function in the following manner on old files (files for which the NEWFILE file attribute is equal to FALSE) if USECATALOG is TRUE and if GENERATION has not been specified or has been assigned the value 0.

- a. If you specify CYCLE and VERSION when you want to access the file, the system locates the generation that has that exact CYCLE and VERSION. If you do not assign a value to VERSION, the system locates the generation with that CYCLE and the VERSION equal to 0. The following situations can occur when the system tries to locate the proper generation:
  - If there is not an entry in the catalog for a file with that file name, the message "NO FILE" is displayed on the ODT.
  - If there is more than one generation of the file with that CYCLE and VERSION, the system chooses the generation with the most recent timestamp. If that generation is resident, the system accesses the file. If that generation is not resident, the system displays the message "NO FILE" on the ODT. This message also displays the serial number of the backup media on which that generation is stored.
  
- b. If you do not specify CYCLE and VERSION when you want to access a file, and you either do not specify GENERATION or assign GENERATION a value of 0, the system locates the generation that has the highest CYCLE, the highest VERSION within that CYCLE, and the most recent timestamp within that CYCLE and VERSION. The following situations can occur when the system tries to locate the proper generation:
  - If there is not an entry in the catalog for a file with that file name, the message "NO FILE" is displayed on the ODT.
  - If there is an entry in the catalog for the file and the generation with the best genealogy is resident, the system accesses the file.
  - If there is an entry in the catalog for the file but the generation with the best genealogy is not resident, the message "NO FILE" is displayed on the ODT, with a list of where backup copies of the generation are stored.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

CYCLE and VERSION function in the following manner on old files (files for which the NEWFILE file attribute is equal to FALSE) if USECATALOG is TRUE, and you assign a value greater than 0 to the GENERATION file attribute.

- a. If you specify CYCLE and VERSION when you want to access the file, the system first locates the generations that have that exact CYCLE and VERSION. If you do not assign a value to VERSION, the system locates the generations with that CYCLE and the VERSION equal to 0. The system then compares the timestamps of the generations within the selected CYCLE and VERSION and chooses the generation based on the value of GENERATION.

For example, if you assign GENERATION the value of 0, the system selects the most recent timestamp within the appropriate CYCLE and VERSION. If you assign GENERATION the value of 1, the system selects the next most recent timestamp within the appropriate CYCLE and VERSION, and so on.

The following situations can occur when the system tries to locate the proper generation:

- If there is not an entry in the catalog for a file with that file name, the message "NO FILE" is displayed on the ODT.
- If the system locates generations with the correct CYCLE and VERSION, but the generation specified by the GENERATION file attribute is missing from the catalog, the message "UNMATCHED GENEALOGY" is displayed on the ODT. The specified generation is missing if GENERATION is assigned a value greater than or equal to the number of generations within that CYCLE and VERSION. For example, if there are three generations within that CYCLE and VERSION (generation 0, generation 1, and generation 2) and you assign GENERATION the value of 3, the system cannot find the correct generation.
- If the system locates the correct generation based on CYCLE, VERSION, and GENERATION, but the specified generation is not resident, the message "NO FILE" is displayed on the ODT. This message also displays the serial number of the backup media on which that generation is stored.



## Cataloging

- b. If you do not specify CYCLE and VERSION when you want to access a file but do assign USECATALOG the value TRUE and assign a value greater than 0 to GENERATION, the system ignores the values of CYCLE and VERSION and uses only the timestamps to rank the generations. The most recent timestamp becomes generation 0, the next most recent timestamp becomes generation 1, and so on. The system then chooses the generation specified by the value of the GENERATION file attribute.

The following situations can occur when the system tries to locate the proper generation:

- If there is not an entry in the catalog for a file with that file name, the message "NO FILE" is displayed on the ODT.
- If the specified generation is not resident, the message "NO FILE" is displayed on the ODT. This message also displays the serial number of the backup media on which that generation is stored.
- If there are not enough generations of the file in the catalog (for instance, if there are only two generations but GENERATION is assigned the value 3), the message "UNMATCHED GENEALOGY" is displayed on the ODT.
- If the specified generation is resident, the system accesses the file.

Examples of File Generation Selection

The following examples illustrate how the system uses CYCLE, VERSION, GENERATION, and the file timestamp to access the appropriate generation of a file named DEPOSITS. The resident generation of DEPOSITS is stored on a disk family named SAVINGS. Each example is based on the same table that lists the available generations of DEPOSITS. In these examples, the catalog level is 6, so that the system can keep track of six generations.

**Example 1**

CYCLE	VERSION	TIMESTAMP	RESIDENT	BACKUP TAPE
-----	-----	-----	-----	-----
6	0	03/28/85 18:06:05	No	230642
4	1	01/10/85 13:20:48	No	421640
3	2	01/17/85 16:45:00	No	726000
3	2	01/07/85 10:47:53	Yes	839216
3	2	01/07/85 10:00:00	No	587231
2	0	12/27/84 13:30:32	No	032105

Assume that you assign the following file attribute values:

```

CYCLE:      3
VERSION:    2
USECATALOG: TRUE
GENERATION: Not specified

```

The system finds three generations with the correct CYCLE and VERSION, so it chooses the one with the most recent timestamp, 01/17/85. That generation is not resident, so the system displays the following message on the ODT:

```
NO FILE DEPOSITS ON SAVINGS (PK), FIND ON (MT) [726000]
```

You can then copy the file in from tape 726000.

## Cataloging

## Example 2

<u>CYCLE</u>	<u>VERSION</u>	<u>TIMESTAMP</u>	<u>RESIDENT</u>	<u>BACKUP TAPE</u>
6	0	03/28/85 18:06:05	No	230642
4	1	01/10/85 13:20:48	No	421640
3	2	01/17/85 16:45:00	No	726000
3	2	01/07/85 10:47:53	Yes	839216
3	2	01/07/85 10:00:00	No	587231
2	0	12/27/84 13:30:32	No	032105

Assume that you assign the following file attribute values:

```

CYCLE:      Not specified
VERSION:    Not specified
USECATALOG: TRUE
GENERATION: Not specified

```

The system locates the generation with the best genealogy (the highest CYCLE and the highest VERSION within that CYCLE): a CYCLE of 6 and a VERSION of 0. That generation is not resident, so the system displays the following message on the ODT:

```
NO FILE DEPOSITS ON SAVINGS (PK), FIND ON (MT) [230642]
```

You can then copy the file in from tape 230642.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

## Example 3

CYCLE	VERSION	TIMESTAMP	RESIDENT	BACKUP TAPE
-----	-----	-----	-----	-----
6	0	03/28/85 18:06:05	No	230642
4	1	01/10/85 13:20:48	No	421640
3	2	01/17/85 16:45:00	No	726000
3	2	01/07/85 10:47:53	Yes	839216
3	2	01/07/85 10:00:00	No	587231
2	0	12/27/84 13:30:32	No	032105

Assume that you assign the following file attribute values:

CYCLE: Not specified  
VERSION: Not specified  
USECATALOG: FALSE  
GENERATION: Not specified

USECATALOG is FALSE, so the system does not examine the catalog. The system automatically accesses the resident generation, which has a CYCLE of 3, a VERSION of 2, and a timestamp of 01/07/85 10:47:53.

## Cataloging

**Example 4**

<u>CYCLE</u>	<u>VERSION</u>	<u>TIMESTAMP</u>	<u>RESIDENT</u>	<u>BACKUP TAPE</u>
6	0	03/28/85 18:06:05	No	230642
4	1	01/10/85 13:20:48	No	421640
3	2	01/17/85 16:45:00	No	726000
3	2	01/07/85 10:47:53	Yes	839216
3	2	01/07/85 10:00:00	No	587231
2	0	12/27/84 13:30:32	No	032105

Assume that you assign the following file attribute values:

```

CYCLE:      3
VERSION:    2
USECATALOG: TRUE
GENERATION: 1

```

The system finds three generations with the correct CYCLE and VERSION and uses the timestamps to rank them. The most recent timestamp (01/17/85) is ranked as generation 0. The next most recent timestamp (01/07/85 10:47:53) is ranked as generation 1. The earliest timestamp (01/07/85 10:00:00) is ranked as generation 2. The generation specified by the GENERATION file attribute, 1, is resident and the system accesses it.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**Example 5**

CYCLE	VERSION	TIMESTAMP	RESIDENT	BACKUP TAPE
6	0	03/28/85 18:06:05	No	230642
4	1	01/10/85 13:20:48	No	421640
3	2	01/17/85 16:45:00	No	726000
3	2	01/07/85 10:47:53	Yes	839216
3	2	01/07/85 10:00:00	No	587231
2	0	12/27/84 13:30:32	No	032105

Assume that you assign the following file attribute values:

```

CYCLE:      3
VERSION:    2
USECATALOG: TRUE
GENERATION: 3

```

The system finds three generations with the correct CYCLE and VERSION and uses the timestamps to rank them. The most recent timestamp (01/17/85) is ranked as generation 0. The next most recent timestamp (01/07/85 10:47:53) is ranked as generation 1. The earliest timestamp (01/07/85 10:00:00) is ranked as generation 2. The generation specified by the GENERATION file attribute is 3, however, and generation 3 does not exist. As a result, the system displays the following message on the ODT:

```
UNMATCHED GENEALOGY
```

## Cataloging

## Example 6

CYCLE	VERSION	TIMESTAMP	RESIDENT	BACKUP TAPE
-----	-----	-----	-----	-----
6	0	03/28/85 18:06:05	No	230642
4	1	01/10/85 13:20:48	No	421640
3	2	01/17/85 16:45:00	No	726000
3	2	01/07/85 10:47:53	Yes	839216
3	2	01/07/85 10:00:00	No	587231
2	0	12/27/84 13:30:32	No	032105

Assume that you assign the following file attribute values:

```

CYCLE:      Not specified
VERSION:    Not specified
USECATALOG: TRUE
GENERATION: 4

```

The system ignores the CYCLE and VERSION values of the generations and uses only the timestamps to determine the genealogy. The system then ranks the generations in the following order:

GENERATION	CYCLE	VERSION	TIMESTAMP
-----	-----	-----	-----
0	6	0	03/28/85 18:06:05
1	3	2	01/17/85 16:45:00
2	4	1	01/10/85 13:20:48
3	3	2	01/07/85 10:47:53
4	3	2	01/07/85 10:00:00
5	2	0	12/27/84 13:30:32

The generation specified by the GENERATION file attribute, 4, is not resident, so the system displays the following message on the ODT:

```
NO FILE DEPOSITS ON SAVINGS (PK), FIND ON (MT) [587231]
```

You can then copy the file in from tape 587231.

**SETTING UP CATALOGING**

To set up CATALOGING for the first time, perform the following steps. This procedure should not be used if you are already running on a CATALOGING system, because the current catalog will become inaccessible as a result.

1. Use the DL (Disk Location) ODT command to designate a disk family as the catalog family.
2. Use the "OP+CATALOGING" version of the OP (Options) ODT command to enable the system option CATALOGING.
3. If you want files to be cataloged by default, use the "OP+USECATDEFAULT" version of the OP (Options) ODT command to assign TRUE as the default value of the USECATALOG file attribute.
4. Halt/Load the system. The system then displays the message "OK TO CREATE NEW CATALOG" on the ODT.
5. Enter the reply "OK". The system then creates the new SYSTEM/CATALOG file on the catalog family.
6. Use the "VOLUME ADD" WFL statement to enter into the volume library each disk and tape on which you want to store cataloged files. It is suggested that all disks and tapes used on your system be added to the volume library.
7. Use the "CATALOG ADD" WFL statement to enter existing files into the catalog.



## Cataloging

**USING CATALOGING**

This section explains the following procedures that are used when operating a CATALOGING system:

- entering files into the catalog
- making backup copies of cataloged files
- accessing cataloged files
- removing catalog entries
- purging catalog backup tapes

**Entering Files Into the Catalog**

Once CATALOGING is set up on your system, you can enter a file into the catalog by doing one of the following actions. The file must be stored on a volumed disk.

- Assign the USECATALOG file attribute the value TRUE before creating the file. The file will automatically be cataloged when the file is made permanent.
- Operate the system with the system option USECATDEFAULT enabled. This makes the default value of the USECATALOG file attribute TRUE and all permanent files are entered into the catalog when they are created unless their USECATALOG file attribute is assigned the value FALSE.
- Use the "CATALOG ADD" WFL statement to mark a permanent file as cataloged.
- Use the "COPY & CATALOG" or "ADD & CATALOG" WFL statement to copy the file to disk from backup media and enter the file into the catalog. The copied version is marked in the catalog as the resident version of the file and the source version is marked in the catalog as a backup copy.
- Use the SM (Send to MCS or Database) ODT command to set the "CATDEFAULT" CANDE option. Enter the following when the CANDE MCS is running:

```
<mix #> SM OP + CATDEFAULT
```

When CANDE workfiles are saved, the CANDE "CATDEFAULT" option governs whether those files become cataloged files.

### Making Backup Copies of Cataloged Files

Once a file is cataloged, you can use the "COPY & BACKUP" WFL statement to make backup copies of the file. COPY & BACKUP performs two functions: it copies the file onto backup media, and stores in the catalog the volume name and serial number of the media the backup was copied to. Both the source and destination volumes in the COPY & BACKUP statement must be volumed media.

You can save up to two backup copies of each generation of a file. If you use COPY & BACKUP to store a third copy of a generation on another volume, the catalog keeps track of only the two most recent copies. The earliest copy is not deleted, but cannot be accessed through the catalog.

### Accessing Cataloged Files

The catalog can keep track of up to seven generations of each cataloged file, depending on the catalog level. You can choose which generation of the file the system accesses. The system uses the catalog to access the file if the value of the USECATALOG file attribute is TRUE or if the USECATDEFAULT system option is enabled so that the default value of USECATALOG is TRUE. USECATALOG takes precedence over USECATDEFAULT. If USECATALOG is assigned the value TRUE, but the default value of USECATALOG is FALSE because USECATDEFAULT is not enabled, then USECATALOG still has the value TRUE. If USECATALOG is assigned the value FALSE, but the default value of USECATALOG is TRUE because USECATDEFAULT is enabled, then the value of USECATALOG is still FALSE.

If USECATALOG is TRUE, the system accesses the generation with the best genealogy unless you request another generation by using the CYCLE, VERSION, or GENERATION file attributes. Again, the generation with the best genealogy is the one with the highest CYCLE, the highest VERSION within that CYCLE, and the most recent timestamp.

USECATALOG must be TRUE in order for the system to automatically access the generation with the best genealogy. If USECATALOG is FALSE, the system accesses the resident version of the file by default. If the generation with the best genealogy has been removed and another generation has been copied to disk, and thus is the resident version, the system might be using an outdated version of the file.

## Cataloging

The "REMOVE," "CHANGE," "ADD," "SECURITY," and "CATALOG ADD" WFL statements always act on the resident generation of the file, regardless of whether or not it has the best genealogy and regardless of whether or not USECATDEFAULT is enabled.

When you use the "CATALOG DELETE" WFL statement, you can specify a particular generation by assigning CYCLE, VERSION, or GENERATION. If you do not specify a particular generation, the "CATALOG DELETE" operation acts on the generation with the best genealogy. The "CATALOG PURGE" WFL statement acts on all the generations of the file. Refer to "Removing Catalog Entries" in this section for more information about the CATALOG DELETE and CATALOG PURGE statements.

The "RUN" WFL statement acts only on the generation with the best genealogy if USECATDEFAULT is enabled. If USECATDEFAULT is not enabled, RUN acts on the resident generation.

If you use the RUN statement and the generation with the best genealogy is not resident, the system displays the "NO FILE" message on the ODT. This message also displays the serial numbers of the media on which backup copies of the file are stored. An example of this message is

```
NO FILE DEPOSITS ON SAVINGS (PK), FIND ON (MT) [347681]
```

where "DEPOSITS" is the file name, "SAVINGS" is the family name, "(PK)" indicates that SAVINGS is a disk pack, "(MT)" indicates that the backup copy is on a magnetic tape, and "[347681]" is the serial number of the tape containing the backup copy.

The following ODT commands act only on the generation with the best genealogy if USECATDEFAULT is enabled: CM (Change MCP), CP (Control Program), CS (Change Supervisor), MC (Make Compiler), PP (Privileged Program), SI (System Intrinsics), and SL (System Library).

## NOTE

The CM, CP, MC, PP, SI, and SL commands will always act on the resident generation, regardless of whether or not it has the best genealogy and regardless of whether or not USECATDEFAULT is enabled.

To examine backup file information such as the available generations, use the PD (Print Directory) ODT command. The display generated by the PD command refers to the generations as entries. These entries range from 1 for the generation with the best genealogy to the value of

## DISK SUBSYSTEM SOFTWARE OVERVIEW

CATALOGLEVELSET for the generation with the worst genealogy. Note that this numbering is different from that used in the GENERATION file attribute. If the PD (Print Directory) ODT command is used to examine the resident version and it is not the generation with the best genealogy, some of the PD display is omitted. The FILEDATA utility can also be used to display information about a file's attributes and backup copies.

Once a file has been entered into the catalog and backed up, it remains in the catalog even if the resident version is removed. You might want to remove the resident version because you need to make disk space available, because the resident version is damaged, or because you want to create a new version of the file.

If you try to open the removed file, the system displays the "NO FILE" message on the ODT. This message also displays the serial numbers of the media on which backup copies of the file are stored. You can then locate a backup and copy it back in with the "COPY" WFL statement.

#### Removing Catalog Entries

There are two ways to remove information about a file from the catalog. The "CATALOG DELETE" WFL statement lets you remove references to a particular generation, including the one that is resident. The "CATALOG PURGE" WFL statement removes all the backup information for a file. The CATALOG DELETE and CATALOG PURGE statements delete only catalog entries; the resident and backup files are still available, but cannot be accessed through the catalog. If the copy specified in the CATALOG DELETE statement is the resident version, the copy still remains the resident version after its catalog entry has been deleted.

#### Purging Catalog Backup Tapes

After using CATALOGING for some time, you may find that you have backup copies on tape that are no longer needed. You can purge these backup tapes, rename them, and use them for other purposes, and the system will automatically change the tape's name in the volume library to SCRATCH. However, the catalog entries for the files that were backed up on the tape will still indicate that backup copies are stored on that tape and refer to its old name.

## Cataloging

VOLUME LIBRARY HANDLING OF DISKS AND TAPES

CATALOGING systems handle disk and tape volumes differently in terms of how they are added to, updated in, or deleted from the volume library.

The system automatically updates the volume library entry for a volumed tape when you purge it with the PG (Purge) ODT command. The system also automatically updates the volume library entry for a tape when you place a different file on a volumed tape. The automatic updating of the volume library entry does not take place if any of the following occur:

- the tape is purged while CATALOGING is not in use
- the tape is purged on a different system
- a new file is stored on the tape while CATALOGING is not in use
- a new file is stored on the tape while the tape is being used on another system

Volumed disks are handled differently. When you want to rename a disk or disk family, you use the RC (Reconfigure Disk) or LB (Relabel Pack) ODT command. When you want to purge the files from a disk or disk family, you use the PG (Purge) ODT command. To use these commands on a volumed disk, however, first use the "VOLUME DELETE" WFL statement to remove the disk from the volume library. After you have reconfigured, renamed, or purged the disk, you can re-enter it into the volume library with the "VOLUME ADD" WFL statement.

To VOLUME ADD a multipack disk family, use the name of the family and the serial number of the pack with the family index number 1. Do not VOLUME ADD the other packs in the family, even if the unit bearing family index number 1 is not currently on-line.

The following examples illustrate how a CATALOGING system handles volumed tapes and volumed disks.

Example of How Volumned Tapes Are Handled

This example shows how to assign a serial number to a new tape, enter the tape into the volume library, add a file to the tape, purge the tape, and assign a new serial number to the tape. In this example, the unit number of the tape drive on which the tape is mounted is 118, and the serial number of the tape is 555. The tape is a single reel family, so some system messages in this example contain "#1" to indicate that this reel is the first (and, in this case, only) reel in the family.

1. Use the SN (Serial Number) ODT command to purge the tape and assign the serial number 555:

```
SN MT 118 555
```

The system then displays the following messages on the ODT:

```
MT 118 WILL BE SN-ED  
MT 118 PURGED
```

2. Use the "VOLUME ADD" WFL statement to enter the tape into the volume library as a scratch tape:

```
VOLUME ADD SCRATCH (KIND = TAPE, SERIALNO = 555)
```

The system then displays the following message on the ODT:

```
VOLUME FAMILY SCRATCH (MT) [555] #1 ENTERED
```

3. Use the "COPY" WFL statement to copy the file PAYABLE to the tape and change the name of the tape from SCRATCH to ACCOUNTS:

```
COPY PAYABLE TO ACCOUNTS (SERIALNO = 555)
```

The system then displays the following messages on the ODT:

```
VOLUME FAMILY SCRATCH (MT) [555] #1 DELETED  
VOLUME FAMILY ACCOUNTS (MT) [555] #1 ENTERED
```

## Cataloging

4. Use the PV (Print Volume) ODT command to display information from the volume library about tape 555:

```
PV MT 555
```

The system then displays the following information on the ODT:

```
-----VOLUME LIBRARY ENTRY FOR (MT) [000555]-----
```

```
SERIALNO 000555, #0001, PETAPE
FAMILY NAME: ACCOUNTS
FAMILY CREATED ON: 3/27/85
FAMILY EXPIRATION DATE: 4/27/85
FAMILY CREATION SITE: 281
ONE MEMBER IN THIS FAMILY
```

5. Use the PG (Purge) ODT command to purge the tape; the PG command uses the unit number, 118, not the serial number, 555.

```
PG MT 118
```

The system purges the tape, automatically updates the volume library entry to indicate that the tape is now a scratch tape, and displays the following messages on the ODT:

```
VOLUME FAMILY ACCOUNTS (MT) [555] #1 DELETED
VOLUME FAMILY SCRATCH (MT) [555] #1 ENTERED
MT 118 PURGED
```

6. Use the SN command to purge the tape and attempt to assign the serial number 666:

```
SN MT 118 666
```

Instead of purging the tape, the system displays the following message on the ODT:

```
MT 118 VOLUME DELETE REQUIRED
```

The system does not allow the serial number to be changed until the existing volume library entry for the tape has been deleted.

7. Use the "VOLUME DELETE" WFL statement to delete the existing volume library entry for the tape:

```
VOLUME DELETE SCRATCH (KIND = TAPE, SERIALNO = 555)
```

The system then displays the following message on the ODT:

```
VOLUME FAMILY SCRATCH (MT) [555] #1 DELETED
```

## DISK SUBSYSTEM SOFTWARE OVERVIEW

8. Enter the SN command again to purge the tape and assign the serial number 666:

```
SN MT 118 666
```

The system then displays the following messages on the ODT:

```
MT 118 WILL BE SN-ED  
MT 118 PURGED
```

9. Use the VOLUME ADD statement to enter the tape back into the volume library:

```
VOLUME ADD SCRATCH (KIND = TAPE, SERIALNO = 666)
```

The system then displays the following message on the ODT:

```
VOLUME FAMILY SCRATCH (MT) [666] #1 ENTERED
```



## Cataloging

Example of How Volumned Disks Are Handled

This example shows how to reconfigure a disk, add it to the volume library, and change the name of the disk. In this example, the family name of the disk is SHIPPING, the serial number of the disk is 032785, and the unit number of the disk drive on which the disk is mounted is 211. SHIPPING is the only member of the family, so some system messages in this example contain "#1" to indicate that this disk is the first (and, in this case, only) disk in the family.

1. Use the RC (Reconfigure Disk) ODT command to reconfigure and name the disk:

```
RC PK 211 NAME=SHIPPING SERIAL=032785
```

2. Use the "VOLUME ADD" WFL statement to enter SHIPPING into the volume library:

```
VOLUME ADD SHIPPING (SERIALNO=032785, KIND = PACK)
```

The system displays the following message on the ODT:

```
VOLUME FAMILY SHIPPING (PK) [032785] #1 ENTERED
```

3. Use the PV (Print Volume) ODT command to display information from the volume library about disk 032785:

```
PV PK 032785
```

The system then displays the following information on the ODT:

```
-----VOLUME LIBRARY ENTRY FOR (PK) [032785]-----
```

```
SERIALNO 032785, #0001, PACK, BASE
FAMILY NAME: SHIPPING
FAMILY CREATED ON: 3/27/85
FAMILY CREATION SITE: 281
ONE MEMBER IN THIS FAMILY
```

4. Use the "VOLUME DELETE" WFL statement to delete the existing volume library entry for the disk:

```
VOLUME DELETE SHIPPING (KIND = PACK, SERIALNO = 032785)
```

The system then displays the following message on the ODT:

```
VOLUME FAMILY SHIPPING (PK) [032785] #1 DELETED
```

5. Enter the LB command to rename the disk INVENTORY:

```
LB PK 211 NAME = INVENTORY OLDNAME = SHIPPING
```

## DISK SUBSYSTEM SOFTWARE OVERVIEW

The system then displays the following message on the ODT:

PK 211 UNIT RELABELLED

6. Use the VOLUME ADD statement to enter INVENTORY into the volume library:

VOLUME ADD INVENTORY (KIND = PACK, SERIALNO = 032785)

The system then displays the following message on the ODT:

VOLUME FAMILY INVENTORY (PK) [032785] #1 ENTERED

## Cataloging

CATALOG REBUILDS

When a CATALOGING system needs to perform a family rebuild to recover from directory errors, it performs a catalog rebuild and then a family rebuild. A catalog rebuild is a lengthy process. During a catalog rebuild, the system reads the catalog to extract all the backup information for each cataloged file and enters the names of files that have backup copies into the Family Access Structure Table (FAST).

The system then performs a family rebuild. During a family rebuild on a CATALOGING system, the system reads the flat directory to determine which files are resident and inserts the names of the resident files into the catalog and the FAST.

For more information about the FAST and family rebuilds, refer to "Family Rebuilds" in the section "Disk Subsystem Concepts."

See also

Family Rebuilds . . . . . 27

CREATING AND USING BACKUP COPIES OF THE CATALOG

You may want to make backup copies of the catalog itself from time to time to provide backups in case any catalog data on disk becomes corrupted or the catalog family fails. How often you should copy the SYSTEM/CATALOG file depends on the needs of your installation. When you use a backup catalog, the information is not available that has been added to the catalog since that backup copy was made. If the catalog entries are updated frequently and recovering the CATALOGING information is critical on your system, you will want to back up the catalog more often.

The system can also have duplicate on-line copies of the catalog; refer to "Catalog File Duplication" in the section "Safety Mechanisms" for more information about this subject.

See also

Catalog File Duplication. . . . . 84

The "COPY" WFL statement can be used to copy SYSTEM/CATALOG to a backup tape.

When you restore the catalog from a backup copy, some catalog information is not up-to-date. The names and serial numbers of backup media are not available if the backup media have been made since the last time the catalog was backed up. As a result, the backup copies of files that were made after the catalog was copied to tape cannot be accessed through the catalog. Also, the names and other information are not available for volumed tapes that have been changed since the catalog was backed up.

When you need to replace the current catalog, you can do one of the following operations:

- If the catalog family is usable, you can replace the current catalog so that the backup catalog is on the same family and is thus easy for you to locate. Replacing the current catalog requires extra steps, however, because the current catalog is marked as a nonremovable system file.
- If the catalog family cannot be restored, you must designate a new catalog family and copy the backup catalog to that family.

## Cataloging

Replacing the Current Catalog

To replace the catalog, perform the following steps:

1. Use the "OP-CATALOGING" version of the OP (Options) ODT command to disable the system option CATALOGING.
2. Halt/Load the system.
3. Use the "REMOVE" WFL statement to delete the catalog. The REMOVE statement syntax is

```
REMOVE SYSTEM/CATALOG/= FROM <family name>
```

where <family name> is the name of the catalog family.

4. Use the "COPY" WFL statement to copy the backup catalog from tape. The COPY statement syntax is

```
COPY SYSTEM/CATALOG/<family index number> FROM <tape name>  
TO <family name> (PACK)
```

where <family index number> is the family index number of the disk that the new catalog is to be stored on and <family name> is the name of the catalog family.

5. Use the "OP+CATALOGING" version of the OP (Options) ODT command to enable the system option CATALOGING.
6. Halt/Load the system. The system then performs a catalog rebuild, followed by a family rebuild for all the families on the system. These rebuilds can be lengthy processes, depending on the number of files on the system.

**Designating a New Catalog Family**

To designate a new catalog family and store the backup catalog file there, perform the following steps:

1. Use the "COPY" WFL statement to copy the backup catalog from tape to a family that is not the current catalog family. The COPY statement syntax is

```
COPY SYSTEM/CATALOG/<family index number> FROM <tape name>  
TO <family name> (PACK)
```

where <family index number> is the family index number of the disk that the catalog is to be stored on and <family name> is the name of the family that is to become the new catalog family.

2. Use the DL (Disk Location) ODT command to designate this family as the catalog family.
3. Halt/Load the system. The system then performs a catalog rebuild, followed by a family rebuild for all the families on the system. These rebuilds can be lengthy processes, depending on the number of files on the system.

## Cataloging

REPLACING A DAMAGED VOLUMED DISK

A base pack for a volumed family can be damaged so that none of the files on the family can be accessed. To preserve the backup information for the files that were on the original family, you must substitute another base pack for the damaged one or repair and re-use the damaged disk.

To substitute a new base pack for the damaged one so that the family inherits the backup information, perform the following steps:

1. Use the RC (Reconfigure Disk) ODT command to reconfigure the new disk with the exact same family name and serial number as the damaged disk. The system then displays the following message on the ODT:

PK<unit number> OK TO RE-ENTER INTO VOLUME LIBRARY

2. Enter the reply "OK". The system then performs a catalog rebuild. When the catalog rebuild is finished, the disk is ready to have files stored on it. Whenever a program tries to access a file that was stored on the original disk, the message "NO FILE" is displayed on the ODT. This message lists the volume name and serial number of the media where backup copies are stored.

If the broken disk has been repaired, you must perform the following steps to re-create the family so that it inherits the backup information.

1. Use the RC (Reconfigure Disk) ODT command to reconfigure the disk with exactly the same family name and serial number as that of the original disk. The system then displays the following message on the ODT:

PK<unit number> VOLUMED DISK BEING CHANGED BY RC

2. Bring the catalog family and any other desired disks on-line. The system then displays the message on the ODT:

PK<unit number> OK TO RE-ENTER INTO VOLUME LIBRARY

## DISK SUBSYSTEM SOFTWARE OVERVIEW

3. Enter the reply "OK". The system then performs a catalog rebuild. When the catalog rebuild is finished, the disk is ready to have files stored on it. Whenever a program tries to access a file that was stored on the original disk, the message "NO FILE" is displayed on the ODT. This message lists the volume name and serial number of the media where backup copies are stored.
4. In order to restore the old disk files to the disk, copy the desired files from backup tapes.



## Cataloging

**IMPACT OF CATALOGING ON SYSTEM PERFORMANCE**

Using CATALOGING to automate the locating of backup copies of files does involve a tradeoff because system performance can be reduced. Each time you open or close a disk file on a non-CATALOGING system, two to three disk I/O operations must occur. One to two additional I/O operations are required to open or close a disk file on a CATALOGING system. Also, rebuilds take substantially longer on a CATALOGING system than on a non-CATALOGING system because both a catalog rebuild and a family rebuild must be done. Rebuilds do occur less frequently on a CATALOGING system, though, because the catalog saves an up-to-date description of the files on a disk. If the disk is brought on-line and none of the files have been altered on another system, no rebuild is necessary.

Another tradeoff involved in CATALOGING is that the file SYSTEM/CATALOG is usually large. At least one sector and sometimes several sectors are needed to store the catalog information for each disk file on the system. It is recommended that the SYSTEM/CATALOG file be stored on a family with files that are not accessed frequently. Frequent I/O operations to the family containing SYSTEM/CATALOG slow the handling of the catalog and thus the performance of the entire system. The DL (Disk Location) ODT command is used to specify on which family you want to store SYSTEM/CATALOG.



## 5            PLANNING AND INSTALLATION

Performance of your system depends upon the efficient operation of certain critical system files. The best system performance is achieved if these files are allocated to disk families so that the accesses of the files do not interfere with each other. This section suggests methods your installation can use to make efficient use of the disk subsystem. Disk file allocation is a complex subject, and this section does not attempt to make flat recommendations about where system files should be placed. The needs of each system are different, and this section is designed to suggest approaches you may want to consider when tuning and balancing your system's operation.

This section discusses the following topics:

- the characteristics and requirements of the various system files
- allocation of system files to improve system performance and to ease recovery from certain errors
- use of family substitution to distribute disk files so that departments, sections, or groups each have a private family, but share a family that contains system files
- use of the MCP instead of SYSTEM/LOADER to recover from subsystem failure

**SYSTEM FILE REQUIREMENTS**

The MCP, disk access structure, flat directories, system utilities, and other system software components are stored as disk files. When this manual refers to system files, it means these system software components.

Before discussing the distribution of system files, it is helpful to examine the characteristics of the following system files:

**MCP code file**

The current MCP code file, the one the system is running on, is accessed frequently and all accesses are time-critical. The WM (What MCP) ODT command can be used to determine which MCP code file the system is running on. Most accesses of the MCP code file are caused by presence-bit interrupts, which in this case notify the MCP that an MCP code file segment is needed that is not in main memory. The system then reads the code file segment into main memory from disk. The MCP cannot predict which code file segments are going to be needed to be read into main memory, so it cannot read them into a "look-ahead buffer" ahead of time. The unit on which the MCP code file is stored is called the Halt/Load unit or the boot unit. Corruption of the MCP code file may require a Halt/Load. The file is restored by recopying the original file and then using the CM (Change MCP) ODT command to designate the new code file as the Halt/Load MCP. The MCP code file is not updated during system operation.

**System library and intrinsic code files**

These files include system libraries that are linked to function names established through the SL (System Library) ODT command and system intrinsics established with the SI (System Intrinsics) ODT command. The characteristics of these files are similar to those of the MCP code file. Their failure usually does not require a Halt/Load, but can cause jobs using them to be discontinued.

**Other system code files**

These files, such as system compilers, have characteristics similar to those of the MCP code file. Their failure usually does not require a Halt/Load, but can cause jobs using them to be discontinued. It is suggested that these files be grouped onto a single family so that they can be conveniently referenced with the family substitution operation. Refer to "Family Substitution" in this section for more information on this subject.

## Planning and Installation

## Overlay files

Data is stored in a temporary overlay file when it is overlaid in main memory. These files do not have headers in the flat directory. These files are accessed frequently, especially if main memory is full or if the overlay goal (the MCP memory management factor OLAYGOAL) is assigned a value greater than 0. All overlay file I/O operations are time-critical, and contention for the family where these files are stored can seriously affect system performance. Failure of the family where overlay files are stored can cause jobs to be discontinued and can require a system Halt/Load. It is not necessary or possible to save or restore the contents of overlay files.

## Swapdisk file (SYSTEM/SWAPDISK) for systems running SWAPPER

The swapdisk file is where the SWAPPER procedure stores files that it has moved out of main memory. Accesses to the swapdisk file are critical to the performance of a system that is running SWAPPER. Failure of the swapdisk file can cause jobs to be discontinued and may require a system Halt/Load. It is not necessary or possible to save or restore the swapdisk file; it can be re-created by running SWAPDISKMAKER.

## JOBDESC and job files

The JOBDESC file contains information about job files. Job files are code files that are compiled by the WFL compiler. Job files do not have headers in the flat directory. These files are accessed regularly, and all JOBDESC and job file I/O operations are time-critical. Failure of these files can cause a Halt/Load. The contents of these files cannot be recovered, but they can be re-created by rerunning jobs. If persistent I/O errors occur for the JOBDESC file or the job file, you may have to do one of two alternatives. The first is to enter the ??RJ (Remove JOBDESC File) primitive ODT command and then Halt/Load the system to build a new JOBDESC file. The second alternative is to use the DL (Disk Location) ODT command to move the JOBDESC file to another family. Failure of the JOBDESC file results in the loss of the input job queues, information about the queues, and job log output for jobs that are waiting to be printed. The JOBDESC file also contains certain system operational characteristics such as ADM (Automatic Display Mode) settings and TERM (Terminal) settings. This information is lost if the JOBDESC file fails or is moved to another family.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

## Printer and punch backup files

These files are accessed frequently, but I/O operations are buffered and thus are not time-critical. If these files are on the same disk with other system files, however, the I/O operations of printer and punch backup files can interfere with the time-critical I/O operations of other system files. The I/O operations of JOBDESC and job files are particularly time-critical. Failure of the printer or punch backup files leads to the loss of some output and some jobs may be discontinued. Data in these files cannot be recovered, but the jobs can be rerun to produce output again.

## SYSTEM/SUMLOG

SYSTEM/SUMLOG contains the log of many system activities and is accessed regularly. Its failure usually does not require a Halt/Load. The data in the log cannot be recovered, which can pose a problem if your installation uses the log to provide information for billing purposes. If you use the log for billing, you need to take precautions to make backup copies. If there are persistent log file errors, you can use the TL (Transfer Log) ODT command to save the log file and create a new one.

## Disk access structure

This file is named SYSTEM/ACCESS/<family index number> on non-CATALOGING systems and SYSTEM/CATALOG/<family index number> on CATALOGING systems. The disk access structure is accessed regularly. Its failure can cause jobs to fail, can cause family and catalog rebuilds, or can require a Halt/Load. Restoration is not necessary on non-CATALOGING systems because re-creating a disk access structure with a family rebuild does not cause the loss of any data. On a CATALOGING system, restoration is difficult and usually involves the loss of some catalog backup information. Refer to the discussion of "Catalog File Duplication" in the section "Safety Mechanisms" for more information on this subject.

## SYSTEM/USERDATAFILE

This file contains usercodes and passwords for system users and is small. Most of the I/O operations for this file are not time-critical. A copy of this file should be kept for backup, although you should take security precautions with the copy because of the sensitive nature of the information it contains.

## Sort files

These files are temporary files used by the sort intrinsic. Sort files' I/O operations do not affect the performance of the MCP, but the I/O operations do affect the performance of programs that use the sort intrinsic. Also, if the sort files are on the same family as other system files, sorting can interfere with the time-critical I/O operations of these system files. Sorting uses large temporary files, and it is not necessary to save backup copies.

**DISK FILE ALLOCATION**

Your installation can control system performance and the ease of recovery from catastrophic errors to a great extent by your choice of which families you place various system files on. The MCP lets you select where the MCP code file is located (and thus what the Halt/Load family is); where the swapdisk file, the intrinsics, and the system libraries are located; and where system files controlled by the DL (Disk Location) ODT command are located. Your installation can mix some or all system files with files used by application programs, or segregate system files from files used by application programs. These decisions involve tradeoffs, which are discussed in this section.

It is important to remember that disk file allocation is a complex task and the needs of one system can differ from the needs of another. Suggestions included in this section are not flat recommendations that apply to every system; instead, these suggestions provide approaches you may want to consider when tuning and balancing your system's operation.

For maximum system performance it would be ideal to store every system file on a different disk and never put any other files on those disks. But this is not practical for two reasons: some of the system files are very small and a large amount of disk space would be wasted, and the system would be vulnerable to the failure of any one of several different disks or disk drives. When deciding where to locate disk files, consider the following criteria:

- system performance (speed)
- amount of storage space needed
- ease of recovery from damaged files or media
- the probability that the failure of a single disk will cause a service interruption (such as "disk drive not ready" errors requiring a Halt/Load)

Except for USERDATAFILE, the log, and the catalog on a CATALOGING system, the failure of a system file or the family it resides on usually does not result in the permanent loss of any important data. Creating a new file or recopying the original file usually solves the problem caused by the failure of system files other than USERDATAFILE, the log, and the catalog on CATALOGING systems. Sometimes a system file must be moved to another family until the original family is restored. The DL command is used when moving a system file from one family to another.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

Most system files do not change in ways that require saving frequent backup copies. It is recommended that they be segregated from application data files that do need frequent safety backups. This way, total failure of a family containing system files does not entail the lengthy recovery operations that might be required for application data files. Similarly, total failure of a family dedicated to application data files does not harm the operations of the MCP. Thus, recovery actions to restore the application files can take place while the MCP is fully operational. In other words, it is probably simpler to segregate static system files (and static application files) from dynamic application files by putting them on separate families.

System performance usually improves if you segregate the Halt/Load family and the overlay files from all other files. MCP code file presence-bit handling and overlay handling sharply affect the performance of the system. The worst possible performance is produced if these time-critical files share families with application programs that perform many I/O operations.

It is suggested that the Halt/Load family be a single disk family with no application program files stored on it. The Halt/Load family should not be a multidisk family unless you want to have duplicate MCP code files. Refer to "MCP Code File Duplication" in the section "Safety Mechanisms" for more information on this subject. System performance usually improves if the Halt/Load family is reserved for the files that have to be there: the MCP code file and the SYSTEM/TRAINABLES file, which controls printer operation. Systems that use Network Support Processors (NSPs) must have the file FIRMWARE/NSP stored on the Halt/Load family, and systems that use Line Support Processors (LSPs) must have the file FIRMWARE/LSP stored on the Halt/Load family. On A 3 systems, it is also suggested that the bootcode file be stored on the Halt/Load family.

If your installation has a limited number of disk families, you should group as many system files as required, taking into account the impact on system performance of grouping system files together. For example, you could store the disk access structure, the USERDATAFILE, and the overlay files on the Halt/Load family. Application files such as seldom-changed code files also could be grouped with the system files.

If your installation has a limited number of disk families, you may have to group all the system files described above on the Halt/Load family and name that family DISK. If your installation has several disk families, however, you can improve performance by distributing the system files to different families.



## Planning and Installation

### FAMILY SUBSTITUTION

You may find it convenient to group your installation's disk resources so that each department or other organizational unit using the system has access to its own disk family where its private files are stored. These organizational units, which this section refers to as departments, can still share the disk family on which the system compilers and other system files are stored.

Family substitution provides the mechanism so that files can be conveniently divided up among disk families. Family substitution allows you to designate which private family a particular program, job, or usercode should access for private files and which system family it should access for system files.

You can assign a default family specification in the following ways:

- with the MAKEUSER utility for usercodes
- with task attributes within programs
- in jobs with a WFL statement or the MQ (Make or Modify Queue) ODT command

Burroughs system software and many application programs are written so that the system by default searches for a specified file on a family named DISK. Placing all files on DISK would be inefficient, so family substitution can be used to redirect files to other families. The family specification can designate both a "substitute family name" and an "alternate family name." The syntax of the family specification statement is

```
FAMILY <target family name> = <substitute family name> OTHERWISE
<alternate family name>
```

To use family substitution to distribute files to families other than DISK, use the family specification statement with DISK as the <target family name>, a department's private family as the <substitute family name>, and the general family that contains system code files as the <alternate family name>.

For example, the accounting department might use the following family specification statement:

```
FAMILY DISK = ACCOUNTPACK OTHERWISE SYSTEMPACK
```

where the accounting department's private files are on ACCOUNTPACK and the system files are on SYSTEMPACK.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

When a program needs to access a file that is specified as being on the family DISK, the family specification causes the system to search on the substitute family, ACCOUNTPACK, and then the alternate family, SYSTEMPACK, if the file is not located on ACCOUNTPACK. If the system needs to access an application file for the accounting department, it uses the family specification statement to locate the file on ACCOUNTPACK. If the system needs to access a system file, such as the COBOL74 compiler, to do processing for the accounting department, the system performs the following steps:

1. Instead of checking on DISK, the system checks ACCOUNTPACK but cannot find the COBOL74 compiler.
2. The system then checks SYSTEMPACK, which is shared by all the departments, and locates the COBOL74 compiler.

All new files that are specified as being directed to the family named DISK are stored on ACCOUNTPACK instead.

On a system with several disk families, it is suggested that the system compilers, code files, and general support programs be stored on an alternate family that is shared by all the departments. On a small system that does not have a large number of disk families, all system files could be grouped on the Halt/Load family. You could call the family DISK. The family specification statement in this case would be

```
FAMILY DISK = <substitute family name> OTHERWISE DISK
```

where each department could have its own <substitute family name>. If a program specifies that the system is to check for a file on a family named DISK, the system checks for the file on the department's family first, and then searches for the file on DISK if the file is not located on the department family.

Using family substitution does not prevent a program or user from accessing or allocating a file on a particular family other than the substitute family or the alternate family. If a family name is used that is not the target family in the family specification statement, the system places the file on the specified family. For example, assume the substitute family name is ACCOUNTPACK. If you enter the "RUN" WFL statement as

```
RUN AUDIT/UPDATE ON AUDITPACK;FILE YEARTODATE (TITLE = FIRST/QUARTER
ON AUDITPACK)
```

the system locates both AUDIT/UPDATE and FIRST/QUARTER directly on AUDITPACK; ACCOUNTPACK is not accessed. However, if the program AUDIT/UPDATE needs to locate files other than YEARTODATE, and these files are specified in the program as being stored on DISK, family substitution causes the system to search for the files on ACCOUNTPACK.

## Planning and Installation

For more information on the family specification statement, refer to the "Work Flow Language (WFL) Reference Manual" and the discussion of usercodes in the section "MAKEUSER" of the "System Software Site Management Reference Manual."

EXAMPLE OF DISK FILE ALLOCATION

The following example shows how your installation might want to allocate system files on a new system that has several disk families. This example uses four disk families for system files: HLPACK (the Halt/Load family), SYSTEMPACK, JOBPACK, and PACK:

## HLPACK

SYSTEM/TRAINABLES, SYSTEM/SUMLOG, SYSTEM/USERDATAFILE, MCP code file

## SYSTEMPACK

Code files, system libraries, system intrinsics, IPSUPPORT library

## JOBPACK

JOBDESC file, job files, SYSTEM/ACCESS or SYSTEM/CATALOG, overlay files

## PACK

Printer and punch backup files, work files for sort tasks

The following is an example of the procedure you can use to allocate the system files to the disk families specified above.

1. Use the "COPY" WFL statement to copy SYSTEM/TRAINABLES to HLPACK.
2. Use the COPY statement to copy the system libraries, SYSTEM/INTRINSICS, and code files such as SYSTEM/COBOL and SYSTEM/ALGOL to SYSTEMPACK.
3. Use the SL (System Library) ODT command so that the system references the libraries on SYSTEMPACK:

SL BASICSUPPORT = SYSTEM/BASICSUPPORT ON SYSTEMPACK

SL BNASUPPORT = SYSTEM/BNASUPPORT ON SYSTEMPACK

SL COMSSUPPORT = SYSTEM/COMSSUPPORT ON SYSTEMPACK

SL DATACOMSUPPORT = SYSTEM/DATACOMSUPPORT ON SYSTEMPACK

SL GENERALSUPPORT = SYSTEM/GENERALSUPPORT ON SYSTEMPACK

SL KEYEDIOSUPPORT = SYSTEM/KEYEDIOSUPPORT ON SYSTEMPACK

SL PLISUPPORT = SYSTEM/PLISUPPORT ON SYSTEMPACK

SL RPGSUPPORT = SYSTEM RPGSUPPORT ON SYSTEMPACK

## Planning and Installation

4. Use the SI (System Intrinsic) ODT command so that the system references the intrinsic on SYSTEMPACK.

```
SI SYSTEM/INTRINSICS ON SYSTEMPACK
```

5. Use the DL (Disk Location) ODT command to place the following system files on the appropriate disk families. When the system creates each file, it does so on the appropriate family.

```
DL BACKUP ON PACK
```

```
DL CATALOG ON JOBPACK
```

```
DL IPFILES ON SYSTEMPACK
```

```
DL JOBS ON JOBPACK
```

```
DL LOG ON HLPACK
```

```
DL OVERLAY ON JOBPACK
```

```
DL SORT ON PACK
```

```
DL USERDATA ON HLPACK
```

6. Use the SB (Substitute Backup) ODT command to specify the substitute backup family for the printer and punch backup files:

```
SB DISK = DLBACKUP
```

```
SB PACK = DLBACKUP
```

If a program specifies that the backup files are to be stored on a disk family, the system uses the SB specification to place the backup files on the family designated by the DL command.

7. Use the COPY statement to copy the MCP code file to HLPACK and then use the CM (Change MCP) ODT command to designate that code file as the Halt/Load MCP.
8. Use the MAKEUSER utility to establish a default family specification for each usercode so that the system is directed to first look for files on a departmental family and then on SYSTEMPACK. In this example, the departmental family is ACCOUNTPACK.

```
FAMILY DISK = ACCOUNTPACK OTHERWISE SYSTEMPACK
```

**SYSTEM STARTUP**

On nearly all Burroughs A Series and B 5000/B 6000/B 7000 Series systems, you use SYSTEM/LOADER the first time you initialize the system (an A 3 system is delivered to the customer preinitialized). The LOADER's functions include setting up the Halt/Load family and copying the MCP to the Halt/Load family.

Once the system is running, the LOADER will probably not be needed again. Instead, you can establish your system configuration with the "COPY" WFL statement and ODT commands such as DL (Disk Location), SB (Substitute Backup), SI (System Intrinsic), and SL (System Library). After the system is running satisfactorily, you should create alternate Halt/Load families. Refer to "Making Alternate Halt/Load Families" in the section "Safety Mechanisms" for more information on this subject. It is probably safer and more productive if you use the MCP to recover from catastrophic errors than to depend on the LOADER. You should be more familiar with running the MCP than the LOADER, and the MCP provides a wider range of capabilities. The LOADER should be used only as a last resort, such as if all alternate Halt/Load families fail.

See also

Making Alternate Halt/Load Families . . . . . 91

## 6      SAFETY MECHANISMS

The MCP code file, the flat directory of each family, and the catalog on CATALOGING systems are vital for proper system operation. Although the failure of one of these critical system files is rare, it is still important to ensure that a problem with one of these files does not cause a service interruption. The disk subsystem software allows the duplication of these three system files so that the system can still operate after the failure of a disk on which a critical system file is stored. This section describes the duplication of each type of file, and compares the approaches to duplicating these files. This section also explains how to make alternate Halt/Load families.

The most basic safety mechanism is making backup copies of user disk files on tape or other disk families. The needs of each installation are different, depending on how often the files are changed, how critical the information on each file is, and whether the information can be more easily restored through an audit or other means. This section focuses on safety mechanisms for system files and does not provide details about safety mechanisms for user files. The utility FILEDATA can be used to produce a list of when each user file was last changed or updated. The utility FILECOPY can be used to automate the creation of WFL jobs that make backup copies of user files. Refer to the "System Software Utilities Reference Manual" for more information about FILECOPY and FILEDATA. For information about making backup copies of database files, refer to the "DMSII Utilities and Operations Guide." You can also refer to the "I/O Subsystem Reference Manual" for information about the DUPLICATED and COPIES file attributes.

FLAT DIRECTORY DUPLICATION

As the number of disks in a family grows, a large amount of data becomes vulnerable to a single failure of the base pack. If the entire base pack is unusable, none of the data on any of the disks in the family can be accessed. If a particular record in the flat directory is corrupted, the file referenced by that record is not available. The DD (Directory Duplicate) ODT command can be used to avoid these problems. The DD command makes an exact duplicate of the flat directory on another member of the family.

The duplicate flat directory is titled

SYSTEMDIRECTORY/<family index number>

where <family index number> is the family index number of the disk where you want to store the duplicate flat directory for the family. Up to three disks in each family can have a copy of the flat directory (the base pack and two continuation packs). When the system Halt/Loads or the family is readied, any of the family members containing flat directories can be used as the base pack. The system arbitrarily chooses one as the base pack and treats the others as continuation packs with duplicate directories.

All the family members that contain a copy of the flat directory must be on-line when you access that family, so that all changes in the directory can be made simultaneously to all copies. If all the disks containing directories are not mounted, then the missing ones become outdated and their flat directories are not accepted by the system as up-to-date duplicates.

If only one of the disks with a duplicate directory is mounted, the system requests the other ones by displaying the following message on the ODT:

REQ PK <serial number> QN <family name>

You should then mount all the disks in the family that contain a flat directory. If for some reason you cannot mount one of these missing disks, you should enter the OF (Optional File) ODT reply after the message is displayed on the ODT. The "OF" reply allows the family to be marked on-line without the missing disk. After the family is on-line, you should use the "DD-" version of the DD command to delete the missing member's flat directory.



## Safety Mechanisms

If a disk with an outdated directory is subsequently mounted, you must be careful to avoid designating the outdated disk as having the most up-to-date directory. If the outdated disk is mounted when the up-to-date base pack is on-line, the system recognizes the discrepancy and asks what you want to do with the mismatching directory by displaying the message "DIRECTORY NOT CURRENT" on the ODT. There are two ways to respond to this message:

- Remove the outdated directory with the RM (Remove) ODT reply, which is equivalent in this situation to the "DD-" command.
  
- Replace the outdated directory with the up-to-date directory by replying "OK". This replacement is equivalent to deleting the outdated directory with the "DD-" command and then creating a new version with the DD command.

Serious problems can occur if you do mount a disk with an outdated directory and there is not an up-to-date base pack on-line. The system detects that the up-to-date disk is missing and requests that you mount it. If you then enter the "OF" reply as a response, the family is marked on-line without that disk. The system cannot determine that the directory on the outdated base pack is out-of-date because the system does not have access to the up-to-date disk to compare timestamps. The system then marks the outdated base pack as even more up-to-date than the off-line, up-to-date disk. The file header pointers to areas on the family will be invalid on the outdated flat directory, and changes to the outdated flat directory will make the more current directory also invalid. This problem can never be corrected, and the system cannot detect the conflict.

If the original base pack is deleted from a family on a CATALOGING system, the original base pack serial number is still used by the volume library to designate the family. This serial number should be specified when a "VOLUME ADD" or "VOLUME DELETE" WFL statement is used for the family.

CATALOG FILE DUPLICATION

The AD (Access Duplicate) ODT command duplicates the system catalog and access structure to protect catalog and volume information. A duplicate SYSTEM/CATALOG file is useful on CATALOGING systems. On non-CATALOGING systems, the SYSTEM/ACCESS file can be rebuilt more easily than it can be duplicated. You can have up to three copies of SYSTEM/CATALOG (the original and two duplicates).

Another way to protect catalog information on CATALOGING systems is to make a backup copy of the SYSTEM/CATALOG file on tape from time to time. The latest catalog copy can be copied back in after a catastrophic failure of the catalog file or the catalog family. Refer to "Creating and Using Backup Copies of the Catalog" in the section "Cataloging" for more information on this subject.

For maximum safety, you may want to have both duplicate on-line catalogs and backup copies of the catalog. Keeping backup copies of the catalog has one advantage over the use of duplicate catalogs. Changes are made to all on-line copies of the catalog, and in rare instances corrupted data can be placed in all the copies, such as in the event of an operator error. Catalog backup tapes have three disadvantages, however:

- Changes made to the catalog since the catalog was copied to tape are lost when the catalog file is copied back in from tape.
- Lengthy catalog rebuilds and family rebuilds occur when the backup copy replaces the old catalog.
- An interruption in system operation is required to copy the backup catalog back in.

See also

Creating and Using Backup Copies of the Catalog . . . . . 62

**MCP CODE FILE DUPLICATION**

If a Halt/Load family has a duplicate flat directory, it can also have a duplicate MCP code file. There are two reasons to have a duplicate MCP code file. The first is to improve system performance; the second is to provide an alternate Halt/Load unit.

Having two MCP code files on the Halt/Load family can improve system performance because they can share the I/O operation load. Performance may not improve significantly, however, if the flat directories of the Halt/Load family are updated frequently because of the opening, closing, creation, and removal of files. All accesses of files would require additional I/O operations, because more than one directory must be updated.

A duplicate MCP code file also provides an alternate Halt/Load unit to use when the normal Halt/Load unit fails. Duplicating the MCP code file to provide an alternate Halt/Load unit in the current Halt/Load family is different from making an alternate Halt/Load family. There are differences between alternate Halt/Load families and alternate Halt/Load units, and your installation can use none, one, or both safety mechanisms.

- If errors occur on one copy of a duplicate MCP code file, the system can still use the other copy and does not require a Halt/Load to recover from the error. A Halt/Load is required to switch to an alternate Halt/Load family.
- Alternate Halt/Load units require duplicate flat directories and a multidisk family, which can slow system performance if the directories are updated frequently or if many files are stored on the family because it has more than one member. Alternate Halt/Load families do not require duplicate directories and can be single-member families.
- In extremely rare cases, family failures can be so severe that a duplicate MCP code file or flat directory does not help anyway.
- On systems with removable disks, alternate Halt/Load families can be stored off-line; alternate Halt/Load units cannot be stored off line.

Refer to "Making Alternate Halt/Load Families" in this section for more information about this subject.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

The CM (Change MCP) ODT command is used to duplicate the MCP code file. The duplication process results in a Halt/Load. The CM command that creates duplicate MCP code files on the Halt/Load family is

```
CM <file name> (<family index number list>)
```

where <file name> is the name of the MCP code file to be duplicated and <family index number list> is the family index numbers, separated by commas, of the disks to receive the duplicates. Up to three disks can contain a copy of the MCP code file (the original and two duplicates), as long as the disks contain a copy of the flat directory.

The name of a duplicate MCP code file is

```
<file name>/FMLYINX<family index number>
```

where <file name> is the name of the original MCP code file and <family index number> is the three-digit family index number of the disk that contains the duplicate.

You can reduce the time needed by the MCP to do the CM operation by first copying the MCP code file (giving it the desired name) to the Halt/Load family members that are to become alternate Halt/Load units. Unlike the DD and AD commands, the CM command skips the copying operation if it locates matching files with the proper names and timestamps on the proper family members.

## Safety Mechanisms

The following procedure is an example of how to use the "COPY" WFL statement to save time in the CM operation. In this example, the members of the family HLDISK with the family index numbers of 1 and 2 receive copies of the MCP code file. MCPBACKUP is the name of the tape containing the backup MCP code file, and SYSTEM/MCP is the name of the backup MCP code file.

1. COPY SYSTEM/MCP AS SYSTEM/MCP/FMLYINX001 FROM MCPBACKUP  
TO HLDISK(FAMILYINDEX=1,PACK)
2. COPY SYSTEM/MCP AS SYSTEM/MCP/FMLYINX002 FROM MCPBACKUP  
TO HLDISK(FAMILYINDEX=2,PACK)
3. CM SYSTEM/MCP/FMLYINX001(1,2)

Multiprocessor tightly-coupled systems require that there be more than one active Halt/Load family. Such systems operate in the following manner if duplicate MCP code files are used:

- The MCP code file must be identical for each processor.
- Two processors cannot Halt/Load from two different disks in the same family.
- On a B 6800 multiprocessor tightly-coupled system, two or more processors are able to Halt/Load from the same unit.

**MONITORING DUPLICATION**

If you have duplicate flat directories, catalog files, or MCP code files, you should monitor the duplication operation at least once each day or after each Halt/Load to ensure that all the required duplicates are still active. It is possible for an operator error or system error to cause the system to stop using a duplicate MCP code file, catalog, or flat directory. You can use the PD (Print Directory) ODT command to examine the duplication and then restart the operation if one of the duplicate files has become invalid. By issuing the appropriate PD command, you can determine which files are in use. If a flat directory, catalog, or MCP code file is not shown in the PD display as "IN USE", then it is not a valid duplicate. The PD command syntax is as follows.

For the catalog on CATALOGING systems:

```
PD SYSTEM/CATALOG/= ON <family name>
```

where <family name> is the name of the family where the catalog is stored.

For the access structure on non-CATALOGING systems:

```
PD SYSTEM/ACCESS/= ON <family name>
```

where <family name> is the name of the family where the access structure is stored.

For flat directories:

```
PD SYSTEMDIRECTORY/= ON <family name>
```

For the running MCP code file:

```
PD <file name>/= ON <family name>
```

where <file name> is the name of the MCP code file and <family name> is the name of the Halt/Load family.

### COMPARISON OF DUPLICATION COMMANDS

Users sometimes become confused about the duplication of flat directories, catalogs, and MCP code files because of misconceptions about the functional or syntactical differences among the files. This section discusses their similarities and differences.

The DD, AD, and CM commands each can be used to make up to two duplicate copies of the given file, for a total of three copies. All three commands place the duplicates on different members in the same family. For all three, the file name assigned by the system indicates the family index number of the disk the file is located on, although the form of the name for AD and DD commands differs from that of the CM command. Each copy of the file is always fully contained on one member of the family.

All three commands provide up to two exact duplicates of the original files. The CM command ensures that the copies match by checking the MCP code file timestamp during the CM operation. Duplicate directories created with the AD or DD commands have special internal timestamps that are checked and changed after every Halt/Load or every time a disk is readied. Because of an operator error, it is possible for an error in the timestamps to occur after a flat directory is duplicated, so that the timestamps do not match. If that occurs, the system might cancel the AD or DD operation. The system can still use the original copy of the directory, but the AD or DD command must be entered again to restore the duplication process. If the DD operation is canceled for a Halt/Load family, a duplicate MCP code file for that family is also deleted.

Duplicate directories created by the DD command and duplicate catalogs created by the AD command lead to extra system overhead, because more than one file must be updated every time a file header is added, deleted, or changed. The duplicate MCP code file created by the CM command does not lead to much extra overhead, except that a duplicate MCP code file can be used only on a family that has a duplicate flat directory.

The AD and DD commands have almost the same syntax: you specify the family index number of the disk that is to receive the copy. The CM command's syntax, however, requires you to list the family members that are to receive a copy. If you do not supply this list, the CM command uses the last CM command list supplied for the family. If this is the first time the CM command is used for that family and no list is supplied, the command defaults to family index 001.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

The "AD-" and "DD-" commands allow a duplicate copy to be deleted. The CM command does not provide a direct method to delete a duplicate MCP code file. The "CM-" command means something else entirely (it cancels an impending change in the MCP). To delete a duplicate MCP code file, you must enter the CM command with a family index list that omits the family index number of the disk where the duplicate is stored.

The DD and CM commands can be used on any multidisk family. The AD command applies only to the current catalog, so the syntax does not call for a family name or file name.

The AD command can be used on a multidisk family whether the DD command has been used on that family or not. Furthermore, even if the family's flat directory has been duplicated using the DD command, the AD command is not restricted to placing the duplicate catalog on family members that contain a duplicate flat directory. The CM command can be used to place a duplicate MCP code file on a family member only if that member contains a duplicate flat directory. However, every member that has a duplicate flat directory need not receive a copy of the MCP code file. For example, there might be two copies of the flat directory but only one copy of the MCP code file.



## Safety Mechanisms

**MAKING ALTERNATE HALT/LOAD FAMILIES**

You can use an alternate Halt/Load family if the normal Halt/Load family fails. Making an alternate Halt/Load family is different from making an alternate Halt/Load unit on the current Halt/Load family. The discussion "MCP Code File Duplication" in this section describes the differences between alternate Halt/Load families and alternate Halt/Load units, and your installation can use none, one, or both safety mechanisms.

There are two ways the command "CM <file name> ON <family name>" can be used effectively to make an alternate Halt/Load family.

## NOTE

Do not Halt/Load using an alternate Halt/Load family created by either of the methods described above on a system that uses "OP+MIRRORING". The result is full stop.

- a. Copy the MCP code file to several families that are usually on-line and then use "CM <file name> ON <family name>" to designate those families as alternate Halt/Load families. If the Halt/Load family experiences a failure, change to one of the alternate Halt/Load families and run from it while you restore the original Halt/Load family.
- b. If you have removable disks, make one or more complete copies of the Halt/Load family on selected disks. Use "CM <file name> ON <family name>" to designate those disks as alternate Halt/Load families and then power off those disks and store them off-line. If the Halt/Load family then experiences a failure, retrieve one of the off-line families and continue operations with it, including the operation of making a replacement alternate Halt/Load family. This technique can be made even more reliable by rotating these off-line backup families as the on-line Halt/Load family. This rotation is a way of checking that each backup family is intact. Note that if SYSTEM/ACCESS or SYSTEM/CATALOG file is stored on the Halt/Load family, time-consuming rebuilds must occur each time the Halt/Load family is changed.

The "CM <file name> ON <family name>" command uses the designated MCP code file on the designated family, but it copies a large number of system attributes from the running Halt/Load family. These attributes cover everything from the host name to the list of saved and reserved units. For this reason, you may want to change a few of these system options (such as CATALOGING or OKTIMEANDDATE) just before entering the

## DISK SUBSYSTEM SOFTWARE OVERVIEW

CM command. Then, when the alternate Halt/Load family is finally used as a Halt/Load unit the system will not be running with the wrong options.

Once an MCP code file has been designated with the CM command, it is marked as a nonremovable file. If you later try to copy in a new version of the file, the copy attempt stops and the message "DUP FILE(SYSTEM FILE)" is displayed on the ODT. You should enter "CM- ON <family name>" and remove the old MCP code file before starting the copy operation. Once the "CM-" operation is completed, the disk is no longer a Halt/Load-capable family until the new version of the MCP code file is copied and the CM command has been used again to designate it as an MCP code file.

If you have removable disks, you may want the backup Halt/Load families to have the same name as the current Halt/Load family. It is then easier to switch from one Halt/Load family to another. If you are running on a CATALOGING system, however, never use the "VOLUME ADD" WFL statement to add a family that does not have a unique family name. To avoid conflicts between the name of the backup Halt/Load family and the active Halt/Load family, you can use the following procedure to make backup Halt/Load families:

1. Relabel the backup disk with the LB (Relabel Pack) ODT command to have a temporary alias.
2. Do all the copy and CM command operations with the alias.
3. Save the unit with the SV (Save) ODT command.
4. Relabel the disk with the LB command to have the proper name.
5. Use the POWER (Power Up/Down) ODT command to power down the disk drive unit.
6. Store the backup disk off-line.

If these precautions are not taken, the system repeatedly issues the error message "DUP FAMILYNAME" during the copy and CM command operations.

## 7      MIRRORED DISK

On large systems with Data Link Processor (DLP)-based I/O, the Mirrored Disk feature allows from two to four disks to be maintained as a "mirrored set," that is, as exact copies of each other.

This section provides an overview of the Mirrored Disk feature and covers the following topics:

- benefits of the Mirrored Disk feature
- requirements
- site options
- initiation
- I/O handling
- operations

### BENEFITS

The Mirrored Disk feature increases both system availability and data integrity. If one copy in a mirrored set is destroyed, goes off-line, or experiences any irrecoverable errors, another on-line copy in the set will allow normal functioning to proceed. Disk mirroring is completely transparent to applications. In the event of an error on one mirror, the application proceeds normally, and the operator is notified of the error.

For mirrored disks, the backup and audit features used should be re-evaluated. Because mirroring significantly decreases the possibility of data loss due to equipment or media malfunction, the number of available processing hours on a system is increased.

Mirroring disks can also improve I/O throughput on disk subsystems that experience a high ratio of reads versus writes. This improvement occurs because the Master Control Program (MCP) distributes the read operations equally to all the mirrors in a set. If a disk subsystem has a low ratio of reads to writes, the I/O throughput may be reduced, because writes must be issued to all mirrors in a set. The actual impact of mirrored disks varies according to the individual characteristics of the installation.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

Mirrors of existing disks can be created without bringing disks off-line or interrupting use by the system.

**REQUIREMENTS**

No special hardware is required for disk mirroring. Disk units must be available, however, to allow for the redundancy.

The Mirrored Disk feature applies to all supported disk types, except head-per-track disks, and can be used with both CATALOGING and non-CATALOGING file systems.

**OPTIONS**

You specify which disks are to be mirrored, the number of disks in a set, and the units on which mirrored disks are to reside. The Mirrored Disk feature puts few restrictions on these choices, except that disks within a given mirrored set must be of the same type. (See "Configuration Recommendations" in this section for system configuration guidelines and for the location of mirrors within a set.)

Once created, mirrored sets are maintained automatically across system interruption. Operator action is required only in certain exception conditions.

You can remove mirrors from any mirrored set or create new mirrors for any set while the system is in normal operation and while the disks are in use. You can also move mirrored sets between systems and within systems.

You can specify recovery options for any mirrored set via the "MIRROR OPTION" Operator Display Terminal (ODT) command. This option determines the action to be taken after a Halt/Load if certain critical MCP information has been lost.

**INITIATION**

When the Mirrored Disk feature is chosen for some or all of the disks in a system, you must set the MIRRORING option. This is done by entering the "OP+MIRRORING" ODT command. The system must then be Halt/Loaded to create the internal structures needed for mirroring. Thereafter, you can create mirrors of existing disks using the "MIRROR CREATE" ODT command. Other MIRROR commands will also be valid.

## Mirrored Disk

The "OP+MIRRORING" command is also used when a disk subsystem is being moved to a new system, or when a system is cold started with pre-existing mirrored sets. Once an "OP+MIRRORING" command is executed, mirrored disks will be brought on-line following the next Halt/Load.

### Creating Mirrors

Once mirroring is initiated, you can create mirrors of selected disks by using the "MIRROR CREATE" ODT command. This command copies the source disk(s) and brings the destination disk on-line. The source disk can already be a part of an existing mirrored set. The source disk(s) remain(s) on-line during the copy process.

The destination disk must not have any open files on it and must not be a member of a mirrored set when the MIRROR CREATE command is issued. All files on the destination disk are overwritten during the mirror creation process. Therefore, any files that you want to save from this disk should be copied to another disk before entering the MIRROR CREATE command.

### Configuration Recommendations

To ensure full redundancy of disks, it is suggested that separate paths be maintained to mirrors within a set. As disk mirroring is managed by the MCP, failure of not only disks, but controllers and other hardware can be handled if the system is so configured. The action suggested above is not required by the Mirrored Disk feature, however. The decision is up to the site manager. Other configuration options, such as multiple paths to disks through different controllers and exchanges, can be just as beneficial.

On tightly-coupled Message-Level Interface Processor (MLIP)-based systems, all paths to a mirrored disk must be routed through only one processor. Further, the paths to all disks comprising a mirrored set must be through the same processor. These restrictions are enforced by the MCP.

### I/O HANDLING

I/O operations are handled differently for mirrored disks than for nonmirrored disks. As described in the following sections, read operations are issued to only one disk within a mirrored set, and write operations are issued to all disks within a mirrored set. (ALGOL "SEEK" operations are considered to be read operations.)

In the following discussion, the terms "on-line," "off-line," and "pending" have special meanings. "On-line" refers to current members of a mirrored set that are available and synchronized. The term "off-line" refers to disks that are in a state of Write Lockout, are not ready, or are otherwise unavailable to the system because they are being audited. "Pending" disks are those that are returning from an off-line to an on-line state, mirrored set members being created, and all members of a mirrored set that has members not yet seen by the system. All three states are mutually exclusive.

### Read Operations

Reads are issued to each on-line disk in turn within a mirrored set. If an I/O error occurs on a read operation to a disk, the next disk in the mirrored set is selected and the read is issued to that disk.

Not Ready and Write Lockout exceptions cause the disk to be placed in an off-line state, and an audit is started for the disk. Any other read errors release the disk from the mirrored set. If errors occur to all on-line disks within a set, the application program receives an error on the I/O; otherwise, the errors are transparent to the application.

Off-line and pending members are not candidates for reads.

### Write Operations

Write operations are issued to all on-line disks within a set. If an irrecoverable write parity error occurs, the disk is released from the set. For Not Ready and Write Lockout errors, the disk is marked "off-line," and an audit for the disk is started. In either case, the operator is notified and appropriate action should be taken. An application program can receive an error on a write only if errors are encountered by all on-line disks within a set.

If an irrecoverable write error occurs on a mirror, the disk is released from the mirrored set, and a message is issued to the operator indicating that the release has occurred. The disk label is modified such that the disk cannot be used without reconfiguring the disk with the "RC" ODT command. In this situation, you should resolve the problem and decide whether a new mirror should be created for the set.

If a disk goes off-line, an audit is automatically started for the disk. A message is issued to the operator identifying the disk as being in Write Lockout or Not Ready.

## Mirrored Disk

Whenever a write is directed to a mirrored set, it is recorded in an MCP table called the "Outstanding Write List" (OWL). When the writes to associated disks are complete, the entry is removed from the OWL. After a Halt/Load, the OWL updates disks within a set so that they are identical.

If the OWL is destroyed, the disks might not be identical, because the writes in process to a set might not have completed to all members of the set. The "MIRROR OPTION" ODT command allows you to specify appropriate action in the event the OWL is lost.

### Audits

An audit table of write operations is kept for off-line mirrors. This audit table is a bit map of the disk in question. Each bit in the table corresponds to a fixed area on the disk. Therefore, the size of the audit table is fixed and is a function of the number of cylinders defined for the disk type. Whenever a write is issued to a mirrored set, corresponding bits are set in the audit table of each off-line member.

The audit table is abandoned if the off-line disk is released from the mirrored set. Packs being audited at the time of a Halt/Load are released from the mirrored set.

When an off-line disk is returned to an on-line state, the audit table is used to update that disk.

### OPERATIONAL INFORMATION

Mirrored disks can be moved within a system just like nonmirrored disks. Mirrored sets can also be moved between systems and MCPs.

#### Moving Packs Within a System

You can move members of a mirrored set within a system while it is down with no ill effects.

To move a pack within a system, either use the "MOVE" ODT command or power off and move the pack to a new drive. In either case, the pack being moved is audited just as any other off-line copy. The rest of the mirrored set remains on-line and usable. After you have moved the pack to the new drive, the audit is applied to update the pack.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

For fixed media, you can copy data to other units via the "MIRROR CREATE" ODT command. After the new copy is complete, you can release the source disk using the "MIRROR RELEASE" ODT command.

**Moving Packs Between Systems**

It is possible to move mirrored sets between systems by physically removing them from one system and installing them in another. Before being moved, however, the mirrored set must be closed (prior to being freed). The disk labels are updated to indicate that the disks are closed. After being moved, the mirrored set must be readied using the "RY" ODT command. When the disks are readied by another system, the new system reads the label to determine if the disk was closed before moving and to determine the number of valid copies in the mirrored set.

If sets that were not closed are moved to a new system, they are not brought on-line as a set unless they have a recovery type specified as "DMS" using the MIRROR RECOVERY command (see the Operator Display Terminal (ODT) Reference Manual for more information).

Mirrored sets with a recovery type of DISCARD are broken (mirroring is discontinued) when one disk is brought on-line as a nonmirrored unit. The other members of the set are released (the pack label is invalidated, the pack is not brought on-line, and a message is issued).

Mirrored Halt/Load units cannot be used to Halt/Load on another system. This action results in a dead stop.

**Off-Line Packs Returning On-line**

When you bring a mirrored disk on-line, the system verifies that mirroring has been established for that system. If mirroring has not been established, the following message is displayed and the process of bringing the disk on-line is terminated.

```
PK<unit number> [<serial number>](<family name>) ERR: MIRRORED PACK  
ON NONMIRRORED SYSTEM.
```

You can bring a mirrored disk on-line as a nonmirrored disk only by issuing an RC (Reconfigure Disk) or PU (Purge) ODT command for the closed unit.



## Mirrored Disk

If you attempt to bring a mirrored disk on-line on a non-DLP-based system, or on a pre-Mark 3.6 Release MCP, the following message is displayed and the disk is not opened:

```
PK<unit number> MIRRORED DISK NOT IMPLEMENTED.
```

When a mirrored disk is readied on a mirroring system, one of three conditions is required:

- The disk must have been closed prior to going off-line.
- The system must have a record of the disk in question.
- The disk must have a recovery type of DMS.

If the disk was closed, the disk is brought on-line when the other members are seen by the system, or when audits are begun (via a "MIRROR AUDIT" ODT command) for those members not yet seen by the system.

If the disk was not closed, but the disk is recorded in the system tables, the system does one of the following:

- If a Halt/Load occurred while the disk was off-line or the disk encountered a parity error, the disk is released (that is, the disk label is invalidated and the disk is not brought on-line) and a message is issued.
- If the disk went off-line and is currently being audited, the audit is applied to the disk. When the audit is complete, the disk is returned on-line.
- If the disk was on-line and is returning after a Halt/Load, it is brought on-line when the other members are seen by the system. Any writes that were outstanding at the time of the Halt/Load are applied.
- If the OWL was corrupted or lost during the Halt/Load, the set is brought on-line only if it has a recovery type of DMS; otherwise, only one disk of the set is brought on-line as a nonmirrored unit, and the other members are released.
- If a mirrored disk returning on-line has no history of being present on the current system (or the disk has been in use on another system) and the set was not closed (by means of the "CLOSE" ODT command), then the set is brought on-line only if its recovery option is DMS.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

- Similarly, if the OWL is lost during a Halt/Load, only those sets with recovery option DMS are brought back on-line. When these situations arise for sets with recovery option DISCARD, only one disk is brought on-line as nonmirrored, and the other members are released.

Following a Halt/Load (or when a mirrored set is moved to a new system), a set does not go on-line until all disks previously on-line (or previously part of the closed set) are visible to the system. If some of the members are absent, or the operator does not wish to wait for all the members to be ready before using the set, the absent members can be forced into an audit state and the set brought on-line via the MIRROR AUDIT command.

Sets that are in the process of being brought on-line are called "partial mirrored" sets. If a task is initiated that causes a list of partial mirrored sets to be displayed, and if that task becomes a waiting entry, the list of partial mirrored sets is redisplayed whenever a change occurs in the state of a mirrored set or when the operator reactivates the waiting entry using the "OK" ODT command. Partial mirrored disks are identified in the "PER" and "OL" ODT commands with a lowercase "m".

### Recovery

When a system is Halt/Loaded with mirrored critical units (that is, units required for the system to run), off-line copies of those units are automatically audited until they are seen by the system. This allows the system to start and you to take appropriate action if one of the members is missing or corrupted before, during, or after the Halt/Load. Noncritical units are handled as described in "Off-Line Packs Returning On-Line."

### NOTE

Mirrored Halt/Load units cannot be moved between mirrored systems. The result is a dead stop.

During a Halt/Load, all needed structures are created or recovered. The Mirror Information Table (MIT), which contains information concerning all mirrored sets on the system, is stored on the Halt/Load disk as an MCP structure and is restored from there after a Halt/Load. The OWL, which keeps track of writes in process to mirrored sets, is preserved in memory. If this structure is corrupted or lost during a Halt/Load, only mirrored sets with the IMS recovery option are brought on-line after the Halt/Load. Other mirrored sets are broken and only one member is

## Mirrored Disk

brought on-line as a nonmirrored member.

The audit tables for off-line disks are not preserved across Halt/Loads and the off-line disks are released from the set when they are brought on-line. Packs having their audits applied and incomplete on-line creations are also released upon return to service.

### Mirror Deallocation

You can deallocate mirrored copies from a mirrored set using the "MIRROR RELEASE" ODT command. Different command forms allow you to release a specified disk, to release off-line copies of a specified disk, and to release all copies of a specified disk. During normal system operations, you can release copies at any time.

Mirrors being audited, created, or having audits applied are automatically released from sets after a Halt/Load. Units receiving parity errors are also released if they are not the last on-line member of a mirrored set.

Whenever a disk is released from a mirrored set, due to an operator command, a system error, or loss of the OWL, the disk's label is invalidated, thus requiring an LB (Relabel Pack or Host Control Unit), a PG (Purge), or an RC (Reconfigure Disk) ODT command before the disk can be used again. If the label cannot be updated at the time, the label is invalidated when next seen by the system. This feature is necessary to prevent out-of-date members from replacing more recent copies of a unit.

### NOTE

If you ready out-of-date members on another mirroring system, they can be brought on-line. As this could lead to incorrect results, take special care to prevent this from occurring.

### Transferring MCPs

When you create an alternate Halt/Load family using a "CM <file name> ON FAMILY" (Change MCP) ODT command, system mirror information is copied to the disk for which the MCP has been changed. Any mirrored set manipulation between the time the MCP change is performed and the time of the subsequent Halt/Load will invalidate the linkage between the mirror information kept in memory and that of the newly changed unit.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

Invalidating manipulation includes the following:

- using "MIRROR" ODT commands
- bringing mirrored units on-line
- releasing mirrored units due to exception conditions
- auditing mirrored units due to exception conditions
- closing a mirrored set

If such a situation arises, the result is a dead stop when the Halt/Load is performed. To resolve this situation, you must Halt/Load back to the original Halt/Load unit. In general, avoid changing Halt/Load units when mirroring unless absolutely necessary.

A similar situation arises if you attempt to transfer Halt/Load units between mirroring systems. This is not allowed and always results in a dead stop.

### Precautions

The MIT on the Halt/Load pack keeps track of the status of the mirrored packs on a system. It also contains records of packs that have been removed from a mirrored set, but whose labels could not be invalidated. These records are the only protection against such an outdated pack returning on-line. As a result, if the MIT is lost (for example, by changing Halt/Load units), that protection is removed. Data corruption can occur if you return such an outdated pack on-line. Therefore, please keep the following recommendations in mind:

- Instead of maintaining a separate, backup Halt/Load unit, mirror the current Halt/Load unit. This ensures that the MIT is not lost.
- If you choose to maintain a separate, backup Halt/Load unit, update that unit using the CM (Change MCP) ODT command every time a pack is added or removed from the set of mirrored packs currently on-line. Update the backup, Halt/Load unit in the following cases:
  - when a pack is added to a mirrored set
  - when a pack is released from a mirrored set
  - when a pre-existing mirrored set is brought on-line

## Mirrored Disk

- when a mirrored set is closed
- after a Halt/Load
- If a dead stop occurs, Halt/Load back to the original Halt/Load unit. If this cannot be done (as when the original Halt/Load unit has failed), warm start the system using the LOADER program. In this case, the MIT is lost. Be very careful not to bring any outdated packs on-line.



## 8 RECOVERY

The disk subsystem can encounter three types of problems:

- hardware problems, such as a broken disk drive or a damaged or destroyed disk
- operator error, such as the accidental reconfiguring of a disk or the accidental removal of files
- directory software errors, such as directory I/O errors, directory data corruption, or MCP program errors

Although these problems are very rare, it is important that your installation be able to recognize and differentiate these problems so that they can be resolved in the shortest amount of time with little or no loss of data. This section explains the following error recovery procedures:

- how to isolate defective sectors on a disk
- what to do if base packs or continuation packs are damaged or destroyed
- when disks can be moved from one drive to another to eliminate errors
- when data can be moved from one disk to another to eliminate errors
- what to do if directory errors are encountered
- what to do if errors are encountered during family rebuilds

Before the system can use the data or directories on a disk, you must complete the following procedure without encountering any errors:

1. Place the disk on a drive.
2. Turn on the drive.
3. Acquire (if necessary) and ready the disk drive on which the disk is mounted.

The system then has to read the disk label and, if the disk contains a flat directory, read the directory file header.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

Processing of the disk stops if any of these steps fail. Usually, hardware I/O errors cause these failures, and these errors must be corrected before the data on the disk can be used. Sometimes, you can correct an I/O error by closing the disk and then readying it again. If this process does not solve the problem, your only recourse is to move the disk to another disk drive.

Once the disk label and flat directory header have been successfully read, the system provides various techniques for overcoming errors. You can isolate defective sectors, replace the disk, or move the data from the disk to another disk.



**ISOLATING DEFECTIVE SECTORS**

When an I/O error occurs while the system is using or trying to use a disk file, the entire disk is not necessarily damaged. A group of sectors on the disk may be defective, and it is possible to isolate these bad sectors so that the rest of the disk can still be used.

When the system encounters an I/O error, it automatically attempts the I/O operation again and places an entry in SYSTEM/SUMLOG that describes whether the error was corrected in the retry or whether the error was not corrected and the I/O operation was discontinued. These log entries and the I/O error messages that are displayed on the ODT can be used to determine if the problem is caused by a few defective sectors or if the entire disk is damaged.

If the log entry or the I/O error messages specify a certain range of sectors repeatedly, the damage is probably limited to those sectors. Also, if the I/O error affects only a few files, but the rest of the files on the disk are accessed properly, that is an indication that the problem was caused by a few defective sectors.

You can use the SCAN (Scan Disk or Pack Volume) ODT command to read a disk and record any defective sectors that were encountered during an attempt to read a file on the disk. The SCAN operation is a time-consuming process, and should be done at night or another time when system usage is minimal.

Once you have determined which sectors are defective, you can use the RES (Reserve) ODT command to transfer the data stored on the defective sectors to other sectors. You should use the "AS BADDISK" clause of the RES command so that the system will mark the defective sectors so they will not be used again.

Refer to the "Operator Display Terminal (ODT) Reference Manual" for more information about the SCAN and RES commands.

**DAMAGED OR DESTROYED DISKS**

A disk can be considered damaged if it experiences irrecoverable I/O errors or if the directory is corrupted. A disk is considered destroyed if it is physically broken. There are different ways to resolve the problem of a damaged or destroyed disk, depending on whether the disk is a base pack or a continuation pack. This section discusses the techniques for replacing both types of disks.

**Replacing a Base Pack**

If the base pack is destroyed and the flat directory is not duplicated on another family member, you must use the RC (Reconfigure Disk) ODT command to reconfigure a new family and then copy all the required files back onto the family from the latest backup tapes. You cannot reconfigure a new base pack in place of the old one, even if the same serial number is used, because the flat directory on the old base pack is lost.

The system marks all the continuation packs in a family with the date and time that the base pack was reconfigured. When you reconfigure a new base pack with the RC command, there is no link between the new base pack and the old continuation packs. If the system did not take this precaution, continuation packs from an old family would get confused with continuation packs for the new family. You can check the creation date and time of a disk family with the OL (Display Labels and Paths) ODT command. The OL command syntax is

```
OL PK <unit number>
```

where <unit number> is the unit number of the disk drive on which the disk is mounted.

If you are running on a CATALOGING system and need to reconfigure a new base pack, you must take special steps to avoid losing all the catalog information for the old family. The system asks if the new family should inherit all the old family's backup information by displaying the following message on the ODT:

```
PK <unit number> OK DO RE-ENTER INTO VOLUME LIBRARY
```

## Recovery

You should enter the reply "OK" to retain the catalog information. Refer to "Replacing a Damaged Volumned Disk" in the section "Cataloging" for more information about this subject.

See also

Replacing a Damaged Volumned Disk. . . . . 65

### Replacing a Continuation Pack

If a continuation pack is destroyed, you have more choices. The base pack with the flat directory is still intact, so files on the base pack and other continuation packs are still usable. When programs try to access files that are partially or totally stored on the missing continuation pack, the system responds with the following error message:

```
REQ <family name> <serial number>
```

You then must discontinue those programs by using the DS (Discontinue) ODT command.

You can create a substitute continuation pack by using the RC (Reconfigure Disk) ODT command. The RC command syntax is

```
RC PK<unit number> BP= <serial number> FAMILYINDEX=
<family index number>
```

where <unit number> is the unit number of the disk drive the substitute disk is mounted on, <serial number> is the serial number of the base pack, and <family index number> is the family index number of the missing disk.

The system then replaces the old continuation pack with the new one and removes all the files in the entire family that had portions stored on the old continuation pack. To retain files that had portions stored on the missing continuation pack, add the "KEEP" clause to the RC command. The system does not completely remove the files, but marks them as having some areas missing. Programs then can use some of the data in the files, but not data from the areas that were on the missing continuation pack. If a program tries to access data from the areas that were on the missing continuation pack, an I/O error occurs.

**MOVING DISKS TO ANOTHER DISK DRIVE**

When a disk drive breaks down or appears to be receiving many I/O errors, it may be possible to correct the problem by moving the disk to another drive. This technique applies only to removable media such as model 677 disks; you cannot move nonremovable media such as model 207 disks.

**CAUTION**

Before moving a disk from one drive to another, especially a disk that has experienced errors, have a Burroughs field engineer inspect the disk to make sure that the surfaces of the disk have not been marred or scratched. A scratched disk can in turn scratch the disk drive read/write heads. Scratched read/write heads can in turn scratch other disks mounted on them, and so on. Your installation may want to keep written records of the drives that disks have been mounted on, by time and date. When a scratched disk surface or a scratched disk read/write head is discovered, you will know which other disks and drives to inspect for damage.

If you decide to move a disk in order to avoid I/O errors, then the first thing you have to do is locate an available disk drive. This unit must be acquired and not saved, not reserved, and not in use by another disk. If the disk that you want to move is not in use, all you have to do is power off the disk and move it to the other drive. If the disk that you want to move is in use, however, you must enter the MOVE (Move Job/Pack) ODT command with the syntax

```
MOVE PK <source unit number> TO PK <destination unit number>
```

where <source unit number> is the unit number of the original disk drive and <destination unit number> is the unit number of the destination disk drive. The system does some checking and then tells you to manually move the disk. An example of the MOVE command is

```
MOVE PK 67 TO PK 143
```

On systems other than the B 7900 and A 15, some families (such as the family on which the JOBDESC file is stored) cannot be moved by this technique. On B 7900 and A 15 systems, any disk except the Halt/Load family can be moved by using the MOVE command.

## Recovery

Sometimes the I/O error problem occurs so many times that a Halt/Load is necessary before you can move the disk to an operable disk drive. However, you may be able to avoid the Halt/Load by performing the following steps. This process is not recommended for B 7000 Series systems and A 15 systems.

1. Halt the processors.
2. Manually move the disk.
3. Start the processors when the disk is ready.

This technique does not always work. If the system does not start running again, proceed with a Halt/Load.

MOVING DATA TO ANOTHER DISK

Usually when a disk experiences problems, it is not totally unusable. If a particular disk in a family produces a large number of I/O problems, you can move the data to another disk by one of two techniques:

- a. If the disk is a continuation pack of a multidisk family, you can reserve the disk with the RES (Reserve) ODT command with the following syntax:

```
RES PK <unit number> AS BADDISK
```

The system copies all the data from the disk to other members in the family. Once the reserve operation is completed, you can perform maintenance operations on the disk; the PG (Purge) ODT command can be used, for instance. If parity errors are encountered during the RES operation, the operation terminates and displays a message on the ODT that specifies which addresses encountered the error. You must then decide whether to remove the affected files or use the "COPYERRORS" clause of the RES command. "COPYERRORS" causes the RES operation to copy all the data on the disk, including data that has parity errors. The data that has parity errors is still invalid and cannot be used.

This version of the RES command can also be used to take a disk out of a family even if the disk is not experiencing I/O problems.

- b. The REPLACE (Replace Disk or Pack Volume) ODT command should be used instead of the RES command in the following situations:
  - if the disk is a base pack or if it contains a large amount of data. In this case, the RES operation can be a lengthy process. Also, if the disk contains a large amount of data, it can be difficult for the RES operation to find sufficient space for the files on the other members of the family.
  - if you know that the disk contains portions of files that were assigned to the disk with the FAMILYINDEX file attribute. The RES operation does not permit files to be moved from a disk if the files were assigned to that family member with the FAMILYINDEX attribute.

To use the REPLACE command, obtain an available disk of the same model (677, for example) or a different model disk that contains a larger number of sectors, and enter

```
REPLACE PK <source unit number> ONTO
PK <destination unit number>
```

## Recovery

The system then copies all the files and label information from the original disk to the new disk. The new disk receives the serial number and family name of the old disk. When the copying is complete, the system erases the label on the old disk so that it does not become confused with the new disk.

## CAUTION

The "REPLACE" ODT command cannot be used to make backup copies of disks because it erases the label of the source disk.

DIRECTORY ERROR RECOVERY

Disk directories are very important. If something goes wrong with a directory, then it is possible to lose some or all files referenced by that directory. The directories are designed so that errors in one part of the directory do not adversely affect other parts of the directory. The system constantly monitors the directories for discrepancies. When an error is detected, the system automatically attempts to eliminate the problem. The following system features help to ensure the integrity of the directories:

## Standard disk I/O error recovery

The standard I/O subsystem attempts to recover from all failed I/O operations, including directory I/O errors. Only I/O errors that are not corrected by these attempts will cause problems.

## Directory record integrity tests

The MCP tests all directory records before they are used. Each record must pass tests such as HDRMARKER, HDRLOCATION, and CHECKSUM. If a record fails one of these tests, the directory subsystem invokes one or more of the following procedures: error reporting, recovery, or termination.

## Automatic ERRORHANDLER family rebuilds

These rebuilds are invoked to build a new File Access Structure Table (FAST). Family rebuilds solve two types of problems. First, certain types of bad records in the flat directory or catalog are bypassed during the rebuild so that these records are not referenced by the rebuilt FAST and do not cause problems. Second, certain corrupted FAST records are discarded during the rebuild. Refer to "Family Rebuild Errors" in this section for more information on this subject.

## Directory duplication

Duplicate directories on multidisk families can be used to solve most directory I/O errors and problems caused by directory data corruption. Duplicate directories also prevent directory loss if a disk is physically destroyed. Duplicate directories require a modest amount of additional disk space and require more I/O operations because more than one copy of the directory must be updated.

Disk directories are stored as disk files. As with any disk file, they can experience problems. The flat directory and the catalog can have three different, but interrelated, types of problems: directory I/O errors, directory data corruption, and MCP program errors. These errors, which are very infrequent, have the following characteristics.



## Recovery

If a disk I/O error message immediately precedes or follows a directory error, then you can infer that the I/O error may be the root of the directory error. You can also make finer distinctions. If the I/O error occurred during a write operation, then it indicates that a file header that was just added, removed, or changed in the directory may not be usable the next time it is referenced. If the error occurred during a read operation, then it indicates that the system was attempting to access a directory record (such as a disk file header) and that directory record is unreadable. Repeated references to that same file presumably would cause repeated read errors.

Some I/O errors can be easily corrected. For example, you may be able to solve a Not Ready or Write Lockout error by turning the proper switch to the proper setting. On the other hand, parity errors on read operations usually are not correctable. In fact, the system only reports a parity error if several attempts to perform the read operation fail. Correction of parity errors depends on the exact nature of the error. If the data truly has a parity error, then that directory record is lost. But if the parity error is caused by a faulty disk drive or a disk drive controller malfunction, fixing the hardware restores access to the directory record.

It is difficult to distinguish directory data corruption from MCP errors. A typical directory data corruption error might cause a CHECKSUM, HDRMARKER, or HDRLOCATION error message. Note that all read errors also appear to the MCP directory subroutines as directory data corruption, so read errors also cause error messages for CHECKSUM, HDRMARKER, HDRLOCATION, and so on. On the other hand, a typical MCP error results in a memory dump by FILEHANDLER. These are only tendencies, however. MCP errors can cause HDRLOCATION errors, and data corruption can cause FILEHANDLER memory dumps.

When the system detects a directory error, it reports the problem with one or more messages. The system then often attempts some type of automatic error recovery. The system usually reports the progress or failure of the recovery with additional messages. These various messages are clues as to what happened. You should try to answer the following list of questions after a directory error occurs. The answers to these questions can help you decide what further corrective actions you might need to take.

- Did the system read the disk label and open the base pack directory, or did the system issue an error message indicating that the disk cannot be used? If such an error message appears, there is a fundamental problem with the disk, and not a problem with individual files on the disk.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

- Does the problem appear to affect only one or a few programs or files? Does it appear to affect every file on a family? Does it appear to affect every file on the system? These questions can help you isolate the problem. If only one or a few programs or files encounter errors, the problem usually is within these programs or files. If only one family encounters errors, the problem is within that family.
- Does the problem appear to be in the flat directory on a given family, or does it appear to be in the catalog or access structure? Such problems are usually caused by I/O errors. If the word FLAT appears in the error message, then it indicates that the flat directory may have a problem. If the words PAST, FAST, CATALOG, VAST, or VOLLIB (Volume Library) appear, it almost always means there is a problem in the catalog or the access structure.
- Does the problem appear to be an I/O error, or does it appear to be a case of data corruption or an MCP error? If it appears to be an I/O error, try to correct the problem as discussed above. If it appears to be a case of data corruption or an MCP error, contact your Burroughs field engineer or file a Field Trouble Report with Burroughs.
- Does the problem appear to be intermittent, or has the problem been there for a long time? Does the same kind of problem crop up occasionally for different files, or does the problem appear only for a particular test case? If you can isolate the test case, you can show it to your Burroughs field engineer.
- Does the problem go away after a family rebuild? If it does, then the rebuild probably took care of the problem.

Be sure to locate the original error message, in SYSTEM/SUMLOG if necessary. Often one error triggers several error reports. The first error message can be the best clue. The utility LOGANALYZER often is helpful in solving I/O error problems because all I/O errors and an audit of any retry attempts are recorded in SYSTEM/SUMLOG. LOGANALYZER can be used to examine the errors of a particular disk by entering

```
LOG MAINT PK <unit number>
```

where <unit number> is the unit number of the disk drive on which the disk is mounted. LOGANALYZER then prints out a list of all I/O error retries and messages that have occurred for that disk drive since the log was initiated. These I/O error messages can help you identify the problem, and you can then contact your Burroughs field engineer if necessary.

## Recovery

**FAMILY REBUILD ERRORS**

There are three types of family rebuilds: rebuilds when a base pack is first placed on-line, rebuilds invoked by the RB (Rebuild Access) ODT command, and rebuilds for error recovery. On CATALOGING systems, catalog rebuilds also occur during error recovery. Family and catalog rebuilds normally do not occur on a CATALOGING system when a volumed disk is placed on-line.

**Family Rebuilds for a New Base Pack or Halt/Load**

The first type of family rebuild occurs when a base pack is first placed on-line or at Halt/Load time. Regardless of whether or not a rebuild is needed, the system reads the entire flat directory on the disk to determine what sectors of the family are already allocated to files and what sectors of the family are available for new files. If a rebuild is necessary, then the FAST is rebuilt at the same time.

The MCP issues error messages if any errors are detected during this reading of the flat directory or rebuild of the FAST. Immediately after the first such error message, the MCP displays the following message on the ODT:

OK TO ERASE BAD RECORDS?

This message indicates that the MCP has just detected an error; there may be more errors as the rebuild progresses. The MCP is asking for permission to erase all flat directory records that caused errors. You can enter one of three replies: "DS", "OF", or "OK".

If you enter the reply "DS", processing of the flat directory halts and the system marks the disk off-line.

The safest reply to the message "OK TO ERASE BAD RECORDS?" is "OF". "OF" causes the rest of the directory to be processed, but does not cause the bad records to be erased.

The advantage of "OF" is that it gives the system a chance to process the rest of the directory without accidentally erasing it. For instance, if the cause of the original problem was that the disk was being read on a faulty disk drive, then erasing directory records could erase good records from the directory.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

When you enter "OF", the system marks the disk as not having any available space for new files. This feature prevents a new file from accidentally being allocated in areas of the disk that overlap the areas in use by the files that apparently were bad. If you need to add records or files to the disk, you will have to remove existing files to make room for the new records or files.

After the system reports one bad record in the flat directory, the system often reports a few subsequent consecutive directory records as also being bad. Directory records are variable in length and several can be accessed together in one block, so additional "bad" records are often all part of the original bad record. If only a few extra bad records are reported, you usually can assume that there is actually just one bad record.

You can enter the reply "OK", which erases corrupted directory records. This reply could lead to the loss of some files on the disk. Use this reply unless you suspect that the disk I/O hardware is defective and may be causing the problem. If you enter the reply "OK", the system proceeds with a family rebuild and then marks the disk on-line.

If the rebuild is being done while readying a disk or Halt/Loading, you can terminate the rebuild by entering the CL (Clear) ODT command with the syntax "CL PK <unit number>". The system stops the rebuild and marks the disk off-line. This can be a useful option if the disk becomes "not ready" during the rebuild or you decide the wrong disk was readied.

**Family Rebuilds Initiated by Your Installation**

The second type of rebuild occurs when you use the RB (Rebuild Access) ODT command to build a new access structure. You can use the RB command when you think that the access structure is corrupt or does not actually describe the files on a disk.

The second type of rebuild only reconstructs the FAST; it does not build an available disk table, does not ask the operator questions, and does not erase flat directory records (good or bad). This rebuild cannot be cleared by the CL (Clear) ODT command.

## Recovery

**Family Rebuilds for Directory Error Recovery**

The third type of rebuild occurs when the directory error recovery procedure ERRORHANDLER is invoked. ERRORHANDLER is invoked automatically when an error is detected while accessing the directory of an on-line family.

The third type of rebuild only reconstructs the FAST; it does not build an available disk table, does not ask the operator questions, and does not erase flat directory records (good or bad). This rebuild cannot be cleared by the CL (Clear) ODT command.



## 9 SYSTEM MESSAGES

This section lists system messages that can be encountered during directory management procedures in the disk subsystem. These procedures include those initiated by your installation and those initiated automatically by the system.

Each message is printed in bold type. The entry for each message is divided into the cause of the error and suggested operator actions.

This section refers to Operator Display Terminal (ODT) commands and Work Flow Language (WFL) statements. For more information about these commands and statements, consult the "Operator Display Terminal (ODT) Reference Manual" and the "Work Flow Language (WFL) Reference Manual."

This section is divided into the following topics:

- an explanation of how the messages are alphabetized and how to read the messages
- the system messages

**HOW TO LOCATE AND READ SYSTEM MESSAGES**

This section defines the metatokens used in system messages, explains how the messages are alphabetized, and describes how to read the messages that are shown in this manual as having several possible entries.

**Metatokens That Appear in Messages**

Metatokens are variables that represent information that is contained in many system messages. Metatokens appear in this section surrounded by angle brackets (< >). The following metatokens appear in this section:

<family index number>

The family index number of a disk in a family.

<family name>

The name of a disk family.

<family>

Synonym for <family name>.

<file name>

The name of a file, without the family name appended.

<mixno>

The mix number of the program that encountered the error described by the message; this mix number is displayed in parentheses.

<no>

An integer. This can be hours, minutes, and seconds; it can be a disk unit serial number; or it can be the record number of a directory record.

<percentage>

The percentage of a process that has been completed.

<rcw>

Return Control Word; this indicates where in the Master Control Program (MCP) file an interrupt or procedure call occurred.

<serial number>

The six-digit serial number of a disk.

<unit number>

The unit number of a disk drive.

<unit>

Synonym for <unit number>.



## System Messages

Alphabetization of the Messages

The system messages are listed alphabetically according to the text of the message only. When these messages were alphabetized, the following information and characters that often precede a message were not considered part of the message:

- metatokens such as <unit number> or <file name>
- device acronyms such as "PK" or "DK" or "MT"
- parentheses, commas, and periods

Each message is preceded by a mix number when it is displayed on the ODT. This section does not specify this mix number for each message. Some messages, however, contain a second mix number in parentheses that is the mix number of the program that encountered the error. This section does specify this second mix number in the appropriate messages.

The following list of six system messages is an example of how the messages in this section are listed alphabetically:

PK<unit number> BASE UNIT I/O ERROR, DUPLICATION ABORTED

CM ABORTED ON ANOTHER HALT/LOAD FAMILY

MT<unit number> DISK FILE HEADER COMPARE ERROR <file name>

HALT/LOAD UNITS DO NOT HAVE SAME MCP

DK<unit number> NEW BACKUP FOR THIS UNIT NOT LABELED

SYSTEMDIRECTORY/<family index number> MISSING

PK<unit number> UNKNOWN JOB FILE HEADER VERSION

Reading Messages With Multiple Entries

Some directory management messages are nearly identical except for entries such as the particular directory or operation involved in the error that caused the message. This manual groups these messages together with multiple entries because the messages are caused by the same type of error, and are resolved by the same type of operator action. Each message that appears in this manual with multiple entries is displayed on the ODT with just one entry from each column that contains more than one entry. The following example shows some of the possible messages that can be derived from one of the message entries that appears in this manual.

The message as it appears in this manual:

```
( <mixno> ) CATUNIT | READ | FAST | CHECKSUM | ERROR REC=<no>
                  | WRITE | VOLLIB | HDRLOCATION
                  | VAST | HDRBLOCKLENGTH
                  | FLAT | HDRMARKER
                  | CAT | TITLE
                  | PAST | I/O
                  | NOT READY
                  | UNKNOWN
```

Messages as they would be displayed on the ODT:

In these examples, the mix number of the message is 3950, the mix number of the program that encountered the error is 3941, and the directory record that encountered the error is record number 210.

```
3950 (3941) CATUNIT READ FAST CHECKSUM ERROR REC=210
```

```
3950 (3941) CATUNIT WRITE: CAT HDRMARKER ERROR REC=210
```

```
3950 (3941) CATUNIT READ VOLLIB I/O ERROR REC=210
```

```
3950 (3941) CATUNIT READ FAST NOT READY ERROR REC=210
```

```
3950 (3941) CATUNIT WRITE: FLAT UNKNOWN ERROR REC=210
```

## System Messages

THE MESSAGES

The rest of this section lists and describes the system messages.

```
PK<unit number> ABANDON FILEHANDLER, TYPE= | SEARCH   | <file name>
                                           | ENTER
                                           | REMOVE
                                           | CHANGE
                                           | PDSEARCH
                                           | ENTER BACKUP
                                           | UPDATE
                                           | AUDIT RECOVER
                                           | TIMESTAMP
```

**Note**

This message includes just one entry from the column that contains more than one entry.

**Cause of message**

This message appears after an error occurs during directory error correction. The system has encountered repeated errors while trying to do the specified operation (for example, SEARCH) in the selected directory. This message indicates that the system is discontinuing the operation and returning an error indication to the calling program.

**Operator action**

Note the error and correlate it with preceding directory error messages that are listed in the system log. If a particular program or disk repeatedly encounters directory errors, consider discontinuing the program with the DS (Discontinue) ODT command or closing the disk with the CLOSE (Close Pack) ODT command.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**PK<unit number> ACCEPT: OLDNAME = <family name>**

## Cause of message

This message appears during an attempt to use the LB (Relabel Pack or Host Control Unit), the RC (Reconfigure Disk), or the PG (Purge) ODT command. The OLDNAME clause was not used. The system has just displayed the old serial number and family name and is waiting for the operator to verify that the proper disk is being changed.

## Operator action

Check that the old disk being changed is the correct disk. In particular, be sure to check the <unit number> supplied by the system. Enter one of the following ODT commands:

DS This terminates the pending command and causes the disk volume to remain unchanged.

AX The syntax "AX OLDNAME = <family name>" causes the OLDNAME supplied by the system to be accepted. If the family name entered matches the old family name of the disk, the system carries out the pending command. Otherwise, the pending command is rejected.

**ACTIVE MB'ED BOOTCODE FILE IS <file name> ON <family name>**

**PK<unit number>**

## Cause of message

This message appears during system installation on an A 3 system.

## Operator action

No action is required.

**ADDED <volume name> (<kind>) <no>**

## Cause of message

This message appears after a volume in the volume library has been marked as related to another volume in the volume library. For instance, during an output tape reel switch, the new reel is added to the tape family of the first reel.

## Operator action

No action is required.

## System Messages

**<file name> ADDED AND CATALOGED FROM <family name> TO <family name>**

## Cause of message

This message appears after a file has been successfully copied from the source to the given disk destination. The source volume is now listed as containing a backup copy of the file copied to the destination disk. The copied file has the same file name as the one listed in the message, including the usercode.

## Operator action

No action is required.

**<file name> ADDED AND BACKED UP FROM <family name> TO <family name>**

## Cause of message

This message appears after a file has been successfully copied from the source to the given destination. The destination volume is now listed as containing a backup copy of the file copied from the source disk. The copied file has the same file name as the one listed in the message, including the usercode.

## Operator action

No action is required.

**<file name> ADDED FROM family name> TO <family name>**

## Cause of message

This message appears after a file has been successfully copied from the source to the given destination. In the case of a disk destination, the file copied was not resident on the destination volume before the copy started. The copied file has the same file name as the one listed in the message, including the usercode.

## Operator action

No action is required.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**<file name> ADDED WITHOUT BACKUP FROM family name> TO <family name>**

## Cause of message

This message appears after a file has been successfully copied from the source to the given destination. The file is NOT listed as backed up on the source volume (probably the file was not cataloged and only cataloged files can be "backed up"). The copied file has the same file name as the one listed in the message, including the usercode.

**PK<unit number> AD- INDEX IS FOR LAST ACTIVE CATALOG**

## Cause of message

This message appears after an error occurs while the system is trying to delete a duplicate catalog. An "AD-" version of the AD (Access Duplicate) ODT command was entered for a system that does not have an active duplicate catalog, so there is no duplicate to be deleted.

## Operator action

Use the PD (Print Directory) ODT command to determine which catalogs are active and which catalogs are inactive or missing. The PD command syntax for non-CATALOGING systems is

```
PD SYSTEM/ACCESS/= ON <family name>
```

The PD command syntax for CATALOGING systems is

```
PD SYSTEM/CATALOG/= ON <family name>
```

**PK<unit number> ALL COMPLEMENTORS FAILED**

## Cause of message

This message appears after an I/O error occurs when a disk is being readied. The system could not finish readying the disk for use on the system. This message was preceded by a message that described the nature of the I/O error.

## Operator action

Correct the I/O error and close the disk with the CLOSE (Close Pack) ODT command and then ready it again with the RY (Ready) ODT command.

## System Messages

**PK<unit number> ALREADY A BACKUP**

## Cause of message

This message appears after an error occurs when duplicating the flat directory. The DD (Directory Duplicate) ODT command specified the family index number of a family member that already had an active flat directory.

## Operator action

Use the PD (Print Directory) ODT command to determine what directories are active and then enter the DD command again. The PD command syntax is "PD SYSTEMDIRECTORY/= ON <family name>".

**PK<unit number> AVAILABLE**

## Cause of message

This message appears after a UR- (Unit Reserved) ODT command is issued to terminate exclusive use of a disk unit. The disk unit is no longer reserved for the exclusive use of the system maintenance subsystem.

## Operator action

No action is required.

**PK<unit number> BACKUP DIRECTORY DELETED AFTER BAD WRITE**

## Cause of message

This message appears after an error occurs during directory error correction. An error was detected while trying to update a duplicate directory. The system has marked the duplicate as bad. Although the system continues to allow access to the family by using one of the alternate directories, the family no longer has a duplicate directory.

## Operator action

Note the problem and decide if another DD (Directory Duplicate) ODT command should be used to restore the duplicate directory. Use the PD (Print Directory) ODT command to determine which directories for the disk are currently active. The PD command syntax is "PD SYSTEMDIRECTORY/= ON <family name>".

**<unit number> BACKUP REQUIRES VOLUMED UNIT**

## Cause of message

This message appears after an attempt to use the "COPY" WFL command with the BACKUP option to an unvolumed destination. "COPY & BACKUP" requires that the output volumes be volumed. Library maintenance waits for the operator to answer.

## Operator action

Use the "VOLUME ADD" ODT command to volume the affected volume and reply OK. Or, enter one of the following ODT commands:

DS This prevents files from being copied.

FR This prevents files from being copied to the affected destination and allows them to be copied to other destinations.

OK This allows files to be copied without backup.

**<unit number> BAD COPY ONTO <file name>**

## Cause of message

This message appears after an error occurs during an attempt to copy a file onto another file using the "COPY" WFL command. No more files will be copied to the affected destination.

## Operator action

Check the file being copied onto and change the COPY request accordingly.

**<unit number> BAD DISK HEADER ON TAPE <file name>**

## Cause of message

This message appears after an error occurs during an attempt to copy a file from tape (using the "COPY" WFL command). The disk file header read from the tape was corrupted or was the wrong size. No more files will be copied.

## Operator action

Try to use the COPY command from another tape unit.



## System Messages

**PK<unit number> [<no>] <family name> BAD FAMILY LIST**

## Cause of message

This message appears after an error occurs during an attempt to ready a base pack. The family list contained in the disk label is corrupted. The disk cannot be used until it is cleared of all files. The system leaves the disk off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Clear the disk of all files using an RC (Reconfigure Disk) ODT command.

**PK<unit number> [<no>] <family name> BAD IC CODE**

## Cause of message

This message appears after an error occurs during an attempt to read a disk unit for use by the system. The system read the label from a disk; the interchange code in the disk label is not valid. This disk cannot be used until it is cleared of all files and relabeled. The system leaves the unit off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Use the RC (Reconfigure Disk) ODT command to clear the disk unit of all files and relabel it.

**PK<unit number> BAD INTERNAL PARAMETER**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), PG (Purge), or RC (Reconfigure Disk) ODT command. The system detected an error in the information supplied with the command. In particular, if a head-per-track (HPT) disk unit is involved, then the IC, IAD, and SERNUM parameters are not allowed. This message also occurs if a Data Communications ALGOL (DCALGOL) program calls SETSTATUS for the RC, LB, or PG command, and the parameter passed to SETSTATUS is not valid. The system leaves the disk closed but does not change the disk or its label.

## Operator action

Reissue the command with the correct information.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**PK<unit number> BAD MCPINFO TABLE ON <family name>**

## Cause of message

This message appears after an error occurs during an attempt to use the RY (Ready) ODT command. This message usually means there is a problem processing the MCPINFO table in the directory of the disk. This message indicates that the specified disk cannot be used as a backup Halt/Load disk until a new CM (Change MCP) ODT command is directed to the family.

## Operator action

Issue a CM command for the affected disk.

**PK<unit number> BADDISK/<file name> CREATED ON <family name>**

## Cause of message

This message appears after the system has created a BADDISK file in response to an XD (Bad Disk) or an RES (Reserve) ODT command or as a result of write parity errors in library maintenance. BADDISK files are used by the system to occupy areas of the disk that have caused a disk parity error. Because BADDISK files cannot be used by any program, the areas of disk that the BADDISK files occupy will no longer cause I/O errors.

## Operator action

No action is required.

**PK<unit number> BADDISK/<file name> NOT CREATED (DISK IN USE)  
ON <family name>**

## Cause of message

This message appears after an error occurs during an attempt to use the XD (Bad Disk) CDT command to mark part of a disk as unavailable for use. Part of that area is already in use by a file. The XD request is ignored.

## Operator action

Check the disk unit number and segment address and resubmit the XD command, or use a RES (Reserve) ODT command instead. RES moves the conflicting files out of the area, then marks the area as unavailable for use.

## System Messages

**PK<unit number> BASE UNIT I/O ERROR, DUPLICATION ABORTED**

## Cause of message

This message appears after an error occurs during an attempt to duplicate a directory with the DD (Directory Duplicate) ODT command or an attempt to duplicate a catalog with an AD (Access Duplicate) ODT command. This message was preceded by an I/O error message that described the nature of the error.

## Operator action

Correct the I/O error and enter the AD or DD command again. If the I/O error persists, examine the log entries for that disk by entering

LOG MAINT PK <unit number>

**PK<unit number> BASE UNIT REQUIRED**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) command. The command specified a BP serial number clause, but that disk family is not on-line. The system leaves the disk unlabeled.

## Operator action

Make sure that the BP clause specifies the correct serial number (not unit number) of the base pack. Also make sure that the NAME clause specifies the correct family and that the family to which the disk is to be added is on-line. Once this is done, reissue the command.

**PK<unit number> BASEPACK I/O ERROR**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a BP clause. The error occurred on the base pack during an attempt to update the disk family list contained on the base pack. The system leaves the new continuation disk unlabeled.

## Operator action

Resolve the base pack disk I/O error and repeat the RC command.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**BOOTCODE FILE FAILED VERIFICATION: <family name> PK<unit number>  
PRIORITY = <no>**

**Cause of message**

This message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command to specify a new active bootcode file.

**Operator action**

Specify another bootcode file.

**PK<unit number> BP ALREADY HAS 255 CPS**

**Cause of message**

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) command with a BP clause. The indicated disk could not be added to the specified disk family because the family already has 255 members.

**Operator action**

Repeat the RC command, using the FAMILYINDEX clause to replace an existing disk in the family. Any files on the replaced family member will be lost.

**PK<unit number> BP= AND IC CONFLICT**

**Cause of message**

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command. The command was directed at the indicated disk with both the BP and IC options. Interchange mode (IC) packs do not have base packs. The BP option should not be used at the same time that an IC family is extended. None of the disks in a native mode family can have the IC option.

**Operator action**

Reissue the command with the BP or the IC option, but not both.

## System Messages

**<unit number> COMPARE ERROR <file name>**

Cause of message

This message appears after an error occurs during an attempt to copy a file from disk. The data read from the given destination does not match the data read from the source. Although the compare error affects a particular destination, it is possible that the real problem was caused by a bad read from the source file. When copying a file from disk, it is possible that a program has changed the file while the copy was in progress. Note that the system logs the first mismatched word detected in the SYSTEM/SUMLOG file.

Operator action

Make sure the input disk file is not in use by a program. Answer the RECOPY request as desired or try COPY again using a different I/O unit.

**PK<unit number> CANNOT LB A MIRRORED UNIT.**

Cause of message

This message appears when an attempt is made to relabel a member of a mirrored set with the LB (Relabel Pack) ODT command.

Operator action

Either use the "MIRROR RELEASE" ODT command to release the disk from the mirrored set and then reissue the LB command, or simply relabel another unit.

**PK<unit number> CANNOT PG A MIRRORED UNIT.**

Cause of message

This message appears when an attempt is made to purge a member of a mirrored set with the PG (Purge) ODT command.

Operator action

Either use the "MIRROR RELEASE" ODT command to release the disk from the mirrored set and then reissue the PG command, or simply purge another unit.

**PK<unit number> CANNOT RC A MIRRORED UNIT.**

## Cause of message

This message appears when an attempt is made to reconfigure a member of a mirrored set with the RC (Reconfigure Pack) ODT command.

## Operator action

Either use the "MIRROR RELEASE" ODT command to release the disk from the mirrored set and then reissue the RC command, or simply reconfigure another disk.

**PK<unit number> CANNOT RES AS MAINT A MIRRORED DISK.**

## Cause of message

This message appears when an attempt is made to reserve for maintenance a member of a mirrored set using the RES (Reserve) ODT command. The command is ignored.

## Operator action

Either use the "MIRROR RELEASE" ODT command to release the disk from the mirrored set and then reissue the RES command, or simply reserve another unit.

**PK<unit number> CANNOT SV A MIRRORED UNIT.**

## Cause of message

This message appears when an attempt is made to save a member of a mirrored set with the SV (Save) ODT command.

## Operator action

Either use the "MIRROR RELEASE" ODT command to release the disk from the mirrored set and then reissue the SV command, or simply save another unit.

## System Messages

**PK<unit number> CANNOT UR A MIRRORED UNIT.**

## Cause of message

This message appears when an attempt is made to reserve a member of a mirrored set using the UR (Unit Reserve) ODT command.

## Operator action

Either use the "MIRROR RELEASE" ODT command to release the disk from the mirrored set and then reissue the UR command, or simply reserve another unit.

```

CAT ABANDON FILEHANDLER, TYPE= | SEARCH | <file name>
                                | ENTER
                                | REMOVE
                                | CHANGE
                                | PDSEARCH
                                | ENTER BACKUP
                                | UPDATE
                                | AUDIT RECOVER
                                | TIMESTAMP
  
```

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This message appears after the system has encountered repeated errors while trying to do the specified operation (for example, SEARCH) in the catalog. This message indicates that the system is discontinuing the operation and returning an error indication to the calling program.

## Operator action

Note the error and correlate it with preceding directory error messages. If a particular program or disk repeatedly encounters directory errors, consider discontinuing the program with the DS (Discontinue) ODT command or closing the disk with the CLOSE (Close Pack) ODT command.

**CATALOGED (MT) <no> <file name>**

## Cause of message

This message appears after a tape file has been added to the catalog in response to the "CATALOG ADD" ODT command.

## Operator action

No action is required.

**CATALOGED ON <unit number> <file name>**

## Cause of message

This message appears after a file has been marked as a cataloged file in response to the "CATALOG ADD" ODT command.

## Operator action

No action is required.

**CATALOG FAMILY MISSING (IL OR HL)**

## Cause of message

This message appears at Halt/Load time. The family designated as the catalog family by the DL (Disk Location) ODT command is off-line. The system waits for you to respond.

## Operator action

Perform the following steps:

1. Use the OL (Display Label and Paths) ODT command to determine the status of on-line disks.
2. Use the DL command to determine what disk should be mounted.
3. Do one of the following actions:
  - Designate a different family by entering the reply "IL PK <unit number>", where <unit number> is the unit number of the disk to become the catalog family.
  - Mount the correct disk and Halt/Load.
  - Use the RY (Ready), UA (Unit Available), or ACQUIRE (Acquire Resource) ODT command to bring the correct unit on-line and then Halt/Load.



## System Messages

**PK<unit number> CATALOG FAMILY MISSING, DEFAULTED TO  
<family name> FAMILY**

**Note**

This message is displayed on one line on the ODT.

**Cause of message**

This message appears when an error occurs at Halt/Load time when the system is running with the AUTORUNNING system option. The family designated with the DL (Disk Location) ODT command as the CATALOG family is not available at Halt/Load time. The MCP uses the Halt/Load family instead.

**Operator action**

On a non-CATALOGING system, repair or locate the correct family and Halt/Load again. On a CATALOGING system, allow system operation to continue and inform the site manager of the problem.

**CATALOG LEVEL LESS THAN 1****Cause of message**

This message appears after an error occurs on a non-CATALOGING system during an attempt to use the "CATALOG", "VOLUME", "RB ON TAPE", or "OP ARCHIVING" ODT command. These catalog requests can only be used if the MCP was compiled with a \$CATALOGLEVEL greater than 0, and if the OP CATALOGING option was set at Halt/Load time.

**Operator action**

Recompile the MCP with a \$CATALOGLEVEL of 0 or greater, set the OP CATALOGING option, Halt/Load the system, and then reissue the command.

**PK<unit number> CATALOG LOCK ERROR****Cause of message**

This message appears after an error occurs during an attempt to duplicate the catalog with the AD (Access Duplicate) ODT command. The AD command was canceled with the DS (Discontinue) ODT command while the AD operation was waiting to "lock" all directories in the system.

**Operator action**

Enter the AD command again.

**PK<unit number> CATALOG SPACE REQUIRED**

## Cause of message

This message appears after an error occurs when a program tries to place an entry in the catalog. The system has run out of disk space in the catalog. The program cannot proceed until space is available. The program waits for you to correct the problem.

## Operator action

Either remove some files from the catalog family or use the DS (Discontinue) ODT command to discontinue the program.

## System Messages

```

( <mixno> ) CATUNIT | READ | FAST | CHECKSUM | ERROR REC=<no>
                  | WRITE | VOLLIB | HDRLOCATION
                  | VAST | HDRBLOCKLENGTH
                  | FLAT | HDRMARKER
                  | CAT | TITLE
                  | PAST | I/O
                  | NOT READY
                  | UNKNOWN

```

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears after an error occurs while reading or updating a directory. This message provides clues as to what kind of error was encountered during the directory access attempt. The mix number in parentheses refers to the program that encountered the error. <no> refers to the record number of the directory record that encountered the error. The system automatically attempts to recover from the error condition.

## Operator action

Note the error so it can be correlated with other problems (if any). The error could have been caused by hardware, software, or data errors. If it appears to be an I/O error and the error persists, examine the log entries for that disk by entering

```
LOG MAINT PK <unit number>
```

and contact your Burroughs field engineer if necessary.

**CHANGED <volume name> (<kind>) <no>**

## Cause of message

This message appears after the system has updated the status of a volumed tape or disk in the volume library. This happens, for example, after a tape or disk that was recently added to the volume library is readied for the first time on the system. The system is then able to update the volume library.

## Operator action

No action is required.

**CHANGED LOG ROWS**

## Cause of message

This message appears when the system is running with an Installation-Allocated Disk (IAD) SYSTEM/SUMLOG file that has two areas and logging has just switched from one area to the other. This can occur because the end of an area was reached or as a result of a TL (Transfer Lcg) ODT command. System operation continues.

## Operator action

Take whatever steps necessary to capture the log information. For example, copy the SYSTEM/SUMLOG file to tape and run SYSTEM/LOGANALYZER.

**PK<unit number> <file name> CHANGED TO <file name> ON <family name>**

## Cause of message

This message appears after the name of a permanent disk file has been changed. The name was changed by a "CHANGE" WFL command or by a program that accessed the file and changed the FILENAME file attribute.

## Operator action

No action is required.

**PK<unit number> CLEANVL ABORTED**

## Cause of message

This message appears after an error occurs during an access into the volume library, on CATALOGING systems only. The system tried to correct a problem in the volume library but that attempt failed.

## Operator action

None.

## System Messages

**CM ABORTED ON ANOTHER HALT/LOAD FAMILY**

## Cause of message

This message appears after an error occurs during a CM (Change MCP) operation on a tightly-coupled system. The CM operation has failed for one of the Halt/Load units.

## Operator action

Determine the cause of the original failure by examining previous messages and enter the CM command again.

**CM ERROR CREATING HLDUMPDISK FILE**

## Cause of message

This message appears after an error occurs during an attempt to specify a Halt/Load dump disk file using the CM (Change MCP) ODT command. The Halt/Load dump disk file is not created.

## Operator action

This message is preceded by a message describing the actual error. Refer to that message for the appropriate action.

**CM ERROR UPDATING MCP HEADER**

## Cause of message

This message appears after an error occurs during an attempt to update the MCP code file header. A directory error occurred when the CM (Change MCP) ODT command was used to try to update the MCP code file header.

## Operator action

Correct the directory error and enter the CM command again.

**CM GETUSERDISK ERROR**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. There is not enough disk space available to finish the CM operation.

## Operator action

Remove some disk files and enter the CM command again. Make sure the disk is write enabled.

**CM -HLDUMPDISK DONE DUE TO CM ERROR**

## Cause of message

This message appears after an error occurs during an attempt to specify a Halt/Load dump disk using the CM (Change MCP) ODT command. The Halt/Load dump disk file is not created, and the previously existing Halt/Load dump disk file has been removed.

## Operator action

This message is preceded by a message describing the actual error. Refer to that message for the appropriate action.

**CM INVALID FAMILY INDEX OR MISSING DISC**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. A family index number specified in the CM command is too large, or a CM command for the Halt/Load family did not include the Halt/Load unit in the list of family index numbers.

## Operator action

Determine what disks in the family have active directories by using the PER (Peripheral Status) and PD (Print Directory) ODT commands. The syntax for these commands is "PER PK" and "PD SYSTEMDIRECTORY/=ON <family name>". Then enter the CM command, specifying the family index numbers of the family members that are to receive a copy of the MCP code file.

## System Messages

**CM I/O ERROR COPYING MCP CODE FILE**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. An I/O error was detected while the CM operation was moving the rows of the MCP code file to the Halt/Load unit(s). This message was preceded by a message that described the nature of the I/O error.

## Operator action

Recopy the MCP to disk and enter the CM command again. If the error persists, examine the log entries for that disk by entering

LOG MAINT PK <unit number>

and correct the I/O error. Contact your Burroughs field engineer if necessary.

**CM I/O ERROR ON MCPINFO, UNITADDL OR BOOTSTRAP**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. The system detected an I/O error or a corrupted directory record. This message was preceded by a message that described the nature of the I/O error.

## Operator action

Enter the CM command again. If the error persists, examine the log entries for that disk by entering

LOG MAINT PK <unit number>

and correct the I/O error. Contact your Burroughs field engineer if necessary.

**CM I/O ERROR READING OLD MCPINFO**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. A directory record appears to be corrupted. This message was preceded by a message that described the nature of the I/O error.

## Operator action

Do one of the following actions:

- Enter the CM command again.
- Reconfigure the disk with the RC (Reconfigure Disk) ODT command, copy the MCP to disk, and enter the CM command again.
- If the error persists, examine the log entries for that disk by entering

LOG MAINT PK <unit number>

and correct the I/O error. Contact your Burroughs field engineer if necessary.

**CM MCP NAME TOO LONG**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. A file name was used that contained more than 13 name constants, separated by slashes.

## Operator action

Change the name of the file and enter the CM command again.



## System Messages

**CM NO ROOM IN CORE FOR HEADER**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. The system could not open the MCP code file.

## Operator action

Enter the CM command again. If the error persists, contact your Burroughs field engineer.

**CM SPECIFICATION CONFLICTS WITH HALTLOAD UNIT**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. The CM command was entered with the syntax "CM <file name> ON <family name>", where <family name> is the name of the Halt/Load family.

## Operator action

Enter the CM command without the "ON <family name>" clause.

**CM TO 3.5 ON A FAMILY WITH VERSION 6 HEADERS NOT ALLOWED**

## Cause of message

This message appears after an attempt to change to a Mark 3.5 Release MCP, using the CM (Change MCP) ODT command, on a family whose family header version is "6".

## Operator action

Change the family header version to "5" using the SYSTEM/CONVERTHEADERS utility program, and re-enter the CM command.

**CM- DISC MISSING**

## Cause of message

This message appears after an error occurs during an attempt to use the "CM-" version of the CM (Change MCP) ODT command. The disks that were specified in the command "CM- ON <family name>" are off-line.

## Operator action

Mount the correct disks and enter the command again.

**PK<unit number> COMPLEMENTOR FAILED**

## Cause of message

This message appears after an error occurs at Halt/Load time or when readying a disk. The system detected an error while processing the flat directory for the family. If the disk does not have a duplicate directory, the system marks the disk off-line. This message was preceded by a message that described the nature of the I/O error.

## Operator action

Do one of the following actions:

- Correct the I/O error and then close the disk with the CLOSE (Close Pack) ODT command and ready it again with the RY (Ready) ODT command.
- Check the status of the directories on the disk with the PD (Print Directory) ODT command. The PD command syntax is "PD SYSTEMDIRECTORY/= ON <family name>". Then restore the directory duplication process with the DD (Directory Duplicate) ODT command.

## System Messages

**CONVERTING HEADERS <percentage>%: PK<unit number> <family name> .**

## Cause of message

This message appears periodically during the conversion of disk file headers in a directory from one format to another. The message is informational only.

## Operator action

No action is required.

**<unit number> COPIED AND CATALOGED FROM <family name> TO <family name>**

## Cause of message

This message appears after a file has been successfully copied from the source to the given disk destination. The source volume is now listed as containing a backup copy of the file copied to the destination disk. The copied file has the same file name as the one listed in the message, including the usercode. .

## Operator action

No action is required.

**<file name> COPIED AND BACKED UP FROM <family name> TO <family name>**

## Cause of message

This message appears after a file has been successfully copied from the source to the given destination. The destination volume is now listed as containing a backup copy of the file copied from the source disk. The copied file has the same file name as the one listed in the message, including the usercode.

## Operator action

No action is required.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**<file name> COPIED FROM <family name> TO <family name>**

Cause of message

This message appears after a file has been successfully copied from the source to the given destination. The copied file has the same file name as the one listed in the message, including the usercode.

Operator action

No action is required.

**<file name> COPIED WITHOUT BACKUP FROM <family name> TO <family name>**

Cause of message

This message appears after a file has been successfully copied from the source to the given destination. The file is NOT listed as backed up on the source volume. The copied file has the same file name as the one listed in the message, including the usercode.

Operator action

No action is required.

**PK<unit number> COPYDIRECTORY-- OUTPUT FILE ROW NOT ALLOCATED**

Cause of message

This message appears after an error occurs during the use of the AD (Access Duplicate) ODT command, the DD (Directory Duplicate) ODT command, or directory listing programs such as the FILEDATA utility. This message refers to problems encountered while making a copy of the directory. The system discontinues the copy.

Operator action

Note the problem and notify the site manager if desired.

## System Messages

**DD REQUIRED FOR FAMILY MEMBER**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command to make a duplicate MCP code file. The CM operation tried to copy the MCP code file onto a family member that does not have an active flat directory.

## Operator action

Perform the following steps:

1. Determine what directories are active by using the PD (Print Directory) ODT command. The syntax is "PD SYSTEMDIRECTORY/= ON <family name>".
2. Use the DD (Directory Duplicate) ODT command to copy the flat directory to the family members that are to receive copies of the MCP code file.
3. Enter the CM command again, specifying the family index numbers of the family members that are to receive copies of the MCP code file.

**PK<unit number> DD- INDEX IS FOR CURRENT BASE UNIT**

## Cause of message

This message appears after an error occurs during an attempt to delete a flat directory with the "DD-" version of the DD (Directory Duplicate) ODT command. The "DD-" command specified the family index number of the disk the system is using as the base pack.

## Operator action

Perform the following steps:

1. Use the CLOSE (Close Pack) ODT command to close all the disks in the family.
2. Use the RY (Ready) ODT command to ready one of the family members that contains a duplicate flat directory. Do not ready the family member that contains the duplicate directory you wish to delete.
3. When the system requests the other family members that contain duplicate flat directories, ready them also.
4. Enter the "DD-" command again to delete the desired flat directory.

**DELETED ON <unit number> <file name>**

## Cause of message

This message appears after the system has deleted the backup information for a particular generation of the file specified by a "CATALOG DELETE" ODT command.

## Operator action

No action is required.

```
PK<unit number> DELETE MEMBER-- | COULDNT REMOVE FILE
                                | ERROR UPDATING FILE HEADER
                                | GETHEADER ERROR
```

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This error occurs while reconfiguring a continuation pack with an RC (Reconfigure Disk) ODT command that contained the "FAMILYINDEX = <family index number>" clause. This error indicates problems that occurred while processing the directory on the base pack for the family. The reconfiguration is discontinued.

## Operator action

Enter the RC command again.

**DESTINATION WAS RELEASED.**

## Cause of message

This message appears during an attempt to create a new mirrored disk using the CREATE option of the "MIRROR" ODT command. The creation is abandoned, the destination disk's label is overwritten, and the destination disk is released.

This message is always preceded by

```
AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.
```

or

```
PK<unit number> NOT CREATED ONTO PK<unit number>.
```

## Operator action

Enter the MIRROR command again.

## System Messages

**DESTROYED VOLUME NOT ADDED IN SCRATCH POOL (MT) [<no>]**

## Cause of message

This message appears after an error occurs during a task that has been restarted from a checkpoint. The system has been attempting to release, as scratch tapes, certain volumed tapes. However, these tapes have been marked as DESTROYED after the checkpoint was taken. The tapes to be released are tapes used in output reel switches after the checkpoint was taken. The restarting task is unaffected and the restart process continues. The term <no> is the serial number of the affected disk volume.

## Operator action

No action is required.

**PK<unit number> DIFFERENT KINDS CANT BE MIXED**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a BP clause. The family that the indicated disk was to be reconfigured to is of an incompatible unit type. All the disks in a single family must either be head-per-track (HPT) disks or disk packs. Packs and HPT disks cannot be mixed in a single family.

## Operator action

Specify a disk unit of a type compatible with the family unit type.

**PK<unit number> DIRECTORY DAMAGED**

## Cause of message

This message appears after an error occurs during an attempt to use the RY (Ready) ODT command to ready a disk. This message usually means there is a problem processing the MCPINFO table in the directory of the disk. This means that if the disk is an active Halt/Load unit, the files on the Halt/Load family may be corrupted or other system problems may exist. If the error has occurred for a disk not in an active Halt/Load family, the specified disk may not operate correctly if it is used for a Halt/Load unit.

## Operator action

If the error occurs on an active Halt/Load unit, be prepared to Halt/Load using a backup Halt/Load disk. If the Halt/Load error does not occur on an active Halt/Load unit, use the CM (Change MCP) ODT command for the affected family.

**PK<unit number> DIRECTORY ERROR**

## Cause of message

This message appears after an error occurs during directory error correction. The system could not fix a previously diagnosed directory error. The program that accessed the directory receives an error indication.

## Operator action

No action is required.

**PK<unit number> DIRECTCRY HEADER UNKNOWN HEADER VERSION**

## Cause of message

This message appears either at Halt/Load time or when readying a disk. The disk file header of the family's directory file has a format the MCP cannot recognize. The family will not be used. The family can only be used by an MCP that understands the format in which the header is written. Such an MCP will have a Mark Release level higher than that of the MCP currently running.

## Operator action

If it is necessary to access the family, use the CM (Change MCP) ODT command to change to an MCP that can recognize the directory file format.

**PK<unit number> DIRECTCRY LINKS ARE BAD**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying an interchange disk pack with the RY (Ready) ODT command. This message describes problems in readying interchange disk packs.

## Operator action

Close the disk pack with the CLOSE (Close Pack) ODT command and then ready it again with the RY command.



## System Messages

**PK <unit number> DIRECTORY NOT CURRENT**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk with the RY (Ready) ODT command. The duplicate flat directory on the specified disk is not up-to-date with the flat directory of another disk in the family.

## Operator action

Enter one of the following ODT commands:

- OK This is the normal reply. The system makes a new copy of the directory to replace the outdated duplicate directory.
- RM The system removes the outdated backup directory and then marks the disk as on-line for ordinary use by programs.
- DS The system leaves the outdated duplicate directory on the disk. The system marks the disk on-line for use by programs, but the system does not use the obsolete directory. The "DD-" version of the DD (Directory Duplicate) ODT command should then be used to remove the outdated directory. If it is not deleted, the "DIRECTORY NOT CURRENT" message is repeated the next time the disk is readied or the system Halt/Loads.

Serious problems can occur if you do mount a disk with an outdated directory and there is not an up-to-date base pack on-line. The system detects that the disk is missing and requests that you mount it. If you then enter the "OF" reply as a response, the family is marked on-line without that disk. The system cannot determine that the directory on the outdated base pack is outdated because the system does not have access to the up-to-date disk to compare timestamps. The system then marks the outdated base pack as even more up-to-date than the off-line, up-to-date disk. The file header pointers to areas on the family will be invalid on the outdated flat directory and changes to the outdated flat directory will make the more current directory also invalid. This problem can never be corrected, and the system cannot detect the conflict.

**PK<unit number> DIRECTORY RECORD RECOPIED FROM BACKUP DIRECTORY**

## Cause of message

This message appears after an error occurs during directory error correction. The system has corrected a previously diagnosed directory error by overwriting the bad record in the directory with a copy of the record from a backup duplicate directory.

## Operator action

None.

**PK<unit number> DIRECTORY SPACE REQUIRED**

## Cause of message

This message appears after an error occurs when a program tries to add a file entry to a family's flat directory. The system has run out of disk space in the directory. The program cannot proceed until space is available and waits for you to correct the problem.

## Operator action

Either remove some files from the family with the "REMOVE" WFL statement or discontinue the program with the DS (Discontinue) ODT command.

**PK<unit number> DISC UNIT IS BLASTED**

## Cause of message

This message appears after an error occurs at Halt/Load time, while readying a disk, or while trying to correct a directory error. Processing of the directory on the disk has been stopped because the unit is marked as blasted. Disks are marked as blasted when certain I/O error recovery operations are discontinued with the DS (Discontinue) ODT command.

## Operator action

Do one of the following actions:

- Move the disk to another unit with the MOVE (Move Pack) ODT command.
- Close the disk with the CLOSE (Close Pack) ODT command and then ready the disk with the RY (Ready) ODT command.

## System Messages

**MT<unit number> DISK FILE HEADER COMPARE ERROR <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The disk file header read from the given destination does not match the disk file header record that was written to that destination.

## Operator action

Answer the RECOPY request as you wish, or try using the COPY command with a different I/O unit.

**MT<unit number> DISK FILE HEADER VERSION ERROR <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The input tape contains a disk file that was created by an advanced version of the MCP. That file cannot be copied by the current MCP.

## Operator action

Use the CM (Change MCP) ODT command to change to the advanced version of the MCP, then resubmit the COPY request.

**DISK MIRRORING ALREADY SET.**

## Cause of message

This message appears after an error occurs during an attempt to use the "OP+" ODT command to set the mirroring and indicates that the mirroring option has already been set.

## Operator action

No action is required.

**DISK MIRRORING NOT YET SET.**

## Cause of message

This message appears after an attempt to use the "MIRROR" ODT command when mirroring has not been set for the specified disk.

## Operator action

Set the mirroring system option by entering the "OP+MIRRORING" command. Enter the MIRROR command again.

**DISK TYPE NOT SUPPORTED FOR MIRRORING.**

## Cause of message

This message appears after an error occurs during an attempt to use the "MIRROR" ODT command to create a mirrored disk. The types of disks specified are not mirrorable. They are either head-per-track disks, which cannot be mirrored, or disks of a new type that has not yet been implemented for disk mirroring. The creation is abandoned.

This error message is always preceded by the following message:

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

If the disk type is new and has not yet been implemented for mirrored disk, or if head-to-track disk was specified, then substitute a pack for which the Mirrored Disk feature has been implemented.

**PK<unit number> DSED BY OPERATOR.**

## Cause of message

On-line mirror creation was discontinued by the operator. Mirror creation is completed. If the destination was altered, the media is scratched.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

No action is required.

## System Messages

**DUMPDISKMASTER ABORT -- CANNOT DN A MIRRORED DISK.**

## Cause of message

This message appears after an error occurs during an attempt to use the DN (Dump Name) ODT command. A mirrored disk cannot be used as a target for a DN command. The DN command is ignored.

## Operator action

Select a nonmirrored disk.

**DUMPDISKMASTER ABORT -- CANNOT DN TO A FAMILY WITH MIRRORED DISK MEMBERS.**

## Cause of message

This message appears after an error occurs during an attempt to use the DN (Dump Name) ODT command. A family containing mirrored units as members cannot be used as a target for a DN command. The DN command is ignored.

## Operator action

Select a family that does not contain mirrored disks.

**DUMPDISKMASTER ABORT -- CANNOT HLDUMPDISK ON A MIRRORED SET.**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command to establish the HLDUMPDISK file on a mirrored set. Specifying a mirrored set for a Halt/Load dump disk file is not permitted. The CM command is ignored.

## Operator action

Select a nonmirrored disk.

**DUMPDISKMASTER ABORT -- CANNOT HLDUMPDISK ON A FAMILY WITH MIRRORED DISK MEMBERS.**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command to establish the HLDUMPDISK file on a family containing mirrored disk members. Specifying a family with mirrored members for a Halt/Load dump disk file is not permitted. The CM command is ignored.

## Operator action

Select a family that does not contain mirrored disks.

**PK<unit number> DUP DISC FAMILY**

## Cause of message

This message appears after an error occurs on CATALOGING systems only, at Halt/Load time or while readying a disk. The disk has the same name and serial number as another disk in the volume library.

## Operator action

Determine the cause of the duplication by using the PER (Peripheral Status) and PV (Print Volume) ODT commands. The PER command syntax is "PER PK" and the PV command syntax is "PV PK <serial number>". Once the cause of the duplication has been determined, do one of the following actions:

- Use the "VOLUME DELETE" WFL statement to delete the duplicate disk. Then close the disk with the CLOSE (Close Pack) ODT command and ready it with the RY (Ready) ODT command.
- Change the name and serial number of the duplicate disk.

**DUP FAMILY <family name>**

## Cause of message

This message appears after a search for a disk file that results in more than one disk family bearing the same name. More than one family with the same family name might be on-line, or, on CATALOGING systems, a second family bearing the same family name might be listed in the volume library. On a CATALOGING system, a disk family listed in the volume library causes DUP FAMILY messages for most file accesses to an on-line disk family with the same name.

## Operator action

If the error occurred on a CATALOGING system, delete the duplicate family from the volume library using the "VOLUME DELETE" WFL command, close one of the duplicates with the CLOSE (Close Pack) ODT command, or change the name of the duplicate on-line family using the LB (Relabel Pack or Host Control Unit) ODT command.

## System Messages

**PK<unit number> DUP FAMILYNAME**

## Cause of message

This message appears after an error occurs when a disk is placed on-line. The disk has the same name as another on-line disk. On a CATALOGING system, this message can also indicate that the disk has the same name as a family in the volume library. The system marks the disk on-line, but most references to it cause programs to stop and cause the following message to be displayed:

<family name> <serial number> ... <serial number> DUP PACK

## Operator action

Do one of the following actions:

- Close one of the duplicates with the CLOSE (Close Pack) ODT command.
- On a CATALOGING system, use the "VOLUME DELETE" WFL statement to delete one of the duplicates.
- Rename one of the disks with the LB (Relabel Pack) ODT command.
- Leave the disks on-line as duplicates.

**DUP FAMILY <file name> ON | DISK | <volume name> <no>  
 | PACK |  
 | TAPE |**

## Cause of message

This message appears after an attempt to add or delete a disk file from the catalog. The system has located more than one disk family with the same family name. Some or all of the duplicate disk families might not be on-line and might be visible only because they are listed in the volume library.

## Operator action

If the duplicate disk families are not on-line, use the "VOLUME DELETE" ODT command to remove them from the volume library. If the duplicate disk families are on-line, use the LB (Relabel Pack or Host Control Unit) ODT command to change the name of the family name of each duplicate family.

**PK<unit number> DUP FILE(SYSTEM FILE)**

## Cause of message

This message appears after an error occurs when replacing a special system file. A program is trying to replace a special system file, such as an MCP code file, with another file of the same name. The program waits for you to correct the problem.

## Operator action

Do one of the following actions:

- Remove the conflicting file with the "REMOVE" WFL statement and then enter the reply "OK". To remove an MCP code file that is marked as a system file, the CM (Change MCP) ODT command must be entered first, with the syntax "CM- ON <family name>".
- Enter the reply "DS" to discontinue the program without replacing the old file.
- Enter the reply "OF". The program receives an error indication without replacing the old file.
- Enter the reply "OK". The system tries to enter the file again. The program will stop again if the old system file is still there.

**PK<unit number> DUP LIBRARY <file name> ON <family name>**

## Cause of message

This message appears after an error occurs during an attempt by the system to put a file name into the directory of a disk family when there is already a permanent file on the disk with the same file name. This conflict can occur while trying to create or close a new permanent file on the disk, while trying to copy a file to the disk, or while trying to change the name of an existing file on the disk. This message appears only if the AUTORM option for the system or task is reset using the OP (Options) ODT command.

## Operator action

The system is asking for permission to replace the existing file with a new file. Enter one of the following ODT commands:

- DS This terminates the program and does not replace the old file. The new file is removed, unless the conflict was caused by a file name change, in which case the new file retains its original name.
- OF This returns an error to the program and does not replace the old file. The new file is removed, unless the conflict was caused by a file name change, in which case the new file retains its original name.



## System Messages

- RM This removes the conflicting file and replaces it with the new file. If the destination file is a system file, use some other command.
- OK This retries the operation. Use this response if the conflicting file has been removed or changed or if the OP AUTORM option has been set.

**PK<unit number> <file name> DUPLICATE FILE TITLE FOUND DURING REBUILD  
ON <family name>**

## Cause of message

This message appears after an error occurs during a family rebuild. Two disk file headers were found bearing the same file name. The rebuild process bypasses the second file so that the file cannot be accessed.

Note that this message is new for the Mark 3.6 Release. Disk file headers may have previously existed in duplicate. Only with the Mark 3.6 Release are duplicate file titles flagged, however.

## Operator action

Do one of the following actions:

- Do nothing. The second copy of the file cannot be accessed, changed, copied, or removed. However, if the first copy of the file is ever removed or changed, then the next rebuild will reveal the second copy of the file.
- Use the "CHANGE" WFL command to change the name of the duplicate file, then use the RB (Rebuild Access) ODT command to rebuild the family again. The duplicate file is uncovered so that both instances of the file can be used.
- Use the "REMOVE" WFL command to remove the duplicate file, then use the RB (Rebuild Access) ODT command to rebuild the family. This uncovers the second file so that it can be used.

**DUPLICATE MB'ED BOOTCODE FILES**

## Cause of message

This message appears during system initialization on an A 3 system. This is a warning message.

## Operator action

Use the PR (Priority) ODT command to change the priority of one of the bootcode files before the next system reinitialization.

**PK<unit number> [<no>] <family name> DUPLICATE SERIALNO**

## Cause of message

This message appears after an error occurs during an attempt to ready a disk for use on the system. The serial number in the disk label is the same as the serial number of a disk already on-line. The system leaves the specified unit off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Use an LB (Relabel Pack or Control Host Unit) ODT command to change the serial number, or close the disk already on-line, then close and ready the new disk.

**DUPLICATE SERIALNO (<kind>) <no>**

## Cause of message

This message appears after an error occurs during an attempt to add an entry for a particular disk or tape to the volume library. An entry already exists in the volume library for the same kind of unit with the same serial number. This error usually occurs when a "VOLUME ADD" ODT command specifies a serial number that was already added to the volume library. The program or job that receives this error continues.

## Operator action

Remove the duplicate entry and try again.

## System Messages

**<family name> <serial number> ... <serial number> DUP PACK**

## Cause of message

This message appears after an error occurs when more than one disk with <family name> is known to the system but the programmer did not specify which one to use. The program waits for you to decide.

## Operator action

Use the PER (Peripheral Status) ODT command to investigate the problem. On CATALOGING systems, the PV (Print Volume) ODT command can also be used to investigate the problem.

Then use one of the following actions to correct the problem:

- Use the CLOSE (Close Pack) ODT command to close all the duplicates but one, and then enter the reply "OK" to tell the program to try again. On CATALOGING systems, also use the "VOLUME DELETE" WFL statement before entering the reply "OK". The "VOLUME DELETE" statement should be used to delete from the volume library all the duplicates that were closed.
- Enter the reply "DS" to discontinue the program without resolving the duplication problem.
- Enter the reply "IL PK<unit number>" to use the disk specified by <unit number>.
- Enter the reply "OF" to indicate an error to the program. Further action depends on how the program responds to the error condition.

**<unit number> END-OF-FILE READING HDR1 LABEL <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. A tape mark was found where a tape label was expected. No more files are copied.

## Operator action

If the input tape was not created incorrectly (the library maintenance program that wrote the input tape might have discontinued before it was completed), retry the COPY request using a different tape drive.

**PK<unit number> ERR: ALL SET MEMBERS MUST BE THROUGH SAME PROC.**

Cause of message

This message appears only on tightly-coupled Message-Level Interface Processor (MLIP) systems with the Mirrored Disk feature. It occurs when an attempt is made to bring a member of a mirrored set on-line using a path through a different processor than that used by the other mirrored set members. The member using the different processor is left off-line.

Operator action

Move the packs (if using interchangeable media) so that all paths to all disks in the mirrored set pass through one processor.

**PK<unit number> ERR: CLOSED PACK NOT CLOSED IN MIT.**

Cause of message

This message appears after the system discovers a MIRRORING DISK error. The disk label of a mirrored unit indicates that the disk was closed, but the system tables reflect a different state. The disk is not brought on-line.

Operator action

The disk must be reconfigured to be used again.

**PK<unit number> ERR: CORRUPTED MIRROR LABEL.**

Cause of message

The specified unit was mirrored but has a corrupted label. The disk is not brought on-line.

Operator action

The disk must be reconfigured or purged.

## System Messages

**PK<unit number> ERR: MIRRORED PACK LABEL LOGIC ERROR**

## Cause of action

This message appears after an unidentifiable label error occurs on a mirrored pack. A nonfatal dump occurs.

## Operator action

This error indicates a problem in the way the system is handling mirrored disks. This problem should be noted and sent to Burroughs as a Field Trouble Report, together with a copy of the SYSTEM/SUMLOG file.

**PK<unit number> ERR: MIRRORED PACK LINKAGE MISMATCH.**

## Cause of message

The disk was recognized by the system as a previous member of a mirrored set, but the system disk linkage has changed. The disk is not brought on-line.

## Operator action

As the disk was probably out-of-date or taken from another system, find the correct disk or (if the pack is needed for something else) reconfigure the current pack.

**PK<unit number> ERR: MIRRORED PACK NAME MISMATCH**

## Cause of message

The unit attempting to come on-line has an identical serial number, mirror ID, and disk linkage as another disk known by the system, but its volume name differs. The disk is not brought on-line.

## Operator action

Because the disk was probably out-of-date or taken from another system, find the correct disk or (if the pack is needed for something else) reconfigure the current pack.

**PK<unit number> ERR: MIRRORED PACK NOT WRITE ENABLED.**

Cause of message

The specified unit is not physically write-enabled.

Operator action

The unit should be made write-enabled and readied. Alternatively, the disk can be released from the set using the "MIRROR RELEASE OFFLINE COPIES" ODT command.

**PK<unit number> ERR: MIRRORED UNIT ON NONMIRRORED SYSTEM.**

Cause of message

The disk is mirrored; however, mirroring is not established. The disk is not brought on-line.

Operator action

Initialize mirroring via the "OP+MIRRORING" ODT command.

**PK<unit number> ERR: OPEN PACK HAS BAD MIT STATE.**

Cause of message

This message appears after an error occurs during an attempt to bring a mirrored disk on-line. The disk label indicates that the disk was on-line, but the system tables indicate a different state. The disk is not brought on-line.

Operator action

The disk must be reconfigured to be used again.

**PK<unit number> ERR: OUTDATED MEMBER OF MIRRORED SET.**

Cause of message

The disk was previously part of a mirrored set. However, it was released from the set, and the MCP was unable to invalidate its label at the time. The disk is not brought on-line, and its label is invalidated.

Operator action

Reconfigure the disk and use it for something else.

## System Messages

**PK<unit number> ERR: PATH THROUGH ONE PROCESSOR ONLY**

## Cause of message

The disk currently being brought up on a tightly-coupled Message-Level Interface Processor (MLIP system) is part of a mirrored set and the disk unit has paths through multiple processors. This is not permitted.

## Operator action

The disk cannot be brought on-line as a mirrored unit from that drive. Free all paths to disk except those passing through the desired processor, then close and ready the unit. Alternatively, move the disk to another unit that has paths through only one processor.

**PK<unit number> ERR: UNABLE TO EXPAND MIT**

## Cause of message

The current maximum number of mirrored sets has been exhausted, and the tables cannot be expanded due to memory constraints. The disk is not brought on-line.

## Operator action

No action is required.

**ERROR ALLOCATING REEL SWITCH DIRECTORY**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. Whenever a copy to tape is initiated, the library maintenance program allocates a temporary disk file on the Halt/Load family. This file is used to save a copy of the tape directory. This duplicate tape directory file could not be opened correctly. No files are copied.

## Operator action

Resubmit the COPY request.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

```
<unit number> ERROR CALLING | FLATREADER(BUILDVAST)
                             | FLATREADER(REBUILDFAST)
                             | FLATREADER(SKINCAT4)
                             | FLATREADER(SQUASHFAST)
                             | INITIALIZEFAST
                             | PASTSEARCH
                             | WRITER FOR PAST BLOCK
```

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This message appears when an error occurs during directory error recovery. This message indicates why a directory error could not be corrected.

## Operator action

None.

```
<unit number> ERROR CLOSING TAPE FILE <file name>
```

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The system CLOSE routine returned an error indication between files. If the error occurs on a source tape, then no more files will be copied. If the error occurs on a destination tape, then no more files will be copied to the affected tape.

## Operator action

Repeat the COPY request with a different tape volume or tape drive.



## System Messages

```

PK<unit> ERROR GETTING DIRECTORY HEADER IN PRESERVESTRUCTURE
PK<unit> ERROR | READING | THE MCP TABLE | CONFIGURATION | ON <pack>
                | WRITING |           | MCPINFO         |
                |           |           | UNITADDL        |
                |           |           | MIRRORINFO      |
                |           |           | SWAPPERINFO     |
                |           |           | FUNCTIONTABLE   |
                |           |           | PERCONINFO      |
                |           |           | PCDIAGRAM       |
                |           |           | PAGEINFO        |
                |           |           | CHANNELINFO     |
                |           |           | FASTTABLE       |
                |           |           | UNKNOWN TABLE  |

```

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command or to Halt/Load the system during normal system operation. The error occurs while reading or writing an important system state table in the directory. The error may have been caused by a hardware I/O error or a corrupted directory record.

## Operator action

Correlate this error message with other directory and disk I/O error messages that precede it. If the error occurred on an active Halt/Load family, the operations of the system can be affected. The system or parts of the system may not run correctly now or after the next Halt/Load. Be prepared to use a backup Halt/Load pack.

If the error occurs on a family other than a currently active Halt/Load family (as during execution of a RES (Reserve), SQUASH (Consolidate Disk Allocation), or CM (Change MCP) ODT command) then the family specified might not be usable as a backup Halt/Load until a successful CM command is executed for it.

**PK<unit number> ERROR IN | CREATEFAMILY  
| INITIALIZEFAST**

**Note**

This message includes just one entry from the column that contains more than one entry.

**Cause of message**

This message appears when an error occurs at Halt/Load time or while readying a disk. The system detected an error while trying to enter a family into the catalog. The system marks the family off-line.

**Operator action**

Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.

**PK<unit number> ERROR MAKING XD FILE**

**Cause of message**

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) or the "RES-" (Reserve) ODT command. The processing failed because of a directory error on the base pack for the family. The system was trying to create a BADDISK file to cover a faulty area of the disk, but the BADDISK file could not be entered into the directory. The system leaves the disk marked as unlabeled.

**Operator action**

Resolve the directory or I/O error on the base pack and then repeat the command.

**ERROR ON LABEL IO: PK<unit number>.**

**Cause of message**

The label of the indicated disk could not be updated. Mirror creation is abandoned.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ONTO PK<unit number>.

**Operator action**

Ensure that the disk is ready and write-enabled, then restart mirror creation. If this does not work, it is possible that a media error exists and that it is impossible to update the label.

## System Messages

**ERROR OPENING TAPE FILE**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The system OPEN routine did not correctly locate an input tape file or did not correctly allocate an output tape file. No more files will be copied.

## Operator action

Determine the cause of the OPEN error (possibly from a preceding message or an I/O error) and resolve that problem. Resubmit the COPY request, possibly using different tapes or tape drives.

**PK<unit number> ERROR PROCESSING BASEPACK FLAT DIR**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a FAMILYINDEX clause. An error occurred while the system was removing files that referenced a disk member that was to be replaced in the family. The error might have been a directory I/O error or a directory processing error on the family base disk. The error might have been described by a preceding error message.

## Operator action

Resolve any disk I/O error or directory problems and then enter the RC command again.

**PK<unit number> ERROR PROCESSING DIRECTORY ON CATALOG FAMILY**

## Cause of message

This message appears after an error occurs during a Halt/Load. The family that was designated as the CATALOG family with the DL (Disk Location) ODT command could not be set up correctly. Preceding messages have noted the reason for the failure. The system next issues the message "CATALOG FAMILY MISSING (IL or HL)" and waits for your response.

## Operator action

Note the preceding error messages and either correct those problems and Halt/Load again or select a different disk family on which the system can create a new catalog.

**PK<unit number> ERROR READING DIRECTORY HEADER**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system detected an I/O error or disk file header corruption while reading a flat directory header. If the family does not have a duplicate directory on another member, the system marks the disk off-line.

## Operator action

Do one of the following actions:

- Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.
- Check the status of the directories on the disk with the PD (Print Directory) ODT command. The syntax is "PD SYSTEMDIRECTORY/= ON <family name>". Then restore the directory duplication process by using the DD (Directory Duplicate) ODT command.

**PK<unit number> ERROR READING PAST BLOCK**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system detected an error while trying to enter a family into the catalog. The system marks the family off-line.

## Operator action

Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.

**PK<unit number> ERROR READING SEGO**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system detected an I/O error while reading the first record in the flat directory or because the first record of the flat directory was corrupted. If there is not a duplicate directory on another member of the family, the system marks the disk off-line.

## Operator action

Perform one of the following actions:

- Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.
- Check the status of the directories on the disk with the PD (Print Directory) ODT command. The syntax is "PD

## System Messages

SYSTEMDIRECTORY/= ON <family name>". Then restore the directory duplication process by using the DD (Directory Duplicate) ODT command.

**<unit number> ERROR READING SEGO OF CATALOG**

## Cause of message

This message appears when an error occurs during directory error recovery. This message indicates why a directory error could not be corrected.

## Operator action

Note the problem and notify the site manager.

**<unit number> ERROR READING TAPE LABEL**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. An I/O error occurred while reading a tape HDR1, HDR2, EOF1, EOF2, or EOVL label, or while reading a tape mark. No more files will be copied.

## Operator action

Resubmit the COPY request using a different tape drive or tape volume.

**PK<unit number> <file name> ERROR ROW <no> REC <no> ON <family name>**

## Cause of message

This message appears after a disk I/O error occurs during an attempt to execute the RES (Reserve) or SQUASH (Consolidate Disk Allocation) ODT command. The error has occurred while copying a file. If COPYERRORS was not selected in entering the RES command, or if the file is a critical file (such as a code file), then the process will terminate.

## Operator action

Correlate this message with preceding disk I/O error messages. Resolve the I/O error problem and repeat the command as desired.

**ERRORS COPYING DATA.**

## Cause of message

Errors were encountered during mirror creation or during audit application to disks in a mirrored set. The label of the destination unit has been erased.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ONTO PK<unit number>

## Operator action

Ensure that the disk is ready and write-enabled. Then restart mirror creation. If this does not work, it is possible that there is a media error and that it is impossible to complete the audit application or creation.

**<unit number> <file name> ERROR SETTING SECURITY GUARD  
ON <family name>**

## Cause of message

This message appears when an error occurs during an attempt to set or change the SECURITYGUARD file attribute for the specified file. This condition normally occurs only if a disk file header has exceeded its maximum size of 2048 words or if a directory error prevented the system from changing the SECURITYGUARD attribute. The program or job that attempted the change will continue processing.

## Operator action

If the problem was caused by a directory error, correlate the error with any preceding disk directory or disk I/O error messages. Resolve any disk I/O problems. Report the error to the originating programmer so the SECURITY command can be reissued. Otherwise, set the SECURITYGUARD attribute using a shorter name than the one that caused the error. If this is not possible and the MCP is compiled with the DIAGNOSTICS compile-time option, then you can obtain a program dump by running the program that caused the error with the FILES option set.

## System Messages

**PK<unit number> ERROR SETTING UP SYSTEMDIRECTORY HEADER**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system detected an error while trying to handle a duplicate flat directory. The system marks the disk on-line for program use but the duplicate directory is not used.

## Operator action

Check to see which directories are active with the PD (Print Directory) ODT command. The syntax is "PD SYSTEMDIRECTORY/= ON <family name>". Then restore the directory duplication process by using the DD (Directory Duplicate) ODT command.

**PK<unit number> ERROR TRYING TO REMOVE SYSTEMDIRECTORY**

## Cause of message

This message appears after an error occurs while trying to remove a duplicate flat directory. The system detected an I/O error while using the "DD-" version of the DD (Directory Duplicate) ODT command to try to remove a duplicate flat directory file.

## Operator action

Enter the "DD-" command again.

**PK<unit number> ERROR WRITING PAST BLOCK**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system detected an error while trying to enter a family into the catalog. The system marks the family off-line.

## Operator action

Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.

**ERROR WRITING REPORT FILE.**

## Cause of message

Errors were encountered while generating the error file for the creation of a mirrored set. The destination label has been erased.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

Ensure that the disk is ready and write-enabled. Then restart mirror creation. If this does not work, it is possible that a media error exists and that it is impossible to create the error file.

**<unit number> ERROR WRITING SEGO OF CATALOG**

## Cause of message

This message appears when an error occurs during directory error recovery. This message indicates that a directory error could not be corrected.

## Operator action

Note the problem and notify the site manager.

**<unit number> ERROR WRITING TAPE LABEL**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command to write a tape HDR1, HDR2, EOF1, EOF2, or EOV1 label or to write a tape mark on the output tape. No more files will be copied.

## Operator action

Try using the COPY command on a different tape drive or tape volume.



## System Messages

**ERROR WRITING TO BOOTCODE FILE <file name> ON <family name>**

## Cause of message

This message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command to display, select, or remove an A 3 bootcode file.

## Operator action

Try using the MB command again.

```
<unit no> EXPECTED | HDR1FILE<no> | BUT WORDS 1&2 OF RECORD = <no> <no>
                  | EOF1FILE<no> |
```

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The error occurred while spacing up tape to a file that was to be copied. Certain kinds of records are expected after each tape mark on library maintenance tapes. In this case, one of these records is wrong or out of place, a tape mark is missing, or an extra tape mark is on the input tape. The library maintenance program continues spacing up the tape, looking for the desired file. It is possible that the tape will run away (if there are no more tape marks on the tape to stop the search).

These errors are likely to happen if the library maintenance program that created the tape did not finish correctly, due to an error condition or a DS (Discontinue) ODT command.

## Operator action

If the messages persist, the input tape is probably unusable and needs to be re-created.

```
<unit number> EXPECTED EOV1FILE<no> BUT WORDS 1&2 OF RECORD = <no> <no>
```

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. An end-of-file (EOF) was detected in the middle of the data portion of the input tape file. The library maintenance program expects a reel after a tape mark and checks for the presence of an end-of-volume (EOV) label. That label was missing. The affected file is not copied.

## Operator action

Find out whether the input tape was correctly created by examining the job log output generated by the COPY command that originally created the tape. If the tape was correctly created, reissue the COPY command using a different tape drive.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**<unit number> EXPECTED RECORD <no> BUT WORDS 1&2 OF RECORD = <no> <no>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The first word of every library maintenance tape block has a record number. The wrong record number was read from the tape. The library maintenance program might issue a RECOPY RSVP. Otherwise, no more files will be copied to or from the given unit.

## Operator action

Answer the RECOPY request as you wish or resubmit the COPY request using a different I/O unit.

**PK<unit number> FAMILYINDEX CANNOT BE USED ON JOBDESC FAMILY**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a FAMILYINDEX clause to replace a continuation disk. The family contains the active JOBDESC file for the system. Disk members in the DL JOBS family cannot be replaced with the RC command.

## Operator action

If continuation disk replacement is urgently needed, use the DL (Disk Location) ODT command to direct the system to look for the JOBDESC file on the new family. Do a Halt/Load. This causes all queued jobs, subsystem specifications, Peripheral Association (PA) specifications, and job queue definitions to be lost. After the Halt/Load, reissue the RC command.

**PK<unit number> FAMILYINDEX MUST BE CLOSED**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a FAMILYINDEX clause to replace a continuation disk. The family member to be replaced is currently on-line.

## Operator action

Check the family index number supplied. Or, use the PG (Purge) ODT command to remove the old family member, then reissue the RC command for the replacement disk.

## System Messages

**PK<unit number> FAMILYINDEX REQ DD-**

Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a FAMILYINDEX clause to replace a continuation disk. The family member to be replaced contains a copy of the family SYSTEMDIRECTORY file.

Operator action

Use the "DD-" (Directory Duplicate) ODT command to delete the duplicate copy of the SYSTEMDIRECTORY file, then reissue the RC command.

**PK<unit number> FAMILY REBUILDING (<percentage>%): PK<unit number>  
<family name>**

Cause of message

This message appears at Halt/Load time, while readying a disk, or during directory error correction. The system is building a list of all the files in the family's directory. When the system has finished making the list, the family is on-line for use by programs. The value <percentage> indicates the percentage of the family that has been rebuilt so far.

Operator action

None.

**PK<unit number> FAST REBUILT**

Cause of message

This message appears during directory error correction. The system has finished recovering from a directory error by rebuilding the Family Access Structure Table (FAST). The program that originally detected the error continues its execution.

Operator action

None.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**PK<unit number> FAULT**

## Cause of message

This message appears after an MCP fault occurs during processing of the flat directory on the disk.

## Operator action

Note the error message and retrieve any memory dump or program dump the system provides.

**PK<unit number> [<no>] <family name> FAULT <rcw>**

## Cause of message

This message appears after an error occurs during an attempt to ready a disk for use on the system. The fault is caused by corrupted information in the disk label or by a problem in the MCP. The system leaves the disk off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Close and ready the disk. If the problem reoccurs, the disk might be unusable and might have to be reconfigured or relabeled.

**PK<unit number> FAULT (BAD PARM)**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) or LB (Relabel Pack or Host Control Unit) ODT command. The fault occurred while the MCP was evaluating the request. This message is also issued if a DCALGOL program calls SETSTATUS for the RC case and the parameter passed to SETSTATUS is not valid. The system leaves the disk closed but does not change the disk or its label.

## Operator action

If the error is the result of an RC or LB command, correct the syntax of the command and reenter. If the error is the result of a programmatic SETSTATUS request, correct the program.

## System Messages

**PK<unit number> FAULT COMPLEMENTING JOBDESC**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system encountered a FAULT interrupt while examining the JOBDESC file on the disk. The system marks the JOBDESC file as a DATA file. If the disk is the one designated as the JOBDESC disk by the DL (Disk Location) ODT command, the system builds a new JOBDESC file. The old job file specifications, job summaries, queued jobs, and settings for SUBSYSTEM, PA (Peripheral Association), and ADM (Automatic Display Mode) are lost.

## Operator action

Restore the lost files and specifications if desired.

**<unit number> FILE TITLE ERROR <file name>**

## Cause of message

This message appears after an error occurs during library maintenance. The file title of a disk file found at a selected spot on a tape is not the file title expected. No more files will be copied.

## Operator action

Find out whether the input tape was correctly created by examining the job log output generated by the COPY command that originally created the tape. If the tape was correctly created, reissue the COPY command using a different tape drive.

**PK<unit number> FILEHANDLER ERROR IN DUPLICATION**

## Cause of message

This message appears after an I/O error occurs during an attempt to duplicate a catalog or directory with the AD (Access Duplicate) ODT command or while trying to duplicate a flat directory with the DD (Directory Duplicate) command. This message was preceded by a message that described the nature of the I/O error.

## Operator action

Correct the I/O error and enter the AD or DD command again.

**PK<unit number> <no> FILES CHANGED IN <file name>/= TO <file name>/=  
ON <family name>**

Cause of message

This message appears after the "CHANGE" WFL command is used to change the name of a directory of files. The expression <no> indicates the number of files removed. Only file names in the old directory that do not conflict with existing file names already in the new directory are changed. System files or files that are otherwise protected are not changed.

Operator action

No action is required.

**PK<unit number> <no> FILES REMOVED IN <file name>/= ON <family name>**

Cause of message

This message appears after the "REMOVE" WFL command is used to remove a directory of files. The expression <no> indicates the number of files removed. System files and files that are otherwise protected are not removed.

Operator action

No action is required.

**FLATREADER ERROR WHILE ANALYZING DAMAGE.**

Cause of message

During the creation of a mirrored disk, an error was encountered while trying to determine the reserved areas on the source unit. The mirror creation is abandoned and the destination label erased. This error may occur if mirror creation is performed on a member of a multidisk family and the base unit is nonpresent.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ON PK<unit number>.

Operator action

Ensure that the disk is ready and write-enabled. Then restart mirror creation.

## System Messages

PK<unit number> FORGETUSERDISK ERROR ON <family name>  
 PK<unit number> <file name> FORGETUSERDISK ERROR ON <family name>  
 PK<unit number> FORGETUSERDISK ERROR: JOB FILE FOR JOB <mixno>  
 ON <family name>

## Cause of message

This message appears when the system is removing the file with <file name> from the family with <family name>. The system has discovered that the available disk table for that disk conflicts with the areas that the removed files had been stored on. This message displays the unit number of the family's base pack, but the error may have occurred on a continuation pack. This is an internal error indication similar to the message "<file name> OVERLAPS ANOTHER FILE ON PK<unit number>". FORGETUSERDISK error messages are often issued long after the actual cause of the original error. The actual error probably occurred when one of the overlapping files was allocated, extended or moved, or when the family was readied.

## Operator action

System operation continues after this error, and no operator action is required. If the problem occurs again, it indicates that there is something wrong with the MCP's handling of some particular action on that disk family.

**FOUR MIRRORS ALREADY EXIST FOR THIS SET: PK<unit number>.**

## Cause of message

The maximum number of mirrors allowed in a mirror set already exists. Mirror creation is abandoned.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

No action is required.





## System Messages

**HALT/LOAD UNITS DO NOT HAVE SAME MCP**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. A CM operation was attempted on a tightly-coupled system, but the MCP code file is not the same on the Halt/Load families for all the processors.

## Operator action

Copy the same MCP code file to the Halt/Load units for go beginprocessors and then enter the CM command again.

**PK<unit number> HAS A BAD LABEL.**

## Cause of message

The unit specified has a bad label. Mirror creation is not performed.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

No action is required (the source unit is corrupted).

**PK<unit number> HAS BAD MAT, PACK NEEDS TO BE IVRED**

## Cause of message

This message appears after the MAT (Master Available Table) on the indicated disk pack has been found to be missing or corrupted. The disk cannot be used by the system until a new MAT is written on the disk and the disk is subsequently reconfigured using the RC (Reconfigure Disk) ODT command.

## Operator action

Issue an RC command for the disk. If that fails, you may have to reinitialize the pack using the IVR (Initialize, Verify, Relocate) process, and then repeat the RC command.

**PK<unit number> HASNT BEEN IVED**

## Cause of message

This message appears after a disk has been found to lack a proper disk label in segment 4 or segment 0. The system leaves the disk marked as unlabeled.

## Operator action

Resolve any possible disk I/O errors that might have caused the system to incorrectly read the label. If the error occurred during the processing of an LB (Relabel Pack or Host Control Unit) ODT command, try an RC (Reconfigure Disk) ODT command, keeping in mind that an RC command effectively removes all the files from the disk. If the RC fails, you may have to reinitialize the pack using the IVR (Initialize, Verify, and Relocate) procedure, and then reissue the RC command.

**HEADER DAMAGED ON PK<unit number> <file name>**

## Cause of message

This message appears after an error occurs during an attempt to ready a disk. The system has discovered that the file named has one or more incorrectly allocated areas or rows. The system marks these areas as unavailable for use. This error is the result of an internal system problem while handling a disk header.

## Operator action

Remove the file and load the most recent uncorrupted version of that file.

**<unit number> HEADER HAS DELETED ROWS <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. A disk file was not copied because some rows (areas) were missing, probably as a result of an RC (Reconfigure Disk) ODT command.

## Operator action

Remove the bad file(s) and reissue the COPY command. Note that the only way to fix deleted rows is to run a program that uses the ALGOL EXCHANGE intrinsic. Otherwise the file cannot be copied.

## System Messages

**<unit number> HEADER ROW MISSING <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The disk file that was to be copied has areas allocated on packs other than the family base pack. These packs are not on-line. No more files will be copied.

## Operator action

Locate and ready the missing packs, then rerun the copy.

**PK<unit number> HEADER SELF LINK IS BAD**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying an interchange disk pack with the RY (Ready) ODT command.

## Operator action

Close the disk pack with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.

**HLDUMPDISK MUST BE SET WITH AUTOLOAD**

## Cause of message

This message appears after an attempt has been made to use the CM (Change MCP) ODT command to enable the AUTORUNNING attribute without specifying a Halt/Load dump disk, or to disable the Halt/Load disk while the AUTORUNNING attribute is still enabled.

## Operator action

If you need to enable the AUTORUNNING attribute, be sure that a Halt/Load dump disk is specified.

**DK<unit number> [<no>] <family name> HPT BAD LABEL**

## Cause of message

This message appears after an error occurs during an attempt to ready a disk for use on the system. The system read the disk label, but either the serial number of the disk is not equal to the unit number of the disk or the interchange code in the label is improper. The system leaves the unit off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Use the RC (Reconfigure Disk) ODT command to change the serial number to be equal to the disk unit number.

**PK<unit number> IAD ILLEGAL ON NEW MACHINE**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command to reserve a disk as IAD (Installation Allocated Disk). The IAD feature is not supported on A 3, A 9, A 10, B 5900, or B 6900 systems.

## Operator action

Reissue the command without the IAD clause.

**PK<unit number> ILLEGAL OR CONFLICTING FAMILYINDEX**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit) or the RC (Reconfigure Disk) command. The specified disk has a bad family index number, or the family index number supplied in the FAMILYINDEX clause was not valid. The family index must be an integer greater than 0 and less than 256. If a FAMILYINDEX clause is used, the number specified must be within the range of family index numbers already assigned to the family.

## Operator action

Reissue the command with a valid family index clause and a correct family index number.

## System Messages

**PK<unit number> INCORRECT OLDNAME ENTERED - RC/PG/LB NOT DONE**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command. The family name specified for OLDNAME did not match the old family name. The original command is not executed.

## Operator action

Reissue the command with the correct OLDNAME, or bring the disk back on-line by closing and readying the unit.

**PK<unit number> <file name> IN IAD AREA ON <family name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "RES-" (Restore) ODT command. An Installation-Allocated Disk (IAD) file was discovered that occupies part of the disk area being returned. The restore operation is terminated.

## Operator action

Determine whether the conflicting file should be removed. If so, reissue the "RES-" command.

**PK<unit number> INCOMPATIBLE UNITS.**

## Cause of message

The destination and source units specified in the "MIRROR CREATE" ODT command have different disk types. Mirror creation is not performed.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

Choose a new destination pack of the same type as the source pack. Restart mirror creation.

**PK<unit number> IN USE.**

Cause of message

The destination unit of the "MIRROR CREATE" ODT command is currently in use.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

Operator action

Choose a new destination pack of the same type as the source pack.  
Restart mirror creation.

## System Messages

**PK<unit number> INVALID FAMILY INDEX**

## Cause of message

This message appears after an error occurs while trying to duplicate a flat directory or catalog, or while trying to delete a duplicate flat directory or duplicate catalog. This message means that an incorrect DD (Directory Duplicate) or AD (Access Duplicate) ODT command was entered. An incorrect DD command has specified a family index number that is not in the family, or specified a member of the family that is off-line. An incorrect AD command has specified a family index number that is not in the catalog family or a member of the catalog family that is off-line. An incorrect "AD-" command has specified a family that does not contain a valid SYSTEM/CATALOG or SYSTEM/ACCESS file.

## Operator action

If it was an incorrect DD command, perform the following steps:

1. Use the PER (Peripheral Status) ODT command to determine the family index numbers of the on-line disks in the family.
2. Enter the correct DD command.

If it was an incorrect AD or "AD-" command, perform the following steps:

1. Use the PER command to determine the family index numbers of the on-line packs in the catalog family.
2. Use the PD (Print Directory) ODT command to determine what catalog files currently are active. The PD command syntax on CATALOGING systems is "PD SYSTEM/CATALOG/= ON <family name>". The PD command syntax on non-CATALOGING systems is "PD SYSTEM/ACCESS/= ON <family name>".
3. Enter the correct AD or "AD-" command.

**INVALID FAMILYINDEX SPECIFIED: <family name> (<family index>)**

## Cause of message

The message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command. The family index specified was invalid.

## Operator action

Reissue the command with a valid family index.

**PK<unit number> INVALID FAMILY LINKAGE**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Disk or Host Control Unit) ODT command. The LB procedure could not determine whether the disk was part of a multidisk family or not. LB commands cannot include a SERIAL clause if the affected disk is part of a multidisk family.

## Operator action

Close the disk, then repeat the LB command.

**INVALID LIST OF FAMILY INDICES**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. The list of family index numbers in a CM command specified the same number twice.

## Operator action

Enter the CM command with a corrected family index list.

**PK<unit number> [<no>] <family name> INVALID NAME**

## Cause of message

This message appears after an error occurs during an attempt to ready a disk for use on the system. The system read the disk label to ready the disk, but the family name contained in the disk label was not properly formatted or was entirely blank. The system leaves the unit off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Use the LB (Relabel Pack or Host Command Unit) ODT command to correct the disk family name.



## System Messages

**PK<unit number> [<no>] <family name> INVALID SERIALNO**

## Cause of message

This message appears after an error occurs during an attempt to ready a disk for use on the system. The system read the disk label to ready the disk, but the serial number contained in the disk label was not properly formatted or was composed entirely of zeros. The system leaves the unit off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Use the LB (Relabel pack or Host Control Unit) ODT command to correct the disk serial number.

**PK<unit number> IO ERR READING LABELS**

## Cause of message

This message appears after an I/O error occurs during an attempt to ready a disk for use on the system. The system tried to read the disk label to ready the disk but was prevented by the I/O error. The unit remains off-line.

## Operator action

Resolve the I/O problem or move the disk to another unit, then close and ready the unit.

**PK<unit number> IO ERROR, DUPLICATION ABORTED**

## Cause of message

This message appears after the system encountered an error while trying to duplicate a catalog with the AD (Access Duplicate) ODT command or while trying to duplicate a flat directory with the DD (Directory Duplicate) command. This message was preceded by a message that described the nature of the I/O error.

## Operator action

Enter the AD or DD command again. If the error persists, examine the log entries for that disk by entering

```
LOG MAINT PK <unit number>
```

and correct the I/O error. Contact your Burroughs field engineer if necessary.

**PK<unit number> I/O ERROR COMPLEMENTING JOBDESC**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system encountered an I/O error while examining the JOBDESC file on the disk. The system marks the JOBDESC file as a DATA file. If the disk is the one designated as the JOBDESC disk by the DL (Disk Location) ODT command, the system builds a new JOBDESC file. The old job file specifications, job summaries, queued jobs, and settings for SUBSYSTEM, PA (Peripheral Association), and ADM (Automatic Display Mode) are lost. This message was preceded by a message that described the nature of the I/O error.

## Operator action

If the error persists, examine the log entries for that disk by entering

LOG MAINT PK <unit number>

and correct the I/O error. Contact your Burroughs field engineer if necessary.

**<unit number> IO ERROR DURING COMPARE <file name>**

## Cause of message

This message appears after an I/O error occurs during an attempt to use a "COPY" WFL command to read data from a peripheral unit to compare the data.

## Operator action

Reenter the COPY command indicating a different I/O unit.

**<unit number> IO ERROR DURING COPY <file name>**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command to copy data to or from the named unit for the file specified.

## Operator action

Reenter the COPY command indicating a different I/O unit.

## System Messages

**PK<unit number> I/O ERROR, MAINTENANCE MODE NOT CHANGED**

## Cause of message

This message appears after an error occurs during an attempt to use the UR (Unit Reserved) ODT command. The system received a disk I/O error when it tried to change the state of the maintenance bit in the disk drive controller.

## Operator action

Correct the I/O error and reissue the command.

**PK<unit number> I/O ERROR OBTAINING UNIT STATUS**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command. The system detected an error while trying to determine the type of disk involved. Either an operable I/O path to the unit does not exist or the unit reported an I/O error to a TEST I/O operation.

## Operator action

Resolve the I/O problem or move the disk to another unit and reissue the command.

**PK<unit number> I/O ERROR OBTAINING UNIT STATUS**

## Cause of message

This message appears after an error occurs during an attempt to ready a disk for use on the system. The system detected the error while trying to determine the type of disk involved. Either an operable I/O path to the unit does not exist or the unit reported an I/O error to a TEST I/O operation. The system leaves the unit off-line.

## Operator action

Resolve the I/O problem or move the disk to another unit, then close and ready the unit.

**I/O ERROR ON DISC REEL SWITCH DIRECTORY**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. Whenever a copy to tape is initiated, the library maintenance program allocates a temporary disk file on the Halt/Load family. This file is used to save a copy of the tape directory. An I/O error has occurred while reading or writing the tape directory file on the Halt/Load family. No more files will be copied.

## Operator action

Reissue the COPY request.

**PK<unit number> I/O ERROR, PO ABORTED**

## Cause of message

This message appears after an error occurs during an attempt to use the POWER (Power Cff) ODT command. The command was directed at an IC (interchange) pack but a disk I/O error occurred while the system was trying to update the AVT (Available Space Table) on the pack.

## Operator action

Resolve the disk I/C error problem. Ready the pack again, and reissue the command.

**PK<unit number> I/O ERROR, RC ABORTED**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command. The system detected the error while it was trying to read or write the label or directory of the specified disk.

## Operator action

Resolve the I/O problem or move the disk to another unit, then reissue the command.

## System Messages

**<unit number> I/O ERROR READING HDR1 LABEL <file name>**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command. The error occurred while reading a tape label from an input tape. The affected file is not copied.

## Operator action

If the input tape has been damaged or was created incorrectly, the affected file cannot be copied. Otherwise, try to copy the file again using a different tape drive.

**PK<unit number> I/O ERROR READING | DIRECTORY  
| HEADER  
| MAT**

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This error occurs at Halt/Load time or while readying an interchange disk pack with the RY (Ready) ODT command.

## Operator action

Close the disk pack with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command. If the error persists, examine the log entries for that disk by entering

LOG MAINT PK <unit number>

and contact your Burroughs field engineer if necessary.

**PK<unit number> IS [<no>] <family name>**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command. The OLDNAME clause was not used. The system displays the old serial number and family name so that the operator can verify that the correct disk volume will be changed. The system issues the "ACCEPT: OLDNAME" AX request. The term <no> is the serial number of the affected disk volume.

## Operator action

Verify the old family name and serial number.

**PK<unit number> IS [<no>] (<owner>) <family name>**

**Cause of message**

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command. The disk specified has a nonblank OWNER field in its label. The term <no> is the serial number of the affected disk volume.

**Operator action**

Verify that the correct disk is being changed.

**<file name> IS A DUPLICATED FILE**

**Cause of message**

This message appears if an attempt is made to use the "MB+" (Make Boot) ODT command on a DUPLICATED file.

**Operator action**

Reissue the MB command, specifying a non-DUPLICATED file.

**<file name> IS A SYSTEM FILE**

**Cause of message**

This message appears after an error occurs during library maintenance. Disk files with certain FILEKINDs (such as directories) cannot be copied by library maintenance.

**Operator action**

Do not attempt to copy a file of this FILEKIND.

**PK<unit number> <file name> IS AN ILLEGAL FILE NAME ON <family name>**

**Cause of message**

This message appears after an error occurs during an attempt to create a disk file or catalog a tape file with the file name USERCODE or with a file name containing more than 14 levels (including its usercode). This message is also issued if an internal system error occurs in handling a file name. The program might continue but the bad name is not entered into the directory.

**Operator action**

Change the program to assign a valid name.

## System Messages

**PK<unit number> IS AN INTERCHANGE PACK.**

## Cause of message

The unit specified in a "MIRROR CREATE" ODT command is an interchange disk. Interchange disks cannot be mirrored. Mirror creation is not performed.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

If the specified disk is the source unit, a mirrored copy cannot be made. Check to see if the disk specified in the message is the correct one. If the specified disk is the destination disk, the disk needs to be reconfigured to the A Series format, using the RC (Reconfigure Disk) ODT command, before it can be used as a mirror destination.

**PK<unit number> IS AN UNLABELED UNIT.**

## Cause of message

The source unit specified in the "MIRROR CREATE" ODT command is not labeled. The MIRROR CREATE command is not carried out.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

No action is required. The source unit is invalid.

**PK<unit number> IS A SCRATCH UNIT.**

## Cause of message

The source unit specified in a "MIRROR CREATE" ODT command is a scratch disk. Mirror creation is not performed.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

No action is required. The source unit is invalid.

**<file name> IS NOT A BOOTCODE FILE**

## Cause of message

This message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command to display, select, or remove an A 3 bootcode file. The file specified is not a bootcode file.

## Operator action

Reissue the MB command, specifying a bootcode file.

**IS NOT OF FILEKIND BOOTCODE**

## Cause of message

This message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command to display, select, or remove an A 3 bootcode file. The file specified is not of FILEKIND bootcode.

## Operator action

Reissue the MB command, specifying a bootcode file.

**PK<unit number> IS RESERVED FOR MAINTENANCE.**

## Cause of message

The unit specified in a "MIRROR CREATE" ODT command is currently reserved. Neither the source nor the destination can be reserved. Mirror creation is not performed.

This error message is always preceded by one of the following messages:

AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.

or

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

After verifying that the unit is not being repaired, unreserve the unit with the UR (Unit Reserve) ODT command. Reissue the MIRROR CREATE command.



## System Messages

**PK<unit number> JOB FILE HEADER DISK ADDRESS ERROR ON <family name>**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. A job file found in the JOBDESC on the disk is not compatible with the current MCP. The system marks the JOBDESC file as a DATA file. If the disk is the one designated as the JOBDESC disk by the DL (Disk Location) ODT command, the system builds a new JOBDESC file. The old job file specifications, job summaries, queued jobs, and settings for SUBSYSTEM, PA (Peripheral Association), and ADM (Automatic Display Mode) are lost.

## Operator action

Restore the lost specifications, settings, queued jobs, and system options, if required.

**PK<unit number> JOBDESC ROW ON OFFLINE DISC**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system could not completely examine a JOBDESC file on the disk because part of the file resides on another disk and the other disk is off-line. The system marks the JOBDESC file as a DATA file. If the disk is the one designated as the JOBDESC disk by the DL (Disk Location) ODT command, the system builds a new JOBDESC file. The old job file specifications, job summaries, queued jobs, and settings for SUBSYSTEM, PA (Peripheral Association), and ADM (Automatic Display Mode) are lost.

## Operator action

Restore the lost specifications, settings, and queued jobs if desired.

**PK<unit number> [<no>] <family name> LABEL MISSING FROM SEGMENT 4**

## Cause of message

This message appears after an error occurs during an attempt to access a disk label. The label information required is missing or corrupted. The disk unit remains off-line. The term <no> is the serial number of the affected disk volume.

## Operator action

Use the RC (Reconfigure Disk) ODT command to re-create the label. Note that this process effectively deletes all the files on the disk.

**PK<unit number> LB SERIAL NO. OF MULTI-PACK FAMILY IS DISALLOWED**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit) ODT command with a SERNUM specification. The affected disk is part of a multimember disk family. Since the system uses disk serial numbers as pointers between disks in a multimember family, the LB command is ignored. The disk label is not changed.

## Operator action

Repeat the LB command without the SERNUM clause or issue an RC (Reconfigure Disk) ODT command to start a new disk family.

**PK<unit number> MAT | EXTENT BIGGER THAN PACK  
| ISNT SORTED  
| LINKS ARE BAD**

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This message appears when an error occurs while readying an interchange disk pack with the RY (Ready) ODT command, or at Halt/Load time.

## Operator action

Close the disk pack with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.

**<file name> MCP CHANGE ABORTED (NOT MCP CODE FILE)**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. The <file name> of the MCP code file specified in the CM command was not a valid MCP code file.

## Operator action

Use the PD (Print Directory) ODT command to determine the correct file name. The PD command syntax is "PD <file name> ON <family name>". Copy in the correct file and enter the CM command again.

## System Messages

**<file name> MCP CHANGE ABORTED(NOT PRESENT)**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. The MCP code file specified by <file name> in the CM command is not available.

## Operator action

Use the PD (Print Directory) ODT command to determine the correct file name. The PD command syntax is "PD <file name> ON <family name>". Copy in the correct file and enter the CM command again.

**<file name> MCP VERSION TOO OLD**

## Cause of message

This message appears after a request is made to change the MCP using the CM (Change MCP) ODT command. Because of its version, the requested MCP is incompatible with the current MCP. The MCP change is not done.

## Operator action

If it is necessary to change to the requested MCP, first change to an MCP of some intermediate Mark Release level. Then while running on that MCP, attempt to change to the desired MCP. Note that due to changes in MCP data structures, it might not be possible to change, even indirectly, to the desired MCP.

**PK<unit number>: MIRRORED DISK: VERIFY REQ TO <action>**

## Cause of message

This message occurs when a MIRROR CREATE, PG (Purge), or an RC (Reconfigure Disk) ODT command is directed to a closed mirror.

## Operator action

If you wish to release the unit from the mirror set, use the OK (reactivate) ODT command to respond to the system RSVP. The label of the mirror is changed to indicate that the disk is no longer mirrored.

**PK<unit number> MIRRORED SET IN USE.**

## Cause of message

This message appears after an error occurs during an attempt to use the CLOSE (Close Pack) or POWER (Power Down) ODT command to close a mirrored set. The set indicated by the unit could not be closed, because it was currently in use.

## Operator action

Ensure that all files on the disk are closed, then attempt to close the disk.

**MIRRORED SET(S) STILL EXIST.**

## Cause of message

This message is a response to the "OP-MIRRORING" ODT command. The command is ignored, because mirrored set(s) still exist on the system.

## Operator action

Close all families with mirrored sets or deallocate all mirrored disks using the "MIRROR RELEASE" ODT command.

**PK<unit number> MISSING OR INVALID SERIAL NUMBER**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Disk or Host Command Unit), PG (Purge), or the RC (Reconfigure Disk) ODT command. Either the serial number specified in the SERNUM or BP clause was invalid or no serial number was specified in a SERNUM clause and the disk does not have a valid serial number already. A disk serial number is valid only if it has six or less numeric digits and the value is not equal to 0. The system leaves the disk unlabeled.

## Operator action

Reissue the command with a valid serial number.

## System Messages

**PK<unit number> MOVETOGLOBAL FAILURE**

## Cause of message

This message appears after an error occurs at Halt/Load time, while readying a disk, or while trying to correct a directory error. The system could not find enough buffer space to process the directory on the disk.

## Operator action

Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.

**<file name> MUST BE ALL ON THE SAME FAMILYINDEX**

## Cause of message

This message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command to display, select, or remove an A 3 bootcode file. The file specified is not all on the same family index.

## Operator action

Copy the bootcode file all to the same family index, then reissue the MB command.

**<file name> MUST BE ON A SMD DISK**

## Cause of message

This message appears after an error occurs during an attempt to use the "MB+" (Make Boot) ODT command to display, select, or remove an A 3 bootcode file. The file specified is not on an SMD disk.

## Operator action

Reissue the command for a bootcode file that is located on a Storage Module Device (SMD) disk.

**PK<unit number> NAME REQUIRED**

## Cause of message

This message appears after an error occurs following a label change but before the operation was complete. The specified pack does not have a valid name, and a valid name was not specified in the command. The system leaves the disk unlabeled.

## Operator action

Reissue the command with a valid NAME clause.

**NEED SPACE ON HL FAMILY TO SAVE TAPE DIRECTORY**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. Whenever a copy to tape is initiated, the library maintenance program allocates a temporary disk file on the Halt/Load family. This file is used to save a copy of the tape directory. Not enough space was available on the Halt/Load family to allocate the tape directory file. No files are copied.

## Operator action

Using the "REMOVE" WFL command, remove some files from the Halt/Load family and reissue the COPY request.

**DK<unit number> NEW BACKUP FOR THIS UNIT NOT LABELED**

## Cause of message

This message appears after an error occurred during an attempt to write a duplicate flat directory onto a head-per-track disk. The head-per-track disk specified in the DD (Directory Duplicate) ODT command does not have a label.

## Operator action

Use the RES (Reserve) ODT command to write a label on the disk. The RES command syntax is "RES DK<unit number> LABEL". Then enter the DD command again.

## System Messages

**NO CATALOGING OR BACKUPING WITH CATALOGLEVEL=0**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. A COPY&BACKUP or COPY&CATALOG was requested on an installation that does not use the OP CATALOGING option. No files are copied.

## Operator action

Resubmit the COPY request without the BACKUP or CATALOG option.

**NO CATALOG ACTION (LIBRARY TAPE) (MT) <file name>**

## Cause of message

This message appears after an error occurs during an attempt to execute a "CATALOG DELETE" ODT command. The specified tape unit has a library maintenance tape mounted on it. Library maintenance tape files are never cataloged. The CATALOG DELETE command is ignored.

## Operator action

No action is required.

**PK<unit number> NO DISK AVAIL FOR DUPLICATION**

## Cause of message

This message appears after an error occurs during an attempt to duplicate a flat directory or a catalog. There was not enough free disk space available on the family member to duplicate a catalog with the AD (Access Duplicate) ODT command or to duplicate a flat directory with the DD (Directory Duplicate) ODT command.

## Operator action

Perform the following steps:

1. Ensure that the disk is write enabled. This can be checked with the PER (Peripheral Status) or MODE (Input or Output Mode) ODT command. The syntax is "PER PK" or "MODE PK<unit number>".
2. Use the DU (Disk Utilization) ODT command to determine how much space is available on the disk. The DU command syntax is  

DU <family name> (<family index number>)
3. Use the "REMOVE" WFL statement to remove some files from the disk.
4. Enter the AD or DD command again.

**NO FAMILY <family name> (<family index>)**

## Cause of message

This message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command. The system cannot find the specified family.

## Operator action

Check the specified family name and family index, then reissue the MB command.

**NO FAMILY <family name>**

## Cause of message

This message appears after an error occurs during an attempt to find a disk file. The required disk family could not be located. The family is not on-line, or a directory error occurred while the system was trying to locate the disk. The system may wait for the file or the system may continue the execution of the task without the requested file.

## Operator action

If a program is waiting for the file, do one of the following:

- Bring the family on-line.
- Use the DS (Discontinue) ODT command to discontinue the program.
- Use the OF (Optional File) ODT command to continue the program.

**NO FAMILY <file name> ON | DISK | <volume name> <no>  
 | PACK |  
 | TAPE |**

## Cause of message

This message appears after an error occurs during an attempt to add or remove a file from the catalog. The disk or tape family could not be located. The family was not on-line or was not listed in the volume library, or a directory error occurred while the system was trying to locate the volume library entry for the disk or tape.

## Operator action

If the specified family is not on-line, bring the family on-line, then reissue the command.



## System Messages

**NO FILES ADDED**

## Cause of message

This message appears after the library maintenance program is run, and no files are copied, because of one of the following:

- All the files to be copied are already resident on the destination disks.
- The input files cannot be found.
- Errors prevent successfully copying the files.
- The library maintenance program was discontinued before any files were copied.

## Operator action

No action is required.

**NO FILES COPIED**

## Cause of message

This message appears after the library maintenance program is run and no files are copied, because of one of the following:

- None of the input files can be found.
- Errors prevent successfully copying the files.
- The library maintenance program was discontinued before any files were copied.

## Operator action

No action is required.

**NO MB'ED BOOTCODE FILE FOUND**

## Cause of message

This message appears after an attempt to use the "MB-" (Make Boot) ODT command. The specified bootcode file was not found.

## Operator action

No action is required.

**NOT ADDED <volume name> (<kind>) <no>**

## Cause of message

This message appears after an error occurs during an attempt to mark a volume in the volume library as being related to another volume in the volume library. The program receiving the error continues.

## Operator action

No action is required.

**<file name> NOT ADDED TO <family name>**

## Cause of message

This message appears after an attempt to use the "ADD" WFL command to copy a file to a given destination. The file is not copied to the given destination because a file bearing the same name is already present on the destination, or because an error prevented the copy process from completing.

## Operator action

No action is required.

**PK<unit number> NOT ALLOWED FOR MIRRORED DISK.**

## Cause of message

An ODT command that was just entered is not allowed for disks in mirrored sets.

## Operator action

No action is required.

## System Messages

**PK<unit number> NOT A MIRRORED UNIT.**

## Cause of message

A "MIRROR" ODT command has been directed to an unmirrored unit (for example, the MIRROR RELEASE command). The MIRROR command is ignored.

## Operator action

No action is required.

**PK<unit number> NOT AVAILABLE FOR USE.**

## Cause of message

The unit specified in the "MIRROR CREATE" ODT command is not available for use. Mirror creation is not performed.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

Make sure that the disk is ready, on-line, and not already in use by the MIRROR CREATE command or by a mirror audit application.

**NOT CATALOGED (NOT IN VOLUME LIBRARY) | (MT) [<no>] <file name> |**  
**| (PK) [<no>] <family name> |**

## Cause of message

This message appears after an error occurs during an attempt to use the "CATALOG ADD" ODT command. The volume where the file resides is not "volumed," or a directory error occurred while the system was trying to enter the file name into the catalog. A disk or tape volume does not have an entry in the volume library if it was never added to the library or if it has been deleted from the volume library. In the case of a tape volume, the tape might have been changed at a time when the current volume library was not active. The program continues execution. The term <no> is the serial number of the affected disk or tape volume.

## Operator action

Use the "VOLUME ADD" WFL command to update the volume library.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**NOT CATALOGED(NOT VOLUMED) ON <unit number> <file name>**

## Cause of message

This message appears after an error occurs during an attempt to enter a disk or tape file in the catalog. The tape or disk volume is not in the volume library. A disk or tape volume is not in the volume library if it was never added to the library, if it was deleted, or if the tape volume was changed at a time when the current volume library was not active. The program continues execution.

## Operator action

Use the "VOLUME ADD" WFL command to update the volume library.

**NOT CATALOGED (VOLUME NOT AVAILABLE) | (MT) [<no>] <file name> |**  
**| (PK) [<no>] <family name> |**

## Cause of message

This message appears after an error occurs during an attempt to execute a "CATALOG ADD" WFL command. The system could not determine what tape or disk volume the file was located on. A file on a tape volume is identified by file name, VERSION, and CYCLE. The file specified might not be on the tape volume specified. The CATALOG ADD command is ignored and the program continues. The term <no> is the serial number of the affected disk or tape volume.

## Operator action

Do one of the following:

- Bring the correct disk family on-line, then resubmit the CATALOG ADD request.
- Specify the serial number of the disk or tape volume on which the file is located.
- Check the file name and genealogy to make sure they match the file name and genealogy of the actual file.

## System Messages

**NOT CHANGED <volume name> (<kind>) <no>**

## Cause of message

This message appears after an error occurs during an attempt to update the status of a volumed tape or disk in the volume library. The system sometimes attempts to update volume library entries when a volumed tape or disk is readied on the system. This error message appears if some kind of directory or disk I/O error prevents the system from successfully updating the volume library.

## Operator action

Correct the directory error, then try again.

**PK<unit number> <file name> NOT CHANGED (NOT PRESENT) ON <family name>**

## Cause of message

This message appears after an error occurs during an attempt to change a file name in a disk directory. The attempt failed because the file could not be found. The program receiving the error continues execution.

## Operator action

If the change attempt was the result of the "CHANGE" ODT command, check the spelling of the file name in the CHANGE command and resubmit the CHANGE command.

**PK<unit number> <file name> NOT CHANGED(SEcurity ERROR) ON <family name>**

## Cause of message

This message appears after a security violation occurs during an attempt to change the file name of a permanent disk file. The task issuing the request is not privileged and either does not own the file or does not own the new file name. It is also possible that the file was marked as specially protected by the system or the new file is in conflict with a specially protected system file.

## Operator action

Correct the difficulty and try again.

**PK<unit number> <file name> NOT CHANGED (SYSTEM FILE) ON <family name>**

Cause of message

This message appears after a request to change the name of a disk file fails because the file is marked as a special system file. Special system files include directory files, the active log, userdata files, catalog files, some BADDISK files, and MCP code files on disks with valid Halt/Load bootstraps. The program receiving the error continues processing.

Operator action

If it is permitted, release the special system file from system control, then change the name. Note that, while some special system files can be changed after releasing them from system control, others cannot. For example, the file name of the MCP code file backup Halt/Load disk can be changed after issuing a CM (Change MCP) ODT command; log files can be changed after issuing a TL (Transfer Log) or a DL (Disk Location) ODT command. System BADDISK files can never be changed.

**NOT CHANGED (TOO MANY LEVELS) ON PK<unit number> <file name>**

Cause of message

This message appears after an error occurs during an attempt to use the "CHANGE" WFL command. An existing disk file under the specified directory name has a file name that would, if changed as requested, contain more than 14 directory nodes. The indicated file name is not changed.

Operator action

Resubmit the CHANGE request, specifying a file name with 14 or fewer nodes.

**PK<unit number> <file name> NOT CHANGED (WRITE LOCK OUT)  
ON <family name>**

Cause of message

This message appears after a request to change a file name in a disk directory fails, because the disk is marked "READONLY". The program receiving the error is not terminated because of the error.

Operator action

If the file needs to be changed, then press the Write Lockout switch on all the disks in the family with directories (as necessary). Use the MODE (Input or Output Mode) ODT command to change the WRITE ENABLE status of all the disks in the family with directories and then resubmit the change request.

## System Messages

**<file name> NOT COPIED TO <family name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command to copy a file at a specified destination. The file is not copied. This message is usually preceded by an error message indicating what kind of error prevented the file from being successfully copied. The TASKVALUE of the library maintenance program is set to a nonzero value.

## Operator action

No action is required.

**NOT | DELETED | (NOT FOUND) ON <unit number> <file name>  
 | PURGED |  
 | CATALOGED |**

## Cause of message

This message appears after an error occurs during an attempt to execute a "CATALOG ADD", "CATALOG DELETE", or "CATALOG PURGE" ODT command. The specified file could not be found in the disk directory (or on the indicated tape), or the task executing the statement was not privileged and the file name was not in that task's usercode directory, or a directory error occurred while executing the CATALOG command. The job executing the CATALOG command continues.

## Operator action

If the CATALOG command was issued from the ODT, reissue the CATALOG command, specifying the correct file name, or sign on under the correct usercode and then reissue the CATALOG command.

**NOT DELETED (RESIDENT ENTRY) ON <unit number> <file name>**

## Cause of message

This message appears after an error occurs during an attempt to execute a "CATALOG DELETE" ODT command. The command specified a disk file, but that generation of the disk file is the resident generation of the file, and it has no backup information to delete. The resident disk file is marked as a non-cataloged file and the job issuing the CATALOG DELETE command continues.

## Operator action

No action is required.

**NOT DELETED (SERIAL NUMBER REQUIRED) | (PK) <family name> |**  
**| (MT) <file name |**

Cause of message

This message appears after an error occurs during an attempt to execute a "CATALOG DELETE" ODT command. The system could not determine what tape or disk volume the file was located on. The delete request is ignored and the program continues.

Operator action

Do one of the following:

- Bring the correct disk family on-line, then resubmit the CATALOG DELETE command.
- Specify the serial number of the disk or tape volume that the file is located on.
- Check the file name and genealogy to make sure they match the file name and genealogy of the actual file.

**PK<unit number> NOT INITIALIZED.**

Cause of message

The unit specified in the "MIRROR CREATE" ODT command has not been initialized using the IVR (Initialize, Verify, Relocate) process. Mirror creation is not performed.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

Operator action

Initialize or reinitialize the disk.



## System Messages

**<file name> NOT ON <volume name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command to copy a file. The file to be copied cannot be found on the input volume or the user is not allowed to copy the file because the input file is marked "PRIVATE". If the file is being copied from tape, it is possible that the file was never successfully copied to the tape when the tape was created. The file is not copied. The TASKVALUE of the library maintenance program is set to a nonzero value.

## Operator action

Look for the file directory on another volume.

**<file name>/= NOT ON <volume name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command to copy a file directory. Either the file directory to be copied cannot be found on the input volume or all of the files in the directory are special files (like BADDISK) that cannot be copied. The TASKVALUE of the library maintenance program is set to a nonzero value.

## Operator action

No action is required.

**PK<unit number> NOT PACK TYPE 215 OR 225 - SHOULD IVR WITH SCR**

## Cause of message

This message appears after an error occurs during an attempt to use the IV option of the RC (Reconfigure Disk) ODT command. The disk pack specified is of a type other than pack type 215 or 225. Only pack types 215 and 225 can be reconfigured with the RC command.

## Operator action

Contact a Burroughs field engineer for the proper method to reconfigure disk packs.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**NOT PURGED (SERIAL NUMBER REQUIRED) (PK) <family name>**

## Cause of message

This message appears after an error occurs during an attempt to execute a "CATALOG PURGE" ODT command. The system could not determine what disk volume the file is located on. The purge request is ignored and the program continues.

## Operator action

Do one of the following:

- Bring the correct disk family on-line, then resubmit the CATALOG PURGE command.
- Specify the serial number of the disk or tape volume that the file is located on.
- Check the file name and genealogy to make sure they match the file name and genealogy of the actual file.

**PK<unit number> NOT READY**

## Cause of message

This message appears after the system discovers that a disk that is in use by the system is no longer ready. This may cause disk I/O errors, or it may cause programs using that disk to wait for the disk to become ready again.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

Ready the disk by pressing the ready switch on the unit, or enter a MOVE (Move Job/Pack) ODT command and transfer the disk to another unit.

## System Messages

**PK<unit number> <file name> NOT REMOVED (NOT PRESENT) ON <family name>**

## Cause of message

This message appears after an attempt to use the "REMOVE" ODT command to remove a file from the disk directory fails because the file cannot be found. The program receiving the error is not terminated because of the error.

## Operator action

No action is required.

**PK<unit number> <file name> NOT REMOVED(SEcurity ERROR) ON <family name>**

## Cause of message

This message appears after a security violation occurs during an attempt to remove a permanent disk file from disk. The task issuing the request is not privileged and does not own the file or the file was marked as specially protected by the system. The system marks files such as the dump-to-disk file as specially protected.

## Operator action

No action is required.

**PK<unit number> <file name> NOT REMOVED (SYSTEM FILE) ON <family name>**

## Cause of message

This message appears when an attempt to remove a file from the disk directory fails because the file is marked as a special system file. Special system files include directory files, the active log, userdata files, catalog files, some BADDISK files, and MCP code files on disks with valid Halt/Load bootstraps. The program receiving the error is not terminated because of the error.

## Operator action

If it is permitted, release the file from system control and try again to remove it. While some special system files can be removed after releasing them from system control, others cannot. For example, the MCP code file on a backup Halt/Load disk can be removed after issuing a CM (Change MCP) ODT command; log files can be removed by the TL (Transfer Log) or DL (Disk Location) ODT command. System BADDISK files can never be removed.

**PK<unit number> <file name> NOT REMOVED (WRITE LOCK OUT) ON  
<family name>**

**Cause of message**

This message appears when an attempt to remove a file from the disk directory fails because the disk is marked "READ ONLY". The program receiving the error is not terminated because of the error.

**Operator action**

If it is necessary to remove the file, press the Write Lock switch on the unit and use the MODE (Input or Output Mode) ODT command to change the mode of the family to permit input. Reissue the "REMOVE" WFL command.

**PK<unit number> [<no>] <family name> NO VOL1**

**Cause of message**

This message appears after an error occurs during an attempt to ready a disk for use by the system. The system read the disk label to ready the disk, but the label was missing the VOL1 label identifier. This identifier may be missing if a preceding RC (Reconfigure Disk) ODT command directed to the disk was not completed properly. The system leaves the unit off-line. The term <no> is the serial number of the affected disk volume.

**Operator action**

Check to make sure the correct disk was readied and that no disk I/O problems exist that might have caused the label data to be read incorrectly. Correct the VOL1 label identifier with the LB (Relabel Pack or Host Command Unit) ODT command.

**PK<unit number> [<no>] <family name> NO VOL2, PACK NEEDS RC**

**Cause of message**

This message appears after an error occurs during an attempt to ready a disk for use on the system. The system read the disk label to ready the disk, but the label was not properly formatted. The system leaves the unit off-line. The term <no> is the serial number of the affected disk volume.

**Operator action**

Check to make sure the correct disk was readied and that no disk I/O problems exist that might have caused the label data to be read incorrectly. Close and ready the disk or clear all the files from the disk with an RC (Reconfigure Disk) ODT command.

## System Messages

```

OFFLIN ABANDON FILEHANDLER, TYPE= | SEARCH      | <file name>
                                   | ENTER
                                   | REMOVE
                                   | CHANGE
                                   | PDSEARCH
                                   | ENTER BACKUP
                                   | UPDATE
                                   | AUDIT RECOVER
                                   | TIMESTAMP

```

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This message appears after an error occurs when the specified operation is attempted on an off-line unit on a CATALOGING system. The system has encountered repeated errors while trying to do the specified operation (for example, SEARCH) in the directory of a family that is off-line. This message indicates that the system is discontinuing the operation and returning an error indication to the calling program.

## Operator action

Note the error and correlate it with preceding directory error messages. If a particular program or disk repeatedly encounters directory errors, consider discontinuing the program with the DS (Discontinue) ODT command or closing the disk with the CLOSE (Close Pack) ODT command.

**PK<unit number> OFFLINE.**

## Cause of message

The unit specified in a "MIRROR CREATE" ODT command is not available to the system. Mirror creation is not performed.

This error message is always preceded by the message

```
PK<unit number> NOT CREATED ONTO PK<unit number>.
```

## Operator action

Make sure the disk is ready and on-line.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

```

( <mixno> ) OFFLINEUNIT | READ   | FAST   | CHECKSUM   | ERROR REC=<no>
                       | WRITE  | VOLLIB | HDRLOCATION  |
                       | VAST   | HDRBLOCKLENGTH
                       | FLAT   | HDRMARKER
                       | CAT    | TITLE
                       | PAST   | I/O
                               | NOT READY
                               | UNKNOWN

```

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears after an error occurs while reading or updating a directory. This message provides clues as to what kind of error was encountered during the directory access attempt. The mix number in parentheses refers to the program that encountered the error. <no> refers to the record number of the directory record that encountered the error. The system automatically attempts to recover from the error condition.

## Operator action

You should note the error so it can be correlated with other problems (if any). The error could have been caused by hardware, software, or data errors.

**PK<unit number> OK TO CREATE MIXED PACK FAMILY?**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a BP clause. The disk to be added to the family is not the same model or does not have the same storage capacity as the base pack of the family. The system waits for the operator to reply.

## Operator action

Enter one of the following ODT commands:

OK This causes the RC procedure to continue.

DS This terminates the RC procedure and leaves the new disk unit off-line.

## System Messages

**PK<unit number> OK TO CREATE NEW CATALOG**

## Cause of message

This message appears at Halt/Load time, on CATALOGING systems only. This is a warning message that the system is about to create a new catalog. The system could not find a valid SYSTEM/CATALOG file on the family that was specified by the DL (Disk Location) ODT command as being the family on which the catalog is stored. The system waits for you to reply.

## Operator action

Check that the proper catalog family is on-line. If not, bring the catalog family on-line or change the DL specification. Then Halt/Load again. If you enter the reply "OK", the system builds a new catalog. None of the backup information in the old catalog is available.

**OK TO CREATE PK<unit number> ONTO PK<unit number>?  
PK<unit number> WILL BE OVERWRITTEN.**

## Cause of message

This is a response to a "MIRROR CREATE" ODT command. The system waits for the operator to verify that the disk unit should become a mirror image of another disk.

## Operator action

The operator must use the OK (Reactivate) ODT command to reactivate the task before the on-line creation will proceed.

**PK<unit number> OK TO ERASE BAD RECORDS?**

## Cause of message

This message appears after an error occurs at Halt/Load time or while reading a disk. This message follows a diagnostic message that described an error that was detected in the disk's directory. Your reply determines how the system handles the error.

## Operator action

Decide whether the corrupted directory records are to be erased or ignored, or if the disk is to be marked off-line. Then enter one of the following ODT commands:

OK Corrupted directory records are to be erased. This reply could lead to the loss of some files on the disk. Use this reply unless you suspect that the disk I/O hardware is defective and may be causing the problem. If you enter "OK", the system proceeds with a family rebuild and then marks the disk on-line.

OF The system continues the family rebuild and ignores corrupted directory records. When finished, the system marks the disk on-line, but the disk does not have any available segments for new disk files. For example, programs writing on the disk stop and receive the error condition SECTORS REQ. Use the "OF" reply if files on the disk are needed for input and you do not want to risk losing a vital file via the "OK" reply.

DS The system marks the disk off-line.

Refer to "Family Rebuild Errors" in the section "Recovery" for more information about which reply you should use to resolve the problem.

## See also

Family Rebuild Errors . . . . .117



## System Messages

**PK<unit number> OK TO RE-ENTER INTO VOLUME LIBRARY**

## Cause of message

This message appears at Halt/Load time or while readying a disk, on CATALOGING systems only. This disk family duplicates the name and serial number of a disk family that is listed in the volume library, but this family has a different creation date. The system is asking if this family is a replacement for the old family (for example, if the old family was destroyed).

## Operator action

Decide if the new family is supposed to replace the old family or not. Use the PV (Print Volume) and OL (Display Label and Paths) ODT commands to compare the creation dates. The PV command syntax is "PV PK<unit number>" and the OL command syntax is "OL PK<unit number>". Then enter one of the following ODT commands:

OK The system changes the creation date in the volume library and marks the family on-line. The new disk inherits all the catalog records for the old family.

OF The new family is marked as not volumed. All the catalog information for files on the old family is lost.

**OLD FORMAT HEADERS WILL BE WRITTEN TO FAMILY: <unit number>  
<family name>**

## Cause of message

This message appears either at Halt/Load time or when readying a disk. It is a temporary informational message only. Mark 3.5 Release version disk file headers are written to the directory of the family being brought on-line.

## Operator action

No action is required.

**PK<unit number> [<no>] <family name> OPERATOR DS**

## Cause of message

This message appears at Halt/Load time or while readying a disk. An operator has entered one of two ODT commands. One is the CL (Clear) command, which clears the disk drive on which the specified disk is mounted. The other is a DS (Discontinue) command that was used to discontinue the MCP program that was readying the disk for system use. After the CL or DS command is entered, the system marks the disk off line. The term <no> is the serial number of the affected disk volume.

## Operator action

Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command.

**PK<unit number> OPERATOR DS**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Disk or Host Command Unit), PG (Purge), or the RC (Reconfigure Disk) ODT command.

## Operator action

If the interruption occurred before the label was changed, close and ready the disk. If the interruption occurred after the label was changed but before the operation was complete, reissue the command.

**OUTPUT DISK FAMILY MISSING**

## Cause of message

This message appears after the library maintenance program failed to locate the disk family specified in a "COPY" WFL command. The operator entered a DS (Discontinue) or OF (Optional File) ODT command in response to the system request for the missing family name. No files are copied to the missing destination.

## Operator action

Check the destination family name and resubmit the command.

## System Messages

**PK<unit number> OVERLAPPING EXTENTS IN MAT**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying an interchange disk pack with the RY (Ready) ODT command. Information in the disk label appears to be corrupted.

## Operator action

Close the disk pack with the CLOSE (Close Pack) ODT command and then ready it with the RY command. If this fails, the disk might have to be reinitialized using the IVR (Initialize, Verify, Relocate) process.

**<file name> OVERLAPS ANOTHER FILE ON PK<unit number>**

## Cause of message

This message appears when an error occurs at Halt/Load time or while a base pack is being readied. The error is caused by one of the following problems:

- Part (or all) of the specified disk file overlaps parts of one or more files on the family.
- Part (or all) of the specified disk file overlaps areas of the family reserved for system usage, such as the label area.

Processing of the family continues and when the family is ready, the overlapping file is available for use. Although the file is available for use, part of it probably is damaged. The file probably has damaged any files it is overlapping. This message usually occurs long after the error that caused the conflict occurred. The system accidentally allocated files incorrectly on the family. Although the error is reported while readying the base pack, the overlapping may have occurred on a continuation pack.

## Operator action

Perform the following steps.

1. Use the utility FILEDATA to produce a listing that shows checkerboarding for the disk. This list will show which files are involved in the overlapping.
2. Do one of the following actions:
  - Remove all the files involved in the overlapping from the family and then close and ready the base pack or Halt/load the system. This is the safest choice.
  - Remove some (or all) of the files involved but leave the family on line. The problem with this choice is that it can cause more overlapping, and the files involved in that overlapping may become corrupted. If the corrupted file is one that is used during system functions, such as a code file, the system cannot operate properly.

## System Messages

**PK<unit number> PACK SCRATCHED**

## Cause of message

This message appears after the system has changed the label on a disk to SCRATCH in response to a PG (Purge) ODT command. Any files that were on the disk are effectively gone. A disk marked as a scratch disk is not available for use by the system or any program.

## Operator action

Reconfigure the disk using the RC (Reconfigure Disk) ODT command.

**PK<unit number> PASTSEARCH ERROR UPDATING TIMESTAMP**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. An error prevented the system from updating the catalog entry for the disk.

## Operator action

Close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY command.

**PK<unit number> PERMISSION DENIED.**

## Cause of message

The operator entered a negative reply to the RSVP message for the MIRROR CREATE command. The mirror creation is not performed.

This error message is always preceded by the message

PK<unit number> NOT CREATED ONTO PK<unit number>.

## Operator action

No action is required.

**PK<unit number> PLACED INTO MAINTENANCE MODE**

## Cause of message

This message appears after the system has marked the indicated disk unit off-line and has set the special maintenance bit in the disk I/O controller in response to the UR (Unit Reserved) ODT command.

## Operator action

No action is required.

**PK<unit number> POINTER TO DUPLICATE CATALOG DELETED**

## Cause of message

This message appears after an error occurs at Halt/Load time. A pointer to a catalog file in the catalog family directory was deleted because the catalog file header is corrupted or the catalog header is the wrong type. This message is a warning that one of the catalogs that was in use before the Halt/Load has now been lost.

## Operator action

Ignore this message if the OP (Options) ODT command was used before the Halt/Load to change the CATALOGING option. If the OP command was not used, perform the following steps:

1. Wait for the disk initialization to finish.
2. Use the PD (Print Directory) ODT command to determine which catalog is in use. The PD command syntax for CATALOGING systems is "PD SYSTEM/CATALOG/= ON <family name>". The PD command syntax for non-CATALOGING systems is "PD SYSTEM/ACCESS/= ON <family name>".
3. Enter the AD (Access Duplicate) ODT command to restart catalog duplication if desired.

## System Messages

**PK<unit number> POINTER TO DUPLICATE CATALOG DELETED AFTER BAD WRITE**

## Cause of message

This message appears after an error occurs during directory error correction. An error was detected while trying to update a duplicate catalog with the AD (Access Duplicate) ODT command. The system has marked the duplicate as bad and the catalog is no longer duplicated.

## Operator action

Note the problem and decide if another AD command should be issued to restore the duplicate catalog. The PD (Print Directory) ODT command can be used to determine which catalogs are active. The PD command syntax for CATALOGING systems is "PD SYSTEM/CATALOG/= ON <family name>". The PD command syntax for non-CATALOGING systems is "PD SYSTEM/ACCESS/= ON <family name>".

**PK<unit number> POWERED OFF**

## Cause of message

This message appears after a "POWER OFF" ODT command has caused the system to turn the indicated disk unit off and to remove from main memory all references to that disk.

## Operator action

No action is required.

**PURGED ON <unit number> <file name>**

## Cause of message

This message appears after the execution of a "CATALOG PURGE" ODT command has deleted all the backup information for a file from the catalog. If there is a resident generation, that generation of the file has been marked as not cataloged.

## Operator action

No action is required.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

```

( <mixno> ) PK<unit number> READ | FAST      | CHECKSUM      | ERROR REC=<no>
                                | VOLLIB      | HDRLOCATION     |
                                | VAST        | HDRBLOCKLENGTH|
                                | FLAT        | HDRMARKER     |
                                | CAT         | TITLE         |
                                | PAST        | I/O           |
                                |             | NOT READY     |
                                |             | UNKNOWN       |

```

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears after an error occurs while reading or updating a directory. This message provides clues as to what kind of error was encountered. The mix number in parentheses refers to the program that encountered the error. <no> refers to the record number of the directory record that encountered the error. The system automatically attempts to recover from the error condition.

## Operator action

You should note the error so it can be correlated with other problems (if any). The error could have been caused by hardware, software, or data errors.

**PK<unit number> READER ERROR ON <family name>**

## Cause of message

This message appears after an error occurs during directory error recovery. Subsequently, the directory error recovery procedure can be adversely affected. Disk files, volume library information, and catalog information may be lost.

## Operator action

Correlate this error message with preceding directory error and disk I/O error messages. Resolve disk I/O problems, if possible.



## System Messages

<mixno>	<unit>	READ	FAST	CHECKSUM	ERROR REC=<no>
	CATUNIT	WRITE	VOLLIB	HDRLOCATION	
	OFFLINEUNIT		VAST	HDRBLOCKLENGTH	
	TAPEUNIT		FLAT	HDRMARKER	
	VOLUNIT		CAT	TITLE	
			PAST	I/O	
				NOT READY	
				UNKNOWN	

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears when the system detects an error while reading or updating a directory. The system now automatically attempts some kind of recovery from the error condition.

## Operator action

Note the error so it can be correlated with other problems as they occur. Because the error could have been caused by hardware failure, software failure, or erroneous data, without further information there is little you or the system can do to determine the exact cause of the problem.

**<unit number> REBUILD OF OFFLINEUNIT NOT IMPLEMENTED**

## Cause of message

This message appears after an error occurs during directory error recovery. This message indicates why a directory error could not be corrected.

## Operator action

None.

**PK<unit number> REBUILDING CATALOG <percentage>%**

**Cause of message**

This message appears on CATALOGING systems only. It occurs at Halt/Load time, while readying a disk, while correcting a directory error, while deleting a volume from the volume library, or while closing a disk. <percentage> indicates the percentage of the catalog that has been rebuilt so far. The system is making a list of all the files in the catalog stored on the specified disk. When the list is complete, the disk is marked on-line for use by programs.

**Operator action**

Monitor the catalog rebuild if desired.

**REBUILDING VAST**

**Cause of message**

This message appears after a directory error in the catalog system has caused a rebuild of the VAST (Volume Access Structure Table) to be initiated. The VAST is used by the system to reference the volume library. The system finishes the rebuild before any directory requests for the volume library can be processed. Tasks that explicitly or implicitly need access to the volume library will wait.

**Operator action**

No action is required.

## System Messages

<unit number> REC=<no> FLAT UNKNOWN HEADER VERSION <file name>

## Cause of message

This message appears at Halt/Load time, while readying a pack. The message indicates a possible MCP incompatibility for some of the files on the pack. Files in the directory of the pack have been processed previously by an MCP that is not completely compatible with the current MCP. The files noted by this message cannot be used on the current MCP.

## Operator action

If it is necessary to access the incompatible files, proceed as follows:

1. Stop processing of the directory on the pack by entering the DS (Discontinue) or OF (Optional File) ODT command in response to the "OK TO ERASE BAD RECORDS" RSVP that follows, or enter the CL (Clear) ODT command.
2. Use the CM (Change MCP) ODT command to change to the earliest MCP (the MCP with the lowest release number) that can process this pack without producing the "ADDRESS FIELD OVERFLOW" error. This MCP will have a Mark Release number greater than the MCP on which the system is currently running.
3. Run the SYSTEM/CONVERTHEADERS program to convert the headers to a format that should be compatible with the MCP that originally produced the error.
4. Use the CM command to change back to the MCP that was running when the error was produced.
5. If the error still occurs, repeat steps 1 through 3 using the converted pack. The lowest Mark Release MCP that will recognize the converted headers will have a Mark Release number between the original MCP and the MCP used in step 2.

**PK<unit number> RECENTLY REBUILT, REBUILD BYPASSED**

## Cause of message

This message appears after an error occurs during directory error correction. Ordinarily, every directory error is followed by a rebuild of the File Access Structure Table (FAST) for the given disk family. This message indicates that the system did not initiate an automatic error rebuild because a rebuild has already been tried within the preceding 20 minutes.

## Operator action

Correlate the message with preceding directory error messages. If a known problem has been corrected (for example, the disk was moved from a broken disk drive to an operating disk drive), you can initiate a family rebuild with the RB (Rebuild Access) ODT command. Explicit operator-initiated rebuilds are never bypassed.

**<unit number> RECOPY REQ'D <file name>**

## Cause of message

This RSVP request is preceded by a library maintenance error message. Certain error conditions can be fixed by recopying the file. When such an error occurs, the library maintenance program issues an error message and then asks the operator whether a recopy should be attempted.

## Operator action

The <unit number> refers to a specific destination because files can be copied to several destinations at the same time. You can use any of the following ODT commands:

- DS This terminates library maintenance. Any files that have already been copied remain, but the file in question and any other files that were to be copied are not copied.
- OF This prevents the file from being recopied. Library maintenance continues with the next file.
- FR This prevents any other files from being copied to this destination. If there are no more destinations, the library maintenance program terminates; otherwise, it continues copying to the other destinations.
- OK This allows the file to be recopied. If the error persists then library maintenance will repeat the error message and ask again whether the file should be recopied or not.

Only a few error conditions allow recopying: IO ERROR DURING COPY, COMPARE ERROR, and IO ERROR DURING COMPARE.

## System Messages

<unit number> RECORD SEQUENCE ERROR <file name>

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command to copy a file from a library maintenance tape. The first word of every library maintenance tape block is a sequence number. The sequence number read from this tape was wrong or out of sequence. If this error occurs while reading the source tape directory or disk file header, no more files are copied. If a sequence error occurs while reading data from the source or destination tape, a "RECOPY" RSVP is issued.

## Operator action

If a RECOPY message was issued, answer as you wish, or copy the file from another tape drive. If the problem persists for a particular input tape, then the tape was probably not created correctly or has been permanently damaged.

<unit number> REC=<no>		FAST		FAULT		<file name>
		VAST		BAD MARKERF		
		FLAT		BAD HEADERTITLE		
		CAT		FILEHANDLER ERROR		
		VOL		HEADER LENGTH TOO BIG		
		PAST		INVALID TYPEV		
				HDRLOCATION IS BAD		
				CHECKSUM OF INUSE REC		
				CHECKSUM OF AVAILMARK OR BADAREAMARK		

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears after an error occurs at Halt/Load time, while readying a disk, closing a disk, duplicating a directory, deleting a volume from the volume library, or recovering from a directory error. This message provides clues about a problem found in a directory. <no> refers to the record number of the directory record that encountered the system continues to process the other records in the directory.

## Operator action

You should note the error so it can be correlated with other problems. There is little you or the system can do to determine the exact cause of the problem. The error could have been caused by hardware, software, or data errors.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

<unit number> REC=<no> FLAT UNKNOWN HEADER VERSION <file name>

## Cause of message

This message appears when an error occurs at Halt/Load time or while readying a disk. This message notes a possible incompatibility for some of the files on the disk. Files in the directory of the disk have been previously processed by an MCP that is not completely compatible with the current MCP. The files specified in this message cannot be used by the current MCP. <no> refers to the number of the directory record that encountered the error. This message is followed by the message "OK TO ERASE BAD RECORDS?"

## Operator action

If you need to access files that encounter the UNKNOWN HEADER VERSION error, then perform the following steps:

1. After the "OK TO ERASE BAD RECORDS?" message appears, enter one of the following ODT commands to stop processing of the directory:  
  
DS This reply discontinues the processing of the directory.  
  
OF This reply marks the directory as an optional file and halts processing of the directory.  
  
CL Enter the CL (CLEAR) ODT command with the syntax "CL PK<unit number>", where <unit number> is the unit number of the disk drive on which the disk is mounted.
2. Use the CM (Change MCP) ODT command to change to the MCP that has the lowest release number that can process the disk without producing the ADDRESS FIELD OVERFLOW error. This MCP will have a release number greater than the MCP on which the system is currently running.
3. Run SYSTEM/? to convert the headers to a format that should be compatible with the MCP that originally produced the UNKNOWN HEADER VERSION error.
4. Use the CM command to change back to the MCP on which the system was running when the UNKNOWN HEADER VERSION error occurred.
5. If the UNKNOWN HEADER VERSION error still occurs, then repeat steps 1 through 3, using the disk with the converted headers. The lowest release MCP that will recognize the converted headers will have a release number between the original MCP and the MCP used in step 2.

## System Messages

**PK<unit number> RELEASED FROM MIRRORED SET DUE TO IRRECOVERABLE  
I/O ERROR**

## Cause of message

The disk indicated has been closed and released from the mirrored set. If the set consisted of only two members, the remaining member is no longer mirrored.

## Operator action

You might have to reinitialize the disk using the IVR (Initialize, Verify, Relocate) procedure before the disk can be used by the system again. A new mirror should be created for the set using the "MIRROR CREATE" ODT command.

**PK<unit number> RELEASED FROM MIRRORED SET DUE TO DETECTION OF HUNG I/O**

## Cause of message

The disk indicated has been closed and released from the mirrored set. If the set consisted of only two members, the remaining member is no longer mirrored. This error usually indicates a controller or DLP failure.

## Operator action

Maintenance tests should be performed. A new mirror through a different path(s) should be created for the set using the "MIRROR CREATE" ODT command.

**PK<unit number> RELEASED FROM SET DUE TO LABEL ERROR DURING CLOSE.**

## Cause of message

The indicated disk was released from the mirrored set because its label could not be updated during an attempt to close the set.

## Operator action

You might have to reinitialize the disk using the IVR (Initialize, Verify, Relocate) procedure before the disk can be used by the system again. A new mirror should be created for the set using the "MIRROR CREATE" ODT command.

**PK<unit number> <file name> REMOVED ON <family name>**

Cause of message

This message appears after a permanent disk file has been removed from the disk directory. The file might have been removed because it was replaced by another file with the same file name, because it was named in a "REMOVE" WFL command, or because the file was closed programmatically with the PURGE option. If the file is in use when removed, it remains in use as a temporary disk file until all programs using it have closed it; then it is discarded.

Operator action

No action is required.

**<file name> REQUIRED**

Cause of message

This message appears after an error occurs during an attempt to access the archive catalog. The error occurred on a CATALOGING system with the OP ARCHIVING option set. The old archive catalog file could not be found or the old archive catalog was not usable. The system waits for an operator reply.

Operator action

Enter one of the following ODT commands:

DS This terminates the archive handler procedure and automatically resets the OP ARCHIVING option.

OK This allows the system to create a new archive log file.

IL PK<unit number>

This specifies that the system should retry the search on the selected disk unit.



## System Messages

**PK<unit number> RESERVED**

## Cause of message

This message appears after a disk unit has been reserved for use by the system maintenance subsystem.

## Operator action

No action is required.

**PK<unit number> <file name> ROW LOCKED BY IOERROR ON <family name>**

## Cause of message

This message appears after an error occurs, because a program attempts to access a row of a disk file that has previously been marked (using the "DMLOCKOUT" MCP procedure) as unusable.

## Operator action

No action is required.

**PK<unit number> <no> SECTORS REQUIRED ON <family name>**

## Cause of message

This message appears after an attempt by the system to allocate or extend a disk file on the specified family fails. There is not enough room for the next area of the file. The file needs the indicated number of contiguous disk sectors. The system waits for the requested number of sectors to become available or for the operator to discontinue the program.

## Operator action

Use the DS (Discontinue) ODT command to stop the program or proceed as follows. Make sure the disks in the family are write-enabled. If they are not, press the Write Lockout switch on the unit(s) and enter a MODE (Input or Output Mode) ODT command for each of them. Determine the amount of free space on the family by entering a DU (Disk Utilization) ODT command. Do one or more of the following actions to make additional space available on the family:

- Remove unnecessary files from the family.
- Use the SQUASH (Consolidate Disk Allocation) ODT command to consolidate small available areas into larger available areas.
- Use the RC (Reconfigure Disk) ODT command to add a continuation disk to the family.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

PK<unit number><no> SECTORS REQUIRED (FAMILYINDEX=<no>) ON <family name>

## Cause of message

This message appears after an attempt by the system to allocate or extend a disk file on the specified family fails. There is not enough room for the next area of the file on that disk. The file needs the indicated number of contiguous disk sectors, and the sectors must all be located on the member of the family indicated by the family index <no>. The system waits for the requested number of sectors to become available or for the operator to discontinue the program.

## Operator action

Use the DS (Discontinue) ODT command to discontinue the program or proceed as follows:

1. Make sure the disk specified by the family index is on-line and write-enabled by using the PER (Peripheral Status) ODT command to view the status of all the disks on-line on the system.
2. If the requested family member does not exist, use the DS (Discontinue) ODT command to discontinue the task or use the RC (Reconfigure Disk) ODT command to reconfigure a disk to the specified family. If the requested family member does exist but is not on-line, then ready the disk on an available disk drive. Make sure the requested family member is write-enabled. If it is not, press the Write Lockout switch on the unit and enter a MODE (Input or Output Mode) ODT command.
3. Determine the amount of free space on the disk by using a DU (Disk Utilization) ODT command.
4. Remove unnecessary files from the family.
5. Use the SQUASH (Consolidate Disk Allocation) ODT command to consolidate the individual available disk space into a large contiguous available area.

In some cases, the program that is waiting for sectors can be given an OK (Reactivate) ODT command to cause it to look for space on other family members.

## System Messages

**PK<unit number> <file name> SECURITY CHANGED ON <family name>**

## Cause of message

This message appears after the security attributes of the specified disk file were changed in response to a "SECURITY" WFL statement.

## Operator action

No action is required.

**<file name> SECURITY NOT CHANGED (NOT FOUND)  
PK<unit number> <file name> SECURITY NOT CHANGED (NOT FOUND)  
ON <family name>**

## Cause of message

This message appears after a "SECURITY" WFL command fails. The disk family is not on-line or the disk file is not resident on the disk. The job issuing the SECURITY command continues.

## Operator action

Either bring the disk family on-line or try again on another disk.

**PK<unit number> : SEQ PACK ON NON-SEQ | SUBSYSTEM |  
| SUBSYSTEM, 'OK' OR 'DS'. |**

## Cause of message

This message appears on Host Data Unit (HDU) systems (B 7900 and A 15), when a volume with sequential formatting has been detected on a unit that is not connected with a sequential Data Link Processor (DLP). If brought on-line, the performance of this pack will be degraded.

## Operator action

Enter one of the following:

OK This causes the pack to be brought on-line.

DS This causes the pack to be left off-line.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**PK<unit number> SERIAL NO. ALREADY IN FAMILY**

## Cause of message

This message appears after an error occurs during an attempt to use the RC (Reconfigure Disk) ODT command with a BP clause. The specified disk family already has a continuation disk with the same serial number as the disk to be added. The system leaves the disk unlabeled.

## Operator action

Reissue the RC command with a SERNUM clause to change the serial number of the disk to be added, or use the RC command with a FAMILYINDEX clause to replace the disk with the duplicate serial number. If the FAMILYINDEX clause is used, all the files that were on the old continuation disk with the duplicate serial number are removed.

**PK<unit number> SLOTS FULL**

## Cause of message

This message appears after an error occurs during an attempt to duplicate a catalog with the AD (Access Duplicate) ODT command or an attempt to duplicate a flat directory with the DD (Directory Duplicate) ODT command. Three active directory or catalog files already exist. The system discontinues the duplication operation.

## Operator action

None.

**<unit number> SOME (OR ALL) CATALOG FAST BLOCKS MAY HAVE BEEN LOST**

## Cause of message

This message appears after an error occurs during directory error recovery. This message describes why a directory error could not be corrected.

## Operator action

Note the problem and correlate it with preceding messages to determine the cause of the error.

## System Messages

**PK<unit number> STACK IS DSED**

## Cause of message

This message appears at Halt/Load time or while readying a disk. An operator has entered one of two ODT commands. One is the CL (Clear) command, which clears the disk drive on which the specified disk is mounted. The other is a DS (Discontinue) command that was used to discontinue the system program that was processing the flat directory on the disk. After the CL or DS command is entered, the system marks the disk off line.

## Operator action

Close the disk with the CLOSE (Close Pack) ODT command and ready it again with the RY (Ready) ODT command.

**SYSTEMDIRECTORY/<family index number> MISSING**

## Cause of message

This message appears after an error occurs during an attempt to use the CM (Change MCP) ODT command. The CM operation tries to put a copy of the MCP code file on the family member specified by <family index number>, but that family member does not have an active flat directory.

## Operator action

Perform the following steps:

1. Use the PD (Print Directory) ODT command to determine what directories are active. The PD command syntax is "PD SYSTEMDIRECTORY/= ON <family name>".
2. Use the DD (Directory Duplicate) ODT command to activate directory duplication as required.
3. Enter the CM command again, specifying the family index numbers of the family members that are to receive copies of the MCP code file.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**PK<unit number> TAKEN OUT OF MAINTENANCE MODE**

## Cause of message

This message appears after the system has reset the special maintenance bit in the disk I/O controller in response to the UR (Unit Reserve) ODT command.

## Operator action

No action is required.

```
TAPE ABANDON FILEHANDLER, TYPE= | SEARCH      | <file name>
                                | ENTER
                                | REMOVE
                                | CHANGE
                                | PDSEARCH
                                | ENTER BACKUP
                                | UPDATE
                                | AUDIT RECOVER
                                | TIMESTAMP
```

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This message appears after an error occurs during an attempt to perform the specified operation on a cataloged tape file on a CATALOGING system. The system has encountered repeated errors while trying to do the specified operation (for example, SEARCH) in the selected directory. This message indicates that the system is discontinuing the operation and returning an error indication to the calling program.

## Operator action

Note the error and correlate it with preceding directory error messages. If a particular program repeatedly encounters directory errors, consider discontinuing the program with the DS (Discontinue) ODT command.

## System Messages

**<unit number> TAPE DIRECTORY COMPARE ERROR**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The tape directory read from the given destination does not match what was written to the tape. No more files are copied to that destination tape.

## Operator action

Reissue the COPY command with a different tape drive or a different tape volume.

**<unit number> TAPE DIRECTORY READ ERROR**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command to copy a file to or from tape. The error occurred while reading the list of file names from the tape volume. If the tape is an input tape, no more files are copied. If the tape is an output tape and the read error occurred while comparing directories, then no more files are copied to that tape. Usually no files at all are copied to the tape, but if the failing tape was started after a reel switch, then the beginning of the tape contains the last part of the file that spanned two reels.

## Operator action

Use the COPY command again or move the tape to another tape drive and try again.

**TAPE DIRECTORY TOO BIG**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The error results from an attempt to copy too many files to tape. The exact number of files allowed is very large and it depends in part on the length of the file names. As the length of file names increases, the number of files that can be copied to tape decreases.

## Operator action

Submit a COPY request for fewer files.

**<unit number> TAPE DIRECTORY WRITE ERROR**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command to copy a file to tape. The error occurred while writing the list of file names to the tape volume. No more files are copied to that tape. Usually no files at all are copied to the tape, but if the failing tape was started after a reel switch, then the beginning of the tape contains the last part of the file that spanned two reels.

## Operator action

Use the COPY command, indicating a different tape volume or tape drive.

**<unit number> TAPE DISKHEADER READ ERROR <file name>**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command to copy a file to tape. The error occurred while reading the file header. If the error occurred while reading a source tape header, then no more files are copied. If the error occurred while reading a destination tape header to compare headers, then no more files are copied to that destination.

## Operator action

Use the COPY command again after moving the tape to another tape drive.

**<unit number> TAPE DISKHEADER WRITE ERROR <file name>**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command to write a file to tape. The error occurred while writing the disk file header to tape. No more files are copied to that tape.

## Operator action

Use the COPY command again after moving the tape to another tape drive.



## System Messages

**<unit number> TAPE DOESN'T SEEM TO BACKSPACE <file name>**

## Cause of message

This message appears after an error occurs during an attempt to recopy or compare a library maintenance tape. The library maintenance program issued more than 5000 backspace I/O operations to the tape, but no tape mark was found. If the error occurs on an input source tape, no more files are copied. If the error occurs on a destination tape, no more files are copied to the affected tape.

## Operator action

Use a different tape volume or tape drive, and reissue the COPY request.

**<unit number> TAPE FILE MISSING <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The tape labels for the given file could not be found on the input tape. No more files are copied.

## Operator action

If the input tape was created incorrectly or has been damaged, the affected file cannot be copied. Otherwise, try to copy the file again using a different tape drive.

**<unit number> TAPE NOT LIBRARY TAPE**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command to copy a file from tape. The input tape specified in the COPY command does not have the proper tape label. No more files are copied.

## Operator action

Check the input tape, then try a different tape drive.

**<unit number> TAPE POSITIONING ERROR <file name>**

## Cause of message

This message appears after an I/O error occurs during an attempt to use the "COPY" WFL command to copy a file to or from tape. The error occurred while forward-spacing the unit to try a recopy or to do a compare. No more files are copied to or from the tape.

## Operator action

Use the COPY command on a different tape drive or tape volume.

**TAPEUNIT FAST REBUILD NOT IMPLEMENTED**

## Cause of message

This message appears after an error occurs during directory error recovery on CATALOGING systems. The directory for the tape family cannot be rebuilt. The system discontinues the rebuild attempt.

## Operator action

Note the problem and correlate it with preceding messages to determine the cause of the problem.

```
( <mixno> ) TAPEUNIT | READ | FAST | CHECKSUM | ERROR REC=<no>
                  | WRITE | VOLLIB | HDRLOCATION
                  | VAST | HDRBLOCKLENGTH
                  | FLAT | HDRMARKER
                  | CAT | TITLE
                  | PAST | I/O
                  | NOT READY
                  | UNKNOWN
```

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears after an error occurs while reading or updating the catalog for a cataloged tape file on a CATALOGING system. This message provides clues as to what kind of error was encountered. The mix number in parentheses refers to the program that encountered the error. <no> refers to the record number of the directory record that encountered the error. The system automatically attempts to recover from the error condition.

## Operator action

You should note the error so it can be correlated with other problems (if any). The error could have been caused by hardware, software, or data errors.

## System Messages

**<unit number> TITLE FOUND WAS: <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. The disk file title expected does not match the file title that was found on the tape. This message is issued after the following error message:

**<unit number> FILE TITLE ERROR <file name>**

## Operator action

Find out whether the input tape was correctly created by examining the job log output from the COPY command that originally created the tape. If the tape was correctly created, reissue the COPY command using a different tape drive.

**UNABLE TO SUCCESSFULLY READ BOOTCODE FILE**

## Cause of message

This message appears after an error occurs during an attempt to use the MB (Make Boot) ODT command to display, select, or remove an A 3 bootcode file.

## Operator action

Resolve disk I/O errors and reissue the command or recopy the bootcode file from a tape and reissue the MB command.

**<unit number> UNEXPECTED TAPE MARK - NOT COPIED <file name>**

## Cause of message

This message appears after an error occurs during an attempt to use the "COPY" WFL command. An end-of-file (EOF) was detected in the middle of the data portion of the input tape file. The affected file is not copied.

## Operator action

Find out whether the input tape was correctly created by examining the job log output from the COPY command that originally created the tape. If the tape was correctly created, reissue the COPY command using a different tape drive.

**PK<unit number> UNIT CLOSED**

## Cause of message

This message appears after an error occurs during an attempt to use the CLOSE (Close Pack) ODT command. The system has removed from main memory all references to the specified disk. The disk is now off-line.

## Operator action

No action is required.

**PK<unit number> UNIT IS IN USE**

## Cause of message

This message appears after an error occurs during an attempt to use the CLOSE (Close Pack), the FREE (Free Resources), the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command, or during an attempt to manually power off the disk unit. The disk is in use by a system program, or one or more files on the disk are in use by tasks. The system ignores the command and leaves the disk unchanged.

## Operator action

Use the OL (Display Label and Paths) or PER (Peripheral Status) ODT command to determine how many files are open on the disk. Wait until the disk is not in use or discontinue any tasks or system programs that are using the disk. Then reissue the command. Note that certain disk families, such as the Halt/Load family or the Overlay family (specified using the DL (Disk Location) ODT command), cannot be closed.

**<unit number> UNIT NOT AVAILABLE**

## Cause of message

This message appears after an error occurs during an attempt to use the CLOSE (Close Pack), the FREE (Free Resources), the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command. The unit is not a disk unit, the disk unit is not ready, or there is no operable I/O path to the unit. The command is ignored.

## Operator action

If an LB, PG, or RC command was issued, use the ACQUIRE (Acquire Resources) ODT command to acquire the unit and make sure the disk is ready and that an operable I/O path to the unit exists. Then repeat the command.

## System Messages

**UNIT NOT IN VOLUME LIBRARY ON MT<unit number> <file name>**

## Cause of message

This message appears after an error occurs during an attempt to execute a "CATALOG ADD" ODT command. The file name or cycle/version of an on-line tape file does not match the file name or cycle/version specified in the command for that tape volume.

## Operator action

Correct the CATALOG ADD command and reissue the command.

**UNIT NOT VOLUMED ON | PK<unit number> <family name> [<no>] |  
 | MT<unit number> TAPE[<no>] |**

## Cause of message

This message appears after an error occurs during an attempt to put a disk or tape file into the catalog. The volume the file is located on is not marked as "volumed." A disk or tape volume is not in the volume library if it was never added to the library, if it was deleted, or if the tape has been changed at a time when the current volume library was not active. The system waits for the operator to answer. The value <no> is the serial number of the affected disk volume.

## Operator action

Determine whether the tape or disk should be "volumed." If it should be volumed, use a "VOLUME ADD" ODT command to add the volume to the volume library, then enter one of the following ODT commands:

DS This terminates the waiting program and prevents the file from being put into the catalog.

OK This causes the system to determine whether the volume has been added to the volume library. If so, the file is put into the catalog. If not, the file is not cataloged. In either case, the program continues.

If the VOLUME ADD command is rejected because the serial number duplicates the serial number of a disk or tape already in the volume library, then determine whether that volume should be deleted from the volume library with a "VOLUME DELETE" ODT command. The volume name of the duplicate can be displayed using a PV (Print Volume) ODT command.

**PK<unit number> UNIT RC-ED**

## Cause of message

This message appears after the system has changed the label on a disk in response to an RC (Reconfigure Disk) ODT command. All files that were on the disk are effectively removed. Unless the unit has been saved, the system readies the disk for system use.

## Operator action

No action is required.

**PK<unit number> UNIT RELABELLED**

## Cause of message

This message appears after the system changes the label on a disk in response to an LB (Relabel Pack or Host Command Unit) ODT command. Any files that were on the disk are still available on the disk. Unless the unit has been saved, the system readies the disk for system use.

## Operator action

No action is required.

**PK<unit number> UNIT TURNED OFF**

## Cause of message

This message appears after a disk that was not in use was manually powered down. The system has deleted the descriptive tables for the disk from main memory.

## Operator action

No action is required.

## System Messages

**PK<unit number> UNKNOWN JOB FILE HEADER VERSION ON <family name>**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. A job file found in the JOBDESC file on the disk is not compatible with the current MCP. The system marks the JOBDESC file as a DATA file. If the disk is the one designated as the JOBDESC disk by the DL (Disk Location) ODT command, the system builds a new JOBDESC file. The old job file specifications, job summaries, queued jobs, and settings for SUBSYSTEM, PA (Peripheral Association), and ADM (Automatic Display Mode) are lost.

## Operator action

Restore the lost specifications, settings, and queued jobs if desired.

**PK<unit number> UPDATEPAST | ERROR  
| PASTSEARCH ERROR**

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This message appears when an error occurs during a family rebuild or when the first change is made in the family's flat directory after a family rebuild. While attempting to update the entry in the Pack Access Structure Table (PAST), the system detected a read error (UPDATEPAST PASTSEARCH ERROR) or a write error (UPDATEPAST ERROR). Future references to the flat directory may cause more errors.

## Operator action

Check for hardware I/O errors on the catalog family (the family designated as the catalog family by the DL (Disk Location) ODT command). After correcting these problems (if any), you can use the RB (Rebuild Access) ODT command to initiate a family rebuild.

**PK<unit number> VERIFY FAST RETURNED UNKNOWN DISC**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. The system was trying to determine which family member to use as the base pack.

## Operator action

Use the CLOSE (Close Pack) ODT command to close all of the disks in the family. Then use the RY (Ready) ODT command to ready all the disks in the family for system use.

**PK<unit number> VERIFY REQUEST TO <command>**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), the PG (Purge), or the RC (Reconfigure Disk) ODT command. The disk has a nonblank OWNER field in its label. The system waits for the operator to reactivate or discontinue the request before proceeding.

## Operator action

Check that the correct disk is being altered, then enter one of the following ODT commands:

DS This discontinues the command.

OK This allows the system to proceed with the operation indicated in the pending command.

**VLRECOVERY ERROR CALLING READANDFINDINDEX**

## Cause of message

This message appears after a directory error occurs involving the volume library. The directory error recovery procedure has been initiated. The recovery procedure has encountered a further error while trying to locate and update some information in the volume library.

## Operator action

Correlate this error message with any preceding directory error messages and disk I/O errors. Resolve any disk I/O problems.



## System Messages

**VLRECOVERY ERROR CALLING WRITER**

## Cause of message

This message appears after a directory error occurs involving the volume library. The directory error recovery procedure has been initiated. The recovery procedure has encountered a further error while trying to write some information in the volume library.

## Operator action

Correlate this error message with any preceding directory error messages and disk I/O errors. Resolve any disk I/O problems.

```

VOL ABANDON FILEHANDLER, TYPE= | SEARCH      | <file name>
                               | ENTER
                               | REMOVE
                               | CHANGE
                               | PDSEARCH
                               | ENTER BACKUP
                               | UPDATE
                               | AUDIT RECOVER
                               | TIMESTAMP

```

## Note

This message includes just one entry from the column that contains more than one entry.

## Cause of message

This message appears after an error occurs while attempting to perform the specified operation on a CATALOGING system. The system has encountered repeated errors while trying to do the specified operation (for example, SEARCH) in the volume library. This message indicates that the system is discontinuing the operation and returning an error indication to the calling program.

## Operator action

Note the error and correlate it with preceding directory error messages. If a particular program or disk repeatedly encounters directory errors, consider discontinuing the program with the DS (Discontinue) ODT command or closing the disk with the CLOSE (Close Pack) ODT command.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**PK<unit number> VOLUMED DISK IS BEING CHANGED BY <command>**

## Cause of message

This message appears after an error occurs during an attempt to use the LB (Relabel Pack or Host Control Unit), PG (Purge), or RC (Reconfigure Disk) ODT command. The specified disk is marked as a "volumed" unit. Processing of the command continues.

## Operator action

If the old catalog information for the disk is no longer needed, delete the volume library entry and all the catalog backup information for the family by means of a "VOLUME DELETE" ODT command. If the catalog backup information is still needed, enter OK when the system asks if the old catalog information is to be inherited by the new family.

**VOLUME FAMILY <volume name> (<kind>) [<no>] NOT DELETED (TAPE IN USE)**

## Cause of message

This message appears after an error occurs during an attempt to use the "VOLUME DELETE" or "VOLUME DESTROY" ODT command. The tape volume specified is in use. The command is ignored and the job issuing the request continues execution. The value <no> is the serial number of the affected disk volume.

## Operator action

Wait for the job using the tape to close the tape file, then reissue the VOLUME DELETE or VOLUME DESTROY command.

## System Messages

```

( <mixno> ) VOLUNIT | READ | FAST | CHECKSUM | ERROR REC=<no>
                   | WRITE | VOLLIB | HDRLOCATION
                   | VAST | HDRBLOCKLENGTH
                   | FLAT | HDRMARKER
                   | CAT | TITLE
                   | PAST | I/O
                               | NOT READY
                               | UNKNOWN

```

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears after an error occurs while the system is reading or updating the volume library on a CATALOGING system. This message provides clues as to what kind of error was encountered. The mix number in parentheses refers to the program that encountered the error. <no> refers to the record number of the directory record that encountered the error. The system automatically attempts to recover from the error condition.

## Operator action

You should note the error so it can be correlated with other problems (if any). The error could have been caused by hardware, software, or data errors.

**PK<unit number> WAITING FOR DIRECTORY EXPANSION TO COMPLETE BEFORE  
PERFORMING DD-**

## Note

This message is displayed on one line on the ODT.

## Cause of message

This message appears after an error occurs during an attempt to delete a duplicate flat directory with the DD (Directory Duplicate) ODT command. The "DD-" version of the DD command is being delayed until the system finishes updating the flat directory.

## Operator action

No response is required. If the DS (Discontinue) ODT command is used to discontinue the update of the flat directory, the "DD-" operation is discontinued.

## DISK SUBSYSTEM SOFTWARE OVERVIEW

**PK<unit number> WAITING ON: <file name>**

## Cause of message

This message appears when one task is using the specified disk file and another task is waiting to use the same file. One or both of the tasks have set the EXCLUSIVE file attribute to TRUE. The system waits for the task(s) currently using the file to close it, then grants access to the waiting task.

## Operator action

If you wish, use the DS (Discontinue) ODT command to discontinue the task that is waiting for the file, or the task(s) that are using it.

**PK<unit number> WRITE ERROR CHANGING JOBDESC FILE**

## Cause of message

This message appears after an error occurs at Halt/Load time or while readying a disk. An I/O error prevented the system from processing a JOBDESC file on the disk. The disk is marked off-line.

## Operator action

If the disk contains the active JOBDESC file that was designated by the DL (Disk Location) ODT command, use the DL command to move the JOBDESC file to another family. If the disk does not contain the active JOBDESC file that was designated by the DL (Disk Location) ODT command, close the disk with the CLOSE (Close Pack) ODT command and then ready it with the RY (Ready) ODT command. The old job file specifications, job summaries, queued jobs, and settings for SUBSYSTEM, PA (Peripheral Association), and ADM (Automatic Display Mode) are lost.

**PK<unit number> WRITE ERROR DURING DIRECTORY COPY**

## Cause of message

This message appears after an error occurs during the use of the AD (Access Duplicate) ODT command, the DD (Directory Duplicate) ODT command, or directory listing programs such as the FILEDATA utility. This message refers to problems encountered while making a copy of the directory. The system discontinues the copy operation. This message was preceded by a message that described the nature of the I/O error.

## Operator action

Correct the I/O error and re-enter the AD or DD command, or the directory listing program.

## System Messages

```

( <mixno> ) PK<unit number>  WRITE | FAST   | CHECKSUM   | ERROR=<no>
                               | VOLLIB  | HDRLOCATION  |
                               | VAST    | HDRBLOCKLENGTH
                               | FLAT    | HDRMARKER  |
                               | CAT     | TITLE      |
                               | PAST    | I/O        |
                               |         | NOT READY  |
                               |         | UNKNOWN    |

```

## Note

This message includes just one entry from each column that contains more than one entry.

## Cause of message

This message appears after an error occurs while updating a directory. This message provides clues as to what kind of error was encountered. The mix number in parentheses refers to the program that encountered the error. <no> refers to the record number of the directory record that encountered the error. The system automatically attempts to recover from the error condition.

## Operator action

You should note the error so it can be correlated with other problems (if any). The error could have been caused by hardware, software, or data errors.

**PK<unit number> WRITE LOCKOUT.**

## Cause of message

The unit specified in a "MIRROR CREATE" ODT command is not write-enabled. Mirror creation was not performed.

This error message is always preceded by one of the following messages:

```
AUDIT NOT SUCCESSFULLY APPLIED TO PK<unit number>.
```

or

```
PK<unit number> NOT CREATED ONTO PK<unit number>.
```

## Operator action

Make sure the disk is write-enabled.

**PK<unit number> WRITER ERROR ON <family name>**

## Cause of message

This message appears after an error occurs during directory error recovery, while the system was writing a directory record from disk. The disk directory may lose some disk files, catalog information, and volume library information.

## Operator action

Correlate this error message with any preceding directory error messages and disk I/O error messages. Resolve the disk I/O problems, if possible.

**<file name> (XDISKFILE) CANNOT BE COPIED**

## Cause of message

This message appears after an error resulting from an attempt to use the "COPY" WFL command to copy a BADDISK file. BADDISK files cannot be copied.

## Operator action

Try copying another file.

## GLOSSARY

This glossary defines terms as they are used in this manual. These terms may have a broader definition outside the scope of this manual.

### **access structure**

A special file used by the system to determine the location of files stored on the disk subsystem. On non-CATALOGING systems, the access structure contains entries that are used to locate files that are accessible to the system. On CATALOGING systems, the access structure contains entries that are used to locate all available versions of a file. The access structure is also called the catalog on both CATALOGING and non-CATALOGING systems.

### **address**

The identification of the location of a disk sector.

### **ADM**

See "Automatic Display Mode."

### **Automatic Display Mode (ADM)**

A scheme by which the system writes screens of information on an Operator Display Terminal (ODT).

### **alternate Halt/Load family**

A family that contains a backup copy of the MCP code file and is not the current Halt/Load family. If the current Halt/Load family fails, the alternate Halt/Load family can be used to operate the system.

### **alternate Halt/Load unit**

A disk that contains a duplicated MCP code file and is a member of the current Halt/Load family.

### **ARCHIVING**

The system option that, when enabled with the OP (Options) ODT command, allows the system to store and retrieve information about old generations of cataloged files in a database.

**area**

The amount of contiguous disk space that is allocated at one time to a disk file as it is being created or expanded. An area is also referred to as a row.

**available disk table**

A table maintained by the system that keeps track of the space available on each disk in the system.

**Available Table (AVT)**

A list used in B 2000/B 3000/B 4000 Series machines to determine what space on a disk can be used for allocating new files.

**AVT**

See "Available Table."

**backup**

- (1) A copy of a file on a CATALOGING system that has been saved with the "COPY & BACKUP" WFL statement.
- (2) A copy of a file that is stored off-line so that it can be copied back in if the original file becomes corrupted or inaccessible.

**base pack**

A disk that contains a copy of the flat directory for that disk's family and is currently being used by the system to identify and access the family.

**block**

A group of physically adjacent records that are transferred to or from a file as a single unit.

**CANDE**

See "Command AND Edit language."



## Glossary

**catalog**

- (1) A file that stores the access structure, which is information about the disks in the system and the disk files. This file is named SYSTEM/CATALOG/<family index number> on CATALOGING systems and SYSTEM/ACCESS/<family index number> on non-CATALOGING systems.
- (2) The component of the SYSTEM/CATALOG file on CATALOGING systems that keeps track of the backup copies of files.

**catalog family**

The disk family designated by the DL (Disk Location) ODT command as being the one on which SYSTEM/CATALOG or SYSTEM/ACCESS is stored.

**catalog level**

An integer value that determines how many generations of each file an installation can have. The catalog level is established by assigning a value to the CATALOGLEVELSET define that is compiled into the MCP. CATALOGLEVELSET can be assigned a value in the range 1 through 7. The default value is 3.

**catalog rebuild**

The process on a CATALOGING system in which the system updates the File Access Structure Table (FAST) with information about backup copies of cataloged files.

**cataloged file**

A file that has been entered into the catalog. A file can be entered into the catalog by using the "CATALOG ADD" or "COPY & CATALOG" WFL statement, by assigning the USECATALOG file attribute the value TRUE, or by enabling the system option USECATDEFAULT.

**CATALOGING**

A system option that, when enabled with the OP (Options) ODT command, allows the system to keep track of copies of files that have been backed up onto tape or disk.

**checkerboarding**

A situation in which there are only small areas available between the in-use areas of a disk. There may be many available sectors, but the system may not be able to use the sectors because contiguous groups of sectors are too small for an area of a file to be stored there.

**CHECKSUM**

A directory test that performs a parity check of a directory record to ensure that the directory record has not been corrupted.

**code file**

A file produced by a compiler when a program is compiled.

**Command AND Edit (CANDE) language**

A language that provides generalized file preparation and updating capabilities.

**complementing**

The process the system uses to construct an available disk table. The MCP starts with the entire disk available and then reads the disk file headers on a family to determine what space is already allocated. The MCP then takes the complement of the allocated space to determine what space is still available.

**continuation pack**

A disk that is not being used currently as the base pack for a family. A continuation pack can have a copy of the flat directory for the family.

**CYCLE**

A file attribute that can be used with the VERSION file attribute to distinguish the generations of a file.

**cylinder**

All the tracks on all the platters of a disk that have the same radius.

**Data Link Processor (DLP)**

A processor that serves as the controller of one or more peripheral devices or data communications lines and provides the interface between the system and the peripherals and lines.

**Data Management System II (DMSII)**

The Burroughs database management system.

**disk**

A data storage device that consists of one or more circular platters containing magnetic bits of information that are stored in concentric circles called tracks. In this manual, the term "disk" is used to refer to both head-per-track disks and disk packs.

**disk drive**

The hardware device on which a disk is mounted. The disk drive has read/write heads that access the data on the disk so the data can be used by the system.

**disk drive controller**

The hardware device on A Series and B 5000/B 6000/B 7000 Series systems that controls the disk drive units and transfers information between the host system and the disk drive units. On some systems, this device is also known as a D-Machine.

**disk file**

A named collection of data that is stored on a disk.

**disk file header**

A data structure that contains information about a disk file. The disk file header for a temporary file is stored in main memory, while the disk file header of a permanent file is stored in the flat directory of the family on which that file resides. This information includes the physical location of the file on the disk and various file attributes. Disk file headers are also referred to as headers.

**disk pack**

A disk that consists of multiple platters on a central spindle. Data on a disk pack is accessed by movable read/write heads. Some disk packs are removable. Disk packs are also referred to as packs.

**DLP**

See "Data Link Processor."

**DMSII**

See "Data Management System II."

**end-of-file (EOF)**

A code at the end of a data file that signals that the last record in the file has been processed.

**EOF**

See "end-of-file."

**end-of-volume (EOV)**

A code at the end of a tape volume that signals the last record in the volume has been processed, but that the file is continued on another tape.

**EOV**

See "end-of-volume."

**family**

One or more disks that are logically grouped together and treated as a single entity by the system. Each family has a family name, and all the disks in the family must have been entered into the family with the RC (Reconfigure Disk) ODT command.

## Glossary

**family index number**

A three-digit number the system assigns to each disk in a family when the disk is added to the family. The base pack is assigned the family index number 001, the first continuation pack is assigned 002, and so on.

**family member**

A disk that is a base back or continuation pack in a family.

**family name**

Up to 17 alphanumeric characters assigned by an installation to identify a family of disks.

**family rebuild**

The process in which the system reconstructs the File Access Structure Table (FAST) entry for a family by reading its flat directory.

**FAST**

See "File Access Structure Table."

**File Access Structure Table (FAST)**

A special file that is part of the access structure the system uses to locate disk files. The FAST contains a pointer to each disk file's header in the flat directory of each family.

**file attribute**

Specifications for a file that define basic information about that file. The system uses this information in file handling. File attributes are stored in the disk file header.

**file name**

A unique identifier for a file that consists of 1 to 14 name constants separated by slashes. Each name constant consists of 1 to 17 letters, digits, hyphens, or underscores. Refer to the "Work Flow Language (WFL) Reference Manual" for more information about file-naming syntax.

**file title**

The complete identifier for a file that consists of the file name and the family name.

**flat directory**

A special structure on each family that the system uses to locate files on that family. The flat directory contains disk file headers for each permanent file in the family. The flat directory is also referred to as the system directory.

**genealogy**

The ranking of a generation of a file relative to the other generations of that file. The generation with the highest CYCLE, the highest VERSION within that CYCLE, and the most recent timestamp within that CYCLE and VERSION is said to have the best genealogy.

**GENERATION**

A file attribute on CATALOGING systems that allows you to select a particular generation.

**generations**

The different copies of a file that are available. The generation of a file is determined by the file attributes CYCLE and VERSION, and also the timestamp of the file.

**Halt/Load**

A system initialization procedure that loads a fresh version of the MCP from disk to main memory.

**Halt/Load family**

The disk family that contains the current MCP code file.

**Halt/Load unit**

The disk that contains the current MCP code file.

**HDRLOCATION**

A directory record test that ensures that the directory record has the correct record number.

**HDRMARKER**

A directory record test that ensures that the directory record is of the correct type.

**header**

A data structure that contains information about a disk file. The header for a temporary file is stored in main memory, while the header of a permanent file is stored in the flat directory of the family on which that file resides. This information includes the physical location of the file on the disk and various file attributes. Headers are also referred to as disk file headers.

**head-per-track disk**

A disk that has one fixed read/write head for each track. A head-per-track disk cannot be removed from the disk drive on which it is mounted.

**IAD**

See "Installation-Allocated Disk."

**Initialize, Verify, and Relocate (IVR)**

A procedure used to write sector boundaries and a blank label on a disk. The IVR procedure can also be used to make a damaged disk re-usable by eliminating defective sectors.

**input/output (I/O)**

An operation in which the system reads data from or writes data to a peripheral device such as a disk drive.

**Installation-Allocated Disk (IAD)**

A special type of native-mode disk on which the users specify the actual sector addresses where files are to be stored.

**interchange disk pack**

A disk pack with a directory format that allows files to be transferred from a Burroughs A Series or B 5000/B 6000/B 7000 Series system to other Burroughs systems such as a B 1000 or B 2900/B 3900/B 4900 system.

**IVR**

See "Initialize, Verify, and Relocate."

**I/O**

See "input/output."

**I/O controller**

The processor that provides the interface between the host system and peripheral devices such as the disk drive controller.

**label**

The first 28 sectors on a disk, on which information about the disk is stored. This information includes the family name and serial number, the Master Available Table (MAT), the family index number, information about the family's base pack, and a pointer to the flat directory if the disk contains a directory.

**label error**

An error that indicates that a disk's label or flat directory was not processed correctly when the disk was prepared for system use with the RY (Ready) ODT command.

**LAST**

See "Local Access Structure Table."

**Local Access Structure Table (LAST)**

A special file located on the base pack that is used to update the Family Access Structure Table (FAST) each time a base pack is brought on-line. The main value of the LAST is that it prevents many time-consuming family rebuilds.



## Glossary

**logical record**

The amount of data that is accessed in the execution of one read or write statement in a program.

**look-ahead buffer**

The buffer area where the system stores records of disk files that it expects to access soon, such as the next record of a file that is being read sequentially.

**Master Available Table (MAT)**

A table stored on each disk that lists the valid sectors on the disk that were successfully processed by the Initialize, Verify, and Relocate (IVR) procedure. Pointers to defective sectors are deleted from the MAT so that the defective sectors will not be accessed. The MAT normally lists the entire disk as being available.

**Master Control Program (MCP)**

The program that controls the operations of the system.

**MAT**

See "Master Available Table."

**MCP**

See "Master Control Program."

**Message-Level Interface Processor (MLIP)**

The input/output (I/O) processor associated with a Central Processor Unit (CPU).

**MLIP**

See "Message-Level Interface Processor."

**multidisk family**

A family that consists of more than one disk. The system treats the family as a single entity.

**native-mode disk**

The type of disk used on nearly all Burroughs A Series systems. When this manual refers to the term "disk," it is referring to native-mode disks unless otherwise noted.

**nonremovable disk**

A disk that cannot be removed from the disk drive on which it is mounted.

**nonresident**

A file is nonresident if it is stored on a backup tape or if it is a backup copy of a file that is stored on a disk family that is not the same as the family on which the primary copy of the file is stored. This term does not always pertain to the RESIDENT file attribute.

**ODT**

See "Operator Display Terminal."

**on-line**

A disk is on-line if it is mounted on a disk drive that is ready and has not been made inaccessible to the system with the UR (Unit Reserved), SV (Save), CLOSE (Close Pack), or FREE (Free Resources) ODT command, and if its label and flat directory (if it has one) have been read successfully.

**Operator Display Terminal (ODT)**

A computer terminal used to enter ODT commands and WFL statements that control the system's operation.

**Outstanding Write List (OWL)**

A table used by a disk subsystem that uses the Mirrored Disk feature. The table is used to assure that writes to one disk in a mirrored set are also made to the remaining disks in the set.

## Glossary

**OWL**

See "Outstanding Write List."

**PA**

See "Peripheral Association."

**pack**

A disk that consists of multiple platters on a central spindle. Data on a pack is accessed by movable read/write heads. Some packs are removable. Packs are also referred to as disk packs.

**Pack Access Structure Table (PAST)**

A special part of the access structure that the system uses to locate disk families. The PAST contains pointers into the File Access Structure Table (FAST) that indicate where in the FAST the entries for a family's files are stored.

**PAST**

See "Pack Access Structure Table."

**Peripheral Association (PA)**

A scheme used by operators to cause the job output submitted through a specified peripheral device to be directed to another specified unit.

**peripheral device**

A hardware I/O device. In this manual, the term "peripheral device" refers to disk drives.

**permanent file**

A disk file that has been closed so that its header has been placed in the flat directory of the family on which the file is stored.

**presence-bit interrupt**

An interrupt that notifies the MCP that an array or code file segment is needed that is not in main memory. The system then allocates space for the array or code file segment. When an array is needed, the system creates it or reads it in from the overlay file. When a code file segment is needed, the system reads it into main memory from disk.

**read/write head**

The component of the disk drive that actually transmits data to and from the disk.

**rebuild**

- (1) A family rebuild, which is the process in which the system constructs the File Access Structure Table (FAST) entry for a family by reading its flat directory.
- (2) A catalog rebuild, which is the process on a CATALOGING system in which the system updates the FAST with information about cataloged files.

**removable disk**

A disk that can be removed from the disk drive on which it is mounted.

**resident**

A file is resident if it is the primary copy of the file (as opposed to a backup copy), and it is stored on a disk, regardless of whether the disk is on-line or not. This term does not apply to backup copies of files that are stored on another disk family. This term does not always pertain to the RESIDENT file attribute.

**row**

The amount of contiguous disk space that is allocated at one time to a disk file as it is being created or expanded. A row is also referred to as an area. The MCP uses the term "row" in its processing.

## Glossary

**scratch tape**

A tape that has been purged so that it is available for re-use; the name of the tape is SCRATCH.

**sector**

The physical units that disks are divided into. Burroughs A Series system sectors are 30 words, or 180 bytes, long. Sectors are also referred to as segments.

**seek**

The movement of the read/write heads of a disk drive to the specified track of the disk mounted on the disk drive.

**segment**

The physical units that disks are divided into. Burroughs A Series system segments are 30 words, or 180 bytes, long. Segments are also referred to as sectors.

**serial number**

The six-digit number an installation assigns to a disk to uniquely identify it. The serial number is stored on the label of the disk.

**system directory**

A special structure on each family that the system uses to locate files on that family. The system directory, which is also referred to as the flat directory, contains disk file headers for each permanent file in the family.

**system file**

System software such as the MCP, flat directories, and the access structure that are stored on disk as files.

**SYSTEM/ACCESS**

The name of the file on non-CATALOGING systems that contains the access structure.

**SYSTEM/CATALOG**

The name of the file on CATALOGING systems that contains the access structure and the catalog.

**temporary file**

A file that does not need to be saved. When a temporary disk file is closed, its disk space is returned to the system. A temporary file's header is not stored in the flat directory.

**tightly-coupled system**

A multiprocessing system with individual local memory subsystems. Not all these subsystems are visible to all processors.

**timestamp**

A system attribute that the system maintains for each file that notes the time and date a file was last altered. If a file has never been altered, the timestamp specifies the time and date the file was created. CATALOGING systems use the timestamp to keep track of file generations.

**track**

One of the concentric circles on a disk on which the data is stored.

**unit**

A peripheral device such as a disk drive.

**unit number**

The number an installation or field engineer assigns to a peripheral device such as a disk drive.

**USECATDEFAULT**

The system option that, when enabled with the OP (Options) ODT command, assigns TRUE as the default value of the USECATALOG file attribute.

**VAST**

See "Volume Access Structure Table."

**VERSION**

A file attribute that can be used with the CYCLE file attribute to distinguish the generations of a file.

**volume**

A tape reel or disk. The term "volume" is not restricted to the volume library on a CATALOGING system.

**Volume Access Structure Table (VAST)**

A section of the catalog file on CATALOGING systems that the system uses to access the volume library.

**volume library**

A section of the catalog that keeps track of all volumed disks and tapes used on a CATALOGING system.

**volumed disk**

A disk that has been entered into the volume library with the "VOLUME ADD" WFL statement so that the disk can be used to store cataloged files on a CATALOGING system.

**WFL**

See "Work Flow Language."

**Work Flow Language (WFL)**

The control card language used to submit jobs to Burroughs computer systems.





## Index

- Access structure, 22
  - requirements, 72
- AD (Access Duplicate) ODT command, 84
- ADD & CATALOG statement, 51
- Alternate Halt/Load families, 91
- Alternate Halt/Load unit, 85
- Area, 10
- AREALENGTH file attribute, 17
- AREAS file attribute, 17
- Available disk table, 28
  
- Backup copies
  - making on CATALOGING system, 52
  - making on non-CATALOGING system, 81
- Backup Halt/Load families, 91
- Bad sectors, isolating, 107
- Base pack, 13
  - creating, 32
  - replacing on CATALOGING system, 65
  - replacing on non-CATALOGING system, 108
- BLOCKSIZE file attribute, 17
- Boot unit, 70
  
- Catalog
  - components, 38
  - creating and using backup copies, 62
  - duplication, 84
  - entering files into, 51
  - level, 40
  - rebuild, 61
  - removing entries from, 54
  - replacing, 63
- CATALOG ADD statement, 51
- CATALOG DELETE statement, 54
- CATALOG PURGE statement, 54
- Cataloged file
  - accessing, 52
  - making backup copies, 52
- CATALOGING, 37
  - backup tapes, purging, 54
  - functions, 38
  - impact on system performance, 67
  - setting up, 50
  - using, 51
- CATALOGLEVELSET, 40
- checkerboarding, 34
- CM (Change MCP) ODT command
  - for creation of alternate Halt/Load family, 91
  - for MCP code file allocation, 70
  - for MCP code file duplication, 85
- Code files, See System code file requirements

- Consolidating disk space, 34
- Continuation pack, 13
  - creating, 32
  - replacing, 109
- COPIES file attribute, 81
- COPY & BACKUP statement, 52
- COPY & CATALOG statement, 51
- CREATIONDATE file attribute, 17
- CREATIONTIME file attribute, 17
- CYCLE file attribute
  - on CATALOGING systems, 39
  - on non-CATALOGING systems, 18
- Cylinder, 8
  
- Damaged or destroyed disk
  - on CATALOGING system, 65
  - on non-CATALOGING system, 108
- DD (Directory Duplicate) ODT command, 82
- Defective sectors, isolating, 107
- DEPENDENTSPECS file attribute, 18
- Directory
  - complementing, 28
  - error recovery, 113
- Disk, 8
  - checkerboarding, 34
  - consolidating space, 34
  - diagram of physical structure, 10
  - family, 13
  - initializing, 29
  - label, 13
  - moving data after I/C errors, 112
  - moving to another disk drive after I/O errors, 110
  - name, 29
  - off-line, 33
  - on-line, 33
  - reconfiguring, 29
  - replacing on CATALOGING system, 65
  - replacing on non-CATALOGING system, 108
  - serial number, 29
  - types used on A Series systems, 31
- Disk file, See File
- Disk file header, 11
- Disk pack, 8
  - nonremovable, 8
  - removable, 8
- Disk subsystem
  - components, 7
  - general concepts, 7
  - types of problems, 105
- DUPLICATED file attribute, 81
- Duplication
  - catalog file, 84

## Index

- Duplication (cont.)
  - comparison of commands, 89
  - flat directory, 82
  - MCP code file, 85
  - monitoring, 88
  
- Error messages, See System messages
- Error recovery, See Recovery
  
- Family, 13
  - base pack, 13
  - index number, 15
  - name, 29
  - specification statement, 75
  - substitution, 75
- Family rebuild, 27
  - error, 117
  - reducing, 27
- FAMILYINDEX file attribute, 13
- FAMILYNAME file attribute, 16
- FAST, See File Access Structure Table
- File, 16
  - access of, 25
  - allocation, 73
  - header, 11
  - nonresident, 20
  - permanent, 20
  - resident, 20
  - temporary, 20
  - title, 13
- File Access Structure Table, 23
  - diagram of, 23
- File attributes, 16
  - AREALENGTH, 17
  - AREAS, 17
  - BLOCKSIZE, 17
  - COPIES, 81
  - CREATIONDATE, 17
  - CREATIONTIME, 17
  - CYCLE on CATALOGING systems, 39
  - CYCLE on non-CATALOGING systems, 18
  - DEPENDENTSPECS, 18
  - DUPLICATED, 81
  - FAMILYINDEX, 13
  - FAMILYNAME, 16
  - FILEKIND, 16
  - FILENAME, 16
  - FRAMESIZE, 16
  - GENERATION, 40
  - KIND, 16
  - MAXRECSIZE, 17

## File attributes (cont.)

- NEWFILE, 16
- USECATALOG, 51
- VERSION on CATALOGING systems, 39
- VERSION on non-CATALOGING systems, 18
- FILECOPY, 81
- FILEDATA, 81
- FILEKIND file attribute, 16
- FILENAME file attribute, 16
- Flat directory, 11
  - duplication, 82
  - name, 15
  - relationship to File Access Structure Table, 23
- FRAMESIZE file attribute, 16

## Generation

- on CATALOGING systems, 39
- on non-CATALOGING systems, 18
- GENERATION file attribute, 40

## Halt/Load family

- allocation, 74
- alternate, 91
- duplicate MCP code file, 85

Halt/Load unit, 70

- alternate, 85

Head-per-track disk, 8

Header, 11

IAD, See Installation-Allocated Disk

Initialize, Verify, and Relocate, 29

Installation-Allocated Disk, 31

Interchange disk pack, 31

Intrinsics, See System intrinsic requirements

IVR, See Initialize, Verify, and Relocate

Job file requirements, 71

JOBDESC file requirements, 71

KIND file attribute, 16

Label, 13

LAST, See Local Access Structure Table

Libraries, See System library requirements

Line Support Processor files, 74

LISTVOLUMELIB, 38

LOADER, 80

## Index

- Local Access Structure Table, 27
- Log, See SYSTEM/SUMLOG
- LOGANALYZER, 116
- Logical record, 17
- LSP files, See Line Support Processor files
  
- Master Available Table, 29
- MAT, See Master Available Table
- MAXRECSIZE file attribute, 17
- MCP code file
  - duplication, 85
  - requirements, 70
- MIRROR AUDIT command, 100
- Mirror Information Table, 100
- Mirrored Disk
  - alternate Halt/Load family, 101
  - audit tables, 101
  - automatic release, 101
  - backup and audit features, 93
  - benefits, 93
  - bringing outdated packs on-line, 102
  - bringing the disk on-line, 99
  - changing Halt/Load units, 102
  - deallocating mirrors, 101
  - Halt/Loading with mirrored critical units, 100
  - Halt/Loading with mirrored noncritical units, 100
  - I/O throughput, 93
  - invalidated disk label, 101
  - invalidated linkage between mirrors, 102
  - limitations on use, 99
  - mirror audit, 99
  - out-of-date members, 101
  - overview, 93
  - partial mirrored sets, 100
  - precautions, 102
  - preparing a pack, 98
  - prerequisites for use, 99
  - Recovery, 100
  - transferring MCPs, 101
- MIT, See Mirror Information Table
- Multidisk family, 13
  - creating, 32
  - diagram of, 14
  
- Native-mode disk, 31
- Network Support Processor files, 74
- NEWFILE file attribute, 16
- Nonremovable disk pack, 8
- Nonresident file, 20
- NSP files, See Network Support Processor files

- Off-line disk, 33
- On-line disk, 33
- Operator Display Terminal command overview, 35
- Outstanding Write List, 100
  - corruption of, 100
- Overlay file requirements, 70
- OWL, See Outstanding Write List
  
- Pack Access Structure Table, 23
- PAST, See Pack Access Structure Table
- Permanent file, 20
  - removing, 21
- Platter, 8
- Presence-bit interrupt, 70
- Printer and punch backup files
  - requirements, 71
- Purging catalog backup tapes, 54
  
- RC command "OWNER" clause, 29
- Read/write head, 8
- Recovery, 105
  - damaged or destroyed disk, 108
  - directory error, 113
  - family rebuild error, 117
  - isolating defective sectors, 107
  - moving data to another disk, 112
  - moving disk to another drive, 110
- Removable disk pack, 8
- Resident file, 20
- Row, 10, See also Area
  
- SCAN (Scan Disk or Pack Volume) ODT command, 107
- Sector, 10
  - isolating defective, 107
- Segment, 10, See also Sector
- Serial number, 29
- Sort file requirements, 72
- SQUASH (Consolidate Disk Space) ODT command, 34
- Swapdisk file requirements, 71
- System code file requirements, 70
- System directory, See Flat directory
- System file requirements, 70
- System intrinsic requirements, 70
- System library requirements, 70
- System messages, 121
  - alphabetization of, 123
  - metatokens in, 122
  - multiple entries, 124
- System startup, 80
- SYSTEM/ACCESS file, 22

## Index

SYSTEM/CATALOG, 38. See also Catalog  
    accessing disk files through, 22  
SYSTEM/LOADER, 80  
SYSTEM/SUMLOG  
    requirements, 72  
    use in correcting I/O errors, 116  
SYSTEM/TRAINABLES, 74  
SYSTEM/USERDATAFILE requirements, 72  
SYSTEMDIRECTORY, See Flat directory

Temporary file, 20  
Track, 8  
TRAINABLES, See SYSTEM/TRAINABLES

USECATALOG file attribute, 51  
USECATDEFAULT, 51  
USERDATAFILE, See SYSTEM/USERDATAFILE requirements

VAST, See Volume Access Structure Table  
VERSION file attribute  
    on CATALOGING systems, 39  
    on non-CATALOGING systems, 18  
Volume Access Structure Table, 38  
Volume library, 38  
    handling of disks and tapes, 55

