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HP 3000
Series 900
Computers

STORE and TurboSTORE/iX
Manual

900 Series HP 3000 Computer Systems

STORE and TurboSTORE/iX Manual

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Printing History

The following table lists the printings of this document, together with the respective release dates for each edition. The software version indicates the version of the software product at the time this document was issued. Many product releases do not require changes to the document. Therefore, do not expect a one-to-one correspondence between product releases and document editions.

Edition	Date	Software Version
First Edition	October 1989	A.30.00
Second Edition	April 1994	C.50.00

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Preface

This book, the *TurboSTORE/XL Reference Manual* (30319-90001), describes how to use the following products:

Product Number	Product Description
30319A	TurboSTORE/iX I
36387A	TurboSTORE/iX II
36388A	TurboSTORE/iX II with on-line backup
36397A	TurboSTORE/iX II with support for optical disk
36398A	TurboSTORE/iX II with support for on-line backup and optical disk

MPE/iX, MultiProgramming Executive with Integrated POSIX, is the latest in a series of forward-compatible operating systems for the HP 3000 line of computers.

In HP documentation and in talking with HP 3000 users, you will encounter references to MPE XL, the direct predecessor of MPE/iX. MPE/iX is a superset of MPE XL. All programs written for MPE XL will run without change under MPE/iX. You can continue to use MPE XL system documentation, although it may not refer to features added to the operating system to support POSIX (for example, hierarchical directories).

Finally, you may encounter references to MPE V, which is the operating system for HP 3000s, not based on PA-RISC architecture. MPE V software can be run on the PA-RISC (Series 900) HP 3000s in what is known as *compatibility mode*.

This book, the *TurboSTORE/XL Reference Manual* (30319-90001) describes the processes and procedures for using the STORE, RESTORE, and VSTORE commands. Specific directions for using your hardware is not described in this book. Refer to your hardware documentation. This book is divided into 12 chapters and 5 appendices as follows:

Chapter 1   **Introduction**, provides basic backup concepts and lists hardware requirements.

Chapter 2   **Managing Backups and Backup Media**, describes planning, scheduling, and maintaining backups.

Chapter 3   **Preparing Storage Devices**, provides procedures for using backup devices.

Chapter 4   **Preparing the System**, provides procedures for notifying the users of the backup process.

Chapter 5   **Storing Files**, provides procedures for using the STORE command to store files and backup media.

Chapter 6   **STORE and TurboSTORE Options**, describes each of the STORE and TurboSTORE options.

Summary of Changes

This book the *TurboSTORE/XL Reference Manual* (30319-90001) is a combined version of the *TurboSTORE/iX II User's Guide* (36388-90001) and the *TurboSTORE/iX Reference Manual* (30319-90001). The contents have been rearranged and streamlined.

In addition, the book has been updated to include changes as a result of the MPE/iX 5.0 Operating System release. These changes include the following new sections:

- File Sets with RENAME Option
- Displaying Names Only
- Forcing the HFS Format
- Bad Media
- Creating Pre-POSIX Compatible Tapes
- Managing File Security (COPYACD and NOACD)

- Notification of File Availability (NOTIFY)
- Storing Files from Split Volumes (SPLITVS)
- Renaming Files (RENAME)
- Specifying HFS Files (TREE and NOTREE)
- Using NODECOMPRESS
- Changing a File's GID (GID)
- Modifying ACDs (COPYACD and NOACD)

Conventions

UPPERCASE
In a syntax statement, commands and keywords are shown in uppercase characters. The characters must be entered in the order shown; however, you can enter the characters in either uppercase or lowercase. For example:

    COMMAND

can be entered as any of the following:

    command   **Command**   **COMMAND**

It cannot, however, be entered as:

    comm   **com_mand**   **comamnd**

italics
In a syntax statement or an example, a word in italics represents a parameter or argument that you must replace with the actual value. In the following example, you must replace *filename* with the name of the file:

    COMMAND *filename*

bold italics
In a syntax statement, a word in bold italics represents a parameter that you must replace with the actual value. In the following example, you must replace ***filename*** with the name of the file:

    COMMAND(***filename***)

punctuation
In a syntax statement, punctuation characters (other than brackets, braces, vertical bars, and ellipses) must be entered exactly as shown. In the following example, the parentheses and colon must be entered:

    (*filename*) : (*filename*)

underlining
Within an example that contains interactive dialog, user input and user responses to prompts are indicated by underlining. In the following example, <u>yes</u> is the user's response to the prompt:

    Do you want to continue? >> <u>yes</u>

{ }
In a syntax statement, braces enclose required elements. When several elements are stacked within braces, you must select one. In the following example, you must select either **ON** or **OFF**:

$$\text{COMMAND} \left\{ \begin{array}{l} \text{ON} \\ \text{OFF} \end{array} \right\}$$

[ ]
In a syntax statement, brackets enclose optional elements. In the following example, **OPTION** can be omitted:

    COMMAND *filename* **[OPTION]**

When several elements are stacked within brackets, you can select one or none of the elements. In the following example, you can select **OPTION** or *parameter* or neither. The elements cannot be repeated.

$$\text{COMMAND} \; filename \; \left[\begin{array}{l} \text{OPTION} \\ parameter \end{array} \right]$$

Conventions
(continued)

[...]   In a syntax statement, horizontal ellipses enclosed in brackets indicate that you can repeatedly select the element(s) that appear within the immediately preceding pair of brackets or braces. In the example below, you can select *parameter* zero or more times. Each instance of *parameter* must be preceded by a comma:

[,*parameter*] [...]

In the example below, you only use the comma as a delimiter if *parameter* is repeated; no comma is used before the first occurrence of *parameter*:

[*parameter*] [,...]

| ... | In a syntax statement, horizontal ellipses enclosed in vertical bars indicate that you can select more than one element within the immediately preceding pair of brackets or braces. However, each particular element can only be selected once. In the following example, you must select **A, AB, BA,** or **B.** The elements cannot be repeated.

$$\left\{ \begin{array}{c} A \\ B \end{array} \right\} | \ ... \ |$$

...   In an example, horizontal or vertical ellipses indicate where portions of an example have been omitted.

Δ   In a syntax statement, the space symbol Δ shows a required blank. In the following example, *parameter* and *parameter* must be separated with a blank:

(*parameter*)Δ(*parameter*)

⬭   The symbol ⬭ indicates a key on the keyboard. For example, (RETURN) represents the carriage return key or (Shift) represents the shift key.

(CTRL)*character*   (CTRL)*character* indicates a control character. For example, (CTRL)Y means that you press the control key and the Y key simultaneously.

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Introduction

This manual presents important information on all aspects of storing files for backup, archive, or transfer. It describes how to use the STORE command and the TurboSTORE/iX programs to save files and restore them back to the system. It also describes important methods for safeguarding the information in your system. More specifically, the manual describes how to do the following:

- Maintain your backup media and manage backup devices.

- Plan and manage system backups.

- Prepare the system for a backup.

- Perform a file and system directory backup with the STORE program.

- Back up the system configuration with the SYSGEN program.

- Use backup media to restore files, and to recover from data loss, file corruption, or a major system failure, with the RESTORE program and/or the ISL INSTALL utility.

- Prepare and implement a disaster recovery plan.

The remainder of this chapter defines important terms, summarizes information on protecting files from unexpected problems, and outlines the basic steps for storing and restoring files. The sections in the chapter are:

- System Backups

- Feature Comparisons

- Hardware Requirements

- Backup Media

- Backup Devices

- Disaster Recovery Plans

- Related Documentation

System Backups

Storing all of the information on your system to backup media is called backing up your system. You back up your system so that you have a copy of the information stored on it should it experience a major failure that causes some or all of your files to be lost. If your system experiences a failure, you can reload that information from your backup media. Refer to subsequent chapters for complete instructions on performing system backups and restoring files from backup media after a system failure.

Planning, managing, and performing necessary system backups are, perhaps, a system administrator's/operator's most important tasks. Regularly scheduled, properly performed system backups guarantee that, in the event of an unexpected system mishap, all information present on the system at the time of the last backup is currently available.

If a system failure does occur, the amount of data lost depends directly upon three factors:

- How recently the last backup was performed.

- The level of system activity since the last system backup.

- The extent of the damage.

As a system administrator, you are responsible for establishing a backup schedule that best meets the needs of your organization and all system users. For example, the schedule may include saving all files in a particular account every day, or more commonly, copying only those files that have been added or modified since the last complete system backup.

You or a member of your staff are probably also responsible for actually performing the backups. In addition to user files, you must be sure to back up all system files since you may need to restore these files from backup media if the system experiences problems.

Feature Comparisons

There are four versions of the TurboSTORE/iX program:

- TuborSTORE/iX (product number 30319)

- TurboSTORE/iX II (product number 36387A).

- TurboSTORE/iX II with Optical Support (product number 36397A).

- TurboSTORE/iX II with On-Line Backup (product number 36388A).

- TurboSTORE/iX II with On-Line Backup and Optical Support (product number 36398A).

With all versions of the TurboSTORE/iX program and the STORE/iX program available with the fundamental operating system (FOS), you use the STORE and RESTORE commands to back up files to media and to restore files to disk.

Table 1-1 compares features of STORE/iX, TurboSTORE/iX, and TurboSTORE/iX II.

Table 1-1. Feature Comparison

Feature	STORE/iX FOS	TurboSTORE/iX 30319A	TurboSTORE/iX II 36387A	TurboSTORE/iX II On-line Backup 36388A	TurboSTORE/iX II Optical Support 36397A	TurboSTORE/iX II On-line Backup Optical Support 36398A
Multiple Devices	NO	YES	YES	YES	YES	YES
File Interleaving	NO	YES	YES	YES	YES	YES
Data Compression	NO	NO	YES	YES	YES	YES
Labeled Media	YES	YES	YES	YES	YES	YES
DDS Fastsearch	YES	YES	YES	YES	YES	YES
Unattended Backup	NO	YES	YES	YES	YES	YES
On-line Backup	NO	NO	NO	YES	NO	YES
Parallel Restore	NO	NO	YES	YES	YES	YES
Optical Device	NO	NO	NO	NO	YES	YES

Hardware Requirements

All versions of TurboSTORE/iX work with any hardware configuration supported by the MPE/iX system.

Minimum Hardware Requirements

To take advantage of the faster backup features of the TurboSTORE/iX II program, it is recommended that you have the minimum hardware configuration:

- At least two devices.

  Any combination of HP 7978, 7979, 7980, 7980XC, 7980S and 7980XS drives.

- If you use digital audio media (DATs), then all devices used for a STORE must be DATs. You cannot mix DATs and magnetic media in a STORE configuration. All devices must be of like type.

- When you configure your system, you must consider the bandwidth of the device adapter. Is it an HP-IB or SCSI adapter? For example, if you want to use two 7980XC's in parallel, you must have an HP-IP device adapter for each tape drive. Refer to the *HP3000 900 Series Computer System Configuration Guide* (5091-7438E) for more hardware configuraton information specific to your system.

Optimum Performance Hardware Requirements

Although the above hardware requirements are sufficient to achieve a performance gain using TurboSTORE/iX II, as compared to the standard STORE program, your system configuration should include the following elements for maximum effect:

- Three or more devices in any combination of HP 7980s or 7980XCs.

- HPC1501A or HPC1511A DDS-format devices. You cannot mix with magnetic media devices or magneto-optical devices for a single STORE operation.

- HPC1700A magneto-optical device. You cannot mix with magnetic media devices or DDS-format devices for a single STORE operation.

- HP 7937 or other HP-supported fiberlink disks connected to at least one HP-FL (fiberlink) device adapter. If HP-IB disks are used, they should be spread over at least four HP-IBs.

- Use a maximum of two HP-FL device adapters per channel.

- Do not mix HP-IB, HP-FL and HPCS device adapters on the same channel.

- Do not use more than three HP-IB device adapters per channel.

Backup Media

Backup media can include reel-to-reel magnetic tapes, DDS tapes, and magneto-optical disks. Backup media provides an economical way to maintain duplicates of important files in your system.

The process of copying a file to backup media is called storing the file. The process of copying a file from backup media is called restoring the file.

As a system administrator/operator, you frequently STORE and RESTORE files. You might, for example:

- Store all files on the system (backup) in case one or more files become corrupted, either accidentally, intentionally, or by a malfunction.

- Store an important file in order to create a duplicate for a user.

- Permanently store several files offline by storing them to media and deleting them from disk (archive).

- Transfer files from one system to another by storing them from one system and restoring them on to the other.

Backup Devices

Backup devices are system peripherals that allow you to write information to, and read information from, backup media. The backup devices currently supported by MPE/iX are:

- 1/2 inch tape drives
- DDS drives
- Magneto-optical drives
- 3480 compatible drives

Because only one person can use a backup device at a time, it is your responsibility to monitor backup devices, grant users access to them, and help them load and unload backup media. Chapter 3, "Preparing Storage Devices," describes how to manage backup devices.

Disaster Recovery Plans

Regular system backups protect the information in your system from irretrievable loss by providing a copy of the information. However, natural and man-made problems, such as smoke, noxious fumes, explosion, flood, earthquake, and sabotage, can still threaten both your backup media and your system hardware. A disaster recovery plan protects your organization from such potential disablement by establishing procedures for duplicating and safely storing backup media and maintaining a site for "substitute" computer hardware. Although implementing a disaster recovery plan is time-consuming and costly, saving your system from an unexpected disaster is almost always worth the effort. Refer to Chapter 12, "Disaster Recovery," for more detail.

Related Documentation

Before you begin to plan and perform system backups, you should have a working knowledge of several system administrator functions. In particular, performing a system backup draws from information presented in the following manuals:

- *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042)

- *MPE/iX Commands Reference Manual Volumes 1 and 2* (32650-90003 and 32650-90364)

- *Commands Reference: HP3000 Series 9X8LX: (3813-90011)*

- *Performing System Manager Tasks* (32650-90004)

- *Performing System Operating Tasks* (32650-90137)

- *MPE/iX Utilities Reference Manual* (32650-90081)

Other documentation that provides additional information related to various aspects of the store and restore processes include:

- *Magneto-Optical Media Management User's Guide* (36398-90001)

- *Setting Up and Maintaining Your System/9X7LX Installation and Maintenance Guide* (A1707-90001)

- *HP3000 900 Series Computer System Configuration Guide* (5091-7438E)

The information presented in this book, *TurboSTORE/XL Reference Manual* (30319-90001), does not describe how to use any specific hardware to perform the store and restore procedures. Refer to your hardware documentation for that specific information.

2

Managing Backups and Backup Media

This chapter describes the purpose and process of performing regular backups to your files and systems. The sections in this chapter are:

- Why Perform Backups?
- TurboSTORE Backup Features
- STORE and RESTORE Process
- What Should You Backup?
- Scheduling Backups
- Preparing to STORE Files
- Using Unlabeled vs Labeled Media
- Maintaining a Backup Library

Why Perform Backups?

Selecting backup methods and scheduling regular backups are important aspects of a system administrator's job. Standard procedures reduce the time necessary to perform backups and guarantee that the most recent system information is always available. A regular backup schedule reduces system interruption.

An important part of planning and performing system backups is making sure that the resources you need are available and well managed. Maintain a supply of backup media and labels and establish procedures for identifying and retaining backup media. Examples of these procedures are explained in the pages that follow.

TurboSTORE Backup Features

The TurboSTORE programs allow you to store files to a single device or to multiple devices.

The best way to use your backup devices depends upon the characteristics of the files that you are storing, your needs for compatibility with other versions of MPE, and your system configuration.

The characteristics of the set of files help determine choices (or options) for storing them. Use the following guidelines to select the most appropriate method:

- How many files do you need to back up?

    Generally, the more files in the file set, it is to your advantage to use multiple devices or a high capacity storage device such as a magneto-optical disk device.

    □ If you are storing only a few files of moderate size, one backup device such as a tape drive or DDS-format device is sufficient.

    □ If you are storing many files (for example, all the files in an account, or a smaller number of very large files), a multiple-device backup or single magneto-optical device is best.

- Do the backup files need to be compatible with another system?

    Compatibility with other versions of MPE limits your choices. If you need to produce STORE files that are compatible with MPE V/E using the TRANSPORT parameter, you can only store files to a single device.

- Does your system configuration include multiple backup devices?

    If you are not limited by your need for compatibility with MPE V/E or earlier versions of MPE XL, your system configuration is the most important determining factor of which multiple-device method to use. Use the following guidelines to select a method:

    □ Which and how many backup devices do you have?

        If you have two or three like backup devices, use either parallel or sequential devices. If you have at least four devices, use two or more parallel device pools.

    □ Do you intend to use labeled tapes?

        Labeled tapes can be used with a single device and parallel devices, but not with sequential devices. Unlabeled tapes can be used with single, parallel, and sequential devices.

    □ Do you use the same back up procedures on a regular basis?

        If you store the same information to file regularly, you can keep the STORE parameters and options in an indirect file (a text file containing the file set and the parameters for a STORE command). Instead of listing the files to store and the options you want to use in a STORE command, enter the STORE files in a

text file and reference the text file name in the STORE command. For example:

```
:PRINT BACKUP
:@.@.@;*T;DIRECTORY;ONVS=MPEXL_SYSTEM_VOLUME_SET,NV1
:STORE ^BACKUP;*T
```

The above example references the file BACKUP as an indirect file.

■ Do you have critical applications that need to be available 24 hours a day?

If your system environment includes applications that need to be available on a 24-hour basis, you should use TurboSTORE/iX II with On-Line Backup. With the online backup feature, you do not need to dedicate the system to perform a backup. The only impact on processing is a period of data inaccessibility while the backup process begins. This period may be longer depending upon the number of files.

Use online backup to store critical applications that need to be available at all times. At the time online backup is started, all files must be closed for approximately five minutes while they are attached to a shadow logging subsystem. Exiting applications and closing files before the attachment to the logging subsystem ensures that the files are both physically and logically consistent. Files that are open for write access at the time online backup is initiated will not be included in the backup. After the backup process begins, users may open their files for read, write, and purge access.

Note   With the TurboSTORE/iX program, as with the STORE program, you use the STORE and RESTORE commands to backup to storage media and to restore to disk.

STORE and RESTORE

The backup (STORE) and recovery (RESTORE) processes have similar steps. Only the specific command options differ. Who is doing what depends on your configuration and the defined duties between yourself, as the system administrator, and your users. The basic steps include the following:

1. Determine what you want to store or restore. Refer to "What Should You Backup?" in this chapter.

2. Identify the storage device. Refer to Chapter 3, "Preparing Storage Devices."

3. Mount the media on the device. Refer to Chapter 3, "Preparing Storage Devices."

4. Prepare the system for store processes. Refer to Chapter 4, "Preparing the System." for preparing to STORE. Refer to Chapter 10, "Restoring Files." for preparing to RESTORE.

5. Issue the STORE or RESTORE command with the appropriate options. Refer to Chapter 5, "Storing Files" and Chapter 6, "STORE and TurboSTORE Command Options" or Chapter 10, "Restoring Files."

6. Reply to the console (media allocation) request. This does not apply if you are using labeled media. Refer to Chapter 7, "Handling Media Requests."

7. Remove the storage media. Refer to Chapter 8, "When STORE is Complete." Refer to Chapter 10, "Restoring Files."

Helping Users Store and Restore Files

Storing and restoring files is not limited to system personnel. Account managers can store and restore any file in their accounts (except files with negative file codes) and all users can store and restore any file in their logon groups and accounts. While these other users can enter commands to store and restore at their terminals, they usually do not have access to backup devices.

The steps described below summarize how you and a user work together to store and restore files. The order in which you perform steps of the procedure may vary; for example, you may see a media request before the user hands you the backup media, instead of the other way around. The basic procedure remains the same, who is doing which steps varies between configurations and user to system administrator defined duties.

1. The user gives you empty backup media onto which to store disk files, or the user gives you the STORE media from which to restore files to disk.

2. You mount the media and prepare the device.

3. The user enters the FILE and STORE or RESTORE commands.

4. You check the console for a media request.

5. If the system does not automatically answer the media request, you must reply to it.

6. When the process is complete, remove the media and return it to the user.

7. As part of your regular routine of retrieving, separating, and distributing reports, collect the report describing the stored or restored files. Either file it in the appropriate pickup bin, or keep it until the user comes to get it from you.

What Should You Backup?

To completely back up your system, you should copy three types of information:

- User and system files. User files are usually the largest part of a system backup. They cannot otherwise be duplicated, except from hardcopy. Since, in total, they can be the product of several months or even years of labor, user files can be considered the most important element within your computer system. All system files are in groups within the SYS account; most system files are owned by the PUB group of the SYS account.

- The file system directory. The file system directory contains your account group, and user structure, and all associated capabilities. Each volume set has its own directory that must be saved to provide a complete backup.

- The current system configuration. The system configuration includes system tables, queues, device I/O attachments, and other parameters.

Backups are stored on different media items depending upon what you are backing up:

- You back up your system configuration on a system load media.
- You back up your user and system files and your file system directory on STORE media.

Backing up system configuration files separately from other files is to your advantage because user, system, and system directory files usually change often while system configuration files change infrequently. Also, with the capability of backing up each type of file separately, you can avoid backing up any inadvertent corruption of system files while still backing up your other files.

Use the SYSGEN program to create a system load backup to supplement a STORE backup. The SYSGEN program enables you to back up the system configuration. You cannot back up your system configuration with the STORE program. When you use STORE to perform system backups, you must still use the SYSGEN program to create a system load tape from which you can reload your system configuration.

To put SLT and store filesets on a single tape, you can use the combined SLT and Storeset functionality. Refer to Chapter 9, "Backing Up the System Configuration," for details of using the SYSGEN utility and combining an SLT and Store set.

Scheduling Backups

There are two important considerations when planning a backup schedule:

■ Plan full and partial backups to efficiently duplicate the most recent system information.

■ Schedule a regular time for performing backups.

Full and Partial Backups

There are two ways to perform a system backup. A full backup copies all files stored in your system whether or not any of the information in them has changed since the last backup. A partial backup copies only the files that have changed since the last full backup. This can be done with the DATE parameter of the STORE command. A well-planned backup schedule combines both methods. It usually calls for a full backup once a week and a partial backup each remaining workday. If you follow such a schedule, you would lose no more than 24 hours worth of information should the system experience problems.

Figure 2-1 shows a sample backup schedule that combines both full and partial system backups.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					Full Backup	
	Partial Backup	Partial Backup	Partial Backup	Partial Backup	Full Backup	
	Partial Backup	Partial Backup	Partial Backup	Partial Backup	Full Backup	
	Partial Backup	Partial Backup	Partial Backup	Partial Backup	Full Backup	
	Partial Backup	Partial Backup	Partial Backup	Partial Backup	Full Backup	

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Figure 2-1. Sample Backup

Selecting a Time for Backups

It is best to perform backups at a time when people are not normally using the system. Often, system administrators choose to perform backups at the close of the workday or later in the evening. It is also a good idea to schedule the backup for the same time every day so users know when to expect it and can plan ahead.

Be sure to schedule enough time for each backup. Full backups take more time and more media than partial backups. Performing a partial backup a day or so after a full backup takes less time and less backup media than a partial backup performed almost a week later. As the week progresses, users will have modified or added more

files since the last full backup, and more new information must be duplicated. If you perform a full backup on Friday, the first partial backup on Monday may take only one tape, for example, and not much time. By Thursday, however, the day before the next scheduled full backup, a partial backup requires several tapes, for example, and considerably more time, but still less than a full backup.

The TurboSTORE ONLINE option allows you to backup critical applications that need to be available at all times. Refer to Chapter 6, "STORE and TurboSTORE Command Options," for additional information.

Preparing to Store Files

Before you begin to store files, identify which backup device you will use. Then select the tapes you think you will need, label them, prepare them, and mount the first media unit(s) on your backup device(s). If you are using multiple backup devices, select, label, prepare, and mount the backup media for each device. The best way to use your backup devices depends upon your system configuration and the characteristics of the set of files you plan to store.

Using Unlabeled vs Labeled Media

STORE and RESTORE let you store and restore files using either labeled or unlabeled tapes. All TurboSTORE options, except sequential, are supported for both formats and there is no performance penalty for using either format.

The use of labeled tape offers the following advantages:

1. Tapes are self identifying.

2. Automatic Volume Recognition (AVR) will eliminate need for operator replies to media requests.

3. TurboSTORE provides hooks for third party tape management systems.

Figure 2-2 illustrates the differences between labeled and unlabeled media.

MPE XL Unlabeled Tape Format:

| T M | T M | Header Label | T M | Tape Directory | T M | File 1 | T M | File 2 | T M | File 3 |

MPE XL Labeled Tape Format:

| V O L 1 | H D R 1 | H D R 2 | U H L | T M | Tape Directory | T M | E O F 1 | E O F 2 | T M | H D R 1 | H D R 2 | T M | File 1 | T M | E O F 1 | E O F 2 | T M |

TM   = Tape Mark
EOF   = End of File Mark
VOL1 = Volume 1 Label
HDR1 = Header 1 Label
HRD2 = Header 2 Label
UHL   = User Header Label

LG200021_037c
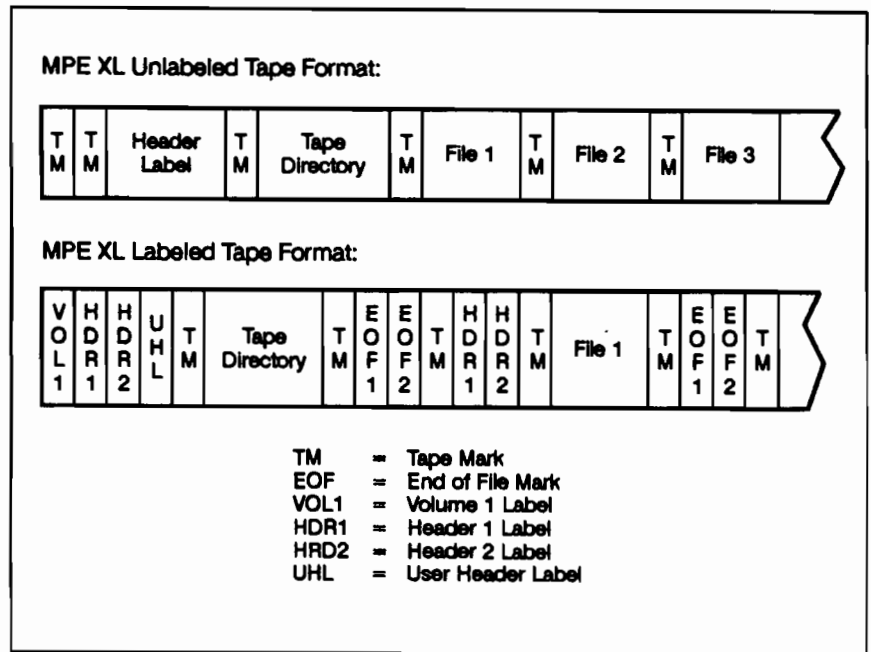
Figure 2-2. Media Format

Maintaining a Backup Library

Establish a library for storing backup media and backup records. Include the following in your library:

- A large stock of new or scratch media to use for backups. (Scratch media are used media containing information that is no longer needed.)

- A record of each tape's (or other media) contents. It should be easy to find the backup media needed to restore the system in the event of a failure.

- Your actual backup media.

Maintaining a Large Stock Of Backup Media

You need to maintain a large and easily accessible stock of available backup media, because you can never be sure ahead of time exactly how many units of backup media you need for each backup. The number of units you need depends upon whether you are performing a full or a partial backup and how much data is stored on your system.

Using new units of backup media ensures the best possible data integrity. You can, of course, safely reuse backup media if they are in good condition and if they contain outdated information. The information on used backup media is outdated when the purge date on the label has passed.

To help judge whether a used tape is in good condition, you can use the cycle field of the Hewlett-Packard standard sticky tape label to track the number of times a tape has been used. Tapes wear out and become unreliable after being used many times. To determine whether a tape is still usable, consult the manufacturer's recommendations.

When using labeled media, the expiration date in the label can be used to recycle media.

Keeping Backup Records

Each time you create a backup, have the system print a report describing the backup unit's contents with the SHOW=OFFLINE option. For example:

```
:FILE T;DEV=TAPE
:STORE @.OPERATOR.SYS;*T;SHOW=OFFLINE
```

File these reports in a special filing cabinet or attach them directly to the appropriate tape reel (or other media). Label each item according to the instructions provided in Chapter 3, "Preparing Storage Devices."

Storage of Backup Media

Backup media may be the only copy of current or previous information stored from your system. When you need to restore information from backup media, you should be able to easily find the item you need. Your library enables you to maintain complete copies of your system's data, and an easy method for locating the data you want to recover.

There are two reasons you should always keep older backup data in addition to your current backup data: in case the most recent copies are bad, and for restoring older files that may have been removed from the system some time ago. In such situations, you can restore files from the most recent intact copy.

To set up a library, perform the following steps:

- Obtain a substantial number of backup media. The exact number you need depends on how much data you will be storing and how long the backup data will be retained.

- Obtain a container such as a vault, a metal cabinet, or rack in which to keep the backup data.

- Establish a control program for maintaining backup data for a specified length of time.

- Establish a cleaning and verifying schedule for the media devices.

- As part of your disaster recovery plan, create a duplicate library in a safe, offsite location. Refer to Chapter 12, "Disaster Recovery," for more information.

Preparing Storage Devices

This chapter describes how to prepare your media and devices for backup. The sections in this chapter are:

- Preparation Process
- Preparing Tape and DDS Media
- Preparing Tape and DDS Devices
- Preparing Magneto-Optical Media and Devices

Preparation Process

The following is a brief list of the preparation steps.

1. Decide which method you will be using to perform the backup. The choice is dependant upon your specific hardware, media configuration, and TurboSTORE product. Every option except single requires a TurboSTORE product. The choices are:

Single   Requires only one backup device. One file at a time is stored. When the media (tape or DDS) fills, the device rewinds the media, you remove the media and replace it with new media, and additional files are stored to the new media.

Sequential   Requires more than one backup device. One file at a time is stored. One device is used at a time. When the media (tape or DDS) fills, additional files are stored on the next device in line. You can set this up to toggle between two devices, giving you time to change media.

Parallel   Requires more than one backup device. Files are being stored to more than one device at the same time. When the media is full on one device, you remove the media and replace it with new media, and additional files are stored to the new media.

Parallel Pools   Requires at least four backup devices. Files are being stored to more than one device at the same time. This is a combination of Sequential and Parallel. When the media (tape or DDS) fills, additional files are stored on the next device in line. You can set this up to have multiple pairs of toggling devices.

2. Decide on the order that each backup device in the pool is to be used.

3. Assign each device a position based on its logical device (LDEV) number. Use the chart in Figure 3-1 as a tool to help you assign your devices.

Planning for Multiple Devices

Select either Sequential, Parallel, or Parallel Device Pools.
Fill in LDEV numbers for each device you plan to use.

___ Sequential

| Device 1 ____ | Device 2 ____ | Device 3 ____ | Device 4 ____ |
| Device 5 ____ | Device 6 ____ | Device 7 ____ | Device 8 ____ |

___ Parallel

Device A ____	Device E ____	Device I ____	Device M ____
Device B ____	Device F ____	Device J ____	Device N ____
Device C ____	Device G ____	Device K ____	Device O ____
Device D ____	Device H ____	Device L ____	Device P ____

___ Parallel Device Pools

Device A1 ____	Device A2 ____	Device I1 ____	Device I2 ____
Device B1 ____	Device B2 ____	Device J1 ____	Device J2 ____
Device C1 ____	Device C2 ____	Device K1 ____	Device K2 ____
Device D1 ____	Device D2 ____	Device L1 ____	Device L2 ____
Device E1 ____	Device E2 ____	Device M1 ____	Device M2 ____
Device F1 ____	Device F2 ____	Device N1 ____	Device N2 ____
Device G1 ____	Device G2 ____	Device O1 ____	Device O2 ____
Device H1 ____	Device H2 ____	Device P1 ____	Device P2 ____

LG200021_040

Figure 3-1. Multiple-Device Planning Chart

Selecting the Backup Method

The best way to use your backup devices depends upon the characteristics of the files that you are storing, your needs for compatibility with other versions of MPE, and your system configuration.

The characteristics of the set of files help determine choices (or options) for storing them. Generally speaking, the more files in the file set, the more it is to your advantage to use multiple devices. If you are storing only a few files of moderate size, one backup device may be sufficient. If you are storing many files (for example, all the files in an account, or a smaller number of very large files), using a multiple-device backup is probably to your advantage.

Your needs for compatibility with other versions of MPE limit your choices. If you need to produce STORE backups that are compatible with MPE V/E using the TRANSPORT parameter, you can only store files to a single device. (See Appendix D, "STORE File Compatibility," for more information on compatability.)

If you aren't limited by your need for compatibility with MPE V/E or earlier versions of MPE XL, the most important determinant of which multiple-device method to use is your system configuration. Use the following the guideline to select a method:

- Which and how many backup devices do you have? Which devices you may use for a multiple-device backup are described in Chapter 3, "Preparing Storage Devices." Obviously, in order to use sequential or parallel devices, you must have at least two backup devices. If you have two or three devices, you may use either parallel or sequential devices. If you have at least four devices, you may begin to use two or more parallel device pools.

Selecting Backup Device Order

Once you've selected the method of multiple-device TurboSTORE/iX you want to perform, decide on each backup device's order of use. Assign each device a position based on its logical device (LDEV) number.

Use the chart in Figure 3-1 to help you assign your devices. Select one of the TurboSTORE/iX methods in the chart, and then write in the LDEV numbers of each device you plan to use in the order that you plan to use it. For example, if you intend to use two parallel devices, write in the LDEV number of the first device next to Device A and the LDEV number of the second device next to Device B in the Parallel section of the chart. It may be helpful for you to photocopy the chart and use it as a guide whenever you use a multiple-device method to store files.

Assigning Device File Names

With TurboSTORE/iX, you can store files to several backup devices sequentially or concurrently. When using multiple backup devices, you have the choice of entering multiple FILE commands to assign a different file name to each device or a single FILE command.

Assigning each device a different file name makes it easier to keep track of each device's position in the backup media. When you receive media requests, you know exactly to which device the request applies. You may use LDEV numbers or a common device class in the FILE command. When you use a device class to name backup devices, STORE asks you to assign a logical device to the file name with a media request. Refer to Chapter 7, "Handling Media Requests" for more information. You must use LDEV numbers to name devices if the devices are to be automatically allocated.

Assign unique file names based on each device's position in the backup. For example, if you plan to use four parallel devices, you might issue the following set of FILE commands:

```
:FILE BACKA;DEV=7
:FILE BACKB;DEV=8
:FILE BACKC;DEV=9
:FILE BACKD;DEV=11
```

Label sequential devices in order. For example, if you are using three sequential devices, you might issue the following FILE commands:

```
:FILE BACK1;DEV=TAPE
:FILE BACK2;DEV=TAPE
:FILE BACK3;DEV=TAPE
```

Label parallel device pools both in parallel and sequential order. For example:

```
:FILE BACKA1;DEV=7
:FILE BACKA2;DEV=8
:FILE BACKB1;DEV=9
:FILE BACKB2;DEV=11
```

If you issue a single FILE command when using multiple backup devices, you assign a common file name and common device class to all of your backup devices. For example:

```
:FILE T;DEV=TAPE
```

You use the common file name, T in the example above, to refer to each device in your STORE command. In a media request, the system asks you to assign an LDEV number to T for each device. If you have four backup devices, you see four identical media requests. You assign a different LDEV number to each media request based upon the order in which you receive the requests. Refer to Chapter 7, "Handling Media Requests," for more information.

Your FILE command gives the backup device a file name and identifies the device. To store files to only one device, you backreference that device in your STORE command, as described previously. For example:

```
:FILE T;DEV=TAPE
:STORE @.OPERATOR.SYS;*T
```

However, with TurboSTORE/iX you may choose to employ multiple device configurations at times when you have a large set of files to store and you want to speed up the process. If so, you probably want to use the FILE command to give each device a file name that reminds you of its position. Then use the STORESET parameter in a STORE command to reference the multiple devices. For example, to store files to three sequential devices, use the following set of commands:

```
:FILE SEQ1;DEV=7
:FILE SEQ2;DEV=8
:FILE SEQ3;DEV=9
:STORE @.@.@;;STORESET=(*SEQ1,*SEQ2,*SEQ3)
```

The above STORE command copies all system and user files to three sequential devices. The parentheses surrounding backreferenced file names group the devices into a device pool.

You do not backreference the file name of a backup device immediately after the name(s) of the file(s) you are storing when you use the STORESET parameter. Rather, you must use a placeholder for the missing parameter normally supplied when using a single backup device. The placeholder is provided by the use of ; ; in the STORE command.

If you gave the backup devices a single file name such as:

```
:FILE T;DEV=TAPE
```

enter the following STORE command to copy files to a set of three sequential backup devices:

```
:STORE @.@.@;;STORESET=(*T,*T,*T)
```

To store files to a set of four parallel devices, you might use the following set of commands:

```
:FILE PARA;DEV=7
:FILE PARB;DEV=8
:FILE PARC;DEV=9
:FILE PARD;DEV=11
:STORE @.OPERATOR.SYS;;&
:STORESET=(*PARA),(*PARB),(*PARC),(*PARD)
```

If you gave the backup devices a single file name such as:

```
:FILE T;DEV=TAPE
```

enter the following STORE command to copy files to a set of three parallel backup devices:

```
:STORE @.@.@;;STORESET=(*T),(*T),(*T),(*T)
```

You describe parallel devices in the STORESET parameter by enclosing each backreferenced device file name within parentheses. Use commas to separate devices.

To store files to parallel device pools, use parentheses to group the devices into pools. Separate the devices in the pool from one another with commas. Commas also separate each device pool. For example, the following commands copy files to two parallel device pools. Each device pool contains two sequential devices. In the following example, STORE uses a total of four devices divided into two device pools.

```
:FILE PPA1;DEV=7
:FILE PPA2;DEV=8
:FILE PPB1;DEV=9
:FILE PPB2;DEV=11
:STORE @.OPERATOR.SYS;;STORESET=(*PPA1,*PPA2),(*PPB1,*PPB2)
```

If you gave the backup devices a single file name such as:

```
:FILE T;DEV=TAPE
```

enter the following STORE command to copy files to a set of parallel device pools:

```
:STORE @.@.@;;STORESET=(*T,*T),(*T,*T)
```

Preparing Tapes and DDSs

You must select the backup media onto which you are going to store your files. If you have followed the instructions for setting up a backup library in Chapter 2, "Managing Backups and Backup Media," you should have a set of new or scratch backup media or both available for storing files.

To prepare your backup media for, perform the following steps:

1. Estimate the number of blank media you need, and take them from your library.

2. Attach a label to each unit of backup media. (A standard Hewlett-Packard tape label has several headings for different types of important information. If your label does not have such headings, you may want to create your own headings including the information which is described next.)

3. Label the first unit of backup media (tape or DDS).

Single or Sequential — Label the first unit Volume 1 of n. Replace n with the total number of units of backup media— if you use more or fewer tapes than you planned, you may have to change this number when you finish storing the files.

Label the second unit of backup media Volume 2 of n. Label the third unit of backup media Volume 3 of n, and so on.

Parallel or Parallel Pools — Label the first backup for the first device (or first device pool) Volume Reel1 Set1 of x replacing x with a list of the last backup for each parallel device or device pool.

If you use more or fewer units of backup media than you planned, you may have to change these numbers when you finish.) For example, if you plan to use four units of backup media and two parallel devices, label the first backup Volume Reel1 Set1 of Reel2 Set1/Reel2 Set2 .

Label the second backup from the first device (or device pool) Volume Reel2 Set1 of Reel2 Set1/Reel2 Set2.

Label the first backup from the second device (or device pool) Volume Reel1 Set2 of Reel2 Set1/Reel2 Set2, and label the second backup Volume Reel2 Set2 of Reel2 Set1/Reel2 Set2.

4. In addition to the media number, write the following information on each media's label:

- The currrent date which serves as a reminder of when the backup was created.

- The name of your computer system.

- A list of the files you intend to store, or if the tape is from a system backup, write either "FULL BACKUP" or "PARTIAL BACKUP".

- If you plan to use interleave format, write "INTERLEAVE". (Interleave format is described in Chapter 5, "Storing Files.")

- Any other important information about the backup. Since it is a STORE backup, write "STORE".

- Your name or initials.

- The date after which the information on the backup is obsolete, called the Purge Date. If you keep STORE backups indefinitely, make a note to that effect.

- The number of times the backup has been used, under the heading "Cycle".

Figure 3-2 shows an example of a correctly labeled backup:

LG200021_022

Figure 3-2. A Correctly Labeled Tape

5. Stack all your media (tapes or DDSs).

Single   If you plan to use a single device, stack all of
                  your backups, label side up, in order, with the
                  lowest number on top, near the device, as shown
                  in Figure 3-3.
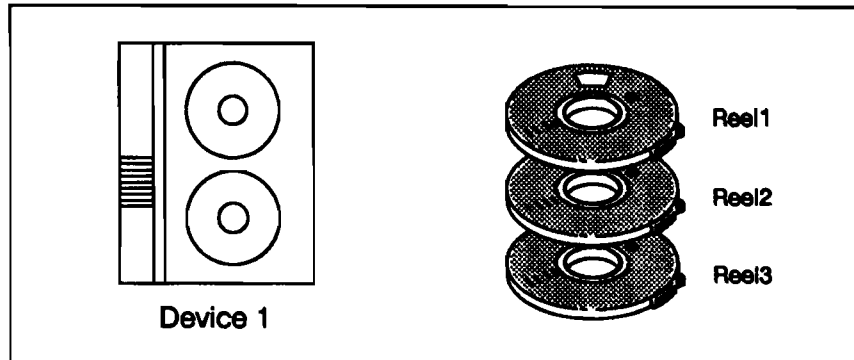
LG200021_007a

Figure 3-3. Preparing Tapes for a Single Device

Parallel   If you are using parallel devices, stack all of
                your backups, label side up, in order with the
                lowest number on top, near the corresponding
                device. For example, place all the backups with
                numbers ending with Set1 near your first parallel
                device. Put media Reel1 Set1 on top of the stack.
                Figure 3-4 shows how to prepare backup medias
                for parallel devices.

LG200021_009a
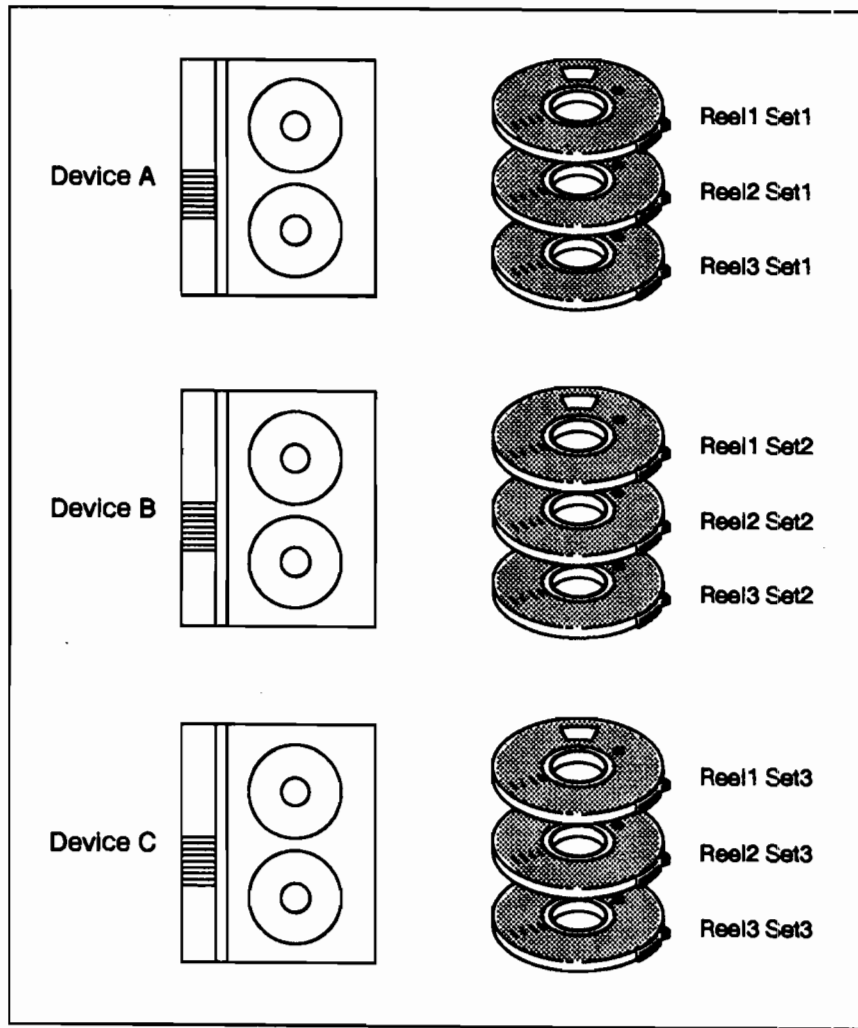
Figure 3-4. Preparing Tapes for Parallel Devices

6. Divide your media among the devices.

Sequential   If you plan to use sequential devices, divide your media among the devices in order. For example, if you have two sequential devices and six media, stack media 1, 3 and 5 near device 1, and stack media 2, 4 and 6 near device 2. Stack all media label side up and make sure that the lowest-numbered backup is on the top of each stack. Figure 3-5 shows an example.
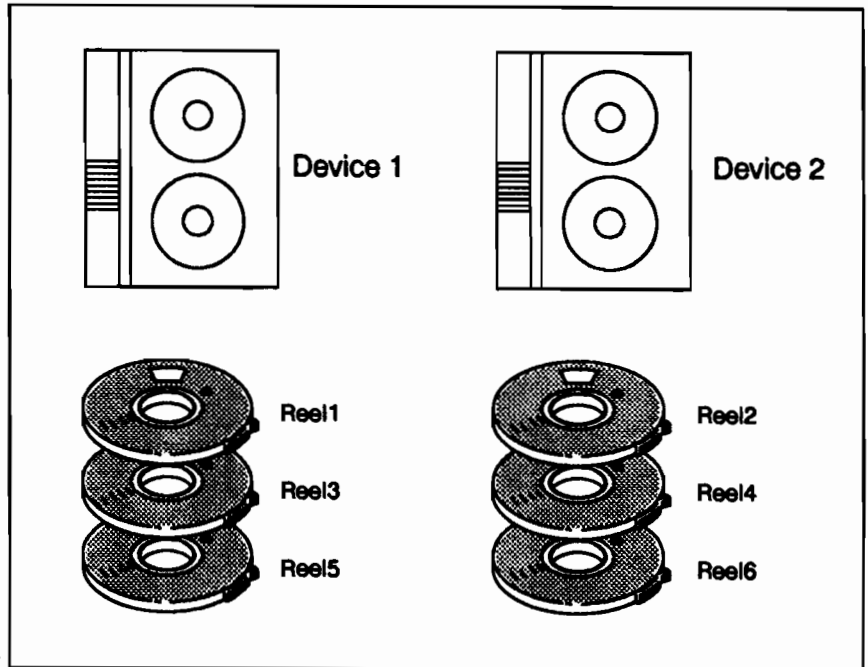
LG200021_006a

Figure 3-5. Preparing Tapes for Sequential Devices

Parallel Pool   If you are using parallel device pools, divide your media among the devices in each device pool, placing them in order with the label side up. For example, if the first device pool has two sequential devices and four media, stack media Reel1 Set1 and Reel3 Set1 near device A1, and place media Reel2 Set1 and Reel4 Set1 near device A2. Figure 3-6 shows media prepared for storing files to parallel device pools.
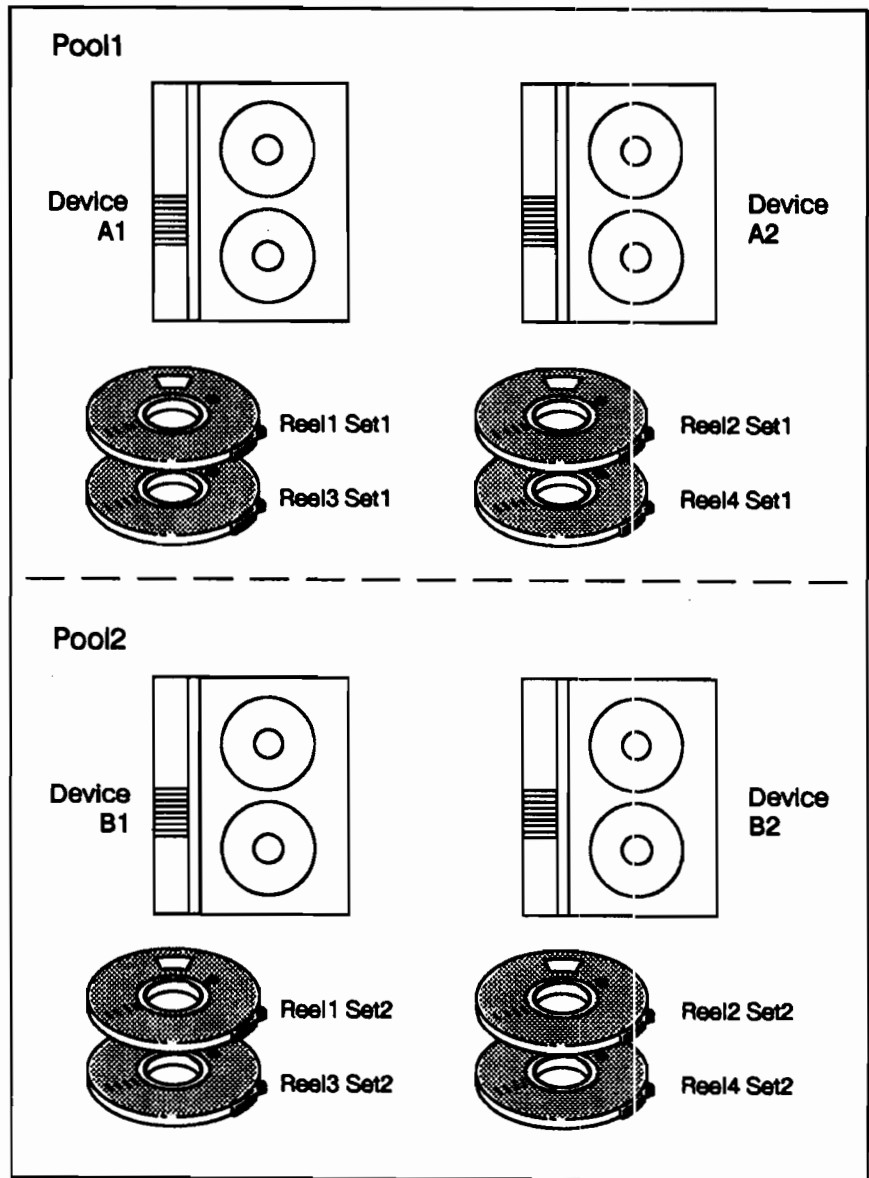
Figure 3-6. Preparing Tapes for Parallel Device Pools

Preparing Tape and DDS Devices

Prepare your backup devices by mounting the first media in the stack near each device onto that device. Follow the instructions in Chapter 3, "Preparing Storage Devices," for mounting backup media.

After mounting the media, check the console for a message telling you that the volume has been mounted. For example:

```
14:47/31/VOL (Unlabeled) mounted on LDEV#8
```

Note the backup drive's logical device (LDEV) number. (The LDEV number is 8 in the example above.) You may need it to answer a backup request later.

Single Tape Devices

When you store to a single backup device (magnetic tape or DDS), files are copied one file at a time. When the backup media is full, it automatically rewinds then prompts you to load new backup media. When the second unit of backup media is loaded, STORE continues writing files until all of the qualified files are stored or another unit of backup media is needed. If you are storing many files, or files that are particularly large, you will have to individually load several units of backup media onto the single device.

Figure 3-7 illustrates a single-device backup.

LG200021_001
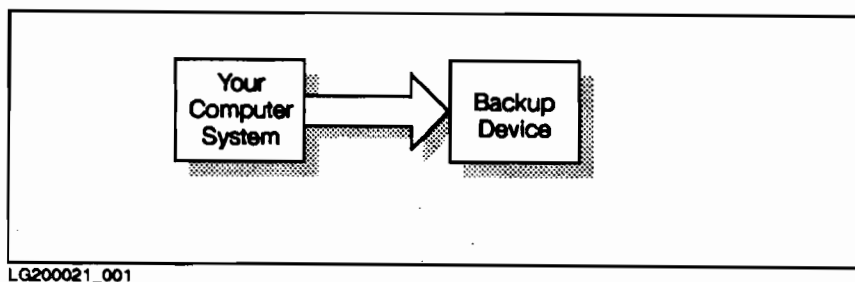
Figure 3-7. Single-Device Backup

The FILE command assigns a file name to a backup device according to its logical device number or its device class. For example, the FILE command below assigns the file name T to the device with LDEV 8:

```
:FILE T;DEV=8
```

To store files to only one device, backreference that device in your STORE command. For example:

```
:FILE T;DEV=TAPE
```

```
:STORE @.OPERATOR.SYS;*T
```

Using one or more FILE commands is recommended, especially when your system is configured to automatically allocate devices (autoreply) or when you are using multiple backup devices.

If auto reply is not enabled on the backup device designated, a reply from the console is necessary to allocate that device for a STORE process. See Chapter 7, "Handling Media Requests," for more information.

The FILE command below assigns the file name BACKUP to the device with the device class name TAPE.

```
:FILE BACKUP;DEV=TAPE
```

Using the backup device's logical device number is a more exact way deto assign a file name to a particular device. There is only one device defined as LDEV 8 on your system. However, several devices may be assigned the device class TAPE. When you use device classes to name backup devices, STORE asks you to assign a logical device number to each file name with a backup request.

FILE Commands for Automatically Allocated Devices

In order to have devices automatically allocated to the backup, you must assign a different file name for each backup device allocated; use an LDEV number or a unique device class for each FILE command you use, one for each device.

Refer to Chapter 7, "Handling Media Requests," for a description of automatically allocated devices.

Multiple Tape Devices

TurboSTORE allows the use of multiple devices for backup processes. Multiple devices are identified as a pool of available devices. When you store to multiple devices, the devices must have similar characteristics; different device types are not allowed. The device characteristics that must be identical are:

- All devices must be local.

- All devices must have the same density.

- All devices must have the same record size.

- All backups must be either labeled or unlabeled; there cannot be a mix.

- All backup devices must be either DDS-format or magnetic tape or magneto-optical; there cannot be a mix.

Multiple devices can be used as:

- Sequential devices.

- Parallel devices.

- Parallel device pools.

Using Tape Devices Sequentially

With sequential backup devices, when the first backup on the first backup device is filled, it immediately begins writing files to a second backup on the second backup device and the first backup rewinds. When the first backup is rewound, you can unload it and prepare the drive with a new backup. You do not lose time while the first backup is rewinding nor while you are loading a new backup.

When the backup on the last sequential device is filled, the process returns to the first device. It continues cycling through all the devices in the device pool until all of the specified files are stored.

Figure 3-8 illustrates a sequential device backup.

LG200021_002
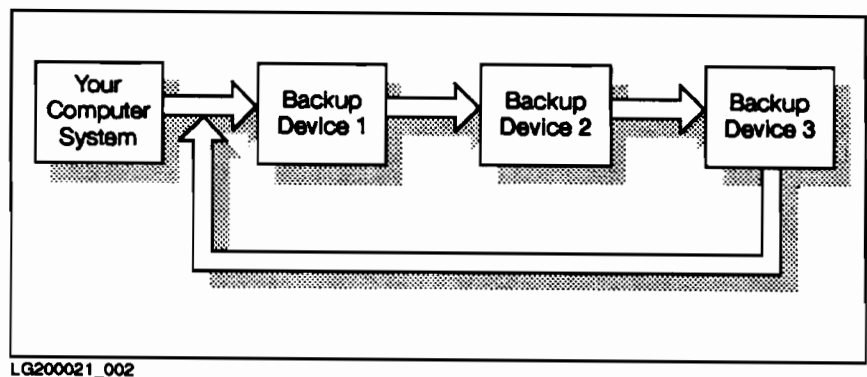
Figure 3-8. Sequential Backup

Use the FILE command to give each device a file name that reminds you of its position. Then use the STORESET parameter in a STORE command to reference the multiple devices. For example, to store files to three sequential devices, use the following set of commands:

```
:FILE SEQ1;DEV=7
:FILE SEQ2;DEV=8
:FILE SEQ3;DEV=9
:STORE @.@.@;;STORESET=(*SEQ1,*SEQ2,*SEQ3)
```

The above STORE command copies all system and user files to three sequential devices. The parentheses surrounding backreferenced file names group the devices into a device pool.

| **Note** | You do not backreference the file name of a backup device immediately after the name(s) of the file(s) you are storing when you use the STORESET parameter. Instead, you must use a placeholder for the missing parameter normally supplied when using a single backup device. The placeholder is provided by the use of ";;" in the STORE command. |

If you gave the backup devices a single file name such as:

```
:FILE T;DEV=TAPE
```

enter the following STORE command to copy files to a set of three sequential backup devices:

```
:STORE @.@.@;;STORESET=(*T,*T,*T)
```

Note   Only unlabeled backups can be used for a sequential device backup.

Using Tape Devices in Parallel

With parallel devices, you have the capability of reducing backup time by storing different files on different devices at the same time. When you store files to a set of parallel devices, the files are grouped before the store begins and then copied to multiple devices simultaneously. For example, when you have three parallel devices, your files are partitioned into three subsets. Files in the first subset are copied to the first backup drive, the files in the second subset are copied to the second backup drive, and so on. When a backup is filled, you are prompted to mount another backup on that drive.

Depending upon the characteristics of your files and your backup devices, storing files to parallel devices usually saves more time than using sequential devices.

Figure 3-9 illustrates a parallel device backup.
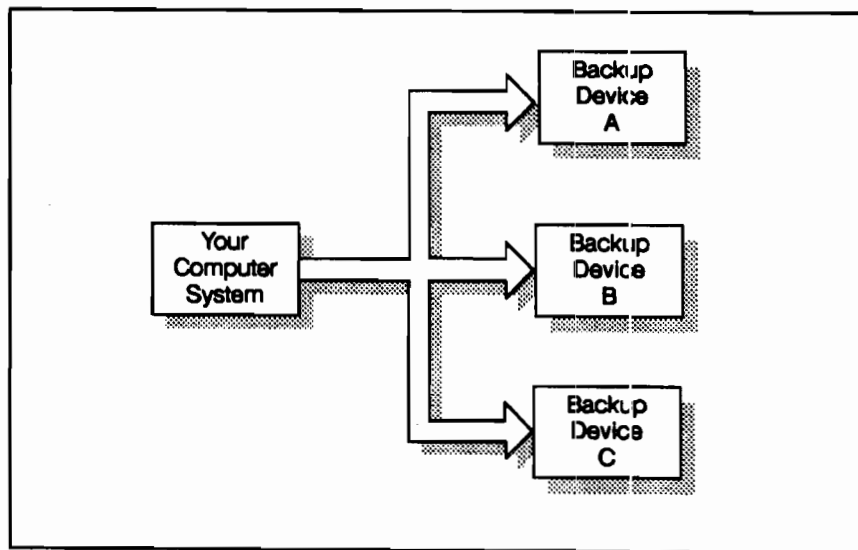
LG200021_003a

Figure 3-9. Parallel Backup

Currently, the TurboSTORE/iX II system configurations support a maximum of 16 parallel backup devices. The actual speed of performance depends on the system, disk configuration and the backup devices used.

To store files to a set of four parallel devices, the following set of commands can be used:

```
:FILE PARA;DEV=7
:FILE PARB;DEV=8
:FILE PARC;DEV=9
:FILE PARD;DEV=11
:STORE @.OPERATOR.SYS;;&
:STORESET=(*PARA),(*PARB),(*PARC),(*PARD)
```

If you gave the backup devices a single file name such as:

```
:FILE T;DEV=TAPE
```

enter the following STORE command to copy files to a set of four
parallel backup devices:

```
:STORE @.@.@;;STORESET=(*T),(*T),(*T),(*T)
```

Describe parallel devices in the STORESET parameter by enclosing
each backreferenced device file name within parentheses. Use commas
to separate devices.

Using Parallel Device Pools

Parallel device pools are multiple sets of sequential devices used in
parallel. Using parallel device pools is often the most efficient way
to store a large set of files when you have several backup devices.
Parallel device pools give you the advantages of both parallel
and sequential devices. You copy file subsets to different devices
simultaneously, and can have another sequential device ready when
the media is filled in any device pool.

Figure 3-10 illustrates a parallel device pool backup.
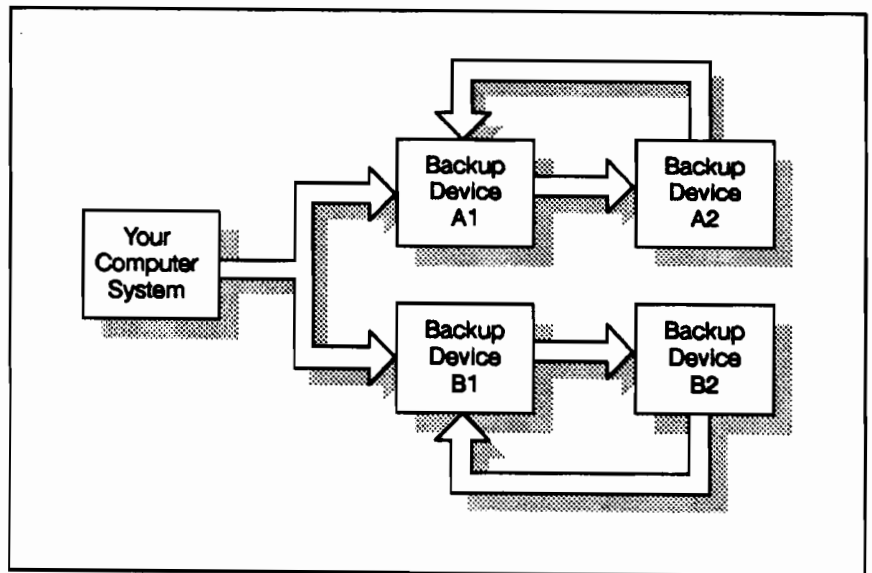
LG200021_004a

Figure 3-10. Parallel Device Pools

Up to eight serial backup devices are currently supported within a parallel device pool. Maximum performance is obtained by using three or four parallel sets, each consisting of two sequential devices.

To store files to parallel device pools, use parentheses to group the devices into pools. Separate the devices in the pool from one another with commas. Commas also separate each device pool. For example, the following commands copy files to two parallel device pools. Each device pool contains two sequential devices. In the following example, STORE uses a total of four devices divided into two device pools.

```
:FILE PPA1;DEV=7
:FILE PPA2;DEV=8
:FILE PPB1;DEV=9
:FILE PPB2;DEV=11
:STORE @.OPERATOR.SYS;;STORESET=(*PPA1,*PPA2),(*PPB1,*PPB2)
```

If you gave the backup devices a single file name such as:

```
:FILE T;DEV=TAPE
```

enter the following STORE command to copy files to a set of parallel device pools:

```
:STORE @.@.@;;STORESET=(*T,*T),(*T,*T)
```

Preparing Magneto-Optical (MO) Disks

TurboSTORE/iX II with Optical Support, product numbers 36397A and 36398A, supports the use of the HP Series 6300 Model 20GB/A magneto-optical (MO) device. The Model 20GB/A features two rewritable optical disk drives and 32 rewritable optical disk cartridges.

Use of magneto-optical disk is recommended for daily backup of large volumes of data. When used in conjunction with TurboSTORE/iX II's low data compression option, the capacity of the magneto-optical device is increased to almost 40 Gbytes of data and the potential backup rate is increased up to 2.8 Gbytes per hour. When used in conjunction with TurboSTORE/iX II's high data compression option, the capacity of the magneto-optical device is increased to almost 64 Gbytes of data.

Preparing for Backup to Optical Disk

When using the Model 20GB/A device, it is important that you ensure that enough scratch media is mounted before you issue the STORE command. The media preparation tasks are performed using the Magneto-Optical Utility (MOUTIL), a utility program provided on the TurboSTORE/iX II product backup. Use of the MOUTIL program is documented in the *Magneto-Optical Media Management User's Guide* (36398-90001).

Determining the Number of Disks Needed

Each optical disk surface holds approximately 290 MBytes of uncompressed data (depending on the type of data and assuming there are no bad sectors on the disk). By comparison, 2400 feet of 1/2 inch backup holds approximately 140 MBytes of data. Therefore, one optical disk surface is equivalent to approximately two tapes. If your backup normally takes four units of backup media, plan on using two optical disk surfaces.

You can estimate the number of optical disk surfaces needed by dividing the total amount of disk sectors in use to be stored by 1,187,840.

1. First, use the DISCFREE command to determine the amount of disk sectors in use on your system. For example:

```
:DISCFREE E,101

DISCFREE A.01.03 Copyright (C) Hewlett-Packard 1989.  All rights reserved.
                    WED, OCT 31, 1990, 04:59 AM

             |   Configured     |    In Use      |    Available     |
 ------------+------------------+----------------+------------------+

TOTALS :
  Device     |   4464384        |  3136672 ( 70%) |  1327712 ( 30%) |
  Permanent  |   3906336 ( 88%) |  3002160 ( 67%) |   904176 ( 20%) |
  Transient  |   3348288 ( 75%) |   134512 (  3%) |  1327712 ( 30%) |
```

Figure 3-11. DISCFREE

In this example, a total of 3,136,672 sectors are in use.

2. Divide the total number of sectors to be stored by 1,187,840 and round up to the nearest whole number to determine the number of disk surfaces required.

```
3136672 / 1187840 = 2.6 disk surfaces
```

In this example you would need three disk surfaces.

Specifying the Magneto-Optical Device

When storing to a magneto-optical device, you do not use file equations as you do when using backup drives. Nor do you use the STORESET parameter to backreference the device. Instead, you specify that backup is to be to the Model 20GB/A through the MOSET parameter of the STORE command. Specify the LDEV number of the magneto-optical device as a parameter to MOSET. For example:

```
;MOSET=(101)
```

or

```
;MOSET=(MO)
```

Actual LDEV numbers are only necessary if you have multiple magneto-optical devices and you want to specify a particular magneto-optical device. Using the keyword "MO" instead of a number causes STORE to use the first available scratch media.

Naming the Backup

You can optionally use the NAME parameter of the STORE command to name the backup with a name that logically relates the media as being from the same backup. The name specified must be unique so that it can be found when restoring files. For example, a monthly backup for September, 1990 on a system called "KING" could be named "MONTHLY.SEPT1990.KING". Note that the backup name is a three-field name separated with periods. Each of the three fields can be up to eight alphanumeric characters. If a backup name is not specified, a default name is created using the time, date, and system name. For example, "BK1130PM.D23OCT90.KING".

The backup name must be unique for RESTORE to be able to find it.

If media is removed from the magneto-optical device, use an external label with the same backup name as you specified with the STORE command.

The media sub *name* of the MEDIASUB parameter to the MOUTIL command SCRATCH is used to hold the media number and set number for each side of the media.

Storing to a Single Magneto-Optical Device

The following example illustrates the STORE command to backup files to a single magneto-optical device with the LDEV number 101.

```
:STORE @.@.@;;MOSET=(101);SHOW;NAME=BK1130PM.D23OCT90.KING
```

Storing to Multiple Magneto-Optical Devices

Multiple magneto-optical devices can be used in parallel (sequential use is not recommended) for backup by specifying each magneto-optical device drive with the MOSET parameter. For example, to use LDEV 102 and 103 in parallel, the MOSET entry would be:

```
;MOSET=(102),(103)
```

For example, to use the first available media in parallel, the MOSET entry is:

```
;MOSET=(MO),(MO)
```

Do not mix alphanumeric with numeric allocation requests. For example:

```
;MOSET=(M1),(102)
```

Storing to Parallel Magneto-Optical Devices

Storing to parallel magneto-optical devices is the recommended method of using multiple magneto-optical devices. The following example illustrates the STORE command entry to use two magneto-optical devices in parallel.

```
:STORE @.@.@;;MOSET=(MO),(MO);SHOW;NAME=BK1130PM.D23OCT90.KING
```

With this usage, both drives will be active storing simultaneously.

4

Preparing the System

This chapter describes the procedures for notifying and preparing all the interactive items of a system for a system level backup. The sections are:

- Notifying Users of Pending Backup
- Preventing New System Activity
- Sending Warning Messages
- Replying to Console Requests
- Temporarily Suspending Jobs
- Sending Final Warning Messages
- Aborting Any Remaining Sessions

It is recommended that system backups be done when no one else is using the system. This ensures that all files are backed up, since files opened for write access will not be stored.

To prevent users from accessing the system during a system backup, you must close all files and log all users off of the system before you begin. It is also a good idea to announce backups in the **WELCOME** message. To prepare for a backup, follow the steps below.

Notifying Users of Pending Backup

About 15 minutes before you plan to begin the backup, use the TELL command to send a message asking all users to finish their work and to log off the system. Enter the following command substituting the actual time that you plan to begin the backup for hh:mm.

```
:TELL @S; BACKUP BEGINS AT hh:mm.   PLEASE LOGOFF; &
:TELL YOUR QUIET NEIGHBORS
```

(A QUIET neighbor is someone who has specified not to be disturbed with terminal messages.)

Preventing New System Activity

You control the number of executing jobs and sessions with two commands, LIMIT and JOBFENCE. The LIMIT command controls the number of jobs or sessions that execute concurrently. (The limits you set with the LIMIT command cannot exceed the maximum job/session limit determined by your system configuration.)

The JOBFENCE command lets you choose the priority jobfence—a number between 0 and 14 (inclusive). Each session and job logs on to the system with an input priority between 1 and 13 (inclusive); the default input priority for standard MPE users is 8. In order for a session or job to execute, its input priority must exceed the current jobfence.

When you set the jobfence high, jobs with an input priority less than or equal to the jobfence enter the WAIT state. MPE XL refuses attempts to initiate a session with an input priority that does not exceed the current job fence. Users see the following message:

```
CAN'T INITIATE NEW SESSIONS NOW.
```

If you set the jobfence to its highest possible value, 14, only users assigned system manager (SM) or system supervisor (OP) capability are able to log on. (System managers and system supervisors are the only users allowed to log on with the HIPRI parameter of the HELLO and JOB commands.) Setting the jobfence to 14 prevents all other users from gaining access to the system during a system backup. Enter:

```
:LIMIT 0,0
:JOBFENCE 14
```

To check the new job/sessions limits and the system jobfence, enter:

```
:SHOWJOB STATUS
```

The last line of the message on your console should now exactly match the example shown below:

```
JOBFENCE= 14; JLIMIT= 0; SLIMIT= 0
```

If you see anything else, you made a mistake entering the LIMIT and JOBFENCE commands. Follow the instructions again.

Sending Warning Messages

About 10 minutes before you plan to begin the backup, use the WARN command to send a message to all users asking them to log off the system.

Unlike the TELL command, the WARN command interrupts users working in QUIET mode so that you can be sure they know about the impending backup. Enter the command below, substituting the time you intend to begin the backup for hh:mm.

    :WARN @S; BACKUP WILL BEGIN AT hh:mm. PLEASE LOG OFF

Now that everyone has been warned, find out who is still using the system. Enter:

    :SHOWJOB JOB=@S

The system responds by listing all sessions. Since you have already told users about the backup once, and warned them again, most users should have ended their sessions. Periodically use the SHOWJOB command to see who is still logged on to the system.

Replying to Console Requests

Before continuing with the backup, check whether there are any console requests pending. Enter:

    :RECALL

If the system responds with NO REPLIES PENDING, skip to the "Temporarily Suspend Jobs" step below. If there are some console requests that you have not yet answered, respond to them now. Refer to Chapter 7, "Handling Media Requests," for information on answering media requests. If you give users access to a device at this point, you may have to wait until they finish their work before you proceed with the backup.

Temporarily Suspending Jobs

It is advisable to suspend the execution of all jobs while a STORE is being performed. (If a job step attempts to open a file for write access which is being stored, the open fails, with possible negative consequences for the job.)

Note

Advise users not to schedule jobs during the time scheduled for backups. STORE does not copy files allocated to suspended jobs; thus, a backup undertaken with suspended jobs may be incomplete.

To check whether there are any jobs running on the system, enter:

    :SHOWJOB JOB=@J

If you see a message stating NO SUCH JOBS, or if the list contains no executing jobs (check the STATE column for EXEC), skip to the "Send Another Warning" step below. If any jobs are in the EXEC state, you should temporarily stop them. To do so, use the job numbers that appear in the first column on your screen with the BREAKJOB command, as follows:

:BREAKJOB #Jnnn

Repeat the BREAKJOB command for each executing job in the list. When you have suspended all executing jobs, check their status by entering:

:SHOWJOB JOB=@J

Each job should now be listed as SUSP, or suspended. However, jobs that have resources allocated to them do not suspend immediately; you may have to wait for them to suspend.

Sending Final Warning Messages

Check to see whether any users are still logged on to the system by entering:

:SHOWJOB JOB=@S

If there are any remaining sessions, besides your own, send them one last warning:

:WARN @S; LOG OFF NOW! BACKUP ABOUT TO BEGIN

Aborting Any Remaining Sessions

Check one more time whether all sessions (except your own) have logged off by entering:

:SHOWJOB JOB=@S

Either abort any sessions other than your own that are still executing, or check with the users and ask them once more to log off. To abort sessions, use the ABORTJOB command and the session numbers that appear in the first column on your screen, as follows:

:ABORTJOB #Snnn

After you have aborted all sessions (except your own) issue a
SHOWJOB command to check that all sessions are aborted. When the
system responds that you are the only session on the system (as
shown below), you are ready to begin the backup.

```
JOBNUM  STATE  IPRI  JIN   JLIST    INTRODUCED   JOB NAME
#S184   EXEC         20    20       FRI 1:03P    OPERATOR.SYS
#J17    SUSP         10S   PP       FRI 5:02P    AJOB,MRS.T
2 JOBS:
     0 INTRO; 0 SCHEDULED
     0 WAIT;  INCL 0 DEFERRED
     1 EXEC;  INCL 1 SESSIONS
     1 SUSP
JOBFENCE= 14; JLIMIT= 0; SLIMIT= 0
```

Figure 4-1. Aborted Session System Response

5

Storing Files

This chapter contains complete information on how to use the STORE command to store files to backup media. STORE can be used to back up a single file, all user, system, and system directory files (that is, a full system backup), or any number of files in between.

The information in this chapter describes how to use the STORE command to specify and create backup files. The subjects are:

1. Specifying Files in the STORE Command

2. Using Indirect Files

3. Using Filesets with the RENAME Option

4. Storing to Labeled Tapes

5. Monitoring STORE Command Progress

Use the STORE command, and optionally the FILE command, to store a file or set of files. A FILE command is used to assign a filename to a backup device. A STORE command names the files to store and the options to use.

The STORE command options for naming files let you name a single file, several files, or all the files on the system. The group of files to store is called a fileset. In addition to naming many kinds of file sets, you can name file subsets not to store.

Refer to Chapter 6,"STORE and TurboSTORE Options," for a description of each of the STORE options. For example, you can print a list of all files stored, purge disk files immediately after storing them to backup, or request progress messages that show the status of the STORE process on the console.

Additionally, the MPE XL command, VSTORE, allows you to verify that the data written to backup using the STORE program are valid. Refer to Chapter 10, "Restoring Files," for descriptions of the VSTORE options.

Files can be stored to a single backup device or to multiple backup devices in several configurations. You can also store files in interleave format. Use multiple backup devices and interleave format to increase performance when you have a large set of files to store, for example, when you are performing a full system backup.

Caution

Do not use the STORE or RESTORE programs to transfer any of the files originally on your system load backup from LDEV 1 to a system disk other than LDEV 1. (These files are contained in the SYS account and can be displayed by entering the SY configurator of the SYSGEN utility and using the SHOW command.) Also, do not purge or put a lockword on these files. Finally, do not use any command other than SYSGEN to manage the files within a configuration group. These configuration files come as a set and individual files may not be moved between groups or systems. Such actions will make these system files inaccessible causing problems either immediately or at a later time.

Specifying Files in a STORE Command

The files that you are allowed to store depend on your capability. In general, you may only store files that you have read access to. If you are a system manager, system supervisor, or system operator, you can store any file in the system.

The following section describes how you specify which files you want to be stored. The entire set of files to be stored is known as a *fileset list*.

The fileset list is the first argument to the store command. If no files are specified, the default set is all files in your current working directory, or "@". This is the default no matter what capabilities you may have.

Note

1. If an empty fileset list is specified, and the DIRECTORY option is used, the default set is empty. This allows a system administrator to create a backup containing just the system accounting structures, without storing any files.

2. If a fileset list is not specified, a semi-colon (;) place holder must be used instead. For example:

   ```
   :FILE T;DEV=TAPE
   :STORE ;*T
   ```

If a fileset list is specified, it must follow certain guidelines. The list is made up of comma seperated fileset items. Each item can be either a fileset or an indirect file.

Filesets   A fileset specifies a group of files to be stored. It can also specify a
group of files to be excluded from the STORE operation.

The syntax for a fileset is:

> filestostore [- filestoexclude [-....]]

The filestostore and filestoexclude are specified using the same
syntax. Any file that matches filestostore will be stored, unless
the file also matches a filestoexclude. An unlimited number of
filestoexclude may be specified. However, if the TRANSPORT option is
also being used, only one filestoexclude may be specified.

Note   Since the hyphen (-) is a valid character for HFS syntax filenames,
a blank character must separate it from HFS filesets to obtain the
special negative fileset meaning.

Specifying A Fileset   Filesets and exclusion sets are specified using the same format. They
can be specified two different ways:

- MPE syntax
- HFS syntax

MPE Syntax

A file is specified as:

> filename [.groupname [.accountname]]

If accountname is omitted, the file is looked for in your logon
account. If groupname is omitted, the file is looked for in your
current working directory.

A lockword may be specified for a file, in the form:

> filename/lockword.group.account

HFS Syntax

A file is specified as:

> /dir_lev_1/dir_lev_2/.../dir_lev_i/.../filedesig

or

> ./dir_lev_i/dir_lev_j/.../dir_lev_k/.../filedesig

If the name begins with a dot (.), then it is fully qualified by
replacing the dot with the current working directory (CWD).

Each of the components *dir_lev_i* and *filedesig* can have a maximum of 255 characters with the full path name being restricted to 1023 characters. Each of the components *dir_lev_i* and *filedesig* can use the following characters:

- Letters a to z
- Letters A to Z
- Digits 0 to 9
- Special characters - _ .

For HFS syntax, the lowercase letters are distinct from the uppercase letters (no upshifting). Names in MPE syntax are upshifted.

Using Wildcard Characters

Use wildcard characters to seletect multiple files to store. The wildcard character is expanded to include all files that match.

Both MPE and HFS name components use the at sign (@), pound sign (#), and question mark (?) as wildcard characters. These wildcard characters have the following meaning:

@   Specifies zero or more alphanumeric characters.

Specifies one numeric character.

?   Specifies one alphanumeric character.

The characters can be used as follows:

n@	All files starting with the character n.
@n	All files ending with the character n.
n##...#	All files starting with character n followed by up to seven digits (useful for storing all EDIT/3000 temporary files).
n@x	All files starting with the character n and ending with the character x.
?n@	All files whose second character is n.
n?	All two-character files starting with the character n.
?n	All two-character files ending with the character n.

Also, character sets may be specified in the following syntax:

[ct]	Specifies letter c or t.
[c-t]	Specifies any letter from range c to t.
[e-g1]	Specifies any letter range e to g or digit 1.

Examples of using character sets are:

[A-C]@   All files that begin with the letters A, B, or C.

myset[e-g1]   All files that begin with the name myset and end
                in E, F, or G, or 1.

myset[d-e1-6]   All files that begin with the name myset and end
                in D or E, or 1, 2, 3, 4, 5, or 6.

You specify up to a maximum of sixteen characters for each character
set, and you cannot nest brackets. Do not use character sets with the
TRANSPORT option.

A character set specifies a range for only one ASCII character. The
range [a-d]@ gets all files that begin with the letter "a" through the
letter "d". The range [ad-de] will cause unpredictable results.

Note	Since the hyphen (-) is a valid character for HFS syntax filenames, it is allowed inside a character set, immediately following a left bracket ([) or preceding a right bracket (]). When specifed between two characters, the hyphen implies a range of characters.

MPE and HFS Naming Equivalences

When an MPE name component is a single @ wildcard, the @
includes all MPE and HFS-named files at that level and below. To
specify only MPE-named files, use ?@ instead. The ? forces the first
character of the filename to be an alphanumeric character, which
only matches MPE-named files.

MPE wildcards are not expanded in exclusion filesets. This means
that @.@.@-@.@.@ is NOT an empty fileset. @.@.@ is the same as
/. -@.@.@ does not have an HFS equivalent. -@.@.@ specifies all
HFS-named files on the system, the resulting fileset is all of the HFS
named files on the system.

You can enter a fileset in any of the following formats and may use
wildcard characters. Equivalent MPE and HFS formats are grouped
together.

`file.group.acct`	One particular file in one particular group in one particular account.
`file.group`	One particular file in one particular group in the logon account.
`file` `./file`	One particular file in the CWD.
`@.group.acct` `/ACCT/GROUP/`	All files (MPE and HFS) in one particular group in one particular account.
`?@.group.acct`	All MPE-named files in one particular group in one particular account.
`@.group` `/LOGONACCT/GROUP/`	All the files (MPE and HFS) in one particular group in the logon account.
`?@.group`	All MPE-named files in one particular group in the logon account.
`@.@.acct` `/ACCT/`	All the files (MPE and HFS) in all the groups in one particular account, plus all the files and directories under the specified account.
`?@.@.acct`	All MPE-named files in all the groups in one particular account.
`thisisit.@.acct`	Any MPE-file named thisisit in all the groups in one particular account.
`@`	All (MPE and HFS) files in the CWD. This is the default for everyone, regardless of permissions.
`@.@`	All (MPE and HFS) files in the logon account.
`?@.@.@`	All MPE-named files in the system.
`@.@.@` `/`	All the files and directories (MPE and HFS) in the system.

Examples:

All of the following examples assume that a file equation for T was previously set up, by issuing the FILE command:

```
:FILE T;DEV=TAPE
```

■ Storing a single file

```
:STORE FILE1.PUB.RESEARCH;*T
```

■ Storing several files

```
:STORE FILE1.PUB.RESEARCH,FILE2.PUB.MYACCT;*T
```

■ Store several files with wildcards

□ Store all MPE and HFS files in GROUP1.ACCTNAME:

```
:STORE @.GROUP1.ACCTNAME;*T
```

□ Store all MPE and HFS files in the dir3 directory:

```
:STORE ./dir3/@;*T
```

□ Store all HFS files that start with lower case letters in the CWD:

```
:STORE ./[a-z]@;*T
```

■ Exclude some files from a fileset:

□ Store everything on the system except files in PUB.SYS, MPE format:

```
:STORE @.@.@-@.PUB.SYS;*T
```

□ HFS format:

```
:STORE / - /SYS/PUB/@;*T
```

■ Store everything on the system except the 3000devs account:

```
:STORE @.@.@ - /3000devs;*T
```

■ Store only the HFS-named files on the system:

```
:STORE / - @.@.@;*T
```

■ Store only the MPE-named files on the system:

```
:STORE ?@.@.@;*T
```

■ All files in the TEST group, except those that begin with A or B:

```
:STORE @.TEST - A@.TEST - B@.TEST;*T
```

Using Indirect Files

If you backup the same information regularly, you might keep the STORE parameters and options you use in an indirect file. An indirect file is a text file containing filesets and parameters for a STORE command. Instead of listing the files you want to store and the options you want to use in a STORE command, enter them in a text file and name the text file in the STORE command.

An indirect file must:

■ Be an existing permanent or temporary file.

■ Have a record length between 8 and 255 bytes.

■ Have read access allowed, although the file may be open, shared, or intrajob.

The following is an example of using an indirect file:

Suppose you regularly back up all the files on your system, including the system directory and a nonsystem volume set's files and directory. The usual STORE command, as illustrated in the previous section, might be:

```
:STORE @.@.@;*T;DIRECTORY;ONVS=MPEXL_SYSTEM_VOLUME_SET,NV1
```

Using an indirect file can save time, especially if your STORE command is long or contains information that is difficult to remember. You enter the STORE files and parameters in a text file:

```
@.@.@;DIRECTORY;ONVS=MPEXL_SYSTEM_VOLUME_SET,NV1
```

Give the text file a name that is easy to remember, and reference the text file name in a STORE command. The following STORE command references the file BACKUP as an indirect file:

```
:STORE ^BACKUP;*T
```

The caret (^) is used prior to the filename to tell STORE that it is an indirect file.

The exclamation point (!) can also be used, but it will be interpreted by the command interpreter (CI) as a variable deference. If you do not intend for it to be used that way, you should specifiy two exclamation points (!!) to cause a single exclamation point (!) to be passed to STORE. However, the recommended character is the carat (^).

Multiple indirect files can also be used. For example:

```
:STORE ^BACKUP1,^BACKUP2;*T
```

Indirect files can also be nested. The maximum nesting level is 3. For example:

```
INDIR1:  @.PUB.SYS;SHOW

INDIR2:
@.OUT.HPSPOOL
^INDIR1

:STORE ^INDIR2;*T
```

Using Filesets With the RENAME Option

If the RENAME option is specified, the fileset syntax is expanded to allow new filenames and creators to be specified. The new syntax is:

```
filestostore [ - filestoexclude [ - ... ] ][ =targetname ]
```

The target name field specifies the new name and creator for the file on the store media. It has the form:

```
filename[ :creator[ .creatoraccount ] ]
```

The filename can be any legal MPE filename or HFS pathname. The creator and creatoraccount must be legal creator and account names, respectively. The only wildcard character allowed is a single at sign (@) for each component of the filename, creator or creatoraccount. The wildcard character @ indicates that the source value for that component should be used. An HFS pathname which ends in a / is considered an HFS directory and no wildcard characters are allowed.

The RENAME option must be specified if the targetname is used. Refer to the RENAME section in Chapter 6, "STORE and TurboSTORE Command Options," for more details.

Storing to Labeled Tapes

The STORE command syntax for backups to labeled tapes is identical to that for unlabeled tapes. However, you must use a FILE equation to request that the STORE command write to a labeled volume. For example, when preparing for a backup to a volume set labeled VOL25, to be mounted on logical device 7, the following file equation could be entered:

`:FILE TAPE7=BACKUP.JAN29;DEV=TAPE;LABEL="VOL25",ANS,02/28/90`

This file equation is followed by a STORE command which references the destination device:

`:STORE @.@.@;*TAPE7;` *storeoptions*

Note ANSI and IBM standard backup labels cannot be used with magneto-optical disks.

Using Previously Labeled Volumes

If the previously labeled volume set has not been mounted prior to the backup, the system sends you a message requesting the first volume of the set. For example:

`?23:20/#S5/50/Mount volume    VOL25    (ANS)`

After you mount the correct volume and it has been recognized by automatic volume recognition (AVR), you will see a message similar to the following:

`23:23/15/Vol VOL25   (ANS)   mounted on LDEV# 7`

After this volume has been successfully written to, STORE requests that the next reel of the set be mounted. For example:

`?23:34/#S5/50/MOUNT REEL 2 OF VOLSET VOL25 ON LDEV 7`

Note AVR messages are not issued for reels 2, 3, and so on.

Using Unlabeled Volumes

If you plan to create labeled volumes using backups that are *not* labeled, the preceding procedure differs slightly. Use the FILE equation and STORE command as you would with a labeled volume. For example:

`:FILE TAPE7=BACKUP.JAN29;DEV=TAPE;LABEL="VOL25",ANS,02/28/90`

`:STORE @.@.@;*TAPE7;` *storeoptions*

You will receive a message similar to the following:

```
?23:26/#S/47/MOUNT VOLUME VOL25    (ANS)
```

This is followed by a message recognizing the media that is mounted:

```
23:27/15/Vol  (unlabeled) mounted on LDEV# 7
```

Reply to the first message by indicating the LDEV where the volume is to be mounted. For example:

```
:=REPLY 47,7
```

The volume mounted is then labeled and the backup continues until a new volume is required. You will receive a message similar to the following:

```
?23:33/#S5/47/MOUNT REEL 2 OF SET VOL25 ON LDEV 7
```

This message is followed by a request to provide a volume ID for the volume.

```
?23:34/#S5/47/REPLY WITH VOL ID FOR VOLSET VOL25 on LDEV 7?
```

Reply to this message with a valid ID for the volume. For example:

```
:=REPLY 47,VOL26
```

The backup continues, requesting new volumes until all files in the fileset are written to the backups.

Note	Labeled backups created by TurboSTORE/iX II cannot be used to transport data to an MPE V system.

Monitoring STORE Command Progress

After you enter a STORE command, STORE issues a message similar to the following one on the console:

```
TURBO-STORE/RESTORE VERSION A.20.01  (C) 1986 HEWLETT-PACKARD CO.
TUE, NOV 6, 1989,  2:57 PM
```

Monitor the console for additional messages. In addition to regular progress messages, if you requested them, STORE sends you messages when you need to reply to a backup request, add a write ring to a backup reel, or mount a new backup on a backup device.

Responding to Tape Requests

When your backup devices are not configured to be automatically allocated, the system answers your STORE command with one or more backup requests. Refer to Chapter 7, "Handling Media Requests," for more information.

If you have previously issued a FILE command that included the backup device's LDEV number, the backup request asks you to confirm that number. For example:

```
?14:57/#S25/43/IS "T" ON LDEV #8 (Y/N)?
```

Replying to Tape Requests for a Multiple-Device Backup

If you are backing up files to several devices, the system sends you a backup request for each device. If you give your backup devices unique filenames, you receive a backup request for each unique filename. Use the "Multiple Device Planning Chart" from figure 3-7 in Chapter 3, "Preparing Storage Devices," to determine which LDEV to assign to each name.

If you give your backup devices a common filename, you receive several identical backup requests referring to the common filename, one for each device. For example, the first backup request in a sequential backup asks for the LDEV number of the first device. The second request asks for the LDEV number of the second device, and so on.

During a parallel backup, backup requests for the parallel devices will be issued to the console. Requests for all parallel devices will be issued at once, in no specific order. There will be a different PIN associated with each request, although all requests are really coming from STORE. You should reply to the requests using the appropriate LDEVs for the parallel sets. Files will not begin to be stored until all requests have been replied to.

When you are using parallel device pools, the requests for the first serial device in all pools will be issued first, in no specific order. After the first serial device has been replied to, then a request will be issued for the next serial device, and so on. Parallel pool requests are independent, with each parallel pool having a different PIN associated with its request. Files will not be stored until all requests have been replied to.

REDO Tape Errors

When a backup error occurs, and REDO was specified for media error resolution (refer to "Tape Error Recovery," in Chapter 6, "STORE and TurboSTORE Command Options"), special information may be displayed if sequential devices were specified. For example, suppose STORESET=(*T1,*T2,*T3)" was requested. If a backup error occurs on the device referenced by *T2 while it is creating reel 2, a special message would be displayed:

```
STORE IS STARTING TO WRITE REEL # OF SET # ON LDEV #
```

where LDEV # is the device referenced by *T2. This means that STORE error recovery occurs on the same device the error occurred on.

Responding to a NO WRITE RING Message

Reel backups require you to insert a write ring into the reel in order to store files onto the backup. You see a NO WRITE RING message when you attempt to store files to a reel-to-reel backup and neglect to insert a write ring into the groove on the back of the backup reel. For example:

```
15:57/2/LDEV#8 NO WRITE RING
```

The message above tells you there is no write ring on the backup reel mounted on LDEV 8. Without the write ring, the files on the backup are protected from being inadvertently copied over. You must rewind and remove the backup reel, and mount a backup which has a write ring. Follow the instructions in Chapter 2, "Managing Backups and Backup Media." When the backup is correctly mounted, STORE continues, and another REPLY is not necessary.

Progress Messages

If you have used the PROGRESS parameter in your STORE command, the system displays progress messages at the interval you specified. For example:

```
STORE OPERATION IS 4% COMPLETE
```

You see similar messages at regular intervals, for example:

```
STORE OPERATION IS 7% COMPLETE
STORE OPERATION IS 11% COMPLETE
STORE OPERATION IS 14% COMPLETE
```

The backup is finished when the 100% complete message displays.

Mounting Additional Tapes

When STORE fills a backup on a device and it has additional information to store to that device, it asks you to mount another backup. You see a mount request and LDEV NOT READY message like the ones below:

```
15:28/#S43/59/MOUNT REEL 2 FOR STORE ON LDEV 8
15:29/#S43/59 LDEV 8 NOT READY
```

The mount request above asks you to mount another backup on logical device 8.

To mount another backup:

1. Unload the first backup and stack it, label side down, on top of any backups previously written on this drive during the current STORE operation; remove the write ring.

2. Select the next backup from the prepared stack near the backup device. If there are no more backups prepared, prepare a new backup following the instructions in "Preparing Your Backup Media", in Chapter 3, "Preparing Storage Devices."

3. Mount the new backup.

4. Continue monitoring the backup process. Mount new backups as the system requests them.

6

STORE and TurboSTORE Command Options

This chapter describes the use of the STORE and TurboSTORE options. The options are:

Option	Description
SHOW	Lists the files stored
ONERROR	Specifies error recovery method
DATE	Stores files specified by a date: files modified since a specified date or files not accessed since a specified date
PURGE	Removing stored files from the system for archiving
PROGRESS	Displays progress messages during backup
DIRECTORY	Stores a backup of the system directory
TRANSPORT	Creates compatible backups in two formats: MPE V/E format and pre-POSIX format
FILES	Specifies the number of files to store
COPYACD, NOACD	Specifies file security
FCRANGE	Stores files with specified file codes
MAXTAPEBUF	Improves storing efficiency, increases the record size of the backup device
NOTIFY	Allows STORE to stream a user specified job file
ONVS	Stores files from volume sets
SPLITVS	Stores files located on split volume sets
RENAME	Changes the name of original files on the system or the target files on the backup media
TREE, NOTREE	Specifies if files should be scanned recursively to include all files in a hierarchical directory
INTER	TurboSTORE option that stores files in Interleave format
COMPRESS	TurboSTORE option that improves storing efficiency, compresses data being stored
ONLINE	TurboSTORE option that stores files while they are open

TurboSTORE/iX provides you with certain special features not available with the standard STORE program. First, the TurboSTORE/iX program has several methods for reducing the time necessary to perform a backup. TurboSTORE/iX enables you to copy files to a single device or copy files to several devices at the same time. With TurboSTORE/iX, you can take advantage of the full speed of your backup devices by copying files in a special format called interleave format.

Listing the Files Stored (SHOW)

Whenever you store a set of files, the system displays the total number of files stored at your terminal. If there was an error, it also displays the number and names of files not stored and the reason each was not stored. Use the SHOW parameter and its options to display the names and additional information about the files stored and to list them on your system printer as well as at your terminal.

Internally, the STORE program writes information about the files it stores to a file with the formal file designator SYSLIST. It prints file information at your terminal by equating SYSLIST with the standard listing device for your session (your terminal). You can redirect the file information to another file or device by issuing a FILE command that assigns SYSLIST to that device or file. For example, you might want to redirect the file information to a disk file so that you can keep it online for your records.

To write STORE information to the disk file, SHOWFILE, enter:

```
:FILE SYSLIST=SHOWFILE;DEV=DISC
```

To print information on the files you stored at the system printer as well as at your terminal, use the SHOW=OFFLINE option:

```
:FILE T;DEV=TAPE
:STORE @.OPERATOR.SYS;*T;SHOW=OFFLINE
```

To redirect the OFFLINE listing to another file or device, issue the following FILE command, it will send a copy of the STORE listing to the disk file SHOWOFFL:

```
:FILE OFFLINE=SHOWOFFL;DEV=DISC
```

To generate a store listing to the terminal as well as to a disk file, enter the previous FILE command followed by the STORE command:

```
:STORE @.OPERATOR.SYS;*t;SHOW=OFFLINE
```

Using a Long or Short File Display

The STORE command gives you two options for displaying additional information about the files stored. Using the SHOW parameter, you can choose to display file information in either long or short form.

A short file display prints the file's full name, volume restrictions, number of sectors, file code, and media number for each file you store.

In addition to there being a long and a short SHOW listing, there are also two different versions of each - MPE and HFS. The type of listing printed depends on the input file set list. You will get a HFS style listing if:

■ At least one file in the file set list is specified in HFS syntax.

■ A file set wildcard is expanded to include a HFS syntax file.

The HFS style listing contains the same information as the MPE style listing. The only difference is that the file name is printed as an absolute pathname at the end of the line.

Since HFS pathnames can be of variable length, and can be quite long, they are placed at the end of the line so that they will not affect the spacing of the other columns. If the name does not fit on one line, it will be wrapped to the next line. An asterisk (*) will be placed at the last column of the line to indicate that the rest of the filename will continue on the next line.

Note

It is likely that a STORE with the file set @.@.@ will result in a HFS format listing, since MPE/iX, by default, contains some HFS syntax files.

To display the list of files stored using the short form in MPE format, use the SHOW=SHORT option in your STORE command. For example:

```
:FILE T;DEV=TAPE
:STORE @.PUB.TEST;*T;SHOW=SHORT
```

Figure 6-1 illustrates a short file display in MPE format using the above example.

FILENAME	GROUP	ACCOUNT	VOLUME RESTRICTIONS		SECTORS	CODE MEDIA
FILE1	.PUB	.TEST	DISC	:C	1104	1
FILE2	.PUB	.TEST	DISC	:C	0	1
FILE3	.PUB	.TEST	DISC	:C	32	1

Figure 6-1. Short File Display (MPE Format)

This example uses the same file set as the first example, except that it is specifed in HFS syntax.

```
:FILE T;DEV=TAPE
```

```
:STORE /TEST/PUB/@;*T;SHOW=SHORT
```

Figure 6-2 illustrates a short file display in HFS format using the
above example.

```
VOLUME RESTRICTIONS SECTORS CODE MEDIA FILENAME

DISC            :C   1104    1              /TEST/PUB/FILE1
DISC            :C   0       1              /TEST/PUB/FILE2
DISC            :C   32      1              /TEST PUB/FILE3
```

Figure 6-2. Short File Display (HFS Format)

This example shows how the HFS syntax names will be wrapped, if
they cause the line to exceed 80 characters:

```
:FILE T;DEV=TAPE
:STORE /usr/lib/terminfo/e/e[t-z]@;*T;SHOW=SHORT
```

Figure 6-3 illustrates a short file display in HFS format with line
wrap using the above example.

```
VOLUME RESTRICTIONS   SECTORS CODE MEDIA FILENAME

DISC            :C    256    1       /_HFSACCT/_HFSGRP/HFSMAP
DISC            :C    16     1       /usr/lib/terminfo/e/ethern*
et
DISC            :C    16     1       /usr/lib/terminfo/e/ex3000
DISC            :C    16     1       /usr/lib/terminfo/e/exidy
DISC            :C    16     1       /usr/lib/terminfo/e/exidy2*
500
```

Figure 6-3. Short File Display with Wrapped HFS Names

A long file display contains the same information as a short file
display plus each file's ending media number, record size, blocking
factor, maximum number of extents allowed, end-of-file, and file
record limit.

Once again, there are two formats for the long listing - MPE and
HFS. The HFS format contains the same information as the MPE
format, except that the variable-length HFS filename is at the end of
the line. It will be wrapped in the same was as the short listing if the
file name length exceeds the line length.

To display the list of files stored using the long form in MPE format,
use the SHOW=LONG option. For example:

```
:FILE T;DEV=TAPE
:STORE @.PUB.TEST;*T;SHOW=LONG
```

Figure 6-4 illustrates a long file display from the above example.

```
FILENAME GROUP ACCOUNT VOLUME RESTRICTIONS SECTORS CODE MEDIA_NUM RSIZE BFCTR #EXT  EOF  LIMIT

FILE1  .PUB  .TEST  DISC      :C       1104   1 - 1  80        16    0    3500  3500
FILE2  .PUB  .TEST  DISC      :C          0   1 - 1  72         3    1       0     0
FILE3  .PUB  .TEST  DISC      :C         32   1 - 1  72         1    2     111   112
```

Figure 6-4. Long File Display (MPE Format)

Figure 6-5 illustrates the same example as above, except specifying the file names in HFS syntax:

```
VOLUME RESTRICTIONS  SECTORS CODE MEDIA_NUM RSIZE BFCTR #EXT EOF LIMIT FILENAME

DISC      :C       1104   1 - 1      80  16    0    3500 3500  /TEST/PUB/FILE1
DISC      :C          0   1 - 1      72   3    1       0    0  /TEST/PUB/FILE2
DISC      :C         32   1 - 1      72   1    2     111  112  /TEST/PUB/FILE3
```

Figure 6-5. Long File Display (HFS Format)

If you use the SHOW parameter, but do not specify either LONG or SHORT, the system displays files in short form when the record size of the output device or file (SYSLIST) contains fewer than 132 characters in native mode and 114 characters in transport mode. The system displays files in long form when the record size is equal to or greater than 132 characters in native mode and equal to or greater than 114 characters in transport mode.

You can combine either LONG or SHORT with any of the other SHOW options, except NAMESONLY, but you cannot specify both LONG and SHORT at the same time within a STORE command.

Displaying File Dates

To display each file's creation date, last access date, and last modification date for the files stored, use the SHOW=DATES option. For example:

```
:FILE T;DEV=TAPE
:STORE @.PUB.DOC;*T;SHOW=DATES
```

Figure 6-6 illustrates a file listing created from the above example.

```
FILENAME GROUP   ACCOUNT  VOLUME RESTRICTIONS  SECTORS CODE MEDIA
         CREATED    ACCESSED   MODIFIED

FILE1    .PUB   .TEST    DISC           :C    1104         1
         1/12/1994  1/12/1994  1/12/1994

FILE2    .PUB   .TEST    DISC           :C       0         1
         1/12/1994  1/12/1994  1/12/1994

FILE3    .PUB   .TEST    DISC           :C      32         1
         1/12/1994  1/12/1994  1/12/1994
```

Figure 6-6. File Date Information (MPE Format)

When the output listing is in HFS format, an additional field is added to the dates display. The STATE_CHANGE field indicates the last date that a file attribute was changed. An example listing is:

Figure 6-7 illustrates a file listing created from the above example in HFS format.

```
VOLUME RESTRICTIONS  SECTORS CODE MEDIA FILENAME
       CREATED     ACCESSED    MODIFIED     STATE_CHANGE

DISC            :C      1104     1          /TEST/PUB/FILE1
       1/12/1994  1/12/1994  1/12/1994  1/12/1994

DISC            :C         0     1          /TEST/PUB/FILE2
       1/12/1994  1/12/1994  1/12/1994  1/12/1994

DISC            :C        32     1          /TEST/PUB/FILE3
       1/12/1994  1/12/1994  1/12/1994  1/12/1994
```

Figure 6-7. File Date Information (HFS Format)

Displaying File Security Information

To display file security information for the files stored, use the SHOW=SECURITY option. The listing includes the file creator's user and account name, the security matrix, and a flag indicating the presence or absence of an ACD. The HFS format displays the same security information. For example:

```
:FILE T;DEV=TAPE
:STORE @.PUB.TEST;*T;SHOW=SECURITY
```

Figure 6-8 illustrates a file listing with security information from the above example.

```
FILENAME GROUP   ACCOUNT  VOLUME RESTRICTIONS  SECTORS CODE MEDIA
FILE1   .PUB   .TEST   DISC        :C      1104         1
   LAURA .STSUPPNM  (R:ANY; A:ANY; W:ANY; L:ANY; X:ANY) *ACD EXISTS*

FILE2   .PUB   .TEST   DISC        :C         0         1
   LAURA .STSUPPNM  (R:ANY; A:ANY; W:ANY; L:ANY; X:ANY) *ACD ABSENT*

FILE3   .PUB   .TEST   DISC        :C        32         1
   LAURA .STSUPPNM  (R:ANY; A:ANY; W:ANY; L:ANY; X:ANY) *ACD ABSENT*
```

Figure 6-8. File Security Information

Displaying Names Only

The SHOW=NAMESONLY allows an abbreviated listing to be displayed. The only fields shown are the starting and ending media number, and the name of the file. This option is most useful when displaying HFS syntax files. Since they can be longer than MPE syntax names, it is sometimes useful to allow more room on the line to display the full pathname. NAMESONLY cannot be used with the SHORT or LONG options to SHOW. It has a slightly different format for MPE and HFS. The HFS style has the filename as the last field, while the MPE style has the filename as the first field.

Figure 6-9 is an example for HFS format.

```
MEDIA_NUM   FILENAME
1 - 1       /_HFSACCT/_HFSCRP/HFSMAP
1 - 1       /usr/lib/terminfo/e/ethernet
1 - 1       /usr/lib/terminfo/e/ex3000
1 - 1       /usr/lib/terminfo/e/exidy
1 - 1       /usr/lib/terminfo/e/exidy2500
```

Figure 6-9. Names Only Format

Forcing the HFS Format

If SHOW=PATH is specified, the output Store listing will be in HFS format, even if no HFS synatx files are being stored. You may want to use this so that all of your listings appear in the same format.

Selecting an Error Recovery Method (ONERROR)

When STORE encounters an error, it either automatically recovers or terminates, depending upon the nature of the error and the error recovery method you choose.

Unrecoverable Errors

The following unrecoverable errors always cause STORE to terminate:

- A command syntax error.

- An error in the file system directory.

- An error opening the backup file or an indirect file. An indirect file is a text file containing STORE command and options. Refer to "Using Indirect Files", in Chapter 5, "Storing Files".

Disk Read Errors

If STORE encounters a disk read error while storing a file, it skips the remainder of that file and sends an error message to the standard listing device describing the offset from the start of the file and the number of bytes that have been lost. STORE then continues to copy the remainder of the files. The STORE operation does not terminate. Since the files that contain disk errors are not stored, you will not be able to restore them.

Media Errors

When a media error occurs while writing to a output device, the behavior of STORE depends on the value of the ONERROR option, as explained below.

Tape Error Recovery

The STORE command's ONERROR parameter lets you specify a backup error recovery procedure. Your options are ONERROR=QUIT and ONERROR=REDO. REDO is the default. QUIT instructs STORE to abort upon encountering a backup I/O error while REDO instructs STORE to continue after encountering an I/O error.

If you specify REDO and the STORE command encounters a backup I/O error on any device, STORE sends a message to your terminal (or the file or device to which you have assigned the file SYSLIST). This message indicates where the error occured. For example, STORESET=(*T1,*T2,*T3) is requested and a backup error occurs on the device referenced by *T2 while it is creating reel 2. STORE rewinds the reel to the load point, marks the reel as bad, and asks you to mount another reel. After you mount the new reel, STORE automatically stores all the files from the point where the bad reel began.

The message is similar to the following:

- The user sees:

```
STORE ENCOUNTERED MEDIA WRITE ERROR ON LDEV #
```

where LDEV # is the device referenced by *T2. This means that the store error recovery occurs on the same device where the error occurred.

- The operator sees:

  STORE IS MARKING REEL BAD ON LDEV #

  MOUNT MEDIA # OF SET # FOR STORE ON LDEV #

Optical Disk Errors

If an optical disk write error is encountered the same messges which are used for backup devices display.

You can determine which piece of media is has been marked bad by using the STATUS command of the MOUTIL program. The status display indicates which piece of media is bad by showing "THE MEDIA IS BAD" in the media name field.

Bad Media   Once a piece of media has been marked bad, it should not be used for future STORE operations. If a media that has been marked bad is mounted for use in a STORE operation, STORE will issue the following message to the console:

  MEDIA ON LDEV # IS BAD. CONTINUE ANYWAY?(Y/N)

If you reply YES, then STORE will write over this media. If you reply NO, the media will be unloaded, and you should mount another piece of media.

Note   STORE will not check to see if a piece of media has been marked bad for the very first reel mounted. Therefore, it is important that once a reel has been marked bad by store, some note is made on the physical label of the media to indicate that it encountered a write error while storing to it.

Specifying Files by Date (DATE)

The DATE option specifies which files are stored based on two possibilities:

- Store files that have been modified since a specified date
- Store files that have not been accessed since a specified date

Storing Files Modified Since a Certain Date

Use the DATE parameter to store only files modified since a certain date. This enables you to do, among other things, a partial system backup. For example, suppose a full system backup was performed on September 30, 1993. The following STORE command would copy all system and user files modified since that date:

```
:FILE T;DEV=TAPE
:STORE @.@.@;*T;DATE>=09/30/93
```

The date must be entered in either the above format ($mm/dd/yy$) or as $mm/dd/yyyy$ (for example, 09/30/1993). The files stored include any modified on the same date as the date entered. The files stored also include those modified since the specified date on nonsystem volume sets that are online.

Use this form of the DATE parameter when you perform regular backups of a file set. Store the entire set, for example, once a week and store only those files modified since the full backup the remaining six days.

Storing Files Not Accessed Since a Certain Date

You can also use the DATE parameter to store only files that have not been accessed since a certain date. For example:

```
:FILE T;DEV=TAPE
:STORE @.OPERATOR.SYS;*T;DATE<=06/10/93
```

The year can be entered as two digits or four digits (93 or 1993). The above command stores any files in the OPERATOR group of the SYS account that have not been accessed since June 10, 1993. You may want to use this form of the DATE parameter with the PURGE parameter to remove out-of-date files from your system. Refer to the next section.

Removing Stored Files from the System: Archiving Files (PURGE)

If your system contains infrequently used or out-of-date files, you can store them onto backup and permanently remove them from the system disks at the same time. This process, called archiving files, increases available space and provides a backup copy of the files in case you need them in the future. To store disk files and then delete the disk files in a single operation, use the PURGE parameter of the STORE command. For example:

```
:FILE T;DEV=TAPE
:STORE @.OLD.ACCTG;*T;PURGE
```

The command above stores all files in the OLD group of the account ACCTG and deletes the files from disk. PURGE deletes the files only after it has successfully stored all of them. Thus, if STORE terminates in the middle of the process, it does not purge any files.

You can combine the DATE and PURGE parameters to periodically archive unused files. For example, the following STORE command

stores to backup all files in the EMPRECS group of the PERSONEL account that have not been accessed since February 2, 1992 and then deletes the disk files:

```
;FILE T;DEV=TAPE
:STORE @.EMPRECS.PERSONEL;*T;DATE<=02/02/92;PURGE
```

Note   In order to use the PURGE parameter with a privileged file or files, you must have system manager (SM), system supervisor (OP), or privileged mode (PM) capability.

You may want to warn users before you archive files and inform them how to request to have archived files restored. If you need to restore purged files to the system, you can find them on the backup to which you stored them and on the backups from the last full system backup you performed before you purged the files.

Displaying Progress Messages (PROGRESS)

Use the PROGRESS parameter to display STORE command progress messages at regular intervals. For example, to display progress messages every five minutes, use the following command:

```
:FILE T;DEV=TAPE
:STORE @.@.@;*T;PROGRESS=5
```

If you use the PROGRESS parameter alone, without specifying an interval, STORE displays status messages every minute.

If STORE is being run from a MPE session, the progress messages will be send to the standard list ($STDLIST). Otherwise, the messages will go to the system console.

System Directory Backup (DIRECTORY)

The system directory keeps track of the accounts, groups, users, and files in your system. Nonsystem volume set directories keep track of the contents of nonsystem volumes. Directory information can be stored when you back up system or nonsystem volumes. Storing directory information helps you rebuild your system from backups should it unexpectedly lose information. To store system directory information, use the DIRECTORY parameter. All HFS directories on the system are also stored.

The following example will store all files on the system, plus the system volume set accounting information.

```
:FILE T;DEV=TAPE
:STORE @.@.@;*T;DIRECTORY
```

To store nonsystem volume set directory information, use DIRECTORY
and ONVS in the same command. For example:

```
:FILE T;DEV=TAPE
:STORE @.@.@;*T;ONVS=VOL_SET_A;DIRECTORY
```

In the above example, the ONVS parameter will also limit @.@.@ to
include only files on the specified volume sets. See "Storing Files
From Volume Sets" in this chapter.

As illustrated above, the DIRECTORY parameter of the STORE
command allows you to back up the system and/or nonsystem
volume set directories (account structure). You may then reload the
account structure in the event of a system disaster by restoring the
directory onto the system from the backup media. You have the
added flexibility of backing up the directories of nonsystem volumes
attached to the system as a part of or as a separate entity from the
system. This allows a nonsystem volume (volume set) to become a
separate reliable entity. System supervisor (OP) or system manager
(SM) capability is required to use the DIRECTORY parameter.

Note   When using the DIRECTORY parameter, the default file set list is
empty. This allows a backup to be created that contains only
directory accounting information for the system volume set, or for
the specified volume sets.

Here is an example of how to back up the system directory and all
other files along with a nonsystem volume set directory and its files:

```
:FILE T;DEV=TAPE
:STORE @.@.@;*T;DIRECTORY;ONVS=MPEXL_SYSTEM_VOLUME_SET,NV1
```

where NV1 is the name of a nonsystem volume set.

Storing Files in Compatible Formats (TRANSPORT)

The TRANSPORT option stores files on media that is compatible with:

- MPE V/E systems
- Pre-POSIX systems

Creating MPE V/E Compatible STORE Tapes

Use the TRANSPORT parameter of STORE to create STORE backups that
are compatible with MPE V/E. For example, to store all of the files
in the PERSONEL account onto an MPE V/E compatible backup,
enter:

```
:FILE T;DEV=TAPE
:STORE @.@.PERSONEL;*T;TRANSPORT
```

The backup that is produced with the TRANSPORT parameter uses
the same format as MPE V/E STORE backup format. Therefore,
files that are not compatible with MPE V/E (due to file/record size

limitations or new file types), are not stored if TRANSPORT is specified. The TRANSPORT option cannot be used with the following NMSTORE options:

STORESET
INTER
DIRECTORY
ONVS
FCRANGE
SPLITVS
ONLINE
MAXTAPEBUF
MOSET
NAME
COMPRESS
TREE
NOTREE
RENAME
NOTIFY

Character set specifications, as listed in "Using Wildcard Characters" in chapter 5, "Storing Files," cannot be used with the TRANSPORT parameter.

Creating Pre-POSIX Compatible Tapes

With the addition of HFS syntax files and other new POSIX-related features, mechanisms exist in STORE to allow backups to be created on a POSIX sytem and restored on a pre-POSIX system (4.0 or earlier).

There are two general scenarios when files would need to be transferred to a pre-POSIX system:

Planned Transport
The user stores off a set of files from one system, to be restored on another system right away.

Unplanned Transport
The data stored off from a system (usually a system backup) is suddenly required to be restored on the same or a different system. This kind of transport is usually done to recover lost data and may require a POSIX system's backup to be restored on a pre-POSIX system.

With these two cases in mind, STORE has the following objectives with respect to data transport:

- The media created on a POSIX system should be restorable on a pre-POSIX as well as a post-posix release.

- The planned transport operation should be as simple and easy as possible.

- A default name conflict should not exist. This means that the naming of non-MPE syntax files on a transport to a pre-POSIX system should occur such that the user does not inadvertently overwrite previously transported files.

■ For each of the transport situations, the security should be at least equal to or more restrictive than require on the target system.

The following sections list the features in Store which address these objectives.

HFS Name Mapping

Every POSIX Store media is created such that any HFS syntax file can be restored to a pre-POSIX system with a unique MPE syntax name. When restoring a backup to a pre-POSIX system, the file set of @.@.@HFSACCT will contain all HFS syntax files on that media. These files are named with the MPE syntax of:

$F\#\#\#\#\#\#$._HFSGRP._HFSACCT

Where $\#\#\#\#\#\#$ represents numbered files starting at 0000001.

A mapping file is also on the media. This file specifies the mapping between the _HFSACCT name and the actual HFS name. The name of this file is HFSMAP._HFSGRP._HFSACCT. Sample entries in the file would look similar to this:

```
F0000001._HFSGRP._HFSACCT <- /SYS/PUB/dir1/file_a
F0000002._HFSGRP._HFSACCT <- /SYS/PUB/dir1/file_b
F0000003._HFSGRP._HFSACCT <- /SYS/PUB/dir1/file_c
```

Since _HFSGRP and _HFSACCT are illegal MPE file names, special steps must be taken when attempting to restore these files on a pre-POSIX system. The LOCAL option can be used to restore the HFS files into your logon group. For example, on a pre-POSIX system, issue:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@HFSACCT;SHOW;LOCAL
```

Alternately, you can specify a specific group and account to place the HFS files, using the CREATE, GROUP, and ACCOUNT options:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@HFSACCT;SHOW;CREATE;GROUP=NEWGRP;ACCT=MYACCT
```

This will restore all of the HFS syntax files to the group NEWGRP.MYACCT. The HFSMAP file will allow to you identify the real names of the $F\#\#\#\#\#\#$ files.

If you want to only restore MPE syntax files from the backup, that can be accomplished by the following command:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@ - @.@.@HFSACCT;SHOW;CREATE
```

Note

There are certain types of files that exist on a POSIX system that have no equivalent on a pre-POSIX system, such as symbolic links and device links. It is not recommended that you attempt to restore these files on a pre-POSIX system. They will contain no useful information for that system, and may be difficult to use or purge.

Preserving File Security

An argument of the TRANSPORT option allows POSIX style ACD's to be translated to pre-POSIX systems, while maintaining the correct security. Using TRANSPORT=MPEXL will cause STORE to write out the pre-POSIX format ACD's. If a POSIX media is created without TRANSPORT=MPEXL, and then restored to a pre-POSIX system, the ACD's will not be understood and the system will enforce a "creator only" security. This provides a more restrictive security.

Specifying the Number of Files to Store (FILES)

The FILES parameter works with the TRANSPORT parameter. By default, MPE/iX stores a maximum of 4000 files at a time. If you are storing more than 4000 files using the TRANSPORT parameter, use the FILES= parameter to specify the maximum number of files to be stored. If you do not use the TRANSPORT parameter, the FILES= parameter is is ignored. For example, to set the maximum number of files stored to 6000 for a TRANSPORT backup, you might enter the following:

```
:FILE T;DEV=TAPE
:STORE @.OPERATOR.SYS;*T;TRANSPORT;FILES=6000
```

Use the MPE/iX RESTORE command to restore files from MPE/iX TRANSPORT backup files to an MPE V/E or MPE X/L system. For NMRESTORE, the program automatically detects TRANSPORT backup files and performs the necessary file format translation.

Refer to Appendix D, "STORE Tape Compatibility," for more information on STORE backup compatability between MPE/iX, MPE XL and MPE V/E.

Managing File Security (COPYACD and NOACD)

An additional way to manage the security of files being stored is to use the COPYACD and NOACD options. The default is COPYACD. This means that in addition to the MPE security matrix, a file's ACD (if one exists) is written to backup. This allows you to store the extra security information associated with an ACD.

If for some reason you want to store files without their ACD, the NOACD option can be specified. This would remove the extra security associated with ACD's, which may be desired if you are moving files to a system where the current ACD's would be inapplicable or undesired. When using these options, keep in mind that RESTORE also has COPYACD and NOACD options. So, even if you create a STORE media with ACD's, you have the choice at RESTORE time to restore or not restore the ACD information.

Storing Files with Certain File Codes (FCRANGE)

Use the FCRANGE parameter to store files with certain file codes. MPE XL file codes distinguish different types of files. You can select up to eight file code ranges to store. For example, files with codes 1100, 1101, and 1102 are HPWORD files. Files with codes 1152 and 1153 are SLATE files. To store all HPWORD and SLATE files in the LETTERS group of the PERSONEL account enter:

```
:FILE T;DEV=TAPE
:STORE @.LETTERS.PERSONEL;*T;FCRANGE=1100/1102,1152/1153
```

Improving Storing Efficiency by Increasing Record Size (MAXTAPEBUF)

Files are stored with greater efficiency by using the maximum backup record (buffer) size allocated to a given backup device. Performance increases because data transmission is more efficient and because the amount of media used for interrecord gaps decreases.

The maximum backup record size of MPE/iX supported backup devices differs from device to device and is shown in Table 6-1.

Table 6-1. Maximum Tape Record Sizes

Tape Drive	Record Size
HP 7974	16 KB
HP 7978A	16 KB
HP 7978B	32 KB
HP 7979	32 KB
HP 7980(XC,S,SX)	32 KB
DDS (all)	32 KB
3480	32KB
MO	32KB

Normally when a STORE command is issued, a default record size of 16 kilobytes is utilized. However, by using the MAXTAPEBUF parameter of the STORE command, the maximum record size of the specified device is automatically used. If multiple backup devices are specified, using the STORESET parameter, in conjunction with MAXTAPEBUF, STORE uses the maximum record size, which is the lowest common denominator of the different devices. This is necessary to ensure that the record sizes are the same on all volumes of the backup set.

Note

Do not use the MAXTAPEBUF parameter with a backup device of 32 KB record size if you anticipate that you will later restore the backup created to a backup device whose maximum record size is 16 KB. Restoring a backup to a larger maximum record size device, on the other hand, does not cause any problem.

To increase record size when storing files, use the MAXTAPEBUF parameter in your STORE command. For example:

```
FILE T;DEV=TAPE
STORE @.OPERATOR.SYS;*T;MAXTAPEBUF
```

Notification of File Availability (NOTIFY)

During the STORE process, the file set that you are storing is usually unavailable for modification. Files can be modified again after STORE is completed. If you are using TurboSTORE and doing an online backup (using the ONLINE option) the files being stored are unavailable for a short time at the beginning of the store. However, once they have been attached to STORE's logging mechanism, they are available for modification.

The NOTIFY option can be used to help automate the process of performing some action at the time where the files being stored are available for modification, either at the end of the STORE or at the end of the attach phase.

NOTIFY allows STORE to stream a user specified job file (using the MPE/iX STREAM command) either at the end of the attach phase (while using ONLINE) or at the end of a successful STORE operation (normal backup). The job file is specified by the user by setting up a formal file designator named NOTIFY, prior to running the store job. This job can contain various actions that notify users that the files are free, start other jobs that modify the files, or allow users back on to the system, for example.

If the specified job does not contain passwords, STORE will prompt the user for the passwords if STORE is being run from a session. If STORE is being run from a job and passwords are not present, the job stream will fail.

When the job fails to stream, due to lack of passwords, or other reasons, all error messages will be sent to the standard list ($STDLIST). All other output as the result of streaming the job will also be sent to $STDLIST.

The following is an example of using the NOTIFY command in conjunction with a user specified job file.

First, set up the file equation, using the FILE command:

```
:FILE NOTIFY=MYJOB.PUB.SYS
```

Where the job stream could contain, for example:

```
!JOB NOTIFY,MANAGER.SYS
!TELL @ Your files are now available!
!EOJ
```

Then, run STORE with the NOTIFY option:

```
:FILE T;DEV=TAPE
:STORE @.PUB.SYS;*T;SHOW;ONLINE;NOTIFY
```

Since this is an online store, the job stream will be executed once the files have been attached, and a message would then be sent to all users telling them that their files are now free to be accessed.

Storing Files from Volume Sets (ONVS)

To store the files on a particular volume set, use the ONVS parameter of the STORE command. ONVS lets you store files from up to 20 volume sets at once. For example, to store all files from the nonsystem volume sets named VOL_SET_A and VOL_SET_B, enter:

```
:FILE T;DEV=TAPE
:STORE @.@.@;*T;ONVS=VOL_SET_A,VOL_SET_B
```

To store files from system and nonsystem volumes, include the system volume set name within the ONVS parameter. For example:

```
:FILE T;DEV=TAPE
:STORE @.@.@;*T;ONVS=MPEXL_SYSTEM_VOLUME_SET,&
VOL_SET_A,VOL_SET_B
```

Note
Although the ONVS and SPLITVS options can be used together, a volume set that is specified for ONVS cannot be specified for SPLITVS and a volume set that is specified for SPLITVS cannot be specified for ONVS.

Storing Files from Split Volumes (SPLITVS)

Use the SPLITVS option to store files that are located on the specified split volume sets. These volumes are also known as mirrored disks.

This provides a form of concurrent, or online backup, because you can:

■ Split a volume

■ Allow users to access their files

■ Perform a backup on the mirrored volume

The SPLITVS option requires:

■ The Mirrored Disc product is installed on the system.

■ The specified volume sets must be configured as mirrored volumes.

The basic procedure to use split volumes and STORE together is:

1. Request users to close the files on the volume sets that are to be backed up for a short duration.

2. VSCLOSE the mirrored volume set with the SPLIT option.

3. VSOPEN the volume set. This will open the user and backup sets.

4. Allow users to begin accessing the files again.

5. Issue the store command, using the SPLITVS option. For example:

```
:STORE @.@.@;*T;SHOW;SPLITVS=my_split_set
```

6. After the backup has completed, join the split set back together using the JOINMIRRSET command in VOLUTIL.

For more information on using mirrored disks, see the *Mirrored Disk/iX User's Guide* (30349-90003).

Note	Although the ONVS and SPLITVS options can be used together, a volume set that is specified for ONVS cannot be specified for SPLITVS and a volume set that is specified for SPLITVS cannot be specified for ONVS.

Renaming Files (RENAME)

When using the RENAME option, an original file refers to the original disk file, and a target file indicates the final file name on the backup media.

Renaming a file requires the capabilities necessary to manipulate files across groups and accounts. Table 6-2 assigns capabilities to the different levels of file renaming.

Table 6-2. Required Capabilities for RENAME

Capabilities Required	File	Group	Acct	Creator
File Creator	Yes	Yes	No	No
Account Manager (AM)	Yes	Yes	No	Yes
System Manager (SM)	Yes	Yes	Yes	Yes
System Supervisor (OP)	Yes	Yes	Yes	Yes

The RENAME option has the following syntax:

```
STORE file set
[ =targetname [ : creatorname [ . creatoraccount] ] ]
[ ,file set [ =targetname [ : creatorname [ . creatoraccount] ] ] ]
; *TAPE; RENAME; SHOW
```

The file set consists of the inclusion file set and all exclusion file sets. All legal file sets are allowed. The targetname can be any legal MPE or HFS file name with the following restrictions on wildcards:

1. Each component of the file or path name must either be equal to @ or have no wildcards.

2. An HFS path name which ends in a / can have no wildcards. The trailing slash is used to designate a directory to place all files.

Each component of the creator name must either be equal to @ or have no wildcards. The account part of the creator name may be omitted.

The @ is used to specify that the component in the original file name should be used for that component of the target file name. When specifying HFS path names, components will be replaced from the

root on down. However, if the last component of the target path name is an @ the last component of the original path name will be used. If there is not a corresponding component for an @ in the original path name the file will not be stored.

The following tables illustrate sample translations for the target file names:

STORE a.b.c=...;TAPE;RENAME;SHOW

Original Filename	Target Specification	Target Filename
A.B.C	x.y.z	X.Y.Z
A.B.C	@.y.z	A.Y.Z
A.B.C	x.@.z	X.B.Z
A.B.C	x.y.@	X.Y.C

STORE /A/B/C=...;TAPE;RENAME;SHOW

Original Filename	Target Specification	Target Filename
/A/B/C	@.y.z	C.Y.Z
/A/B/C	x.@.z	X.B.Z
/A/B/C	x.y.@	X.Y.A

STORE /a/b/c=...;TAPE;RENAME;SHOW

Original Filename	Target Specification	Target Filename
/a/b/c	@.y.z	/z/y/c
/a/b/c	x.@.z	/z/b/x
/a/b/c	x.y.@	/a/y/x

STORE /a=/@/x/@/y/@;*TAPE;RENAME;TREE;SHOW

Original Filename	Target Specification	Target Filename
/a/	/@/x/@/y/@	NOT STORED:[1]
/a/f1	/@/x/@/y/@	NOT STORED:[1]
/a/b/	/@/x/@/y/@	NOT STORED:[1]
/a/b/f2	/@/x/@/y/@	NOT STORED:[1]
/a/b/c/	/@/x/@/y/@	NOT STORED:[1]
/a/b/c/f3	/@/x/@/y/@	/a/x/c/y/f3
/a/b/c/d/	/@/x/@/y/@	/a/x/c/y/d/
/a/b/c/d/f4	/@/x/@/y/@	/a/x/c/y/f4
/a/b/c/d/e/	/@/x/@/y/@	/a/x/c/y/e/
/a/b/c/d/e/f5	/@/x/@/y/@	/a/x/c/y/f5
/a/b/c/d/e/f/	/@/x/@/y/@	/a/x/c/y/f/
/a/b/c/d/e/f/f6	/@/x/@/y/@	/a/x/c/y/f6
/a/b/c/d/e/f/g/	/@/x/@/y/@	/a/x/c/y/g/
/a/b/c/d/e/f/g/f7	/@/x/@/y/@	/a/x/c/y/f7

1 Source name does not have component for substitution

The following table illustrates sample translations for a target file directory when the file set specification was not a directory:

```
STORE /a/b=/w/x/y/z/;*TAPE;RENAME;TREE;SHOW
```

Original Filename	Target Specification	Target Filename
/a/b/	/w/x/y/z/	/w/x/y/z/b/
/a/b/f2	/w/x/y/z/	/w/x/y/z/b/f2
/a/b/c/	/w/x/y/z/	/w/x/y/z/c/
/a/b/c/f3	/w/x/y/z/	/w/x/y/z/c/f3
/a/b/c/d/	/w/x/y/z/	/w/x/y/z/d/
/a/b/c/d/f4	/w/x/y/z/	/w/x/y/z/d/f4
/a/b/c/d/e/	/w/x/y/z/	/w/x/y/z/e/
/a/b/c/d/e/f5	/w/x/y/z/	/w/x/y/z/e/f5
/a/b/c/d/e/f/	/w/x/y/z/	/w/x/y/z/f/
/a/b/c/d/e/f/f6	/w/x/y/z/	/w/x/y/z/f/f6
/a/b/c/d/e/f/g/	/w/x/y/z/	/w/x/y/z/g/
/a/b/c/d/e/f/g/f7	/w/x/y/z/	/w/x/y/z/g/f7

The following table illustrates sample translations for a target file directory when the file set specification was a directory:

```
STORE /a/b/=/w/x/y/z/;*TAPE;RENAME;SHOW
```

Original Filename	Target Specification	Target Filename
/a/b/	/w/x/y/z/	/w/x/y/z/
/a/b/f2	/w/x/y/z/	/w/x/y/z/f2
/a/b/c/	/w/x/y/z/	/w/x/y/z/c/
/a/b/c/f3	/w/x/y/z/	/w/x/y/z/c/f3
/a/b/c/d/	/w/x/y/z/	/w/x/y/z/c/d/
/a/b/c/d/f4	/w/x/y/z/	/w/x/y/z/c/d/f4
/a/b/c/d/e/	/w/x/y/z/	/w/x/y/z/c/d/e/
/a/b/c/d/e/f5	/w/x/y/z/	/w/x/y/z/c/d/e/f5
/a/b/c/d/e/f/	/w/x/y/z/	/w/x/y/z/c/d/e/f/
/a/b/c/d/e/f/f6	/w/x/y/z/	/w/x/y/z/c/d/e/f/f6
/a/b/c/d/e/f/g/	/w/x/y/z/	/w/x/y/z/c/d/e/f/g/
/a/b/c/d/e/f/g/f7	/w/x/y/z/	/w/x/y/z/c/d/e/f/g/f7

In a similar manner, the wildcard @ is used to specify the use of the
original creator name component in the new creator name. If no
creator is specified, the original creator is kept. This is equivalent to
specifying @.@ in the creator field. If the creator name is specified
without an account part, the account part of the creator name will be
made equal to the account of the new file.

There is an exception to this rule when the new file name does not
have a legal account name in its path name. A directory off of the
root node that has a legal account name will be considered the
account for the creator. This is true whether this directory is an
account or not.

Table 6-3 below illustrates the translations for the creator. All
files below in the "sg" group of the "sa" account were created by
"CREATOR.CRACCT."

Table 6-3. Creator File Translations

Original Filename	Target Specification	Target Creator
s1.sg.sa	d1.dg.da	CREATOR.CRACCT
s2.sg.sa	d2.dg.da:@.@	CREATOR.CRACCT
s3.sg.sa	d3.dg.da:user.acct	USER.ACCT
s4.sg.sa	d4.dg.da:user	USER.DA
s5.sg.sa	d5.dg.da:user.@	USER.CRACCT
s6.sg.sa	d6.dg.da:@.acct	CREATOR.ACCT
s7.sg.sa	d7.dg.da:@	CREATOR.DA
s11.sg.sa	/d11	CREATOR.CRACCT
s18.sg.sa	/d18:@.@	CREATOR.CRACCT
s12.sg.sa	/d12:user.acct	USER.ACCT
s13.sg.sa	/d13:user	USER.CRACCT
s15.sg.sa	/d15:user.@	USER.CRACCT
s17.sg.sa	/d17:@.acct	CREATOR.ACCT
s19.sg.sa	/d19:@	CREATOR.CRACCT
s14.sg.sa	/NOTACCT/dir2/d14:user	USER.NOTACCT
s14.sg.sa	/NOTACCT/dir2/d14:user.@	USER.CRACCT
s16.sg.sa	/NOTACCT/dir2/d16:@	CREATOR.NOTACCT

If the SHOW option is specified, only the target names are listed. The security option of the SHOW option displays the target creator name if one is specified.

The ACD associated with a file is not changed when the file is renamed. As with other STORE operations, the ACD is copied unless the NOACD option is specified. If you need to change the ACD, use the ALTSEC command.

You can specify the same target file information for more than one org file. However, when two or more files have the same name on a backup created using the RENAME option, RESTORE will write the second file over the first file.

The files excluded may only be specified on the original side of the file set. As with normal exclusion, there is no limit to the number of excluded file sets. The below example shows an exclusion file specification:

```
:STORE @.PUB.SYS -a -b -c -d=@.backup.sys:creator;*t;rename
```

Lockwords are not allowed on target files, and if specified cause STORE to abort. The options that are not supported with the RENAME option and will cause STORE to abort are:

- PURGE

- TRANSPORT

- SPLITVS

Specifying HFS Files (TREE and NOTREE)

By default, STORE uses the last character of a HFS file name to determine if the specified file or file set should be scanned recursively to include all files below the specified wildcards or directories. If a filename ends in a /, then it will be scanned recursively to include all files below it in the hierarchical directory. Otherwise, the file or file set is not scanned recursively, resulting in a horizontal cut at its level in the dierarchical directory. Using TREE and NOTREE can override that default behavior.

If TREE is specified, ALL files and file sets are scanned recursively, regardless of their ending character. If NOTREE is specified, then NO files or file sets are recursively scanned, resulting in a horizonal cut in the directory structure.

TurboSTORE Options

The following options are available only if the TurboStore/iX program is purchased. For more information on purchasing TurboStore/iX, contact your Hewlett-Packard sales representative. The solely TurboSTORE options are:

- INTER, For interleave format

- COMPRESS, For file compression

- ONLINE, Allows files to be modified while being stored

Storing Files in Interleave Format (INTER)

With TurboSTORE/iX, you have the capability of simultaneously reading information from different files on multiple disk drives and storing the accessed information on the backup device in a single operation.

This process, called interleaving, allows you to match a slow input device (for example, a disk drive), with a fast backup device (for example, a streaming backup drive). This effectively increases the input rate.

By varying the number of concurrent input operations, the effective input rate can be matched with the output rate. This allows the backup to execute closer to the speed of the output device.

When you STORE files in interleave format, STORE:

1. Partitions the set of files to your backup device or devices.

2. Opens the files. It may (depending upon file characteristics), access several files at the same time.

3. Interleaves files on the same backup to make sure that your backup device or devices operate at the highest speed possible.

Interleave format significantly reduces the time necessary to store a large set of files, such as when performing a full system backup. It merges the stream of data from multiple files on separate disks into a single stream of data sent to the backup device or devices. If necessary, STORE processes files out of sequence to keep backup devices operating efficiently.

Interleave format is most efficient when your file set is evenly spread across two or more system disks. Use sequential devices or parallel devices alone when the set of files to store is smaller and less evenly distributed, such as when doing a partial backup, or if the files are only coming from one disk.

Figure C-4, "Interleave Tape Format," in Appendix C, "STORE Tape Formats," illustrates interleave format. To STORE files in interleave format, use the INTER parameter. For example:

```
:FILE T;DEV=TAPE
:STORE @.OPERATOR.SYS;*T;INTER
```

When these files are restored, RESTORE will automatically recognize the interleave format and restore the files properly.

Using the STORESET and INTER parameters together improves backup time on large systems. For example, the following STORE command uses both parallel device pools and interleaving to minimize backup time:

```
:STORE @.@.@;;SHOW=OFFLINE;&
STORESET=(*T,*T),(*T,*T);INTER
```

Compressing Data (COMPRESS)

With TurboSTORE/iX, backup performance can be improved through the use of host data compression. By specifying the COMPRESS parameter, the host system filters the data through a compression algorithm prior to writing it to the backup device. This operation has two effects:

- The device's throughput is increased by transferring more data than the device's maximum sustained rate. The increase is dependent upon available CPU resources.

- Fewer media changes are required by putting more data on each piece of media.

Two levels of compression are supported by the COMPRESS parameter: HIGH and LOW.

Note

No matter whether you specify HIGH or LOW, the actual level of data compression is dependent upon the type of data being compressed. For example, program files will not compress as much as data files.

You must determine which of the compression algorithms best suits your needs. In some cases the low-compression algorithm may perform almost as well as, or better than, the high-compression algorithm.

It is advisable to try both algorithms on your data in order to evaluate which algorithm best suits your needs. Some of the factors to consider are:

- Elapsed time of backup.

- Amount of CPU time required.

- Amount of media required.

With the high-compression algorithm running, backup takes most of the processing capabilities of the machine. With the low-compression algorithm running, other activity can coexist with backup.

Use the high-compression algorithm if backup time is dedicated or if the difference in the amount of media used for backup is substantial enough to warrant the complete consumption of the machine.

When compressed format files are restored, RESTORE automatically recognizes the compress format and restores the files properly.

To compress data when storing files to backup, use the FILE command, then use the COMPRESS parameter in your STORE command. For example:

```
:FILE T;DEV=TAPE
:STORE @.OPERATOR.SYS;*T;COMPRESS=HIGH
```

If using a compression device no extra compression is attained by using COMPRESS=HIGH. The best throughput results come from no compression or COMPRESS=LOW when used with a compression drive.

To compress data when storing files to magneto-optical disks, use the MOSET and COMPRESS parameters in your STORE command. For example:

```
:STORE @.@.@;;MOSET=(101);NAME=DAILY.D24SEPT.TIGER;COMPRESS=HIGH
```

Storing Files Online (ONLINE)

With TurboSTORE, online backup can be used to store those critical applications that need to be available at all times. At the time the online backup is started, all files must be closed for a brief period while they are attached to the shadow logging system. How much time is required depends upon how many files are being stored. The range of time is usually from 1 to 30 minutes. Applications should be closed during this attach period. Any files open for write access during this period will NOT be stored.

The shadow logging subsystem maintains the original state of the files as they appeared when the online backup began. If an attached file is modified, the before image of the portion (block) of the file being modified is saved in a log file. After the store process has written the attached file to the backup media, it requests the logging information from the shadow subsystem and appends the logged data, if any, to the end of the data file.

If an attached file is purged during the online backup, the system logically removes the file, but does not physically remove it until it has been stored. Therefore, the backup reflects the state of the system at the time STORE was initiated.

Notes

1. The logging operation will fail if there is not enough disk space available. In this event, files needing log space are not stored.

2. Online backup is optional and is available only if you are using TurboSTORE/iX II with On-Line Backup (product numbers 36388A and 36398A).

3. Any Image databases being stored with the ONLINE option should be closed for write access before the backup is started. If user logging is enabled for the database(s), then the current log file should be closed when the database is closed. Once the attach period has finished, the database can be opened again. A new user log file should be started at this time.

Performing Online Backup

Heavily modified files should be stored first. This is accomplished by specifying these files first in the STORE command file set list. By storing these files first, you reduce the system overhead and the amount of logging information written to the backup media. Refer to "Online Backup Tapes" in Appendix C for the online backup format.

When online backup begins, the shadow subsystem assigns each file in the store file set to a log file created on the same volume where the file resides. Actual logging activity does not take place unless the file is modified after the attach phase.

The amount of log space required is directly proportional to the amount of modifications performed against the attached file. Therefore, the more modifications made to an attached file, the more log space required. In the worst case, the maximum amount of log space required equals the sum of the space required for all of the files being stored. By storing the heavily modified files first, you reduce the amount of logging space required. Reducing the amount of logging data written to the backup media will also reduce the time required to restore the files.

As each piece of backup media is filled, logging is disabled for the files that were stored on that media.

Use the ONLINE parameter of STORE to perform an online backup. Before the STORE process is initiated, you must warn the users to close all files to ensure that the files are both physically and logically consistent. For example, the following message can be sent:

<u>WARN @S;ONLINE BACKUP WILL BEGIN IN TEN MINUTES.</u>
<u>WARN @S;PLEASE CLOSE YOUR FILES.</u>

Begin the online backup by specifying the ONLINE parameter with the STORE command. For example, the following illustrates the STORE command entry for an online backup to backup.

<u>:STORE @.@.@;*T;DIRECTORY;ONVS=MPEXL_SYSTEM_VOLUME_SET,NV1;ONLINE</u>

The following illustrates the STORE command entry for an online backup to a magneto-optical device.

<u>:STORE @.@.@;;MOSET=(101);NAME=DAILY.D24SEPT.TIGER;DIRECTORY;&</u>
<u>ONVS=MPEXL_SYSTEM_VOLUME_SET,NV1;ONLINE</u>

When online backup begins, all files not currently open for write are attached to a log handler known as the shadow subsystem. Once the attach phase is complete, STORE issues the following message to the console.

FILES LOCKED BY ONLINE STORE ARE NOW FREE FOR READ/WRITE/PURGE''

This message is also written to $STDLIST if STORE is being run from a session. After you receive the above message, the users are allowed read, write and purge access to the attached files. Send your

users a message telling them they may resume their applications. For example:

```
WARN @S;ONLINE BACKUP HAS BEGUN.
YOU MAY NOW RESUME YOUR APPLICATIONS.
```

The NOTIFY option (described earlier in this chapter) can be used to automate this task. If any files were still open at the time you started online backup, you will receive the following message:

```
! NOT STORED:  FILE OPEN FOR WRITE AT ATTACH''
```

where the exclamation point (!) is replaced by the actual file name(s).

During the RESTORE process, the log file is used to reconstruct the original contents of the files; that is, the way they appeared at the moment they were attached during online backup.

Note

The ONLINE option cannot be specified with the SPLITVS or TRANSPORT options.

7

Handling Media Requests

This chapter describes the processes for handling the backup media. The subjects include:

- Preparing the Backup Device
- Checking the Console
- Replying to a Media Request
- Pending Media Requests
- Denying a Media Request
- Using REPLY and RECALL
- Automatically Assigning Devices

Note   Instructions for using backup devices in this chapter are general procedures that apply to most devices. Your devices may operate differently. Refer to the documentation for each device for exact instructions and additional information.

Unless your backup devices are configured to be automatically allocated, when a user (or a user's program) needs to use a backup device, you see a media request at the console. For example:

    ?16:04/#S37/23/LDEV# FOR "T" ON MEDIA (NUM)?

The media request asks you to assign an LDEV number to the file named in the request. This process is called allocating the device. The request above asks you to assign a logical device to the file T.

It tells you the time it arrived (16:04 in the example above), the job or session that sent it (#S37 in the example above), and the process identification number (called the PIN) of the program or command that sent the request (23 in the example).

Depending upon your system configuration, the system may or may not answer media requests automatically. Refer to "Automatically Assigning Devices" later in this chapter. If it does, you need only to prepare the backup device for use. If the system does not answer media requests automatically, you must prepare the backup device and reply as explained in "Replying to a Media Request," below.

Preparing the Backup Device

In general, a reel-to-reel media drive cannot be shared. Only one person at a time can use it. Often, users cannot access media drives without your assistance because media drives may be in a restricted computer room or you may be required to monitor media drive use.

Users only have direct access to media drives when you provide them physical access and configure media drives so that they are automatically assigned to users. See "Automatically Assigning Devices," later in this chapter.

When a user (or a program) requests the use of a media drive and the device is available, you mount the media so that the storage process can begin. You mount the media by preparing it, loading it onto the media drive, and placing the media drive online.

To prepare a backup device for storing or restoring files, use the backup media from the user you are helping (or obtain it from your media library) and mount it on the device.

When the media is ready, you see a VOLUME MOUNTED message on the console. For example:

```
16:05/31/VOL (Unlabeled) mounted on LDEV#8
```

The VOLUME MOUNTED message indicates the logical device (LDEV) number of the media drive. In the example above, the LDEV number is 8. Note the LDEV number. You use it to assign the device to STORE or RESTORE when you respond to the media request.

Checking the Console

During periods you are away from the console, other messages and requests can cause media requests to scroll off the screen. When you return to the console, some messages and requests will no longer be in view. The system keeps track of media requests until you answer them. Use the RECALL command to check for outstanding media requests. For example:

```
:RECALL

THE FOLLOWING REPLIES ARE PENDING:
?16:04/#S37/23/LDEV# FOR "T" ON MEDIA (NUM)?
```

Replying to a Media Request

Check that the request comes from the user who gave you the media. First, locate the user's job or session number in the media request. There can be different PINs for each request. In the following example, the session number is #S37.

```
?16:04/#S37/23/LDEV# FOR "T" ON MEDIA (NUM)?
```

Issue a SHOWJOB command to determine from which user the request came. For example:

```
:SHOWJOB #S37
```

The system describes the job or session. For example:

```
JOBNUM    STATE    INPRI    JIN    JLIST    INTRODUCED    JOB NAME
#S37      EXEC              36     36       MON8:46A
   WANDA.PERSONEL

JOBFENCE= 5; JLIMIT= 10; SLIMIT= 40
```

Figure 7-1. Job Session Description

Check that the job name matches the user's job name. If it does, use the REPLY command to assign the backup device to the user.

To reply to a media request, you need to know the STORE or RESTORE user's PIN and the media drive's LDEV number. For example, the PIN for the following media request is 23.

```
?16:04/#S37/23/LDEV# FOR "T" ON MEDIA (NUM)?
```

The backup device's LDEV number appears in the message you receive when you mount a media on the backup device. In the following message, the LDEV number is 8.

```
16:05/31/VOL (Unlabeled) mounted on LDEV#8
```

To answer a media request, use the REPLY command to assign the LDEV number to the PIN. For example, the following REPLY command assigns LDEV 8 to PIN 23.

```
:REPLY 23,8
```

Pending Media Requests

If several media requests appear at once, you can choose respond to any or all of them, in any order. When you choose not to respond to a media request, it remains pending until you respond or deny it. You can use the RECALL command at any time to list pending media requests.

Denying a Media Request

If the backup device is unavailable, or for another appropriate reason, you choose not to let a user or users access a backup device, you should deny media requests when they appear. To deny a media request, use the REPLY command to assign the LDEV number 0 to the user's PIN. So, for example, to deny a media request you received from the user with PIN 23, enter:

:<u>REPLY 23,0</u>

The user receives a message reporting that the device (the media drive) is unavailable. You may want to send the user another message using TELL explaining the situation in detail and estimating when the device might be available.

Using REPLY and RECALL

During the time you are running a program on the console, you are unable to get a colon prompt on the console. However, you can still review and reply to media requests. At the console, press the (CTRL) and (A) keys simultaneously to display the equal-sign (=) prompt. In response to the equal-sign prompt, you can issue either the RECALL or the REPLY command, described in the preceding sections. This feature is useful, for example, when running a program such as STORE which you expect will take a long time to complete.

Automatically Assigning Devices

You may choose to configure backup devices so that they are automatically assigned to users. This is also referred to as *auto reply*. When devices are configured for automatic assignment, the system automatically answers media requests for you.

Devices configured for automatic assignment must have the following characteristics:

■ The device mode must be R (autoreply).

■ The device must not be job or data accepting.

■ The device must not be assigned to another user.

- The device specification must be unique. You must use the device specification (logical device number or unique device class) in a FILE command describing the device.

- The user must request an unlabeled media.

Refer to *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042) for instructions for configuring devices.

In order for the system to automatically assign a correctly configured device, the user (or you, if you are storing or restoring files yourself) must name the device and its LDEV number (or device class, if the device class is unique) in a FILE command preceding the STORE command, and the device must not be assigned to any other user. If a device cannot be automatically assigned, you must assign the device in the standard manner. Instructions for using the FILE and STORE commands can be found in Chapter 5, "Storing Files."

8

When STORE is Complete

When you see the **END OF PROGRAM** message, STORE is complete. To be absolutely sure that important files have been stored correctly, you will probably want to do the following:

- Checking File Listings for Errors
- Verifying That STORE Files Are Error Free
- Using NODECOMPRESS
- Retaining the STORE Tapes
- Allowing Users Back on the System

Checking File Listings for Errors

As STORE copies files to backup, it will list them at the console provided you use the SHOW parameter. For example, if you enter

```
:STORE TO.SREXP.SYS;*T;SHOW
```

the following might be listed on the console:

```
TURBO-STORE/RESTORE VERSION A.20.01   (C) 1986 HEWLETT-PACKARD CO.
TUE, NOV 6, 1989,  2:57 PM

FILENAME GROUP   ACCOUNT   VOLUME RESTRICTIONS        SECTORS CODE   REEL
TDORSERR.SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S       32      1
TSRBUGFX.SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S      160      1
TSRDOC  .SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S      672      1
TSRERR  .SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S      240      1
TSRGLOB .SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S       64      1
TSRINCL1.SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S      656      1
TSRINCL2.SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S      480      1
TSRINCL3.SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S      272      1
TSRTAPE .SREXP .SYS        MPEXL_SYSTEM_VOLUME_SET   :S      384      1

FILES STORED:  9
```

Figure 8-1. Listing Files Copied to Tape

When STORE finishes, you see the total number of files stored and, if there is an error, the number not stored. Use the listing to verify that the correct files were indeed stored and that none were omitted.

Verifying That STORE Files Are Error Free

After using the STORE program to write files to backup, you may want to check to be sure that no errors occurred in the process. A new MPE XL command, VSTORE, allows you to verify that any or all the files were correctly stored. VSTORE can also be used to verify the file system directory or to list the date that a given file was stored.

The user interface for the VSTORE command is similar to that for the RESTORE command which is described in Chapter 10, "Restoring Files." Command syntax for VSTORE is shown in Appendix B, "Command Syntax."

To verify one or more files on a STORE backup, mount the backup on your backup device. The write ring should be removed as a protection.

As with the STORE and RESTORE commands, you may optionally precede the VSTORE command with a FILE command assigning a file name to the backup drive. If you do not assign a file name, a default name is used.

For example, to verify the files on a backup, enter:

    :FILE T;DEV=TAPE

Now issue a VSTORE command that backreferences the backup file and includes the file or files you want to verify. For example:

    :VSTORE *T;@.@.@

If you have omitted the FILE command, you would enter:

    :VSTORE ;@.@.@

In addition to the backup file name and the names of the files to be verified, four parameters are available: SHOW, ONERR[OR], LOCAL, and DIRECTORY. The following is a brief description of each of these parameters:

- The SHOW parameter allows you to list the names of each file successfully verified. (If you do not specify this parameter, the total number of files verified is displayed.) Additional options used with the SHOW parameter include short and long form descriptions of files, creation, last access, last modification date, security status, and an offline printing option.

- The ONERR[OR] parameter informs VSTORE what to do if a media error is encountered while verifying a file. Two options are available. If ONERR=SKIP is specified, then VSTORE will continue to verify files after an error is encountered. It will print an error message for any file that it was unable to verify. This is the

default. Specifying `ONERR=QUIT` causes VSTORE to terminate upon getting a media error. The rest of the files in the backup will not be verified, and an error message for each file will be issued.

- The `DIRECTORY` parameter allows for the file system directory on the backup to be verified. Use of this parameter requires SM or OP capability.

The following are examples of the above parameters:

```
:VSTORE *T;@.@.@;SHOW
:VSTORE *T;FILE1.MANAGER.SYS;SHOW;ONERR=SKIP
:VSTORE *T;@.@.@;DIRECTORY
```

Note

The VSTORE command is not valid for a STORE backup created with the `TRANSPORT` parameter.

For a full discussion of all VSTORE command options, refer to the *MPE/iX Commands Reference Manual Volumes 1 and 2* (32650-90003 and 32650-90364) or refer to Chapter 10, "Restoring Files." Implementation of the VSTORE options is the same as implementation of the RESTORE options. The VSTORE options are:

- SHOW
- ONERR
- DIRECTORY
- COPYACD, NOACD
- TREE, NOTREE
- RESTORESET, TurboSTORE only
- MOSET, TurboSTORE only

Using NODECOMPRESS

Normally, when VSTORE verifies a compressed store media, it reads in each record and decompresses it. This results in a thorough verification of the media by checking both the integrity of the data on the media as well as the correctness of the compression algorithm. If the `NODECOMPRESS` option is specified, VSTORE will only read the records from the media. It will not decompress them. This verifies only that there are no media errors on the media. on the media. It also speeds up the VSTORE process, since it does not have to perform the decompression.

This option should be used when the time to verify compressed store media is a prime concern. In most cases, full verfication should be done to ensure that the data was compressed and written without error.

The NODECOMPRESS option can only be used with VSTORE, for example:

```
:FILE T;DEV=TAPE
:VSTORE *T;@.@.@;SHOW;NODECOMPRESS
```

Retaining the STORE Tapes

Unload each backup and check for correct labeling. If you used the SHOW=OFFLINE option of the STORE command, the system has printed a list of the files you stored. Retrieve the report from your printer and either file it with your records or attach it directly to one or more backup reels. Place each backup in your backup library.

Allowing Users Back on the System

If you prevented users from accessing the system during your backup, as discussed in Chapter 4, "Preparing the System," you need to allow users to access the system again.

To allow users access to the system again, perform the following:

1. Reset the job and sessions limits to their original values. Enter:

   ```
   :LIMIT nn,nn
   ```

2. To check that you've used the correct numbers, enter:

   ```
   :SHOWJOB STATUS
   ```

   The last line should report the correct job limit (JLIMIT) and session limit (SLIMIT) for your computer. If the values are incorrect enter the LIMIT command again with the corrected values.

3. Reset the system jobfence to its original value by entering:

   ```
   :JOBFENCE nn
   ```

4. To check that the jobfence is correct, enter:

   ```
   :SHOWJOB STATUS
   ```

   If the jobfence value is incorrect, enter the JOBFENCE command with the correct value.

5. Restart any suspended jobs. To determine whether any jobs had been temporarily stopped, enter:

   ```
   :SHOWJOB
   ```

   The system lists your session and any suspended jobs in the following way:

```
JOBNUM    STATE   IPRI JIN     JLIST     INTRODUCED   JOB NAME
#S185     EXEC         20      20        FRI  1:03P   OPERATOR.SYS
#J17      SUSP         10S     PP        FRI  5:02P   AJOB,MRS.T
2 JOBS:
   0 INTRO; 0 SCHEDULED
   0 WAIT; INCL 0 DEFERRED
   1 EXEC; INCL 1 SESSIONS
   1 SUSP

JOBFENCE= nn; JLIMIT= nn; SLIMIT= nn
```

Figure 8-2. Listing Suspended Jobs

The example shows one suspended job (#J17). To restart that job, enter:

:<u>RESUMEJOB</u> #J17

Repeat the RESUMEJOB command for each job listed as SUSP. When you have done this for each suspended job, check that all have been restarted by entering:

:<u>SHOWJOB</u>

The list should look nearly identical, except that jobs that were suspended before should now be listed as executing or EXEC:

```
JOBNUM    STATE   IPRI JIN     JLIST     INTRODUCED   JOB NAME
#S185     EXEC         20      20        FRI  1:03P   OPERATOR.SYS
#J17      EXEC         10S     PP        FRI  5:02P   AJOB,MRS.T

2 JOBS:
   0 INTRO; 0 SCHEDULED
   0 WAIT; INCL 0 DEFERRED
   2 EXEC; INCL 1 SESSIONS
   0 SUSP
JOBFENCE= nn; JLIMIT= nn; SLIMIT= nn
```

Figure 8-3. Listing Resumed Jobs

When you have returned the system to its normal status and restarted suspended jobs, the backup is complete, and users can begin using the system again.

9

Backing Up the System Configuration

This chapter describes how to use the SYSGEN utility to perform a system backup. The subjects in this chapter are:

- SYSGEN Backup Capabilities
- Running SYSGEN
- The System Backup Command
- Creating a System Load Tape
- Combined SLT and Store set

SYSGEN Backup Capabilities

A complete system backup consists of system files, user files, the file system directory, and system configuration information. STORE copies only system and user files and the file system directory to backup.

To back up your system configuration, use the SYSGEN utility. This creates a system load tape (SLT). A system load tape contains system configuration information, and all the system files necessary to boot and run a basic system.

SYSGEN requires that you have system supervisor (OP) capability to view system configuration data and system manager (SM) capability to save changes.

SYSGEN provides a series of command-driven user interfaces and online help facilities that describe command syntax and options. Through the interfaces, referred to as configurators, you can build new system configurations and generate a system load tape based on the new information.

SYSGEN stores configuration data in a group of files that are maintained by one or more of the five system configurators. Each configurator provides you with an interface to make changes to an independent portion of the configuration data. For example, there is an I/O configurator that allows you to change the physical makeup of the system and a Log configurator for making changes to the type and quality of system and user log files.

The base group is the group containing the set of configuration files to be read or modified by SYSGEN. The default group is the group that was specified (or defaulted to) when the system was started. If a base group is not specified, then the default group becomes the base group. The default group is generally CONFIG.SYS.

CONFIG.SYS is a permanent file set containing information on device classes, assigned I/O paths, assigned LDEV numbers, volume names, and various data in system files. When changes are made to the system configuration from one or more of the configurators, the files remain unchanged until you formally keep the new information through the SYSGEN KEEP command. You can always back out of changes until you actually keep them. You may KEEP the base group or to a group you specify.

Multiple configurations can be kept on disk and stored to backup through a full system backup. When you KEEP your changes to another group name (for example, CONFG950), a new group is created in the SYS account with an identical file set. When a system load tape is generated, however, the current configuration data is always written to the SLT as CONFIG.SYS regardless of what your working name on disk is for the group. This reduces confusion over which group is the current configuration or what its original name was if you suddenly have to regenerate a system. For information on changing or creating configurations groups, refer to *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042).

Running SYSGEN

To run the SYSGEN utility, enter the following:

:SYSGEN *basegroup,newgroup,inputfile,outputfile*

All of the parameters are optional.

The *basegroup* parameter is the group in the account SYS that contains the configuration data you use or alter. The default is CONFIG.SYS (or the group specified at system startup). If you specify a group that does not exist, an error occurs. You can change the base group within SYSGEN using the BASEGROUP command. Refer to *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042) for additional information.

The *newgroup* parameter is the group to which you will store your data. If you do not specify this parameter, SYSGEN stores the changes to the base group. If the group you specify already exists, SYSGEN asks you whether you actually want the configuration data written to that group. To override *newgroup*, specify an alternate group with the SYSGEN KEEP command.

The *inputfile* parameter is the actual file designator of the file for command input. The formal file designator is SYSGIN. The default is $STDIN. Use a file equation to change the command input file.

The *outputfile* is the actual file designator of the file for output requests. The formal file designator is SYSGOUT. The default is $STDLIST. Use a file equation to redirect output.

For example, to change input to a command input file and redirect output to the line printer, enter:

```
:FILE SYSGIN=NEWIN
:FILE NEWOUT;DEV=LP

:SYSGEN,MYGROUP,*NEWIN,*NEWOUT
```

When you run SYSGEN, you receive a list of SYSGEN first-level commands:

```
SYSGEN version E.00.00 : catalog version E.00.00
FRI, JAN 7, 1994, 5:57 PM
Copyright 1987 Hewlett-Packard Co. All Rights Reserved

        **warning** no NMCONFIG file in this configuration.
        **warning** NMCONFIG.PUB.SYS is now the NMCONFIG file

        ** First level command **

            io              log (lo)        misc (mi)       spa (sp)
   sysfile (sy)

        basegroup (ba)  keep (ke)       permyes (pe)    show (sh)
        backup (ta)

        clear (cl)(c)   exit (ex)(e)    help (he)(h)    oclose (oc)
        redo
sysgen>
```

Figure 9-1. SYSGEN First-Level Command Listing

Note	The warnings refer to the network manager configuration file, which configures remote devices and terminals on the system. SYSGEN is concerned with the devices actually interfaced to the system.

The System Backup Command

The SYSGEN command that you use to make a system load tape is TAPE (TA).

To create a system load tape without user files or optional system files included, enter the following command:

sysgen>TAPE

or

sysgen>TA

At the end of the tape creation, you receive the following message:

** Boot backup generated successfully **

If an error occurs during the tape creation, a flashing TAPE ERROR message is issued to the console, describing the error.

Creating a System Load Tape

To create a system load backup that contains a new configuration, follow the sample commands as illustrated:

```
:SYSGEN CONFIG,NEWFIG

:SYSGEN version E.00.00 : catalog version E.00.00
FRI, JAN 7, 1994, 5:57 PM
Copyright 1987 Hewlett-Packard Co. All Rights Reserved

        **warning** no NMCONFIG file in this configuration.
        **warning** NMCONFIG.PUB.SYS is now the NMCONFIG file

        ** First level command **

        io              log  (lo)    misc (mi)    spa (sp)
   sysfile (sy)

        basegroup (ba)  keep (ke)    permyes (pe) show (sh)
        backup (ta)

        clear (cl)(c)   exit (ex)(e) help (he)(h) oclose (oc)
        redo
sysgen>
```

Figure 9-2. Creating a System Load Tape Sample

Make your system configuration changes through the utility configurators. For information, refer to *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042). Return to the first-level SYSGEN menu and keep the changes to the new configuration group:

    sysgen>KEEP

or

    sysgen>KE

    Keeping to group NEWFIG
    Purge old configuration (yes/no)?Y

    sysgen>

To this point, your configuration changes have been saved to disk under the configuration group NEWFIG. If you specify NEWFIG as the

base group and you issue the TAPE command, NEWFIG is written to backup as CONFIG.SYS, overwriting the default configuration files.

Recall the new configuration and generate a system load backup:

    sysgen>BA NEWFIG

    sysgen>TA

SYSGEN takes about 15 minutes to store the new MPE/iX system to tape.

If you are completely confident that you have a working configuration, exit SYSGEN. Otherwise, recall the original CONFIG.SYS and store it under a different group name:

    sysgen>BASEGROUP CONFIG

or

    sysgen>BA CONFIG

    sysgen>KEEP OLDFIG
    sysgen>

    sysgen>EXIT
    END OF SUBSYSTEM
    :

If the system does not boot under the new CONFIG group, you can use the START GROUP=OLDFIG option under the initial system loader (ISL) to boot the system under the original CONFIG group. For more information on the ISL START command and options, refer to *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042).

Combined SLT and Store Set

Now MPE/iX allows you to combine a SLT and any store fileset to make a combined SLT/Store set. With the large capacity of the DDS device, this will allow both the SLT and store filesets to fit on a single cassette.

In a combined SLT/Store set, the files are stored after the SLT. These files can be retrieved either by a reload or a separate RESTORE command which will skip over the SLT.

In order to create a combined SLT/Store set backup, SYSGEN needs to be invoked. The option STORE is added to the TAPE command inside SYSGEN. The TAPE command looks as follows:

```
sysgen>  help TAPE
tape (ta) [mode  = VERBOSE|NOCHANGE|NOCONFIG|NODIAG|
                   NOLOGNUM|LOGNUM]
          [dest  = OFFLINE]
          [store = filesetlist string]
```

When the STORE option is used, files will be stored after the SLT as specified through the filesetlist string. The filesetlist string parameter is the same as the filesetlist parameter that is specified when using the STORE command. The only difference is that it specifies a set of files to be stored after an SLT as opposed to just a normal store to a backup.

An example of how to use the STORE option is as follows:

sysgen> <u>TA STORE = "@.pub.sys"</u>

or

sysgen> <u>TA STORE = " "</u>

If the STORE option is used without specifying a filesetlist (2nd example), which is the same as invoking the STORE command without a filesetlist, the files that are stored will depend on the user capabilities. Since the parameter to the STORE option is a string, it must be enclosed by quotes.

If you want to specify other STORE options like SHOW, PROGRESS etc., they can be specified through the use of an indirect file:

sysgen> <u>TA STORE = "*indirectfile*"</u>

where "*indirectfile*" might contain:

@.@.2.;SHOW;PROGRESS=1

STORE options TRANSPORT, STORESET and MOSET (TurboSTORE) are invalid when a combined SLT/Store set is being created. If the store results in an error, the normal STORE errors will be displayed, and the user will be left in SYSGEN.

Storing files after the SLT will not work for a remote device. The use of the TAPE command to store files is not backward compatible (prior to 3.1).

When a single reel combined SLT/Store set is used to restore files, RESTORE will skip past the SLT set automatically prior to restoring files. In a multi-reel, if one of the reels that contain SLT information is mounted, RESTORE will skip past the SLT beginning with that backup, that is, reel one does not have to be mounted first in order for the RESTORE to work.

10

Restoring Files

This chapter describes the RESTORE process and options. You RESTORE a file by transferring it from a STORE tape to disk. You might need to RESTORE a single file, for example, when a user accidentally deletes it. You might restore all the files in an account after you have permanently archived the account offline, deleted the files, and a user needs access to the files again. After a major system failure, you might need to RESTORE all of your files from tapes.

This chapter describes step-by-step procedures for restoring files with RESTORE. The sections in this chapter are as follows:

- Preparing to Restore Files
- Restoring Different Format Tapes
- Referencing Files in a RESTORE Command
- Issuing a RESTORE Command
- Restoring from Labeled Tapes
- Restoring from Single Devices
- Restoring from Multiple Devices
- Restoring from Magneto-Optical Disk
- RESTORE Command Options
- Monitoring RESTORE Command Progress
- When RESTORE is Complete

Caution
- Do not use RESTORE to transfer any of the files originally on your system load tape from LDEV 1 to a system disk other than LDEV 1. These files are contained in the SYS account and can be displayed by entering the SY configurator of the SYSGEN utility and using the SHOW command.

- Also, do not purge or put a lockword on these files.

- Finally, do not use any command other than SYSGEN to manage the files within a configuration group. These configuration files come as a set and individual files may not be moved between groups or systems. Such actions make these system files inaccessible, causing problems either immediately or at a later time.

For simplicity, the term tape is used throughout the procedures in this chapter. Substitute the appropriate media and device where applicable.

Preparing to Restore Files

Since restoring files involves the use of one or more tapes on a tape device, you must complete the following three steps before issuing the RESTORE command:

- Locate the necessary backup file or files.
- Check for duplicate file names.
- Prepare the tape and the tape device.

Locate the Necessary File or Files

Search your tape library for the STORE tape(s) containing the files you want to restore. If you do not know where the tape file(s) are, you can use the RESTORE command to list the contents of the tape. Refer to "When RESTORE is Complete", later in this chapter.

Checking for Duplicate File Names

Before you RESTORE a file from a STORE tape, check whether a disk file with the same name already exists. If a file with the same name resides in the account and group you are restoring to, the disk file is overwritten by the backup file during the RESTORE process by default.

Caution

If you do not wish to lose current disk files with the same fully qualified file names as the files you are restoring, use the KEEP parameter of the RESTORE command.

To check for duplicate filenames, use the LISTF command for each file you intend to RESTORE. For example:

:LISTF *filename.groupname.accountname*

Use wildcard characters to represent a set of files. Refer to "Using Wildcard Characters", in Chapter 5, "Storing Files," for details. For example, the following LISTF command lists all files in the PUB group of the RESEARCH account:

:LISTF @.PUB.RESEARCH

If at least one file exists, the system prints the filename at your terminal. If files matching the search criteria do not exist, the system prints the message:

NON-EXISTENT FILE (CIERR 907)

Preparing the Media and the Backup Device

Prepare the STORE tape following the instructions in Chapter 3, "Preparing Storage Devices." Make sure that you protect the files on the tape by removing the write ring. Mount the STORE tape on your tape device.

Referencing Files in a RESTORE Command

You can name a single file to RESTORE, several individual files, or all the files from one or more STORE tapes. The group of files you want to RESTORE is called a file set. In addition to naming many kinds of file sets, you can name file subsets to exclude from the RESTORE process.

As a system supervisor (with OP capability) or a system manager (with SM capability), you can RESTORE any file in the system. To RESTORE a file that is not in your logon group and account, you must specify the complete name of the file in the form *filename.group.account*. If you do not name an account for the file, RESTORE assumes your logon account.

If you do not name a group, RESTORE assumes your current group. Thus, if you want to restore a file from your logon group and account, you need only specify its filename. RESTORE does not RESTORE a file if its group and account do not exist on your system, unless you instruct RESTORE to create accounts and groups (using the CREATE parameter). Refer to "Creating Accounts, Groups, and Creators", later in this chapter.

RESTORE uses the same guidelines and syntax to describe files to be restored as STORE. See the "Referencing Files in a STORE Command," in Chapter 5, "Storing Files."

You do not need to specify a file set for the RESTORE command. If you omit a list of files in the RESTORE command, the default is to restore a file set based on your capabilities, as follows:

- @. *group.account* for users

- @.@. *account* for the account manager (AM)

- @.@.@ for the system manager (SM) and system supervisor (OP)

Restoring from Labeled Tapes

Restoring files from labeled tapes requires that the RESTORE command include a RESTORE file reference that was named previously in a file equation. For example:

```
:FILE TAPE7=BACKUP.JAN29;DEV=TAPE;LABEL="VOL25",ANS,02/28/90
```

To recover all files in the volume set, you would then enter the following RESTORE command.

```
:RESTORE *TAPE7;@.@.@; restoreoptions
```

The system then requests that you mount the first volume of the volume set. For example:

```
?23:20/#S1/49/Mount tape of volumeset   VOL25   (ANS)
```

After you mount the volume and it is recognized by the system, RESTORE continues. If the tape mounted is the first volume of the set, file recovery begins automatically. If the tape mounted is not the first volume of the set, you are prompted for the first volume. For example:

```
23:17/15/Vol XYZ  (ANS) of set VOL25 mounted on LDEV# 7
```

```
23:17/#S1/50/MOUNT REEL 1 OF VOLSET VOL25 FOR RESTORE ON LDEV 7
```

Note   Labeled tapes cannot be used to RESTORE with a sequential device configuration.

Restoring from Single Devices

The FILE command gives the tape device a filename and identifies the device. To RESTORE files from only one device, back reference that device in your RESTORE command. For example:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.OPERATOR.SYS
```

Restoring from Multiple Devices

To RESTORE files from multiple devices, use the RESTORESET parameter in the RESTORE command to reference the multiple devices. Use of the RESTORESET parameter is explained in the following pages.

Sequential Devices

You can use sequential device configuration when you have a large set of files to RESTORE from a number of tapes and you want to speed up the process. The sequential device configuration is described under "Using Tape Devices Sequentially," in Chapter 3, "Preparing Storage Devices."

To RESTORE files from sequential devices:

1. Mount the tapes on all of the devices you plan to use.

2. Use the FILE command to give each device a filename that indicates its position.

3. Use the RESTORESET parameter in a RESTORE command to reference the multiple devices.

For example, to RESTORE files from three sequential devices, use the following set of commands:

```
:FILE SEQ1;DEV=7
:FILE SEQ2;DEV=8
:FILE SEQ3;DEV=9
:RESTORE ;@.@.@;RESTORESET=(*SEQ1,*SEQ2,*SEQ3)
```

Note

Do not back reference the filename of a tape device immediately before the name(s) of the file(s) you are restoring when using the RESTORESET parameter. Instead use a placeholder for the missing parameter normally supplied when using a single tape device. The placeholder is provided by the use of the first semicolon (;) in the RESTORE command.

The above RESTORE command restores all system and user files from three sequential devices. The parentheses surrounding back referenced file names group the devices into a device pool.

When RESTORE has transferred all the files from the first tape on the first tape device, it immediately begins restoring files from the second tape on the second tape device. While RESTORE continues, you can unload the first tape and mount a new tape on the drive. When RESTORE finishes restoring the files on the last device, it reverts to restoring files from the first device. The process continues to cycle through the devices in the device pool until it has restored all the files you specified.

If you gave the tape devices a single filename such as:

```
:FILE T;DEV=TAPE
```

Enter the following RESTORE command to RESTORE files from a set of three sequential tape devices:

```
:RESTORE ;@.@.@;RESTORESET=(*T,*T,*T)
```

You can RESTORE files that were created using parallel devices or parallel device pools in a sequential configuration. For example, to RESTORE a set of reels that have been created using parallel device pools, you must use the following logical order to mount the reels on sequential devices: A1, A2....B1, B2 and so on. (The first alphabetic character, in capital letters, indicates an original, unique parallel set; the second numeric character indicates an original sequential reel within the set.) That is, mount A1 first, followed by A2. The reel that you mount prior to B1 should be the last "A" reel.

Note   Sequential RESTORE is not available for labeled tapes.

Parallel Devices   A parallel device or parallel device pool configuration can be used for restoring files. Therefore, you can use the same designations with the RESTORESET parameter that you can use with the STORESET parameter. Refer to Chapter 3, "Preparing Storage Devices," for information on storing to multiple devices.

If you gave the tape devices a single filename such as:

```
:FILE T;DEV=TAPE
```

Enter the following RESTORE command to copy files from a set of four parallel tape devices:

```
:RESTORE;@.@.@;RESTORESET=(*T),(*T)
```

Describe parallel devices in the RESTORESET parameter by enclosing each back referenced device filename within parentheses. Use commas to separate devices.

To RESTORE files from parallel device pools, use parentheses to group the devices into pools. Separate the devices in the pool from one another with commas. Commas also separate each device pool.

For example, the following commands copy files from two parallel device pools. Each device pool contains two sequential devices. In the following example, RESTORE uses a total of four devices divided into two device pools.

```
:FILE PPA1;DEV=7
:FILE PPA2;DEV=8
:FILE PPB1;DEV=9
:FILE PPB2;DEV=11
:RESTORE @.OPERATOR.SYS;;RESTORESET=(*PPA1,*PPA2),(*PPB1,*PPB2)
```

If you gave the tape devices a single filename such as:

```
:FILE T;DEV=TAPE
```

Enter the following RESTORE command to copy files from a set of parallel device pools:

```
:RESTORE @.@.@;;RESTORESET=(*T,*T),(*T,*T)
```

Notes	Parallel RESTOREs can be performed only with tape sets that were created with a parallel STORE option. A sequential RESTORE can be used with any tape set.

Parallel RESTORE allocates every subset of the tape set (for example, STORESET=(*T1),(*T2) creates two subsets) to distinct parallel devices or device pools, and expects a volume belonging to the subset to be mounted on its allocated device or device pool only.

Restoring Files from Magneto-Optical Disk

To RESTORE files from magneto-optical devices, use the MOSET parameter in the RESTORE command to reference the devices. Use of the MOSET parameter is explained in the following pages.

Specifying the Magneto-Optical Device

Normally, you do not need to designate a specific device or LDEV when restoring from a magneto-optical device. You use the MOSET parameter to indicate a magneto-optical device. You do not use file equations as you do when using tape drives. Nor do you use the RESTORESET parameter to back reference the device. Instead, you specify that the RESTORE is to be from the Model 20GB/A through the MOSET parameter of the RESTORE command. For example:

```
;MOSET=(MO)
```

If you must specify the LDEV, (for example, you have multiple magneto-optical devices and media is not loaded in the magneto-optical device), the MOSET parameter can be used to specify the LDEV number. For example:

```
;MOSET=(101)
```

Specifying the Backup Name

The media name you specified with the STORE command is required when restoring from a magneto-optical device. Use the NAME parameter to indicate the logical tape name from which the RESTORE is to be done. For example:

```
;NAME=BK1130PM.D230CT90.KING
```

If the media is not loaded in the magneto-optical device at the time the RESTORE is started, you are prompted to mount the media. For example:

```
23:24/#S1/51/MOUNT THE MEDIA LABELLED BK1130PM.D230CT90.KING IN THE MAIL.SLOT OF LDEV 101 (Y/N)?
```

After you load the correct media in the magneto-optical device, reply to the message.

When the specific media is no longer required, it ejects to the devices mail slot. The media is returned to the storage slot or mail slot depending on where the specific media was loaded.

Restoring from a Single Magneto-Optical Device

The following example illustrates the RESTORE command to RESTORE files from a single magneto-optical device.

```
:RESTORE; @.@.@;MOSET=(MO);NAME=BK1130PM.D23OCT90.KING
```

Restoring from Multiple Devices

Multiple magneto-optical devices can be used in parallel (sequential use is not recommended) for restores by specifying each magneto-optical device drive with the MOSET parameter. For example, two devices in parallel, the MOSET entry would be:

```
;MOSET=(MO),(MO)
```

Restoring from Sequential Magneto-Optical Devices

Note

Restoring from sequential magneto-optical devices is not recommended.

The following example illustrates the RESTORE command entry to use two magneto-optical devices sequentially.

```
:RESTORE @.@.@;;MOSET=(MO,MO);NAME=BK1130PM.D23OCT90.KING
```

With this usage, only one drive will be active restoring at any given time while the other drive is swapping media. Since the swap time for media is very short, this method is not an efficient use of the two magneto-optical devices.

Restoring from Parallel Magneto-Optical Devices

Restoring from parallel magneto-optical devices is the recommended method of using multiple magneto-optical devices. The following example illustrates the RESTORE command entry to use two magneto-optical devices in parallel.

```
:RESTORE;@.@.@;MOSET=(MO),(MO);NAME=BK1130PM.D23OCT90.KING
```

With this usage, both drives will be actively restoring simultaneously.

Issuing a RESTORE Command

To RESTORE the files from the tape to the system disk, you may optionally first issue a FILE command. The optional FILE command names the tape device and describes its type. If you do not use a FILE command, RESTORE creates a default file name. You must issue a RESTORE command describing:

- The files you want to RESTORE

- The options you want to use, if any

- Back references to the filename of the tape device, unless you use the default file name.

For example:

```
:FILE T;DEV=TAPE
:RESTORE *T;FILE1.OPERATOR.SYS
```

or

```
:RESTORE ;FILE1.OPERATOR.SYS
```

Note

If the back reference is omitted, the semicolon (;) serves as a placeholder and must be included.

You must use a FILE command if you want the device to be automatically allocated.

Refer to "Naming the Backup", in Chapter 3, "Preparing Storage Devices," for more information on the FILE command.

You can RESTORE files from a single tape device or from multiple tape devices with TurboSTORE/iX. However, you do not have the use of parallel devices or parallel device pools, as you do with the STORE command. RESTORE uses only sequential devices.

Restoring Different Format Tapes

RESTORE can restore files from any tape created by STORE. This includes tapes that were made using TurboSTORE only options, such as compression (COMPRESS), online (ONLINE), interleave (INTER), and parallel store sets (STORESET=). Even if you have not purchased a version of TurboSTORE, basic RESTORE can still copy the files off of the tape.

For a tape that was created by an online STORE, the original state of the file is constructed based on the written file data, plus any online log information that follows the file. The file will be restored to the state it was at the time of the attach.

You can also RESTORE files from a tape that was created with parallel store sets, even if you have only one tape device, or have fewer tape devices than were used to create the tape. Mount the media from the first store set initially. When RESTORE has finished reading files from

that set, it will prompt you to mount media from the next set. It will continue to request media until all files have been restored.

RESTORE can restore files from a tape which is in MPE/VE STORE format. MPE/VE STORE format tapes are made when the TRANSPORT option is specified on an MPE/iX STORE command. When restoring from an MPE/VE STORE format tape, the STORE or TSTORE program will sense that the tape is in MPE/VE STORE format and invoke CMSTORE to RESTORE the files. However, the following options are not available in CMSTORE:

- DIRECTORY
- LISTDIR
- FCRANGE
- VOLSET
- VOL
- VOLCLASS
- COPYACD
- NOACD
- RESTORESET
- TREE
- NOTREE
- MOSET
- NAME
- USENAME

RESTORE Command Options

The following sections descirbe the RESTORE options. The options are:

- VOL, VOLCLASS, VOLSET
- DEV
- FCRANGE
- SHOW
- LISTDIR
- FILES
- CREATE
- KEEP, NOKEEP
- OLDDATE, NEWDATE
- DIRECTORY
- ACD, NOACD
- TREE, NOTREE

Listing Restored Files (SHOW)

Whenever you RESTORE a set of files, the system displays the total number of files restored at your terminal. If there was an error, it also displays the names of files not restored, the reason each was not restored, and the total number of files not restored . Use the SHOW parameter to display the names and additional information about the files restored and to list them on your system printer as well as at your terminal.

The output listings are in the same format as STORE, which are described in Chapter 6, "STORE and TurboSTORE Command Options." Refer to that chapter for information on the possible SHOW suboptions, as well as the format and fields in the listings.

Two differences between STORE and RESTORE listing do exist, however:

- The filenames displayed in a RESTORE listing are those of the final destination filename, which may not be the same name the file has on the tape. Restore options such as GROUP, ACCOUNT, and LOCAL may affect what filename is printed.

- For the LONG listing, RESTORE has an extra field, called OLDSP. This field will contain the old spoolfile name for any spool files that are being restored. Since a spoolfile is given a new name when it is restored, this field will help you to associate new spoolfiles with their previous names.

Selecting a RESTORE Error Recovery Method (ONERROR)

As RESTORE restores files from tape, it displays the number of files restored and not restored, and the names of files not restored, if any. The RESTORE message also explains why each file was not restored. Such errors do not necessarily abort the RESTORE process. When RESTORE encounters an error, it either automatically recovers or terminates, depending upon the nature of the error and the error recovery method you choose.

The following errors always cause RESTORE to abort:

- A command syntax error.

- A disk input or output error (in the system).

- A file directory error.

- An error opening the tape file or an indirect file. Refer to "Using Indirect Files," in Chapter 5, "Storing Files.")

- An incorrectly formatted STORE tape.

- No continuation reel. You did not find a continuation reel for a multi-reel tape set.

- A device reference error. Either the specification for the device parameter is illegal, or the device is not available.

The ONERROR parameter of the RESTORE command lets you choose an error recovery procedure. Your options are ONERROR=QUIT or

ONERROR=SKIP. SKIP is the default. You will only need to include the ONERROR parameter if you do not wish to use the default.

If you specify QUIT, RESTORE terminates upon encountering a tape error. If you specify SKIP, RESTORE skips the file in which the error occurred and continues restoring files from the tape.

Restoring Files to the Correct Group, Account, and Creator (CREATE)

Files on STORE tapes belong to the same group, account, and creator that they belonged to on disk. You RESTORE files to their original group, account, or creator, or if you have the correct capabilities, you can use RESTORE command options to copy a file to your own group and account or to copy a file to a different group, account, or creator.

Creating Groups, Accounts, and Creators

If a file's account, group, or creator has been deleted from your system after storing the file to tape, you can recreate it as you RESTORE the file from tape using the CREATE parameter. RESTORE sets account, group, and user capabilities to their default values when it creates them. You must have the necessary capabilities to create a new group or account. That is, you must have system manager (SM) or system supervisor (OP) capability to create a new account. You must have system manger (SM), system supervisor (OP), or account manager (AM) capability to create a new group.

For example, you stored all files in the account FEBRECS to tape on the first of March and then purged the account, its users, and its groups from the system. Several months later, a user asks you to RESTORE the files in the FEBRECS account. Using the CREATE parameter, you can recreate the account, groups, and creators as you RESTORE the files. For example:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.FEBRECS;CREATE=GROUP,ACCOUNT,CREATOR
```

Or alternatively, you could enter:

```
:RESTORE;;CREATE
```

which will by default RESTORE all files and create all missing structures.

Caution   Using this method, the CREATE parameter creates groups, accounts, and users with default capabilities and access rights (those that exist for the group, account, and user to which you are restoring, not those that exist on the tape).

Restoring Files to Your Group and Account

Regardless of the group, account, or creator from which files were stored, you can RESTORE files into your own group and account if you have read access to the files on the tape, or system manager (SM), system supervisor (OP), or account manager (AM) capability.

"Read access" implies that if the files were restored to the groups and accounts from which they came, and those groups and accounts had default access capabilities, you would able to read the files on disk, such as with FCOPY.

Use the LOCAL parameter. For example, enter:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;LOCAL
```

The files are restored to your logon group and account with your logon user name as the creator.

Restoring a File to a Different Group, Account, or Creator

Similarly, use the GROUP and ACCOUNT parameters to switch a file's group and account as you RESTORE it from backup. You can use either option alone, or use both together, but you cannot use either GROUP or ACCOUNT with LOCAL. You must have system manager (SM) or system supervisor (OP) capability to switch a file's account. You must have system manager (SM), system supervisor (OP), or account manager (AM) capability to switch a file's group.

Note

A user without the capabilities described above can RESTORE a file to a different account or group if the following conditions are met:

- The group, account, and file level access are available to the user.

- The file has no lockword, or if it does, the user knows the lockword.

- The file is not privileged.

The commands displayed below RESTORE the files that belong to the PUB group of the SMITH account on tape to the PUB group of the JONES account on disk.

```
:FILE T;DEV=TAPE
:RESTORE *T;@.PUB.SMITH;GROUP=PUB;ACCOUNT=JONES
```

The CREATOR parameter lets you change a file's creator as you RESTORE the file from tape. For example, the following command restores the files in the PUB group of the SMITH account on tape to the PUB group of the JONES account on the system disk, changing the creator to MARTY:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.PUB.SMITH;GROUP=PUB;ACCOUNT=JONES;CREATOR=MARTY
```

You must name a user that exists in the account as the new creator, or specify CREATE to cause the user to be created in the directory. If RESTORE does not find the user name, it does not RESTORE the file. If you use the CREATOR parameter without specifying a user name, RESTORE restores the file only if the tape file's creator exists in the file system directory.

The CREATOR parameter cannot be used when the LOCAL parameter is used.

Changing a File's GID (GID)

If you need to change a file's group ID, or GID, you may specify the GID option. The GID option takes an optional file group name, for example:

    ;GID=MANAGER

If the file group name is specified, all files being restored will have their GID changed to the specified GID. If the file group name is not specified, the GID present on the backup will be preserved. This overrides any change in GID that may occur due to the LOCAL or ACCOUNT options.

Overwriting or Retaining Disk Files (KEEP, NOKEEP)

By default, RESTORE replaces disk files with the same fully qualified filename as the file you are restoring from backup. Therefore, especially if you are restoring a large number of files, to be sure that you do not overwrite an important file or files, use the KEEP parameter of RESTORE.

For example, your STORE tape might contain several files, some of which have names that are the same as files on disk. To RESTORE only those backup files with names that do not duplicate disk file names, use the following commands:

    :FILE T;DEV=TAPE
    :RESTORE *T;@.@.@;KEEP

Using KEEP in the command above tells the system not to replace the files already on disk with files that have identical names on tape. You successfully RESTORE to disk all files on the backup that do not have the same names as files already on disk. You do not overwrite existing files on the disk.

To explicitly require RESTORE to overwrite disk files with the same fully qualified file names, use the NOKEEP parameter in your RESTORE command. For example:

    :FILE T;DEV=TAPE
    :RESTORE *T;@.@.@;NOKEEP

Specifying Modification and Last Access Date (OLDDATE, NEWDATE)

When you RESTORE a file or files, you can choose either to retain the creation, modification, access, and state change dates and times stored with the file on the backup, or you can choose to change the file's dates and times to the date you restored the file.

To retain the creation, modification, access, and state change dates and times in the file label on the backup, use the OLDDATE parameter of RESTORE. For example:

    :FILE T;DEV=TAPE
    :RESTORE *T;@.@.@;OLDDATE

To change the dates and times to the date you restored the files, use the NEWDATE parameter. For example:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;NEWDATE
```

You will probably want to use NEWDATE when you RESTORE archived files, so that you do not quickly archive them again.

Restoring Directory Information (DIRECTORY)

Use the DIRECTORY parameter to restore directory information from backup. To do this, you must have system supervisor (OP) or system manager (SM) capability. All system and volume set directories located are restored. For example, to RESTORE all files and all directories from a backup, enter:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;DIRECTORY
```

If you use the LOCAL, ACCOUNT, GROUP, CREATOR, or CREATE parameters with DIRECTORY, RESTORE does not create or change accounts, groups, or users for files that belong to directories on tape. The LOCAL, ACCOUNT, GROUP, CREATOR, and CREATE parameters will create accounting structures only for the files that do not belong to the directories you restore.

All HFS directories, and directories from any other volume sets that were stored, are also restored when DIRECTORY is specified.

Finding Out What Is on Your Tape (LISTDIR)

Use the LISTDIR parameter of the RESTORE command to display information from the tape directory and tape label without restoring any files. The tape creation type, record size, and any files that match your file set list display. LISTDIR may not be specified with any other parameter except DIRECTORY.

Note

The LISTDIR parameter works only using native mode STORE tapes and not with tapes created for MPE V/E using the automatic TRANSPORT mode of the STORE command.

The following example shows a sample `RESTORE` command and output display format using the `LISTDIR` parameter:

```
:RESTORE *T;@.SREXP.SYS;LISTDIR

TURBO-STORE/RESTORE VERSION  A.20.01 (C) 1986 HEWLETT-PACKARD CO.
WED, MAR 30, 1988, 10:59 AM

MPEXL MEDIA DIRECTORY

MEDIA NAME    : STORE/RESTORE-HP/3000.MPEXL
MEDIA VERSION : MPEXL 08.50 FIXED ASCII
REEL NUMBER   : 1

MEDIA CREATION DATE
WED, MAR 30, 1988, 10:53 AM

MEDIA CREATED WITH THE FOLLOWING OPTIONS

MEDIA RECORD SIZE : 16384
INTERLEAVE DEPTH  : 1

FILENAME GROUP     ACCOUNT  CREATOR      REEL  SET
TDORSERR.SREXP     .SYS     BOB    >=    1
TSRBUGFX.SREXP     .SYS     BOB    >=    1
TSRDOC  .SREXP     .SYS     BOB    >=    1
TSRERR  .SREXP     .SYS     BOB    >=    1
TSRGLOB .SREXP     .SYS     BOB    >=    1
TSRINCL1.SREXP     .SYS     BOB    >=    1
TSRINCL2.SREXP     .SYS     BOB    >=    1
TSRINLC3.SREXP     .SYS     BOB    >=    1
TSRTAPE .SREXP     .SYS     BOB    >=    1

FILES RESTORED:                          0
```

Figure 10-1. Sample RESTORE Command and Output

If any HFS syntax files exist on the media being examined, the resulting listing will show the file names in HFS syntax. The names will be displayed at the end of the line, similar to the HFS format for the `SHOW` option.

Restoring Files with Certain File Codes (FCRANGE)

Use the FCRANGE parameter to restore only files with certain file codes. MPE/iX file codes distinguish different types of files. You can select up to eight file code ranges to restore. For example, files with codes 1100, 1101, and 1102 are HPWORD files. Files with codes 1152 and 1153 are SLATE files. To restore all HPWORD and SLATE files from a backup, enter:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;FCRANGE=1100/1102,1152/1153
```

Note
The FCRANGE parameter is not valid when restoring from TRANSPORT tapes.

Specifying a Maximum Number of Files to Restore (FILES)

By default, MPE/iX restores a maximum of 4000 files at a time. If you are restoring more than 4000 files using the automatic TRANSPORT mode, use the FILES= parameter to specify the maximum number of files to be restored. If you do not use the TRANSPORT mode, the FILES= parameter is not necessary. If the FILES= parameter is present with the TRANSPORT mode, it is ignored. For example, to set the maximum number of files restored to 6000 from a TRANSPORT tape, you might enter the following:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.OPERATOR.SYS;FILES=6000
```

Restoring Files to a Specific Device (DEV)

Use the DEV parameter to specify the device where you want to RESTORE files. Use an LDEV number or a device class to indicate the device. For example, the following command restores the file FILE1 to the disk with logical device number 2.

```
:FILE T;DEV=TAPE
:RESTORE *T;FILE1.OPERATOR.SYS;DEV=2
```

If you name a device class, RESTORE allocates the files to any of the home volume set's volumes within that class. If you name a specific logical device, RESTORE restores the file to that device only if the device is a system disk.

If you do not specify a device with the DEV parameter, RESTORE tries to RESTORE a file to the logical device compatible with the device type and subtype specified in the file's label and the device type and subtype of the mounted home volume set. If it cannot find such a device, RESTORE tries to RESTORE the file to a device with the device class specified in the file's label and the home volume set. If it cannot find a device with the appropriate device class, RESTORE tries to RESTORE the file to any member of the home volume set; if it cannot, it does not RESTORE the file.

You cannot use DEV with VOLSET, VOLCLASS, or VOL. See the following section.

Restoring Files to Specific Volumes (VOL, VOLCLASS, VOLSET)

Use the VOL, VOLCLASS, and VOLSET parameters to RESTORE files to a particular volume, volume class, or volume set.

Use the VOLSET parameter to reference a particular volume set. If there is no room in the volume set, RESTORE does not RESTORE the file. For example:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;VOLSET=PRIVATE_VOL_A
```

Use VOLCLASS to reference a particular volume class. If there is no room in the volume class you indicate, RESTORE restores the files to a volume within the volume set. If there is no room in the volume set, RESTORE does not RESTORE the files. For example, to RESTORE files to the volume class CLASS_B within the PRIVATE_VOL_A volume set, enter:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;VOLSET=PRIVATE_VOL_A;VOLCLASS=CLASS_B
```

Use VOL to reference a particular volume. If you do not indicate a volume class or volume set, the volume you indicate must be part of the system volume set. If there is no room on the volume you name, RESTORE restores the file to another volume within the volume class. If there is no room within the volume class, RESTORE restores the file to a volume within the volume set. As an example, to restore files to the volume named VOL_C within the PRIVATE_VOL_A volume set, enter:

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;VOLSET=PRIVATE_VOL_A;VOL=VOL_C
```

You cannot use VOL, VOLCLASS, or VOLSET together with the DEV parameter (see previous section). If a file's group and account do not exist on the volume specified with VOLSET, the file is restored to the volume set where its group and account do exist. Refer to *Volume Management Reference Manual* (32650-90045) for more information on using volumes, volume classes, and volume sets.

Note

The VOL, VOLCLASS, and VOLSET parameters are not valid for restoring from TRANSPORT tapes.

Modifying ACDs (COPYACD, NOACD)

When restoring files, the NOACD option can be used to prevent the ACDs on the backup from being restored. This will cause the files being restored to have less security than when they previously existed on the system. Using NOACD can be useful when the ACDs that exist on the backup refer to users or accounts that do not exist on the current system. Specifying COPYACD (which is the default), will cause all ACDs associated with files on the backup to be restored to the system.

Specifying HFS Files (TREE, NOTREE)

By default, RESTORE uses the last character of an HFS filename to determine if the specified file or file set should be scanned recursively to include all files below the specified wildcards or directories. If a filename ends in a slash (/), then it will be scanned recursively to include all files below it in the hierarchical directory. Otherwise, the file or file set is not scanned recursively, resulting in a horizontal cut at its level in the hierarchical directory. Using TREE and NOTREE can override that default behavior.

If TREE is specified, ALL files and file sets are scanned recursively, regardless of their ending character. If NOTREE is specified, then NO files or file sets are recursively scanned, resulting in a horizonal cut in the directory structure.

Monitoring RESTORE Command Progress

After entering a RESTORE command, you see the following message at the console telling you that the RESTORE process has begun:

```
TURBO-STORE/RESTORE VERSION  A.20.01 (C) 1986 HEWLETT-PACKARD CO.
WED, MAR 30, 1988, 10:59 AM
```

Responding to Tape Requests

If your system is not configured to automatically assign devices, you see a tape request. For example:

```
?9:08/#S25/43/LDEV# FOR "T" ON TAPE (NUM)?
```

If you have previously issued a FILE command that included the tape device's LDEV number, the tape request asks you to confirm that number. For example:

```
?14:57/#S25/43/IS "T" ON LDEV #8 (Y/N)?
```

See Chapter 7, "Handling Media Requests," for information on how to respond to tape requests.

Replying to Tape Requests for a Multiple-Device RESTORE

If you are restoring files from several devices, the system sends you a tape request for each device. The order that you receive tape requests corresponds to the order that you listed the devices in your RESTORE command.

If you gave your tape devices unique file names, you receive a tape request for each unique file name. See Figure 3-1, "Multiple Device Planning Chart," in Chapter 3, "Preparing Storage Devices," to determine which LDEV to assign to each name.

If you gave your tape devices a common file name, you receive several identical tape requests referring to the common file name, one for each device. For example, the first tape request in a sequential RESTORE asks for the LDEV number of the first device. The second request asks for the LDEV number of the second device, and so on.

Mounting Additional Tapes

If you are restoring a large set of files, the set may extend on to several tapes. If you have more than one tape to mount on a tape device, RESTORE immediately prompts you to mount the next tape after it finishes restoring files from the previous tape. You see messages similar to the ones below:

```
15:28/#S415/59/MOUNT NEXT REEL FOR STORE ON LDEV 8
15:29/#S415/59/LDEV #8 NOT READY
```

To mount another tape, perform the following steps:

1. Unload the first tape following the instructions in Chapter 3, "Preparing Storage Devices."

2. Locate the second tape, prepare it, and mount it. You do not have to issue another RESTORE command to respond to a tape request. The system automatically continues restoring files. If you leave the console while restoring files, other messages can cause mount requests to scroll off of the console screen. Use the RECALL command to redisplay mount requests.

3. Continue monitoring the RESTORE process. Mount new tapes as the system requests them.

When RESTORE is Complete

If you specify the SHOW parameter, as RESTORE proceeds, it lists each file restored at your terminal. For example:

```
:RESTORE *T;FILE1.OPERATOR.SYS;SHOW

WILL RESTORE        1 FILES;    NUMBER OF FILES ON TAPE =  1

    FILENAME GROUP    ACCOUNT  VOLUME R'TIONS   SECTORS CODE    REEL

    FILE1   .OPERATOR .SYS     DISC               :C        4         1

FILES RESTORED: 1
```

Figure 10-2. Listing Restored Files

When you see that all the files you named are restored, remove all tapes from your tape devices. Check that the label on the tape properly describes it, and relabel it if necessary.

If you used the SHOW=OFFLINE option, the system prints the list of files restored on the system printer. Retrieve the report from the printer and keep it for your records.

Return your tapes to your library.

11

Using Backup Media to Recover from a System Failure

This chapter describes how to recover from a major system failure. The sections in this chapter are:

- Reloading Your System Configuration
- Restoring Files from Partial Backup Tapes
- Restoring Files from Full Backup Tapes

In the event of a major system failure, you may need to reload your system from backup media. Regardless of which method you used to back up your system, your backups contain three important types of information:

- Your operating system (native library, system library) configuration.
- The file system directory.
- User and system files.

Depending upon the nature of the system failure, you might need to reload any one of these components or all three. You reload your system configuration from your system load backup, and you reload your file system directory and system and user files from your STORE backups. Always consult your Hewlett-Packard representative before you completely reload system information from backup media. To completely reload your system from backup media, perform the following steps:

1. Reload the system configuration from your backup system load tape. Refer to the instructions below.

2. Use the RESTORE command to copy system and user files and the file system directory from your most recent backups to disk. Follow the instructions below.

3. If your most recent backups are from a partial backup, use RESTORE to copy files from your most recent full backups to disk, keeping the files you have already restored from the partial backup. Follow the instructions below.

Reloading Your System Configuration

If your most recent system configuration files are from backups, do the following to retrieve your system configuration:

1. Install your latest system load backup.

2. Start the system. Only the system master volume on LDEV 1 is initialized. Other volumes must be initialized using VOLUTIL. This can be done with the following set of commands:

   :VOLUTIL
   volutil: NEWVOL *volumesetname:membername* LDEV=*nn*

   The *volumesetname* for the system volume set is MPEXL_SYSTEM_VOLUME_SET. Issue the NEWVOL command for each member of the volume set. None of the drives can be written to until they have been initialized. Refer to *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042) for more detailed instructions.

3. Make any changes to the SYSGEN configuration and reboot the system. (This step is optional.)

4. Restore your partial and full backups using the KEEP and DIRECTORY parameters of the RESTORE command. These procedures are described in the following sections.

Refer to *System Startup, Configuration, and Shutdown Reference Manual* (32650-90042) for additional information.

Restoring Files from Partial Backup Tapes

Use the RESTORE command to copy system files, user files, and the file system directory from your STORE backups to disk.

To restore system and user files from your most recent backups, perform the following steps:

1. First gather all the units of backup media from your most recent backup.

2. Mount the backup(s) on the backup drive(s) and bring the drive(s) online.

3. After a system failure, only LDEV 1 is available as the system volume set. You must use the VOLUTIL program in order to initialize your other volume sets, if you have not done so already. This can be done with the following set of commands:

   :VOLUTIL
   volutil: NEWVOL *volumesetname:membername* LDEV=*nn*

   The *volumesetname* for the system volume set is MPEXL_SYSTEM_VOLUME_SET. Issue the NEWVOL command for each member of the volume set. For more detailed instructions, see the *Volume Management Reference Manual* (32650-90045).

4. Issue the following FILE and RESTORE commands to copy the files from the backup media.

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;KEEP;OLDDATE;DIRECTORY
```

5. Monitor the console for tape requests.

6. Mount additional backup media when necessary until you have copied all files from all backups.

Restoring Files from Full Backup Tapes

If your most recent backups are from a partial backup, you need to reload your remaining files from your most recent full backup.

To restore system and user files from your most recent full backups:

1. Gather all the backup media from your most recent full backup.

2. Mount the backup(s) on the backup devices and bring the devices online.

3. Issue the following FILE and RESTORE commands to copy the files from the backup device. The SHOW=OFFLINE option, if used, lists the files you restored on the system printer.

```
:FILE T;DEV=TAPE
:RESTORE *T;@.@.@;SHOW=OFFLINE;KEEP;OLDDATE
```

4. Monitor the console for tape requests.

5. Mount additional backup media when necessary until you have copied all files from all backups.

12

Disaster Recovery

This chapter discusses methods and planning for disaster recovery. The sections in this chapter are:

- Recovery Facilities
- Planning for Disaster Recovery
- Testing Your Recovery System

In this age of highly computerized business, some of your business information may be available only through your computer systems. Very often the information we rely on is only available through our computers. Regularly backing up the information stored on your computer system protects that information from a system failure. Your backups and your computer system, however, are not indestructible and can be damaged or destroyed by smoke, noxious fumes, explosion, flood, earthquake, sabotage, and many other natural and man-made problems. Without access to your computer system, you may lose track of sales, production, existing customers, and accounting information.

This chapter discusses strategies for protecting computer operations from a variety of disasters. Planning for a disaster and identifying the best means for recovering with a minimum of delay is the key to disaster recovery. Costs of disaster recovery systems vary greatly depending upon the alternative you select and the features you require. However, if a properly designed disaster recovery system saves your business, you will want it at any cost.

Recovery Facilities

The best way to prepare for an unpredictable disaster is to have a recovery facility available. A recovery facility contains a backup system onto which you can reload your files from backups. You can use the backup system for all of your information processing needs until your system is repaired or replaced. There are several types of recovery facilities. You should select the type that best meets the needs of your data center.

Private Recovery Facilities: Cold Sites and Hot Sites

A private recovery facility is owned and maintained by your company. It is usually located at a facility close to, but separate from, your data center. There are two types of private backup sites, cold sites and hot sites.

Cold Sites

A cold site is a facility with sufficient electrical power, air conditioning, and telecommunications equipment to support a computer system, but it does not contain an actual computer system. If a disaster occurs, you must obtain the computer and the necessary peripherals to support your information processing requirements. The cold backup site offers guaranteed access at a relatively low cost, but requires considerable time to obtain, install, and test a new computer system.

Hot Sites

A hot site is a cold site with an operational computer system similar, if not identical, to the one you intend to protect. If a disaster occurs, you can reload your information from the backup system at the hot site. This alternative is the quickest, but most costly, method for recovering from a disaster. Because of the cost of maintaining a complete backup system, companies with hot sites sometimes begin using the backup system for regular information processing.

Mutual Backup Arrangements

Another recovery site option is a mutual backup arrangement. A mutual backup arrangement is an agreement between two companies with similar computer systems to provide the use of their Data Centers to one another should a disaster occur. Usually the two businesses are located close to one another. Some companies seek partners in different industries to eliminate competition or protect confidentiality. A mutual backup arrangement can provide both a quick and cost-effective recovery facility, but may not work well if either party is unwilling to disrupt its information processing to accommodate the other party. Contractual and legal problems sometimes arise in this type of agreement.

Hewlett-Packard Disaster Recovery Services

Hewlett-Packard offers a full range of disaster recovery services. Contact your local Hewlett-Packard representative for more information.

Commercial Backup Companies

Commercial backup companies offer hot and cold backup sites identical to private hot and cold sites except that the site is owned and operated by a company in the disaster recovery business. A commercial backup site is less costly than a private backup site, but has the disadvantage that the clients of the backup company could potentially compete for backup resources at the same time. For example, in the event of a widespread natural disaster such as an earthquake or a flood, many businesses may need the backup facility at the same time.

Computer Service Bureaus

Some companies use a Computer Service Bureau in the event of a disaster. Although such an arrangement is generally available, it is often costly, restricts computer use, causes capacity and compatibility problems, and ignores special computer requirements.

Planning for Disaster Recovery

Selecting a recovery facility is only part of a comprehensive disaster recovery program. You should prepare and implement a comprehensive disaster recovery plan. Your plan should detail resource requirements and procedures for each step in the recovery process.

The Recovery Facility

Locate your recovery facility close to the computer system you want to protect, but not in the same building or group of buildings. It should be in a different power distribution system. If you think your system may be damaged by a major earthquake, locate the recovery facility in another region of the country. The facility should have adequate security, provided by either security guards or controlled system access.

System Compatibility

The disaster recovery computer system must be compatible with your Data Center computer system. The main memory, disk drives, backup drives, and printers should allow you to perform necessary recovery operations without requiring you to reconfigure your system. The recovery computer system should also be expandable to meet your future needs.

The number of telephone lines into the disaster recovery facility should be sufficient to support recovery operations. Telephone lines should be either of voice or data quality, depending on your requirements. Data communications equipment must be compatible with your data transmission requirements. Pay attention to required baud rates and other special requirements.

Name representatives from your Data Center and the disaster recovery facility who will keep in frequent contact to ensure continued compatibility between computer systems. They ensure that changes made in either system do not affect the disaster recovery

capability, and that upgrades in the Data Center computer system are quickly reflected in the disaster recovery computer system.

Disaster Notification and Response Time

A disaster can occur any time without warning. Your recovery center should be available 24 hours a day. The time from when you notify the recovery center to the time that your backup system is up and running is called response time. Response time requirements vary depending upon the business situation. A response time of four hours is normally considered a quick turnaround.

Only authorized personnel should notify the disaster recovery facility to initiate disaster recovery. They should identify themselves to the disaster recovery facility by a prearranged codeword; and, of course, the disaster recovery facility personnel must act quickly and report promptly for recovery operations.

Storage of Backup Tapes

If you keep your regular backups at your Data Center, and the Data Center is destroyed by fire, the backups are also destroyed. Create a duplicate set of backups to keep at a suitable off site storage facility. In this way, you have a set easily accessible for routine problems and a set available in case of a major disaster. Arrange to have around-the-clock access to the backups, and to have them quickly delivered from the disaster recovery facility when necessary.

Testing Your Recovery System

When you initiate a disaster recovery service contract, use backups to test for system compatibility problems and bugs in your disaster recovery system. As time passes, perform periodic tests (for example, every quarter) to ensure that your systems remain compatible and your disaster recovery procedures work well. Also test your disaster recovery system whenever you change it. You can either notify the facility in advance, to minimize costs and interruption of the recovery facility, or you can do a full-scale simulation. Either way, prepare a test plan and have it approved by all parties.

A

Error Messages

This appendix describes how to interpret and apply STORE, RESTORE, and VSTORE error message information. The sect.ons in this appendix are:

- Determining the Cause of STORE and RESTORE Errors
- Using the STORE_ERROR Variable

Determining the Cause of STORE and RESTORE Errors

Some STORE and RESTORE errors cause the program not to store or restore a particular file. Others cause the program to stop running. When STORE or RESTORE cannot transfer files that you named in your command, it lists the names of those files on your terminal as part of its standard progress listing.

When STORE or RESTORE aborts because of an error, you see one of the following messages:

    STORE ABORTED BECAUSE OF ERROR

or

    RESTORE ABORTED BECAUSE OF ERROR (CIERR 1091)

You can use the STOREJCW job control word (JCW) to determine the cause of an error and a proper recovery procedure. Each time you issue a STORE or RESTORE command, the system updates the value assigned to STOREJCW.

When STOREJCW is equal to 0, the command executed successfully. STOREJCW values greater than 0 alert you to the cause of an error.

· Note

Issuing the VSTORE command also results in the system updating the value assigned to STOREJCW.

Viewing the Value of STOREJCW

To view the value assigned to STOREJCW, use the following SHOWVAR command:

    :SHOWVAR STOREJCW

The system reports the current value. For example:

    STOREJCW=4

Determining the Cause of an Error

The value of STOREJCW after you issue a STORE, RESTORE, or VSTORE command tells you the cause of any errors in storing, restoring, or verifying the files you named. To determine the cause of an error:

1. Use the SHOWVAR command to view the value of STOREJCW.

2. Look up that value in Table A-1. In addition to the cause of an error, Table A-1 displays recommended recovery procedures.

Table A-1. STOREJCW Values

Value	Cause	Recovery Procedure
0	No errors.	None.
1	Syntax error.	Correct and reenter command.
2	Error in opening system resource allocation.	Purge some files or perform disk space recovery.
3	Error in opening an indirect file.	Does the indirect file you named exist? Do you have adequate access to it" Is it in use? Is the redirect file an EDIT file?
4	Error in opening the file.	Is the FILE command describing the correct device? Is the media on the device you named? Unload and reload the media. If you are restoring or verifying files, check whether or not you have adequate access to them.
5	Error scanning the files.	Make sure the file names are syntactically correct and correctly spelled.
6	Error in actually storing, restoring, or verifying files.	Enter the command again. After a second failure, contact your system manager.
7	A file you attempted to store does not exist on disk, or a file you attempted to restore or verify does not exist in the STORE files, or the system could not find files that matched the pattern you specified (for example, FEB@).	Did you name the files correctly in the STORE, RESTORE, or VSTORE command? Do the files you want to store, restore, or verify exist? Computer Museum
8	A file that you tried to store, restore, or verify was in use.	Wait until the file is no longer in use. Enter the command again.
9	Media Manager Service error encountered.	Check the STORE listing for the media manager error message. Look up the message in Appendix A of the *Magneto-Optical Media Management User's Guide* (36398-90001) and follow the suggested action.

A complete listing of all possible STORE and RESTORE errors, along with the probable cause and recommended action can be found in the *MPE/iX Error Message Manual Volumes 1, 2 and 3* (32650-90066, 32650-90152, and 32650-90368).

Using the STORE_ERROR Variable

When STORE, RESTORE, or VSTORE aborts because of an error, the Command Interpreter (CI) variable STORE_ERROR is set to a non-zero value. This value can be used to look up more detailed cause and action error text in the *MPE/iX Error Message Manual Volumes 1, 2 and 3* (32650-90066, 32650-90152, and 32650-90368). If STORE exits successfully, then STORE_ERROR is set to 0.

B

Command Syntax

This appendix lists the STORE, RESTORE, and VSTORE command syntax. The parameters, options, and variables are described in Chapter 6, "STORE and TurboSTORE Options" and Chapter 10, "Restoring Files." The sections in this appendix are:

- STORE Syntax
- RESTORE Syntax
- VSTORE Syntax

STORE Syntax

STORE $[$ filesetlist $][$;storefile $][$;option $[$; ... $]]$

where *option* is

$[$;SHOW $[$ =showparmlist $]]$

$\left[\text{;ONERR}[\text{OR}] = \left\{ \begin{array}{c} \text{REDO} \\ \text{QUIT} \end{array} \right\} \right]$

$\left[\left\{ \begin{array}{l} \text{;DATE}[S] <= accdate \\ \text{;DATE}[S] >= moddate \end{array} \right\} \right]$

$[$;PURGE $]$
$[$;PROGRESS $[$ =minutes $]]$
$[$;DIRECTORY $]$

$[$;FILES= maxfiles $]$
$[$;TRANSPORT $[$ =MPEXL $]]$
$[$;COPYACD $][$;NOACD $]$
$[$;FCRANGE=filecode/filecode $[$, ... $]]$
$[$;MAXTAPEBUF $]$
$[$;NOTIFY $]$

$[$;ONVS=volumesetname $[$,volumesetname $[$, ... $]]]$
$[$;SPLITVS=split_setname $[$,split_setname $]]$

$[$;RENAME $]$
$[$;TREE $][$;NOTREE $]$

** TurboStore products only:

$[$;INTER $]$
$[$;STORESET=(device $[$, ... $])[$,(device $[$, ... $])[$, ... $]]]$

$[$;COMPRESS $[$ =compressionparmlist $]]$ $[$;ONLINE $]$

$[$;MOSET=(ldev $[$, ... $])[$,(ldev $[$, ... $])[$, ... $]]]$
$[$;NAME=backupname $]$

RESTORE Syntax

RESTORE [restorefile][;filesetlist][;option[; ...]]

where option is

[;SHOW[=showparmlist]]

$\left[;\text{ONERR}[\text{OR}]=\left\{ \begin{matrix} \text{QUIT} \\ \text{SKIP} \end{matrix} \right\} \right]$

$\left[;\left\{ \begin{matrix} \text{LOCAL} \\ \text{GROUP}=groupname \\ \text{ACC}[\text{OUN}]\text{T}=accountname \end{matrix} \right\} [; ...] \right]$

$\left[;\text{CREATE} \left[=\left\{ \begin{matrix} \text{GROUP} \\ \text{ACCT} \\ \text{CREATOR} \\ \text{PATH} \end{matrix} \right\} [, ...] \right] \right]$

[;CREATOR[=username]]
[;GID[=filegroupname]]

$\left[;\left\{ \begin{matrix} \text{KEEP} \\ \text{NOKEEP} \end{matrix} \right\} \right]$

$\left[;\left\{ \begin{matrix} \text{OLDDATE} \\ \text{NEWDATE} \end{matrix} \right\} \right]$

[;DIRECTORY]
[;LISTDIR]

[;FCRANGE=filecode/filecode[, ...]]
[;FILES=maxfiles]

[;DEV=device]
[;VOL=volumename]
[;VOLCLASS=volumeclassname]
[;VOLSET=volumesetname]

[;COPYACD][;NOACD]
[;TREE][;NOTREE]

** TurboStore products only:

[;RESTORESET=(device[, ...])[,(device[, ...])[, ...]]]

[;MOSET=(ldev[, ...])[,(ldev[, ...])[, ...]]]

VSTORE Syntax

```
VSTORE [vstorefile][;filesetlist][;option[; ... ]]
```

where option is

$$\left[\text{;SHOW}\left[\text{=}showparmlist \right] \right]$$

$$\left[\text{;ONERR}\left[\text{OR} \right] = \left\{ \begin{array}{c} \text{QUIT} \\ \text{SKIP} \end{array} \right\} \right]$$

```
[;DIRECTORY]
```

```
[;COPYACD][;NOACD]
[;TREE][;NOTREE]
[;NODECOMPRESS]
```

** TurboStore products only:

$$\left[\text{;RESTORESET=}(device[, ...])[,(device[, ...])[, ...]]] \right]$$

$$\left[\text{;MOSET=}(ldev[, ...])[,(ldev[, ...])[, ...]]] \right]$$

```
[;NAME=backupname]
```

C

STORE Tape Formats

This appendix illustrates the tape formats used by TurboSTORE/iX II. These include:

- Unlabeled tape
- Labeled tape
- On-line backup tape
- Interleave format tape

The standard **STORE** format is the format used for unlabeled tapes. The other formats are variations of the standard format. In the case of labeled tapes, each volume is delimited by standard ANSI or IBM labels. With on-line backup tapes, the difference is the addition of log data, and with interleave format, the order of the files on the tape does not always correspond to the order of the files in the directory.

Unlabeled Tapes

At the beginning of each reel of a STORE tape is the STORE label and a directory described all of the files stored on the tape. The directory contains one entry for each file. Depending on the number of files being stored, the directory can span multiple records. Following the directory is the directory extension, which contains parallel set information, as well as the names of HFS syntax files. This is followed by the first tape mark on a STORE tape.

The next section of the tape is the data for the files being stored. Each file begins with a tape mark, followed by a file information record. This record contains a STORE record header, a file label, contiguous block information, and an optional file label extension. This record may also contain the beginning of the file's data. If it does not, the file's data starts in the next record.

At the end of the tape, there are two tape marks, and then a record containing store trailer information. Following the trailer are three tape marks, signifying the end of the media.

Figure C-1 illustrates the unlabeled STORE tape format.
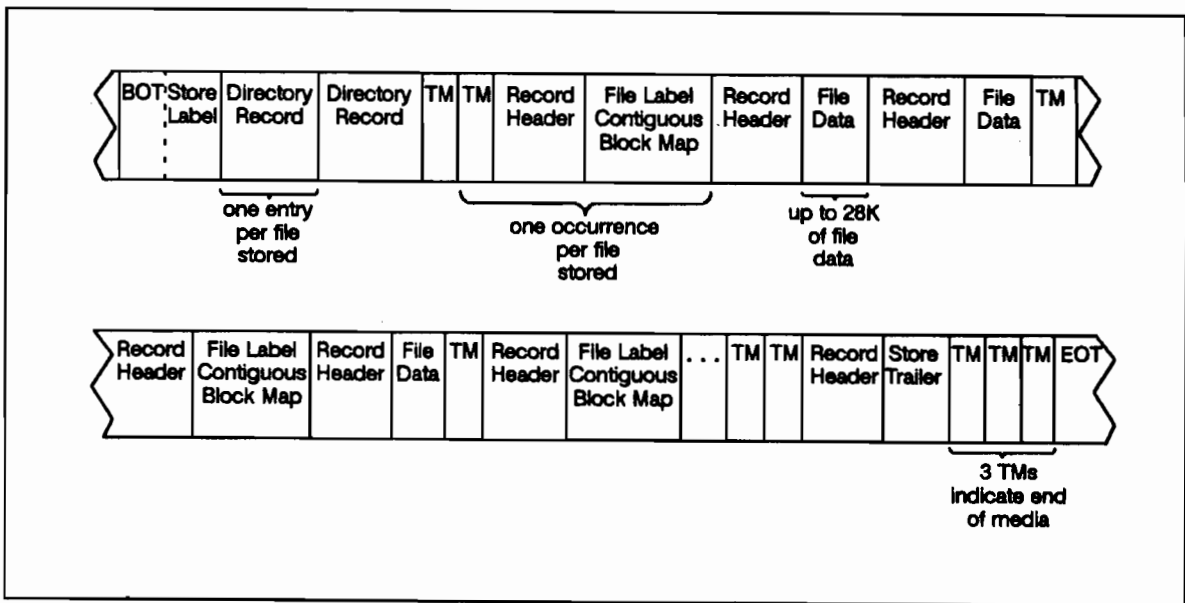
LG200021_056

Figure C-1. Unlabeled Tape Format

Labeled Tapes

The labeled tape format is similar to the unlabeled tape format except the tape marks are not used so that the storeset is written as one large file. The tape marks are replaced by data marks, which are special record headers defined to represent tape marks. On DDS drives, save set marks are also written in place of tape marks. This results in a volumeset requiring labeling only at the beginning and ending of each member volume.

Figure C-2 illustrates the labeled tape format.

LG200021_054
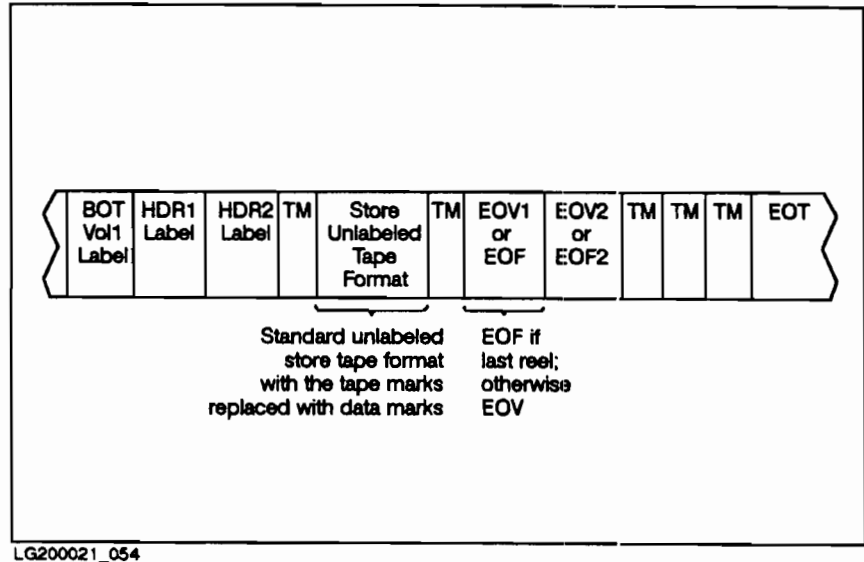
Figure C-2. Labeled Tape Format

On-line Backup Tapes

On-line backup tapes are similar to regular store tapes. The only difference is the addition of the log data associated with a file. Figure C-3 illustrates the on-line backup tape format.
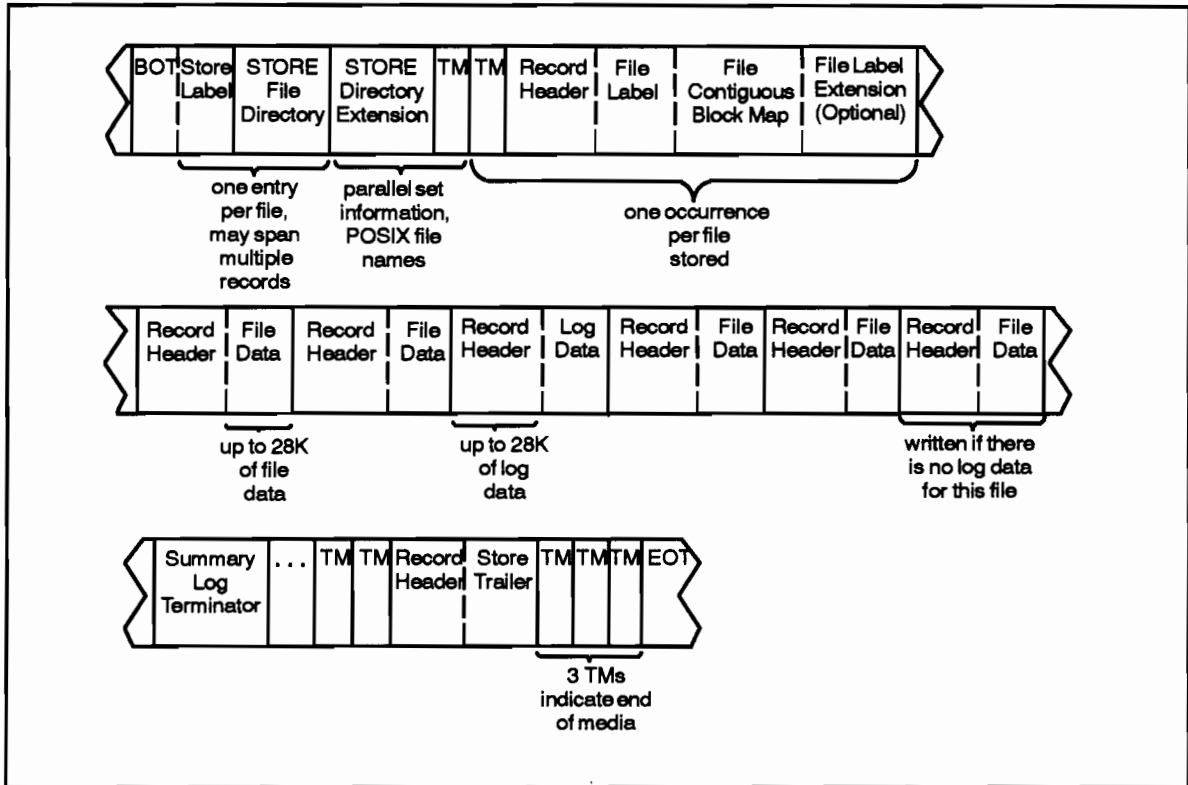
LG200021_055

Figure C-3. On-line Backup Tape Format

Interleave Format Tapes

The only difference between interleave format and any other store tape format is the order of the files on the tape does not necessarily correspond with the order of the files in the media directory. In addition, file data records are interleaved with records from multiple files.

Figure C-4 illustrates the interleave tape format.

TM = Tape Mark (Beginning of File Marker)
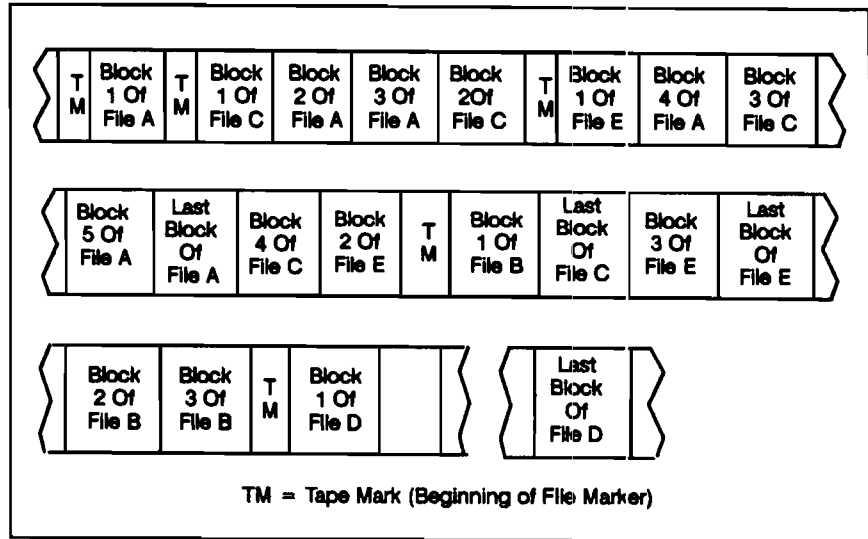
LG200021_045a

Figure C-4. Interleave Tape Format

D

STORE File Compatibility

On MPE/iX, use the TRANSPORT parameter of STORE to create STORE files that are compatible with MPE V/E. This is also referred to as a compatability mode file. Figure D-1 shows the relationships between MPE/iX and MPE V/E programs and file formats. Each program (depicted as a rectangle) can read or write a file (depicted as a circle) if interconnected by an arrow in the appropriate direction.
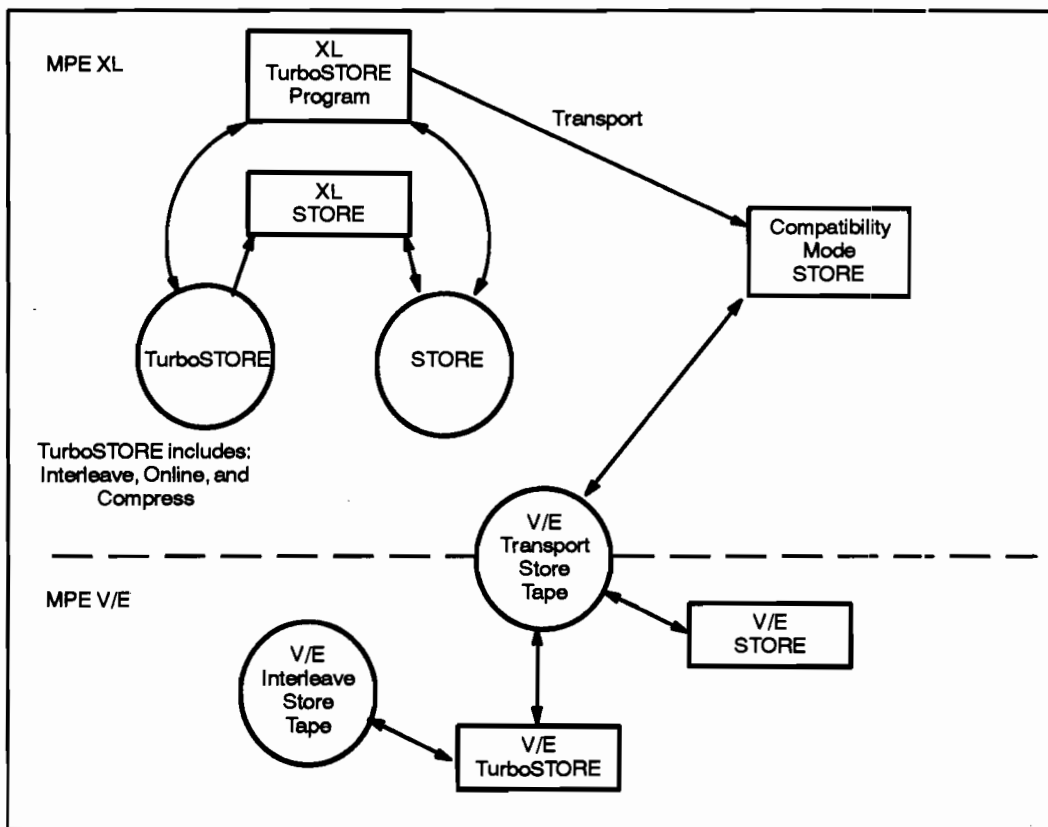
LG200021_052

Figure D-1. File Compatibility within MPE XL and MPE V/E

E

Transferring Optical STORE Backups onto Standard Tapes

STORCOPY is a utility that allows the user to transfer optical STORE backups onto standard tape backup, a less expensive backup medium. STORCOPY copies backups on magneto-optical devices to any other STORE backup media *except* magneto-optical.

The STORCOPY program resides in PUB.SYS. It can be used by users with OP and SM capability by entering either of the following commands from the MPE/iX prompt:

:STORCOPY *option* (Return)

or

:STORCOPY (Return)

Note
If the user enters STORCOPY where no "*option*" parameters are specified, as in the second example, the "STORCOPY:" prompt appears. Acceptable responses to this prompt are a complete STORCOPY command line (see the following examples).

In the following example, a backup called MOBACK is copied to a single output device on LDEV 8. No listing is produced. MOBACK may have been created with the STORESET option, and thus may contain more than one set. STORCOPY will copy these sets one at a time to the output device until all the sets have been copied.

:STORCOPY COPYTOSET=(8);NAME=MOBACK (Return)

or

:STORCOPY (Return)

:STORCOPY:storcopy copytoset=(8);name=moback (Return)

The next example shows a backup called MOBACK is copied to a single output device defined by the file equation DDSTAPE to a DDS drive. A listing will be produced and sent to $STDLIST and the line printer.

:FILE DDSTAPE;DEV=DDS (Return)
:FILE SYSLIST;DEV=LP (Return)
:STORCOPY COPYTOSET=(*DDSTAPE);NAME=MOBACK;SHOW=OFFLINE (Return)

or

```
:STORCOPY  (Return)
```

```
:STORCOPY:FILE DDSTAPE;DEV=DDS  (Return)
:STORCOPY:FILE SYSLIST;DEV=LP  (Return)
:STORCOPY:STORCOPY COPYTOSET=(*DDSTAPE);NAME=MOBACK;SHOW=OFFLINE  (Return)
```

In the following example, a backup called MOBACK, which has five
sets, is copied to three output devices. Two of the output devices
are DDS drives on LDEV 7 and LDEV 8. The other output device
is defined by file equation DDSTAPE. A SECURITY and LONG listing is
produced and sent to $STDLIST and a new file called MOLIST via the
file equation SYSLIST.

Since MOBACK consists of five sets and only three output devices,
STORCOPY will copy the first three sets to output and will produce the
other two sets as the output devices become available.

```
:FILE DDSTAPE;DEV=DDS  (Return)
:FILE SYSLIST=MOLIST,NEW;SAVE  (Return)
:STORCOPY COPYTOSET=(7),(8),(*DDSTAPE);NAME=MOBACK; &  (Return)
:SHOW=SECURITY,OFFLINE  (Return)
```

or

```
:STORCOPY  (Return)
```

```
:STORCOPY:FILE DDSTAPE;DEV=DDS  (Return)
:STORCOPY:FILE SYSLIST=MOLIST,NEW;SAVE  (Return)
:STORCOPY:STORCOPY COPYTOSET=(7),(8),(*DDSTAPE);NAME=MOBACK;  (Return)
:SHOW=SECURITY,OFFLINE  (Return)
```

Note   Parenthesis ( ) enclosed in quotation marks *must* be entered as part
of the command line syntax.

```
COMMAND ''(parameter)''
```

Glossary

absolute pathname

A pathname that begins with the root directory, such as
/SYS/PUB/TDP. See also *pathname* and *relative pathname*.

access control definition (ACD)

Security feature that controls access to files and directories.
Consists of a list of access permissions and user specifications.
(For example, R,W,X:@.PAYROLL gives all users in the PAYROLL
account read, write, and execute access to the file or directory
that is assigned this ACD.) ACDs are applied to files or
directories by using the ALTSEC command. By default, all files
existing outside the traditional MPE account/group structure and
all directories are assigned ACDs when they are created.

access mode

A type of access permitted to a file, such as write, read, or
execute access.

appropriate privilege

Having sufficient capabilities to perform an operation on
MPE/iX. SM capability always provides appropriate privilege to
system administrators.

archiving

Storing infrequently used or out-of-date files onto tape and
permanently removing them from the system disks at the same
time.

back reference

The technique of using an asterisk (*) before a formal file
designator to indicate that it has been previously defined during
the current session or job with the FILE command.

backup

The process that duplicates computer data to offline media, such
as a magnetic tape. Backups protect data if a system problem
should occur.

backup devices

System peripherals that allow you to write information to, and
read information from, backup media.

case sensitivity
HFS file names can be saved in uppercase or lowercase letters. The file named ./FILE1 does not refer to the same file as ./file1 or ./File1.

character
A letter, number , or symbol represented by one byte of data.

character set
A series of characters to substitute for a single character to name a group of files.

command
A system-reserved word that directs the operating system, a subsystem, or a utility program to perform a specific operation.

compatibility mode(CM)
Compatibility mode provides object code compatibility between MPE V/E-based systems and the 900 Series HP 3000. Compatibility mode allows current Hewlett-Packard customers to move applications and data to the 900 Series HP 3000 without changes or recompilation.

concurrent backup devices
A set of multiple, concurrently accessible backup devices to which you are able to store information simultaneously.

consecutive backup devices
A set of multiple backup devices used for a given tapeset to which you are able to store information sequentially.

console
See system console.

current working directory
The directory in which you are working and from which relative pathnames are resolved. See also *directory* and *relative pathname*.

DAT
Digital Audio Tape. A data storage media used by the HP 1300H DDS-format device.

database
An integrated collection of logically related data files and the structural information about the data.

data compression
The use of data compression algorithms on the host system to reduce the amount of data transferred to the output device.

DDS

Digital Data Storage. A format for storing computer data on DAT cassettes.

device

See peripheral.

device class

A collection of devices that have some user-defined relation. The MPE/iX file system supports a means of maintaining collections of devices but is cognizant of the relation only for certain MPE device class names.

device pool

A series of identical backup devices.

device type

Device types are defined by a number. For example, 0 represents a moving-head disk and 16 is the class type number assigned to line printers.

directory

A special kind of file that contains entries that point to other files. It acts like a container for files and other directories. On MPE/iX, accounts and groups are special types of directories.

disk

A circular plate of magnetically coated material used to store computer data. A disk may be fixed, removable, hard, or flexible.

dot (.)

Convention that signifies the current working directory in HFS syntax. See also *current working directory* and *HFS syntax.*

dot-dot (..)

Convention that signifies the parent directory in HFS syntax. See also *current working directory* and *HFS syntax.*

dot-slash (./)

A convention that you can use to refer to a file using HFS syntax in your current working directory. For example, `./myfile.old` refers to the file `myfile.old` in your current directory.

error messages

Messages describing errors occurring during either an interactive session or a batch job. The messages are reported to the standard list device, which is usually a terminal (for a session) or a line printer (for a job).

file

An object that can be written to, read from, or both. A file has certain attributes including access permissions and file type. A group of related records that represents ASCII text (text files) or

binary data (such as executable code). Every file must have a file name so that the user can access the file's contents.

file equation
A method of equating a file name to a device or another file. The MPE/iX FILE command is used to establish the relationship of the file to the device. Generally used to direct the input to or output from a program, job, or session to a particular device by referencing the device class, such as TAPE or LP.

file name
A name of a file that can be in MPE syntax (FILE.GRP.ACCT) or HFS syntax (/ACCT/GRP/FILE1). Each syntax has different restrictions on file name length and the characters that can compose the name. See also *MPE syntax* and *HFS syntax*.

file owner
The person who has complete access to a file unless the user is restricted by a $OWNER ACD entry. The $OWNER ACD entry can restrict the file access of the file owner. The file owner is similar to the file creator. The command LISTFILE filename -3 displays the fully qualified user ID (user.account) of the file owner.

group
For POSIX compatibility, refers to a group of related users. This is distinct from MPE groups, which are special types of directories existing directly below accounts.

group ID database
A system database that contains the group name, group ID, and user names for all groups.

group ID (GID)
A number that determines group access privileges. (On MPE/iX, it is actually the string @.account).

HFS syntax
Expanded MPE/iX syntax that is case sensitive and allows users to address multiple levels in the hierarchical file system. A name beginning with "./" or "/" automatically signifies HFS syntax to MPE/iX.

Some additional rules are as follows:

- Names of directories directly under root or under an account may have up to 16 characters.
- Names of directories or files not directly under the root or a group can be up to 255 characters.
- Names of directories and files can contain the following special characters: hyphen (-), dot (.), or slash (/)

hierarchical file system (HFS)
A file system that is tree structured and can contain files at many different levels. This file organization is obtained through the use of directories, which can contain files and other directories.

indirect file
A text file containing the parameters for a STORE or RESTORE command that you execute regularly.

input
The data to be processed, or the process of transferring data from external storage to the computer.

input/output (I/O)
The process of, or equipment used in, transmitting information to or from the computer.

interleave
A method of writing data to a disk device for the purpose of improving data access speed.

I/O error
A data transmission error between a computer and peripheral. Examples of I/O errors are baud rate or parity mismatch, and incorrect syntax in device-control instructions.

job
A single file, submitted by a user, containing operating system and utility commands and references to the files to be manipulated.

media
Devices capable of storing data, such as disks or magnetic tape.

media name
The name of the media set to make available for use by TurboSTORE/XL II. The media name is the name assigned during the STORE operation.

media sub-name
The name of the surface within the media set to use. The media sub-name is the sub-name assigned during the STORE operation.

mounting
The act of making a data storage device accessible. To physically mount the device, you load the media onto the device. To logically mount the device, you tell the operating system which device you want to use, and it allows you access to that device.

MPE/iX
Multi-programming executive with intetrated Posix: The operating system for 900 Series HP 3000 computers. MPE/iX

manages all system resources and coordinates the execution of all programs running on the system.

MPE syntax

Rules that determine the file name length, special characters, and conditions for files, groups, and accounts. Account, group, and file names can be up to 8 characters. Characters are always converted up uppercase. Characters must be alphanumeric. This is the syntax current MPE/iX users are used to using (for example, `LEDGER.PUB.SYS`).

native mode (NM)

The native run-time environment of MPE/iX. In native mode, source code has been compiled into the native instruction set of the 900 Series HP 3000.

online backup

Online backup means that the STORE file set and structures are accessible for any access while the backup is taking place. Any modifications made to the STORE file set during the backup are logged and saved along with the data on the backup medium. On RESTORE, the data and log file are used to recover the data to a consistent state.

output

Data transferred from internal to secondary (external) storage in a computer. Also, the process of transferring information from the computer to a peripheral device.

parallel devices

A set of backup devices to which you are able to store information simultaneously.

parameter

A value in a list of values that is passed to a procedure. The parameter is used on calculations or operations in the procedure.

parent directory

A directory that contains other directories.

pathname

A way of identifying the path to any MPE/iX file. For example, you can refer to `FILE1.PUB.SYS` using the pathname `/SYS/PUB/FILE1`. Notice that pathnames are top- down rather than bottom-up as MPE syntax.

peripheral

A hardware device attached to and controlled by a computer, such as a terminal, a tape or disk drive, or a printer.

POSIX

Portable Operating System Interface. A set of standards that
address various areas of operating system technology. The POSIX
standards describe functions of an operating system interface
that applications use to become "POSIX- compliant." The main
point of POSIX is to facilitate software portability and minimize
porting costs.

purge

To delete a permanent file from the system with the PURGE
command. The PURGE command is also used to delete an account
structure entry such as a user name, a group name, or an account.

relative pathname

A pathname that is interpreted from the current working
directory. For example, ./dir1/longfilename refers to the file
longfilename in directory dir1 in the current working directory.

required parameter

A parameter that is required when entering a command or calling
an intrinsic. In reference manuals, required parameters are
surrounded by braces ({}).

restore

The process of retrieving user files from SYSGEN (MPE/iX),
SYSDUMP (MPE V/E), and STORE tapes or serial disk and
writing them to disk. Restoring is executed with the RESTORE
command.

root directory

Also called (and designated by) a slash or /. It is a system
directory; all files, accounts, groups, and directories connect
back to the root directory. All accounts on MPE/iX are direct
descendants of the root directory.

scratch tapes

Used tapes containing information that is no longer needed.

sequential

A manner in which information may be read from or written to a
device. Sequentially accessed files are stored in such a way that
the logical order of the file's record is identical to their physical
layout on disk or tape.

shadow logging

A method of saving the "before" images of file blocks when the
records in the file block are modified during online backup. The
before images are stored on tape and are used by RESTORE to
reconstruct the original contents of the file.

slash (/)
Another name for the root directory. See also *root directory*.

storage device
A device (such as a disk pack, a disk cartridge, a flexible disk, magnetic tape, or cartridge tape), onto which data can be stored and subsequently retrieved.

subdirectory
A directory that is contained within another directory is sometimes referred to as a subdirectory.

system
A group of one or more CPUs that communicate through buses without the use of data communications software.

system console
1)A workstation given a unique status by the operating system. It is used by the operator to execute specific commands for the purpose of managing sessions, jobs, and system resources. It is associated with all boot or system loader error messages, system error messages, and certain system status messages.

2)The terminal, usually logical device 20, that the system operator uses to monitor system activity, respond to resource requests, and send messages to user's terminals. The console (and its associated privileges and responsibilities) may be transferred to another logical device with the **CONSOLE** command.

system file directory
A directory maintained by MPE that records the name, group, and account of each permanent file on the system. The directory contains the size of each file, its location on the disk, who may access it, and other information.

system manager
The person who manages the computer installation, responsible for creating accounts and assigning capabilities and resource-use limits to each.

tape request
A printed message at the console asking for a backup device to be assigned to a user.

transport backup
Transport refers to the movement of files between MPE V/E and MPE/iX systems using backup media. MPE/iX backup and recovery provides a compatibility option with which an MPE V/E-compatible tape may be created or read.

user

Anyone logged on to a session, using a local or remote terminal to
interact with the computer. Each user is identified by a user and
account name, and can access files in the logon group.

utility program

An operating system program that performs specific functions
such as file copying, sorting and merging, memory dump analysis,
or monitoring available disk space.

volume

A volume is one disk. Each volume is a member of a volume set
and contains a volume label, a label table, and a free space map.

volume class

Volume classes are used for the allocation and restriction of disk
space. A volume class is a logical subset or partition within
a volume set and can bridge any number of physical member
volumes of a volume set.

volume set

A volume set is a group of from 1 to 255 related disks. One
volume of the volume set must be designated as the master
volume for the set. Each volume set is assigned a name by which
it is identified and referenced.

wildcard

A symbol that is used to replace a character or set of characters.
In MPE, the "at sign" (@), the "pound sign"(#), and the
question mark (?) are used as wildcard characters.

write-enable

To remove a disk's write-protection, allowing the disk to be
written upon.

write-protect

To protect stored data so that it cannot be overwritten.

write ring

A plastic ring that fits onto the inner groove of a reel-to-reel tape,
enabling you to write information onto the tape.

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