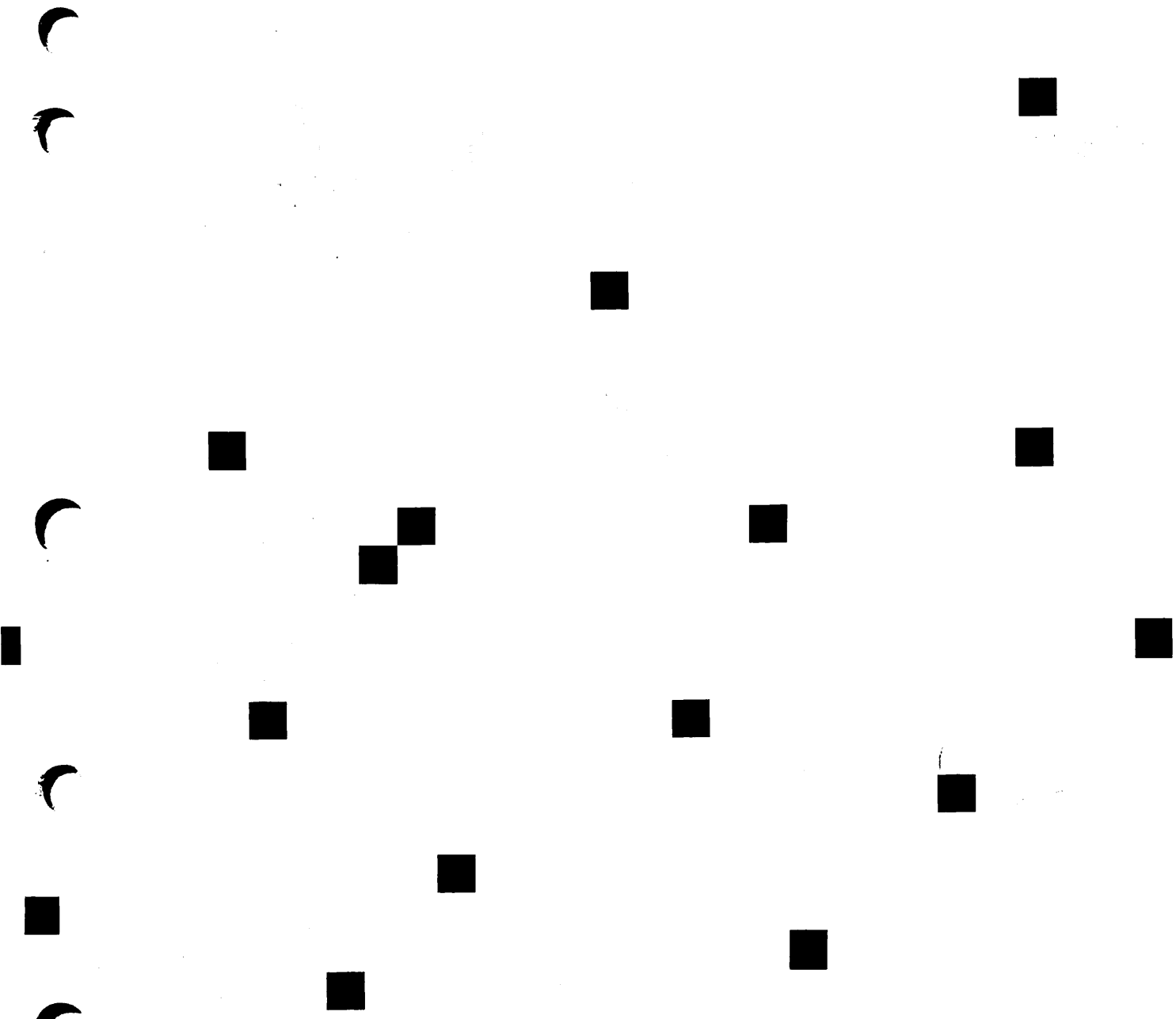

Prime®

Data Backup and Recovery Guide

Revision 21.0

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Data Backup and Recovery Guide

First Edition

by

Ian K. Turnbull

Updated for Revision 22.0

by

Ian K. Turnbull

This guide documents the software operation of the Prime computer and its supporting system and utilities as implemented at Master Disk Revision Level 22.0 (Rev. 22.0).

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Contents

ABOUT THIS BOOK

PART I - OVERVIEW

1 BACKUP AND RECOVERY UTILITIES

Introduction 1-1
Backup and Recovery for Users 1-2
Backup and Recovery for System Operators 1-3

2 BRMS OVERVIEW

Introduction 2-1
Summary of BRMS Utilities 2-2
Volumes 2-2
  Tapes and Reels 2-2
Labeling and Releasing Tapes 2-4
Catalogs 2-4
  Catalog Information About Volumes 2-4
  Catalog Information About Reels 2-5
  Catalog Information About Objects Saved to Tape 2-5
BRMS Help 2-5
Error Recovery 2-6

3 USER CONTROL OF TAPE DRIVES

Introduction 3-1
Checking Tape Drive Availability (STATUS DEVICE) 3-2
Assigning Tape Drives (ASSIGN) 3-2
ASSIGN 3-3
  How to Assign Tape Drives 3-5
  ASSIGN Command Messages 3-8
Unassigning Tape Drives (UNASSIGN) 3-9
UNASSIGN 3-9
  Using the UNASSIGN Command 3-10
  UNASSIGN Command Messages 3-11

PART II - ARCHIVING AND TRANSPORTING DATA

4 INTRODUCTION TO ARCHIVE AND TRANSPORT

Introduction 4-1
Archiving Data 4-2
Transporting Data 4-3
Archive And Transport Tools 4-3
Getting Started 4-4
  ARCHIVE 4-4
  ARCHIVE_RESTORE 4-6
  TRANSPORT 4-7
  TRANSPORT_RESTORE 4-8

5 ARCHIVING DATA: ARCHIVE

Introduction 5-1
Overview of ARCHIVE 5-2
  Catalogs 5-2
  Saves 5-2
  Default ARCHIVE Command 5-3
  ARCHIVE Options 5-3
ARCHIVE 5-4
How To Archive Data 5-8
  Preparation 5-8
  Archiving a Directory 5-9
  Archiving Several Files or Directories at Once 5-10
  Archiving All Your Files and Directories 5-10
  Archiving to a 60Mb Cartridge Tape 5-10
Using the ARCHIVE Options 5-11
  Selecting the Objects to Save 5-12
  Creating an Index 5-15
  Specifying the Catalog Location 5-16
  Archiving Objects to Another User's Tapes 5-16
  Deleting Saved Objects From Disk 5-17
  Adding a Remark to the Save 5-17
  Controlling Command Queries 5-17
  Validating the Save 5-18
  Converting CAM to DAM Files 5-18
  Moving Objects to a Rev.19 System 5-18

6 RESTORING ARCHIVED DATA: ARCHIVE_RESTORE

Introduction 6-1
Overview of ARCHIVE_RESTORE 6-2
  How ARCHIVE_RESTORE Handles ACLs, DTM and DTB 6-2
  Default ARCHIVE_RESTORE Command 6-3
  ARCHIVE_RESTORE Options 6-3
ARCHIVE_RESTORE 6-4

How to Restore Data 6-9
Preparation 6-9
Restoring an Archived File or Directory 6-10
Restoring Several Files or Directories 6-12
Restoring All Your Files and Directories 6-13
Using the ARCHIVE_RESTORE Options 6-13
Specifying the Volume and/or Reel to Restore 6-14
Specifying the Catalog Location 6-15
Selecting the Objects to Restore 6-15
Selecting the Saves to Restore 6-19
Creating an Index 6-19
Restoring Files and Directories From Another User's Tape 6-20
Controlling Command Queries 6-21
Converting Between CAM and DAM Files 6-21

7 TRANSPORTING DATA: TRANSPORT

Introduction 7-1
Overview of TRANSPORT 7-2
Saves 7-2
Default TRANSPORT Command 7-3
TRANSPORT Options 7-3
TRANSPORT 7-4
How to Transport Data 7-7
Preparation 7-8
Transporting a Directory 7-9
Transporting Several Files or Directories 7-9
Transporting All Your Files and Directories 7-9
Transporting to a 60Mb Cartridge Tape 7-10
Using the TRANSPORT Options 7-10
Specifying the Volume Name 7-11
Selecting the Objects to Save 7-11
Saving Security Information 7-14
Creating an Index 7-15
Adding a Remark to the Save 7-16
Controlling Command Queries 7-16
Validating the Save 7-17
Converting CAM to DAM Files 7-17
Moving Objects to a Rev.19 System 7-17

8 RESTORING A TRANSPORT TAPE: TRANSPORT_RESTORE

Introduction 8-1
Overview of TRANSPORT_RESTORE 8-2
Default TRANSPORT_RESTORE Command 8-2
TRANSPORT_RESTORE Options 8-3
TRANSPORT_RESTORE 8-3
How to Restore Data 8-7
Preparation 8-7
Restoring a Transported File or Directory 8-8
Restoring Several Files or Directories at Once 8-9
Restoring an Entire TRANSPORT Tape 8-10
Using the TRANSPORT_RESTORE Options 8-12
Specifying the Volume and/or Reel to Restore 8-12
Selecting the Objects to Restore 8-13
Selecting the Saves to Restore 8-16
Creating an Index 8-17
Controlling Command Queries 8-18

PART III - SYSTEM BACKUPS: ADMINISTRATION

9 OVERVIEW OF SYSTEM BACKUPS

Introduction 9-1
Types of Backup 9-2
Physical and Logical Backups 9-3
Full and Incremental Backups 9-3
Restoring Data From Backups 9-3
Summary of the System Backup and Restore Utilities 9-4
Disk-to-disk Utilities 9-4
Disk-to-tape Utilities 9-4

10 DEFINING A BACKUP STRATEGY

Introduction 10-1
Types of Backup 10-2
Physical Backups 10-2
Logical Backups 10-4
Maximizing the Performance of Backup Utilities 10-5
Backup Procedures 10-5
Hardware Configurations 10-5
Scheduling Backups 10-8
Retaining Your Backups 10-8
Logging Backups 10-9
Selecting Your Backup Strategy 10-9
Assessing Your System Requirements 10-9
Example 1 10-10

Example 2 10-10
Example 3 10-11
Example 4 10-11

11 SYSTEM PREPARATION PROCEDURES

Introduction 11-1
Why you Need a System Preparation Procedure 11-2
Choosing a System Preparation Procedure 11-2
Closing the System to Users 11-3
Closing a Partition to Users 11-8

PART IV - SYSTEM BACKUPS: OPERATION

12 LOGICAL SAVE TO TAPE: BACKUP

Introduction 12-1
Overview of BACKUP 12-2
Catalogs 12-2
Saves 12-3
Setting Attributes 12-3
How BACKUP Handles ROAM Files 12-3
Default BACKUP Command 12-3
BACKUP Options 12-4
BACKUP 12-4
How to Back Up Files and Directories 12-8
Preparation 12-8
BACKUP Procedure 12-9
Invoking BACKUP 12-17
A Full Backup Using Multiple Reels 12-18
A Full Backup With the -INDEX Option 12-18
An Incremental Backup 12-20
Backing Up Individual Files and Directories 12-21
Backing Up to a 60Mb Cartridge Tape 12-22
Using BACKUP Options 12-23
Selecting the Objects to Save 12-23
Creating an Index 12-27
Suppressing Catalog Generation 12-28
Adding a Remark to the Save 12-28
Controlling Command Queries 12-29
Validating the Save 12-29
Converting CAM to DAM Files 12-29
Moving Objects to a Rev.19 System 12-29

13 RESTORING A BACKUP TAPE: BACKUP_RESTORE

Introduction 13-1
Overview of BACKUP_RESTORE 13-2
How BACKUP_RESTORE Handles ACLs, DTM and DTB 13-2
Default BACKUP_RESTORE Command 13-3
BACKUP_RESTORE Options 13-3
BACKUP_RESTORE 13-4
How to Restore Files and Directories 13-8
Preparation 13-8
BACKUP_RESTORE Procedure 13-10
Invoking BACKUP_RESTORE 13-16
Restoring a Directory 13-17
Restoring a File 13-18
Restoring all the Files and Directories From a Volume 13-19
Using the BACKUP_RESTORE Options 13-19
Specifying the Volume and/or Reel to Restore 13-19
Selecting the Objects to Restore 13-20
Selecting the Saves to Restore 13-24
Creating an Index 13-24
Controlling Command Queries 13-26
Converting Between CAM and DAM Files 13-26
Using the -RECOVER Option 13-26
Recovering a Disk 13-26
Recovering the Disk From a Full Backup 13-27
Recovering the Disk From Incremental Backups 13-28
Recovering the Disk When All Catalogs Exist 13-31
Recovering the Disk When No Catalogs Exist 13-34
Recovering the Disk When Only Some Catalogs Exist 13-34
Further Examples of Disk and File Recovery 13-35

14 PHYSICAL SAVE TO TAPE: PHYSAV

Introduction 14-1
Overview of PHYSAV 14-2
Default PHYSAV Command 14-2
Using the Record Availability Table (RAT) 14-2
PHYSAV Options 14-3
PHYSAV 14-3
How to Save a Partition 14-4
Preparation 14-4
PHYSAV Procedure 14-5
Invoking PHYSAV 14-9

Example PHYSAV Session 14-11
Saving to a 60Mb Cartridge Tape 14-11
Reentering PHYSAV 14-12
Verifying PHYSAV Tapes 14-13
Running PHYRST 14-14

15 RESTORING A PHYSAV TAPE: PHYRST

Introduction 15-1
Overview of PHYRST 15-2
Disk Format 15-2
Default PHYRST Command 15-3
PHYRST Options 15-3
PHYRST 15-4
How to Restore a Partition 15-4
Preparation 15-5
PHYRST Procedure 15-5
Invoking PHYRST 15-9
Reentering PHYRST 15-11
Example PHYRST Session 15-12

16 PHYSICAL COPY BETWEEN DISKS: COPY_DISK

Introduction 16-1
Overview of COPY_DISK 16-2
Disk Format 16-2
Default COPY_DISK Command 16-3
COPY_DISK Options 16-4
COPY_DISK 16-4
How to Copy a Partition 16-5
Preparation 16-5
COPY_DISK Procedure 16-6
Invoking COPY_DISK 16-11
Example COPY_DISK Session Without Options 16-12
Example COPY_DISK Session With -DO_VERIFY 16-13
Using COPY_DISK on a Cartridge Module Device (CMD) 16-13

17 LOGICAL COPY BETWEEN DISKS: COPY

Introduction 17-1
Overview of COPY 17-2
Default COPY Command 17-2
COPY 17-2
How to Copy Files and Directories 17-5
Preparation 17-5
COPY Procedure 17-6
Invoking COPY 17-11
Copying a Specific File or Directory 17-11

Incremental Copies 17-12

18 CREATING A SYSTEM BOOT TAPE

Introduction 18-1
Overview of BOOT_CREATE 18-2
Creating A List File 18-2
List File Options 18-2
Example List File 18-3
BOOT_CREATE 18-4
Creating a System Boot Tape 18-5
Preparation 18-5
Invoking BOOT_CREATE 18-5
Example BOOT_CREATE Session 18-6

19 RESTORING THE SYSTEM

Introduction 19-1
Restoring the Command Device From Disk 19-2
Restoring the Command Device From Tape 19-3
Recovering From a Command Device Crash 19-3
Recreating a System 19-5

PART V - BRMS TOOLS

20 INTRODUCTION TO BRMS TOOLS

Introduction 20-1
Overview of BRMS Tools 20-2
BRMS Help 20-2
ARCHIVE_RELEASE, TRANSPORT_RELEASE and BACKUP_RELEASE 20-3
GENERATE_CATALOG 20-3
LIST_CATALOG 20-3
LIST_TAPE 20-3
Error Recovery 20-3

21 BRMS HELP

Introduction 21-1
Invoking HELP 21-2
Command Syntax and Options 21-4
Command Description and Summary of Options 21-4
Details of a Specific Option 21-5
Examples of Command Usage 21-6
Using Wildcards in BRMS 21-6

Error Messages 21-6

22 RELEASING TAPES

Introduction 22-1
Overview of the Tape Release Commands 22-2
Preparation 22-2
Releasing a TRANSPORT Tape 22-3
TRANSPORT_RELEASE 22-3
How to Use TRANSPORT_RELEASE 22-4
Releasing an ARCHIVE Tape 22-5
ARCHIVE_RELEASE 22-6
How to Use ARCHIVE_RELEASE 22-7
Releasing a BACKUP Tape 22-9
BACKUP_RELEASE 22-9
How to Use BACKUP_RELEASE 22-10
Releasing a 60Mb Cartridge Tape 22-11

23 REGENERATING AND VALIDATING CATALOGS: GENERATE_CATALOG

Introduction 23-1
Overview of GENERATE_CATALOG 23-2
Default GENERATE_CATALOG Command 23-2
GENERATE_CATALOG Options 23-2
Regenerating the Catalog Entry of a Released Reel 23-3
GENERATE_CATALOG 23-3
Regenerating Your Own Catalog 23-5
Regenerating Another User's Catalog 23-5
Validating a Catalog 23-6

24 LISTING A CATALOG: LIST_CATALOG

Introduction 24-1
Overview of LIST_CATALOG 24-2
Default LIST_CATALOG Command 24-2
LIST_CATALOG Options 24-3
LIST_CATALOG 24-6
How to Use LIST_CATALOG 24-10
Listing the Contents of All Your Catalogs 24-11
Selecting the Catalogs and/or Reel to List 24-12
Selecting Objects to List 24-12
Selecting the Saves to List 24-15
Selecting the Level of Information 24-16
Displaying Reel Statistics 24-18
Locating the Catalog 24-18
Listing Another User's Catalog 24-20
Controlling the Display 24-20
Sending the Listing to a File 24-21
Suppressing Command Queries 24-21

25 LISTING A TAPE: LIST_TAPE

Introduction 25-1
Overview of LIST_TAPE 25-2
Default LIST_TAPE Command 25-2
LIST_TAPE Options 25-2
LIST_TAPE 25-4
How to Use LIST_TAPE 25-8
Listing all Objects on the Mounted Reel 25-9
Specifying the Volume and/or Reel to List 25-9
Selecting Objects to List 25-10
Selecting the Saves to List 25-12
Selecting the Level of Information 25-13
Displaying Reel Statistics 25-15
Controlling the Display 25-15
Sending the Listing to a File 25-16
Suppressing Command Queries 25-17

26 ERROR RECOVERY

Introduction 26-1
Recoverable Errors 26-2
Warnings of Recoverable Errors 26-2
Events Not Requiring User Action 26-2
Events Requiring User Action 26-2
Unrecoverable Errors 26-4
ROAM Errors 26-5

APPENDICES

A COMMAND REFERENCE A-1

B PROCEDURE REFERENCE B-1

C MAGNETIC TAPES

Introduction C-1
Tape Reels C-2
Tape Drives C-2
Density, Tracks, and Frames C-3
Records, Gaps, and Blocks C-3
Tape Markers and Labels C-5
Parity C-5
Initializing Tapes C-6
LABEL C-6
LABEL Command Errors C-8

D PHYSAV MESSAGES D-1

E PHYRST MESSAGES E-1

F COPY_DISK MESSAGES F-1

G USER'S GUIDE TO MAGSAV AND MAGRST

Introduction G-1
The MAGSAV Subsystem G-2
How MAGSAV Handles ACLs G-2
MAGSAV Options G-2
MAGSAV G-3
How to Use MAGSAV G-4
Running MAGSAV G-5
Performing a Multireel Save G-7
Verifying a MAGSAV Tape G-8
Saving to a 60Mb Cartridge Drive G-8
Moving Files to a Rev.19 System G-9
Example MAGSAV Session G-10
The MAGRST Subsystem G-11
How MAGRST Handles ACLs and Passwords G-11
Segment Directories G-12
MAGRST Options G-12
MAGRST G-12
How to Use MAGRST G-13
Running MAGRST G-13
Restoring From a Sequence of Tapes G-16
Example MAGRST Session G-17

H USING MAGSAV FOR SYSTEM BACKUPS

Introduction H-1
The MAGSAV Subsystem H-2
How MAGSAV Handles ACLs H-2
The Dumped Bit H-2
MAGSAV Options H-3
MAGSAV H-3
How to Back Up Data H-5
Preparation H-5
MAGSAV Procedure H-5
Invoking MAGSAV H-10
Performing a Full Backup H-10
Performing an Incremental Backup H-11
MAGSAV Dialog H-12
Verifying a MAGSAV Tape H-13
Example MAGSAV Session H-13

I USING MAGRST TO RESTORE SYSTEM BACKUP TAPES

Introduction I-1
The MAGRST Subsystem I-2
How MAGRST Handles ACLS and Passwords I-2
Segment Directories I-3
MAGRST Options I-3

MAGRST I-3
How to Restore a Partition I-4
Preparation I-4
Procedure to Restore a Partition I-4a
Invoking MAGRST to Restore a Partition I-9
Partial Restores I-11
Preparation I-11
Procedure for a Partial Restore I-11
Invoking MAGRST for a Partial Restore I-12
Multireel Restores I-14

J MAGSAV AND MAGRST MESSAGES J-1

K TRANSPORTING DATE BETWEEN PRIMOS AND UNIX: UX_TAPE

Introduction K-1
UX_TAPE Command Format K-2
Saving PRIMOS Files K-5
Default UX_TAPE Command K-5
Pathnames K-5
Access Rights K-6
Command-line Options K-6
Examples of Saves K-7
Exiting From a Save K-8
End-of-reel During a Save K-8
Tape Errors During a Save K-9
Restoring UNIX Files to a 50 Series System K-10
Default UX_TAPE Command K-10
Pathnames K-10
Access Rights K-10
Command-line Options K-11
Examples of Restores K-11
Exiting From a Restore K-13
End-of-reel During a Restore K-13
Tape Errors During a Restore K-13
Saving Files on a UNIX System K-14
Using TAR to Save Files K-14
Using CPIO to Save Files K-14
Restoring Files to a UNIX System K-15
Using TAR to Restore Files K-15
Using CPIO to Restore Files K-15
Filename Translation K-15

INDEX X-1

About This Book

The Data Backup and Recovery Guide is for both new and experienced users of Prime's data backup and recovery utilities. It is a multipurpose book, serving as a

- User's Guide
- Operator's Guide
- System Administrator's Guide
- Reference Guide

The structure of the book is as follows:

PART I, OVERVIEW gives a brief introduction to Prime's backup and recovery utilities. It is for readers who are not already aware of the utilities and their basic functions. In particular, there is an overview of all the BRMS (Backup and Recovery Management Service) utilities.

PART II, ARCHIVING AND TRANSPORTING DATA describes how users can save their files and directories to tape, and restore these files and directories back to disk. It contains detailed explanations about how to use each of the archive and transport utilities.

PART III, SYSTEM BACKUPS: ADMINISTRATION gives guidance to System Administrators about the relative advantages of the different utilities for system backups and restorations. It also discusses the factors that System Administrators must

consider when they decide whether to close either the system or individual partitions to users during a system backup or restoration.

PART IV, SYSTEM BACKUPS: OPERATION gives detailed guidance to operators about how to use each of the utilities that enable them to either backup or restore system data. It explains how to create a system boot tape, and how to restore the command device from either disk or tape.

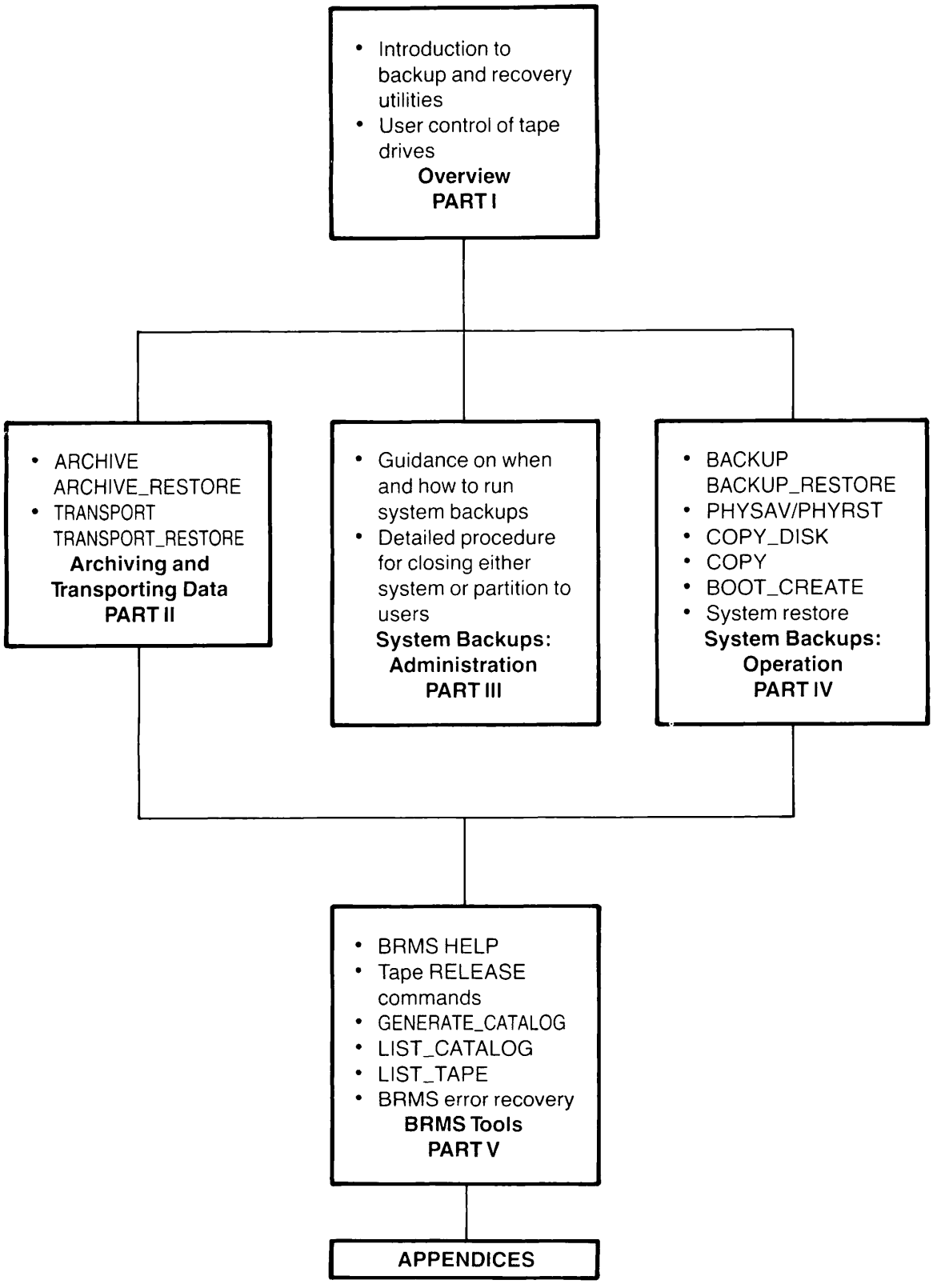
PART V, BRMS TOOLS describes how to use the tools that support the ARCHIVE, TRANSPORT, or BACKUP utilities, and is of interest to all those who use these utilities. It also describes the BRMS error recovery facilities.

The APPENDICES provide

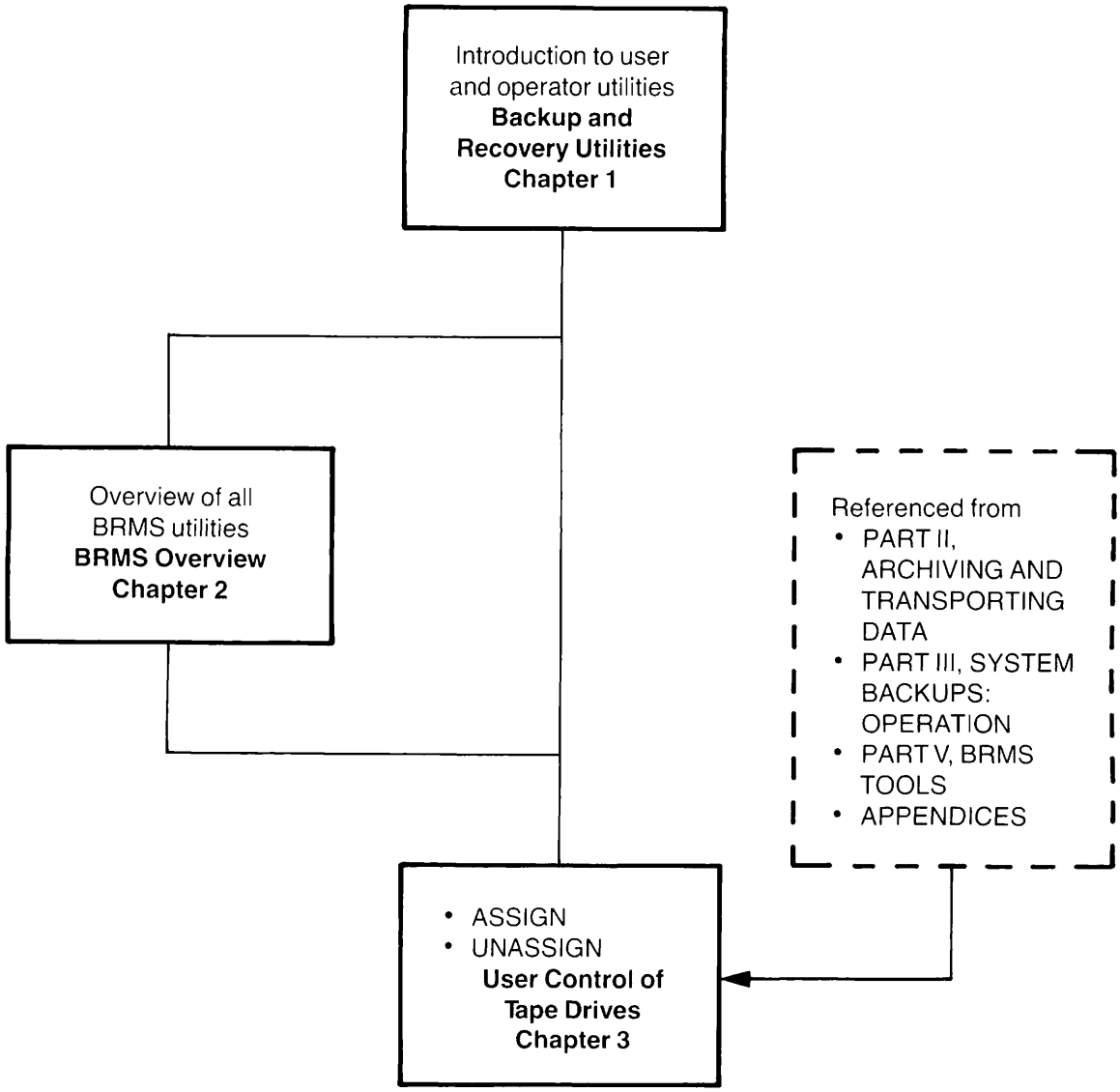
- A reference list of all the commands described in this book
- A summary of the operator backup and restore procedures
- Lists of error messages, with explanations
- Guidance for users and operators on how to use MAGSAV and MAGRST
- An introduction to basic concepts of magnetic tapes, and guidance on how to initialize tapes with the LABEL command
- Guidance on how to use UX_TAPE to transport data between a 50 Series system and a UNIX system

The following diagrams show the overall structure of the manual, and the inter-relationship between the chapters in each part of the manual.

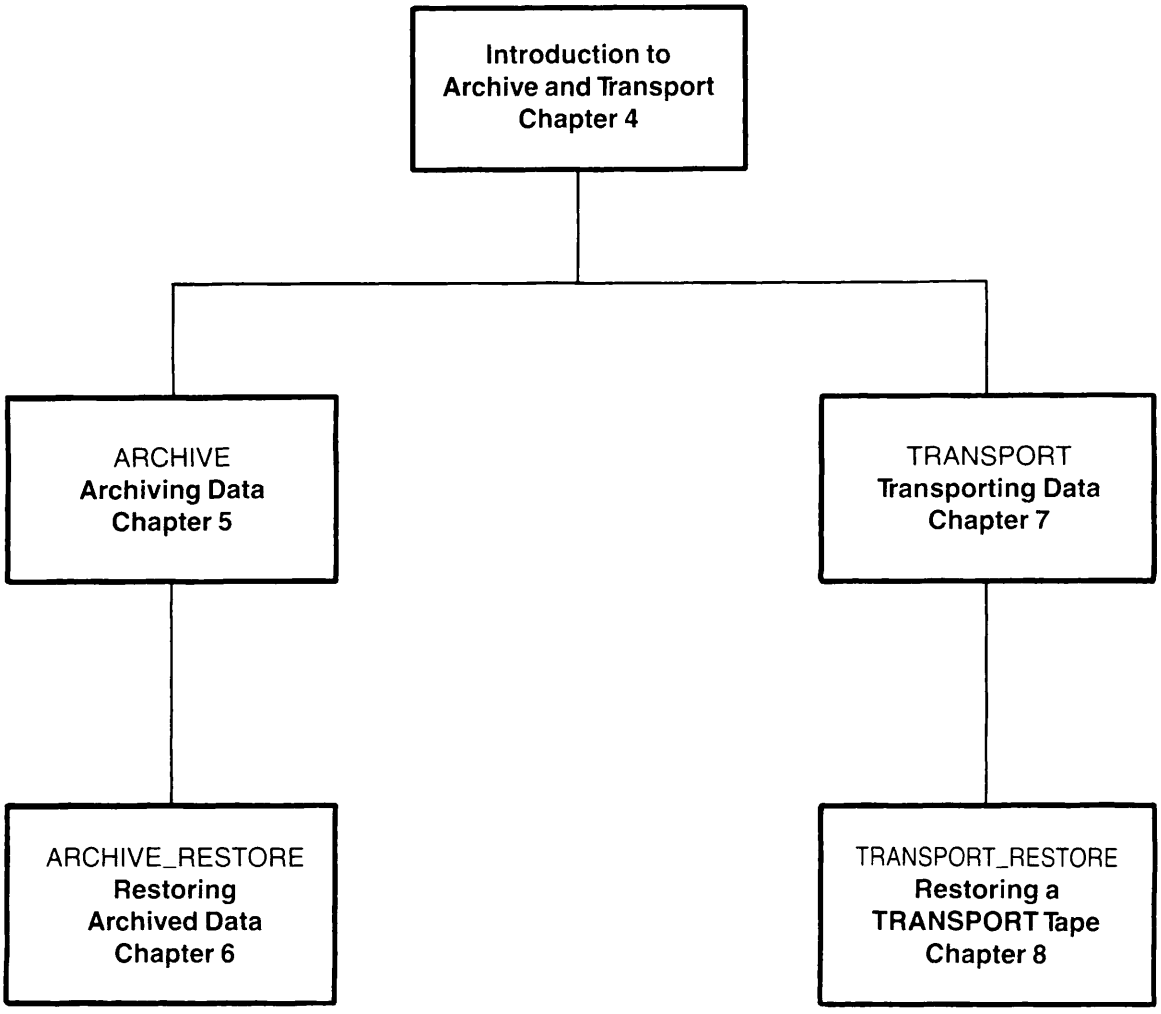
This diagram shows the overall structure of the manual.



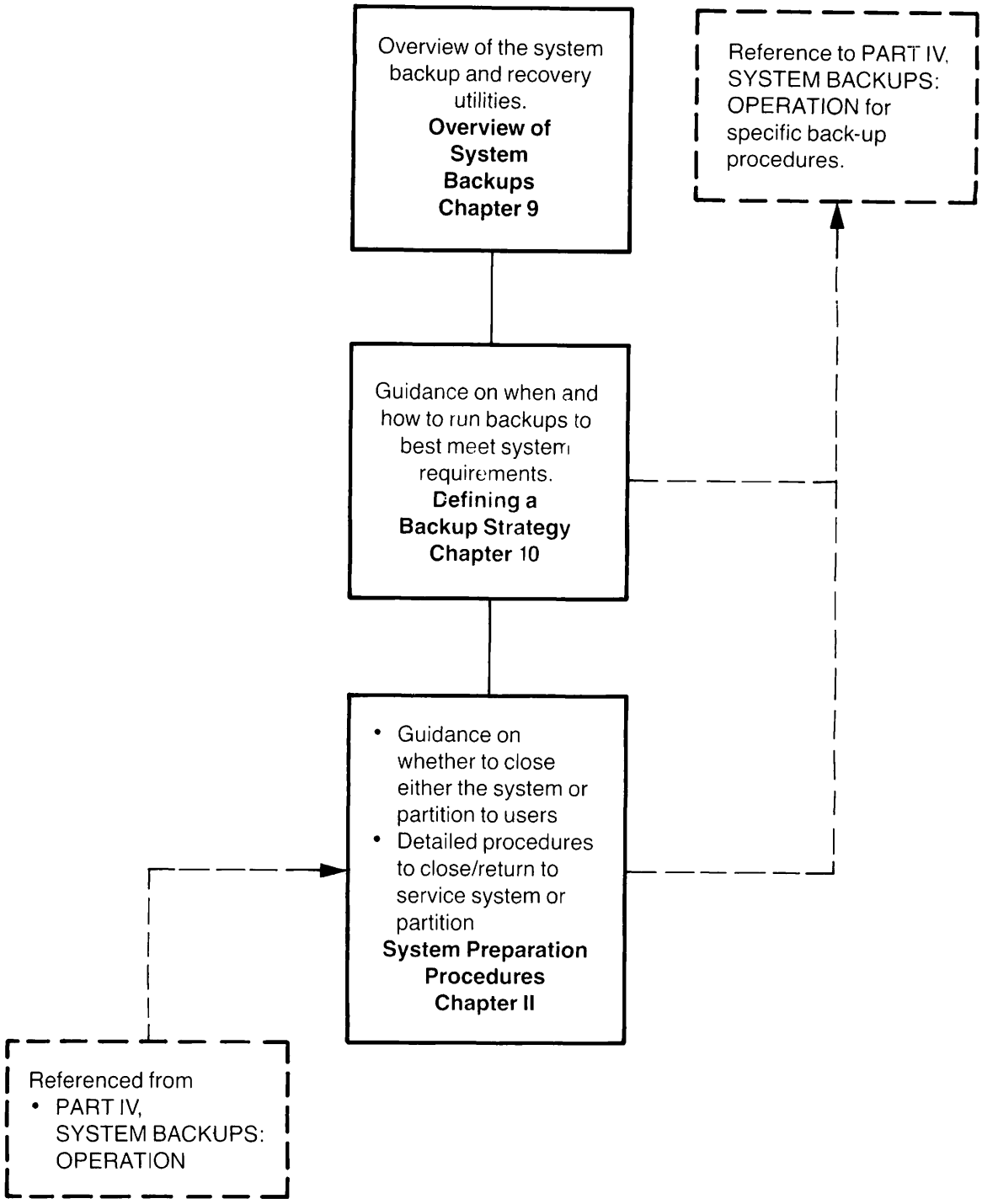
The following diagram shows the inter-relationships between the chapters in PART I, OVERVIEW.



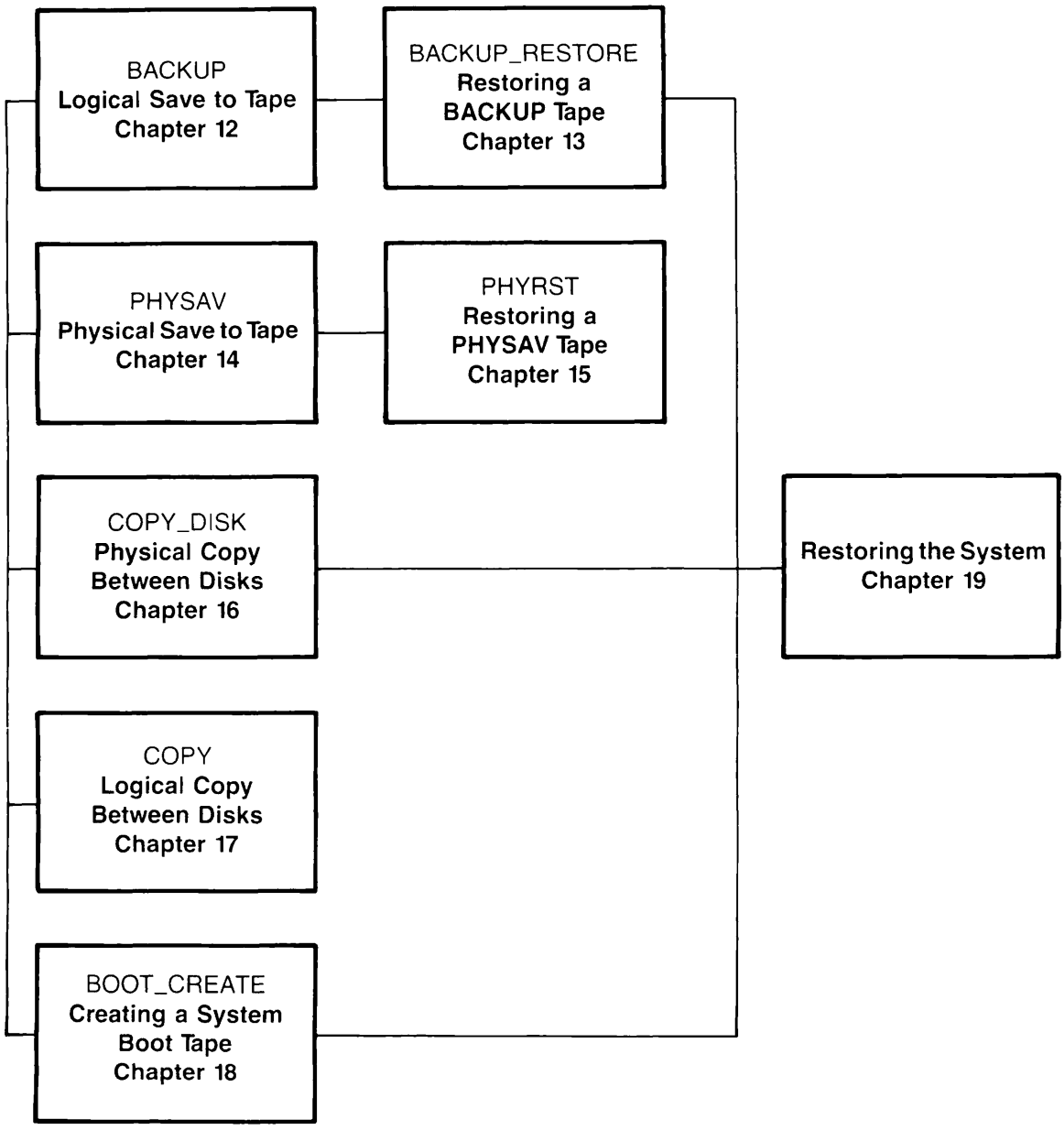
The following diagram shows the inter-relationships between the chapters in PART II, ARCHIVING AND TRANSPORTING DATA.



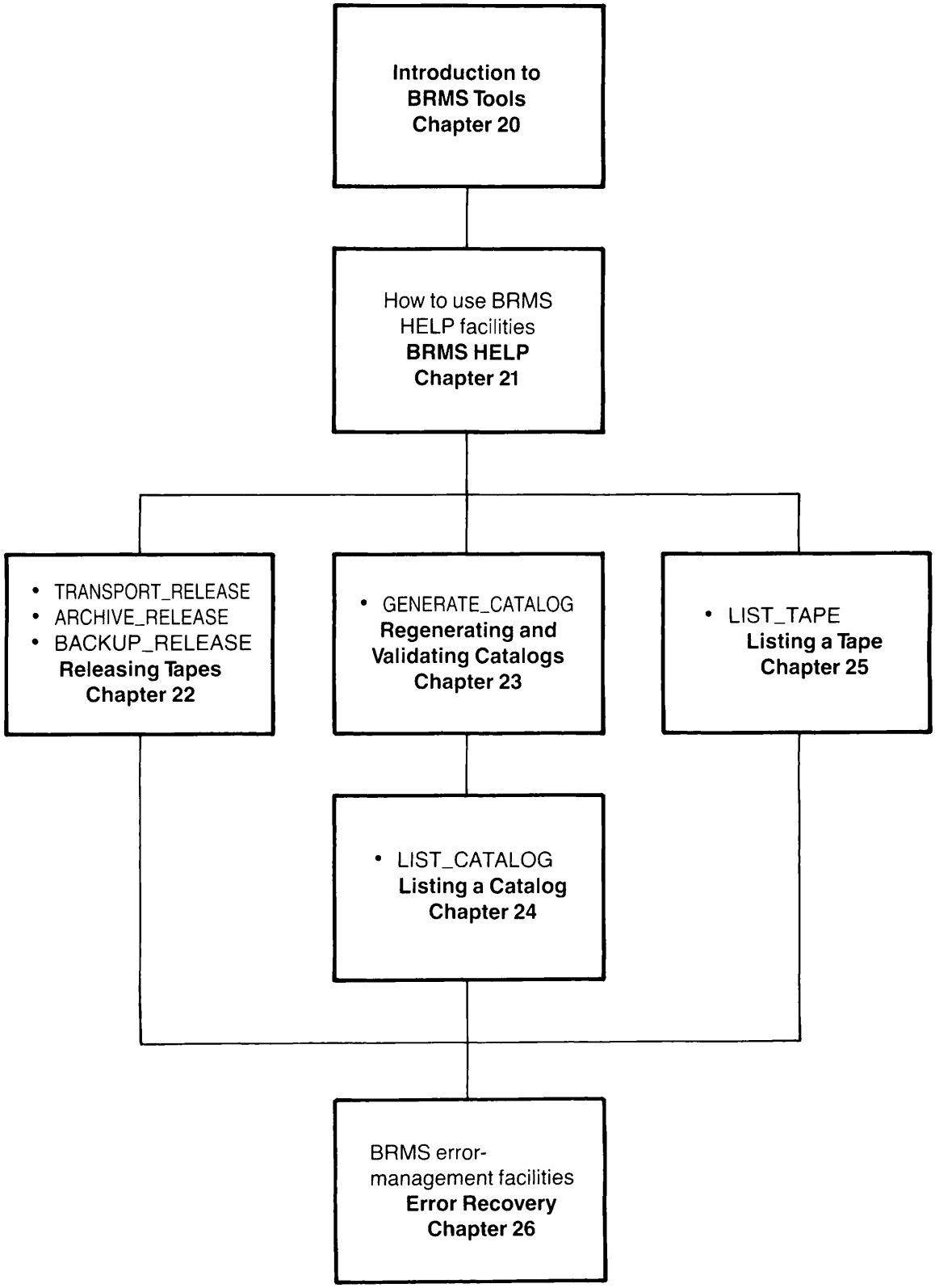
The following diagram shows the inter-relationships between the chapters in PART III, SYSTEM BACKUPS: ADMINISTRATION.



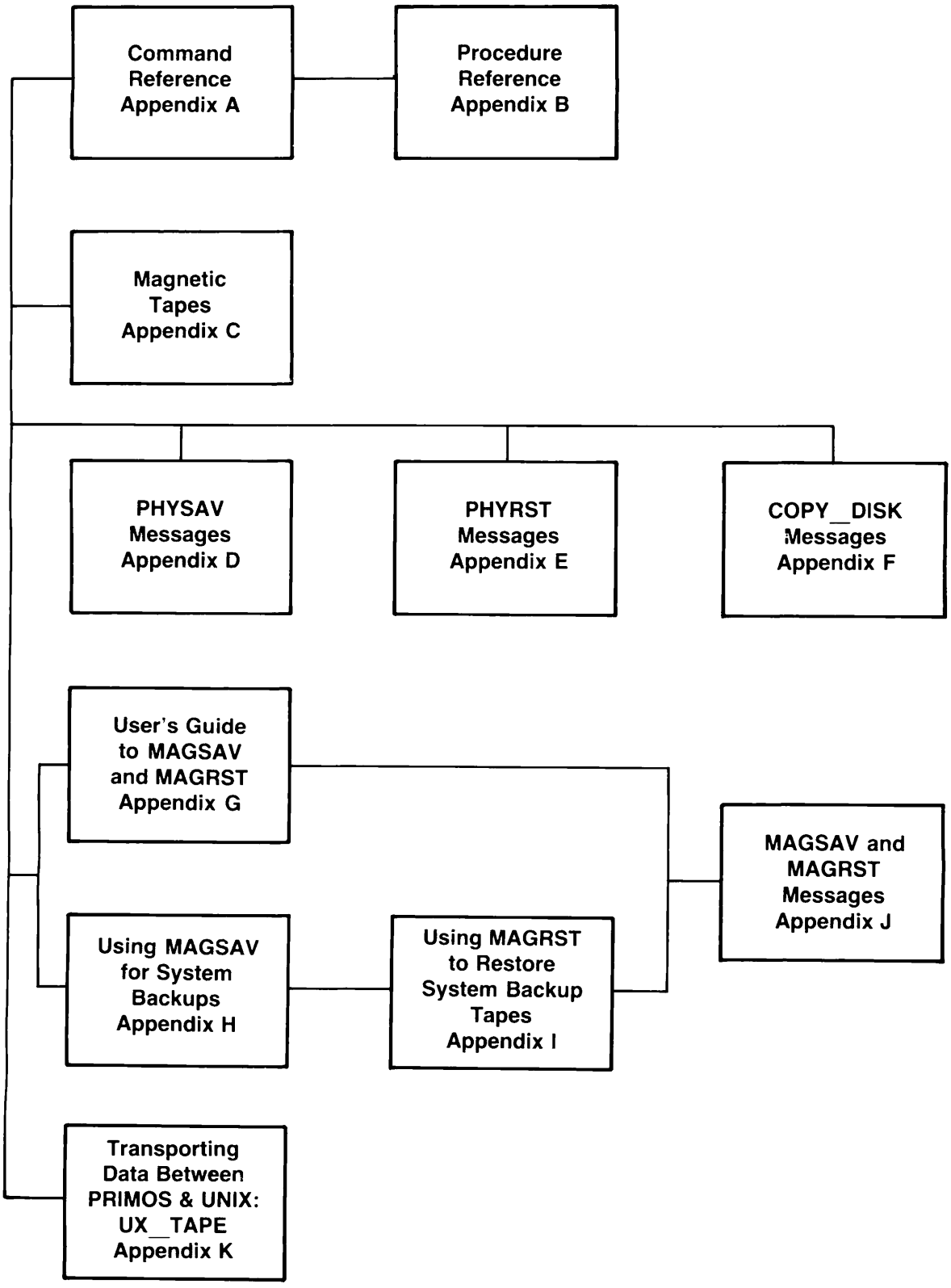
The following diagram shows the inter-relationships between the chapters in PART IV, SYSTEM BACKUPS: OPERATION.



The following diagram shows the inter-relationships between the chapters in PART V, BRMS TOOLS.



The following diagram shows the overall structure of the appendices.



PRIME DOCUMENTATION CONVENTIONS

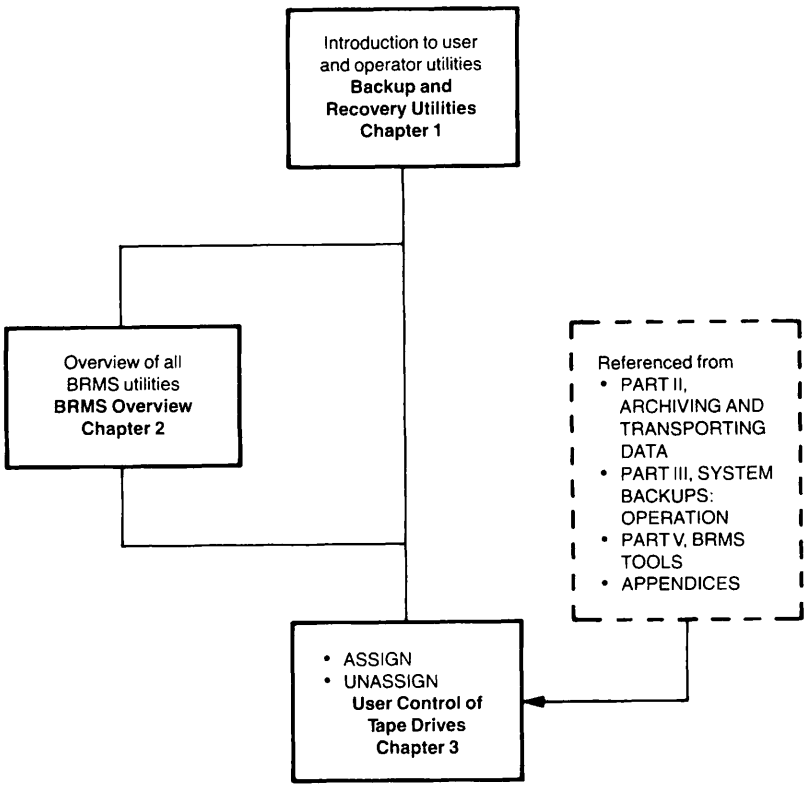
The following conventions are used in command formats, statement formats, and in examples throughout this document. Examples illustrate the uses of these commands and statements in typical applications.

Convention	Explanation	Example
UPPERCASE	In command formats, words in uppercase indicate the actual names of commands, options, statements, and keywords. Enter them in either uppercase or lowercase.	ARCHIVE
lowercase	In command formats, words in lowercase indicate variables for which you must substitute a suitable value.	COPY pathname
Abbreviations in format statements	If an uppercase word in a command format has an abbreviation, it is shown below the full name, and the name and abbreviation are placed within braces.	{ ASSIGN / AS }
Underscore in examples	In examples, user input is underscored but system prompts and output are not.	OK, ASSIGN MTO Device MTO assigned. OK,
Brackets	Brackets enclose a list of one or more optional items. Choose none or one or more of these items.	-INDEX [pathname]
Braces	Braces enclose a list of items. Choose one and only one of these items.	-SPEED { 25 / 100 }
Ellipsis ...	An ellipsis indicates that the preceding item may be repeated.	-VOLID volume-name1 [...volume-name10]
Hyphen -	Wherever a hyphen appears as the first letter of an option, it is a required part of that option.	PHYSAV -COMDEV

Convention	Explanation	Example
Angle brackets in examples < >	In examples, a keycap enclosed within angle brackets indicates that you press that key.	Press <return>: <RETURN>

PART I

Overview



1

Backup and Recovery Utilities

INTRODUCTION

This chapter provides an overview of the data backup and recovery utilities that are available to users and operators. The term backup is used here in a general sense, to include archiving and transporting data, as well as system backups.

The following paragraphs summarize the contents of the chapter.

BACKUP AND RECOVERY FOR USERS describes the utilities that enable users to save their personal files and directories to tape.

BACKUP AND RECOVERY FOR OPERATORS describes the utilities that enable operators to back up and restore system data.

BACKUP AND RECOVERY FOR USERS

You may want to save your files to tape in order to archive them, or to transport them to another Prime system. There may also be occasions when you want to create secure copies of your current files and directories.

When you archive files, you save them to tape and can then, if you wish, delete them from disk, on the assumption that you are unlikely to want to access these files again in the near future.

Table 1-1 lists the utilities that you can invoke to transfer data between disk and tape, and summarizes the function of each utility.

Table 1-1
Backup and Restore Utilities for Users

Utility	Function
ARCHIVE	Saves files and directories to tape
ARCHIVE_RESTORE	Restores files and directories from an ARCHIVE tape
TRANSPORT	Saves files and directories to tape for restoration on another Prime system
TRANSPORT_RESTORE	Restores files and directories from a TRANSPORT tape
MAGSAV	Saves files and directories to tape
MAGRST	Restores files and directories from a MAGSAV tape

The ARCHIVE utility enables you to

- Save disk space by archiving online files that you use only rarely
- Make secure copies of valuable online files
- Backup your files and directories

To restore files and directories from an ARCHIVE tape, use ARCHIVE_RESTORE. The procedures for using ARCHIVE and ARCHIVE_RESTORE are described in Chapter 5, ARCHIVING DATA: ARCHIVE and Chapter 6, RESTORING ARCHIVED DATA: ARCHIVE_RESTORE.

The TRANSPORT utility saves data to tape in a way that makes it easy for anyone to restore that data on another Prime system. To restore transported data, use the TRANSPORT_RESTORE utility. The purpose of the transport utilities is simply to enable you to transport your files and directories from one Prime system to another Prime system: they do not give the security that the archive utilities provide against unauthorised access to your data on tape. The procedures for using TRANSPORT and TRANSPORT_RESTORE are described in Chapter 7, TRANSPORTING DATA: TRANSPORT, and Chapter 8, RESTORING A TRANSPORT TAPE: TRANSPORT_RESTORE.

MAGSAV and MAGRST are logical backup and restore utilities for users and operators. MAGSAV saves files and directories to tape, and MAGRST restores them from a MAGSAV tape. The procedures for using MAGSAV and MAGRST are described in Appendix G, USER'S GUIDE TO MAGSAV AND MAGRST.

BACKUP AND RECOVERY FOR SYSTEM OPERATORS

Operators back up data in order to

- Restore files and directories that users have accidentally deleted or overwritten
- Recover from major losses of data, for example after a disk crash

Operators can backup to either disk or tape, and these backups can be either physical or logical. A physical backup makes an exact copy of the contents of a partition, and file system objects are spread across the backup medium (disk or tape) in exactly the same way as on the source partition. A partition is the smallest unit you can restore from a physical backup. A logical backup saves individual file system objects as logical entities, in such a way that you can restore one or more objects from the backup.

Table 1-2 lists the system backup and recovery utilities for operators, and summarizes the function of each utility.

Table 1-2
System Backup and Recovery Utilities

Name	Type	Function
BACKUP	Logical, disk-to-tape	Saves files and directories from disk to tape
BACKUP_RESTORE	Logical, tape-to-disk	Restores files and directories from a BACKUP tape
MAGSAV	Logical, disk-to-tape	Saves files and directories from disk to tape
MAGRST	Logical, tape-to-disk	Restores files and directories from a MAGSAV tape
PHYSAV	Physical, disk-to-tape	Saves physical disk partition(s) to tape
PHYRST	Physical, tape-to-disk	Restores physical disk partition(s) from a PHYSAV tape
COPY_DISK	Physical, disk-to-disk	Copies physical disk partitions to other physical disk partitions
COPY	Logical, disk-to-disk	Copies online files and directories

BACKUP performs logical backups to tape, and you can therefore restore individual files and directories from a BACKUP tape.

MAGSAV also performs logical backups to tape, and is an alternative to BACKUP.

To perform a physical backup to tape, use PHYSAV. When you want to restore a partition from a PHYSAV tape, use PHYRST.

To make physical backups to another disk, use COPY_DISK. You can restore an entire partition from the backup pack by using COPY_DISK, or you can use COPY to restore individual files and directories.

Part III, SYSTEM BACKUPS: ADMINISTRATION, describes the system backup and recovery utilities, and discusses the circumstances under which each is the most appropriate utility for your system backups.

Part IV, SYSTEM BACKUPS: OPERATION, describes in detail how to use the system backup and recovery utilities.

2
BRMS Overview

INTRODUCTION

This chapter gives an overview of the Backup and Recovery Management Service (BRMS) utilities, and explains the basic concepts of these utilities.

The following paragraphs outline the contents of this chapter.

SUMMARY OF BRMS UTILITIES lists all the BRMS utilities, and summarizes their functions.

VOLUMES explains how the BRMS utilities use the concepts of volume, reel and tape.

LABELING AND RELEASING TAPES outlines how BRMS tapes are labeled, and what is meant by the term releasing a tape.

CATALOGS explains what catalogs are, and what information they contain.

BRMS HELP summarizes the HELP that the BRMS utilities offer users and operators.

ERROR RECOVERY outlines the error recovery facilities that the BRMS utilities provide.

SUMMARY OF BRMS UTILITIES

Table 2-1 lists all the BRMS utilities and summarizes their functions. For a full description of the function of each BRMS utility, and explanations about how to use them, refer to the following parts of this book:

- Part II, ARCHIVING AND TRANSPORTING DATA, describes ARCHIVE, ARCHIVE_RESTORE, TRANSPORT and TRANSPORT_RESTORE
- Part IV, SYSTEM BACKUPS: OPERATION, includes descriptions of BACKUP and BACKUP_RESTORE
- Part V, BRMS TOOLS, describes how to use
  - ARCHIVE_RELEASE, TRANSPORT_RELEASE and BACKUP_RELEASE
  - GENERATE_CATALOG and LIST_CATALOG
  - LIST_TAPE

VOLUMES

A volume is a set of physical reels that contain logically related data. A volume can consist of 1-255 reels. If you append data to a volume, and run out of space on the latest reel in the volume, the BRMS utility prompts you to mount a new reel. This reel then becomes part of the volume. Each volume has a unique name, which is shared by all the reels in the volume. The name can be a maximum of 28 characters, and you can use any of the following characters:

A through Z (uppercase or lowercase)

0 through 9

& - # $ _ * . /

The first character of the name cannot be a digit or a hyphen.

Tapes and Reels

This book uses the term tape in a general sense, to refer to the physical medium on which data is written. However, it uses a tape or the tape in a specific sense, to refer to a reel of tape. The terms a tape and a reel are therefore interchangeable.

Table 2-1
BRMS Commands

Command	Used by	Function
ARCHIVE	User	Creates tapes of user's files
ARCHIVE_RESTORE	User	Restores ARCHIVE tapes
ARCHIVE_RELEASE	User	Releases ARCHIVE tapes
TRANSPORT	User Operator	Creates tape for transport to another system
TRANSPORT_RESTORE	User Operator	Restores TRANSPORT tapes
TRANSPORT_RELEASE	User Operator	Releases TRANSPORT tapes
BACKUP	Operator	Creates BACKUP tapes
BACKUP_RESTORE	Operator	Restores BACKUP tapes
BACKUP_RELEASE	Operator	Releases BACKUP tapes
GENERATE_CATALOG	User Operator	Regenerates catalog of ARCHIVE or BACKUP tape
LIST_CATALOG	User Operator	Lists contents of catalog of ARCHIVE or BACKUP tape
LIST_TAPE	User Operator	Lists contents of any BRMS tape mounted on a drive

LABELING AND RELEASING TAPES

The ARCHIVE, BACKUP and TRANSPORT utilities label a new tape with the volume name and the function of the tape (ARCHIVE, BACKUP or TRANSPORT). Before you can overwrite a tape, or use it for another purpose, that tape must be released: when a tape is released, it is labeled as free. You cannot, therefore, accidentally overwrite a tape. Chapter 22, RELEASING TAPES, explains in detail how to release tapes.

CATALOGS

The ARCHIVE and BACKUP utilities create by default online files, called catalogs, that record information about each save you make to tape. There is one catalog for each volume. When you append data to a volume, ARCHIVE and BACKUP automatically update the information in that volume's catalog.

Catalogs provide an efficient way to manage the backup and recovery of your data. Each catalog holds information about

- The volume
- The reels in the volume
- The objects saved on each reel

When you restore data, ARCHIVE_RESTORE and BACKUP_RESTORE use the catalogs to identify the volume and reels that hold the objects you want to restore.

You can keep track of what is on your tapes by listing the catalogs with the command LIST_CATALOG. Chapter 24, LISTING A CATALOG: LIST_CATALOG, describes how to use this command.

Access to catalogs is controlled by ACLs: you cannot list a catalog, or use a command that accesses a catalog unless you have the correct access rights. The command descriptions in subsequent chapters of this book detail the ACLs that you need to access catalogs.

Catalog Information About Volumes

A catalog provides the following information about its associated volume:

- Name of the volume
- Type of save (BACKUP or ARCHIVE)
- The date the volume was created (the same as when the catalog was created)

- The number of reels in use
- Any user-defined remark about the volume

Catalog Information About Reels

A catalog has the following information about each reel in a volume:

- The date and time of the last save to this reel
- The command used to save data to the reel, and the revision of that command
- The density of the tape
- The maximum block size
- The number of times the reel has been used
- The amount of data on the reel

Catalog Information About Objects Saved to Tape

A catalog includes the following information about each object you have saved to the volume:

- The full pathname
- The object type
- The size of the object, in disk records
- The date and time when the object was created, and last accessed, backed up, modified, and written to tape

BRMS HELP

There is detailed online HELP on all the BRMS commands. You can display

- The syntax of a command and a list of its options
- A description of the command function, and a summary of each option
- A description of the function of an option

- Examples of how you can use a command, with an explanation of the effect of each example
- Information about how to use wildcards with a command and its options
- Lists of command error numbers, and the text for each error number

For an explanation of how to invoke HELP, refer to Chapter 21, BRMS HELP.

ERROR RECOVERY

The BRMS utilities always attempt to recover from an error without requesting you to take any recovery action. If a utility is able to effect a recovery, you receive one of the following types of message on your screen:

- A warning that the recoverable error has occurred
- An offer of help, and sometimes the opportunity to abort the command

When you have to take recovery action, the command prompts you. For example, you may be prompted to mount a new reel, or to assign a tape drive. You are able to exit temporarily from the utility, perform the recovery action, and then continue with the command.

Refer to Chapter 26, ERROR RECOVERY, for a detailed explanation about how the BRMS commands handle error recovery.

3
User Control of Tape Drives

INTRODUCTION

This chapter describes how you can control tape drives, using the following commands

- STATUS
- ASSIGN
- UNASSIGN

STATUS lets you check the availability of tape drives.

ASSIGN allows you to control a physical or logical tape drive, or to request operator assistance.

UNASSIGN lets you relinquish control of a tape drive.

CHECKING TAPE DRIVE AVAILABILITY (STATUS DEVICE)

To see which tape drives are in use, use the STATUS command with the command-line argument DEVICE:

```
STATUS DEVICE
```

This command displays the physical and logical device numbers for any assigned magnetic tape drives. It does not show tape drives that are not assigned.

An example display is

```
OK, STATUS DEVICE

Device  User name                          Usrnum  Ldevice
MT0     ALLEY                                 1    MT0
MT1     PARIS                                13    MT2
```

where

Device — is the physical device number

User name — is the login name of the user to whom the device is assigned

Usrnum — is that user's user number

Ldevice — is the logical device number being used for the drive

ASSIGNING TAPE DRIVES (ASSIGN)

The ASSIGN command gives you complete control over a magnetic tape drive. You can either specify a particular drive by device number (for example, MT0) or request any drive that meets specified requirements. You specify these requirements by command-line options, described below in the section ASSIGN.

ASSIGN also allows you to send special requests to the operator; for example, a request to remove the write-enable ring, or to mount a tape. Such requests are useful primarily for Batch jobs.

If you have not specified an ASSIGN option that requires the operator's assistance, some sites allow you to mount a tape drive yourself after you give the ASSIGN command. Other sites channel all tape drive assignment requests through the operator. In this latter case, you

should receive a message from the system operator after you have issued the ASSIGN command, to tell you of your request status (for example, accepted or aborted). In some cases, no tape drive assignments are allowed, in which case you should receive a message to this effect.

Note that you cannot have more than one 60Mb cartridge tape drive assigned at a time.

▶ ASSIGN

The format of the ASSIGN command is

```
{ ASSIGN }     {     MTpdn              }     [options]
{ AS     }     { MTX   -ALIAS MTldn     }
```

Descriptions of the arguments and options follow.

Argument	Description
MTpdn	Identifies the magnetic tape drive (MT) unit number specified by pdn, in the range 0-7 inclusive. pdn is the physical device number assigned to each drive at system startup.
MTX	Assigns any available drive: must be accompanied by the -ALIAS MTldn option, which assigns a number (alias) to the drive for reference. The drive that is assigned depends on the other options that you specify on the command line.

Option	Description
-7TRK -9TRK	Indicates seven-track or nine-track tape drive; default is nine-track. Requires operator intervention. These options are usually used with the MTX argument.
-ALIAS MTldn	This option is used to specify a drive with a logical device number ldn in the range 0-7 inclusive. The ldn is a user-defined number that is assigned to a particular physical drive unit. When you use this option with the MTpdn argument, ldn is mapped onto pdn in subsequent magnetic tape operations. This option is particularly useful in programs that run from command files, or in

CPL programs. It allows the programs to refer to logical device numbers, which remain constant, irrespective of the physical device numbers, which vary according to device availability.

-DENSITY n

Requests a tape density setting, and may require operator intervention. The value of n specifies the tape density in bpi (bits per inch). Valid values for n are 800, 1600, 3200, and 6250.

Most drives can handle 800 and 1600 bpi settings. Streamer drives use 1600 and 3200 bpi. This option sets density automatically on Version 3 (6250 bpi) drives, but requires the operator to set density manually on older drives. If you do not specify -DENSITY, it defaults to 1600 bpi. See Table 10-1 for a list of recommended density settings for streamer tape drives.

-MOUNT

Instructs the operator to mount a new tape reel on an already assigned tape drive. This option is usually accompanied by the -TPID option.

-RETENSION

This option should only be used with cartridge tape drives (Version 5 drives). It runs the tape fast-forward to the end of the tape, and then rewinds it to the beginning of the tape. This stabilizes the tape-to-head pressure and stacks the tape evenly on the reel.

-RINGOFF

Instructs the operator to remove the write ring from the tape, so that it can be read, but not written.

-RINGON

Instructs the operator to place the write ring on the tape, so that it can be both read and written.

-SPEED { 25 / 100 }

Selects speed for a streamer tape drive (in inches-per-second) running at 1600 bpi. The default is 25 ips. This option is ignored on other drives, including streamers running at 3200 bpi: a speed of 50 ips is automatically set for streamers running at 3200 bpi. See Table 10-1 for a list of recommended speed and density settings.

-TPID id	Requests the operator to mount a particular reel of tape, identified by a tape id: the id can be a maximum of eight characters. An id is a tape identifier that describes a reel of tape, and/or type of tape drive. Identifiers cannot begin with a hyphen (-), as this is a reserved character that indicates the next control argument on the ASSIGN command line. Identifiers that begin with a hyphen, or that contain other reserved characters (commas, spaces, and /*) must be placed inside quotation marks.
-WAIT	Indicates that you can wait until the requested drive is available.

How to Assign Tape Drives

You can assign magnetic tape drives in any one of three ways:

- By physical device number (pdn)

  ```
  ASSIGN MTpdn [options]
  ```

- By logical device number (ldn)

  ```
  ASSIGN MTX -ALIAS MTldn
  ```

- By logical device number plus characteristics

  ```
  ASSIGN MTX -ALIAS MTldn -options
  ```

Assigning Drives by Physical Device Number: When you assign a tape drive by a physical device number, you request that particular tape drive. If the drive is unavailable, the option -WAIT queues your request. In the following example, you assign magnetic tape drive MT1, where 1 is the physical device number. This is the default assignment, and does not require operator intervention

```
OK, ASSIGN MT1
Device MT1 assigned.
OK,
```

Assigning Drives by Logical Device Number: When you assign a tape drive by a logical device number, you are mapping the ldn onto the pdn.

If you use the ASSIGN command in the format

```
ASSIGN MTpdn -ALIAS MTldn
```

you specify that the drive identified by the pdn is to be referred to by the specified ldn.

For example:

```
OK, ASSIGN MT4 -ALIAS MT0
Device MT4 assigned.
OK,
```

Until you unassign the drive, MT4 is referred to as logical drive MT0. Note that the physical, not the logical, device number is returned in the message that follows the ASSIGN command. ldns and pdns are associated internally in a special table and can be used interchangeably. To display the physical-to-logical number correspondence, invoke the STATUS DEVICE command as described at the beginning of this chapter.

When you wish to assign a logical device number to any available drive, use the command format

```
ASSIGN MTX -ALIAS MTldn
```

For example:

```
OK, ASSIGN MTX -ALIAS MT4
Device MT2 assigned.
OK,
```

requests the operator to assign any available drive as logical device 4. The operator responds by sending a message to your terminal that indicates which drive has been assigned. In this example the operator has assigned drive 2.

Note

Once you have specified a number as an ldn, you cannot assign another drive by that number. Just as each pdn refers to a unique drive, so each ldn must refer to one drive only. For example, if BOB assigns MT1 with an alias of MT0, he cannot then assign MT0 as itself. For example:

```
OK, STAT DE

Device  User name                              Usrnum  Ldevice

OK, ASSIGN MT1 -ALIAS MT0
Device MT1 assigned.
OK, ASSIGN MT0
The device is in use.  MT0 (asnmt$)
```

To assign drive MT0 in these circumstances, BOB must also give it an alias. For example:

```
OK, ASSIGN MT0 -ALIAS MT2
Device MT0 assigned.
OK, STAT DE

Device  User name                              Usrnum  Ldevice
MT0     BOB                                    15      MT2
MT1     BOB                                    15      MT0
```

Assigning Drives by Logical Device Numbers Plus Characteristics: When you assign a tape drive by a logical device number plus characteristics, you are asking for any drive that can handle a particular type of tape (for example, a nine-track tape at 6250 bpi). In this case you give this drive a logical alias.

For example:

```
OK, ASSIGN MTX -ALIAS MT0 -TPID SYS -9TRK -RINGON -DENSITY 6250
```

specifies that you wish to assign a drive with the following characteristics: nine-track, read and write (no protect), and 6250 bpi. It states that you wish to mount tape SYS on the drive if a drive is assigned, and MT0 is the number you will use to refer to the assigned drive. All subsequent tape operations of the assigned drive will use MT0 as the unit number. If for any reason no drive is assignable, then you receive an an error message.

Mounting Tapes: It is sometimes necessary to remove one tape from a tape drive, and replace it with another: to do this use the -MOUNT option. Before you specify -MOUNT, the tape drive must already be assigned. When you first assign a tape drive, you can use the -TPID option to specify which tape is to be placed on the drive.

For example, suppose that you assign logical drive 7 as follows:

```
OK, ASSIGN MT0 -ALIAS MT7 -DENSITY 800 -TPID GRADES
```

To mount another tape, called EXAMS, issue the command

```
OK, ASSIGN -ALIAS MT7 -MOUNT -TPID EXAMS
```

In this example the operator receives a message at the supervisor terminal, indicating that you want tape EXAMS to be mounted. The operator responds to this request by using the REPLY command, and you receive a message to indicate whether the mount operation was successful. The mount operation might be unsuccessful if, for example,the operator could not find the requested tape.

ASSIGN Command Messages

When you use the ASSIGN command you receive messages that are either informational or error-related. These messages are described below.

- Bad parameter. (asnmt$)

Indicates an ASSIGN syntax error; your input is invalid. Check your command line, and issue the command again.

- Device MTpdn assigned.

Your tape drive has been assigned. (Notice that this message gives the physical device number.)

- Device not assigned. MTn (usnmt$)

The device you specified has not been assigned. Wait until the drive is available, or select another drive.

- Device not available. Magtape assignment request aborted (asnmt$)

Indicates the operator cannot handle your assignment request. Check your command line options, and if necessary discuss your request with the operator.

- No Magtape assignments permitted. (asnmt$)

The operator does not permit magnetic tape assignments at this time. Wait until assignments are permitted.

- The device is in use. (asnmt$)

Indicates that another user has assigned the specified device. Wait until the drive is available, or select another drive.

- Use of 'MTX' argument not permitted at system console. (asnmt$)

Indicates that the MTX argument requires a response from the supervisor terminal. Moreover, work cannot be done at the user terminal until the response is received. For these reasons, a user at the supervisor terminal is not allowed to send himself an ASSIGN request involving the MTX argument.

UNASSIGNING TAPE DRIVES (UNASSIGN)

The UNASSIGN command unassigns a tape drive that you have previously assigned with the ASSIGN command. When you complete a magnetic tape operation, it is good practice to release the tape drive for general use as soon as possible after you have removed the reel from the drive.

Note that if you log out, any drives that you have assigned are unassigned automatically.

▶ UNASSIGN

The command line format for UNASSIGN is

```
{ UNASSIGN }     { MTpdn        }     [-UNLOAD]
{ UN       }     { -ALIAS MTldn }
```

You can thus unassign a drive by specifying either the physical device number (pdn) or the logical device number (ldn).

The -UNLOAD option rewinds the tape onto the supply reel, and places it offline (unloaded). This option is not available on all drives or

controllers. Find out from either your System Administrator or operator whether you can use -UNLOAD at your installation.

Using the UNASSIGN Command

A tape drive can only be unassigned by

- The user who assigned the drive
- The system operator

The system operator can unassign any drive by using the pdn argument, but can only use the -ALIAS ldn option if that operator assigned, and hence owns, the drive.

If an operator unassigns your tape drive, no message appears at your terminal. If you subsequently attempt to unassign the same device, an error message is displayed.

The following examples illustrate the use of UNASSIGN.

Suppose that you assign the tape drives MT1 and MT0 as follows:

```
OK, ASSIGN MT1 -ALIAS MT2
Device MT1 assigned.
OK, ASSIGN MTX -ALIAS MT0
Device MT0 assigned.
OK,
```

You can unassign physical drive MT1 by specifying either the pdn or the ldn on the UNASSIGN command line:

```
OK, UNASSIGN MT1
```

or

```
OK, UNASSIGN -ALIAS MT2
```

If the command is successful, the message "Device released" is printed.

In the case of MT0 the pdn and ldn are the same, and to unassign the drive you can issue one of the following commands:

```
OK, UNASSIGN -ALIAS MT0
```

or

```
OK, UNASSIGN MTO
```

UNASSIGN Command Messages

Messages you get from using the UNASSIGN command are either informational or error-related. These messages are described below, in alphabetical order.

- Bad parameter. (usnmt$)

Indicates an UNASSIGN syntax error; your input is invalid. Check your command line, and issue the command again.

- Device not assigned. MTn (usnmt$)

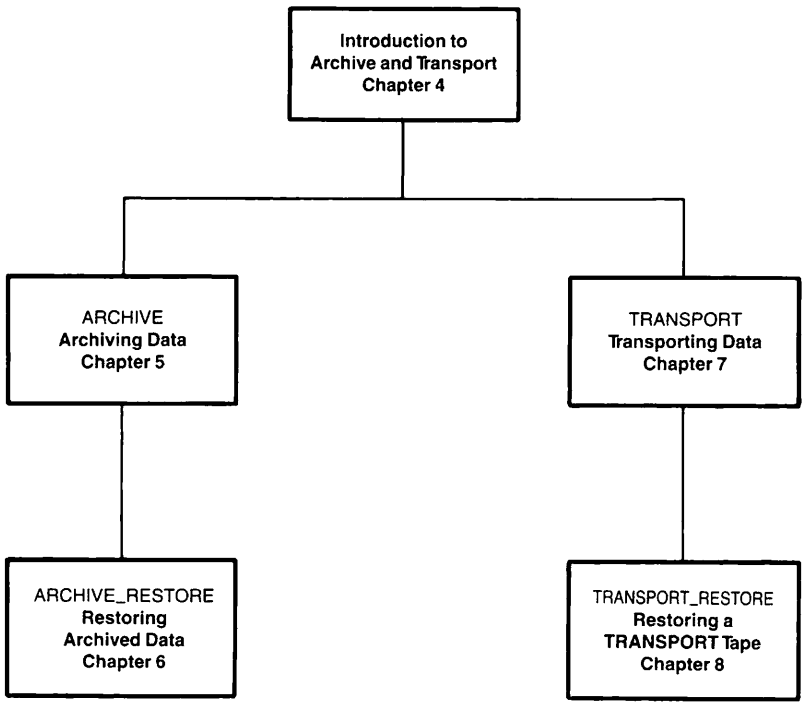
The device you are attempting to unassign has not yet been assigned. Check that you have specified the correct drive in your command

- Device released.

The device you unassigned is released.

PART II

Archiving and Transporting Data



4

Introduction to Archive and Transport

INTRODUCTION

This chapter summarizes the facilities that enable users to transfer their files and directories between disk and tape. These facilities are in two categories, archiving and transporting, and are supported by a number of tools. The tools are described in detail in Part V, BRMS TOOLS, and summarized in the section below ARCHIVE AND TRANSPORT TOOLS.

ARCHIVING DATA

The term archiving describes the process of saving to tape, files and directories that you no longer require, or which you use only occassionally. Archiving also enables you to make secure copies of valuable online files.

You can archive your files and directories, and restore archived objects back to disk, using two commands:

- ARCHIVE
- ARCHIVE_RESTORE

The ARCHIVE command saves specified files and directories to tape. It keeps a record of the files and directories that are saved, and stores this in an online catalog file: there is one catalog for each ARCHIVE volume. The catalog records information about the volume, the reels in the volume, and the objects stored on each reel. Whenever you archive objects to a tape, ARCHIVE appends entries to the catalog. The catalog thus records what is saved, and where it is saved.

For further information about catalogs in general, and about ARCHIVE catalogs in particular, refer to Chapter 2, BRMS OVERVIEW, and Chapter 5, ARCHIVING DATA: ARCHIVE.

ARCHIVE allows you to save a single file or directory, several files and directories, or the entire contents of your top-level directory. It automatically saves all ACLs and passwords associated with the archived objects.

For the basic ARCHIVE command, you simply identify the object you want to archive, name the tape, and name the drive on which the reel is mounted. ARCHIVE does, however, offer an extensive range of command-line options for users who have special archiving requirements.

When you want to retrieve archived files and directories, use the ARCHIVE_RESTORE command. This restores specified objects, together with their ACLs and passwords. ARCHIVE_RESTORE uses the tape catalog to find the objects you want to restore, and to check the ownership of these objects. You do not have to specify which tape has the objects that you want to restore: ARCHIVE_RESTORE searches your catalogs for the specified objects, and then tells you which tapes and reels to mount. As with ARCHIVE, the basic ARCHIVE_RESTORE command is very easy to use. You simply identify the objects that you want to restore, and the drive on which the reel is mounted.

Detailed information about how to use ARCHIVE and ARCHIVE_RESTORE is given in Chapter 5, ARCHIVING DATA: ARCHIVE and Chapter 6, RESTORING ARCHIVED DATA: ARCHIVE_RESTORE.

TRANSPORTING DATA

The transport facility allows for users and operators to transfer files and directories on tape from one Prime site to another Prime site. TRANSPORT tapes are not 'owned' and do not create catalogs, therefore anyone who receives a TRANSPORT tape can restore files and directories from that tape. You should therefore use the archive rather than transport commands if you are concerned about the security of your files and directories.

Two commands are used to transport data:

- TRANSPORT
- TRANSPORT_RESTORE

TRANSPORT saves file system objects from disk to tape. It does not copy ACLs and passwords, unless you request them. You can transport your entire top-level directory, several files and directories, or just a single file or directory. For the basic TRANSPORT command you simply name the object that you want to restore and the tape drive identifier. However, as for the archiving commands, there is an extensive range of options for the TRANSPORT command.

TRANSPORT_RESTORE restores objects to disk from a TRANSPORT tape. You can restore the entire contents of a tape, several files and directories, or just a single object. To restore objects, simply specify their name and the tape drive. If you do not know the contents of the tape, run LIST_TAPE to list every object on the tape. (See Chapter 25, LISTING A TAPE: LIST_TAPE.)

The TRANSPORT_RESTORE command also has an extensive range of options. There is detailed information about how to use TRANSPORT and TRANSPORT_RESTORE in Chapter 7, TRANSPORTING DATA: TRANSPORT, and Chapter 8, RESTORING A TRANSPORT TAPE: TRANSPORT_RESTORE.

ARCHIVE AND TRANSPORT TOOLS

There are four commands you can use in conjunction with the archive command:

- ARCHIVE_RELEASE
- GENERATE_CATALOG
- LIST_CATALOG
- LIST_TAPE

There are two commands you can use in conjunction with the transport command:

- TRANSPORT_RELEASE
- LIST_TAPE

ARCHIVE_RELEASE and TRANSPORT_RELEASE release ARCHIVE and TRANSPORT tapes, so that you can either overwrite the tape, or use the tape for some other purpose. Until you release such a tape, you cannot use it for any purpose other than its current one, nor can you rename the tape.

GENERATE_CATALOG regenerates a lost or damaged ARCHIVE catalog, or validates the catalog.

LIST_CATALOG lists an ARCHIVE catalog. If you do not know which tape has a particular object, LIST_CATALOG searches your ARCHIVE catalogs for the object, and tells you which tape and reel to mount.

LIST_TAPE lists the contents of an ARCHIVE or TRANSPORT tape. If your system crashes during an archive or transport operation use the LIST_TAPE command to see which objects have been saved successfully.

Part V, BRMS TOOLS, gives detailed descriptions of how to use all these tools.

GETTING STARTED

The following sections show how easy it is to save your data to tape, and to restore that data. They give step-by-step procedures to save and restore your files and directories, and give example command lines.

For full information about the ARCHIVE, ARCHIVE_RESTORE, TRANSPORT, and TRANSPORT_RESTORE utilities, refer to the chapters that follow in this Part II, ARCHIVING AND TRANSPORTING DATA.

ARCHIVE

To archive one or more of your files and directories, follow the steps below.

1. Assign a tape drive. For example, the command

```
OK, ASSIGN MTO
```

assigns drive MTO.

2. Mount a reel on the drive you assigned at step 1.

3. Invoke ARCHIVE by issuing the command line

```
OK, ARCHIVE pathname -MT n -VOLID volume-name
```

where

pathname is the pathname of the object(s) you want to save

-MT n is the tape drive identifier, with n in the range 0-7

volume-name is the name of the volume.

For example, if you have assigned tape drive MT0, the following command archives an object with the pathname <DSK1>RICHARD to a tape with the volume name RICH.

```
OK, ARCHIVE <DSK1>RICHARD -MT 0 -VOLID RICH
```

As another example, the following command saves the entire contents of your current directory to a tape with the volume name PETER.

```
OK, ARCHIVE @@ -MT 0 -VOLID PETER
```

If the save reaches the end of the mounted reel, you are prompted to mount another reel.

4. When the save has finished, remove the reel from the tape drive.

5. Unassign the tape drive you assigned at step 1. For example:

```
OK, UNASSIGN MT0
```

unassigns tape drive MT0.

ARCHIVE_RESTORE

To restore one or more of your files and directories from an archive tape, follow the steps below.

1. Assign a tape drive. For example, the command

   ```
   OK, ASSIGN MT0
   ```

   assigns drive MT0.

2. Mount the reel from which you want to restore objects, on the drive you assigned at step 1.

3. Invoke ARCHIVE_RESTORE by issuing the command line

   ```
   OK, ARCHIVE_RESTORE pathname -MT n
   ```

   where

   pathname is the pathname of the object(s) you want to restore

   -MT n is the tape drive identifier, with n in the range 0-7

   For example, if you have assigned tape drive MT0, the following command restores an object with the pathname <DSK1>RICHARD from the tape mounted on MT0, assuming that <DSK1>RICHARD is on this tape.

   ```
   OK, ARCHIVE_RESTORE <DSK1>RICHARD -MT 0
   ```

   As another example, the following command restores the latest versions of all the file system objects on the reel mounted on tape drive MT 0.

   ```
   OK, ARCHIVE_RESTORE @@ -MT 0
   ```

   If the reel is part of a multi-reel volume, you are prompted at the end of each reel to mount the next reel.

4. When the restore has finished, remove the reel from the tape drive.

5. Unassign the tape drive you assigned at step 1. For example:

    OK, UNASSIGN MT0

    unassigns tape drive MT0.

TRANSPORT

To save one or more of your files or directories to a TRANSPORT tape, follow the steps below.

1. Assign a tape drive. For example, the command

    OK, ASSIGN MT0

    assigns drive MT0.

2. Mount a reel on the drive you assigned at step 1.

3. Invoke TRANSPORT by issuing the command line

    OK, TRANSPORT pathname -MT n

    where

    pathname is the pathname of the object(s) you want to save

    -MT n is the tape drive identifier, with n in the range 0-7

    For example, if you have assigned tape drive MT0, the following command saves the object with the pathname <DSK1>RICHARD to a tape.

    OK, TRANSPORT <DSK1>RICHARD -MT 0

    As another example, the following command saves the entire contents of your current directory.

    OK, TRANSPORT @@ -MT 0

If the save reaches the end of the mounted reel, you are prompted to mount another free reel.

4. When the save has finished, remove the reel from the tape drive.

5. Unassign the tape drive you assigned at step 1. For example:

```
OK, UNASSIGN MTO
```

unassigns tape drive MTO.

TRANSPORT_RESTORE

To restore files and directories from a TRANSPORT tape, follow the steps below.

1. Assign a tape drive. For example, the command

```
OK, ASSIGN MTO
```

assigns drive MTO.

2. Mount the reel from which you want to restore objects, on the drive you assigned at step 1.

3. Invoke TRANSPORT_RESTORE by issuing the command line

```
OK, TRANSPORT_RESTORE pathname -MT n
```

where

pathname is the pathname of the object(s) you want to restore

-MT n is the tape drive identifier, with n in the range 0-7

For example, if you have assigned tape drive MTO, the following command restores the latest version of an object with the pathname <DSK1>RICHARD from the tape mounted on MTO, assuming that <DSK1>RICHARD is on this tape.

```
OK, TRANSPORT_RESTORE <DSK1>RICHARD -MT 0 -NO_QUERY
```

If you omit the -NO_QUERY option from the command line, TRANSPORT_RESTORE runs interactively, and allows you to restore any version of the specified objects.

As another example, the following command restores the latest versions of every object on the transport tape mounted on MT0.

```
OK, TRANSPORT_RESTORE @@ -MT 0 -NO_QUERY
```

4. When the restore has finished, remove the reel from the tape drive.

5. Unassign the tape drive you assigned at step 1. For example:

```
OK, UNASSIGN MT0
```

unassigns tape drive MT0.

5
Archiving Data: ARCHIVE

INTRODUCTION

This chapter describes how to use the ARCHIVE command to save files and directories from disk to tape. It provides an overview of the ARCHIVE command, describes its format and options, and explains in detail how to use the command.

The following paragraphs summarize the chapter contents.

OVERVIEW OF ARCHIVE introduces the ARCHIVE command. It explains catalogs and saves, describes the function of the default command, and summarizes the command options.

ARCHIVE describes the command format, arguments and options.

HOW TO ARCHIVE DATA explains how to use ARCHIVE to save your files and directories to tape.

USING THE ARCHIVE OPTIONS explains how to use each of the command options to extend the command function.

OVERVIEW OF ARCHIVE

Archiving saves your files and directories to tape.

You can use the ARCHIVE command to

- Save disk space by archiving online files and directories that you rarely use
- Make secure copies of valuable online files
- Perform your own personal backup

When you archive files, you save them to tape, and can then delete them from disk, on the assumption that you are unlikely to want to access them again in the near future. With a personal backup, you create offline copies of important data, but keep the original data online.

Catalogs

The first time you use ARCHIVE, it automatically sets up a subdirectory named CATS* in which it stores your catalogs, and creates a catalog for the volume. The catalog records details of all archive sessions that use this catalog. CATS* is located below your origin directory and has the pathname origin-directory>CATS*. The command names the catalog by adding the suffix .CAT to your name for the volume. For example, if your archiving session saves a file system object to a volume named TOM, ARCHIVE creates the catalog TOM.CAT.

ARCHIVE handles catalogs by echoing your actions. If you create a new volume, ARCHIVE creates a new catalog. If you append to a current volume, ARCHIVE appends to the catalog for that volume. You can read the contents of your catalogs at any time by using the command LIST_CATALOG.

Saves

Each time you invoke the ARCHIVE command it creates a unique section on the reel, and in the corresponding catalog. This section is called a save. The first save on a tape is save 1, the second is save 2, and so on.

ARCHIVE always appends new data to the end of a tape, and creates a new save for the data. If a file or directory is archived to tape more than once, its pathname no longer uniquely identifies each version of that object. In this case, refer to the save number, listed in the catalog, to identify the version you want to archive.

Whenever you use the ARCHIVE command, you can either add to the same volume or create a new ARCHIVE volume with a new name. ARCHIVE's

security mechanism prevents the accidental overwriting of an ARCHIVE tape. If you add to the same volume and run out of room on the reel, ARCHIVE asks you to mount a new reel. The new reel is still part of the same volume.

Default ARCHIVE Command

You can archive an object simply by specifying its pathname, the drive identifier and the volume name on the command line. For example:

```
OK, ARCHIVE MYFILE -MT 0 -VOLID IAN
```

archives MYFILE to tape IAN, on drive MT 0.

The default ARCHIVE command creates and appends information about the save to the catalog for the volume identified by -VOLID.

ARCHIVE Options

Command-line options enable you to shape the command to meet your needs. You can

- Select the file system objects to save
- Create a save index
- Specify a pathname for the catalog directory
- Archive files and directories to another user's tape
- Delete saved objects from disk
- Add a remark to a save
- Control the generation of screen prompts
- Validate a save
- Save CAM files to tape as DAM files
- Archive objects to a Rev.19 tape
- Display help text about the command's syntax, arguments and options

▶ ARCHIVE

This section describes the format of the ARCHIVE command, and summarizes the functions of the command-line arguments and options.

The format of the ARCHIVE command is

```
ARCHIVE  pathname  -MT n -VOLID volume-name  [options]
```

Descriptions of arguments and options follow.

Argument	Description
pathname	Identifies the location of the objects on disk that you wish to archive. You can use wildcards, iteration and treewalking.
-MT n	Specifies the unit number n of the drive on which the reel is mounted. The drive must be online and assigned to you.
-VOLID volume-name	Identifies the name of the volume. You can either name an unused volume or specify a named volume. The volume name must be a valid object name and can be a maximum of 28 characters.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Writes to tape those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Writes to tape those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.

{ -BACKEDUP_AFTER [date] }
{ -BKA }

Writes to tape those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

{ -BACKEDUP_BEFORE [date] }
{ -BKB }

Writes to tape those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

{ -CAM_TO_DAM }
{ -CTD }

Causes any CAM files among the selected objects to be written to tape as DAM files.

{ -CATALOG_PATHNAME pathname }
{ -CAPA }

Specifies the pathname of the ARCHIVE catalog directory, if it is other than the tape owner's origin-directory>CATS*. This directory must already exist. The catalog found at pathname is checked for the correct owner. This option is required if the directory uses passwords: the password becomes part of the pathname, and you must enclose the pathname and password together in single quotes.

{ -COMPATIBLE_VERSION [rev] }
{ -CVN }

Specifies that data is to be written to tape in rev format, where rev identifies a revision of PRIMOS. The format of rev is nn or nn.n; for example 19.4. Used in a post-Rev.19 system to save data to a Rev.19 tape. This option is invalid if you archive to a tape that already has data in post-Rev.19 format. rev defaults to Rev.19.

{ -CREATED_AFTER [date] }
{ -CRA }

Writes to tape those objects created on on or after the specified date or, if date is not given, after 00:00 AM today.

{ -CREATED_BEFORE [date] -CRB }	Writes to tape those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
{ -DELETE -DL }	Deletes file system objects from disk after you have saved them to tape.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INDEX [pathname]	Creates an index of all the objects that are written to tape. If you do not specify pathname, the index is displayed on the screen: otherwise it is stored in pathname, and is not displayed.
{ -INDEX_LEVELS [n] -IXL }	Specifies the number n of levels of a directory structure that you want to include in the index, and displays the index on your screen. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen. The default value for n is 99.
{ -LEVELS n -LV }	Specifies the number of levels of the directory structure that you want to archive. The command default is to save all levels.
{ -MODIFIED_AFTER [date] -MDA -AFTER }	Writes to tape those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a Date_Time_Modified (DTM) on or after date, the command archives the directory's subordinate objects that have been modified on or after this date.

{-MODIFIED_BEFORE [date]
-MDB
-BEFORE}

Writes to tape those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today. If the object is a directory that does not have a Date_Time_Modified (DTM) before date, the command archives the directory's subordinate objects that have been modified before this date.

{-NO_QUERY
-NQ}

Suppresses command prompts when the user's response can be assumed: is used for unattended operation. If you specify this option and the command then requires some user action, the command aborts.

{-OWNER user-id
-OWN}

Identifies the owner of an ARCHIVE tape: user-id is the tape owner's user id. ARCHIVE expects to find the catalog in the tape owner's origin-directory>CATS*, unless you have used the -CAPA option to specify another catalog directory pathname. If -OWNER is not specified, ARCHIVE assumes that you are the tape owner.

-REMARK [character string]

Lets you add a comment to your tape and catalog each time that you archive data. The remark can contain a maximum of 80 characters. If spaces are included, you must enclose the entire character string in single quotation marks. If you do not specify character string, the remark is a string of blank characters.

{-TTY
-T}

If you run ARCHIVE from either a CPL program or a command input file, this option enables you to specify the tape drive number from your terminal at the end of each reel.

{-VALIDATE
-VAL}

Checks the objects that you save against the original objects on disk, and informs you of any discrepancies as the save proceeds. -VALIDATE is not a valid option if you archive to a 60Mb cartridge tape.

{ -VERIFY { -VFY	Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to save every object that matches the pathname.

HOW TO ARCHIVE DATA

This section describes, with examples, how to use the basic ARCHIVE command to save files and directories. It includes examples of the screen displays generated by ARCHIVE, and consists of the following subsections:

- Preparation describes the preparations needed before you invoke ARCHIVE
- Archiving a Directory shows how to archive a single directory
- Archiving Several Files or Directories at Once explains how to archive a number of files and/or directories
- Archiving All Your Files and Directories explains how to save all the files and directories at your current attach point
- Archiving to a 60Mb Cartridge Tape describes additional messages that you may receive when you archive data to a 60Mb cartridge tape

Note

When you run ARCHIVE, you may receive a phantom logout message. This message refers to the logging out of a disk-reader process, and is a normal part of the ARCHIVE operation. No user action is required.

Preparation

Before you use the ARCHIVE command, you should determine which files and directories you want to save. You can archive your own or anyone else's files and directories, provided that you have the correct access rights. You need

- Read rights for any files you plan to archive
- List and use rights for any directories you plan to archive
- Write and read access to the catalog

- List and use access to the catalog directory. If there is no catalog for the tape, you also need add access to the catalog directory

To check your access rights, use the LIST_ACCESS command to display them.

For example, the command

```
OK, LIST_ACCESS <SYSDSK>DIR1
```

lists your rights to <SYSDSK>DIR1.

For more information on the LIST_ACCESS command type

```
OK, HELP LIST_ACCESS
```

To archive files and directories to another user's tape, you must use the ARCHIVE options described below in Archiving an Object to Another User's Tape.

Before you invoke ARCHIVE, you must have a tape drive assigned to you, and there must be a tape mounted on that drive. Remember to unassign the tape drive when you have completed your ARCHIVE operation and removed the last reel. Chapter 3, USER CONTROL OF TAPE DRIVES, describes how to assign and unassign drives.

Archiving a Directory

In the following example a directory called PERSONNEL is archived to an ARCHIVE tape called BETA. The command ARCHIVE displays successive messages on the screen to report progress of the save.

```
OK, ARCHIVE PERSONNEL -MT 0 -VOLID BETA

[ARCHIVE Rev. 20.2 ..... ]
*** Checking mounted reel ***
MT0 rewinding.
**** Begin Save of "PERSONNEL" ****
**** End Save of "PERSONNEL" ****
OK,
```

Archiving Several Files or Directories at Once

You can save more than one file or directory at a time, by enclosing the list of objects to be saved in parentheses. In the following example, a file called NEW-HIRES and a directory TRAINING are archived at the same time.

```
OK, ARCHIVE (NEW-HIRES TRAINING) -MT 0 -VOLID RICH

[ARCHIVE Rev. 20.2 ..... ]
*** Checking mounted reel ***
MTO rewinding.
**** Begin Save of "(NEW-HIRES TRAINING)" ****
**** End Save of "(NEW-HIRES TRAINING)" ****
OK,
```

In this example the save is to an ARCHIVE tape called RICH.

Archiving All Your Files and Directories

To archive the entire contents of your current directory, use wildcards on the ARCHIVE command line, as shown below.

```
OK, ARCHIVE @@ -MT 0 -VOLID ALPHA

[ARCHIVE Rev. 20.2 ..... ]
*** Checking mounted reel ***
MTO rewinding.
**** Begin Save of "@@" ****
**** End Save of "@@" ****
OK,
```

For more information about how to use wildcards, refer to the section below, Selecting the Objects to Save.

Archiving to a 60Mb Cartridge Tape

If you archive to a 60Mb cartridge tape, use ARCHIVE in the same ways as shown above. You may, however, receive additional messages, not shown in the previous examples.

If the tape drive is to begin the save operation at the start of the tape, you may receive the messages

```
Tape initializing, please wait ...

Tape initialization complete.
```

The ARCHIVE procedure then continues as shown in the previous examples of how to archive files and directories.

USING THE ARCHIVE OPTIONS

This section describes how you can use the ARCHIVE options to shape the archive function to your requirements. It consists of the following subsections:

- Selecting the Objects to Save describes how you can specify the category of file system objects you want to save
- Creating an Index explains how you can create an index of the objects saved
- Specifying the Catalog Location explains how to specify the pathname of the ARCHIVE catalog directory when it is not the default pathname
- Archiving Objects to Another User's Tape describes how to archive files and directories to a tape that you do not own
- Deleting Saved Objects From Disk describes how you can automatically delete objects from disk after they have been saved
- Adding a Remark to the Save explains how to add a descriptive remark about the save, to the tape and the catalog
- Controlling Command Queries describes how to suppress the generation of those command prompts where the user's response can be assumed, and how to make the command interactive when you run ARCHIVE from either a CPL program or a command input file
- Validating the Save describes how you can compare the original objects on disk with those saved to tape
- Converting CAM to DAM Files shows how to change the format of RBF files when you archive them
- Moving Objects to a Rev.19 System explains how to transfer file system objects to a Rev.19 system

Selecting the Objects to Save

This section describes how you can determine which file system objects are saved. You can

- Specify the pathname of the object(s) you wish to save
- Specify the number of levels of the directory structure that you want to save
- Select objects according to the date on which they were created, last accessed, last backed up, or last modified

Specifying the Pathname: The ARCHIVE argument pathname enables you to specify the pathname of the file system object that you wish to save. For example, the command

```
OK, ARCHIVE BOB>TEST1 -MT 0 -VOLID ALPHA
```

saves file system object BOB>TEST1 to the reel on MT0.

You can use wildcards, iteration and treewalking with the pathname.

When you use wildcards in the pathname, you can also include the -VERIFY option on the ARCHIVE command line. This causes ARCHIVE to prompt you to verify that you wish to archive the file system objects selected by your wildcard specification.

You can use wildcard options to

- Select only file system objects of a particular type
- Select objects according to when they were created, last accessed, last backed up, or last modified
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, ARCHIVE BOB>PROJ@@ -MT 0 -VOLID ALPHA -DIR
```

saves, to the reel on MT0, any occurrences of subdirectories in BOB whose names begin with PROJ.

Note that you must use the -RBF wildcard option when you want to select RBFs (Recovery Based Files). For example, by including the wildcard options -FILE and -RBF, the command

```
OK, ARCHIVE @@ -MT 0 -VOLID RBF.ARCH -FILE -RBF
```

saves all files and all RBFs to volume RBF.ARCH.

For a detailed account of how to use ARCHIVE to save RBF files, refer to the ROAM Administrator's Guide.

Treewalking options direct the command to designated objects within a directory tree. You can only use these options when you include a wildcard in an intermediate position in the pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about the use of wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. You can obtain online HELP about how to use treewalking and wildcard options with ARCHIVE, by issuing the command

```
OK, ARCHIVE -HELP WILDCARDS
```

Specifying the Number of Directory Levels: The ARCHIVE default is to save all levels of the selected directory structure. However, the -LEVEL n option enables you to specify that the save is to include only n levels, where 1 is the top level. For example, the command

```
OK, ARCHIVE @@ -MT 0 -VOLID ALPHA -LEVELS 2
```

saves only the top two levels of the directory structure.

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up
- Created
- Last modified

For each of the above events, you can select objects to archive on the basis of whether the event took place before, on, or after a specified date.

The ARCHIVE options are

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]

The options suffixed with _AFTER cause ARCHIVE to save only objects that have been created, last accessed, last backed up, or last modified on or after the specified date.

The options suffixed with _BEFORE cause ARCHIVE to save only objects that have been created, last accessed, last backed up, or last modified before the specified date.

Note that these options are not exclusive: you can select objects for listing on the basis of more than one of the file attributes.

You can specify date in any one of the following formats:

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as 2 digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes.

Thus if you do not specify date, it defaults to 00:00 AM TODAY.

In the following example, any object that has been modified before 00:00 AM TODAY is archived to volume BETA. This example uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, ARCHIVE @@ -MT 0 -VOLID BETA -MDB
```

As another example, the following command archives, to volume MYFILES, any object that has been backed up after 18th May 1986:

```
OK, ARCHIVE @@ -MT 0 -VOLID MYFILES -BACKEDUP_AFTER 05/18/86
```

Creating an Index

ARCHIVE options enable you to create an index of the objects you save to tape, and to control the level of information in the index.

Two options are available:

- -INDEX [pathname]
- -INDEX_LEVELS [n]

The -INDEX [pathname] option generates an index of all the objects you archive, unless you modify this by also using the -INDEX_LEVELS option. When you do not specify pathname, the index is displayed on your screen. If you do specify a file pathname, the command sends the listing to the file, instead of displaying it on your screen. If this file already exists, the index is appended to the end of the file. If the file is one of the objects that you have selected for archiving, you receive a "File in use" error message, and the index is not saved.

The following example command uses the -INDEX option to display an index of all the objects you save:

```
OK, ARCHIVE @@ -MT 0 -VOLID ARCH2 -INDEX
```

The next example shows how you can file the index by adding a file pathname to the -INDEX option. In this example the command would file the index in ARCH2_IX.

```
OK, ARCHIVE @@ -MT 0 -VOLID ARCH2 -INDEX ARCH2_IX
```

When you use the -INDEX option, the ARCHIVE default is to index all selected objects. You can, however, restrict the index to a number of levels by including the -INDEX_LEVELS [n] option on the command line,

where n is the number of levels that you want to index, and level 1 is the top level.

You can use the -INDEX_LEVELS option in conjunction with the -INDEX option, or on its own.

When you use the -INDEX_LEVELS option with -INDEX, -INDEX_LEVELS determines the number of levels of the save that are indexed, and -INDEX allows you to write the index to a file. The following example extends the previous example command line by adding the option -IXL 2, which specifies that you want to index only the top two levels of the save. In this example the index would be sent to file ARCH2_IX.

```
OK, ARCHIVE @@ -MT 0 -VOLID ARCH2 -INDEX ARCH2_IX -IXL 2
```

When you use the -INDEX_LEVELS option on a command line that does not also include the -INDEX option, -INDEX_LEVELS generates an index to the specified level and displays the index on your screen: you cannot write the index to a file. For example, the command

```
OK, ARCHIVE @@ -MT 0 -VOLID ARCH2 -IXL 2
```

displays a two-level index of the save on your screen.

Specifying the Catalog Location

The default ARCHIVE command assumes that the pathname of the ARCHIVE catalog directory is origin-directory>CATS*. If the catalog directory is located elsewhere, you must inform ARCHIVE of that location by using the -CATALOG_PATHNAME option. For example, if your ARCHIVE catalogs are held in BOB>ARCHIVE1>CATS*, you must include the option -CAPA BOB>ARCHIVE1>CATS* on the command line whenever you invoke ARCHIVE.

Archiving Objects to Another User's Tapes

ARCHIVE assumes that you want to save your files and directories to your own tape. However, you can archive your files and directories to another user's tape if you have the necessary access rights (see the subsection Preparation, earlier in this chapter). You tell ARCHIVE the name of the owner by using the -OWNER user-id option.

In the following example, all the files and directories would be archived to TOM's tape ARCH_TOM:

```
OK, ARCHIVE @@ -MT 0 -VOLID ARCH_TOM -OWNER TOM
```

Here ARCHIVE would assume the default pathname for TOM's catalog directory.

Deleting Saved Objects From Disk

The ARCHIVE default is to leave the objects on disk after they have been saved to tape. However, if you do not expect to use these files and directories again, it is sensible to delete them from disk. This gives you more disk space, and could improve system performance. The -DELETE option causes ARCHIVE to automatically delete objects from disk after they have been saved to tape.

Adding a Remark to the Save

Whenever you invoke ARCHIVE, you can specify a remark that will be written to the tape and the catalog. Do this by specifying the -REMARK character string option on the command line. The remark can be a maximum of 80 characters, including spaces. If you include spaces in the remark, you must enclose the entire character string in single quotation marks '.....'. The remark is displayed against the save number whenever you request reel statistics as part of a LIST_TAPE or LIST_CATALOG command. (See Chapter 24, LISTING A CATALOG: LIST_CATALOG and Chapter 25, LISTING A TAPE: LIST_TAPE, for example displays of reel statistics.)

For example, you might want to add a remark such as Inactive files. The following command adds this remark to a save of file system object TEST_FILES:

```
OK, ARCHIVE TEST_FILES -MT 0 -VOLID ARCH1 -REMARK 'Inactive files'
```

If you do not specify a character string, the remark is a string of blank characters: the effect is exactly the same as if you had not used the -REMARK option.

Note that you cannot change a save's remark.

Controlling Command Queries

The -NO_QUERY option suppresses any command prompts to which a user response is assumed. If you specify this option, and a situation arises in which user action is required, the command aborts. You should therefore only use this option if you are confident that no user action will be required.

When you run ARCHIVE from either a CPL program or a command input file, specify the option -TTY if you want to be able to specify the tape drive number from your terminal at the end of each reel.

Validating the Save

You can check that the save operation has written the original objects on disk to tape by including the -VALIDATE option on the ARCHIVE command line. This option compares the disk objects with the objects written to tape. You receive a warning message if ARCHIVE finds any discrepancies between the disk and tape objects.

Notes

When you use the -VALIDATE option, the save takes noticeably longer.

ARCHIVE modifies a file's DTA (Date_Time_Accessed) attribute, and -VALIDATE therefore does not detect up discrepancies in the DTA field.

The -VALIDATE option is not supported if you archive data to a 60Mb cartridge tape.

Converting CAM to DAM Files

Contiguous Access Method (CAM) files, were introduced at PRIMOS Rev.20, to improve the performance of ROAM data management products. It is not possible to either create or access CAM files using pre-Rev.20 versions of PRIMOS, and ARCHIVE therefore has an option, -CTD, to write CAM files to tape as DAM files.

For example, the command

```
OK, ARCHIVE @@ -MT 0 -VOLID ALPHA1 -CTD
```

saves the entire contents of your current directory to ALPHA1, and writes any CAM files as DAM files.

Moving Objects to a Rev.19 System

The ARCHIVE command allows you to save objects to tape in Rev.19 format, so that you can subsequently restore these objects on a Rev.19 system.

Use the ARCHIVE -CVN option to convert data to Rev.19 format when you perform the save.

The complete procedure for moving objects to a Rev.19 system is

1. Issue the ARCHIVE command with the -CVN option. For example:

   OK, ARCHIVE REPORTS -MT 0 -VOLID R19_TAPE -CVN 19

   appends REPORTS to volume R19_TAPE, and writes REPORTS in Rev.19 format.

2. If you wish to recreate the catalog, run GENERATE_CATALOG on the Rev.19 system.

3. Run ARCHIVE_RESTORE on the Rev.19 system to restore REPORTS from R19_TAPE to disk.

Remember that you must have access to the catalog to restore an ARCHIVE tape. If the catalog does not exist, you must be either the System Administrator or tape owner to restore an ARCHIVE tape.

Remember also that you cannot restore RBF files to another machine.

6
Restoring Archived Data: ARCHIVE_RESTORE

INTRODUCTION

This chapter describes in detail how to use the ARCHIVE_RESTORE command to restore files and directories from tape to disk. It also includes an overview of the command, and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF ARCHIVE_RESTORE introduces the ARCHIVE_RESTORE command. It explains how the command handles ACLs and file attributes, describes the function of the default command, and summarizes the command options.

ARCHIVE_RESTORE describes the command format, arguments and options.

HOW TO RESTORE DATA explains how to use ARCHIVE_RESTORE to restore your files and directories from tape.

USING THE ARCHIVE_RESTORE OPTIONS explains how to use each of the command options to extend the command's function.

OVERVIEW OF ARCHIVE_RESTORE

ARCHIVE_RESTORE restores directories and files saved to tape by the ARCHIVE command. You can restore objects from both your own and other user's tapes if you have the correct access rights. (See the section HOW TO RESTORE DATA, later in this chapter, for information about access rights.)

To restore an object, you enter its pathname on the command line. You should always take care that the pathname uniquely identifies the object that you want to restore, because ARCHIVE_RESTORE restores all objects with that pathname.

ARCHIVE_RESTORE always restores the selected objects to your current attach point, unless you also specify a new pathname on the command line. The new pathname allows you to restore objects to another attach point, or to rename them as they are restored. If any of the specified objects already exist on disk, ARCHIVE_RESTORE overwrites these objects with the tape versions.

The command always reads the catalog before it restores an object from tape, and the default command expects to find the catalog in subdirectory CATS* of the tape owner's origin directory. If you have deleted the catalog, or it is corrupted, ARCHIVE_RESTORE asks whether you want to restore the tape without the catalog. If you answer yes, ARCHIVE_RESTORE reads the tape sequentially, record by record, until it finds the objects you want to restore. This slows the restore process significantly, and you are therefore advised not to delete catalogs.

When the catalog is not in the default location, your origin-directory>CATS*, use a command-line option to identify the location. The section USING THE ARCHIVE_RESTORE OPTIONS later in this chapter describes how to do this.

If the catalog is damaged, either the tape owner or the System Administrator can regenerate the catalog by using the GENERATE_CATALOG command. This procedure is described in Chapter 23, REGENERATING AND VALIDATING CATALOGS: GENERATE_CATALOG.

How ARCHIVE_RESTORE Handles ACLs, DTM and DTB

ARCHIVE_RESTORE always copies the ACL protection of an object on tape, regardless of whether it overwrites an existing object on disk, or creates a new object on disk.

When it overwrites an existing object, ARCHIVE_RESTORE also overwrites that object's Date_Time_Modified (DTM) attribute: the DTM of the disk object becomes the same as the DTM of the tape object.

ARCHIVE_RESTORE sets the Date_Time_Backed-up (DTB) to never backed up, so that the object is saved during the next system backup.

Default ARCHIVE_RESTORE Command

You can restore archived objects simply by specifying their pathname and the tape drive identifier on the ARCHIVE_RESTORE command line. For example:

```
OK, ARCHIVE_RESTORE TEST_FILE3 -MT 0
```

restores TEST_FILE3 from the tape on MT0.

The default command searches all your catalogs for the tape objects specified by the pathname argument, lists the volumes and reels needed to restore these objects and, if it is not already mounted, asks you to mount the first reel. If the object has been archived to tape more than once, the command restores the most recent version.

ARCHIVE_RESTORE Options

Command-line options enable you to shape the command to meet your needs. You can

- Specify the volume and/or the reel that you want to restore objects from
- Select categories of file system objects to be restored
- Select which saves you wish to restore
- Create a restore index
- Specify a pathname for the catalog directory
- Restore files and directories from another user's tape
- Control the generation of screen prompts
- Restore all RBF files as either CAM or DAM files
- Display help text about the command's syntax, arguments and options

▶ ARCHIVE_RESTORE

This section describes the format of the ARCHIVE_RESTORE command, and summarizes the functions of the command-line arguments and options.

The format of the ARCHIVE_RESTORE command is

ARCHIVE_RESTORE pathname [new-pathname] -MT n [options]

Descriptions of the arguments and options follow.

Argument	Description
pathname	Identifies the objects on tape that you wish to restore. Also called the source pathname. You can use wildcards, iteration and treewalking.
new-pathname	Identifies the pathname of the objects when restored to disk. Also called the target pathname. This allows you to rename an object as it is restored, and/or to place the object in a location other than your current attach point. You can use name generation with new-pathname. If you do not give a new pathname, the object being restored is copied into your current attach point, and has the same name as on tape.
-MT n	Specifies the unit number n of the drive on which the reel is mounted. The drive must be online and assigned to you.

Option	Description
{ -ACCESSED_AFTER [date] } { -ACA }	Restores those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.

{ -ACCESSED_BEFORE [date] }
{ -ACB }

Restores those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.

{ -BACKEDUP_AFTER [date] }
{ -BKA }

Restores those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

{ -BACKEDUP_BEFORE [date] }
{ -BKB }

Restores those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

{ -CAM_RBF }
{ -CRBF }

Restores any DAM RBF files as CAM files. Useful for restoring runfiles created at Rev. 19 on a Rev. 19 partition to a Rev. 20 partition.

{ -CATALOG_PATHNAME pathname }
{ -CAPA }

Specifies the pathname of the ARCHIVE_RESTORE catalog directory, if it is other than the tape owner's origin-directory>CATS*. The catalog directory must already exist. The catalog found at pathname is checked for the correct owner. This option is required if the directory uses passwords: the password becomes part of the pathname, and you must enclose the pathname and password together in single quotes.

{ -COMBINE }
{ -COMB }

Only restores objects that do not already exist on disk.

-CREATED_AFTER [date] -CRA	Restores those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
-CREATED_BEFORE [date] -CRB	Restores those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-DAM_RBF -DRBF	Restores any CAM RBF files as DAM files. Used to restore data from a post-Rev. 19 partition to a Rev. 19 partition.
-FROM_SAVE_NUMBER n -FSN	Starts the restore at save number n. Values for n are 1-255. The command default is to begin at the first save on the reel. This option is not valid when you restore from a 60Mb cartridge tape drive.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INDEX [pathname]	Creates an index of all the objects that are restored to disk. If you do not specify pathname, the index is displayed on the screen: otherwise it is stored in pathname, and is not displayed.
-INDEX_LEVELS [n] -IXL	Specifies the number n of levels of a directory structure that you want to index, and displays the index on your screen. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen. The default value for n is 99.
-MODIFIED_AFTER [date] -MDA -AFTER	Restores those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a DTM on or after date,

the command restores the directory's subordinate objects that have been modified on or after this date.

{-MODIFIED_BEFORE [date] -MDB -BEFORE}	Restores those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today. If the object is a directory that does not have a DTM before date, the command restores the directory's subordinate objects that have been modified before this date.
{-NO_QUERY -NQ}	Suppresses command prompts when the user's response can be assumed: is used for unattended operation. If you specify this option and the command then requires user action, the command aborts.
{-OWNER user-id -OWN}	Identifies the tape owner: user-id is the tape owner's user id. This option allows you to restore from another user's tape if you have access rights to the tape catalog. ARCHIVE_RESTORE expects to find the catalog in the tape owner's origin-directory>CATS*, unless you have used the -CAPA option to specify another catalog directory pathname. If -OWNER is not specified, ARCHIVE_RESTORE assumes that you are the tape owner.
-REEL n	Identifies the reel from which to restore objects. The command default is to restore all reels of a tape in sequence.
-REPLACE	Only restores those objects that already exist at the restore point: that is, the command overwrites existing objects.
{-TO_SAVE_NUMBER n -TSN}	Ends the restore when save number n is reached, and does not restore from save n. Values for n are 1-255. The command default is to continue to the end of the tape volume. This option is not valid when you restore from a 60Mb cartridge tape drive.

{-TTY / -T}

If you run ARCHIVE_RESTORE from either a CPL program or a command input file, this option enables you to specify the tape drive identifier from your terminal at the end of each reel.

{-VERIFY / -VFY}

Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to restore the latest saves of every object that matches the pathname.

-VOLID volume-name1...volume-name10

Identifies the tape volumes from which to restore objects. You can specify a maximum of 10 volume names. The volume name must be a valid object name and can be a maximum of 28 characters long. The command default is to search all your catalogs for the objects you want to restore.

{-WRITTEN_AFTER [date] / -WRA}

Restores only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today. If the object is a directory and was not written to tape on or after the given date, the command restores the directory's subordinate objects written to tape on or after this date.

{-WRITTEN_BEFORE [date] / -WRB}

Restores only those objects that were written to tape before date or, if date is not given, before 00:00 AM today. If the object is a directory and was not written to tape before the given date, the command restores the directory's subordinate objects written to tape before this date.

HOW TO RESTORE DATA

This section describes, with examples, how to use the basic ARCHIVE_RESTORE command to restore files and directories. It includes examples of the screen displays generated by ARCHIVE_RESTORE, and consists of the following subsections:

- Preparation describes the preparation needed before you restore files and directories
- Restoring an Archived File or Directory shows how to restore a single file or directory
- Restoring Several Files or Directories explains how to restore a number of files and/or directories
- Restoring All Your Files and Directories shows how to restore all your files and directories from a tape

Note that the examples in this section assume that the catalogs are in your origin-directory>CATS*. If your catalogs are in a different location you must use the -CATALOG_PATHNAME option, which is described in the section Specifying the Catalog Location, later in this chapter.

Preparation

Before you use the ARCHIVE_RESTORE command, you should determine which files and directories you want to restore. You can restore files and directories from your own tapes, or from any other user's tapes, provided that you have the necessary access rights. You need

- Write access to restore an existing file
- Add, delete, list, and use access to restore an existing directory
- Add rights if the object is not in the target directory
- List and use rights to the catalog directory
- Read rights to the catalog

To check your access rights, use the LIST_ACCESS command to display them.

For example:

```
OK, LIST_ACCESS <SYSDSK>DIR1
```

lists your rights to <SYSDSK>DIR1.

For more information on the LIST_ACCESS command type

```
OK, HELP LIST_ACCESS
```

You must also consider the location of the catalog. If it is not in your origin-directory>CATS*, you must use the -CATALOG_PATHNAME option, described below in the section Specifying the Catalog Location. To restore files and directories from another user's tape, you must use the ARCHIVE_RESTORE options described below in the section Restoring Files and Directories from Another User's Tape.

Before you invoke ARCHIVE_RESTORE, you must have a tape drive assigned to you, and there must be a tape mounted on that drive. Remember to unassign the tape drive when you have completed your ARCHIVE_RESTORE operation and removed the last reel. Chapter 3, USER CONTROL OF TAPE DRIVES, describes how to assign and unassign drives.

Restoring an Archived File or Directory

This section describes how to restore a single file or directory.

This following example assumes that a directory called REPORTS in top-level directory JOHN has been archived to volume BETA. Assume also that there is an index of the save in file BETA.INDEX. If you were to list the index to see which files were saved as part of REPORTS, it might show four files: JAN.REPORT, FEB.REPORT, MAR.REPORT, Q1.REPORT, as follows:

```
OK, SLIST BETA.INDEX
ARCHIVE index of tape BETA
Generated by user JOHN on 16 March 87 12:00:48 Monday

**** reel 1 ****
***** save number 2 *****
acl dir     <DSK1>MFD>JOHN>REPORTS
sam         <DSK1>MFD>JOHN>REPORTS>JAN.REPORT
sam         <DSK1>MFD>JOHN>REPORTS>FEB.REPORT
sam         <DSK1>MFD>JOHN>REPORTS>MAR.REPORT
sam         <DSK1>MFD>JOHN>REPORTS>Q1.REPORT

          ***** Tape Statistics *****
tape density : 1600 bpi, maximum block size : 5141 words
total number of recovered errors in this save/restore : 0
total number of files saved/restored          : 5
total number of blocks saved/restored         : 18

***** End of index *****
OK,
```

Here the index lists the directory REPORTS and its four files. Note that the index shows the full pathnames of the archived files. The tape statistics, which appear at the end of the listing, include information about the tape density, the number of read errors from which the command has recovered, and the number of files saved. The tape statistics also specify the maximum block size. However, this is a fixed aspect of the software, and has no special significance for your restore.

You can control the point to which a directory or file is restored in one of two ways:

- Attach to the desired restore point, and specify the source pathname of the object you want to restore on the ARCHIVE_RESTORE command line
- Specify the full source and target pathnames while you are at any attach point

For example, if your current attach point is <DSK1>JOHN, you can restore the entire directory REPORTS as a subdirectory of JOHN by specifying any of the following pathnames:

```
JOHN>REPORTS
<DSK1>JOHN>REPORTS
*>REPORTS
REPORTS
```

Note

Always use a unique pathname, to ensure that the correct file system object is restored.

The following example shows how you can restore the directory by using the simplest of these pathnames, REPORTS. It assumes that you want to restore REPORTS to your current attach point. As ARCHIVE_RESTORE restores REPORTS, it displays messages on the screen to keep you informed of progress as follows:

```
OK, ARCHIVE_RESTORE REPORTS -MT 0 -VOLID BETA

[ARCHIVE_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : BETA ****

List of tapes containing saves of "REPORTS".
Tape name: BETA, reel(s): 1

**** Checking mounted reel ****
**** Begin restore of "REPORTS" ****
**** Positioning tape ****
**** End restore of "REPORTS" ****
OK,
```

In this example ARCHIVE_RESTORE checks the BETA catalog against the mounted reel. The correct reel is loaded, and ARCHIVE_RESTORE therefore restores the directory without prompting you for the correct reel. The -VOLID option causes ARCHIVE_RESTORE to search only the BETA catalog, rather than all the user's catalogs.

If you only want to restore a single file from directory REPORTS, you must again specify the full pathname of the file, but you do not need to specify the MFD element of the pathname. In the following example the BETA index shows that REPORTS has a file FEB.REPORT, and just this file is restored to the current attach point.

```
OK, ARCHIVE_RESTORE *>REPORTS>FEB.REPORT -MT 0

[ARCHIVE_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : ALPHA ****
**** Processing catalog : BETA ****

List of tapes containing saves of "*>REPORTS>FEB.REPORT".
Tape name: BETA, reel(s): 1

**** Checking mounted reel ****
**** Begin restore of "*>REPORTS>FEB.REPORT" ****
**** Positioning tape ****
**** End restore of "*>REPORTS>FEB.REPORT" ****
OK,
```

In this example there are two catalogs, ALPHA and BETA. ARCHIVE_RESTORE checks the catalogs, lists the volumes and reels that contain FEB.REPORT, and checks that the mounted reel is the correct one (BETA reel 1 in this case). ARCHIVE_RESTORE then copies the file FEB.REPORT to the location <DSK1>JOHN>FEB.REPORT, and returns you to PRIMOS level.

You can give a new name to a file system object that you restore. For example, the command

```
OK, ARCHIVE_RESTORE *>REPORTS>FEB.REPORT FEB.ARCH -MT 0
```

restores file FEB.REPORT to your current attach point and gives the restored file the name FEB.ARCH: the file on tape retains the name FEB.REPORT.

Restoring Several Files or Directories

You can restore more than one file or directory at a time by enclosing the list of objects to be restored in parentheses. The following example, restores a file called ADDRESSES and a directory called PROJECTS at the same time. In this instance the restore is from volume GAMMA.

```
OK, ARCHIVE_RESTORE (ADDRESSES PROJECTS) -MT 0 -VOLID GAMMA

[ARCHIVE_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : GAMMA ****

List of tapes containing saves of "(ADDRESSES PROJECTS)".
Tape name: GAMMA, reel(s): 1

**** Checking mounted reel ****
**** Begin restore of "(ADDRESSES PROJECTS)" ****
**** Positioning tape ****
**** End restore of "(ADDRESSES PROJECTS)" ****
OK,
```

Restoring All Your Files and Directories

You can use wildcards on the ARCHIVE_RESTORE command line to restore the latest versions of all file system objects on tape. In the following example all your files and directories are restored from a volume BETA.

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID BETA

[ARCHIVE_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : BETA ****

List of tapes containing saves of "@@".
Tape name: BETA, reel(s): 1

**** Checking mounted reel ****
**** Begin restore of "@@" ****
**** Positioning tape ****
**** End restore of "@@" ****
OK,
```

USING THE ARCHIVE_RESTORE OPTIONS

This section describes how you can use the ARCHIVE_RESTORE options to shape the restore function to particular requirements. It consists of the following subsections:

- Specifying the Volume and/or Reel to Restore explains how to specify the volumes and/or reels from which the selected objects are to be restored
- Specifying the Catalog Location explains how to specify the pathname of the catalog directory when it is not the default pathname

- Selecting the Objects to Restore describes how you can specify that only certain categories of file system objects are to be restored
- Selecting the Saves to Restore shows how you can restore only selected saves
- Creating an Index explains how you can create an index of the objects restored
- Restoring Files and Directories from Another User's Tape describes how to restore files and directories from a tape that you do not own
- Controlling Command Queries describes how to suppress the generation of those command prompts where the user's response can be assumed, and how to make the command interactive when you are running ARCHIVE_RESTORE from either a CPL program or a command input file
- Converting Between CAM and DAM Files shows how to change the format of RBF files when you restore them

Specifying the Volume and/or Reel to Restore

The command default is to explore all your catalogs for the objects specified on the ARCHIVE_RESTORE command line. When it finds these objects, ARCHIVE_RESTORE lists the volumes and reels that are needed, and asks you to mount the first reel. When more than one reel is needed to complete a restore, you are prompted at the appropriate time to mount the next reel.

To restrict the search to specific catalogs, and to ensure that the restores are only made from selected volumes, use the -VOLID option on the command line. This option specifies the names of the volumes. For example:

```
OK, ARCHIVE_RESTORE REPORTS -MT 0 -VOLID ANN.ARCH
```

only restores REPORTS from volume ANN.ARCH. ARCHIVE_RESTORE checks the mounted reel against the ANN.ARCH catalog: if the reel on MT0 were not part of ANN.ARCH, or did not hold REPORTS, you would be prompted for the correct reel. If ANN.ARCH did not have a version of REPORTS, ARCHIVE_RESTORE would inform you of this, and return you to PRIMOS.

You can also restrict the restore to a specific reel by using the -REEL option on the command level. For example the following command

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID ANN.ARCH -REEL 3
```

restores objects from reel 3 of ANN.ARCH. Here, if reel 3 were not mounted on MTO, you would be prompted to mount the correct reel.

Specifying the Catalog Location

The default ARCHIVE_RESTORE command assumes that the pathname of the ARCHIVE catalog directory is origin-directory>CATS*. If the catalog directory is located elsewhere, you must inform ARCHIVE_RESTORE of that location by using the -CATALOG_PATHNAME option. For example, if your ARCHIVE catalogs are held in BOB>ARCHIVE_RESTORE1>CATS*, you must include the option -CAPA BOB>ARCHIVE_RESTORE1>CATS* on the command line whenever you invoke ARCHIVE_RESTORE.

Selecting the Objects to Restore

This section describes how to control which file system objects are restored. You can

- Specify the source and target pathnames of the object(s) you wish to restore
- Select objects according to whether or not they already exist on disk
- Select objects according to the date on which they were created, last accessed, last backed up, last modified, or last written to tape

In addition, you can also select the saves that you want to restore. You can begin and end the restore at specific saves, or can select a particular save of a certain file system object. See the section Selecting the Saves to Restore, which follows, for details of how to select saves.

Specifying the Pathname: The ARCHIVE_RESTORE arguments pathname and new-pathname enable you to specify the source and target pathnames of the file system object that you wish to restore. For example:

```
OK, ARCHIVE_RESTORE BOB>NET NET2 -MT 0 -VOLID ALPHA
```

restores the latest save of file system object BOB>NET as NET2.

You can use wildcards, iteration, treewalking and name generation with the pathname.

When you use wildcards in the pathname, you can also include the -VERIFY option on the ARCHIVE_RESTORE command line. This causes ARCHIVE_RESTORE to prompt you to verify that you wish to restore the file system objects selected by your wildcard specification.

You can use wildcard options to

- Select only file system objects of a particular type
- Select objects according to when they were created, last accessed, last backed up, last modified, or last written to tape
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, ARCHIVE_RESTORE BOB>PROJ@@ -MT 0 -VOLID ALPHA -DIR
```

restores the latest saves of subdirectories in BOB whose names begin with PROJ.

Treewalking options direct the command to designated objects within a directory tree. You can only use these options when you include a wildcard in an intermediate position in the source pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about how to use wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. You can also obtain online HELP about how to use these options with ARCHIVE_RESTORE by issuing the command

```
OK, ARCHIVE_RESTORE -HELP WILDCARDS
```

Combining and Replacing File System Objects: You can choose to restore

- Only objects that already exist on disk (-REPLACE)
- Only objects that do not already exist on disk (-COMBINE)

For example:

```
OK, ARCHIVE_RESTORE @@ -MT 0 -REPLACE
```

restores only objects that already exist on disk. The option -REPLACE thus replaces objects on disk with the tape versions of these objects. Objects on disk are unchanged if there is not an object with an identical name on tape, and objects are not restored if there is not an identically-named object on disk.

The -COMBINE option restores only objects that do not already exist on disk: it adds new objects to disk. However, if ARCHIVE_RESTORE finds that a top-level directory already exists at the target pathname, it still allows you to perform the combine operation. The command asks whether you want to overwrite the directory. If you answer no, ARCHIVE_RESTORE restores no part of that directory. If you answer yes, it restores any file system objects that do not already exist in the disk version of the directory.

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up
- Created
- Last modified
- Last written to tape

For each of the above events, you can select objects to restore on the basis of whether the event took place before, on, or after a specified date.

The ARCHIVE_RESTORE options are

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]
- -WRITTEN_AFTER [date] and -WRITTEN_BEFORE [date]

The options suffixed with _AFTER cause ARCHIVE_RESTORE to restore only objects that have been created, last accessed, last backed up, last modified, or last written to tape on or after the specified date.

The options suffixed with _BEFORE cause ARCHIVE_RESTORE to restore only objects that have been created, last accessed, last backed up, last modified, or last written to tape before the specified date.

Note that these options are not exclusive: you can select objects for listing on the basis of more than one of the file attributes.

You can specify date in any one of the following formats:

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as 2 digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes.

Thus if you do not specify date, it defaults to 00:00 AM TODAY.

In the following example, any object that has been modified before 00:00 AM TODAY is restored from volume BETA. This example uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID BETA -MDB
```

As another example, the following command restores, from volume BETA, any object that has been backed up after 18th May 1986:

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID BETA -BACKEDUP_AFTER 05/18/86
```

Selecting the Saves to Restore

The ARCHIVE_RESTORE default is to start the first save on the mounted reel, and to continue through to the last save on the reel. However, command options enable you to

- Begin at a specific save (-FROM_SAVE_NUMBER)
- End at a specific save (-TO_SAVE_NUMBER)

For example, the command

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID ARCH1 -FSN 3 -TSN 6
```

restores objects from saves 3 to 5 inclusive, from volume ARCH1. This example uses the abbreviated names for the -FROM_SAVE_NUMBER and -TO_SAVE_NUMBER options. Note that -TSN specifies save 6. The restore stops when it reaches this save, and so save 5 is the last save restored.

Creating an Index

ARCHIVE_RESTORE options enable you to create an index of the objects you restore, and to control the level of information in the index.

Two options are available:

- -INDEX [pathname]
- -INDEX_LEVELS [n]

The -INDEX [pathname] option generates an index of all the objects you restore, unless you modify this by also using the -INDEX_LEVELS option. When you do not specify pathname, the index is displayed on your screen. If you do specify a file pathname, the command sends the listing to the file, instead of displaying it on your screen. If this file already exists, the index is appended to the end of the file. If the file is one of the objects that you have selected to restore, you receive a "File in use" error message, and the index is not saved.

The following example command uses the -INDEX option to display an index of all the objects you restore from volume ARCH2.

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID ARCH2 -INDEX
```

The next example shows how you can file the index by adding a file pathname to the -INDEX option. In this example the command would file the index in ARCH2_IX.

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID ARCH2 -INDEX ARCH2_IX
```

When you use the -INDEX option, the ARCHIVE_RESTORE default is to index all the selected objects. You can, however, restrict the index to a number of levels by including the -INDEX_LEVELS [n] option on the command line, where n is the number of levels that you want to index, and level 1 is the top level.

You can use the -INDEX_LEVELS option in conjunction with the -INDEX option, or on its own.

When you use the -INDEX_LEVELS option with -INDEX, -INDEX_LEVELS determines the number of levels of the restore that are indexed, and -INDEX allows you to write the index to a file. The following example extends the previous example command line by adding the option -IXL 2, which specifies that you want to index only the top two levels of the restore. In this example the index would be sent to file ARCH2_IX.

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID ARCH2 -INDEX ARCH2_IX -IXL 2
```

When you use the -INDEX_LEVELS option on a command line that does not also include the -INDEX option, -INDEX_LEVELS generates an index to the specified level and displays the index on your screen: you cannot write the index to a file. For example, the command

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID ARCH2 -IXL 2
```

displays a two-level index of the restore on your screen.

Restoring Files and Directories from Another User's Tape

ARCHIVE_RESTORE assumes that you want to restore files and directories from your own tape. However, you can restore files and directories from another user's tape if you have the necessary access rights (see the subsection Preparation, earlier in this chapter). You tell ARCHIVE_RESTORE the name of the owner by using the -OWNER user-id option. For example, if you have sufficient access and the catalog directory is in the default location,the command

```
OK, ARCHIVE_RESTORE @@ -MT 0 -VOLID ARCH_TOM -OWNER TOM
```

restores the latest versions of all the files and directories of user TOM from volume ARCH_TOM.

Controlling Command Queries

The -NO_QUERY option suppresses any command prompts to which a user response is assumed. If you specify this option, and a situation arises in which user action is required, the command aborts. You should only use this option if you are confident that no user action will be required.

When you run ARCHIVE_RESTORE from either a CPL program or a command input file, specify the option -TTY if you want to be able to specify the tape drive number from your terminal at the end of each reel.

Converting Between CAM and DAM Files

Contiguous Access Method (CAM) files were introduced at PRIMOS Rev.20, to improve the performance of ROAM data management products. It is not possible to either create or access CAM files via pre-Rev.20 versions of PRIMOS. ARCHIVE_RESTORE therefore has otions to restore CAM files as DAM files, and vice versa. The options are

- -CAM_RBF, which restores all RBF files as CAM files, regardless of whether they were saved as CAM or DAM files
- -DAM_RBF, which restores all RBF files as DAM files, regardless of whether they were saved as CAM or DAM files

For details of how to use ARCHIVE_RESTORE to restore RBF files, refer to the ROAM Administrator's Guide.

7

Transporting Data: TRANSPORT

INTRODUCTION

This chapter describes in detail how to use the TRANSPORT command to save files and directories from disk to tape. It also includes an overview of the command, and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF TRANSPORT introduces the TRANSPORT command. It describes the function of the default command, and summarizes the command options.

TRANSPORT describes the command format, arguments and options.

HOW TO TRANSPORT DATA explains how to use the TRANSPORT command to save your files and directories to tape.

USING THE TRANSPORT OPTIONS explains how to use each of the command options to extend the command's functions.

OVERVIEW OF TRANSPORT

Transporting is a means of sending file system objects from one Prime site to another on magnetic tape. A TRANSPORT tape can be restored at any site.

TRANSPORT is similar, but not identical to ARCHIVE. Both commands copy directories, segment directories, and files from disk to tape. If the object is a directory, TRANSPORT automatically copies all of its files and subdirectories. However, unlike ARCHIVE, TRANSPORT does not copy RBF files. Nor does it create catalogs during a save. Instead, TRANSPORT stores the information needed for a restore on reel labels that are invisible to the user. To ensure site security, TRANSPORT does not record the full pathname of the object it saves: it only records the object name and the tree structure below the object.

The function of TRANSPORT is to save objects in a way that permits Prime users to restore these objects on another Prime system without any restriction. TRANSPORT tapes are therefore not as secure as ARCHIVE tapes. The default TRANSPORT command writes file system objects to tape without saving access categories, ACLs or passwords, and the only restriction on access to restored objects is then imposed by the ACLs at the restore point. TRANSPORT has an option, -SAVE_PROTECTION, that enables you to save access categories, ACLs and passwords. If you use that option, this security information will subsequently be restored with the transported files and directories. However, users who have protect rights at the restore point can reset ACLs and passwords on restored objects, and can therefore access these objects freely.

If you want security for your data, or wish to have online catalogs, use ARCHIVE rather than TRANSPORT.

Saves

Each time you invoke TRANSPORT it creates a unique section on the reel, and in the corresponding catalog. This section is called a save. The first save on a tape is save 1, the second is save 2, and so on.

TRANSPORT always appends new data to the end of a tape, and creates a new save for the data.

Whenever you use the TRANSPORT command, you can either add to the same volume or create a new TRANSPORT volume with a new name. If you add to the same volume and run out of room on the reel, TRANSPORT asks you to mount a new reel. The new reel is still part of the same volume.

Default TRANSPORT Command

You can transport files and directories simply by specifying the object pathname and the tape drive identifier on the command line. For example:

```
OK, TRANSPORT DIR1 -MT 0
```

saves DIR1 to the tape on MT0.

The default command saves the specified objects to the tape on the assigned drive.

TRANSPORT Options

Command-line options enable you to shape the command to meet your needs. You can

- Specify the name of the TRANSPORT tape you want to use
- Select the file system objects you want to transport
- Specify whether you want to save access categories, ACLs and passwords
- Create a save index
- Add a remark to a save
- Control the generation of screen prompts
- Validate a save
- Save CAM files to tape as DAM files
- Transport objects to a Rev.19 tape
- Display help text about the command's syntax, arguments and options

▶ TRANSPORT

This section describes the format of the TRANSPORT command, and summarizes the functions of the command-line arguments and options.

The format of the TRANSPORT command is

```
TRANSPORT  pathname  -MT n  [options]
```

Descriptions of arguments and options follow.

Argument	Description
pathname	Identifies the location of the objects on disk that you wish to transport. You can use wildcards, iteration and treewalking.
-MT n	Specifies the unit number n of the drive on which the reel is mounted. The drive must be online and assigned to you.

Option	Description
{-ACCESSED_AFTER [date] / -ACA}	Writes to tape those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{-ACCESSED_BEFORE [date] / -ACB}	Writes to tape those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{-BACKEDUP_AFTER [date] / -BKA}	Writes to tape those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

{-BACKEDUP_BEFORE [date] | -BKB}

Writes to tape those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

{-CAM_TO_DAM | -CTD}

Causes any CAM files among the selected objects to be written to tape as DAM files.

{-COMPATIBLE_VERSION [rev] | -CVN}

Specifies that data is to be written to tape in rev format, where rev identifies a revision of PRIMOS. The format of rev is nn or nn.n; for example 19.4. Used in a post-Rev.19 system to save data to a Rev.19 tape. This option is invalid if you transport to a tape that already has data in post-Rev.19 format. rev defaults to Rev.19.

{-CREATED_AFTER [date] | -CRA}

Writes to tape those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

{-CREATED_BEFORE [date] | -CRB}

Writes to tape those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

-HELP

Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.

-INDEX [pathname]

Creates an index of all the objects that are written to tape. If you do not specify pathname, the index is displayed on the screen: otherwise it is stored in pathname, and is not displayed.

{-INDEX_LEVELS [n] | -IXL}

Specifies the number n of levels of a directory structure that you want to include in the index, and displays the index on your screen. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen. The default value for n is 99.

{-LEVELS n | -LV}

Specifies the number of levels of the directory structure that you want to transport. The command default is to save all levels.

{-MODIFIED_AFTER [date] | -MDA | -AFTER}

Writes to tape those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a Date_Time_Modified (DTM) on or after date, the command saves the directory's subordinate objects that have been modified on or after this date.

{-MODIFIED_BEFORE [date] | -MDB | -BEFORE}

Writes to tape those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today. If the object is a directory that does not have a Date_Time_Modified (DTM) before date, the command saves the directory's subordinate objects that have been modified before this date.

{-NO_QUERY | -NQ}

Suppresses command prompts when the user's response can be assumed: is used for unattended operation. If you specify this option and the command then requires some user action, the command aborts.

-REMARK [character string]

Lets you add a comment to your current reel each time that you transport data. The remark can contain a maximum of 80 characters. If spaces are included, you must enclose the entire character string

in single quotation marks. If you do not specify character string, the remark is a string of blank characters.

{-SAVE_PROTECTION / -SAVEP} — Saves security protection information to tape. The command default is to write file system objects to tape without saving access categories, ACLs, or passwords.

{-TTY / -T} — If you run TRANSPORT from either a CPL program or a command input file, this option enables you to specify the tape drive identifier from your terminal at the end of each reel.

{-VALIDATE / -VAL} — Checks the objects that you save against the original objects on disk, and informs you of any discrepancies as the save proceeds. -VALIDATE is not a valid option if you transport to a 60Mb cartridge tape.

{-VERIFY / -VFY} — Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to save every object that matches the pathname.

-VOLID volume-name — Identifies the volume to which you are going to save objects. You can either name an unused volume or specify a named volume. The volume name must be a valid object name, and can be a maximum of 28 characters long.

HOW TO TRANSPORT DATA

This section describes how to use the basic TRANSPORT command to save files and directories. It includes examples of the screen displays generated by TRANSPORT, and consists of the following subsections:

- Preparation describes the preparations needed before you invoke the TRANSPORT command
- Transporting a Directory shows how to transport a single directory
- Transporting Several Files or Directories explains how to transport a number of files and/or directories

- Transporting All Your Files and Directories explains how to save all the files and directories at your current attach point
- Transporting to a 60Mb Cartridge Tape describes messages that you may receive when you transport to a 60Mb cartridge tape

Note

When you run TRANSPORT, you may receive a phantom logout message. This message refers to the logging out of a disk-reader process, and is a normal part of the TRANSPORT operation. No user action is required.

Preparation

Before you use the TRANSPORT command, determine which files and directories you want to save. You can transport your own or anyone else's files and directories, provided that you have the correct access rights, which are

- Read rights for any files you plan to transport
- List and use rights for any directories you plan to transport

To check your access rights, display them with the LIST_ACCESS command. For example:

```
OK, LIST_ACCESS <SYSDSK>DIR1
```

lists your rights to <SYSDSK>DIR1.

For more information on the LIST_ACCESS command type

```
OK, HELP LIST_ACCESS
```

Before you invoke TRANSPORT, you must have a tape drive assigned to you, and there must be a tape mounted on that drive. Remember to unassign the tape drive when you have completed your TRANSPORT operation and removed the last reel from the drive. Chapter 3, USER CONTROL OF TAPE DRIVES, describes how to assign and unassign a drive.

Transporting a Directory

This example shows how you can transport a directory called TRAINING to an TRANSPORT tape. Make sure that you first check your access rights, assign a tape drive, and mount a reel. TRANSPORT displays messages on the screen to keep you informed of the progress of the save, as shown in the following example.

```
OK, TRANSPORT TRAINING -MT 0

[TRANSPORT Rev. 20.2 ..... ]
*** Checking mounted reel ***
MT0 rewinding.
**** Begin Save of "TRAINING" ****
**** End Save of "TRAINING" ****
OK,
```

Transporting Several Files or Directories

You can save more than one file or directory at a time by enclosing the list of objects to be saved in parentheses. In the following example, a file called NEW_HIRES and a directory TRAINING are transported at the same time.

```
OK, TRANSPORT (NEW_HIRES TRAINING) -MT 0

[TRANSPORT Rev. 20.2 ..... ]
*** Checking mounted reel ***
MT0 rewinding.
**** Begin Save of "(NEW_HIRES TRAINING)" ****
**** End Save of "(NEW_HIRES TRAINING)" ****
OK,
```

Transporting All Your Files and Directories

You can transport the entire contents of your current directory by using wildcards on the TRANSPORT command line, as shown in the following example.

```
OK, TRANSPORT @@ -MT 0

[TRANSPORT Rev. 20.2 ..... ]
*** Checking mounted reel ***
MT0 rewinding.
**** Begin Save of "@@" ****
**** End Save of "@@" ****
OK,
```

For more information about wildcards, refer to the section below, Selecting the Objects to Save.

Transporting to a 60Mb Cartridge Tape

To transport to a 60Mb cartridge tape, use TRANSPORT in the same ways as shown above. You may, however, receive additional messages, not shown in the previous examples.

If the tape drive is to begin the save operation at the start of the tape, you may receive the messages

```
Tape initializing, please wait ...

Tape initialization complete.
```

The TRANSPORT procedure then continues as shown in the previous examples of how to transport files and directories.

USING THE TRANSPORT OPTIONS

This section describes how you can use the TRANSPORT options to shape the transport function to your needs. It consists of the following subsections

- Specifying the Volume Name describes how to name an unused volume, or ensure that the save is made to the correct volume
- Selecting the Objects to Save describes how you can specify that only certain categories of file system objects are saved
- Saving Security Information describes how to save access categories, ACLs and passwords associated with the selected file system objects
- Creating an Index explains how you can create an index of the objects saved
- Adding a Remark to the Save explains how to add a descriptive remark about the save to the tape
- Controlling Command Queries describes how to suppress the generation of those command prompts where the user's response can be assumed, and how to make the command interactive when you run TRANSPORT from either a CPL program or a command input file
- Validating the Save describes how you can compare the original objects on disk with those saved to tape

- Converting CAM to DAM Files shows how to change the format of RBF files when you transport them
- Moving Objects to a Rev.19 System explains how to transfer file system objects to a Rev.19 system

Specifying the Volume Name

The TRANSPORT default is to generate an unnamed tape. If you wish to give a name to an unused tape, or if you want to ensure that the save is made to a specific volume, use the -VOLID option on the TRANSPORT command line. This option specifies the name of the tape. For example:

```
OK, TRANSPORT (REPORT1 REPORT2) -MT 0 -VOLID MYDIRS.TRAN
```

saves REPORT1 and REPORT2, provided that the reel on MT0 is either an unnamed tape or is part of an existing volume called MYDIRS.TRAN.

Note that if you do not specify a volume name when you first transport data to a tape, that tape has a name that consists of a series of blank characters. You cannot subsequently use -VOLID to name the tape without first releasing it.

Selecting the Objects to Save

This section describes how you can control which file system objects are saved. There are several methods you can use

- Specify the pathname of the object(s) you wish to save
- Specify the number of levels of the directory structure that you want to save
- Select objects according to the date on which they were created, last accessed, last backed up, or last modified

Specifying the Pathname: The TRANSPORT argument pathname enables you to specify the pathname of the file system object that you wish to save. For example:

```
OK, TRANSPORT BOB>TEST -MT 0 -VOLID TRANS1
```

saves file system object BOB>TEST to the reel on MT0.

You can use wildcards, iterations and treewalking with the pathname.

When you use wildcards in the pathname, you can also include the -VERIFY option on the TRANSPORT command line. This causes TRANSPORT to prompt you to verify that you wish to transport the file system objects selected by your wildcard specification.

You can use wildcard options to

- Select only file system objects of one type
- Select objects according to when they were created, last accessed, last backed up, or last modified
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, TRANSPORT BOB>TEST@@ -MT 0 -VOLID TRANS1 -DIR
```

saves, to the reel on MT0, any subdirectories in BOB whose names begin with TEST.

Treewalking options make the command act on designated objects within a directory tree. You can only use these options when you include a wildcard in an intermediate position in the pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about how you use wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. You can also obtain online HELP about how to use these options with TRANSPORT by issuing the command

```
OK, TRANSPORT -HELP WILDCARDS
```

Specifying the Number of Directory Levels: The TRANSPORT default is to save all levels of the selected directory structure. However, the -LEVEL n option enables you to specify that the save is to include only n levels, where 1 is the top level. For example:

```
OK, TRANSPORT @@ -MT 0 -VOLID TRANS1 -LEVELS 2
```

saves only the top two levels of the directory structure.

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up
- Created
- Last modified

For each of the above events, you can select objects to transport on the basis of whether the event took place before, on, or after a specified date.

The TRANSPORT options are

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]

The options suffixed with _AFTER cause TRANSPORT to save only objects that have been created, last accessed, last backed up, or last modified on or after the specified date.

The options suffixed with _BEFORE cause TRANSPORT to save only objects that have been created, last accessed, last backed up, or last modified before the specified date.

Note that these options are not exclusive: you can select objects to list on the basis of more than one of the file attributes.

You can specify date in any one of the following formats:

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters

DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as 2 digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes.

Thus if you do not specify date, it defaults to 00:00 AM TODAY.

In the following example, any object that has been modified before 00:00 AM TODAY is transported to volume MYFILES.TRAN. This example uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, TRANSPORT @@ -MT 0 -VOLID MYFILES.TRAN -MDB
```

As another example, the following command transports, to volume MYFILES.TRAN, any object that has been backed up after 18th May 1986

```
OK, TRANSPORT -MT 0 -VOLID MYFILES.TRAN -BACKEDUP_AFTER 05/18/86
```

Saving Security Information

The TRANSPORT default is to save files and directories without saving security information, that is, access categories, ACLs, or passwords. If you wish to save this security information, include the -SAVE_PROTECTION option on your TRANSPORT command line. This causes TRANSPORT to save all access categories, ACLs and passwords associated with the selected objects.

Note, however, that if the recipient has protect rights at the point at which the TRANSPORT tape is restored, that person can reset any ACLs and passwords on restored objects. Thus, even if you transport file system objects and their security information, this does not guarantee that the objects are secure when they are restored. If you require greater security, use the ARCHIVE command.

Creating an Index

TRANSPORT options enable you to create an index of the objects you save to tape, and to control the level of information in the index.

Two options are available:

- -INDEX [pathname]
- -INDEX_LEVELS [n]

The -INDEX [pathname] option generates an index of all the objects you save, unless you modify this by also using the -INDEX_LEVELS option. When you do not specify pathname, the index is displayed on your screen. If you do specify a file pathname, the command sends the listing to the file, instead of displaying it on your screen. If this file already exists, the index is appended to the end of the file. If the file is one of the objects that you have selected to transport, you receive a "File in use" error message, and the index is not saved.

The following example command uses the -INDEX option to display an index of all the objects you save

```
OK, TRANSPORT @@ -MT 0 -VOLID RITA -INDEX
```

The next example shows how you can file the index by adding a file pathname to the -INDEX option. In this example the command would file the index in RITA_IX.

```
OK, TRANSPORT @@ -MT 0 -VOLID RITA -INDEX RITA_IX
```

When you use the -INDEX option, the TRANSPORT default is to index all the selected objects. You can, however, restrict the index to a number of levels by including the -INDEX_LEVELS [n] option on the command line, where n is the number of levels that you want to index, and level 1 is the top level.

You can use the -INDEX_LEVELS option in conjunction with the -INDEX option, or on its own.

When you use the -INDEX_LEVELS option with -INDEX, -INDEX_LEVELS determines the number of levels of the save that are indexed, and -INDEX allows you to write the index to a file. The following example extends the previous example command line by adding the option -IXL 2, which specifies that you want to index only the top two levels of the save. In this example, the index would be sent to file RITA_IX.

```
OK, TRANSPORT @@ -MT 0 -VOLID RITA -INDEX RITA_IX -IXL 2
```

When you use the -INDEX_LEVELS option on a command line that does not also include the -INDEX option, -INDEX_LEVELS generates an index to the specified level and displays the index on your screen: you cannot write the index to a file. For example, the command

```
OK, TRANSPORT @@ -MT 0 -VOLID RITA -IXL 2
```

displays a two-level index of the save on your screen.

Adding a Remark to the Save

Whenever you invoke TRANSPORT, you can specify a remark that will be written to the tape. To do this specify the -REMARK [character string] option on the command line. The remark can be a maximum of 80 characters, including spaces. If you include spaces in the remark, you must enclose the entire character string in single quotation marks '.....'. The remark is displayed against the save number whenever you request reel statistics as part of a LIST_TAPE command. (See Chapter 25, LISTING A TAPE: LIST_TAPE, for an example display of reel statistics.)

For example, you might want to add a remark such as New PRIMOS. The following example command adds this remark to a save of file system object FILE3. The tape name is TESTS.

```
OK, TRANSPORT FILE3 -MT 0 -VOLID TESTS -REMARK 'New PRIMOS'
```

If you do not specify a character string, the remark is a string of blank characters: the effect is exactly the same as if you had not used the -REMARK option.

Note that you cannot change a save's remark.

Controlling Command Queries

The -NO_QUERY option suppresses any command prompts to which a user response is assumed. If you specify this option, and a situation arises in which user action is required, the command aborts. You should therefore only use this option if you are confident that no user action will be required. If you run TRANSPORT from either a CPL program or a command input file, specify the option -TTY to display on your screen any command prompts for additional tape drives or reels.

Validating the Save

You can compare the original objects on disk with those written to tape by including the -VALIDATE option on the TRANSPORT command line. You receive a warning message if TRANSPORT finds discrepancies between the disk and tape objects.

Notes

When you use the -VALIDATE option, the save takes noticeably longer.

The TRANSPORT command modifies a file's DTA (Date_Time_Accessed) attribute, and -VALIDATE therefore does not pick up discrepancies in the DTA field.

The -VALIDATE option is not supported if you transport data to a 60Mb cartridge tape.

Converting CAM to DAM Files

Contiguous Access Method (CAM) files, were introduced at PRIMOS Rev.20, to improve the performance of ROAM data management products. It is not possible to either create or access CAM files using pre-Rev.20 versions of PRIMOS, and TRANSPORT therefore has an option, -CTD, to write CAM files to tape as DAM files.

For example, the command

```
OK, TRANSPORT @@ -MT 0 -VOLID TRANS1 -CTD
```

saves your current directory to volume TRANS1, and writes any CAM files as DAM files.

Moving Objects to a Rev.19 System

The TRANSPORT command allows you to save objects to tape in Rev.19 format, so that you can subsequently restore these objects to a Rev.19 system. Note, that TRANSPORT and TRANSPORT_RESTORE do not handle RBF files. If you wish to restore RBF files, you must use the archive functions.

Use the TRANSPORT -CVN option to convert data to Rev.19 format when you perform the save. -CVN either appends files to a Rev.19 tape or creates a new Rev.19 tape. You cannot use -CVN to save to a post-Rev.19 tape: mixed format is invalid.

The complete procedure to move objects to a Rev.19 system is

1. Issue the TRANSPORT command with the -CVN option. For example:

   OK, TRANSPORT REPORTS -MT 0 -VOLID R19_TAPE -CVN 19

   saves REPORTS to volume R19_TAPE, writing REPORTS in Rev.19 format.

2. Run TRANSPORT_RESTORE on the Rev.19 system to restore REPORTS from R19_TAPE to disk.

8

Restoring a Transport Tape: TRANSPORT_RESTORE

INTRODUCTION

This chapter describes in detail how to use the TRANSPORT_RESTORE command to restore files and directories from tape to disk. It also includes an overview of the command, and describes the command format options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF TRANSPORT_RESTORE introduces the TRANSPORT_RESTORE command. It describes the function of the default command, and summarizes the command options.

TRANSPORT_RESTORE describes the command format, arguments and options.

HOW TO RESTORE DATA explains how to use TRANSPORT_RESTORE to restore files and directories from a TRANSPORT tape.

USING THE TRANSPORT_RESTORE OPTIONS explains how to use each of the command options to extend the command's functions.

OVERVIEW OF TRANSPORT_RESTORE

TRANSPORT_RESTORE restores directories and files saved to tape by the TRANSPORT command. You can restore objects from any TRANSPORT tape if these objects have been saved with the default TRANSPORT command: no access rights are required. However, if the TRANSPORT command that saved the objects to tape included the -SAVE_PROTECTION option, TRANSPORT_RESTORE restores ACLs, access categories and passwords. This protection may prevent you from restoring the objects, or you may not be able to access newly-restored objects until you reset the ACLs and passwords. To reset ACLs and passwords, you need protect rights at the restore point.

You can choose to restore the entire contents of a TRANSPORT tape, several objects, or only a single object.

When you invoke TRANSPORT_RESTORE you must specify the tape object that you wish to restore. You must use the same name as that on the TRANSPORT tape: if you are uncertain of the tape contents, run LIST_TAPE on the tape.

TRANSPORT_RESTORE always restores the selected objects to your current attach point, unless you also specify a new pathname on the command line. The new pathname allows you to restore objects to another attach point, or to rename them as they are restored.

Default TRANSPORT_RESTORE Command

You can restore transported objects by specifying only the object name and the tape drive identifier on the command line. For example:

```
OK, TRANSPORT_RESTORE REPORTS -MT 0
```

restores the object REPORTS from the tape on drive MT0.

The default TRANSPORT_RESTORE command restores specified objects from the tape mounted on the specified drive. It begins the restore from the first save on the tape, and continues to the last save, unless you tell the command not to continue searching for further saves. Objects are restored to your current attach point, and have the same name as on tape.

TRANSPORT_RESTORE Options

Command-line options enable you to shape the command to meet your needs. You can

- Specify the volume and/or the reel from which you want to restore objects
- Select categories of file system objects that you want to restore
- Select which saves you wish to restore
- Create a restore index
- Control the generation of screen prompts
- Display help text about the command's syntax, arguments and options

▶ TRANSPORT_RESTORE

This section describes the format of the TRANSPORT_RESTORE command, and summarizes the functions of the command-line arguments and options.

The format of the TRANSPORT_RESTORE command is

```
TRANSPORT_RESTORE pathname [new-pathname] -MT n [options]
```

Descriptions of the arguments and options follow.

Argument	Description
pathname	Identifies the objects on tape that you wish to restore. Also called the source pathname. You can use wildcards, iteration and treewalking.
new-pathname	Identifies the pathname of the objects when restored to disk. Also called the target pathname. This allows you to rename an object as it is restored, and/or to place the object in a location other than your current attach point. You can use name generation with new-pathname. If you do not give a new pathname, the object restored is copied into your current attach point, and has the same name as on tape.

Option	Description
-MT n	Specifies the unit number n of the drive on which the reel is mounted. The drive must be online and assigned to you.
-ACCESSED_AFTER [date] -ACA	Restores those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
-ACCESSED_BEFORE [date] -ACB	Restores those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
-BACKEDUP_AFTER [date] -BKA	Restores those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.
-BACKEDUP_BEFORE [date] -BKB	Restores those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.
-COMBINE -COMB	Only restores objects that do not already exist on disk.
-CREATED_AFTER [date] -CRA	Restores those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

-CREATED_BEFORE [date] -CRB	Restores those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-FROM_SAVE_NUMBER n -FSN	Starts the restore at save number n. Values for n are 1-255. The command default is to begin at the first save on the reel. This option is not valid when you restore from a 60Mb cartridge tape drive.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INDEX [pathname]	Creates an index of all the objects that are restored to disk. If you do not specify pathname, the index is displayed on the screen: otherwise it is stored in pathname, and is not displayed.
-INDEX_LEVELS [n] -IXL	Specifies the number n of levels of a directory structure that you want to index, and displays the index on your screen. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen. The default value for n is 99.
-MODIFIED_AFTER [date] -MDA -AFTER	Restores those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a Date_Time_Modified (DTM) on or after date, the command restores the directory's subordinate objects that have been modified on or after this date.
-MODIFIED_BEFORE [date] -MDB -BEFORE	Restores those objects that have been modified before the specified date or,

	if date is not given, before 00:00 AM today. If the object is a directory that does not have a Date_Time_Modified (DTM) before date, the command restores the directory's subordinate objects that have been modified before this date.
{ -NO_QUERY -NQ }	Suppresses command prompts when the user's response can be assumed: is used for unattended operation. If you specify this option and the command then requires some user action, the command aborts.
-REEL n	Specifies the reel from which to restore objects. Default value for n is 1, and the command default is to restore all reels of a tape in sequence.
-REPLACE	Only restores those objects that already exist on disk.
{ -TO_SAVE_NUMBER n -TSN }	Ends the restore when save number n is reached, and does not restore from save n. Values for n are 1-255. The command default is to continue to the end of the tape volume. This option is not valid when you restore from a 60Mb cartridge drive.
{ -TTY -T }	If you run TRANSPORT_RESTORE from either a CPL program or a command input file, this option enables you to specify the tape drive identifier from your terminal at the end of each reel.
{ -VERIFY -VFY }	Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument.
-VOLID volume-name	Identifies the tape volume from which objects are to be restored. The volume name must be a valid object name, and can be a maximum of 28 characters long.

{ -WRITTEN_AFTER [date] }
{ -WRA }

Restores only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today. If the object is a directory and was not written to tape on or after the given date, the command restores the directory's subordinate objects written to tape on or after this date.

{ -WRITTEN_BEFORE [date] }
{ -WRB }

Restores only those objects that were written to tape before date or, if date is not given, before 00:00 AM today. If the object is a directory and was not written to tape before the given date, the command restores the directory's subordinate objects written to tape before this date.

HOW TO RESTORE DATA

This section describes how to use the basic TRANSPORT_RESTORE command to restore files and directories. It includes examples of the screen displays generated by TRANSPORT_RESTORE, and consists of the following subsections:

- Preparation describes the preparations needed before you invoke TRANSPORT_RESTORE
- Restoring an Transported File or Directory shows how to restore a single file or directory
- Restoring Several Files or Directories explains how to restore a number of files and/or directories
- Restoring All Your Files and Directories shows how to restore all your files and directories from tape

Preparation

Before you use the TRANSPORT_RESTORE command, you should determine which files and directories you want to restore. If you do not already know the contents of the tape, use the LIST_TAPE command: this is described in Chapter 25, LISTING A TAPE: LIST_TAPE. Before you invoke TRANSPORT_RESTORE, you must have a tape drive assigned to you, and

there must be a tape mounted on that drive. Remember to unassign the tape drive when you have completed your TRANSPORT_RESTORE operation and removed the last reel from the drive. Chapter 3, USER CONTROL OF TAPE DRIVES, describes how to assign and unassign tape drives.

Restoring a Transported File or Directory

To restore individual files or directories you specify the name by which they were transported onto tape: the LIST_TAPE command shows these names. To restore a file within a transported directory, specify its pathname.

In the following example a file FILE3 is restored from a transported directory DIRECTORY1. The tape volume is PETER.TRANS. This restore would place a copy of FILE3 in your current attach point.

```
OK, TRANSPORT_RESTORE DIRECTORY1>FILE3 -MT 0

[TRANSPORT_RESTORE Rev. 20.2 ..... ]
***** details of tape loaded *****
Tape name : "PETER.TRANS"      Tape reel number : 1
Save number on tape: 1
Save number on tape: 2
Do you wish to continue search (type "YES","NO" or "QUIT") ? no
OK,
```

The TRANSPORT_RESTORE command works interactively. When you invoke the command it first displays the name of the mounted tape. It then reads through the saves on the tape until it finds the object you want to restore. In this example, DIRECTORY1 is the second save on the tape. When FILE3 is restored, TRANSPORT_RESTORE asks if you wish to look for other copies of FILE3. If you type no, the restore terminates, as in the example. If you type yes, TRANSPORT_RESTORE continues the search, and prompts you when you have to mount another reel. The process continues until there are no more copies of the object, or you have terminated the search. When the search has ended and the object is restored, TRANSPORT_RESTORE returns you to PRIMOS.

Note that if you had included the -NO_QUERY option on the command line, TRANSPORT_RESTORE would have restored the latest save of FILE3 without prompting you to continue the search for the next save.

In the above example, the restored object has the same name on disk as on tape. You can, however, rename an object as it is restored. In the next example a file called TEST.FTN is restored and renamed TESTING.

```
OK, TRANSPORT_RESTORE TEST.FTN TESTING -MT 0

[TRANSPORT_RESTORE Rev. 20.2 ..... ]
MTO rewinding.
***** details of tape loaded *****
Tape name : "PETER.TRANS"      Tape reel number : 1
Save number on reel: 1
Do you wish to continue search (type "YES","NO" or "QUIT") ? no
OK,
```

This example places the file TEST.FTN in your current directory as TESTING. TRANSPORT_RESTORE asks if you want to search for more copies of TEST.FTN: in this example the user has responded no. However, you can type y or yes to search for more copies. To continue the above example, the screen display might appear as shown below.

```
Do you wish to continue search (type "YES","NO" or "QUIT") ? yes
Save number on reel : 2
Save number on reel : 3
Save number on reel : 4
"<DSK2>CHRIS>TESTING" already exists, do you wish to overwrite it
with "TEST.FTN"  ? y
Do you wish to continue search (type "YES", "NO" or "QUIT") ? y
End of volume label read
**** End restore of "TEST.FTN" ****
OK,
```

Here TRANSPORT_RESTORE searches saves 2 and 3 before it finds a copy of file TEST.FTN in save 4. The user requests TRANSPORT_RESTORE to overwrite TESTING with the tape object TEST.FTN, and to continue the search for further copies of TEST.FTN. There are no other copies and the restore terminates. In this example the tape volume only spans a single reel. If there is more than one reel in a volume, TRANSPORT_RESTORE prompts you to mount the next reel when it has searched the current reel.

Restoring Several Files or Directories at Once

You can restore more than one file or directory at a time by placing the list of objects to be restored in parentheses. In the following example the directory DIRECTORY1 and the file TEST.FTN are restored at the same time.

TRANSPORT_RESTORE asks whether to continue the search after it has restored DIRECTORY1. The answer yes restores the file TEST.FTN.

```
OK, TRANSPORT_RESTORE (DIRECTORY1 TEST.FTN) -MT 0

[TRANSPORT_RESTORE Rev. 20.2 ..... ]
MTO rewinding.
***** details of tape mounted *****
Tape name : "TRANS.N"      Tape reel number : 1
Save number on reel : 1
**** Begin restore of "(DIRECTORY1 TEST.FTN)" ****
Do you wish to continue search (type "YES","NO" or "QUIT") ? yes
Do you wish to continue search (type "YES","NO" or "QUIT") ? no
**** End restore of "(DIRECTORY1 TEST.FTN)" ****
OK,
```

If you had included the -NO_QUERY option on the command line, TRANSPORT_RESTORE would have restored both DIRECTORY1 and TEST.FTN without asking whether to continue the search.

Restoring an Entire TRANSPORT Tape

The following example command would enable you to restore either the partial or the entire contents of a TRANSPORT tape:

```
OK, TRANSPORT_RESTORE @@ -MT 0
```

In this example the command would check the reel mounted on MTO, and restore the first object of the first save. TRANSPORT_RESTORE would display the name of the object, then ask whether you wish to continue with the restore. To terminate a restore, you answer no or quit, and to continue with the restore, you answer yes.

As long as you respond with yes to the prompt to continue the restore, TRANSPORT_RESTORE would repeat this process for each successive save on the tape.

If you know beforehand that you want to restore every object on the tape, include the -NO_QUERY option on the command line. This suppresses the TRANSPORT_RESTORE prompts, and the command automatically restores each object.

The following example shows how you can restore an entire TRANSPORT tape from the first save on the reel, to the last: the tape volume spans only one reel. It also shows how you can use the -INDEX option to track the progress of the restore. TRANSPORT_RESTORE displays details such as the volume name and the reel number, then reads and restores each save. When the restore ends, TRANSPORT_RESTORE returns you to PRIMOS level.

The tape statistics, which appear at the end of the listing, include information about the tape density, the number of read errors from

which the command has recovered, and the number of files saved. The tape statistics also specify the maximum block size. However, this is a fixed aspect of the software, and has no special significance for your restore.

```
OK, TRANSPORT_RESTORE @@ -MT 0 -INDEX

[TRANSPORT_RESTORE Rev. 20.2 ..... ]
MTO rewinding.
***** details of tape mounted *****
Tape name : CFILES.TRANS      Tape reel number : 1
TRANSPORT_RESTORE index of tape CFILES.TRANS
Generated by user CHRIS on 17 Jun 87 14:06:48 Wednesday

Save number on reel : 1
**** Begin restore of "@@" ****
**** reel 1 ****
**** save number 1 ****
sam         <DSK4>CHRIS>TEST.FTN
Do you wish to continue search (type "YES","NO" or "QUIT") ? yes
Save number on reel : 2
***** save number 2 *****
acl dir     <DSK4>CHRIS>DIRECTORY1
sam         <DSK4>CHRIS>DIRECTORY1>GUIDE
sam         <DSK4>CHRIS>DIRECTORY1>CPU
                      .
                      .
                      .
sam         <DSK4>CHRIS>DIRECTORY1>APPB
sam         <DSK4>CHRIS>DIRECTORY1>BOOK
Do you wish to continue search (type "YES","NO" or "QUIT") ? yes
End of volume label read

          ***** Tape Statistics *****
tape density : 1600 bpi, maximum block size : 5141 words
total number of recovered errors in this save/restore : 0
total number of files saved/restored          : 43
total number of blocks saved/restored         : 163

**** End restore of "@@" ****
OK,
```

USING THE TRANSPORT_RESTORE OPTIONS

This section describes how you can use the TRANSPORT_RESTORE options to shape the restore function to your needs. It consists of the following subsections:

- Specifying the Volume and/or Reel to Restore explains how to specify the volumes and/or reels from which the selected objects are to be restored
- Selecting the Objects to Restore describes how you can specify that only certain categories of file system objects are restored
- Selecting the Saves to Restore shows how you can restore only selected saves
- Creating an Index explains how you can create an index of the objects restored
- Controlling Command Queries describes how to suppress the generation of those command prompts where the user's response can be assumed, and how to make the command interactive when you run TRANSPORT_RESTORE from either a CPL program or a command input file

Specifying the Volume and/or Reel to Restore

The command default is to search the mounted reel for the objects specified by the pathname argument. To ensure that the restore is only made from a particular volume, use the -VOLID option on the command line. This option specifies the name of the TRANSPORT tape. For example:

```
OK, TRANSPORT_RESTORE PROJECTS -MT 0 -VOLID GUY
```

only restores PROJECTS from volume GUY. If this volume did not have a version of PROJECTS, TRANSPORT_RESTORE would inform you of this, and return you to PRIMOS.

You can also restrict the restore to a specific reel by using the -REEL option on the command level. The following example restores objects from reel 3 of GUY.

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID GUY -REEL 3
```

If reel 3 were not mounted on MT0, you would be prompted to mount the correct reel.

Selecting the Objects to Restore

This section describes how you can control which file system objects are restored. There are several methods you can use

- Specify the source and target pathnames of the object(s) you wish to restore
- Select objects according to whether or not they already exist on disk
- Select objects according to the date on which they were created, last accessed, last backed up, last modified, or last written to tape

You can also select saves that you want to restore. You can begin and end the restore at specific saves, or can select a particular save of a certain file system object. For details of how to select saves, refer to the section Selecting the Saves to Restore, later in this chapter.

Specifying the Pathname: The TRANSPORT_RESTORE arguments pathname and new-pathname enable you to specify the source and target pathnames of the file system object that you wish to restore. For example:

```
OK, TRANSPORT_RESTORE <DSK2>BOB>NET NET.TRAN -MT 0 -VOLID TRAN1
```

restores saves of file system object <DSK2>BOB>NET as NET.TRAN.

You can use wildcards, iteration, treewalking and name generation with the pathnames.

When you use wildcards in the pathname, you can also include the -VERIFY option on the TRANSPORT_RESTORE command line. This causes TRANSPORT_RESTORE to prompt you for verification that you wish to restore the file system objects selected by your wildcard specification.

You can use wildcard options to

- Select only file system objects of one type
- Select objects according to when they were created, last accessed, last backed up, last modified, or last written to tape
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, TRANSPORT_RESTORE <DSK2>BOB>NET@@ -MT 0 -VOLID TRAN1 -DIR
```

restores subdirectories in BOB whose names begin with NET.

Treewalking options make the command act on designated objects within a directory tree. You can only use these options when you include a wildcard in an intermediate position in the source pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about how you use wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. You can also obtain online HELP about how to use these options with TRANSPORT_RESTORE by issuing the command

```
OK, TRANSPORT_RESTORE -HELP WILDCARDS
```

Combining and Replacing File System Objects: You can choose to restore

- Only objects that already exist on disk (-REPLACE)
- Only objects that do not already exist on disk (-COMBINE)

For example:

```
OK, TRANSPORT_RESTORE @@ -MT 0 -REPLACE
```

restores only objects that already exist on disk. The option -REPLACE thus replaces objects on disk with the tape versions of these objects. Objects on disk are unchanged if there is not an object with an identical name on tape, and objects are not restored if there is not an identically-named object on disk.

The -COMBINE option restores only objects that do not already exist on disk: it adds new objects to disk. However, if TRANSPORT_RESTORE finds that a top-level directory already exists at the target pathname, it still allows you to perform the combine operation. The command asks whether you want to overwrite the directory. If you answer no, TRANSPORT_RESTORE restores no part of that directory. If you answer yes, it restores any file system objects that do not already exist in the disk version of the directory.

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up

- Created
- Last modified
- Last written to tape

For each of the above events, you can select objects to restore on the basis of whether the event took place before, on, or after a specified date.

The TRANSPORT_RESTORE options are

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]
- -WRITTEN_AFTER [date] and -WRITTEN_BEFORE [date]

The options suffixed with _AFTER cause TRANSPORT_RESTORE to restore only objects that have been created, last accessed, last backed up, last modified, or last written to tape on or after the specified date.

The options suffixed with _BEFORE cause TRANSPORT_RESTORE to restore only objects that have been created, last accessed, last backed up, last modified, or last written to tape before the specified date.

Note that these options are not exclusive: you can select objects to list on the basis of more than one of the file attributes.

You can specify date in any one of the following formats:

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as 2 digits
hh is the hour, specified as 1 or 2 digits in the range 00-23

mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes.

Thus if you do not specify date, it defaults to 00:00 AM TODAY.

In the following example, any object that has been modified before 00:00 AM TODAY is restored from volume TRAN. This example uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID TRAN -MDB
```

As another example, the following command restores, from volume TRAN, any object that has been backed up after 18th May 1986:

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID TRAN -BACKEDUP_AFTER 05/18/86
```

Selecting the Saves to Restore

The TRANSPORT_RESTORE default is to begin at the first save on the mounted reel, and to continue through to the last save on the reel. However, command options enable you to

- Begin at a specific save (-FROM_SAVE_NUMBER)
- End at a specific save (-TO_SAVE_NUMBER)

For example, the command

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID TRANS1 -FSN 3 -TSN 6
```

restores objects from saves 3 to 5 inclusive, from volume TRANS1.

This illustrates how you can use abbreviated names for the -FROM_SAVE_NUMBER and -TO_SAVE_NUMBER options. Note that -TSN in this example specifies save 6. The restore stops when it reaches this save, and so save 5 is the last save restored.

Creating an Index

TRANSPORT_RESTORE options enable you to create an index of the objects you restore, and to control the level of information in the index.

Two options are available:

- -INDEX [pathname]
- -INDEX_LEVELS [n]

The -INDEX [pathname] option generates an index of all the objects you restore, unless you modify this by also using the -INDEX_LEVELS option. When you do not specify pathname, the index is displayed on your screen. If you do specify a file pathname, the command sends the listing to the file, instead of displaying it on your screen. If this file already exists, the index is appended to the end of the file. If the file is one of the objects that you have selected to restore, you receive a "File in use" error message, and the index is not saved.

The following example command uses the -INDEX option to display an index of all the objects you restore from volume ROY

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID ROY -INDEX
```

The next example shows how you can file the index by adding a file pathname to the -INDEX option. In this example the command would file the index in ROY_IX.

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID ROY -INDEX ROY_IX
```

When you use the -INDEX option, the TRANSPORT_RESTORE default is to index all the selected objects. You can, however, restrict the index to a number of levels by including the -INDEX_LEVELS [n] option on the command line, where n is the number of levels that you want to index, and level 1 is the top level.

You can use the -INDEX_LEVELS option in conjunction with the -INDEX option, or on its own.

When you use the -INDEX_LEVELS option with -INDEX, -INDEX_LEVELS determines the number of levels of the restore that are indexed, and -INDEX allows you to write the index to a file. The following example extends the previous example command line by adding the option -IXL 2, which specifies that you want to index only the top two levels of the restore. In this example, the index would be sent to file ROY_IX.

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID ROY -INDEX ROY_IX -IXL 2
```

When you use the -INDEX_LEVELS option on a command line that does not also include the -INDEX option, -INDEX_LEVELS generates an index to the specified level and displays the index on your screen: you cannot write the index to a file. For example, the command

```
OK, TRANSPORT_RESTORE @@ -MT 0 -VOLID ROY -IXL 2
```

displays a two-level index of the restore on your screen.

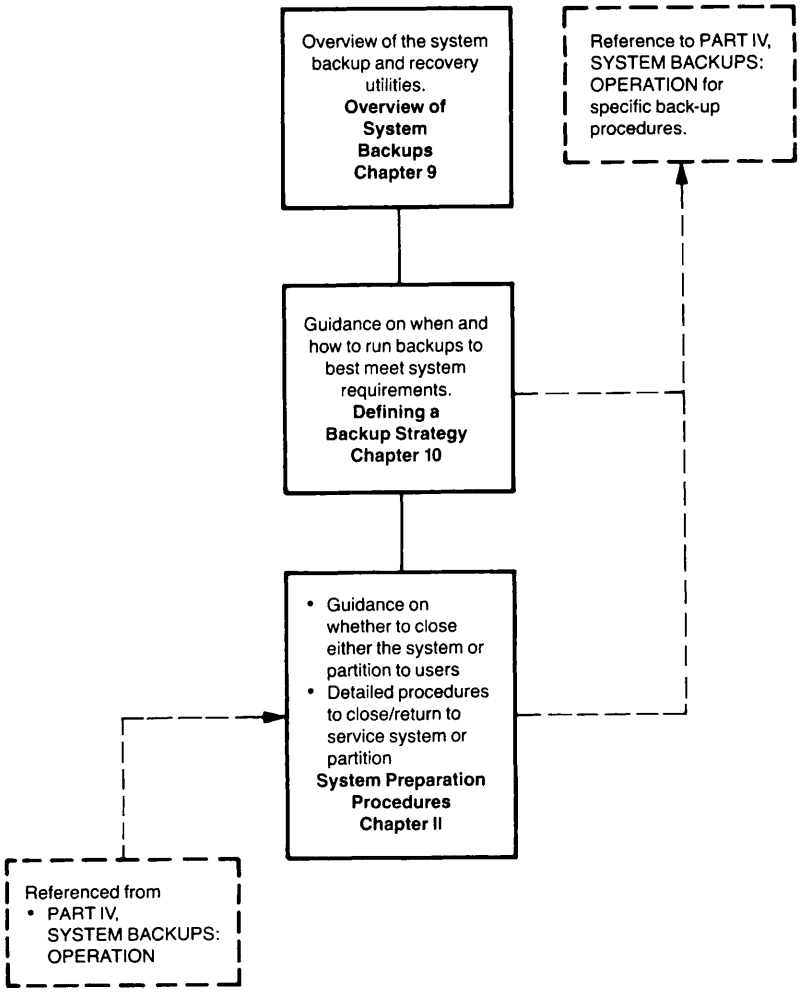
Controlling Command Queries

The -NO_QUERY option suppresses any command prompts to which a user response is assumed. If you specify this option, and a situation arises in which user action is required, the command aborts. You should therefore only use this option if you are confident that no user action will be required.

When you run TRANSPORT_RESTORE from either a CPL program or a command input file, specify the option -TTY if you want to be able to specify the tape drive number from your terminal at the end of each reel.

PART III

System Backups: Administration



9

Overview of System Backups

INTRODUCTION

This chapter provides an overview of the methods by which you can back up and restore your system. The following paragraphs outline the contents of the chapter.

TYPES OF BACKUP summarizes the types of backup that you can make. It explains the concepts of logical, physical, full, and incremental backups.

RESTORING DATA FROM BACKUPS outlines the circumstances under which you may need to restore data, and explains the concepts of partial and partition restores.

SUMMARY OF THE SYSTEM BACKUP AND RESTORE UTILITIES summarizes the functions of the utilities that you can use to back up and restore data.

TYPES OF BACKUP

When you back up file system objects, you copy them to disk or tape, and hold the copies (backups) offline. The System Adminstrator usually sets a schedule for backups, and the factors that you should consider when you organize a schedule are discussed in Chapter 10, DEFINING A BACKUP STRATEGY.

It is helpful to categorize backups on the basis of whether they are

- Made to disk or tape
- Organized in physical or logical format on the backup medium
- Full or incremental

Table 9-1 lists the commands that you can use for physical and logical backups to disk and tape. It also lists the commands that you use to restore the backups.

Table 9-1
Backup and Restore Utilities

	Backup	Restore
Disk-to-disk, physical	COPY_DISK	COPY_DISK
Disk-to-disk, logical	COPY	COPY
Disk-to-tape, physical	PHYSAV	PHYRST
Disk-to-tape, logical	BACKUP	BACKUP_RESTORE
Disk-to-tape, logical	MAGSAV	MAGRST

For details of how to use the backup utilities, refer to the chapters and appendices listed below.

- BACKUP is explained in Chapter 12, LOGICAL SAVE TO TAPE: BACKUP
- PHYSAV is explained in Chapter 14, PHYSICAL SAVE TO TAPE: PHYSAV
- COPY_DISK is explained in Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK
- COPY is explained in Chapter 17, LOGICAL COPY BETWEEEN DISKS: COPY
- MAGSAV is explained in Appendix H, USING MAGSAV FOR SYSTEM BACKUPS

Physical and Logical Backups

A physical backup is one in which the backup utility copies the contents of an entire physical disk partition exactly as they appear on disk, without regard to the logical structure of the data. In a logical backup, the utility copies logical entities from disk, so that each file system object is saved as a separate unit.

Full and Incremental Backups

A full backup saves all the objects you have selected on the command line. When you make an incremental backup to tape, the backup utility only saves those file system objects that have changed since the most recent backup. You can also make incremental saves to disk with the COPY command after you have made a full backup to either tape or disk. However, COPY does not recognize the Date_Time_Backed-up (DTB) attribute that BACKUP sets. Nor does COPY itself set a backed-up attribute. When you run COPY to supplement the BACKUP or COPY_DISK utilities, you therefore have to specify -MODIFIED_AFTER date on the COPY command line, where date is the time and date of the previous full or incremental backup.

You can only make an incremental save when you run a logical backup utility: incremental saves are not possible in a physical backup.

RESTORING DATA FROM BACKUPS

You need to restore file system objects when either user error or hardware failure has caused their loss. You should use the most recent backup of these objects, so that only changes made since this backup are lost. Usually, the effort required to reinstate recent modifications is considerably less than that needed to recreate all the lost data.

There are two types of restore: partial restores and partition restores. In a partial restore, you restore specific files and directories. Typically, you require partial restores to recover from such user errors as the accidental overwriting or deletion of a file. In a partition restore, you restore an entire partition. Most often, you need to restore entire partitions to recover from a hardware failure, such as a head crash.

For details of how to use the restore utilities, refer to the chapters and appendices listed below.

- BACKUP_RESTORE is explained in Chapter 13, RESTORING A BACKUP TAPE: BACKUP_RESTORE.
- PHYRST is explained in Chapter 15, RESTORING A PHYSAV TAPE: PHYRST.

- COPY_DISK is explained in Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK.
- COPY is explained in Chapter 17, LOGICAL COPY BETWEEN DISKS: COPY.
- MAGRST is explained in Appendix I, USING MAGRST TO RESTORE SYSTEM BACKUP TAPES.

SUMMARY OF THE SYSTEM BACKUP AND RESTORE UTILITIES

This section summarizes the functions of the system backup and restore utilities. For a discussion of how to decide which utilities to use, refer to Chapter 10, DEFINING A BACKUP STRATEGY. To find out how to use a particular utility, refer to the appropriate chapter in Part IV, SYSTEM BACKUPS: OPERATION.

Disk-to-disk Utilities

There are two disk-to-disk utilities: COPY_DISK and COPY.

The COPY_DISK utility enables you to copy disk partitions to other disk partitions. It makes physical copies of partitions, and you can use it to both back up and restore data.

The COPY utility is available to all users who wish to copy files and directories, and is not primarily a system backup utility. However, operators can also use COPY during system maintenance activities to back up and restore individual files and directories.

Disk-to-tape Utilities

For disk-to-tape backup and recovery, use

- BACKUP and BACKUP_RESTORE
- PHYSAV and PHYRST
- MAGSAV and MAGRST

The MAGSAV and BACKUP utilities both perform logical backups to tape. They allow you to make full and incremental backups. To restore objects saved by MAGSAV, use MAGRST; and to restore objects saved by BACKUP, use BACKUP_RESTORE.

The PHYSAV utility enables you to perform a physical backup to tape. When you want to restore a partition saved with PHYSAV, use PHYRST.

10
Defining a Backup Strategy

INTRODUCTION

This chapter gives guidance about when and how to carry out backups. It is for System Administrators who have yet to decide on a backup strategy, and for those Administrators who want to reconsider the suitability of their current approach to backups.

The following paragraphs outline the contents of each of the sections in this chapter.

TYPES OF BACKUP describes physical and logical backups. It discusses the relative merits of each, and the types of system for which each is most appropriate.

MAXIMIZING THE PERFORMANCE OF BACKUP UTILITIES describes ways in which you can obtain the best performance from the backup utilities. This section is relevant both to System Administrators who already run one of these utilities and to Administrators who have yet to decide on a strategy. A consideration of the procedures and peripheral devices required to maximize the performance of the backup utilities may influence your decision about which utility to use.

SCHEDULING BACKUPS explains how careful scheduling of your backups can both improve the speed of your backups and minimize any inconvenience to system users.

RETAINING YOUR BACKUPS discusses how long you should retain each backup disk or tape, and where you should keep them. To get the best out of your backups, it is important that your backup disks or tapes are available when you need them.

LOGGING BACKUPS suggests that you keep a record of your backups.

SELECTING YOUR BACKUP STRATEGY summarizes the aspects of your system that you should assess before you make a decision about your backup strategy. This section brings together the general backup information from the preceding sections, and applies it to example company profiles to suggest appropriate backup strategies for their systems.

> WARNING
>
> The tape capacities and data transfer rates quoted in this chapter are only approximate average figures. In practice, there are too many variables for there to be an average system. You must, therefore, only use the quoted tape capacities and data transfer rates to make broad comparisons between the backup utilities. There is no guarantee that you will obtain on your system any of the performance figures quoted in this chapter. Note also that the backup times quoted do not include the time that operators take to change reels.

TYPES OF BACKUP

This section describes physical and logical backups to disk and tape. It discusses their relative merits and the circumstances under which each is most appropriate.

Your choice of backup utility affects considerably the time that your system backups take, and thus the impact upon users. There are, however, ways in which you can influence both the performance of the backup utilities and the impact of your backups upon system users. These ways are described in the sections MAXIMIZING THE PERFORMANCE OF BACKUP UTILITIES and SCHEDULING BACKUPS, below.

You may find that you need to use a mix of backup utilities, or that one is sufficient.

Physical Backups

Physical backups make an exact copy of the contents of a partition. File system objects are spread across the backup medium (disk or tape) in exactly the same way as on the source partition.

If you have related files spread across several partitions, for example ROAM master and slave files, you must back up all partitions that hold the related files, to ensure the files remain a logically consistent set.

Physical backups are faster than logical backups, for a given amount of data, and are thus especially useful when you want to back up large amounts of data.

There are two physical backup utilities

- PHYSAV saves physical disk partitions to tape.
- COPY_DISK saves physical disk partitions to other physical disk partitions.

PHYSAV: Physical backups to tape are a relatively cheap way of backing up large volumes of data quickly.

The smallest unit that you can save is a partition: you cannot make incremental physical saves to tape. Conversely, you cannot restore individual files and directories that users have accidentally deleted from disk. Typically, therefore, physical backups to tape are used for maximum speed, and so that you can recover the data in the event of a disk crash.

Using a 6250 bpi tape, it usually takes between 30 minutes and one hour to back up a full 300Mb disk, the length of time depending largely on the processor. A restore takes approximately the same time as the backup.

COPY_DISK: Disks are an expensive backup medium when compared with tapes. Disks also need more careful handling and storage. However, if you want to back up large volumes of data as quickly as possible, and also want to restore individual objects, then disk-to-disk backups are appropriate.

Physical backups to disk enable you to both recover from disk crashes and restore accidentally deleted files. To restore lost files from a backup disk created by COPY_DISK, use the COPY command. To restore entire partitions from the backup pack, use COPY_DISK. Disk backups also have the advantage of being immediately available, because you can access objects direct from the backup disk. When you make backups to tape, you must restore the entire partition back to disk before users can access objects on the partition.

It usually takes between 30 minutes and one hour to copy a full 300Mb disk, the length of time depending largely on the processor.

You can make incremental backups to a backup disk by using the COPY command with the -MODIFIED_AFTER date option, where date specifies the date and time of the most recent backup.

Logical Backups

Logical backups copy each file system object from disk as separate logical entities, and allow you to restore individual files and directories.

There are two logical backup utilities

- BACKUP saves file system objects from disk to tape.
- COPY copies file system objects between disks.

BACKUP: BACKUP provides a flexible way to back up your data to tape. It saves file system objects to tape in such a way that you can restore either individual objects or the contents of an entire partition. There is security against unauthorized use of the BACKUP utility, and the System Administrator should set up a predefined privileged group called .BACKUP$, whose members are authorized to invoke BACKUP. For full details of BACKUP, refer to Chapter 12, LOGICAL SAVE TO TAPE: BACKUP.

Full logical backups to tape are slower than physical backups to tape, for a given amount of data. It takes approximately 36 minutes to save 300Mb of data if you run BACKUP on a Prime 9955, and use a 6250 bpi tape. On a Prime 2450,, the same save takes approximately two hours.

You can reduce the total time needed to keep your system backed up by making incremental logical saves. Your backup cycle could, for example, consist of daily incremental backups and a weekly full backup.

An incremental backup only saves file system objects that have changed since the last backup. The potential saving offered by incremental backups is therefore dependent upon the rate of change of the data on the system, and the regularity with which you back up your system: if a large proportion of the data changes between each incremental backup, you will not save much time by performing incremental backups.

In summary, BACKUP combines much of the flexibility of COPY_DISK, with the ease-of-use and lower cost of tape backup. It is valuable for backing up systems where the speed of a COPY_DISK backup is not a critical requirement, but you need to be able to restore individual

As an alternative to BACKUP, you can use MAGSAV, which also performs logical backups

COPY: The COPY utility enables you to make incremental backups to disk, to supplement full backups made with either the COPY_DISK or BACKUP utilities. However, COPY does not recognize the

Date_Time_Backed-up (DTB) attribute that BACKUP sets. Nor does COPY itself set a backed-up attribute. You therefore have to include the -MODIFIED_AFTER date option on the COPY command line, where date is the time and date of the previous full or incremental backup.

You can also use COPY to restore individual files and directories from a COPY_DISK backup of a partition.

MAXIMIZING THE PERFORMANCE OF BACKUP UTILITIES

This section gives guidance on the backup procedures and hardware that maximize the performance of the backup utilities.

Backup Procedures

The BACKUP, PHYSAV and COPY_DISK utilities run best on lightly-loaded systems. In the case of BACKUP no more than 20% of the CPU should be taken by other processes while BACKUP is running. Ideally you should close the entire system to users before you begin the backup. To improve the performance of these utilities, while minimizing the inconvenience to users, you should therefore consider scheduling the backups for off-peak hours. For more information about the benefits of careful scheduling, refer to SCHEDULING BACKUPS, later in this chapter.

BACKUP runs more slowly when it has to save heavily fragmented file structures. When you use a partition for a long time without logically restoring the contents, it is likely that the files on the partition will become heavily fragmented. It may be worthwhile to make a logical save and restore of all the objects on such a partition, to tidy up the partition and speed up subsequent backups of objects on the partition. You will probably find that the easiest way to do this is to

- Use TRANSPORT to save all the partition objects to tape
- Run MAKE on the partition
- Restore the partition objects with TRANSPORT_RESTORE

You could also tidy up a partition by using the sequences BACKUP - MAKE - BACKUP_RESTORE, or COPY_DISK - MAKE - COPY.

Hardware Configurations

This section makes recommendations about the tape drives that you should use for disk-to-tape backups, and about disk drives. There are no recommendations about CPUs: if other relevant factors remain constant, the speed of your backups increases when you run them on a more powerful system.

Tape Drives on High-end Systems: If you use a high-end machine (a Prime 9655 or higher), you should use a 6250 bpi tape drive, to maximize data throughput and tape capacity. The greater tape capacity enables you to minimize the number of reel changes you have to make during the backup.

When you run BACKUP, the capacity of a 2400 foot, 6250 bpi tape, is approximately 110Mb for a typical file structure. This means that a full 300Mb disk would require 3 reels. The backup would take approximately 36 minutes on a Prime 9955. A typical file structure is one with a mix of large and small files. If you back up a small number of large files, the tape capacities will probably be greater than those quoted here, and if you back up a large number of small files the tape capacities will probably be less. For example, when you run BACKUP to save large files, the capacity of a 2400 foot, 6250 bpi tape, could increase to approximately 140Mb, and the speed of the backup would also increase. Conversely, if you save a high proportion of small files, the capacity of a 2400 foot, 6250 bpi tape could fall to approximately 50Mb

The capacity of a 6250 bpi PHYSAV tape is approximately 150Mb. To save a full 300Mb disk, you would therefore require two reels.

Tape Drives on Low-end Systems: If you run a low-end system, such as the 2655, and have a streamer tape drive, you should normally use the drive on its 3200 bpi setting to maximize data throughput and tape capacity. Table 10-1, below, gives recommended speed and density settings for streamer tape drives.

When you run BACKUP, the capacity of a 3200 bpi streamer tape is approximately 40Mb for a typical file structure. This can rise to approximately 70Mb if you save a small number of large files, and fall to approximately 15Mb if you save a lot of small files. A full 300Mb disk, with a typical file structure, would probably require eight reels and take approximately two hours to back up.

When you run PHYSAV, the capacity of the 3200 bpi streamer is approximately 65Mb, and you would require five reels to back up a full 300Mb disk.

Disk Drives: The speed of your disk drives is not always a key factor in the speed of your backups, but it is likely that faster drives will improve backup performance. The extent of any improvement will, however, be dependent upon such factors as the type of Prime machine, the structure of the data you back up, the backup utility, and the peripheral devices you use.

When you use disk-to-disk backups, you can speed up the backup procedure and minimize the inconvenience to users by having a free disk drive for the backup pack. If you follow the backup strategy of not closing the entire system to users, the additional drive means that you avoid having to close down the partitions on the backup drive.

Table 10-1
Recommended Speed and Density Settings for
Streamer Tape Drives

Utility	Settings		Usage
	Speed (ips)	Density (bpi)	
BRMS (BACKUP, ARCHIVE)	50	3200	For optimal capacity and speed. (Tapes not compatible with ANSI or IBM
BRMS TRANSPORT	25	1600	For transporting data to sites which do not support 3200 bpi
	50	3200	For transporting data to sites which do support 3200 bpi (optimal capacity and speed)
MAGSAV MAGRST	50	3200	For optimal capacity and speed
PHYSAV PHYRST	100	1600	For optimal speed
PHYSAV PHYRST	50	3200	For optimal tape capacity

Note

On drives other than streamer tape drives, use the highest density that the drive supports when you run backups, and use 1600 bpi when you transport data.

SCHEDULING BACKUPS

The section above, MAXIMIZING THE PERFORMANCE OF BACKUP UTILITIES, describes some of the factors that you have to consider when you schedule your backups. The BACKUP utility, for example, performs best when there are no other users on the system, and performance can be degraded when you run BACKUP in a multi-user environment. You should therefore attempt to schedule such backups for a time when you can remove the system from service without inconveniencing users. Similarly, COPY_DISK performs much better in a lightly loaded system, and you should try to schedule COPY_DISK backups accordingly. It may be that you have to perform the backups out of working hours. If some partitions are less active at certain times of the day, take this into account when you schedule backups.

In addition to the above considerations about the availability of system resources, you have to consider such factors as the volume of data, its rate of change, and value. You do not want to make unnecessary backups, but neither do you want to have data that is not backed up if its loss would be critical to your users.

If your system data changes very rapidly, you may need to run backups every day. If a disk crashes, users have to reenter any data input since the last backup. Thus the more often you make backups, the more data you can recover after a disk crash.

You may find that data usage on your system justifies a mix of full and incremental logical backups. For example, if the rate of data change is low over the system as a whole, but high on a few directories or files, it would be appropriate to perform full backups of the overall system, with more regular incremental backups to keep the high-activity files up to date. For example, you might do a full backup every Monday, and incrementals every Tuesday, Wednesday, Thursday and Friday.

If your data changes only slowly, it could be appropriate to make a full backup only, at weekly or longer intervals.

RETAINING YOUR BACKUPS

This section discusses how long you need to retain your tape or disk backups, and where you should keep them.

It is a good idea to retain three generations of backups, and to keep each backup in a separate place. When you make a new backup, rotate the three generations and delete the oldest version. You should keep the most recent backup in an easily accessible place: this is the backup that you use if you need to restore data. Ideally, you should keep the intermediate backup in a secure, fireproof location somewhere in the same building, and place the oldest copy off-site.

You can use ARCHIVE to archive inactive files that you might need at some time in the future. In that case, the life of the archived data

is indefinite: retain the archive tapes for as long as the archived data may be useful.

Note

Do not retain any tape for longer than a year, because after that time tapes begin to deteriorate. You should regularly transfer your data to new tapes, to be sure of being able to read the data when you need it.

LOGGING BACKUPS

After you have adopted a backup strategy, it is a good idea to record the backup procedures in the system log book. It is also advisable to record in the log book the details of each backup and any problems that the operator has encountered during a backup.

SELECTING YOUR BACKUP STRATEGY

This section helps you select the backup strategy that is most appropriate to your system requirements. It presents four example systems, and suggests the backup strategy that would be most appropriate in each example.

Assessing Your System Requirements

You must analyse your system before you can decide on your best backup strategy. This section lists the factors that you should quantify, as closely as possible, when you make this analysis. You should assess the

- Total volume of data that you have to secure against loss
- Proportion of the data that changes between backups
- Time you have available for performing backups
- Availability and experience of your operations staff

An assessment of the above factors will give you a good basis on which to make a judgement about the type of backups you should use, and how you should schedule them. The following examples suggest backup strategies for four types of system.

Example 1

The following example is of an imaginary financial services company. It runs a large transaction processing (TP) application on a Prime 9955. The system has about 7Gb of data, including a 5Gb database. About 5% of the database changes each day. The company uses after-imaging with DBMS, to roll the database forward to the last completed transaction. The operations staff are experienced, and are employed specifically to perform operations tasks. A scheduled downtime of up to eight hours per day is acceptable.

An appropriate backup strategy for this type of system would be

- Daily physical save of the database, using PHYSAV or COPY_DISK
- Weekly full logical save of the non-database files, using BACKUP
- Daily incremental backup of the non-database files, using BACKUP

The daily physical save would take approximately seven hours, using either PHYSAV or COPY_DISK. It would require approximately 50 reels, or 23 300Mb disks. The full and incremental logical backups would take approximately two hours and ten minutes respectively.

To maximize the speed of the PHYSAV operation, the system should have at least two high-speed, high-density tape drives. There should also be a free disk drive on the system: this speeds up a physical restore from either disk or tape, and also improves the speed of COPY_DISK backups.

The performance of BACKUP could be improved by having the files for the backups on the same part of the system, rather than having them spread thinly across many partitions.

Example 2

The following example is of an imaginary engineering company that runs a CAD system on a Prime 9750. There are several CAD databases, totalling approximately 1.2Gb, and they change by 5% a day. There are a small number of operations staff, but they are experienced.

An appropriate backup strategy for this type of system would be

- Weekly full logical backup, using BACKUP
- Daily incremental backup, using BACKUP

The full backup would take approximately two hours, and require nine reels. The incremental backups would take approximately ten minutes, and require half a reel.

The system should include a high-speed, high-density tape drive, to maximize the speed of the backup.

Example 3

The following example is of an imaginary small advertising company that runs a Prime Information application on a Prime 2450, and uses a 60Mb cartridge tape drive for backups. The total volume of data on the system is about 300Mb, 2% to 5% of which changes each day. Computer expertise amongst the staff is low. The operators who perform the backups are inexperienced, and do not specialize in computer operation tasks.

An appropriate backup strategy for this system would be

- Weekly full backup, using BACKUP
- Daily incremental backup, using BACKUP

The full backup would take approximately two hours, and require five cartridges. The incremental backups would each take approximately ten minutes, and take up a quarter of a cartridge.

An alternative approach would be to perform a full backup every day. This would simplify the backup and restore procedures for inexperienced operators.

Example 4

The following example is of an imaginary university that uses a Prime 9650 system for both teaching and general administration. There are a large number of users, and most of the files on the system are small. The total volume of data is about 3.6Gb, and approximately 5% of the data changes each day. Operations staff are experienced.

An appropriate backup strategy for such a system would be

- Weekly full logical backup, using BACKUP
- Daily incremental backups, using BACKUP

The full backup would take approximately seven hours and require 30 reels. Each incremental backup would take approximately 30 minutes and require one reel.

An alternative strategy for such a system would be to perform a physical backup of the system each day, using PHYSAV. This would take approximately two hours and require 25 tapes. However, logical restores would be difficult, and it would take approximately two hours to recover even one small file.

11

System Preparation Procedures

INTRODUCTION

This chapter describes how to prepare the system before you back up or restore data, or repair disk partitions. These activities are referred to collectively as system maintenance tasks.

The following paragraphs outline the contents of each of the sections in this chapter.

WHY YOU NEED A SYSTEM PREPARATION PROCEDURE introduces the system preparation procedures, and explains why you need such procedures.

CHOOSING A SYSTEM PREPARATION PROCEDURE discusses the factors that you must consider when you decide what preparation procedure to adopt for your backups and restores: you can close either the entire system to users or just individual partitions.

CLOSING THE SYSTEM TO USERS describes the procedure you must follow to close the system to users, and to return the system to service after you have performed your system maintenance tasks (backups, restores, or partition repairs).

CLOSING A PARTITION TO USERS describes the procedure to close a partition to users, and to return it to service after you have finished your system maintenance tasks.

Note that the explanations of how to close either the system or a partition to users do not describe how to back up or restore data, or repair a partition. For details of how to back up and restore data, refer to Part IV, SYSTEM BACKUPS: OPERATION. For information about how to repair disk partitions, refer to the manual Operator's Guide to File System Maintenance.

WHY YOU NEED A SYSTEM PREPARATION PROCEDURE

The system preparation procedures provide a protected environment within which you can maintain your system without risk of unwanted intrusion from system users. For example, you must ensure that users cannot change a partition while you back up that partition, nor change the target partition while you perform a restore. If users reference a partition that you are either backing up or restoring, inconsistencies may result or data might be lost

CHOOSING A SYSTEM PREPARATION PROCEDURE

There are two system preparation procedures

- Taking the entire system out of service
- Taking a partition out of service

When you take an entire system out of service, users cannot access any of the disk partitions, but you can perform all your system maintenance tasks. If you only close down selected partitions, the remaining partitions remain in use. This lessens the inconvenience to system users, but also slows down your system maintenance activities.

To decide which procedure to follow, you need to know

- Which partitions will be affected directly by your system maintenance activity
- Which partitions have users' origin directories
- Which partitions contain information that is crucial to the typical running of the system
- Which partitions hold the command device (COMDEV), paging device (PAGDEV), and alternate paging device (ALTDEV)

Remember that if you do not have a free drive, COPY_DISK requires you to remove the pack normally mounted on your backup drive. You must close down the partitions on this pack, as well as the partition that you back up.

You should close the entire system to users if the partitions affected by your system maintenance hold

- Many user's origin directories (20% or more of the system users)
- Information accessed by most of the users on the system
- The command device, paging device, or alternate paging device

If the partitions do not fall into any of these categories, you may be able to carry out your system maintenance work adequately by only closing down the partitions directly affected by your work. However, the backup utilities run much more efficiently if the system is lightly loaded, or closed entirely to users. Such considerations may lead you to close down the system even if this is not necessitated by the contents of the partitions. For a discussion of the ways in which the performance of the backup utilities can be maximized, refer to Chapter 10, DEFINING A BACKUP STRATEGY.

Before you begin either of the system preparation procedures, you should make a note of the physical device numbers and names of all the partitions that you are going to back up, restore, or repair.

CLOSING THE SYSTEM TO USERS

This section describes how to close down the entire system to users, and is applicable to all the system backup and restore utilities.

Unless otherwise specified, perform the following steps at the supervisor terminal.

1. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
                    .
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

2. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

Wait until

- A BATCH -STATUS command shows no jobs running
- All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
- All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

3. Remind users about the impending shutdown.

4. Log out all users:

```
OK, LOGOUT ALL
```

5. Remove partitions from service, in the following ways, according to the utility you intend to use.

BACKUP: Set priority access on the partition you want to back up:

```
OK, SPAC diskname user-id:ALL $REST:NONE
```

If you do not already have all access to top-level directory BACKUP*, set priority access by issuing the command

```
OK, SPAC diskname user-id:ALL
```

where diskname is the name of the partition that holds BACKUP*.

BACKUP_RESTORE: Set priority access on the partition you want to restore:

```
OK, SPAC diskname user-id:ALL $REST:NONE
```

If you do not already have all access to top-level directory BACKUP*, set priority access by issuing the command

```
OK, SPAC diskname user-id:ALL
```

where diskname is the name of the partition that holds BACKUP*.

COPY: Set priority access on the partition that you want to back up or restore. The backup partition is handled as part of the specific COPY procedure, described in Chapter 17, LOGICAL COPY BETWEEN DISKS: COPY.

```
OK, SPAC diskname user-id:ALL $REST:NONE
```

PHYSAV and PHYRST: Shut down the partitions that are to be backed up, or restored, and add them to the Assignable Disks Table. Do this by issuing the following commands for each partition:

```
OK, SHUTDN pdev
OK, DISKS pdev
```

COPY_DISK: Shut down the partition that you want to back up or restore, and all partitions on the disk pack, if there is one, in the backup drive. Do this by issuing the following command for each partition:

```
OK, SHUTDN pdev
```

Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK, describes when to assign source and target partitions to the Assignable Disks Table.

6. It may be more convenient to run the backup or restore from a user terminal. Issue the MAXUSR command and log into a user terminal close to the tape and disk drives.

```
OK, MAXUSR
OK, LOGIN user-id
```

7. If you intend to run BACKUP from the supervisor terminal, and have therefore not issued the MAXUSR command at step 6, you must issue the command

```
OK, MAXUSR 1
```

8. Follow the procedures that are specific to the backup or recovery utility. These procedures require you to assign (and later to unassign) tape and disk drives. You may also have to remove disk packs, and replace them with new packs. For details of the steps you have to take, and for the command lines, refer to the appropriate chapters in Part IV, SYSTEM BACKUPS: OPERATION.

   You can operate from either the supervisor terminal or the user terminal you logged into at step 6.

9. When you have completed your backup or restore, continue according to the backup/recovery utility you have used. Perform this and the remaining steps at the supervisor terminal.

   BACKUP: Remove priority access to the backup partition (set at step 5) by issuing the REMOVE_PRIORITY_ACCESS (RPAC) command.

```
OK, RPAC diskname
```

   If you also set priority access to the partition that holds BACKUP*, restore normal access to this partition by issuing the command

```
OK, RPAC diskname
```

BACKUP_RESTORE: Use the REMOVE_PRIORITY_ACCESS command to restore normal access to the partitions.

```
OK, RPAC diskname
```

If you also set priority access to the partition that holds BACKUP*, restore normal access to this partition by issuing the command

```
OK, RPAC diskname
```

PHYSAV and PHYRST: Remove the partitions from the Assignable Disks Table, and make them available to users by issuing the following commands, at the supervisor terminal, for each partition:

```
OK, DISKS NOT pdev
OK, ADDISK pdev
```

COPY_DISK: Return to service the partitions that you shut down at step 5 by issuing the following command, at the supervisor terminal, for each partition:

```
OK, ADDISK pdev
```

Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK, describes when to remove disks from the Assignable Disks Table.

COPY: Use the REMOVE_PRIORITY_ACCESS command to restore normal access to the partitions.

```
OK, RPAC diskname
```

10. Start up the subsystems from the supervisor terminal. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

11. If you did not issue the MAXUSR command at step 6, you must now allow users to log in.

```
OK, MAXUSR
```

12. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

CLOSING A PARTITION TO USERS

If you have decided to close one or more partitions to users, and not to take the entire system out of service, follow the steps below. These steps are applicable to all the system backup and restore utilities.

Unless otherwise specified, carry out all these steps at the supervisor terminal.

1. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN AT 14:00 HOURS
TODAY
                    .
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN IN 1 MINUTE
```

2. Remove the partitions from service, make them available for use again and set priority access. Do this in the following ways, according to the backup/recovery utility that you intend to use.

   BACKUP: Remove users from the backup partition and set priority access by issuing the following commands:

```
OK, SHUTDN pdev
OK, ADDISK pdev;  SPAC diskname user-id:ALL $REST:NONE
```

If you do not already have all access to the top-level directory BACKUP*, set priority access by issuing the command

```
OK, SPAC diskname user-id:ALL
```

where diskname is the name of the partition that holds BACKUP*.

BACKUP_RESTORE: Issue the following commands for each partition that you want to restore:

```
OK, SHUTDN pdev
OK, ADDISK pdev; SPAC diskname user-id:ALL $REST:NONE
```

If you do not already have all access to the top-level directory BACKUP*, set priority access by issuing the command

```
OK, SPAC diskname user-id:ALL
```

where diskname is the name of the partition that holds BACKUP*.

PHYSAV, PHYRST: Issue the following commands for each disk partition:

```
OK, SHUTDN pdev
OK, DISKS pdev
```

COPY_DISK: Shut down the partitions that you want to back up or restore, and all partitions on the disk pack, if there is one, in the backup drive. Do this by issuing the following command for each partition:

```
OK, SHUTDN pdev
```

Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK, describes when to add the partitions to the Assignable Disks Table.

COPY: Issue the following commands for each disk partition:

```
OK, SHUTDN pdev
OK, ADDISK pdev; SPAC diskname user-id:ALL $REST:NONE
```

3. It may be more convenient to run the backup or restore operation from a user terminal. If you wish to do so, log into a terminal:

   OK, LOGIN user-id

   Choose a terminal close to the tape and disk drives.

4. Perform the procedures that are specific to the backup/recovery command. These procedures require you to assign (and later to unassign) tape and disk drives. You may also have to remove disk packs, and replace them with new packs. For details of the steps you have to take and of the command lines, refer to the appropriate chapters in Part IV, SYSTEM BACKUPS: OPERATION.

   You can perform all the procedures from either the supervisor terminal or the user terminal that you logged into a step 3.

5. When you have completed your backup or restore, return to service the disk partitions you closed at step 2. Do this in the following ways, according to the backup/recovery utility that you have used. Issue the commands from the supervisor terminal.

   BACKUP: Remove priority access to the backup partition (set at step 2), by issuing the command

   OK, RPAC diskname

   If you also set priority access to the partition that holds BACKUP*, restore normal access to this partition by issuing the command

   OK, RPAC diskname

   BACKUP_RESTORE: Issue the following command for each partition taken out of service at step 2:

   OK, RPAC diskname

   If you also set priority access to the partition that holds BACKUP*, restore normal access to this partition by issuing the command

   OK, RPAC diskname

PHYSAV, PHYRST: Issue the following commands for each partition you took out of service at step 2:

```
OK, DISKS NOT pdev
OK, ADDISK pdev
```

COPY_DISK: Issue the following command for each partition you took out of service at step 2:

```
OK, ADDISK pdev
```

Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK, describes when to remove disks from the Assignable Disks Table.

COPY: Issue the following command for each partition you took out of service at step 2:

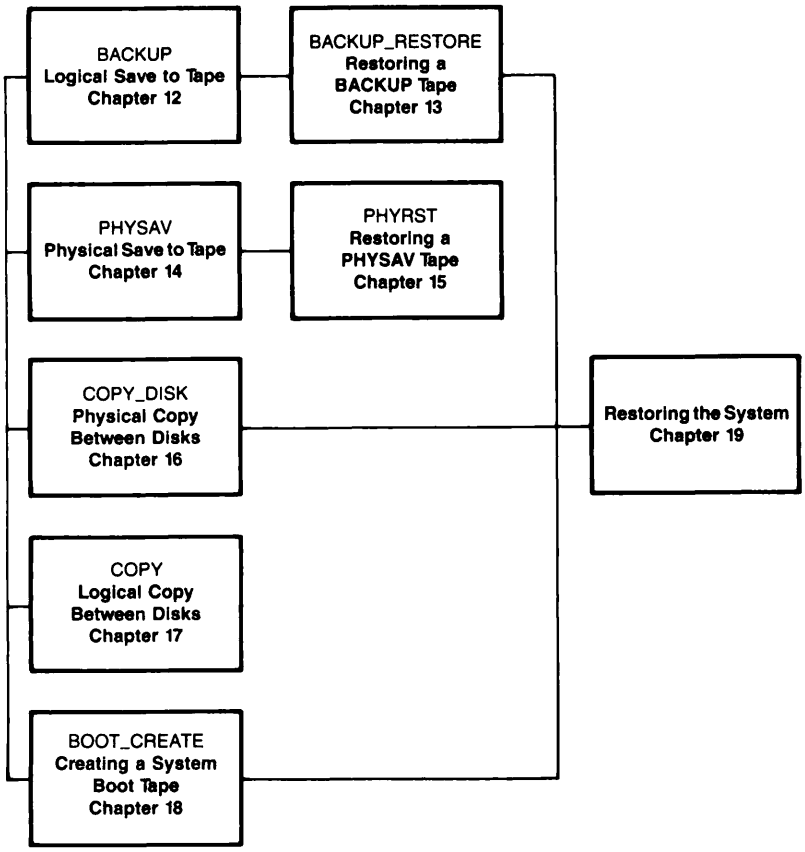
```
OK, RPAC diskname
```

6. Issue a message, from the supervisor terminal, to inform users that the partitions are available. For example:

```
OK, MESSAGE -ALL -NOW
PARTITIONS DSK1 AND DSK3 ARE NOW AVAILABLE
```

PART IV

System Backups: Operation



12
Logical Save to Tape: BACKUP

INTRODUCTION

The BACKUP command enables operators to perform system backups to tape, and to save individual files and directories. This chapter explains how to use BACKUP. It also gives an overview of the command, and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF BACKUP introduces BACKUP. It explains catalogs and saves, describes which file attributes are set by BACKUP, describes the function of the default command, and summarizes the command options.

BACKUP describes the command format, arguments and options.

HOW TO BACK UP FILES AND DIRECTORIES describes the preparations for a backup, and the step-by-step BACKUP procedure.

INVOKING BACKUP describes example command lines that execute

- Full backups
- Incremental backups
- Saves of individual files and directories

It also describes additional messages that you may receive when you back up to a 60Mb cartridge tape drive.

USING BACKUP OPTIONS explains how to use the command options to extend the command's functions.

OVERVIEW OF BACKUP

You can use BACKUP to make either a full or an incremental backup. A full backup copies to tape all file system objects selected by the BACKUP command line. An incremental backup saves only objects modified since the last back up.

To invoke BACKUP, you must be a member of the predefined privileged group .BACKUP$, unless you intend to run the entire backup from the supervisor terminal, in which case user SYSTEM must be a member of .BACKUP$. If you are not a member of .BACKUP$ and you want to use BACKUP, contact your System Administrator.

Access rights to the backup partition are set during the backup procedure. The section HOW TO BACK UP FILES AND DIRECTORIES later in this chapter explains what access rights you require and when you must set them.

You can back up an object from any attach point.

You can run the entire backup from the supervisor terminal. However, it is sometimes faster and more convenient to carry out as much as possible of the backup procedure from a user terminal. The section BACKUP Procedure, later in this chapter, explains which terminal to use at each stage of the procedure.

Catalogs

The first time you use BACKUP, it automatically creates catalogs in the directory MFD>BACKUP*>CATS*. BACKUP* and CATS* must exist before you begin the backup. Each catalog in CATS* describes one BACKUP volume. BACKUP names the catalog by adding the suffix .CAT to your name for the volume. For example, if your BACKUP session saves files to a volume that you name TOM, BACKUP creates the catalog TOM.CAT.

BACKUP handles catalogs by echoing your actions. If you create a new volume, BACKUP creates a new catalog. If you append to a current volume, BACKUP appends to the catalog for that volume. You can read the contents of your catalogs at any time by using the command LIST_CATALOG (see Chapter 24, LISTING A CATALOG: LIST_CATALOG).

Saves

During a backup session, the BACKUP command creates a unique section on the reel and in the corresponding catalog for the data. This section is called a save. The first save on a tape is save 1, the second is save 2, and so on. BACKUP always appends new data to the end of a volume. The catalog records the pathnames of the objects backed up at each save, and you can display this information by running the LIST_CATALOG command.

Whenever you use the BACKUP command, you can choose to either add to the same volume or create a new BACKUP volume with a new name. If you add to the same volume and run out of room on the reel, BACKUP asks you to mount a new reel. The new reel is still part of the same volume.

Setting Attributes

When BACKUP saves objects to tape, it sets the file system attribute, Date_Time_Backed-up, (DTB). When you request an incremental backup, the command compares an object's DTB with its Date_Time_Modified (DTM), and saves only those objects modified since the last backup.

How BACKUP Handles ROAM Files

A ROAM file is made up of entries in one or more related segment directories. At minimum, the file has at least one entry, entry 0, in the master segment directory. However a ROAM file may consist of a master file and several slave files located throughout the file system. In that case BACKUP saves the master file, then locates and saves its associated slave files. ROAM files that have their after imaging set to ON are saved during a full backup, but not during an incremental backup.

For details of how to back up ROAM files, refer to the ROAM Administrator's Guide.

Default BACKUP Command

You can save objects simply by specifying their pathname, the drive identifier and the volume name on the command line. For example:

```
OK. BACKUP @@ -MT 0 -VOLID IAN
```

backs up all the objects at your current attach point to volume IAN, on drive MT0.

The default BACKUP command creates and appends information about the save to the catalog for the tape identified by -VOLID: in the above example the catalog would be called IAN.CAT.

See the sections HOW TO BACK UP FILES AND DIRECTORIES and INVOKING BACKUP, later in this chapter, for detailed information about how to back up files and directories.

BACKUP Options

Command-line options enable operators to shape the command to meet their needs. You, the operator, can

- Specify that you want to perform an incremental backup
- Select the categories of file system objects to save
- Create a save index
- Suppress the generation of a catalog
- Add a remark to a save
- Control the generation of screen prompts
- Validate a save
- Save CAM files to tape as DAM files
- Save objects to a Rev.19 tape
- Display help text about the command's syntax, arguments and options

▶ BACKUP

This section describes the format of the BACKUP command, and summarizes the functions of the command-line arguments and options.

The format of the BACKUP command is

```
BACKUP  pathname  -MT n -VOLID volume-name  [options]
```

Descriptions of arguments and options follow.

Argument	Description
pathname	Identifies the location of the objects on disk that you wish to archive. You can use wildcards, iteration and treewalking.
-MT n	Specifies the unit number n of the drive on which the reel is mounted. The drive must be online and assigned to you.
-VOLID volume-name	Identifies the name of the volume. You can either name an unused volume or specify a named volume. The volume name must be a valid object name, and can a maximum of 28 characters long.

Option	Description
{ -ACCESSED_AFTER [date] } { -ACA }	Writes to tape those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] } { -ACB }	Writes to tape those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] } { -BKA }	Writes to tape those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.
{ -BACKEDUP_BEFORE [date] } { -BKB }	Writes to tape those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.
{ -CAM_TO_DAM } { -CTD }	Writes to tape as DAM files any CAM files among the selected objects.

{ -COMPATIBLE_VERSION [rev] | -CVN }

Specifies that data is to be written to tape in rev format, where rev identifies a revision of PRIMOS. The format of rev is nn or nn.n; for example 19.4. Used in a post-Rev.19 system to save data to a Rev.19 tape. This option is invalid if the tape already has data in post-Rev.19 format. rev defaults to Rev.19.

{ -CREATED_AFTER [date] | -CRA }

Writes to tape those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

{ -CREATED_BEFORE [date] | -CRB }

Writes to tape those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

-HELP

Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.

{ -INCREMENTAL | -INC }

Saves only those objects that have been modified since the last backup. This option is required for an incremental backup.

-INDEX [pathname]

Creates an index of all the objects that are written to tape. If you do not specify pathname, the index is displayed on the screen: otherwise it is stored in pathname, and is not displayed.

{ -INDEX_LEVELS [n] | -IXL }

Specifies the number n of levels that you want to include in the index, and displays the index on your screen. You can use this option with the -INDEX pathname option, in which case the index is filed in pathname, and is not displayed on your screen. The default value for n is 99.

{ -LEVELS n | -LV }

Specifies the number of levels of the directory structure that you want to save. The command default is to save all levels.

{ -MODIFIED_AFTER [date] | -MDA | -AFTER }

Writes to tape those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a DTM on or after date, the command saves the directory's subordinate objects that have been modified on or after this date.

{ -MODIFIED_BEFORE [date] | -MDB | -BEFORE }

Writes to tape those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today. If the object is a directory that does not have a DTM before date, the command saves the directory's subordinate objects that have been modified before this date.

{ -NO_CATALOG | -NOCAT }

Suppresses the generation of a new catalog.

{ -NO_QUERY | -NQ }

Suppresses command prompts when the user's response can be assumed: is used for unattended operation. If you specify this option and the command then requires some user action, the command aborts.

-REMARK [character string]

Lets you add a comment to your tape and catalog each time that you archive data. The remark can contain a maximum of 80 characters. If spaces are included, you must enclose the entire character string in single quotation marks. If you do not specify character string, the remark is a string of blank characters.

{ -TTY } { -T }	If you run BACKUP from either a CPL program or a command input file, this option enables you to specify the tape drive number from your terminal at the end of each reel.
{ -VALIDATE } { -VAL }	Checks the objects that you save against the original objects on disk, and informs you of discrepancies as the save proceeds. -VALIDATE is not a valid option if you archive to a 60Mb cartridge tape.
-VERIFY	Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to save every object that matches the pathname.

HOW TO BACK UP FILES AND DIRECTORIES

This section describes the procedures for performing a backup. It consists of the following subsections:

- Preparation describes the preparations needed before you begin a backup.
- BACKUP Procedure describes the step by step procedure for a backup.

You should read Preparation and BACKUP Procedure before you attempt a backup.

Preparation

Before you begin a backup you must

- Decide which files and directories you want to save
- Check what access rights you require
- Decide whether to
  - Close the entire system to users
  - Close the backup partition
  - Close neither the system nor the backup partition to users

Access Rights: You must have List, Use, Read, and Protect rights to the objects you want to back up. As part of the backup procedure, you set priority access to the backup partition, and this ensures that you have adequate access to the objects you want to back up.

If top-level catalog directory BACKUP* is not on the backup partition, the following ACL must be set on BACKUP* before you invoke BACKUP: .BACKUP$:DALURWX $REST:LURX. With this ACL set on BACKUP*, the default access rights to CATS* and to the individual catalogs are correct.

Note that BACKUP* also holds the directory HELP, on which you should set the specific ACL $REST:LUR.

Remember that either you or, when you invoke BACKUP from the supervisor terminal, user SYSTEM, must be a member of the predefined privileged group .BACKUP$.

Closing Either the System or the Backup Partition to Users: You should close the entire system to users if your backup partition holds

- Many users' origin directories (20% or more of system users)
- Files accessed by most of the users on the system
- The command device, paging device, or alternate paging device

You should also close the entire system to users if you want to maximize the speed of the backup.

If the backup partition does not fall into any of the three categories listed above, and performance is not your top priority, you can close only the backup partition to users, or keep both the system and partition open to users.

The choice between closing the backup partition and leaving it open is dependent upon your requirements and upon the timing of the backup. The performance of BACKUP is better if the partition is closed. However, if the backup is done during working hours, it may be more convenient for users if the partition remains in service. If you do keep the partition open, BACKUP saves both closed files and files open for reading, but it does not save files written during the save, for example COMOUTPUT files. Any file modifications by a user during an incremental backup are saved during the next backup.

BACKUP Procedure

This section describes how to back up files and directories.

If you decide to close either the system or the disk partition to users, follow the procedure described in the subsection System or

Partition Taken out of Service, below. If you intend to keep the system and partition in service, follow the procedure in the subsection System and Partition Kept in Service, below. There are summaries of these procedures in Appendix B, PROCEDURE REFERENCE.

System or Partition Taken out of Service: This subsection describes the backup procedure for when you have decided to close either the system or the partition to users. The procedure specifies which parts of the backup you can run from a user terminal; unless otherwise specified, perform all the steps from the supervisor terminal.

1. If you have decided to close the entire system to users, do this by following steps (a) through (f) below.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

   b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

   If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

   Wait until

   - A BATCH -STATUS command shows no jobs running
   - All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
   - All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

   c. Remind users about the impending shutdown. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING IN ONE MINUTE - LOGOUT IMMEDIATELY
```

d. Log out all users

```
OK, LOGOUT ALL
```

e. Set priority access to the partition you want to back up by issuing the command

```
OK, SPAC diskname user-id:ALL
```

where user-id is SYSTEM if you intend to run the whole backup from the supervisor terminal, or is your user ID if you want to run some of the backup from a user terminal. diskname is the name of the partition you want to back up.

f. Set MAXUSR to permit two processes to run: this is the maximum number of processes you need to run the backup

```
OK, MAXUSR 2
```

Note

BACKUP always requires one process. You need a second process if you want to run the backup from a user terminal.

2. If you have decided to close only the backup partition to users, do this by following steps (a) and (b) below.

a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITION <DSK1> CLOSING DOWN AT 14:00 HOURS TODAY
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITION <DSK1> CLOSING DOWN IN 1 MINUTE
```

b. Remove the backup partition from service and set priority access by issuing the commands

```
OK, SHUTDN pdev
OK, ADDISK pdev: SPAC diskname user-id:ALL $REST:NONE
```

where user-id is SYSTEM if you intend to run the whole backup from the supervisor terminal, or is your user ID if you want to run some of the backup from a user terminal.

3. If top-level directory BACKUP* is on the backup partition, continue at step 4.

   If BACKUP* is not on the backup partition, ensure you have adequate access rights to BACKUP*. The access rights should be .BACKUP$:DALURWX $REST:LURX. If .BACKUP$ already has these access rights, continue at step 4. If .BACKUP$ does not have the correct access rights, issue the following command to give yourself priority access to the partition that holds BACKUP*:

   ```
   OK, SPAC diskname user-id:ALL
   ```

   where user-id is SYSTEM if you intend to run the entire backup from the supervisor terminal, or is your user ID if you intend to run the backup from a user terminal. diskname is the name of the partition that holds BACKUP*.

4. If you have decided to run the backup from a user terminal, log into a terminal close to the tape and disk drives.

   ```
   OK, LOGIN user-id
   ```

   You can execute steps 5 through 9 below from either this terminal or the supervisor terminal.

5. Assign the tape drive(s). For example:

   ```
   OK, ASSIGN MTO
   ```

6. Mount the first reel. Before you mount the reel, you should label it with the following information:

   - Your initials
   - The date and time

- The names of the objects being saved
- The name of the volume
- The name of the system
- The recording density
- The tape number of this set, as in "Tape 1 of __"
- The fact that BACKUP is being used
- Whether it is a full or incremental backup
- The PRIMOS revision level

7. Invoke BACKUP. For example:

```
OK, BACKUP MFD -MT 0 -VOLID KATE.BAK
```

If you are unsure about the BACKUP command line, refer to INVOKING BACKUP, later in this chapter.

If you display a BACKUP index, by using the -INDEX or -INDEX_LEVELS options, it shows the save number. When you dismount a reel, label it with this save number.

8. At the end of the backup you should save all your BACKUP catalogs to another tape. If a catalog is lost, you can quickly recover an up-to-date version from tape: you can also use GENERATE_CATALOG to regenerate a lost catalog, but it is quicker to restore a catalog from tape, especially if the volume consists of many reels.

9. When you have saved the catalogs, dismount the last reel, and unassign the tape drives you assigned in step 5. For example:

```
OK, UNASSIGN MT0
```

10. If BACKUP* is on the backup partition, continue at step 11.

If BACKUP* is not on the backup partition, and you set priority access to the partition that holds BACKUP* at step 3, remove that priority access by issuing the following command at the supervisor terminal:

```
OK, RPAC diskname
```

where diskname is the name of the partition that holds BACKUP*.

11. Issue the following command at the supervisor terminal to remove the priority access you set on the backup partition:

```
OK, RPAC diskname
```

where diskname is the name of the backup partition.

12. If you have closed the entire system to users, return the system to service in the following manner, at the supervisor terminal:

    a. Start up the subsystems from the supervisor terminal. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

    b. Allow users to log in

```
OK, MAXUSR
```

    c. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

13. If you have closed only the backup partition to users, inform them that the partition is in service again. For example:

```
OK, MESSAGE -ALL -NOW
PARTITION DSK1 NOW AVAILABLE
```

System and Partition Kept in Service: This subsection describes how to make a backup when you do not close either the system or the backup partition to users. The procedure specifies which parts of the backup you can run from a user terminal; unless otherwise specified, perform all the steps from the supervisor terminal.

1. Set priority access to the backup partition by issuing the following command at the supervisor terminal:

   OK, SPAC diskname user-id:ALL

   where user-id is SYSTEM if you intend to run the whole backup from the supervisor terminal, or is your user ID if you want to run some of the backup from a user terminal.

2. If top-level directory BACKUP* is on the backup partition, continue at step 3.

   If BACKUP* is not on the backup partition, ensure you have adequate access rights to BACKUP*. The access rights should be .BACKUP$:DALURWX $REST:LURX. If .BACKUP$ already has these access rights, continue at step 3. If .BACKUP$ does not have the correct access rights, issue the following command to give yourself priority access to the partition that holds BACKUP*:

   OK, SPAC diskname user-id:ALL

   where user-id is SYSTEM if you intend to run the entire backup from the supervisor terminal, or is your user ID if you intend to run the backup from a user terminal. diskname is the name of the partition that holds BACKUP*.

3. If you want to run the backup from a user terminal, log into a terminal close to the tape and disk drives.

   OK, LOGIN user-id

   You can execute steps 4 through 8 below from this user terminal, or from the supervisor terminal.

4. Assign the tape drive(s). For example:

   OK, ASSIGN MTO

5. Mount the first tape reel. Before you mount a reel you should label it with the following information:

   - Your initials
   - The date and time
   - The names of the objects being saved

- The name of the volume
- The name of the system
- The recording density
- The tape number of this set, as in "Tape 1 of __"
- The fact that BACKUP is being used
- Whether it is a full or incremental backup
- The PRIMOS revision level

6. Invoke BACKUP. For example:

```
OK, BACKUP MFD -MT 0 -VOLID KEV.BAK
```

If you are unsure about the BACKUP command line, refer to INVOKING BACKUP, later in this chapter.

If you display a BACKUP index, by using the -INDEX or -INDEX_LEVELS options, it shows the save number. When you dismount a reel, label it with this save number.

7. At the end of the backup you should save all your BACKUP catalogs to another tape. If a catalog is lost, you can quickly recover an up-to-date version from tape: you can also use GENERATE_CATALOG to regenerate a lost catalog, but it is quicker to restore a catalog from tape, especially if the volume consists of many reels.

8. When you have saved the catalogs, dismount the last reel, and unassign the tape drives you assigned in step 4. For example:

```
OK, UNASSIGN MT0
```

9. If BACKUP* is on the backup partition, continue at step 10.

   If BACKUP* is not on the backup partition, and you set priority access to the partition that holds BACKUP* at step 2, remove that priority access by issuing the following command at the supervisor terminal:

```
OK, RPAC diskname
```

   where diskname is the name of the partition that holds BACKUP*.

10. Restore normal access rights to the backup partition by issuing the following command at the supervisor terminal:

    OK, RPAC diskname

    where diskname is the name of the backup partition.

INVOKING BACKUP

Notes

You should not run BACKUP until you are conversant with the preparation and BACKUP procedure, described in HOW TO BACK UP FILES AND DIRECTORIES, earlier in this chapter.

When you run BACKUP, you may receive a phantom logout message. This message refers to the logging out of a disk-reader process, and is a normal part of the BACKUP operation. No user action is required.

This section explains, with examples, how to invoke BACKUP for full and incremental backups, and how to back up individual files and directories. It consists of the following subsections:

- A Full Backup Using Multiple Reels shows how to invoke BACKUP to perform a full backup that requires multiple reels.
- A Full Backup With the -INDEX Option uses the -INDEX option to show more fully the progress of a full backup session.
- An Incremental Backup shows how to invoke BACKUP to perform an incremental backup.
- Backing Up Individual Files and Directories describes how to use BACKUP to back up individual files and directories.
- Backing Up to a 60Mb Cartridge Tape describes additional messages that you may receive when you save data to a 60Mb cartridge tape.

This section shows the use of BACKUP options -INDEX and -INC. For descriptions of how to use all the BACKUP options to extend the basic command, refer to the section USING THE BACKUP OPTIONS later in this chapter.

A Full Backup Using Multiple Reels

To back up the disk, attach to the MFD and enter MFD as the pathname of the object to be backed up. The following example command saves partition MYSYS, and the backup requires two reels. The example assumes that the system is closed to users, and that you have opened a COMO file for the backup.

```
OK, A MFD
OK, BACKUP MFD -MT 0 -VOLID SYS1.BAK

[BACKUP Rev. 20.2 ..... ]
*** Checking mounted reel ***
MT0 rewinding.
**** Begin Save of "MFD" ****
Error 2013:
Unable to open object : File in use. (Save_object)
Pathname: <MYSYS>MFD>SARAH>COMOS>MULTREEL.COMO Type: dam
Error 2013:
Unable to open object : File in use. (Save_object)
Pathname: <MYSYS>MFD>BACKUP*>CATS*>SYS1.BAK.CAT Type: segdam

End of reel has occurred, mount new reel.
Enter new tape unit or PAUSE : 0
*** Checking mounted reel ***
MT0 rewinding.
**** Begin Save of "MFD" ****

**** End Save of "MFD" ****
Files skipped during save.
OK,
```

BACKUP interacts with you as the backup operation proceeds. First it checks that you have mounted the correct tape. BACKUP then saves the entire disk except for the BACKUP catalog and any other files that are in use. As it copies files, BACKUP sets the Date_Time_Backed-up (DTB) attribute to the current date and time: this file attribute specifies the date and time of the backup, and is used by BACKUP when you perform incremental backups. BACKUP also creates the catalog, SYS1.BAK.CAT in this example, and enters the information about the save into the catalog.

When BACKUP reaches the end of the first reel, it informs you and displays the message "Enter new tape unit or PAUSE :". In this example the new reel is mounted on the same drive as the first, MT0.

A Full Backup With the -INDEX Option

This section gives another example of a full backup, but in this instance the command line includes the -INDEX option. The -INDEX

option is never a mandatory part of the BACKUP command line, but is included here to provide a better example of the BACKUP command. Except for the addition of -INDEX, the command line is identical to the example in the previous section. The -INDEX option gives detailed information about the backup including the reel number, save number, types and pathnames of all objects saved, errors and corrections, and tape statistics. The tape statistics, which appear at the end of the listing, include information about the tape density, the number of write errors from which the command has recovered, and the number of files saved. The tape statistics also specify the maximum block size. However, this is a fixed aspect of the software, and has no special significance for your save.

```
OK, BACKUP MFD -MT 0 -VOLID SYS1.BAK -INDEX

[BACKUP Rev. 20.2 ..... ]
*** Checking mounted reel ***

*** Positioning tape ***
BACKUP index of tape SYS1.BAK
Generated by user SARAH on 21 April 87 10:54:48 Tuesday

**** reel 1 ****
***** save number 2 *****
**** Begin Save of "MFD" ****
acl dir     <MYSYS>MFD>CMDNCO
sam         <MYSYS>MFD>CMDNCO>NSED
sam         <MYSYS>MFD>CMDNCO>MAKE
sam         <MYSYS>MFD>CMDNCO>PRIMOS
sam         <MYSYS>MFD>CMDNCO>PHYSAV
sam         <MYSYS>MFD>CMDNCO>PHYRST
sam         <MYSYS>MFD>CMDNCO>FUTIL
sam         <MYSYS>MFD>CMDNCO>FIXRAT
dam         <MYSYS>MFD>CMDNCO>LD.RUN
sam         <MYSYS>MFD>CMDNCO>COPY_DISK
sam         <MYSYS>MFD>CMDNCO>EDIT_PROFILE.SAVE
sam         <MYSYS>MFD>CMDNCO>LOGPRT
dam         <MYSYS>MFD>CMDNCO>DELETE.RUN
dam         <MYSYS>MFD>CMDNCO>COPY.RUN
dam         <MYSYS>MFD>CMDNCO>PROTECT.RUN
                        .
                        .
                        .
acl dir     <MYSYS>MFD>BACKUP*
acl dir     <MYSYS>MFD>BACKUP*>CATS*
Error 2013:
Unable to open object : File in use. (Save_object)
Pathname: <MYSYS>MFD>BACKUP*>CATS*>SYS1.BAK.CAT Type: sam
pwd dir     <MYSYS>MFD>BACKUP*>HELP
                        .
                        .
                        .
**** End Save of "MFD" ****
```

```
Files skipped during save.

          ***** Tape Statistics *****
tape density : 1600 bpi, maximum block size : 5141 words
total number of recovered errors in this save/restore : 0
total number of files saved/restored          : 2670
total number of blocks saved/restored         : 10326
OK,
```

An Incremental Backup

This section gives an example of an incremental backup. You must include the -INCREMENTAL option on the command line when you want to make an incremental backup. The command line in the example also includes the -INDEX option to show the progress of the save, but -INDEX is not mandatory.

In an incremental save, BACKUP saves the data of all files modified since the last backup and references to all directories. In the following example, the index shows that files CPS, PROG.PLP, AGENDA, and MEETING have been saved during the incremental backup. A SAM file label, in the left column of the display, identifies these files.

```
OK, BACKUP MFD -MT 0 -VOLID KEV.BAK -INC -INDEX

[BACKUP Rev. 20.2 ..... ]
*** Checking mounted reel ***
MTO rewinding.
BACKUP index of tape KEV.BAK
Generated by user KEVIN on 13 May 87 10:16:52 Wednesday

**** reel 1 ****
***** save number 1 *****
**** Begin Save of "MFD" ****
acat       <MYSYS>MFD>KEVIN>DERBY.ACAT
acl dir    <MYSYS>MFD>KEVIN>PERF_TOOLS
acl dir    <MYSYS>MFD>KEVIN>CPL_PROGRAMS
acl dir    <MYSYS>MFD>KEVIN>PLP_PROGRAMS
sam        <MYSYS>MFD>KEVIN>CPS
acl dir    <MYSYS>MFD>KEVIN>TEST1
sam        <MYSYS>MFD>KEVIN>TEST1>PROG.PLP
acl dir    <MYSYS>MFD>KEVIN>SERVER5
acl dir    <MYSYS>MFD>KEVIN>DOCS
acl dir    <MYSYS>MFD>KEVIN>DOCS>REPORT1
acl dir    <MYSYS>MFD>KEVIN>DOCS>PERFORMANCE
sam        <MYSYS>MFD>KEVIN>AGENDA
acl dir    <MYSYS>MFD>KEVIN>BKIO
Error 2013:
Unable to open object : File in use. (Save_object)
Pathname: <MYSYS>MFD>KEVIN>TEMP Type: dam
acl dir    <MYSYS>MFD>KEVIN>CATS*
```

```
sam         <MYSYS>MFD>KEVIN>MEETING
acl dir     <MYSYS>MFD>KEVIN>TEST
**** End Save of "MFD" ****
Files skipped during save.

          ***** Tape Statistics *****
tape density : 1600 bpi, maximum block size : 5141 words
total number of recovered errors in this save/restore : 0
total number of files saved/restored          : 4
total number of blocks saved/restored         : 636
OK.
```

The "Files skipped during save" message refers to file TEMP, which was not backed up, because it was in use during the backup. The tape statistics, which appear at the end of the listing, are described in the previous section, A Full Backup With the -INDEX Option.

Backing Up Individual Files and Directories

A system operator normally backs up an entire disk, or disk partition, working to a fixed backup schedule. Operators can, however, back up a selected top-level directory, file, or subdirectory: this section explains how to do so.

Backing Up Top-level Directories: You can back up an object from any attach point, and the type of pathname you use depends on your attach point. For example, assume you are attached to <DSK3>MFD, and you want to back up <DSK1>RICH3. The command

```
OK, BACKUP <DSK1>RICH3 -MT 0 -VOLID RICH3.BAK
```

saves RICH3 to the volume RICH3.BAK, on tape drive MT0.

If you are attached to RICH3, you can back up all the contents of RICH3 by using wildcards instead of the full pathname. For example, if you are attached to RICH3, the command

```
OK, BACKUP @@ -MT 0 -VOLID RICH3.BAK
```

saves RICH3 onto volume RICH3.BAK.

Note

If you use wildcards to back up the contents of a directory, only the files and subdirectories in that directory are backed up. This means that the ACLs for these objects are only saved if they have been using the default protection provided by the directory's ACL or access categories. Specific ACLs for the files and subdirectories are not saved. To save specific ACLs for these objects, you must specify the full directory pathname on the BACKUP command line.

Backing Up Files and Subdirectories: To back up individual files and subdirectories within a top-level directory, specify the name of the file or subdirectory that resides in the directory to which you are attached. For example, assume that file POWER resides in RICH3 and that you are attached to RICH3. The command

```
OK, BACKUP POWER -MT 0 -VOLID RICH3.BAK
```

saves POWER to RICH3.BAK on tape drive MT0.

Backing Up to a 60Mb Cartridge Tape

If you back up to a 60Mb cartridge tape, use the BACKUP command in the same ways as described in the preceding sections, Backing Up Top-level Directories and Backing Up Files and Subdirectories. You may, however, receive additional messages, not shown in the previous examples.

If the tape drive begins the save operation at the start of the tape, you may receive the messages

```
Tape initializing, please wait ...

Tape initialization complete.
```

The BACKUP procedure continues as shown in the previous examples.

USING BACKUP OPTIONS

This section describes how you can use BACKUP options to shape the backup function to your requirements. It consists of the following subsections:

- Selecting the Objects to Save describes how you can specify that only certain categories of file system objects are saved.
- Creating an Index describes how you can create an index of the objects saved.
- Suppressing Catalog Generation describes how to suppress the generation of a new catalog.
- Adding a Remark to the Save describes how to add a descriptive remark about the save to the tape and the catalog.
- Controlling Command Queries describes how to suppress the generation of those command prompts where the operator's response can be assumed, and how to make the command iterations when running BACKUP from either a CPL program or a command input file.
- Validating the Save describes how you can check that the save is successful.
- Converting CAM to DAM Files describes how to change the format of files when you save them.
- Moving Objects to a Rev.19 System describes how to move objects from a post-Rev.19 to a Rev.19 system.

The -INCREMENTAL option is described above in the section An Incremental Backup.

Selecting the Objects to Save

You can control which file system objects are saved by

- Specifying the pathname of the object(s) you wish to save
- Specifying the number of levels of the directory structure to be saved
- Selecting objects according to the date on which they were created, last accessed, last backed up, or last modified

Specifying the Pathname: The BACKUP argument pathname enables you to specify the pathname of the file system object that you wish to save. For example, the command line

```
OK, BACKUP BOB>NET -MT 0 -VOLID SYS1.BAK
```

saves file system object BOB>NET to the reel on MT0.

You can use wildcards, iteration and treewalking with the pathname.

When you use wildcards in the pathname, you can also include the -VERIFY option on the BACKUP command line. This causes BACKUP to prompt you for verification that you wish to save the file system objects selected by your wildcard specification.

You can use wildcard options to

- Select only file system objects of a particular type
- Select objects according to when they were created, last accessed, last backed up, or last modified
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, BACKUP BOB>DAY@@ -MT 0 -DIR -VOLID SYS1.BAK
```

saves any subdirectories in BOB whose names begin with DAY.

Note that when you want to select RBFs (Recovery Based Files) you must use the -RBF wildcard option. For example, by including the wildcard options -FILE and -RBF the command

```
OK, BACKUP BOB>@@ -MT 0 -VOLID RBF.BAK -FILE -RBF
```

saves all files and all RBFs in directory BOB to volume RBF.BAK.

Treewalking options make the command act on designated objects within a directory tree. You can only use these options when you include a wildcard in an intermediate position in the pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. To obtain online HELP about treewalking and wildcard options with BACKUP

issue the command

```
OK, BACKUP -HELP WILDCARDS
```

Specifying the Number of Directory Levels: The BACKUP default is to save all levels of the selected directory structure. However, the -LEVEL n option enables you to specify that the save is to include only n levels, where 1 is the top level. For example, the command

```
OK, BACKUP BOB -MT 0 -VOLID SYS1.BAK -LEVELS 2
```

saves only the top two levels of the directory structure.

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up
- Created
- Last modified

For each of the above events, you can select objects for archiving on the basis of whether the event took place before, on, or after a specified date.

The BACKUP options are

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]

The options suffixed with _AFTER cause BACKUP to save only objects that have been created, last accessed, last backed up, or last modified on or after the specified date.

The options suffixed with _BEFORE cause BACKUP to save only objects that have been created, last accessed, last backed up, or last modified before the specified date.

Note that these options are not exclusive: you can list selected objects on the basis of more than one of the file attributes.

You can specify date in any one of the following formats

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as 2 digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes.

Thus if you do not specify date, it defaults to 00:00 AM TODAY.

The following example, shows how to save, to volume SYSTEM, any object that has been modified before 00:00 AM TODAY. This example uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, BACKUP MFD -MT 0 -VOLID SYSTEM -MDB
```

As another example, the following command would back up, to tape SYS.BAK2, any object that has been backed up after 18th May 1986:

```
OK, BACKUP MFD -MT 0 -VOLID SYS.BAK2 -BACKEDUP_AFTER 05/18/86
```

Creating an Index

BACKUP options enable you to create an index of the objects you save to tape, and to control the level of information in the index.

Two options are available:

- -INDEX [pathname]
- -INDEX_LEVELS [n]

The -INDEX [pathname] option generates an index of all the objects you save, unless you modify this by also using the -INDEX_LEVELS option. When you do not specify pathname, the index is displayed on your screen. If you do specify a file pathname, the command sends the listing to the file, instead of displaying it on your screen. If this file already exists, the index is appended to the end of the file. If the file is one of the objects that you have selected for archiving, you receive a "File in use" error message, and the index is not saved.

The following example command uses the -INDEX option to display an index of all the objects you save:

```
OK, BACKUP MFD -MT 0 -VOLID DSK1.BAK -INDEX
```

The next example shows how to file the index by adding a file pathname to the -INDEX option. In this example the command would file the index in DSK1_INDEX.

```
OK, BACKUP MFD -MT 0 -VOLID DSK1.BAK -INDEX DSK1_INDEX
```

When you use the -INDEX option, the BACKUP default is to index all the selected objects. You can, however, restrict the index to a number of levels by including the -INDEX_LEVELS [n] option on the command line, where n is the number of levels that you want to index and level 1 is the top level.

You can use the -INDEX_LEVELS option in conjunction with the -INDEX option, or on its own.

When you use the -INDEX_LEVELS option with -INDEX, -INDEX_LEVELS determines the number of levels of the save that are indexed, and -INDEX allows you to write the index to a file. The following example extends the previous example command line by adding the option -IXL 2, which specifies that you want to index only the top two levels of the save. In this example, the index would be sent to file DSK1_INDEX.

```
OK, BACKUP MFD -MT 0 -VOLID DSK1.BAK -INDEX DSK1_INDEX -IXL 2
```

When you use the -INDEX_LEVELS option on a command line that does not also include the -INDEX option, -INDEX_LEVELS generates an index to the specified level and displays the index on your screen: you cannot write the index to a file. For example, the command

```
OK, BACKUP MFD -MT 0 -VOLID DSK1.BAK -IXL 2
```

displays a two-level index of the save on your screen.

Suppressing Catalog Generation

The default BACKUP command automatically creates a catalog when you first make a save to a tape. Thereafter it appends information to the catalog each time you make another save to that tape.

Where a catalog does not exist, you can use the option -NO_CAT to suppress the generation of a catalog. Note, however, that when you attempt to restore the save without a catalog, BACKUP_RESTORE reads the tape sequentially, record by record, until it finds the objects you want to restore. This slows the restore process significantly.

Adding a Remark to the Save

Whenever you invoke BACKUP, you can specify a remark to be written to the tape and the catalog, by specifying the -REMARK character string option on the command line. The remark can be up to 80 characters, including spaces. If you include spaces in the remark, you must enclose the entire character string in single quotation marks ('.....'). The remark is displayed against the save number whenever you request reel statistics as part of a LIST_TAPE or LIST_CATALOG command. See Chapter 24, LISTING A CATALOG: LIST_CATALOG, and Chapter 25, LISTING A TAPE: LIST_TAPE, for example displays of reel statistics.

The following example shows how you can add a remark such as Monday BACKUP. The option _REMARK adds this remark to a save of file system object TEST_FILES

```
OK, BACKUP TEST_FILES -MT 0 -VOLID BAK1 -REMARK 'Monday BACKUP'
```

If you do not specify a character string, the remark is a string of blank characters: the effect is exactly the same as if you had not used the -REMARK option.

Note that you cannot change a save's remark.

Controlling Command Queries

The -NO_QUERY option suppresses any command prompts to which a user response is assumed. Specifying this option when user action is required, aborts the command. You should only use this option if you are confident that no user action is required.

When you run BACKUP from either a CPL program or a command input file, specify the option -TTY if you want to be able to specify the tape drive number from your terminal at the end of each reel.

Validating the Save

You can compare the original objects on disk with those written to tape by including the -VALIDATE option on the BACKUP command line. You receive a warning message if BACKUP finds any discrepancies between the disk and tape objects.

Notes

When you use the -VALIDATE option, the save takes noticeably longer.

The -VALIDATE option is not supported if you are archiving data to a 60Mb cartridge tape.

Converting CAM to DAM Files

Contiguous Access Method (CAM) files, were introduced at PRIMOS Rev.20. to improve the performance of ROAM data management products. It is not possible to either create or access CAM files using pre-Rev.20 versions of PRIMOS. BACKUP therefore has an option, -CTD, to write CAM files to tape as DAM files.

For example:

```
OK, BACKUP <DSK1>TOM>@@ -MT 0 -VOLID DSK1.BAK -CTD
```

saves the entire contents of directory TOM to volume SYS1.BAK, and writes any CAM files as DAM files.

Moving Objects to a Rev.19 System

The BACKUP command allows you to save objects to tape in Rev.19 format, so that you can subsequently restore these objects on a Rev.19 system.

This facility is provided by the -COMPATIBLE_VERSION (-CVN) option, which tells BACKUP to write objects to tape in Rev.19 format.

The complete procedure for moving objects to a Rev.19 system is

1. Issue the BACKUP command with the -CVN option. For example:

```
OK, BACKUP MFD -MT 0 -VOLID R19_TAPE -CVN 19
```

   would append all the objects in your current partition to volume R19_TAPE, writing them in Rev.19 format.

2. Run GENERATE_CATALOG on the Rev.19 system to recreate the catalog.

3. Run BACKUP_RESTORE on the Rev.19 system to restore objects from R19_TAPE to disk.

Remember that you cannot restore RBF files to a different machine.

13
Restoring a BACKUP Tape: BACKUP_RESTORE

INTRODUCTION

This chapter describes how to use the BACKUP_RESTORE command to restore files and directories from a BACKUP tape volume to disk. It also includes an overview of the command and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF BACKUP_RESTORE introduces BACKUP_RESTORE. It explains how BACKUP_RESTORE handles ACLs, file attributes and ROAM files, describes the function of the default command, and summarizes the command options.

BACKUP_RESTORE describes the command format, arguments and options.

HOW TO RESTORE FILES AND DIRECTORIES describes the preparations for restoring data, and the step-by-step restore procedure.

INVOKING BACKUP_RESTORE describes example command lines that restore files and directories.

USING BACKUP_RESTORE OPTIONS describes how to use the command options to extend the command's functions.

RECOVERING A DISK describes how to restore a partition, other than the command device, after a disk crash. For details of how to restore the command device, refer to Chapter 19, RESTORING THE SYSTEM.

FURTHER EXAMPLES OF DISK AND FILE RECOVERY describes BACKUP_RESTORE command lines that restore disks from full and incremental backups, and that restore individual files, all with reference to an example backup schedule.

OVERVIEW OF BACKUP_RESTORE

BACKUP_RESTORE enables operators to do two types of recovery operation: retrieve individual directories and files, or restore an entire disk.

To use BACKUP_RESTORE, you must be a member of the predefined privileged group .BACKUP$, unless you intend to run the entire restore from the supervisor terminal, in which case user SYSTEM must must be a member of .BACKUP$. If you are not a member of .BACKUP$ and you want to use BACKUP_RESTORE, contact your System Administrator.

You identify the objects that you want to restore by specifying the pathname on the command line. BACKUP_RESTORE restores all objects with that name, and you should therefore always take care that the pathname uniquely identifies the object that you want to restore.

BACKUP_RESTORE always restores the selected objects to your current attach point, unless you also specify a new pathname on the command line. The new pathname allows you to restore objects to another attach point, or to rename them as they are restored.

How BACKUP_RESTORE Handles ACLs, DTM and DTB

BACKUP_RESTORE always copies the ACL protection of an object to disk, regardless of whether it is overwriting an existing disk object, or creating a new disk object.

When it overwrites an existing object on disk, BACKUP_RESTORE also overwrites that object's Date_Time_Modified (DTM) attribute: the DTM of the disk object becomes the same as the DTM of the tape object.

The Date_Time_Backed-up (DTB) is set to never backed up, so that the object is saved during the next system backup.

If you restore a ROAM file, BACKUP_RESTORE first restores the master file and then any slaves. BACKUP_RESTORE sets the Date_Time_Backed-up (DTB) of the directory that contains the ROAM file to never. It does not change the Date_Time_Saved (DTS) of the ROAM file. Therefore, if you use the LIST_RBF command on the restored file, you see the DTS, and

if you list your directory by typing LD. you see the DTB. For details of how to restore ROAM files, refer to the ROAM Administrator's Guide.

Default BACKUP_RESTORE Command

You can restore objects from tape simply by specifying the pathname and the tape drive identifier. The following example command restores a file system object, TEST_FILE3, from the BACKUP tape on tape drive MT0 to your current attach point:

```
OK, BACKUP_RESTORE TEST_FILE3 -MT 0
```

It does not matter whether the object was last backed up during a full save, or an incremental save. BACKUP_RESTORE searches the BACKUP catalogs, and tells you which volume and reel to mount for the latest copy.

If the object that you want to restore from tape already exists on disk and is of the same file type as the object on disk, BACKUP_RESTORE asks whether you want to restore the object. If you type yes, BACKUP_RESTORE overwrites the object on disk. On the other hand if the object on tape is a different type of file system object to the identically-named object on disk, BACKUP_RESTORE automatically restores the object from tape, without overwriting the object already on disk.

BACKUP_RESTORE Options

Command-line options enable you to shape BACKUP_RESTORE to meet your needs. You can

- Specify that you want to recover an entire disk
- Specify the volume and/or the reel from which you want to restore objects
- Select categories of file system objects to be restored
- Select which saves you wish to restore
- Create a restore index
- Control the generation of screen prompts
- Restore all RBF files as either CAM or DAM files
- Display help text about the command's syntax, arguments and options

▶ BACKUP_RESTORE

This section describes the format of the BACKUP_RESTORE command, and summarizes the functions of the command line arguments and options.

The format of the BACKUP_RESTORE command is

```
BACKUP_RESTORE pathname [new-pathname] -MT n [options]
```

Descriptions of the arguments and options follow.

Argument	Description
pathname	Identifies the objects on tape that you wish to restore. Also called the source pathname. You can use wildcards, iteration and treewalking.
new-pathname	Identifies the pathname of the objects when restored to disk. Also called the target pathname. This allows you to rename an object as it is restored, and/or to place the object in a location other than your current attach point. You can use name generation with new-pathname. If you do not give a new pathname, the object being restored is copied into your current attach point, and has the same name as on tape.
-MT n	Specifies the unit number n of the drive on which the reel is mounted. The drive must be online and assigned to you.

Option	Description
{ -ACCESSED_AFTER [date] | -ACA }	Restores those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] | -ACB }	Restores those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.

{ -BACKEDUP_AFTER [date] | -BKA }

Restores those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

{ -BACKEDUP_BEFORE [date] | -BKB }

Restores those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

{ -CAM_RBF | -CRBF }

Restores any DAM RBF files as CAM files. Useful for restoring runfiles created at Rev 19 on a Rev 19 partition to a Rev 20 partition.

{ -COMBINE | -COMB }

Only restores objects that do not already exist on disk.

{ -CREATED_AFTER [date] | -CRA }

Restores those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

{ -CREATED_BEFORE [date] | -CRB }

Restores those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

{ -DAM_RBF | -DRBF }

Restores any CAM RBF files as DAM files. Used to restore data from a post-Rev. 19 partition to a Rev.19 partition.

{ -FROM_SAVE_NUMBER n | -FSN }

Starts the restore at save number n. Values for n are 1-255. The command default is to begin at the first save on the reel. This option is useful for specifying the latest incremental save when there is no catalog. This option is not valid when you restore from a 60Mb cartridge tape drive.

-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INDEX [pathname]	Creates an index of all the objects that are restored to disk. If you do not specify pathname, the index is displayed on the screen: otherwise it is stored in pathname, and is not displayed.
{ -INDEX_LEVELS [n] } { -IXL }	Specifies the number n of levels of a directory structure that you want to index, and displays the index on your screen. You can use this option with -INDEX pathname, in which case the index is filed to pathname and is not displayed on your screen. The default value for n is 99.
{ -MODIFIED_AFTER [date] } { -MDA } { -AFTER }	Restores those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a DTM on or after date, the command restores the directory's subordinate objects that have been modified on or after this date.
{ -MODIFIED_BEFORE [date] } { -MDB } { -BEFORE }	Restores those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today. If the object is a directory that does not have a DTM before date, the command restores the directory's subordinate objects that have been modified before this date.
{ -NO_QUERY } { -NQ }	Suppresses command prompts when the user's response can be assumed: is used for unattended operation If you specify this option and the command then requires user action, the command aborts.

-RECOVER

Used to recover data from an incremental backup, typically after you have lost a disk. This option overrides all options except -VOLID, -INDEX, and -INDEX_LEVELS. Not used to restore single files.

-REEL n

Specifies the reel from which to restore objects. n defaults to 1, and the command default is to restore all reels of a volume in sequence.

-REPLACE

Only restores those objects that already exist on disk. BACKUP_RESTORE restores the objects regardless of their DTM on tape.

{ -TO_SAVE_NUMBER n | -TSN }

Ends the restore when save number n is reached, and does not restore from save n. Values for n are 1-255. The command default is to continue to the end of the tape volume. This option is not valid when you restore from a 60Mb cartridge tape drive.

{ -TTY | -T }

If you run BACKUP_RESTORE from either a CPL program or a command input file, this option enables you to specify the tape drive identifier from your terminal at the end of each reel.

{ -VERIFY | -VFY }

Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to restore the latest saves of every object that matches the pathname.

-VOLID volume-name1...volume-name10

Identifies the volumes from which to restore objects. You can specify a maximum of 10 volume names. The command default is to search all the catalogs for the objects you want to restore. The volume name must be a valid object name, and can be a maximum of 28 characters.

{ -WRITTEN_AFTER [date] | -WRA }

Restores only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today. If the object is a directory and

was not written to tape on or after the given date, the command restores the directory's subordinate objects written to tape on or after this date.

{ -WRITTEN_BEFORE [date] }
{ -WRB }

Restores only those objects that were written to tape before date or, if date is not given, before 00:00 AM today. If the object is a directory and was not written to tape before the given date, the command restores the directory's subordinate objects written to tape before this date.

HOW TO RESTORE FILES AND DIRECTORIES

This section describes the procedures for restoring data: you should read these procedures before you invoke BACKUP_RESTORE. The section consists of the following subsections:

- Preparation describes the preparations you must make before you begin to restore files and directories
- BACKUP_RESTORE Procedure describes the step-by-step procedure for restoring files and directories.

Preparation

Before you begin a restore you must

- Decide which files and directories you want to restore
- Check what access rights you require
- Decide whether to
  - Close the entire system to users
  - Close the restore(target) partition
  - Close neither the system nor the target partition to users

Access Rights: You need the following access rights to the objects you want to restore:

- Write access to restore an existing file
- Add, Delete, Write, List, and Use access to restore an existing directory
- Add rights if the object is not in the target directory

As part of the restore procedure, described below, you set priority access to the target partition, and this ensures you have adequate access rights to the objects you want to restore.

If top-level catalog directory BACKUP* is not on the target partition, the following ACL must be set on BACKUP* before you invoke BACKUP_RESTORE: .BACKUP$:DALURWX $REST:LURX. With this ACL set on BACKUP*, the default access rights to CATS* and to the individual catalogs are correct.

Note that BACKUP* also holds the directory HELP, on which you should set the specific ACL $REST:LUR.

Remember that either you or, when you invoke BACKUP_RESTORE from the supervisor terminal, user SYSTEM must be a member of the predefined privileged group .BACKUP$.

Closing Either the System or the Partition to Users: You should close the entire system to users if your target partition holds

- Many users' origin directories (20% or more of system users)
- Files accessed by most of the users on the system
- The command device, paging device, or alternate paging device

You should also close the entire system to users if you want to maximize the speed of the restore.

If you want to restore a partition after a disk crash (using the -RECOVER option), it is advisable to close either the system or the partition to users.

If the target partition does not fall into any of the categories listed above, and performance is not your top priority, you can close only the partition to users, or keep both the system and partition in service.

The choice between closing the partition and leaving it open is dependent upon your requirements and upon the timing of the restore. The performance of BACKUP_RESTORE is better if the partition is closed. However, if the restore is done during working hours, it may be more convenient for users if the partition remains in service.

BACKUP_RESTORE Procedure

This subsection describes the step by step procedure for restoring a BACKUP tape.

If you decide to close either the system or the disk partition to users, follow the procedure described in the next subsection, System or Partition Taken out of Service. If you are not going to take the system or partition out of service, follow the procedure in the subsection System and Partition Kept in Service. There are summaries of these procedures in Appendix B, PROCEDURE REFERENCE.

System or Partition Taken out of Service: This subsection describes the procedure for performing a restore when you close either the system or the partition to users.

To carry out a restore, follow the steps below. The procedure specifies which parts of the restore you can run from a user terminal; unless otherwise specified, perform all the steps at the supervisor terminal.

1. If you have decided to close the entire system to users, do this by following steps (a) through (f) below.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

   b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

   If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

Wait until

- A BATCH -STATUS command shows no jobs running
- All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
- All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

c. Remind users about the impending shutdown.

d. Log out all users:

```
OK, LOGOUT ALL
```

e. Set priority access to the partition you want to restore by issuing the command

```
OK, SPAC diskname user-id:ALL $REST:NONE
```

where diskname is the name of the partition you want to restore. user-id is SYSTEM if you intend to run the whole restore from the supervisor terminal, or is your user ID if you want to run some of the restore from a user terminal.

f. If you have decided to run the backup from a user terminal, log into a terminal close to the tape and disk drives. Do this be issuing the commands

```
OK, MAXUSR
OK, LOGIN user-id
```

You can execute steps 4 through 7 below from either this terminal or the supervisor terminal.

2. If you have decided to close only the target partition to users, do this by following steps (a) through (c) below.

a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITION <DSK1> CLOSING DOWN AT 14:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
PARTITION <DSK1> CLOSING DOWN IN 1 MINUTE
```

b. Set priority access on the partition you want to restore by issuing the following commands:

```
OK, SHUTDN pdev
OK, ADDISK pdev;  SPAC diskname user-id:ALL $REST:NONE
```

where diskname is the name of the partition you want to restore. user-id is SYSTEM if you intend to run the whole restore from the supervisor terminal, or is your user ID if you want to run some of the restore from a user terminal.

c. If you have decided to run some of the restore from a user terminal, log into a terminal close to the tape and disk drives:

```
OK, LOGIN user-id
```

You can execute steps 4 through 7 below from either this terminal or the supervisor terminal.

3. If top-level directory BACKUP* is on the target partition, continue at step 4.

   If BACKUP* is not on the target partition, ensure you have adequate access rights to BACKUP*. The access rights should be .BACKUP$:DALURWX $REST:LURX. If .BACKUP$ already has these access rights, continue at step 4. If .BACKUP$ does not have the correct access rights, issue the following command to give yourself priority access to the partition that holds BACKUP*:

```
OK, SPAC diskname user-id:ALL
```

   where user-id is SYSTEM if you intend to run the entire restore from the supervisor terminal, or is your user ID if you intend to run the restore from a user terminal. diskname is the name of the partition that holds BACKUP*.

4. Assign the tape drive(s) you want to use. For example:

```
OK, ASSIGN MTO
```

5. Mount the first tape reel. If you do not know which reel to mount, BACKUP_RESTORE tells you when you invoke it. You can also use LIST_CATALOG to find out which reel you need to mount.

6. Invoke BACKUP_RESTORE. For example:

```
OK, BACKUP_RESTORE @@ -MT 0
```

   If you are unsure about how to use BACKUP_RESTORE, refer to the section INVOKING BACKUP_RESTORE, later in this chapter.

7. When you have ended the restore, unassign the tape drives you assigned in step 4. For example:

```
OK, UNASSIGN MTO
```

8. If BACKUP* is on the target partition, continue at step 9.

   If BACKUP* is not on the target partition, and you set priority access to the partition that holds BACKUP* at step 3, remove that priority access by issuing the following command at the supervisor terminal:

```
OK, RPAC diskname
```

   where diskname is the name of the partition that holds BACKUP*.

9. If you have closed the entire system to users, return the system to service in the following manner, at the supervisor terminal:

   a. Use the REMOVE_PRIORITY_ACCESS (RPAC) command to restore normal access to the partition:

```
OK, RPAC diskname
```

   b. Start up the subsystems from the supervisor terminal. For example:

```
OK, BATCH -START
```

```
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

c. If you have run the entire restore from the supervisor terminal and did not issue the MAXUSR command at step 1(f), you must now allow users to log in:

```
OK, MAXUSR
```

d. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

10. If you have closed only the partition to users, return it to service in the following manner, at the supervisor terminal.

a. Use the REMOVE_PRIORITY_ACCESS (RPAC) command to restore normal access to the partition:

```
OK, RPAC diskname
```

b. Issue a message to inform users that the partition is available. For example:

```
OK, MESSAGE -ALL -NOW
PARTITION DSK1 IS NOW AVAILABLE
```

System and Partition Kept in Service: This subsection describes how to perform a restore without closing either the system or the partition to users.

To carry out a restore, follow the steps below. The procedure specifies which parts of the restore you can run from a user terminal; unless otherwise specified, perform all the steps at the supervisor terminal.

1. Set priority access to the partition you want to restore by issuing the command

```
OK, SPAC diskname user-id:ALL
```

where diskname is the name of the partition you want to restore.

2. If top-level directory BACKUP* is on the target partition, continue at step 3.

   If BACKUP* is not on the target partition, ensure you have adequate access rights to BACKUP*. The access rights should be .BACKUP$:DALURWX $REST:LURX. If .BACKUP$ already has these access rights, continue at step 3. If .BACKUP$ does not have the correct access rights, issue the following command to give yourself priority access to the partition that holds BACKUP*:

```
OK, SPAC diskname user-id:ALL
```

   where user-id is SYSTEM if you intend to run the entire restore from the supervisor terminal, or is your user ID if you intend to run the restore from a user terminal. diskname is the name of the partition that holds BACKUP*.

3. If you wish to run BACKUP_RESTORE from a user terminal, log into a terminal close to the tape and disk drives.

```
OK, LOGIN user-id
```

   You can carry out steps 4 through 7 below from this user terminal, or from the supervisor terminal.

4. Assign the required tape drive(s). For example:

```
OK, ASSIGN MT0
```

5. Mount the first tape reel. If you do not know which reel to mount, BACKUP_RESTORE tells you when you invoke it. You can also use LIST_CATALOG to find out which reel you need to mount.

6. Invoke BACKUP_RESTORE. For example:

```
OK, BACKUP_RESTORE FILE1 -MT 0
```

   If you are unsure how to run BACKUP_RESTORE, refer to the following section INVOKING BACKUP_RESTORE.

7. When you have ended the restore, unassign the tape drives you assigned in step 4. For example:

```
OK, UNASSIGN MTO
```

8. If BACKUP* is on the target partition, continue at step 9.

   If BACKUP* is not on the target partition, and you set priority access to the partition that holds BACKUP* at step 3, remove that priority access by issuing the following command at the supervisor terminal:

```
OK, RPAC diskname
```

   where diskname is the name of the partition that holds BACKUP*.

8. At the supervisor terminal, restore normal access rights to the partition you have restored:

```
OK, RPAC diskname
```

INVOKING BACKUP_RESTORE

Note

You should not run BACKUP_RESTORE until you are conversant with the preparation and restore procedures described in the previous section HOW TO RESTORE FILES AND DIRECTORIES.

This section describes, with examples, how to invoke BACKUP_RESTORE to restore files and directories. It consists of the following subsections:

- Restoring a Directory explains how to restore a directory from a BACKUP volume.
- Restoring a File explains how to restore a file from a BACKUP volume.
- Restoring All the Files and Directories From a Volume explains how to restore the latest versions of all the objects on a BACKUP volume.

To find out how to restore an entire partition after a disk crash, refer to the section RECOVERING A DISK, later in this chapter.

Restoring a Directory

This subsection describes how to restore a single directory and its files. The example command restores ANN. It assumes that you are attached to the MFD. In this example, the command line includes the -INDEX option, providing a better demonstration of BACKUP_RESTORE. Note, -INDEX is never mandatory.

BACKUP_RESTORE locates the first save that contains the specified objects, restores the objects, and continues to the next save. If BACKUP_RESTORE finds another save of the same object, it asks if you wish to overwrite the object with the later copy. Answer yes to overwrite it (as in the example below), or no to keep the present version of the object.

```
OK, BACKUP_RESTORE @@ -MT 0 -INDEX

[BACKUP_RESTORE Rev. 20.2..... ]
**** Processing catalog : SYS1.BAK ****

List of tapes containing saves of "@@".
Tape name: SYS1.BAK, reel(s): 1

**** Checking mounted reel ****
BACKUP_RESTORE index of tape SYS1.BAK
Generated by user ANN on 22 April 87 10:46:52 Wednesday

**** Begin restore of "@@" ****
**** reel 1 ****
**** save number 1 ****
**** Positioning tape ****
sam         <DSK1>MFD>ANN>DIR1>GEN
sam         <DSK1>MFD>ANN>DIR1>ACL.TB
sam         <DSK1>MFD>ANN>DIR1>FSUM
sam         <DSK1>MFD>ANN>DIR1>CHART
sam         <DSK1>MFD>ANN>DIR1>DISK.TB
                    .
                    .
                    .
**** save number 2 ****
**** Positioning tape ****
"<DSK1>ANN>DIR1>APA" already exists, do you wish to overwrite it
with "<DSK1>MFD>ANN>DIR1>APA" ? yes
sam         <DSK1>MFD>ANN>DIR1>APA
**** Positioning tape *****
"<DSK1>ANN>DIR1>BK1" already exists, do you wish to overwrite it
with "<DSK1>MFD>ANN>DIR1>BK1" ? yes
sam         <DSK1>MFD>ANN>DIR1>BK1

          ***** Tape Statistics *****
tape density : 1600 bpi, maximum block size : 5141 words
total number of recovered errors in this save/restore : 0
total number of files saved/restored         : 41
```

```
total number of blocks saved/restored        : 156

**** End restore of "@@" ****
OK,
```

Note the tape statistics at the end of the listing. These include information about the tape density, the number of read errors from which the command has recovered, and the number of files restored. The tape statistics also specify the maximum block size. However, this is a fixed aspect of the software, and has no special significance for your restore.

Restoring a File

This subsection shows how to restore a single file from a BACKUP volume. The following example assumes that you want to restore the file to your current attach point. BACKUP_RESTORE checks the catalog, identifies the volume containing FILE1, and checks that the correct reel is mounted. The command then restores the file to your current attach point and returns you to PRIMOS.

```
OK, BACKUP_RESTORE FILE1 -MT 0

[BACKUP_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : SYS1.BAK ****

List of tapes containing saves of "FILE1".
Tape name: SYS1.BAK, reel(s): 1

**** Checking mounted reel ****
**** Begin restore of "FILE1" ****
**** Positioning tape ****
**** End restore of "FILE1" ****
OK,
```

If you want to restore a file to a point other than your current attach point, specify a target pathname on the command line. For example, assume you saved file FILE2 from directory <DSK1>ANN, and that <DSK1>ANN is your current attach point. The following command would restore FILE2 to directory <DSK3>PAUL, and name the restored file FILE2.ANN.

```
OK, BACKUP_RESTORE FILE2 <DSK3>PAUL>FILE2.ANN -MT 0
```

Restoring All the Files and Directories From a Volume

This example shows the command line you would use to restore the latest versions of all the objects on the volume mounted on the assigned drive (MT0).

```
OK, BACKUP_RESTORE @@ -MT 0
```

USING BACKUP_RESTORE OPTIONS

This section describes how you can use BACKUP_RESTORE options to shape the restore function to your needs. It consists of the following subsections:

- Specifying the Volume and/or Reel to Restore explains how to specify the volumes and/or reels from which the selected objects are to be restored.
- Selecting the Objects to Restore explains how you can specify that only certain categories of file system objects are to be restored.
- Selecting the Saves to Restore explains how you can restore only selected saves.
- Creating an Index explains how you can create an index of the objects restored.
- Controlling Command Queries explains how to suppress the generation of those command prompts where the user's response can be assumed, and how to make the command interactive when you are running BACKUP_RESTORE from either a CPL program or a command input file.
- Converting Between CAM and DAM Files explains how to change the format of RBF files when you restore them.
- Using the -RECOVER Option explains when you need to use the -RECOVER option.

Specifying the Volume and/or Reel to Restore

The command default is to explore all your BACKUP catalogs for the objects specified on the BACKUP_RESTORE command line. When it finds these objects, BACKUP_RESTORE lists the volumes and reels that are needed. BACKUP_RESTORE prompts you at the appropriate time to mount another reel if more than one is required to complete a restore.

To restrict the search to specific catalogs, and to ensure that BACKUP_RESTORE only restores objects from selected volumes, use the -VOLID option on the command line. This option specifies the names of the volumes. For example:

```
OK, BACKUP_RESTORE REPORTS -MT 0 -VOLID SYS3
```

only restores REPORTS from volume SYS3. BACKUP_RESTORE checks the mounted reel against the volume catalog: if, in this example, the reel on MT0 were not part of SYS3, or did not hold REPORTS, you would be prompted for the correct reel. If SYS3 did not have a version of REPORTS, BACKUP_RESTORE would return you to PRIMOS. You can mount the reels in any order.

You can also restrict the restore to a specific reel by using the -REEL option on the command level. For example, the command

```
OK, BACKUP_RESTORE DAVE>FILE2 -MT 0 -VOLID SYS3 -REEL 2
```

restores DAVE>FILE2 from reel 2 of volume SYS3. If reel 2 were not mounted on MT0, BACKUP_RESTORE would prompt you to mount the correct reel.

Selecting the Objects to Restore

This subsection describes ways to control which file system objects are restored. You can

- Specify the source and target pathnames of the object(s) you wish to restore
- Select objects according to whether or not they already exist on disk
- Select objects according to the date on which they were created, last accessed, last backed up, last modified, or last written to tape

In addition, you are able to select the saves that you want to restore. You can begin and end the restore at specific saves, or select a particular save of a certain file system object. See the subsection Selecting the Saves to Restore, later in this chapter, for details of how to select saves.

Specifying the Pathname: The BACKUP_RESTORE arguments pathname and new-pathname enable you to specify the source and target pathnames of the file system object that you wish to restore. For example:

```
OK, BACKUP_RESTORE JOHN>TEST1 TEST1.BAK -MT 0 -VOLID SYS3
```

restores the latest save of file system object JOHN>TEST1 as TEST1.BAK.

You can use wildcards, iteration, treewalking, and name generation with the pathnames.

When you use wildcards in the pathname, you can also include the -VERIFY option on the BACKUP_RESTORE command line. BACKUP_RESTORE then prompts for verification that you wish to restore the file system objects selected by your wildcard specification. If you answer yes, and the catalog exists, BACKUP_RESTORE restores the latest copy of the selected object. If you answer yes and the catalog does not exist, BACKUP_RESTORE restores the next version of the object: you can continue the sequence of prompt and response until BACKUP_RESTORE has restored the latest version.

You can use wildcard options to

- Select particular types of file system objects
- Select objects according to when they were created, last accessed, last backed up, last modified, or last written to tape.
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, BACKUP_RESTORE JOHN>WEEK@@ -MT 0 -DIR -VOLID SYS3
```

restores, from volume SYS3, any subdirectories in JOHN whose names begin with WEEK.

Treewalking options make the command act on designated objects within a directory tree. You can only use these options when you include a wildcard in an intermediate position in the source pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about how to use wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. The following command shows how you can obtain online HELP about the use of treewalking and wildcard options.

```
OK, BACKUP_RESTORE -HELP WILDCARDS
```

Combining and Replacing File System Objects: You can choose to restore

- Only objects that already exist on disk (-REPLACE)
- Only objects that do not already exist on disk (-COMBINE)

In the following example, the command will only restore FILE1 if it already exists on disk.

```
OK, BACKUP_RESTORE FILE1 -MT 0 -REPLACE
```

The effect of -REPLACE is to replace objects on disk with the tape versions of these objects. Objects on disk do not change if there is not an object with an identical name on tape, and tape objects are not restored if there is not an identically-named object on disk.

The -COMBINE option restores only objects that do not already exist on disk: it adds new objects to disk. However, if BACKUP_RESTORE finds that a top-level directory already exists at the target pathname, it still allows you to perform the combine operation. The command asks whether you want to overwrite the directory. If you answer no, BACKUP_RESTORE restores no part of that directory. If you answer yes, it restores any file system objects that do not already exist in the disk version of the directory.

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up
- Created
- Last modified
- Last written to tape

For each of the above events, you can select objects to restore on the basis of whether the event took place before, on, or after a specified date.

BACKUP_RESTORE has the following options

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]
- -WRITTEN_AFTER [date] and -WRITTEN_BEFORE [date]

The options suffixed with _AFTER cause BACKUP_RESTORE to restore only objects that have been created, last accessed, last backed up, last modified, or last written to tape on or after the specified date.

The options suffixed with _BEFORE cause BACKUP_RESTORE to restore only objects that have been created, last accessed, last backed up, last modified, or last written to tape before the specified date.

Note that these options are not exclusive: objects can be selected for listing on the basis of more than one of the file attributes.

You can specify date in any one of the following formats:

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as 2 digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes.

Thus if you do not specify date, it defaults to 00:00 AM TODAY.

The following example shows how you can restore, from volume SYS2.BAK, any object that has been modified before 00:00 AM TODAY. It uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, BACKUP_RESTORE @@ -MT 0 -VOLID SYS2.BAK -MDB
```

In the following example, the command restores, from volume BACKUP4, any object that has been backed up after 18th May 1986.

```
OK, BACKUP_RESTORE @@ -MT 0 -VOLID BACKUP4 -BACKEDUP_AFTER 05/18/86
```

Selecting the Saves to Restore

The BACKUP_RESTORE default is to begin at the first save on the mounted reel, and to continue through to the last save on the reel. However, command options enable you to

- Begin at a specific save (-FROM_SAVE_NUMBER)
- End at a specific save (-TO_SAVE_NUMBER)

The following example shows how you can restore objects from saves 3 to 5 inclusive, from volume DSK1.BAK. It uses the abbreviated names for the -FROM_SAVE_NUMBER and -TO_SAVE_NUMBER options.

```
OK, BACKUP_RESTORE @@ -MT 0 -VOLID DSK1.BAK -FSN 3 -TSN 6
```

Note that -TSN specifies save 6. The restore stops when it reaches the specified save, and therefore save 5 is the last save restored.

Creating an Index

BACKUP_RESTORE options enable you to create an index of the objects you restore, and to control the level of information in the index.

Two options are available:

- -INDEX [pathname]
- -INDEX_LEVELS [n]

The -INDEX [pathname] option generates an index of all the objects you restore, unless you modify this by also using the -INDEX_LEVELS option. When you do not specify pathname, the index is displayed on your screen. If you do specify a file pathname, the command sends the listing to the file, instead of displaying it on your screen. If this file already exists, the index is appended to the end of the file. If the file is one of the objects that you have selected to restore, you receive a "File in use" error message, and the index is not saved.

In the following example, the -INDEX option would cause the command to display an index when you restore directory DIR1 from volume DSK2.

```
OK, BACKUP_RESTORE DIR1 -MT 0 -VOLID DSK2 -INDEX
```

The next example shows how you can file the index by adding a file pathname to the -INDEX option. In this example the command would file the index in DSK2_IND.

```
OK, BACKUP_RESTORE DIR1 -MT 0 -VOLID DSK2 -INDEX DSK2_IND
```

When you use the -INDEX option, the BACKUP_RESTORE default is to index all the selected objects. You can, however, restrict the index to a number of levels by including the -INDEX_LEVELS [n] option on the command line, where n is the number of levels that you want to index and level 1 is the top level.

You can use the -INDEX_LEVELS option in conjunction with the -INDEX option, or on its own.

When you use the -INDEX_LEVELS option with -INDEX, -INDEX_LEVELS determines the number of levels of the restore that are indexed, and -INDEX allows you to write the index to a file. The following example extends the previous example command line by adding the option -IXL 2, which specifies that you want to index only the top two levels of the restore. In this example, the index would be sent to file DSK2_IND.

```
OK, BACKUP_RESTORE DIR1 -MT 0 -VOLID DSK2 -INDEX DSK2_IND -IXL 2
```

When you use the -INDEX_LEVELS option on a command line that does not also include the -INDEX option, -INDEX_LEVELS generates an index to the specified level and displays the index on your screen: you cannot write the index to a file. For example, the command

```
OK, BACKUP_RESTORE DIR1 -MT 0 -VOLID DSK2 -IXL 2
```

displays a two-level index of the restore on your screen.

Controlling Command Queries

The -NO_QUERY option suppresses any command prompts to which BACKUP_RESTORE can assume the user's response. If you specify this option, and a situation arises in which BACKUP_RESPONSE requires user action, the command aborts. You should only use this option if you are confident that BACKUP_RESTORE will not require user action.

When you run BACKUP_RESTORE from either a CPL program or a command input file, the -TTY option enables you to specify the tape drive number from your terminal at the end of each reel.

Converting Between CAM and DAM Files

Contiguous Access Method (CAM) files were introduced at PRIMOS Rev.20. to improve the performance of ROAM data management products. It is not possible to either create or access CAM files via pre-Rev.20 versions of PRIMOS. BACKUP_RESTORE therefore has options to restore CAM files as DAM files, and vice versa. The options are

- -CAM_RBF, which restores all RBF files as CAM files, regardless of whether they were saved as CAM or DAM files
- -DAM_RBF, which restores all RBF files as DAM files, regardless of whether they were saved as CAM or DAM files

For a detailed account of the use of BACKUP_RESTORE to restore RBF files, refer to the ROAM Administrator's Guide.

Using the -RECOVER Option

You should only use -RECOVER to restore directories from incremental backups. If you want to restore directories from a full backup, or to restore individual files, use BACKUP_RESTORE without the -RECOVER option. The next section, RECOVERING A DISK, describes how to use -RECOVER to restore from incremental saves. It gives detailed examples of disk-recovery commands. The section FURTHER EXAMPLES OF DISK AND FILE RECOVERY, later in this chapter, gives example BACKUP_RESTORE command lines that restore disks from full and incremental backups, and command lines that restore individual files.

RECOVERING A DISK

This section describes how to use BACKUP_RESTORE to recover a disk after a crash. It assumes that the disk is not the command device. For information about how to restore the command device from either disk or tape, refer to Chapter 19, RESTORING THE SYSTEM.

You should read this section in conjunction with the subsection BACKUP_RESTORE Procedure, earlier in this chapter. The following procedures assume that you have closed either the system or the partition to users, and that you are ready to start the disk recovery procedure.

The first step after a disk crash is to run FIX_DISK on the damaged disk. For details about how to run FIX_DISK refer to the Operator's Guide to File System Maintenance.

After you have run FIX_DISK, run BACKUP_RESTORE with the -RECOVER option to recover the contents of the disk from BACKUP tapes. The manner in which BACKUP_RESTORE performs the restore depends upon whether the most recent save of the objects to be restored was a full or incremental backup. It also depends upon whether catalogs exist for the BACKUP tapes. Normally all the catalogs do exist, but it may be that you have only some of them, or none at all.

The following subsections explain how BACKUP_RESTORE restores a partition to the condition it was in when the most recent backup was made. They also give examples of how BACKUP_RESTORE commands can be used.

- Recovering the Disk From a Full Backup describes how BACKUP_RESTORE restores from a full backup.
- Recovering the Disk From Incremental Backups describes how BACKUP_RESTORE restores from incremental backups.
- Recovering the Disk When All Catalogs Exist describes how to use BACKUP_RESTORE when all the catalogs exist for the backup volumes.
- Recovering the Disk When No Catalogs Exist describes how to use BACKUP_RESTORE when no catalogs exist for the backup volumes.
- Recovering the Disk When Only Some Catalogs Exist describes how to use BACKUP_RESTORE when not all the catalogs are available.

Recovering the Disk From a Full Backup

If the most recent save of the objects you want to restore was a full backup, do not use the -RECOVER option. BACKUP_RESTORE searches the catalogs for the latest save. If all the catalogs exist, BACKUP_RESTORE restores all the objects to disk. If all the catalogs do not exist, the procedure is slightly different: see the following sections for details of the restore procedures.

Recovering the Disk From Incremental Backups

To recover a disk when the most recent save was an incremental backup, you must include the -RECOVER option on the command line. In an incremental save, the save only includes complete versions of the objects backed up if they have been modified since the previous backup. Objects that have not changed since the previous backup are referenced in a directory template. BACKUP_RESTORE uses the template to create a skeleton structure of the disk as it appeared before the crash. BACKUP_RESTORE then fills in the skeleton by reading previous incremental saves and, finally, the most recent full backup.

Note

BACKUP_RESTORE only restores objects that occur on the most recent incremental backup as either complete objects or file references: if an object is on an earlier incremental save, but has been deleted before the most recent incremental save, it does not appear on this last save and BACKUP_RESTORE does not restore it. The section FURTHER EXAMPLES OF DISK AND FILE RECOVERY, later in this chapter, explains how you can restore such an object.

If more than one tape volume is used in the recovery operation, BACKUP_RESTORE uses the latest save of all the catalogs to create the skeleton structure.

The following example shows how you can perform a recovery from the three volumes A, B and C. It assumes a full backup was made to volume A on Monday, and incrementals to B on Tuesday, and to C on Wednesday. The latest increment is on volume C. Note though that the order in which you list the volumes on the command line is not important: BACKUP_RESTORE automatically restores the volumes in the correct order.

```
OK, BACKUP_RESTORE <DSK1>MFD -MT 0 -VOLID A B C -RECOVER
```

The most recent save, on volume C in this example, provides the skeleton for the restore, while all other saves on B and C help to fill in the skeleton. After BACKUP_RESTORE has restored the most recent incremental save, it restores from any other incremental backups made after the most recent full backup. BACKUP_RESTORE then completes the skeleton structure by restoring from the most recent full save, on volume A in this example.

For another example of how to use the -RECOVER option, refer to the section FURTHER EXAMPLES OF DISK AND FILE RECOVERY, later in this chapter.

The tables below summarize the actions of BACKUP_RESTORE when the latest save is an incremental save. In the first part of the recovery operation (Table 13-1), BACKUP_RESTORE identifies and restores the most recent incremental backup. In the second part of the recovery operation (Table 13-2), BACKUP_RESTORE restores all other recent incremental backups, in any order.

Table 13-1

Identifying and Restoring the
Most Recent Incremental Backup

Disk Information	Reel Information	Action
File does not exist.	File exists.	File is created, data restored. DTM is set to DTM off reel.
File does not exist.	File reference only.	Empty file is created. DTM is set to "very early".
File is truncated (by FIX_DISK).	File exists.	Truncated file is cleared. Data is restored. DTM is set to DTM off reel.
File is truncated (by FIX_DISK).	File reference only.	DTM is set to "very early".
DTM is earlier than DTM on reel.	File exists.	Data is restored. DTM is set to DTM off reel.
DTM is earlier than DTM on reel.	File reference only.	NO ACTION.
DTM is later than DTM on reel.	File exists.	NO ACTION.
DTM is later than DTM on reel.	File reference only.	NO ACTION.

Table 13-2

Restoring Other Recent Incremental Backups

Disk Information	Reel Information	Action
File does not exist.	File exists.	NO ACTION.
File does not exist.	File reference only.	NO ACTION.
File is truncated (by FIX_DISK).	File exists.	NO ACTION.
File is truncated (by FIX_DISK).	File reference only.	NO ACTION.
Empty file from Step 1 exists. (DTM is earlier than DTM on reel.)	File exists.	Data is restored. DTM is set to DTM off reel.
Empty file from Step 1 exists. (DTM is earlier than DTM on reel.)	File reference only.	NO ACTION.
DTM is later than DTM on reel.	File exists.	NO ACTION.
DTM is later than DTM on reel.	File reference only.	NO ACTION.

Recovering the Disk When All Catalogs Exist

When catalogs exist for all the volumes from which objects are to be restored, BACKUP_RESTORE carries out a normal restore. It searches the catalogs and locates the latest save. If the save is a full save, BACKUP_RESTORE restores that save and then ends. It is not necessary to use the -RECOVER option.

If the latest save is an incremental save, you must include the -RECOVER option on the command line. BACKUP_RESTORE identifies the tape volume and reel with the latest save. Follow the steps below.

1. BACKUP_RESTORE prompts you to load a reel: load the reel as prompted.

2. Press <RETURN>.

   BACKUP_RESTORE restores any objects saved during the last incremental save that do not exist on disk, or that have a Date_Time_Modified (DTM) later than on disk.

3. BACKUP_RESTORE prompts for another reel: mount the reel and then press <RETURN>.

   BACKUP_RESTORE restores objects only if they have a DTM later than the one on disk, or if they replace an empty object.

4. Repeat step 3 until the restore is complete.

The following two examples show this procedure. Both examples assume that the most recent backup was incremental and they therefore include the -RECOVER option.

Recovery Without Specifying the Volumes: The example below assumes that there are only two catalogs, for tape volumes PETE and DAVE. BACKUP_RESTORE checks these catalogs, locates the latest save of the object, and asks you to mount the correct reel. In this example, the latest save is incremental, and BACKUP_RESTORE therefore restores this save before asking you to mount the reels that contain other recent incremental backups.

```
OK, BACKUP_RESTORE <DSK1>MFD -MT 0 -RECOVER

[BACKUP_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : PETE ****
**** Processing catalog : DAVE ****

List of tapes containing saves of "<DSK1>MFD".
Tape name: PETE, reel(s): 1
Tape name: DAVE, reel(s): 1, 2

Latest save of "<DSK1>MFD" located. Tape name required is "PETE"
(Incremental save)
Save number 1, Reel(s) required: 1

Please mount reel 1 of tape "PETE" on MTO.
If you do not have this save, type "NO".
If you have already restored this save, type "CONTINUE".
If you want to quit, type "QUIT".
When the tape is mounted, press <return>. : <RETURN>
**** Checking mounted reel ****
**** Begin restore of <DSK1>MFD ****
**** Positioning tape ****
**** End restore of <DSK1>MFD ****

List of tapes containing saves of "<DSK1>MFD".
Tape name: DAVE, reel(s): 1, 2

Please mount one of the tapes on MTO.
Press <return> when ready  (or QUIT) : <RETURN>

**** Checking mounted reel ****
       .
       .
       .
**** End restore of "<DSK1>MFD" ****

List of tapes containing saves of "<DSK1>MFD".
Tape name: DAVE, reel(s): 2

**** End restore of "<DSK1>MFD" ****
OK,
```

Recovery With Volume Names Specified: The following example shows how the previous recovery, above, proceeds when you specify the volume names on the command line. BACKUP_RESTORE checks only the catalogs for the specified volumes, locates the latest save, and tells you which reel to mount. BACKUP_RESTORE restores the first save, prompts you to mount the other reels, and restores recent saves from each reel.

```
OK, BACKUP_RESTORE <DSK1>MFD -MT 0 -VOLID PETE DAVE -RECOVER

[BACKUP_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : PETE ****
**** Processing catalog : DAVE ****

List of tapes containing saves of "<DSK1>MFD".
Tape name: PETE, reel(s): 1
Tape name: DAVE, reel(s): 1, 2

Latest save of "<DSK1>MFD" located. Tape name required is "PETE"
(Incremental save)
Save number 1, Reel(s) required: 1

Please mount reel 1 of tape "PETE" on MT0.
If you do not have this save, type "NO".
If you have already restored this save, type "CONTINUE".
If you want to quit, type "QUIT".
When the tape is mounted, press <return>. : <RETURN>
**** Checking mounted reel ****
**** Begin restore of "<DSK1>MFD" ****
**** Positioning tape ****
**** End restore of "<DSK1>MFD" ****

List of tapes containing saves of "<DSK1>MFD".
Tape name: DAVE, reel(s): 1, 2

Please mount one of the tapes on MT0.
Press <return> when ready (or QUIT) : <RETURN>
**** Checking mounted reel ****
     .
     .
     .
**** End restore of"<DSK1>MFD" ****

List of tapes containing saves of "<DSK1>MFD".
Tape name: DAVE, reel(s): 2

**** End of restore of "<DSK1>MFD" ****
OK,
```

Notice that BACKUP_RESTORE restores the latest save first, then restores other recent incremental backups from other reels.

Recovering the Disk When No Catalogs Exist

This subsection describes the restore procedure required when no catalogs exist for the volumes from which you want to recover the disk. The example assumes that the most recent backup was incremental.

BACKUP_RESTORE asks you if you want to restore from the tape volumes without the catalogs. If you answer y or yes, BACKUP_RESTORE asks you for the name of the volume which contains the latest increment, and for the number of the latest save on the reel. The following example shows how BACKUP_RESTORE works in this situation.

```
OK, BACKUP_RESTORE <GEN>MFD -MT 0 -VOLID VOL2 VOL1 -RECOVER

[BACKUP_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : VOL2 ****
Error 3032:
Unable to access catalog : Not found. (BACKUP_RESTORE)
Do you wish to restore from this tape without the catalog? yes
**** Processing catalog : VOL1 ****
Error 3032:
Unable to access catalog : Not found. (BACKUP_RESTORE)
Do you wish to restore from this tape without the catalog? yes

List of tapes containing saves of "<GEN>MFD".
Tape name: VOL2, all reels
Tape name: VOL1, all reels

None of the volume ids have catalogs.
To do the recover operation you must enter the name of the volume
that holds the latest save, and the save number.
Enter volume id (or QUIT) : vol2
Enter save number : 3
    .
    .
```

The rest of the operation proceeds as a normal recovery, as shown in the previous section.

Recovering the Disk When Only Some Catalogs Exist

In the following example, the command line specifies two volumes, ALPHA and BETA. It assumes that there is a catalog for ALPHA, but not for BETA. It also assumes that the latest save shown in the ALPHA catalog is not the latest save: the latest save is on BETA, and is an incremental save.

BACKUP_RESTORE checks the catalogs for the latest save and asks you if this information is correct. If this save is the latest save, BACKUP_RESTORE restores it. If the latest save shown in the catalog is not the latest save, BACKUP_RESTORE asks you to mount the reel that contains the latest save and to enter its volume name. BACKUP_RESTORE

restores the latest save and continues the operation as a normal recovery.

```
OK, BACKUP_RESTORE <DSK3>MFD -MT 0 -VOLID ALPHA BETA -RECOVER

[BACKUP_RESTORE Rev. 20.2 ..... ]
**** Processing catalog : ALPHA ****
**** Processing catalog : BETA ****
Error 3032:
Unable to access catalog : Not found. (BACKUP_RESTORE)
Do you wish to restore from this tape without the catalog? yes

List of tapes containing saves of "<DSK3>MFD".
Tape name: ALPHA, reel(s): 1
Tape name: BETA, all reels

Latest save of "<DSK3>MFD" located. Tape name required is "ALPHA"
(Full save)
Save number 1, Reel(s) required: 1

Please mount reel 1 of tape "ALPHA" on MT0.
If you do not have this save, type "NO".
If you have already restored this save, type "CONTINUE".
If you want to quit, type "QUIT".
If the latest save does not have a catalog, type in volume name.
When the tape is mounted, press <return>. : beta
Enter save number : 2
**** Checking mounted reel ****
      .
      .
      .
```

The rest of the operation proceeds as a normal recovery.

FURTHER EXAMPLES OF DISK AND FILE RECOVERY

This section describes the BACKUP_RESTORE command lines that restore directories from full and incremental backups, and the command lines that restore individual files. It refers to an example backup schedule to illustrate how you use BACKUP_RESTORE.

Assume in this example that the partition structure is as shown below. There are three directories: CRITICAL, IMPORTANT and STABLE. The directory names indicate the nature of the data they contain.

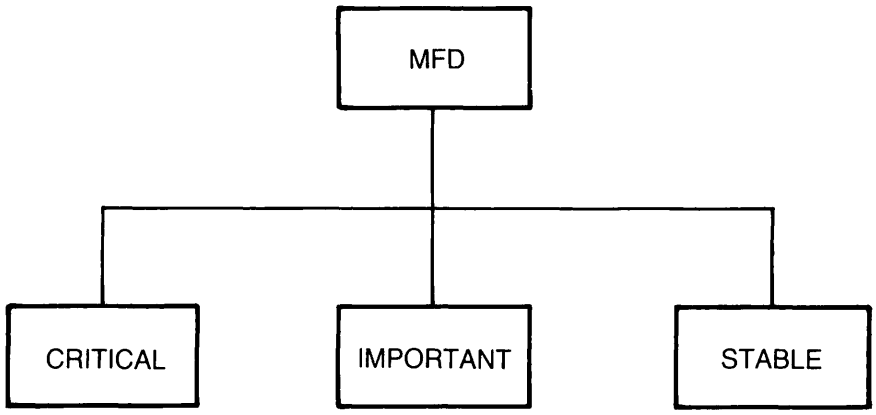


Table 13-3 gives an example weekly backup schedule for the above partition.

Table 13-3
Example Backup Schedule

Day of week	Directory	Type of Backup	Typical Volume ID
Monday	CRITICAL	Incremental	MON.880706
	IMPORTANT	Incremental	MON.880706
	STABLE	Full	STABLE
Tuesday	CRITICAL	Full	TUE.880707
	IMPORTANT	Incremental	TUE.880707
	STABLE	None	
Wednesday	CRITICAL	Incremental	WED.880708
	IMPORTANT	Incremental	WED.880708
	STABLE	None	
Thursday	CRITICAL	Full	THU.880709
	IMPORTANT	Incremental	THU.880709
	STABLE	None	
Friday	CRITICAL	Incremental	FRI.880710
	IMPORTANT	Full	FRI.880710
	STABLE	None	

Assume that the disk is lost on a Wednesday, before the backups for that day, and that you have to restore all three directories. The following paragraphs explain how you would restore each directory.

To restore directory CRITICAL an appropriate command would be

```
OK, BACKUP_RESTORE CRITICAL -MT 0 -VOLID TUE.880707
```

The -VOLID option specifies the volume with the most recent save of CRITICAL. That save was a full backup, and therefore the -RECOVER option is not needed.

To restore directory IMPORTANT an appropriate command would be

```
OK, BACKUP_RESTORE IMPORTANT -MT 0 -RECOVER
```

The command line includes the -RECOVER option because the most recent backup of IMPORTANT was incremental.

To restore directory STABLE an appropriate command would be

```
OK, BACKUP_RESTORE STABLE -MT 0 -VOLID STABLE
```

The -RECOVER option is not used here because all saves of STABLE were full backups.

Continuing the example, assume that in the week prior to the disk failure a user had accidentally deleted a file called TPTEST from directory IMPORTANT. File TPTEST would not be in the most recent incremental save of IMPORTANT, and therefore it would not have been restored with the directory. To restore TPTEST you would need to issue the command

```
OK, BACKUP_RESTORE IMPORTANT>TPTEST -MT 0
```

BACKUP_RESTORE would search all the catalogs to find the latest save of TPTEST.

As another example of file recovery, assume that a user accidentally updated file DO_NOT_ALTER from directory STABLE in the week prior to the disk crash. You would now need to restore the original version of the file. The LIST_CATALOG -DETAIL command would enable you to list the STABLE catalog and to identify the save that held the original version of -DO_NOT_ALTER. For example:

```
OK, LIST_CATALOG STABLE>DO_NOT_ALTER -DETAIL
```

Assume the catalog listing shows that the original version of DO_NOT_ALTER was in save 5 of the volume STABLE. The following command would restore the file from save 5:

```
OK, BACKUP_RESTORE STABLE>DO_NOT_ALTER -MT 0 -VOLID STABLE -FSN 5
-TSN 5
```

14
Physical Save to Tape: PHYSAV

INTRODUCTION

This chapter describes how to use the PHYSAV command to copy physical disk partitions to tape. It also includes an overview of the command and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF PHYSAV introduces PHYSAV. It describes the function of the default command, and summarizes the command options.

PHYSAV describes the command format and options.

HOW TO SAVE A PARTITION describes

- Preparations for saving a partition
- The step-by-step save procedure
- The sequence of PHYSAV prompts and user responses
- An example PHYSAV session
- How to save a partition to a 60Mb cartridge tape drive
- How to exit temporarily and then reenter PHYSAV

VERIFYING PHYSAV TAPES describes ways to verify your PHYSAV tapes.

OVERVIEW OF PHYSAV

The PHYSAV command saves entire partitions at a time, and a partition is the smallest unit that you can restore from a PHYSAV tape.

Note that you should not attempt to use a version of PHYSAV that is older than the partition you want to save, because the older version of PHYSAV may not understand the format of the disk.

If you save a partition that has related files on another partition, remember to save this other partition also, to ensure the files remain a logically consistent set. For example, a ROAM file may consist of a master file and several slave files, and the slave files might not be on the same partition as the master file.

Default PHYSAV Command

You can save any partition, except the command device, by invoking PHYSAV without any options. For example:

```
OK, PHYSAV
```

PHYSAV issues a series of prompts, and your responses to these prompts define the save. The sequence of PHYSAV prompts and user responses is called the PHYSAV dialog. A later section in this chapter, Invoking PHYSAV, describes in detail the PHYSAV prompts and the responses you should give.

To save the command device, you must use the -COMDEV option, which is described below.

Using the Record Availability Table (RAT)

When you invoke PHYSAV, it prompts you to specify whether you want PHYSAV to refer to the Record Availability Table (RAT) during the save. The RAT specifies which records on the partition are being used by the file system. If you request PHYSAV to use the RAT, PHYSAV refers to the table, and saves only records that are in use. This reduces the time taken to save a partition, and it is therefore recommended that you always use the RAT.

PHYSAV Options

You can run PHYSAV without using any command options. There are however four options, which enable you to

- Request PHYSAV to save the command device
- Set the speed of streamer tape drives
- Instruct PHYSAV to request the tape drive unit number at your terminal when you run PHYSAV from within either a CPL program or a command input file
- Tell PHYSAV that you are using equipment with certain early disk controllers

The option descriptions in the next section give more information about when and how to use these options.

▶ PHYSAV

The format of the PHYSAV command is

```
PHYSAV  [options]
```

Descriptions of the options follow.

Option	Description
-COMDEV	Physically saves the command device. Automatically shuts down the device, places it in the Assignable Disks Table, saves and then restarts the device. No operator intervention is required. When COMDEV restarts, any event logging that was in effect when you invoked PHYSAV is reinstated. PHYSAV also restores a maximum of 10 priority ACLs.
-SPEED { 25 | 100 }	Specifies the tape speed, and is used only when writing to a streamer tape drive. With these drives, speed automatically defaults to 100 ips or, if you assign the drive at a density of 3200 bpi, to 50 ips.
-TTY	PHYSAV asks for the magnetic tape unit number at the terminal, even if you run PHYSAV from a CPL program or a command input file. Do not use the -TTY

	option if you plan to run the command input file as a Batch job or phantom, or if you want PHYSAV to take the magnetic tape unit number from the command input file.
-UNMOD	Prevents system hangs that are caused by incorrect recovery from DMX overruns. Use this option only if your equipment has one of the following early model controllers: wire wrap disk controller boards without ECR 3748, or etched boards without ECRs 3062 and 3342.

HOW TO SAVE A PARTITION

This section describes how to make a physical save to tape. It consists of the following subsections

- Preparation describes the preparations needed before you save a partition.
- PHYSAV Procedure describes the steps to save a partition.
- Invoking PHYSAV describes how to invoke PHYSAV, and what responses to make to the PHYSAV prompts.
- Example PHYSAV Session shows a typical sequence of PHYSAV prompts and user responses.
- Saving to a 60Mb Cartridge Tape describes slight differences in PHYSAV's function and dialog when you use it to save to a 60Mb cartridge tape.
- Reentering PHYSAV explains how you can temporarily exit from, and then reenter, PHYSAV.

Preparation

Before you save a partition, you have to decide whether to close the entire system to users, or just the partition that you want to back up: you must do one or the other. Chapter 11, SYSTEM PREPARATION PROCEDURES, discusses the factors that you should consider when deciding which approach to adopt.

PHYSAV Procedure

This subsection describes how to save a partition. Unless otherwise specified, perform the steps below from the supervisor terminal. The procedure does, however, allow you to run part of the backup from a user terminal. There is a summary of the procedure in Appendix B, PROCEDURE REFERENCE.

Note that step 1 describes the procedure for closing the entire system to users. If you have decided to close only the backup partition, begin at step 2.

1. If you have decided to close the entire system to users, do this by following steps (a) through (f) below, and then continue at step 3.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

   b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

   If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

   Wait until

   - A BATCH -STATUS command shows no jobs running
   - All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
   - All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

   c. Remind users about the impending shutdown.

d. Log out all users:

```
OK, LOGOUT ALL
```

e. Shut down the partitions that are to be backed up, and add them to the Assignable Disks Table. Do this by issuing the following commands for each partition:

```
OK, SHUTDN pdev
OK, DISKS pdev
```

f. It may be more convenient to run the backup from a user terminal. To do this, issue the MAXUSR command, and log into a user terminal close to the tape and disk drives.

```
OK, MAXUSR
OK, LOGIN user-id
```

You can execute steps 3 through 9 from either this terminal or the supervisor terminal.

2. If you have decided to close only the backup partition(s) to users, do this by following steps (a) through (c) below.

a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITION <DSK1> CLOSING AT 14:00 HOURS TODAY
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN IN 1 MINUTE
```

b. Issue the following commands for each disk partition:

```
OK, SHUTDN pdev
OK, DISKS pdev
```

c. It may be more convenient to run the backup from a user terminal. If you wish to do so, log into a terminal:

OK, LOGIN user-id

Choose a terminal close to the tape and disk drives. You can execute steps 3 through 9 from either this terminal or the supervisor terminal.

3. Assign the partition(s) you want to save by issuing the following command for each partition:

OK, ASSIGN DISK pdev

> WARNING
>
> If you save partitions from more than one disk, and use the same disk drive, you must reissue the ASSIGN command for all partitions. This ensures that the disk controller accesses the badspot table from the correct disk. If you do not reissue the ASSIGN command, some controllers use the badspot table from the first disk on which a given pdev occurs for saves of partitions with the same pdev on other disks.

4. Assign the tape drive to which you intend to make the save. For example:

OK, ASSIGN MTO

5. Mount a tape. It is recommended that before you mount the tape you label it with the following information:

- Your initials
- The date and time
- The name of the partition being saved
- The physical disk number of the partition being saved
- The name of the system
- The recording density (usually 1600 or 6250 bpi)
- The tape number of this set, as in "Tape 1 of __"
- The fact that PHYSAV is being used to save the tape
- The PRIMOS revision level

6. Invoke PHYSAV:

```
OK, PHYSAV
```

This initiates the PHYSAV dialog, which is described in the next section, Invoking PHYSAV.

7. When PHYSAV has completed the save, dismount the last tape. It is very important to fill in the blanks on the tape labels to indicate the number of tapes in the set. Remember also to remove the write-permit rings from the backup tapes, to avoid accidental overwriting.

8. Unassign the tape drive that you have used. For example:

```
OK, UNASSIGN MTO
```

9. Unassign the partition(s) that you have saved by issuing the following commmand for each partition:

```
OK, UNASSIGN DISK pdev
```

10. If you have closed the entire system to users, return the system to service in the following manner, at the supervisor terminal.

    a. Remove the partitions from the Assignable Disks Table, and make them available to users by issuing the following commands for each partition:

```
OK, DISKS NOT pdev
OK, ADDISK pdev
```

    b. Start up the subsystems. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

    c. If you have performed all the backup from the supervisor terminal and did not issue the MAXUSR command at step 1(f), you must now allow users to log in:

```
OK, MAXUSR
```

d. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

11. If you have closed only the backup partitions, return them to service in the following manner, at the supervisor terminal:

a. Return to service the disk partitions you closed at step 2 by issuing the following commands for each partition:

```
OK, DISKS NOT pdev
OK, ADDISK pdev
```

b. Issue a message to inform users that the partitions are available. For example:

```
OK, MESSAGE -ALL -NOW
PARTITIONS DSK1 AND DSK3 ARE NOW AVAILABLE
```

Invoking PHYSAV

This subsection describes how to invoke PHYSAV and describes the responses that you should make to the PHYSAV prompts.

To invoke PHYSAV, issue the command

```
OK, PHYSAV
```

The subsection PHYSAV Options, above, describes the ways that you can modify this basic command.

When you invoke PHYSAV, it presents you with a series of prompts about the save. These prompts, and the responses you should give are detailed below. Note that if you use PHYSAV to save to a 60Mb cartridge tape, the dialog is slightly different to that shown below: these differences are described in the subsection Saving to a 60Mb Cartridge Drive.

Prompt	Response
Unit no:	Supply the tape drive unit number (0-7), or type quit to exit from PHYSAV. (To reenter PHYSAV type ren.)
Logical tape:	Enter the logical tape number.
Comment:	Supply a comment up to 80 characters long. Include the name of the partition being saved. For example: SAVE OF PARTITION DSK4 ON 2/10/87.
Phys.Dev.No:	Specify the physical device number of the partition to be saved (for example, 21060).
Use the rat (Yes/No)?	Answer yes.
Phys.Dev.No:	Enter another pdev, or a carriage return (CR).
Parameters OK (Yes/No)?	Enter yes to begin the save operation. To exit from PHYSAV, type no. You can reenter by typing ren.
Write next log.tape (Yes/No)?	To end the PHYSAV session, answer no. To make another physical save, answer yes.

If PHYSAV reaches the end of the reel of tape, it rewinds that reel, and asks you for a new tape unit. Label a new tape as you did the first, for example "Tape 2 of __". Mount the new tape on another tape drive or, after dismounting the previous tape, mount it on the drive you have just used. Then enter the tape drive unit number.

Example PHYSAV Session

This subsection complements the previous section on procedure by giving an example of the PHYSAV dialog. In this example, the user asks PHYSAV to save the partition identified by physical device number 21060, to logical tape 1 on tape drive MT0. The save has the comment SAVE OF DSK4, 05/17/88.

```
OK, ASSIGN MT0
OK, ASSIGN DI 21060
OK, PHYSAV
[PHYSAV Rev.22.0 Copyright (c) 1988, Prime Computer, Inc.]
Date : MAY 17, 1988    Time : 08.41
Unit no: 0
Logical tape: 1
Comment:
SAVE OF DSK4, 05/17/88
Phys.Dev.No: 21060
Use the rat (Yes/No)? yes
Phys.Dev.No: (CR)

Disk                          Head offset, #Heads,  Saving
021060   DSK4                     4          4      records used
Parameters OK (Yes/No)? yes
Reel:      1  Log.Tape:      1  Section:      1
Save complete
Write next log.tape (Yes/No)? no
OK, UNASSIGN DI 21060
OK, UNASSIGN MT0
OK,
```

Saving to a 60Mb Cartridge Tape

When you use PHYSAV to save to a 60Mb cartridge tape, the procedure is similar to that described above in the section PHYSAV Procedure. The main difference is that you can only make one logical save to tape: all the partitions that you save are held in one logical tape.

To invoke PHYSAV, follow the procedure described in the previous subsection, Invoking PHYSAV. After you have responded to the prompt "Unit no:", PHYSAV displays a new message

```
Only one logical tape possible on this drive type.
```

This message is a reminder that when you use PHYSAV, you can only have one logical tape on the cartridge.

PHYSAV does not prompt for the logical tape number, because there can only be the one logical tape. Instead, the PHYSAV dialog continues from the "Comment:" prompt, up to the prompt

```
Parameters OK (Yes/No)?
```

If you answer yes, PHYSAV displays the message

```
Tape initializing .....
```

This message indicates that the entire contents of the tape are being erased: the process takes approximately 2 minutes.

When initialization is complete, PHYSAV displays the message

```
Starting save at reel:  1
```

and the process continues until PHYSAV has saved the partition.

Reentering PHYSAV

Up to the point at which the PHYSAV save operation begins, you can exit from PHYSAV and then restart at the latest convenient point by typing ren. For example

- If the magnetic tape unit is not assigned, you can type quit in response to the "Unit no:" prompt, assign the magnetic tape unit, then reenter the subsystem at this point by typing ren.
- If you have not assigned the partition to be saved, the subsystem exits. You can then assign the partition and restart the subsystem from this same point by typing ren. You have to reenter the physical disk number.

If you exit from PHYSAV after the save operation has begun, you can continue from the exit point by typing start, or restart the latest section (logical tape or current reel, whichever is the most recent) by typing ren.

When PHYSAV prompts

```
Write next log.tape (Yes/No)?
```

you can reenter PHYSAV by responding yes. You reenter at the latest point from which PHYSAV is able to continue. If you answer no, you exit from the subsystem completely.

VERIFYING PHYSAV TAPES

This subsection discusses three ways to verify PHYSAV tapes. Each approach involves the use of PHYRST, and the subsection therfore gives a summary of the steps to follow to run PHYRST. If you need more information about how to use PHYRST, refer to Chapter 15, RESTORING A PHYSAV TAPE: PHYRST. The verification process takes approximately the same length of time as the original save.

The three ways to verify PHYSAV tapes are

- Verify reels on a different system to that on which the save is taking place: run PHYRST on the new system to verify one reel, while you continue on the other system with the save to the next reel
- Verify the reel on the same system as that on which the save is taking place, at the same time as the save operation
- Verify the reel on the same system as that on which the save is taking place, after the save operation has ended

The first approach is useful if the save requires more than one reel of tape, because backup and verification can proceed in parallel and this reduces the time needed to complete the overall process. This approach does, however, have the disadvantage that you must have another system free, with an available tape drive.

The second approach requires you to run PHYSAV from one terminal on the system, and PHYRST from another terminal on the same system. This provides concurrent backup and verification, but reduces system performance and lengthens the time taken to complete the save. You also need to have a second tape drive available.

The third approach is to verify the tapes after the backup has ended. You make the system available to users when you have completed the backup, and then verify the tapes while other people also use the system.

Running PHYRST

To verify your PHYSAV tapes, follow the steps below.

1. Check that you have unassigned any partitions that you have just saved.

2. Mount the first tape, which is labeled "Tape 1 of n".

3. Invoke PHYRST by entering the command

   OK, PHYRST

4. PHYRST asks for the unit number. Enter the tape drive unit number.

5. PHYRST asks for the logical tape. Enter the logical tape number.

6. PHYRST asks for confirmation that the correct tape is mounted. Answer yes to continue, no to mount the correct tape and restart at step 4.

7. PHYRST asks whether you want to restore or verify the tape. Enter ve. If there is more than one reel, PHYRST prompts you to mount the next reel, and asks for the drive unit number again.

8. PHYRST indicates that verification has been successful by issuing the message "Verify Complete", or issues an error message if it has failed.

9. PHYRST asks whether you want to verify the next logical tape. Answer no.

10. The verification is complete. Dismount the last tape, which is labeled "Tape n of n".

15
Restoring a PHYSAV Tape: PHYRST

INTRODUCTION

This chapter describes how to use the PHYRST command to restore physical partitions from tape to disk. It also includes an overview of the command, and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF PHYRST introduces PHYRST. It describes the function of the default command, and summarizes the command options.

PHYRST describes the command format and options.

HOW TO RESTORE A PARTITION describes

- The prepartion for restoring a partition
- The step-by-step restore procedure
- The sequence of PHYRST prompts and user responses
- An example PHYRST session
- How to exit temporarily and reenter PHYRST
- How to use PHYRST on a system that has dynamic badspot handling

OVERVIEW OF PHYRST

PHYRST restores an entire physical disk partition previously saved by PHYSAV: it cannot be used to restore parts of a partition.

During the restore PHYRST may remap records, to avoid badspots on the target disk. If this does occur, PHYRST advises you to run FIX_DISK on the target disk before you use that disk again. The procedure for restoring a partition, described later in this chapter in the section PHYRST Procedure, includes instructions for running FIX_DISK.

Note

You should not attempt to use a version of PHYRST that is older than the revision of the partition you want to restore, because the older version of PHYRST may not understand the format of the disk.

If you restore a partition that has related files on another partition, remember to restore this other partition also, to ensure the files remain a logically consistent set. For example, a ROAM file may consist of a master file and several slave files, and the slave files might not be on the same partition as the master file.

Disk Format

At Rev.21 the format of disks changed, to permit dynamic badspot handling and disk mirroring.

From Rev.21 onwards, partitions can be in one of two modes:

- Intelligent-controller (-IC) mode, in which only an intelligent controller can access the disk, and dynamic badspot handling and disk mirroring are available. The disk controller handles all the badspots on the disk, which appears error-free to PRIMOS.
- All-controller (-AC) mode, in which all types of controller can access the disk, but dynamic badspot handling and disk mirroring are not possible.

For details of how to set and change the partition modes, and for information about badspot handling and disk mirroring, refer to the Operator's Guide to File System Maintenance.

Caution

You cannot restore to a Rev. 21 or Rev. 22 partition that has a larger dynamic badspot remap area (RMA) than the source partition. If you attempt such a restore you receive an error message, and PHYRST aborts. This means, for example, that you cannot restore a non-first partition to a first partition, because first partitions have an RMA, whereas non-first partitions do not have an RMA.

Partitions can be either robust or nonrobust. Robust partitions have an enhanced resilience to machine failure, but can only hold CAM files. Note that you can only restore a save of a robust partition onto another robust partition, and you can only restore a save of a nonrobust partition onto another nonrobust partition.

Default PHYRST Command

You can restore a partition from tape by issuing the PHYRST command without any options. For example:

```
OK, PHYRST
```

PHYRST issues a series of prompts, and your responses to these prompts define the restore. The sequence of prompts and user responses is called the PHYRST dialog. A later section in this chapter, Invoking PHYRST, describes in detail the prompts and the responses you should give.

PHYRST Options

You can run PHYRST without using any command options. There are however four options, which enable you to

- Set the speed of streamer tape drives
- Disable badspot handling by PHYRST
- Instruct PHYRST to request the tape drive unit number at your terminal when you run PHYRST from within either a CPL program or a command input file
- Tell PHYRST that you are using equipment with certain early disk controllers

▶ PHYRST

The format of the PHYRST command is:

```
PHYRST   [options]
```

The option descriptions follow.

Option	Description
-NO_BADS	Disables badspot handling by PHYRST, and causes PHYRST to ignore any badspots on the output disk. This option is supplied only for compatibility with earlier revisions of PRIMOS, and you should exercise great care if you use it.
-SPEED { 25 | 100 }	Specifies the tape speed, and is used only when you write to a streamer tape drive. With these drives, speed automatically defaults to 100 ips or, if you assign the drive at a density of 3200 bpi, to 50 ips.
-TTY	Causes PHYRST to ask for the magnetic tape unit number at the terminal, even if you run PHYRST from a CPL program or a command input file.
-UNMOD	Prevents system hangs from occurring as a result of incorrect recovery from DMX overruns. Use this option only if your equipment has one of the following early model controllers: wire wrap disk controller boards without ECR 3748, or etched boards without ECRs 3062 and 3342.

HOW TO RESTORE A PARTITION

This section describes how to restore a physical partition from tape. It consists of the following subsections:

- Preparation describes the preparations needed before you restore a partition.
- PHYRST Procedure describes the steps to restore a partition.
- Invoking PHYRST describes how to invoke PHYRST, and what responses to make to the PHYRST prompts.

- Reentering PHYRST explains how you can exit from, and then restart, PHYRST.
- Example PHYRST Session shows a typical sequence of PHYRST prompts and user responses.

You should be conversant with the preparation and PHYRST procedures before you invoke PHYRST.

Preparation

Before you restore a partition, you have to decide whether to close the entire system to users, or just the partition that you want to restore: you must do one or the other. Chapter 11, SYSTEM PREPARATION PROCEDURES, discusses the factors that you should consider when deciding which approach to adopt.

PHYRST Procedure

This subsection describes how to restore a partition.

Unless otherwise specified, perform the steps below from the supervisor terminal. The procedure does, however, allow you to run part of the restore from a user terminal. There is a summary of the procedure in Appendix B, PROCEDURE REFERENCE.

Note that step 1 describes the procedure for closing the entire system to users. If you have decided to close only the partitions that you want to restore, begin at step 2.

1. If you have decided to close the entire system to users, do this by following steps (a) through (f) below, and then continue at step 3.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

   b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

Wait until

- A BATCH -STATUS command shows no jobs running
- All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
- All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

c. Remind users about the impending shutdown.

d. Log out all users:

```
OK, LOGOUT ALL
```

e. Shut down the partitions that are to be restored, and add them to the Assignable Disks Table. Do this by issuing the following commands for each partition:

```
OK, SHUTDN pdev
OK, DISKS pdev
```

f. It may be more convenient to run the restore from a user terminal. To do this, issue the MAXUSR command, and log into a user terminal close to the tape and disk drives.

```
OK, MAXUSR
OK, LOGIN user-id
```

You can execute steps 3 through 11 from either this terminal or the supervisor terminal.

2. If you have decided to close to users only the partitions you want to restore, close them by following steps (a) to (c), below.

   a. Inform users of the impending shutdown by issuing a series

of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITIONS <DSK1> AND <DSK3> CLOSING AT 14:00 HOURS
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN IN 1 MINUTE
```

b. Issue the following commands for each disk partition:

```
OK, SHUTDN pdev
OK, DISKS pdev
```

c. It may be more convenient to run the restore from a user terminal. If you wish to do so, log into a terminal:

```
OK, LOGIN user-id
```

Choose a terminal close to the tape and disk drives. You can execute steps 3-11 from either this terminal or the supervisor terminal.

3. Assign the target partitions by issuing the following command for each partition:

```
OK, ASSIGN DISK pdev
```

WARNING

If you restore partitions to more than one disk, and use the same disk drive, you must reissue the ASSIGN command for all partitions. This ensures that the disk controller accesses the badspot table from the correct disk. If you do not reissue the ASSIGN command, some controllers use the badspot table from the first disk on which a given pdev occurs for saves of partitions with the same pdev on other disks.

4. Assign the tape drive from which you want to restore the partition. For example:

```
OK, ASSIGN MTO
```

5. Mount the first tape.

6. Invoke PHYRST:

```
OK, PHYRST
```

   This initiates the PHYSAV dialog, which is described in the next section, Invoking PHYRST.

7. After PHYRST has finished, dismount the last tape.

8. PHYRST may print the message

```
Badspots handled on partition pdev - please run FIX_DISK
```

   If you do receive this message, continue at step 9. If you do not receive this message, omit step 9 and proceed to step 10.

   For detailed information about badspots and the way that utilities handle badspots, refer to the Operator's Guide to File System Maintenance.

9. Run FIX_DISK on the restored partition, including the -FIX option on the command line.

```
OK, FIX_DISK -DISK pdev -FIX
```

10. Unassign the partitions that you have just restored by issuing the following command for each partition:

```
OK, UNASSIGN DISK pdev
```

11. Unassign the tape drive. For example:

```
OK, UNASSIGN MTO
```

12. If you have closed the entire system to users, return the system to service in the following manner, at the supervisor terminal.

    a. Remove the partitions from the Assignable Disks Table, and make them available to users by issuing the following commands for each partition:

```
OK, DISKS NOT pdev
OK, ADDISK pdev
```

b. Start up the subsystems. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

c. If you have performed all the restore from the supervisor terminal and did not issue the MAXUSR command at step 1(f), you must now allow users to log in:

```
OK, MAXUSR
```

d. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

13. If you have closed only the partitions that you wanted to restore, return them to service in the following manner, at the supervisor terminal:

a. Return to service the disk partitions you closed at step 2 by issuing the following commands for each partition:

```
OK, DISKS NOT pdev
OK, ADDISK pdev
```

b. Issue a message to inform users that the partitions are available. For example:

```
OK, MESSAGE -ALL -NOW
PARTITIONS DSK1 AND DSK3 ARE NOW AVAILABLE
```

Invoking PHYRST

This subsection shows how to invoke PHYRST and describes the responses that you should make to the PHYRST prompts.

To invoke PHYRST, issue the command

```
OK, PHYRST
```

The subsection PHYRST Options, above, describes the ways that you can modify this basic command.

When you invoke PHYRST, it presents you with a series of prompts about the restore. These prompts, and the appropriate responses, are detailed below.

Prompt	Response
Unit no:	Supply the tape drive number (0-7). To exit from PHYRST, type quit.
Logical tape:	Enter the number of the logical tape you want to restore.
Correct tape: (Yes/No)?	Verify that the information displayed is correct. For example, make sure the partition name is correct, and that the date and time displayed represent the date and time you believe the tape was made. If the information is correct, enter yes. If the information displayed is not correct, enter no. If you have mounted the correct tape, then the PHYSAV operation must have been unsuccessful. If you have mounted the incorrect tape, replace it with the correct tape: PHYRST reissues the the "Unit no" prompt.
Restore or Verify (re/ve)?	Enter re.
Restore all partitions to original positions (Yes/No)?	Enter yes to restore the partition to its original position. If you type no, PHYRST asks whether you want to restore each of the partitions on the tape. For each partition that you want

	to restore, PHYRST also asks for the pdev of the disk you want to restore it onto.
Parameters OK (Yes/No)?	Check the parameters that PHYRST displays, to make sure that you have specified correctly the partitions you want to restore, and the disks that you want to restore them onto. The section, Example PHYRST Session, below, shows the layout of the screen display. If the parameters are correct, enter yes. This starts the restore. If the parameters are not correct, enter no, and mount the correct tape: PHYRST then repeats the "Unit no" prompt.
Restore complete	This message indicates that the partition has been restored successfully. If PHYRST displays an error message, this means that the tape is unreadable and the partition has not been restored.
Restore/Verify next Log.Tape (Yes/No)?	To end the PHYRST session, enter no. If you want to restore another logical tape, enter yes.

If PHYRST reaches the end of the tape, it tells you, rewinds the tape, and asks for a new tape unit. Mount the next tape on another tape drive or, after dismounting the previous tape, mount it on the drive just used. Then enter the tape drive unit number.

Reentering PHYRST

If you exit, or quit from PHYRST, for example because a partition is not assigned, you can reenter by typing s 1000. PHYRST restarts from the latest convenient point. For example, if a partition is not assigned, PHYRST restarts from the beginning of the sequence that specifies the partition you want to restore.

If you type <ctrl>-P or quit during a restore operation, PHYRST restarts from the beginning of the latest section (logical tape or current reel, whichever started most recently).

Note that you cannot reenter PHYRST with the REN command.

Example PHYRST Session

This subsection complements the previous subsection on procedure by giving an example of the PHYRST dialog. In this example, the user asks PHYRST to restore the partition identified by physical device number 21060, from logical tape 1 on tape drive MT0, to its original position on disk. The partition is called DSK4.

```
OK, PHYRST
[PHYRST Rev.22.0 Copyright (c) 1988, Prime Computer, Inc.]
Unit no: 0
Logical tape: 1

Reel:   1 Log.tape:    1 Section:   1

Date created: MAY 17, 1988  at  10.31
Comment: SAVE OF DSK4, 05/17/88
Partitions saved
021060  DSK4                          80MB or 200MB removable media

Correct tape (Yes/No)? yes
Restore or Verify (re/ve)? re
Restore all partitions to original positions (Yes/No)? yes
Disk                                 To be restored as
021060  DSK4                                 021060

Parameters OK (Yes/No)? yes
Reel:    1 Log.tape:   1 Section:   1
Restore complete
Restore/Verify next Log.Tape (Yes/No)? no
OK,
```

16
Physical Copy Between Disks: COPY_DISK

INTRODUCTION

This chapter describes how to use the COPY_DISK command to copy physical disk partitions from one disk to another. It includes an overview of the command, and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF COPY_DISK introduces COPY_DISK. It describes the function of the default command, and summarizes the command options.

COPY_DISK describes the command format and options.

HOW TO COPY A PARTITION describes

- Preparations for copying a partition
- The step-by-step COPY_DISK procedure
- The sequence of COPY_DISK prompts and user responses
- Example COPY_DISK sessions
- How to use COPY_DISK in a system that has dynamic badspot handling
- Additional COPY_DISK prompts when you use a Cartridge Module Device

OVERVIEW OF COPY_DISK

You can use COPY_DISK to either back up or restore partitions. The copy procedure and the format of the command are the same for each task.

COPY_DISK can copy a maximum of five partitions. The only restrictions are that

- All source partitions must reside on the same physical pack, that is, they must have the same controller and drive number.
- All target partitions must reside on the same physical pack, that is, they must have the same controller and drive number.
- The source and target partitions in each partition pair must be the same size, that is, the same number of surfaces.
- You can only copy one partition when you use a Cartridge Module Device (CMD).

Note

You must not attempt to use a version of COPY_DISK that is older than the partition you copy, because the older version of COPY_DISK may not understand the disk format.

When you copy partitions, COPY_DISK tells you the number of active tracks on each selected partition, and the percentage of the partition in use. As the copy proceeds, COPY_DISK also displays a bar graph to indicate progress.

If you use a Cartridge Module Device (CMD), you can only copy one partition at a time, and COPY_DISK does not report on the progress of the copy.

If you copy a partition that has related files on another partition, remember to copy this other partition also, to ensure the files remain a logically consistent set. For example, a ROAM file may consist of a master file and several slave files, and the slave files might not be on the same partition as the master file.

Disk Format

At Rev.21 the format of disks changed, to permit dynamic badspot handling and disk mirroring.

From Rev.21 onwards, partitions can be in one of two modes:

- Intelligent-controller (-IC) mode, in which only an intelligent controller can access the disk, and dynamic badspot handling and disk mirroring are available. The disk controller handles all the badspots on the disk, which appears error-free to PRIMOS.

- All-controller (-AC) mode, in which all types of controller can access the disk, but dynamic badspot handling and disk mirroring are not possible.

For details of how to set and change the partition modes, and for information about badspot handling and disk mirroring, refer to the Operator's Guide to File System Maintenance.

> Caution
>
> You cannot copy to a Rev. 21 or Rev. 22 partition that has a larger dynamic badspot remap area (RMA) than the source partition. If you attempt such a copy you receive an error message, and PHYRST aborts. This means, for example, that you cannot copy a non-first partition to a first partition, because first partitions have an RMA, whereas non-first partitions do not have an RMA.

Partitions can be either robust or nonrobust. Robust partitions have an enhanced resilience to machine failure, but can only hold CAM files. Note that you can only copy a robust partition to another robust partition, and you can only copy a nonrobust partition to another nonrobust partition.

Default COPY_DISK Command

You can copy physical disk partitions by issuing the COPY_DISK command without any options:

```
OK, COPY_DISK
```

COPY_DISK issues a series of prompts. Your responses to these prompts define the copy operation. A later section in this chapter, Invoking COPY_DISK, describes in detail the prompts and the responses you should give.

The default command uses the Record Availability Table (RAT) to determine which tracks on each partition contain records that the file system is using. It then saves only those tracks, and ignores unused tracks.

COPY_DISK Options

COPY_DISK options enable you to

- Verify that the copy was successful
- Disable badspot handling by COPY_DISK
- Copy all tracks, used and unused
- Input yes/no responses from your terminal when COPY_DISK runs from a CPL program or a command input file

▶ COPY_DISK

This section describes the format of the COPY_DISK command, and summarizes the functions of the COPY_DISK options.

The format of the COPY_DISK command is

```
COPY_DISK [options]
```

The options are described below.

Option	Function
-DO_VERIFY	COPY_DISK checks that the input and output partitions are the same. This approximately doubles the time to copy a partition.
-NO_BADS	Turns off badspot handling by COPY_DISK. This option is only supplied for compatibility with earlier revisions of PRIMOS. You should exercise great care if you use the option, because COPY_DISK will ignore any existing badspots on the input and output disk, and will assume that they are all valid data records.
-NO_RAT	Instructs COPY_DISK not to refer to the Record Availability Table: COPY_DISK copies all tracks on the selected partitions. This option slows the copy, and you should not normally use it.
-TTY	You answer all COPY_DISK prompts that require a yes or no answer from the terminal, even when you run COPY_DISK

from a CPL program or a command input file.

HOW TO COPY A PARTITION

This section describes how to copy a physical disk partition to another partition. It is applicable to both system backups and restores. There are the following subsections

- Preparation describes the preparations needed before you copy a partition.
- COPY_DISK Procedure describes the steps to copy a partition.
- Invoking COPY_DISK describes how to invoke COPY_DISK, and what responses you should make to the COPY_DISK prompts.
- Example COPY_DISK Session Without Options shows an example COPY_DISK session with the default command.
- Example COPY_DISK Session With -DO_VERIFY shows what a COPY_DISK session looks like when you want verification of the copy.
- Using COPY_DISK on a Cartridge Module Device (CMD) describes variations in the COPY_DISK prompts when you copy between partitions on a CMD.

Preparation

Before you begin to copy a partition, you have to

- Identify the source and target disk drives
- Decide whether to close the entire system to users, or only to close the partitions on the source and target drives

When you copy between two disk drives, the disk pack with the partition that you want to back up, or restore, will probably be mounted on one drive, and your backup pack on another drive. The description of the copy procedure assumes that the partition you want to back up or restore is already online, but that you have not yet mounted the backup pack. There may normally be another disk pack on your backup drive, in which case you have to take the partitions on this pack out of service, and replace it with the backup pack.

If you use a Cartridge Module Device (CMD), the principles of the copy procedure are the same as with two separate drives. However, instead of copying between drives, you copy between the removable and non-removable portions of the CMD.

Regardless of the type of drive you use, you also have to decide whether to close the entire system to users, or close only the partitions on the source and target drives. Chapter 11, SYSTEM PREPARATION PROCEDURES, discusses the factors that you must consider when deciding which approach to adopt.

Remember that target partitions must be write-enabled before you begin to copy the source partitions.

COPY_DISK Procedure

The procedure described in this subsection assumes that you are using two disk drives. The principles of the procedure are however the same when you use a Cartridge Module Device (CMD): use the removable platters as your backup pack, and copy between the removable and nonremovable portions of the CMD.

Unless otherwise specified, perform the steps below from the supervisor terminal. The procedure does, however, allow you to run part of the copy from a user terminal. There is a summary of the procedure in Appendix B, PROCEDURE REFERENCE.

Step 1 describes the procedure for closing the entire system to users. If you have decided to close only the source and target partitions, begin at step 2. Remember that if the backup drive is already available, you only need to shut down the partitions you want to back up or restore.

1. If you have decided to close the entire system to users, do this by following steps (a) through (e) below, and then continue at step 3.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

   b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

Wait until

- A BATCH -STATUS command shows no jobs running
- All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
- All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

c. Remind users about the impending shutdown.

d. Log out all users:

```
OK, LOGOUT ALL
```

e. Shut down the partitions that you want to back up or restore, and all partitions on the disk pack, if there is one, in the backup drive. Do this by issuing the following command for each partition:

```
OK, SHUTDN pdev
```

2. If you have decided to close only the source and target partitions to users, do this by following steps (a) and (b) below.

a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITIONS <DSK1> AND <DSK3> CLOSING AT 14:00 HOURS
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN IN 1 MINUTE
```

b. Shut down the partitions you want to back up or restore, and all partitions on the disk pack, if there is one, in the backup drive. Do this by issuing the following command for each partition:

```
OK, SHUTDN pdev
```

3. If you have a free drive for the backup disk pack, proceed to step 4. Otherwise, remove the disk pack from the backup drive.

4. Mount your backup pack in the backup drive.

5. Add the source and target partitions to the Assignable Disks Table by issuing the following command for each partition:

```
OK, DISKS pdev
```

6. It may be more convenient to run the backup or restore from a user terminal. If you do want to use a user terminal, choose one close to the disk drives.

   If you have closed the entire system to users, log into a user terminal by issuing the commands

```
OK, MAXUSR
OK, LOGIN user-id
```

   If you have only closed source and target partitions to users, log into a user terminal by issuing the command

```
OK, LOGIN user-id
```

   You can execute steps 7 through 11 from either this user terminal or from the supervisor terminal.

7. Assign the source and target partition by issuing the following command for each partition:

```
OK, ASSIGN DISK pdev
```

> WARNING
>
> If you copy partitions to or from more than one disk, and use the same drive, you must reissue the ASSIGN command for each partition. This ensures that the disk controller accesses the badspot tables from the correct pair of disks. If you do not reissue the ASSIGN command, some controllers use the badspot tables from the first disk on which a given pdev occurs for saves of partitions with the same pdev on other disks.

8. Invoke COPY_DISK.

   OK, COPY_DISK

   This initiates the COPY_DISK dialog, which is described in the next section, Invoking COPY_DISK.

9. COPY_DISK may print the message

   Badspots handled on partition pdev - please run FIX_DISK

   If you receive this message, proceed to step 10. If you do not receive this message, omit step 10 and continue at step 11.

10. Run FIX_DISK on the target partition; include the -FIX option.

    OK, FIX_DISK -DISK pdev -FIX

11. Unassign the source and target partitions by issuing the following command for each partition:

    OK, UNASSIGN DISK pdev

12. At the supervisor terminal, remove the source and target partitions from the Assignable Disks Table by issuing the following command for each partition:

    OK, DISKS NOT pdev

13. Remove the backup pack from the backup drive.

14. If you do not need the backup drive for another purpose, proceed to step 15. If the backup drive normally has another disk pack (removed at step 3), mount that pack again.

15. If you have closed the entire system to users, return the system to service in the following manner:

    a. Return to service the partitions you shut down at step 1(e). Do this by issuing the following command for each partition:

```
OK, ADDISK pdev
```

b. Start up the subsystems. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

c. If you have performed all the backup from the supervisor terminal and did not issue the MAXUSR command at step 6, you must now allow users to log in:

```
OK, MAXUSR
```

d. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

16. If you have closed only the source and target partitions, return them to service in the following manner:

a. Return to service the partitions you closed at step 2(b) by issuing the following command for each partition:

```
OK, ADDISK pdev
```

b. Issue a message to inform users that the partitions are available. For example:

```
OK, MESSAGE -ALL -NOW
PARTITIONS DSK1 AND DSK3 ARE NOW AVAILABLE
```

Invoking COPY_DISK

This subsection shows how to invoke COPY_DISK, and describes the responses that you should make to the COPY_DISK prompts.

Note

If you use a Cartridge Module Device, you do not receive all the prompts shown in this section. There are also additional prompts. You can only specify one source/target partition pair, and you do not receive information about the progress of the copy. For further information, refer to the section Using COPY_DISK on a Cartridge Module Device, later in this chapter.

To invoke COPY_DISK, issue the command

```
OK, COPY_DISK
```

COPY_DISK presents you with a series of prompts. These, and the appropriate responses, are described below. The dialog enables you to specify the source and target partitions. When you identify the partitions, remember that

- All source partitions must reside on the same physical pack, that is, they must be on the same controller and drive.
- All target partitions must reside on the same physical pack, that is, they must be on the same controller and drive.
- The source and target partitions must be the same size.

The prompts and responses are as follows.

Prompt	Response
Source PDEV:	Enter the physical device number of the source partition.
Target PDEV:	Enter the physical device number of the target partition. The cycle of prompts for source and target partitions continues, to allow you to enter up to five pairs. To terminate the cycle, press the CARRIAGE RETURN (CR) key in response to the prompt "Source PDEV:". COPY_DISK then lists the specified partitions, their size, and details of the tracks in use.

Parameters OK (yes/no)	Answer yes to proceed with the save. Answer no to cancel the list of source/target partitions, and return to the start of the dialog: you can then select new source/target partitions.
Begin copy.	Wait for the copy to be completed. COPY_DISK displays a bar graph to show you the progress of the copy. It prints a star for every 5% of the used tracks that it copies.
Done copy.	The copy is complete.

Example COPY_DISK Session Without Options

This subsection gives an example of a COPY_DISK session that does not use any command options. The example is of a copy between two separate disk drives. The user requests COPY_DISK to copy the partition with physical device number 40462 to device 40660, and physical device 61062 to device 61260.

```
OK, COPY_DISK
[COPY_DISK Rev.22.0 Copyright (c) 1988, Prime Computer, Inc.]

Source PDEV: 40462
Target PDEV: 40660

Source PDEV: 61062
Target PDEV: 61260

Source PDEV:

  From    To     Name        Records     Tracks     Tracks in use (%)

 040462  040660  DISK-A        14814       1646           1093  (66%)
 061062  061260  DISK-B        29628       3292           1778  (54%)

Parameters OK (yes/no)? yes
Begin copy.
0       50%      100%
I--------I---------I
**********
Done copy.
OK,
```

The partition details in this example show that partition 40462 has 1093 tracks in use, and that these represent 66% of the total number of tracks on the partition. The display shows that the total number of tracks is 1646, with 14814 records.

Example COPY_DISK Session With -DO_VERIFY

This subsection gives an example of a COPY_DISK session in which COPY_DISK verifies the copy. The example is of a copy between two separate disk drives.

```
OK, COPY_DISK -DO_VERIFY
[COPY_DISK Rev.22.0 Copyright (c) 1988, Prime Computer, Inc.]

Source PDEV: 40462
Target PDEV: 40660

Source PDEV: 61062
Target PDEV: 61260

Source PDEV:

  From    To     Name       Records    Tracks    Tracks in use (%)

  040462  040660 DISK-A     14814       1646          1646  (100%)
  061062  061260 DISK-B     29628       3292          3292  (100%)

Parameters OK (yes/no)? yes
Begin copy.
0       50%       100%
I--------I---------I
**********
Done copy.
Begin verify.
0       50%       100%
I--------I---------I
**********
Done verify.
OK,
```

Using COPY_DISK on a Cartridge Module Device (CMD)

When you copy betweeen the removable and nonremovable parts of a Cartridge Module Device, COPY_DISK copies one disk surface at a time.

You must restore in the same order as you back up. If you do mount a platter in the wrong order, COPY_DISK tells you which surface you have mounted and requests the correct surface again.

During the copy process, COPY_DISK prompts

```
Surface n ready?
```

If the disk is not ready, power down the CMD and insert the next removable platter. Then power up the CMD and type

```
yes
```

If you type yes before the disk is ready, COPY_DISK aborts and issues the message

```
SRWREC not ready
ER!
```

Restart COPY_DISK at the next surface by typing s: you do not have to copy the previous surfaces again.

17
Logical Copy Between Disks: COPY

INTRODUCTION

This chapter describes how to use the COPY command to copy individual files and directories from one partition to another. It includes an overview of COPY, and summarizes the COPY command and its options. For further information about how to use COPY, refer to the Prime User's Guide, and for more detail of the COPY command and its options, refer to the PRIMOS Commands Reference Guide.

The following paragraphs summarize the chapter contents.

OVERVIEW OF COPY introduces the COPY command, and describes the function of the default command.

COPY describes the command format, arguments and options.

HOW TO COPY FILES AND DIRECTORIES describes the preparations needed before you copy file system objects, and details the step-by-step COPY procedure.

INVOKING COPY describes the COPY command lines needed to

- Copy individual files and directories
- Make incremental backups to disk that supplement full BACKUP, COPY_DISK and MAGSAV backups

OVERVIEW OF COPY

COPY copies individual files and directories, and is useful when you want to back up or restore a relatively small amount of information on disk. You can use it, for example, to

- Make incremental backups that supplement physical COPY_DISK backups
- Make incremental backups that supplement logical backups to tape
- Restore a small number of files and directories from a COPY_DISK backup partition

If you have lost a large proportion of the contents of a partition, it is probably quicker to restore the entire partition, using COPY_DISK (see Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK).

Default COPY Command

You can copy a file system object to your current attach point simply by specifying the pathname of the object you want to copy. For example, assuming you have sufficient access rights, the command

```
OK, COPY <DSK1>JOHN>TEST
```

copies TEST from directory JOHN, on partition DSK1, to your current attach point: the object retains the name TEST.

▶ COPY

This section summarizes the COPY command and options.

The format of the COPY command is

```
COPY source-pathname [target-pathname] [options]
```

The arguments and options are described below.

Argument	Description
source-pathname	Specifies the pathname of the object that you want to copy. You can use wildcards and iteration in the source pathname.

target-pathname	Specifies the pathname to be given to the object when copied. You can use name generation in the target pathname.

Option	Description
{-ACCESSED_AFTER [date] / -ACA}	Copies only those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{-ACCESSED_BEFORE [date] / -ACB}	Copies only those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{-COPY_ALL / -CA}	Copies all the attributes of the source object.
{-CREATED_AFTER [date] / -CRA}	Copies only those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
{-CREATED_BEFORE [date] / -CRB}	Copies only those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-DAM	Copies SAM files as DAM files.
{-DELETE / -DL}	Deletes the source object after it has been copied.
-DTM	Copies the source object DTM to the target object.
-FORCE	Forces the deletion of delete-protected objects.
-HELP	Displays Help text about the command.

-INCREMENTAL -INC	Copies only objects that have not been backed up by MAGSAV. If you copy a directory, all its entries are automatically copied.
-LEVELS n -LV	Copies a directory tree down to the level indicated by n.
-MERGE	Merges the source object with the target object.
-MODIFIED_AFTER [date] -MDA -AFTER	Copies only those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.
-MODIFIED_BEFORE [date] -MDB -BEFORE	Copies only those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.
-NO_CHECK	Disables the check by COPY that source and target objects are the same object.
-NO_CMLV	Prevents COPY from invoking a new command level when a disk full or maximum quota exceeded condition occurs. COPY aborts.
-NO_QUERY -NQ	COPY does not query you: assumes the user response, or aborts.
-PROTECT -PRO	Copies the source object's protection attributes to the target object.
-QUERY -Q	COPY queries you to resolve situations that arise during the copy.
-QUOTA	Sets the maximum quota of a copied directory and its subdirectories to be the same as the source object.

-REPLACE	Deletes an object named target-pathname from the target directory, and copies the source object to the target directory under the name target-pathname.
-REPORT -RPT	Reports a successful copy operation.
-RWLOCK -RWL	Sets the concurrency lock setting of the target object to the same as that of the source object.
-SAM	Copies SAM files as DAM files.
-SAVE_UFD -SUFD	Used in conjunction with the -INC option. Tells COPY to always copy directories, regardless of whether they have been modified.

HOW TO COPY FILES AND DIRECTORIES

This section describes how to copy file system objects from one disk to another. It is applicable to both backups and restores. There are the following subsections:

- Preparation describes the preparation needed before you copy file system objects
- COPY Procedure describes the steps to copy file system objects

Preparation

Before you begin the copy procedure, you have to decide whether you want to close down any of the partitions involved in the copy. You may decide to

- Close down none of the partitions
- Close down the partitions that you want to back up or restore
- Close the entire system to users

It is not essential to shut down any partitions when you use COPY, except when there is already a disk pack on the backup drive. Before you remove this pack, you must shut down all its partitions. For a discussion of the factors you should consider when you decide whether to close either the entire system or individual partitions to users, refer to Chapter 11, SYSTEM PREPARATION PROCEDURES.

The procedure in the following subsection, COPY Procedure, assumes that you use two disk drives. The principles are, however, the same if you use a Cartridge Module Device: copy the files and directories between the removable and nonremovable portion of the CMD. You will probably have to shut down partitions on the removable platters, and mount backup platters.

COPY Procedure

To copy selected files and directories to or from a backup partition, follow the steps below. Unless otherwise specified, perform the steps at the supervisor terminal. The procedure description does, however, explain how you can invoke COPY from a user terminal.

The example commands in these steps assume that

- You want to back up or restore partition 21060, and this partition has the diskname DSK1
- The backup partition is partition 1062

Note that you begin the procedure at step 1, step 2 or step 3. If you want to close the entire system to users, begin at step 1. If you want to close only the partition that you will backup or restore, begin at step 2. If you want to keep open both the system and the partition you intend to back up or restore, begin at step 3. Remember that if the backup drive is not free, you always have to close the partitions on that drive as part of the COPY procedure.

1. If you have decided to close the entire system to users, do this by following steps (a) through (f) below.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

Wait until

- A BATCH -STATUS command shows no jobs running
- All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
- All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

c. Remind users about the impending shutdown.

d. Log out all users:

```
OK, LOGOUT ALL
```

e. Set priority access on the partition that you want to back up or restore. For example:

```
OK, SPAC DSK1 user-id:ALL $REST:NONE
```

where user-id is SYSTEM if you intend to invoke COPY at the supervisor terminal, or is your user-id if you intend to invoke COPY at a user terminal.

f. Continue at step 4.

2. If you have decided to close only the partition that you want to backup or restore, do this by following steps (a) through (c) below.

a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN AT 14:00
HOURS TODAY
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN IN 1 MINUTE
```

b) Shut down the partition, return it to service, and then immediately set a priority access on the partition. For example:

```
OK, SHUTDN 21060
OK, ADDISK 21060 ;SPAC DSK1 user-id:ALL $REST:NONE
```

where user-id is SYSTEM if you intend to invoke COPY at the supervisor terminal, or is your user-id if you intend to invoke COPY at a user terminal.

c. Continue at step 4.

3. If you have decided to keep the system and the partition open to users give your user-id, or SYSTEM if you intend to run the copy from the supervisor terminal, all rights to the partition by using the SET_PRIORITY_ACCESS (SPAC) command. For example:

```
OK, SPAC DSK1 user-id:ALL
```

4. If you have a free backup drive, proceed to step 6.

   If you do not have a free backup drive, shut down the partitions on the pack mounted in your chosen drive.

   For example, the commands

```
OK, SHUTDN 1062
OK, SHUTDN 21062
OK, SHUTDN 41062
```

   would shut down partitions 1062, 21062 and 41062.

5. Remove the pack from the backup drive.

6. Mount your backup pack in the backup drive.

7. Make the backup partition available to users, and immediately give yourself priority access to the partition.

   If you copy from a COPY_DISK backup partition to the original source partition, change the name of the backup partition, so that you do not copy between identically-named partitions. Change the name by including the -RENAME option on the ADDISK command line. For example, the commands

   ```
   OK, ADDISK 1062 -RENAME BACKUP ; SPAC BACKUP user-id:LUR
   $REST:NONE
   ```

   would make partition 1062 available to users, name it BACKUP, and give you priority access.

8. It may be more convenient to run the backup or restore from a user terminal. If you do want to use a user terminal, choose one close to the disk drives.

   If you have closed the entire system to users, log into a user terminal by issuing the commands

   ```
   OK, MAXUSR
   OK, LOGIN user-id
   ```

   If you have kept the system open to users, log into a user terminal by issuing the command

   ```
   OK, LOGIN user-id
   ```

   You can execute step 9 from either this user terminal or from the supervisor terminal.

9. Invoke COPY. For example:

   ```
   OK, COPY <DSK4>TEST3.BAK <DSK1>KEV>TEST3
   ```

   would copy TEST3.BAK from partition DSK4 to KEV>TEST3 on DSK1.

   If you are unsure how to use COPY to back up or restore files and directories, refer to the following section, INVOKING COPY.

10. When you have no more files and directories to copy, return to the supervisor terminal and shut down the backup partition. If you renamed this partition at step 7, reset the name by including the -RENAME option on the SHUTDN command line. For example, the command

```
OK, SHUTDN 1062 -RENAME DSK1
```

would shut down partition 1062, and name it DSK1.

11. Remove the backup pack.

12. If you did not remove a disk pack from the backup drive at step 5, proceed to step 13.

    If you did remove a disk pack from the backup drive, place it back in the drive and return the partitions to service. For example, the commands

```
OK, ADDISK 1062
OK, ADDISK 21062
OK, ADDISK 41062
```

    would return partitions 1062, 21062, and 41062 to service. Issue these commands from the supervisor terminal.

13. Remove the priority access, set at step 1(e), 2(b) or 3, on the partition that you have backed up or restored. For example:

```
OK, RPAC DSK1
```

14. If you have closed the entire system to users, return the system to service in the following manner, at the supervisor terminal.

    a. Start up the subsystems. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

b. If you have performed all the backup or restore from the supervisor terminal and did not issue the MAXUSR command at step 8, you must now allow users to log in:

```
OK, MAXUSR
```

c. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

15. If a user has requested the copy, inform the user that the operation is complete.

The COPY procedure is summarized in Appendix B, PROCEDURE REFERENCE.

INVOKING COPY

This section describes COPY command lines for copying individual files and directories from one partition to another partition.

The format of the COPY command is

```
COPY source-pathname [target-pathname] [options]
```

The argument source-pathname identifies the objects that you want to copy, and target-pathname specifies the pathname of the copied objects. If you do not include the target pathname on the command line, COPY copies objects into your current attach point, and each copy has the same file or directory name as the original object.

All the following examples of COPY command usage include the -COPY_ALL option on the command line. This option ensures that each target object has the same ACL protection as the source object.

Copying a Specific File or Directory

To copy a file or directory to another partition, include the source and target pathnames on the command line. For example, the command

```
OK, COPY <DSK1>CHRIS>DIR1 <DSK3>TEMP>DIR1.BAK -COPY_ALL
```

copies DIR1 from <DSK1>CHRIS to <DSK3>TEMP, and names the copy DIR1.BAK.

It is advisable to give new names to the copies, to avoid overwriting existing files and directories. If COPY asks

"pathname" already exists, do you wish to overwrite it?

answer no, and reissue the COPY command with a different target pathname.

Incremental Copies

The COPY options -INC, and -MODIFIED_AFTER enable you to make incremental disk copies that supplement full backups to either disk or tape.

Supplementing BACKUP: If you use the BACKUP command to save your files and directories to tape, you can make incremental copies of these objects by including the -MODIFIED_AFTER date option on the COPY command line. This option copies only objects that you have either created or modified after the specified date. For an incremental copy, make date the date of your most recent BACKUP save. For example, the command

```
OK, COPY @@ <DSK2>BACKUP>== -MDA 12/30/86 -COPY_ALL
```

copies, from your current attach point, files and directories that you modified or created after 00:00 A.M., 30th December 1986. This example uses the abbreviated option names.

You can specify date in any one of the following formats

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31

YY is the year, specified as 2 digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes. Thus if you do not specify date, it defaults to 00:00 AM TODAY.

Supplementing COPY_DISK: You can use the -MODIFIED_AFTER date option, to update a COPY_DISK backup. The previous subsection, Supplementing BACKUP, describes the format of date. If you make date the date of the most recent COPY_DISK save, and use COPY to copy to the COPY_DISK backup partition, you can

- Overwrite objects that have changed since the COPY_DISK save
- Add objects that have been created since the COPY_DISK save

Note, however, that if there are a lot of new, or modified files and directories, you should copy the entire physical partition, using COPY_DISK.

Supplementing MAGSAV: When you run MAGSAV with its -UPDT option, MAGSAV sets a dumped bit to 1 on all files and directories that it saves to tape. If you subsequently modify or create a file or directory, the dumped bit is set to 0. The dumped bit thus indicates whether an object has been saved in its current form. When you include the -INC option on the COPY command line, COPY reads the dumped bits, and copies only those files and directories on which the dumped bit is set to 0. That is, it saves only objects that you have either modified or created after the most recent full backup. For example, the command

```
OK, COPY @@ <DSK2>BACKUP>== -INC -COPY_ALL
```

copies all the files and directories at your current attach point that have their dumped bit set to 0. The files and directories are copied to <DSK2>BACKUP, but retain their original name. If COPY -INC copies a directory, it also copies all the entries in that directory, regardless of the setting of their dumped bit.

Note that COPY does not reset the dumped bit when it copies a file or directory. If you issued the example command again at a later date, before another MAGSAV save, you would not only copy newly created or modified objects; you would also copy all the objects that you copied with the first COPY command.

18
Creating a System Boot Tape

INTRODUCTION

This chapter explains how to use BOOT_CREATE to make a boot tape from which you can boot your system in the event of a system failure. It also includes an explanation of how to create a list file, and describes the BOOT_CREATE command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF BOOT_CREATE outlines how to use BOOT_CREATE to create a system boot tape from a list file.

CREATING A LIST FILE explains the format of the list file, and gives an example list file.

BOOT_CREATE explains the BOOT_CREATE command format, arguments and options.

CREATING A SYSTEM BOOT TAPE describes

- The preparations needed before you invoke BOOT_CREATE
- The BOOT_CREATE prompts and user responses
- An example BOOT_CREATE session

OVERVIEW OF BOOT_CREATE

To make the system boot tape you must first create a list file, to contain the pathnames of all the directories and files needed to restore your system. BOOT_CREATE uses the information contained in the list file to generate the system boot tape.

When BOOT_CREATE runs, it reads the list file twice. The first pass checks that the files listed are present and accessible; the second pass calls MAGSAV, which writes the files to tape.

If either of the checks in the first pass of the list file is unsuccessful, you receive an error message.

When you use the boot tape to restore your disk, any directories that were originally ACL-protected are restored as unprotected directories.

CREATING A LIST FILE

To create the list file, you can use either the Prime line editor ED or the screen editor EMACS. You can place the list file anywhere in the system.

You should include the following files and directories in the list file, and add other utilities and PRIMOS-related files as the need arises.

- CMDNCO>MAKE.SAVE
- CMDNCO>FIX_DISK.SAVE
- CMDNCO>MAGRST.SAVE
- CMDNCO>COPY_DISK.SAVE
- DOS>DOS.SAVE
- PRIRUN

You must put each pathname on a new line of the list file.

Note that an object pathname must be sufficient to identify the object from your current attach point when you run BOOT_CREATE.

List File Options

You can attach one of the options listed below to each of the file and directory pathnames in the list file: use only one option with each pathname. The default option is -YES, which displays an error message if BOOT_CREATE cannot find or access an object listed in the list file.

Option	Description
-CHECK	Checks whether a file exists in a directory without saving the file or directory. If the file exists, nothing is submitted to BOOT_CREATE. If the file is not found, an error message is displayed and BOOT_CREATE aborts.
-NO	BOOT_CREATE displays a warning if it cannot locate or access the specified file or directory, and writes the remaining objects to the tape.
-YES	BOOT_CREATE displays an error message if it cannot locate or access the specified file or directory, and terminates the program.

Example List File

The following example shows how you can use ED to create a typical list file.

In this example, the list file is created in a directory called TEST>MASTERFILE, and is filed as BOOT_LIST.

```
OK, ATTACH TEST>MASTERFILE
OK, ED
INPUT
PRIRUN
DOS>DOS.SAVE
CMDNCO>MAGRST.SAVE
CMDNCO>MAKE.SAVE
CMDNCO>FIX_DISK.SAVE
CMDNCO>COPY_DISK.SAVE
CMDNCO>NSED
CMDNCO>PHYRST
CMDNCO>PRIMOS.COMI -CHECK
CMDNCO>CONFIG -CHECK
-EOT
SYSTEM -NO
SAD -NO

EDIT
FILE BOOT_LIST
OK,
```

▶ BOOT_CREATE

This section describes the format of the BOOT_CREATE command, and summarizes the function of the command line arguments and options.

The format of the BOOT_CREATE command is

```
BOOT_CREATE  [pathname] [options]
```

Descriptions of the argument and options follow.

Argument	Description
pathname	Specifies the pathname of the list file. If you have created the list file in a password-protected directory and you want to use the -NO_QUERY option, you must include the password in the pathname: enclose the entire pathname in single quotes, write it in upper case, and separate the password from the directory name by one space.

Options	Description
{ -HELP / -H }	Displays a help text that shows you the calling sequence of BOOT_CREATE and explains the options available.
-MT [n]	This option suppresses the prompt for the magnetic tape drive. If you omit n, the default is Drive 0.
{ -NO_QUERY / -NQ }	Suppresses any prompt for the list file password. If your list file is in a password-protected directory and you have not specified the password in the command line, or you have specified the wrong password, BOOT_CREATE displays an error message and aborts.

CREATING A SYSTEM BOOT TAPE

This section describes how to create a system boot tape. It consists of the following subsections

- Preparation describes the preparations needed before you invoke BOOT_CREATE
- Invoking BOOT_CREATE describes how to invoke BOOT_CREATE, and what responses to make to the command prompts
- Example BOOT_CREATE Session shows an example sequence of BOOT_CREATE prompts and user responses

Preparation

You need to assign a tape drive, and can do this

- Before you invoke BOOT_CREATE, by using the ASSIGN command
- When you invoke BOOT_CREATE, by including the -MT option on the command line
- During the BOOT_CREATE dialog: BOOT_CREATE prompts you to identify the tape drive that you want to assign

Chapter 3, USER CONTROL OF TAPE DRIVES, describes how to assign and unasssign tape drives.

Mount the reel that you want to use as your system boot tape after you have assigned a tape drive.

Invoking BOOT_CREATE

To invoke the basic BOOT_CREATE command, type

```
OK, BOOT_CREATE
```

If you wish, you can include any of the BOOT_CREATE options (described above) on the command line.

When you invoke BOOT_CREATE, you receive a series of prompts. These prompts and the appropriate responses are as follows.

Prompt	Response
Does <diskname>dirname>subdirname have a password ?	BOOT_CREATE asks whether the directory that holds the list file is protected by a password. You do not receive this prompt if you have used the -NO_QUERY option. If you answer yes, BOOT_CREATE asks you for the password. If you either fail to give the password or give an incorrect password, BOOT_CREATE aborts. If the directory is not protected by a password, answer no, and BOOT_CREATE continues.
Enter List-File name:	Enter the name of the list file. You only receive this prompt if you did not specify the list-file on the BOOT_CREATE command line.
Which drive are you using ? (0 to 7):	Give the number of the tape drive you want to assign. You only receive this prompt if you have not specified the drive number as part of the BOOT_CREATE command line (-MT n).
Have you mounted the tape on drive <device number> ?	If you answer yes, BOOT_CREATE continues. If you answer no, BOOT_CREATE asks you to mount the correct tape on the tape drive.

To suppress all these prompts, use the command line options -MT and -NO_QUERY.

If you run BOOT_CREATE on a phantom process, you may find it useful to direct the terminal output to a COMO file.

Example BOOT_CREATE Session

In the following example, BOOT_CREATE reads the list file BOOT_LIST. The command line specifies the options -NO_QUERY and -MT 0, which

suppress all the BOOT_CREATE prompts. This example assumes that file BOOT_LIST is the example file created in the subsection Example List File, above. Note that two of the pathnames in BOOT_LIST include the list file -CHECK option; these pathnames therefore do not appear in the example.

```
OK, BOOT_CREATE TEST>MASTERFILE>BOOT_LIST -MT 0 -NO_QUERY

[BOOT_CREATE Rev.21.0 Copyright (c) Prime Computer, Inc. 1986]


No Warnings

Assigning Tape drive 0 to your job ......
Device MT0 assigned.
Calling MAGSAV ......
[MAGSAV Rev.21.0 Copyright (c) Prime Computer, Inc. 1986]
Tape unit (9 Trk): 0
Enter logical tape number: 1
Tape name: BOOT1
Date (MM DD YY):
Rev no:
Name or Command: $A DOS
Name or Command: DOS.SAVE
Name or Command: $A CMDNCO
Name or Command: MAGRST.SAVE
Name or Command: $A CMDNCO
Name or Command: MAKE.SAVE
Name or Command: $A CMDNCO
Name or Command: FIX_DISK.SAVE
Name or Command: $A CMDNCO
Name or Command: COPY_DISK.SAVE
Name or Command: $A CMDNCO
Name or Command: NSED
Name or Command: $A CMDNCO
Name or Command: PHYRST
Name or Command: $R
[MAGSAV Rev.21.0 Copyright (c) Prime Computer, Inc. 1986]
Tape unit (9 Trk): 0
Enter logical tape number: 2
Tape name: BOOT2
Date (MM DD YY):
Rev no:
Name or Command: $A MFD
Name or Command: CMDNCO
Name or Command: $A MFD
Name or Command: PRIRUN
Name or Command: $A MFD
Name or Command: SYSTEM
Name or Command: $A MFD
Name or Command: SAD
Name or Command: $R
Device released.
```

19
Restoring the System

INTRODUCTION

This chapter describes how to restore your command device from either disk or tape, and how to recreate the system from a system boot tape.

The following paragraphs summarize the chapter contents.

RESTORING THE COMMAND DEVICE FROM DISK describes how you can restore the command device if you have used COPY_DISK to create a backup copy.

RESTORING THE COMMAND DEVICE FROM TAPE describes how you can restore either the command device or the entire system from a system boot tape.

WARNING

Never mount a pack in a disk drive that you suspect is faulty. When a disk pack seems to be unreadable, this may be due to a fault in the disk drive. If you do mount another pack in the drive and the drive is faulty, you might lose that second pack in addition to the first.

When you suspect that a disk drive is faulty, contact your System Administrator or Customer Support Representative. Do not mount another disk pack in the drive. Leave the corrupted pack in the suspect drive. Do not test the disk pack by mounting it in another drive.

In short, treat any suspicious disk pack or drive with great caution: take both the drive and pack out of service.

RESTORING THE COMMAND DEVICE FROM DISK

If your command device (COMDEV) is destroyed, you cannot start up PRIMOS. However, if you have a backup copy of COMDEV, created by running COPY_DISK, you can use the backup to get the system running again quickly. This section describes how to restore the system from disk. You do not have to close either the system or individual partitions to users, because the system is already down.

To restore the command disk, follow the steps below.

1. Relabel the backup pack as the master pack, and mount it in place of the corrupted pack.

2. Modify the label on the corrupt pack to show that is corrupt.

3. Label a new pack as the backup pack.

   You could use the old corrupted master pack as the backup pack. However, if you do use it as the new backup pack, you prevent your Customer Support Representative from examining the pack. It is therefore recommended that you do not reuse the corrupted pack. Such an examination may determine the cause of the corruption and enable you to reclaim crucial files for which the backup copies are insufficient.

4. From the supervisor terminal, boot PRIMOS. For example:

```
CP> SYSCLR
CP> 14114
```

initiates an autoboot. For details of the ways in which you can boot PRIMOS from disk, refer to the description of bootstraps in your system Handbook.

5. Run COPY-DISK to back up the master pack. Follow the backup procedure described in Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK.

RESTORING THE COMMAND DEVICE FROM TAPE

This section describes how to use the boot tape to either repair a damaged command device (COMDEV) or recreate the entire system. The success of these procedures depends upon regular backups, to enable you to recover lost files.

The following two sections describe the restore procedures step by step. They do not, however, give detailed explanations of the procedures, and for a comprehensive explanation of all aspects of booting from tape you should refer to your system Handbook.

Recovering From a Command Device Crash

If a disk crashes because of a problem on a partition other than the command device (COMDEV), you may be able to recover the partition by booting PRIMOS from the command device and then running FIX_DISK on the partition. However, if the problem is with the command device, it may not be possible to boot PRIMOS. In that event you must follow the steps below to repair the command device. The example commands in this section assume that the command device is on the first four surfaces of an 80Mb disk pack, and that the rest of the surfaces are the paging partition.

1. Boot PRIMOS from tape. For example:

```
CP> SYSCLR
CP> BOOT 114005
```

When PRIMOS asks for the COMDEV, enter 100000, which indicates a null command device.

PRIMOS then asks for PAGDEV, NTUSR, and the system name: enter the appropriate values for your system.

Enter the date and time if you are prompted to do so. Many machines have an internal battery clock, and do not issue this prompt.

Note

If the system contains ICS communication controllers, you must set the '100000 switch (bit 1) in the boot command option word. This prevents the system from halting if an initialization error involving the ICS communication controllers occurs as a result of the DOWNLINE_LOAD* UFD and its files not being found. Thus, when you boot from tape with a null COMDEV, you must use the BOOT '100xxx command.

2. Assign the tape drive to your terminal. For example:

```
OK, ASSIGN MT0
```

3. Place the partition to be repaired in the Assignable Disks Table, and assign it to your terminal. For example:

```
OK, DISK 1060
OK, ASSIGN DI 1060
```

4. Resume FIX_DISK.SAVE from tape, to repair the command device.

```
OK, MTRESUME MT0 CMDNCO>FIX_DISK.SAVE -CMDOPT -DISK 1060
-COMDEV -FIX -DUFE -CMPR
```

Note

Sometimes it is preferable to run FIX_DISK in two passes. First, run FIX_DISK without the -FIX option to determine what would be lost by fixing the partition. If the partition can still be added to the system, try adding it and saving as much information as possible that has not already been backed up. After that, run FIX_DISK again, this time with the -FIX option, to fix the partition. If you find that you cannot use FIX_DISK on the partition, you must recreate the system, as discussed in a following subsection, Recreating a System.

5. Unassign the repaired partition, and remove it from the Assignable Disks Table. For example:

```
OK, UNASSIGN 1060
OK, DISKS NOT 1060
```

6. Add the partition to the system. For example:

```
OK, ADDISK 1060
```

7. Shut down the system and reboot PRIMOS from disk, so that you can specify the correct CONFIG file and initialize the communications controllers.

Recreating a System

This section describes how to recreate your entire system after a system crash. To recreate the system, you need the following:

- An unformatted disk
- A Rev. 22.0 boot tape, created with BOOT_CREATE and containing the files recommended in Chapter 18, CREATING A SYSTEM BOOT TAPE.
- Another tape that contains the files to make up a total system

To recreate the system, follow the steps below.

1. Boot MAKE.SAVE from tape, to create and format the paging device (PAGDEV). Assume for example, that the boot tape is on drive 1, controller 0.

```
CP> SYSCLR
CP> BOOT 10205
```

The system begins to boot, and you are prompted

```
RUN FILE TREENAME=
```

Enter

```
CMDNCO>MAKE.SAVE
```

2. MAKE prompts

   Enter command line options:

   Enter

   -DISK pdev -DT SMD -FORMAT -NO_INIT

   where pdev is the physical device number of the paging partition.

3. MAKE prompts

   Partition name?

   Enter, for example:

   PAGING

4. When MAKE halts, boot it again to create the command device. Repeat steps 1-3, but this time enter the physical device number of the command device at step 2, and the name of command device partition at step 3. MAKE writes the file MFD>BOOT to disk, and performs a number of other tasks.

5. When MAKE halts, boot PRIMOS.SAVE from tape with the '100000 switch (bit 1) set. This switch setting generates queries for the three configuration parameters: command device and paging device physical device numbers, and the number of terminal users. It also prevents the initialization of the communications controllers.

   Assume for example, that you boot from tape drive 1 on controller 0.

   ```
   CP> SYSCLR
   CP> BOOT 100205
   ```

6. The system begins to boot, and prompts

   PHYSICAL DEVICE=

   Enter the tape drive identifier. For example:

   MT0.

7. You are prompted

   RUN FILE TREENAME=

   Press the RETURN key, to boot PRIRUN>PRIMOS.SAVE.

8. Answer the prompts for the command device, partition device, and the number of terminal users. Assume, for example, that the physical device numbers of the new command device (COMDEV) and paging device (PAGDEV) are 1060 and 20060, respectively.

   ```
   Enter COMmand DEVice:  1060
   Enter PAGing DEVice:  20061
   Enter Number Terminal USeRs:  1
   ```

9. The system may prompt

   Are you SURE you want to page on PAGDEV <pdev>?

   Answer yes.

10. The system prompts for the system name.

    Enter System Name:

    Enter the name. For example:

    sys1

11. Wait for the "OK," prompt, which indicates that PRIMOS is running.

12. Assign a tape drive and mount the reel that holds MAGRST. For example:

    OK, ASSIGN MT1

13. Attach to the MFD.

    OK, ATTACH MFD

14. Resume MAGRST from the tape on the assigned drive (MT1 in this example).

    OK, MTRESUME MT1 CMDNCO>MAGRST

    When MAGRST is running, replace the boot tape on MT1 with the tape that holds the system software.

15. MAGRST prompts

    Ready to Restore

    Answer yes, and MAGRST restores the entire tape to the MFD.

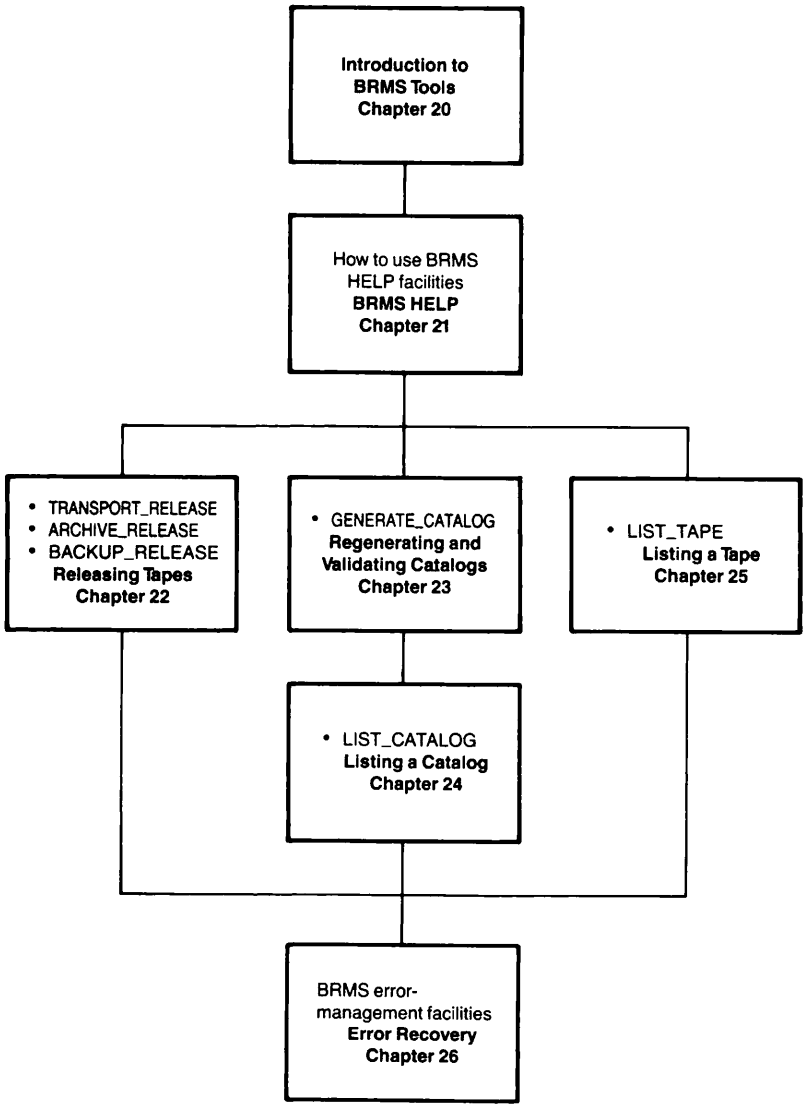
16. Use NSED to edit the PRIMOS.COMI and CONFIG files: you need to specify the new COMDEV and PAGDEV physical device numbers.

17. Boot PRIMOS from disk, following the procedure described in your system Handbook.

18. You can now install other software. You can also use EDIT_PROFILE to create a System Administration Directory (SAD) and login ids, so that users can log into the system.

PART V

BRMS Tools



20
Introduction to BRMS Tools

INTRODUCTION

This chapter gives an overview of the BRMS tools. The subsequent chapters in this part of the manual (Part V) describe in detail how to use these tools.

OVERVIEW OF BRMS TOOLS

The BRMS tools are

- BRMS HELP (see Chapter 21, BRMS HELP)
- ARCHIVE_RELEASE, TRANSPORT_RELEASE and BACKUP_RELEASE (see Chapter 22, RELEASING TAPES)
- GENERATE_CATALOG (see Chapter 23, REGENERATING AND VALIDATING CATALOGS: GENERATE_CATALOG)
- LIST_CATALOG (see Chapter 24, LISTING A CATALOG: LIST_CATALOG)
- LIST_TAPE (see Chapter 25, LISTING A TAPE: LIST_TAPE)

Chapter 26, ERROR RECOVERY, covers the error recovery facilities provided by the BRMS utilities. It describes the types of error that can occur, and how you can recover the system.

The basic commands to invoke the tape and catalog tools are all simple. However, all offer an extensive range of options that allow you to tailor the command to meet your needs.

The following sections summarize the functions of the BRMS tools, and the error recovery procedures.

BRMS HELP

The BRMS online HELP facility allows you to display

- The syntax of a command, and a list of its options
- A description of the command function, and a summary of each option
- A description of the function of a command option
- Examples of command usage
- Information about how to use wildcards with a command and its options
- Lists of error numbers, and the text for each error number

There is also the PRIMOS HELP facility for all the backup and recovery commands described in this manual.

ARCHIVE_RELEASE, TRANSPORT_RELEASE AND BACKUP_RELEASE

The three tools ARCHIVE_RELEASE, TRANSPORT_RELEASE and BACKUP_RELEASE enable you to recycle an ARCHIVE, a TRANSPORT or a BACKUP tape respectively. The first time that you archive, transport or backup data to tape, that tape is labeled with the volume ID and the function the tape serves; ARCHIVE, TRANSPORT or BACKUP. If you want to use an ARCHIVE or TRANSPORT tape for some other purpose, or if you want to overwrite the tape, you must first release it. You do this by using the ARCHIVE_RELEASE or TRANSPORT_RELEASE command. These restrictions also apply to a BACKUP tape if you use the default BACKUP command: you must release the BACKUP tape, using the BACKUP_RELEASE command, before you use it for another purpose, or before you overwrite it with another volume ID.

GENERATE_CATALOG

You can use GENERATE_CATALOG to regenerate a lost or corrupted catalog from the physical tape, or to validate the catalog by comparing its contents with those of the tape.

The ARCHIVE and BACKUP commands create or update catalogs each time you save data to tape, as described in Chapter 2, BRMS OVERVIEW. A catalog holds information about the tape, about the file system objects that you have saved, and about the reels on which they are held.

LIST_CATALOG

LIST_CATALOG lists the contents of catalogs, and so allows you to find out quickly what is on a volume or reel. You can also use this command to search catalogs for a file system object.

LIST_TAPE

The function of LIST_TAPE is similar to LIST_CATALOG. It lists the contents of a tape, by reading directly from the physical tape.

ERROR RECOVERY

Where possible, a BRMS command attempts to continue the specified operation. If a minor recoverable error occurs, the command issues a warning and continues. When the error is more significant, but does not require any user action for recovery, you receive an error message and the offer of help. This HELP text explains the reason for the error.

When the command can only recover after user action, it prompts you about the action to take. You can temporarily exit from a save or restore operation if you have to perform the recovery action at PRIMOS level, for example to assign a tape drive.

There are conditions from which no recovery is possible. For example, you are not able to recover from tape read errors that are caused by physical damage to the tape: any data on the damaged part of the tape is lost.

21
BRMS Help

INTRODUCTION

There is detailed online help for all BRMS commands. This chapter describes the HELP facilities, and explains how to use them.

The following paragraphs summarize the chapter contents.

INVOKING HELP summarizes how to obtain help about a BRMS command.

COMMAND SYNTAX AND OPTIONS explains how to display the syntax of a command and a list of its options.

COMMAND DESCRIPTION AND SUMMARY OF OPTIONS explains how to display a description of a command's function, and a summary of each option to the command. It also describes how, in response to system prompts, you can display further details of a specific option, or display examples of command usage.

DETAILS OF A SPECIFIC OPTION explains how to display a description of a specific option direct from the command line.

EXAMPLES OF COMMAND USAGE explains how to display, direct from the command line, examples of command usage and an explanation of the effect of each example.

USING WILDCARDS IN BRMS explains how to display information about how to use wildcards with a command and its options.

ERROR MESSAGES explains how to display lists of command error numbers and the text for each error number.

INVOKING HELP

You invoke HELP options with a command in the format

```
command -HELP [option]
```

where command is the BRMS command on which you require help.

The HELP options enable you to display the various types of help listed above. Table 21-1 summarizes these options, and they are described in more detail in following sections.

Note that you do not need to have a tape mounted when you invoke HELP. The -HELP option overrides any other command-line option, and the command will not perform any function other than to display HELP text.

To obtain an online description of the BRMS HELP system, type the command

```
OK, command -HELP HELP
```

This command summarizes the types of help available and gives the command line you use to invoke each type.

Table 21-1
BRMS HELP Options

Option	Description
USER OPERATOR	Shows the command format, including options.
command-line option	Describes the selected command-line argument or option.
EXAMPLE	Gives two working examples of the command. The first example shows the basic command. The second example shows the command with options.
ERROR [error number]	Displays a menu of error groups to select from or, with error number, displays information about that error.
ERROR_LIST	Displays a list of the current error numbers for that command.
WILDCARDS	Explains how wildcards can be used with BRMS.
HELP	Describes the BRMS HELP facility.

COMMAND SYNTAX AND OPTIONS

To display the syntax of a BRMS command, and its valid options, type

OK, command -HELP

The following example shows the help for the ARCHIVE_RELEASE command.

```
OK, ARCHIVE_RELEASE -HELP

[ARCHIVE_RELEASE Rev. 20.2 ..... ]

        Usage :   ARCHIVE_RELEASE -VOLID name [options]

 MANDATORY ARGUMENTS
           -VOLID name
 OPTIONS
 -MT n         (0 <= n <= 7)
 -REEL n       (0 <= n <= 255)
 -OWNER user_name, -OWN
 -CATALOG_PATHNAME pathname, -CAPA
 -NO_QUERY, -NQ
 -HELP [{USER or OPERATOR, command line option, EXAMPLE, ERROR [error#],
                                        ERROR_LIST, WILDCARDS, HELP}]
```

COMMAND DESCRIPTION AND SUMMARY OF OPTIONS

To display an explanation of how to use a command, and a summary of the function of each option, type

OK, command -HELP USER

or

OK, command -HELP OPERATOR

For example, to display information about BACKUP_RELEASE and its options, type

OK, BACKUP_RELEASE -HELP USER

At the end of the resultant HELP display you are prompted

Type in option name, QUIT or EXAMPLE

This allows you to select further details of an option, or request two examples of command usage.

For further information about an option, type in either the full or the abbreviated option name without the preceding hyphen (-). For example, BACKUP_RELEASE has an option -NO_QUERY (-NQ). To obtain more information about this option, type either NO_QUERY or NQ.

To display two example uses of a command, with explanatory text, type EXAMPLE in response to the prompt.

You can also display the option and example HELP texts direct from the command line; the following two sections describe how to do this.

DETAILS OF A SPECIFIC OPTION

To display HELP text about an option, type

```
OK, command -HELP command-option
```

Note that command-option is the name of the option without the prefix (-); for example, NO_QUERY, not -NO_QUERY.

The following example shows how you can display HELP text about the -NO_QUERY option to ARCHIVE_RELEASE.

```
OK, ARCHIVE_RELEASE -HELP NO_QUERY
[ARCHIVE_RELEASE Rev. 20.2 ..... ]

    NO_QUERY, -NQ

    This option is for unattended operation; if specified
    prompts will be suppressed and a default response applied.
    However, any prompt which must have a user supplied
    response will result in the command being aborted.

    If you use this option the command will abort when :

     * the volume name of the mounted reel is not that
       specified with the -VOLID option;

     * if a reel is not mounted, or the tape drive unit is not
       ready;

     * any errors occur.
```

EXAMPLES OF COMMAND USAGE

To display two examples of how to use a command, type

```
OK, command -HELP EXAMPLE
```

For example:

```
OK, TRANSPORT -HELP EXAMPLE
```

provides two example TRANSPORT command lines, with an explanation of the effect of each command line.

USING WILDCARDS IN BRMS

To obtain HELP on how to use wildcards within BRMS, type

```
OK, command -HELP WILDCARDS
```

where command is the name of a BRMS command.

The HELP text explains how to use wildcards with the command and its options.

ERROR MESSAGES

A BRMS error message includes an error number, and you can display the explanation of the error number by issuing the command

```
OK, command -HELP ERROR error-number
```

where command is the BRMS command that generates the error.

If you do not know the error number, you can list all the error numbers currently for a command by typing

```
OK, command -HELP ERROR_LIST
```

```
OK, ARCHIVE_RESTORE -HELP ERROR

[ARCHIVE_RESTORE Rev. 20.2 ..... ]

            ERROR HELP MAIN MENU FOR ARCHIVE_RESTORE
            ========================================

   The following are the sub menus available within the Error help.

   1) Magnetic Tape errors, error numbers 1000 - 1012.

   2) File system errors , error numbers 3000 - 3013.

   3) Catalog, index or tape unit errors, error numbers 3030 - 3037.

   4) Miscellaneous errors, error numbers 3050 - 3061.

   5) Miscellaneous errors, error numbers 3062 - 3074.


Please enter sub_menu number (or QUIT) : 3

                ARCHIVE_RESTORE SUB-MENU 3
                ==========================

            Error 3030: Unable to get list of catalogs
            Error 3031: Catalog is corrupt
            Error 3032: Unable to access catalog :
            Error 3033: Unable to open index file :
            Error 3036: Invalid tape unit character typed.
            Error 3037: Invalid tape unit number.


Please enter error number (or QUIT)
Carriage return re-displays the main menu : 3037

     Error 3037
     ----------
     Invalid tape unit number
     ------------------------

     You specified an invalid number when specifying the tape
     drive unit which you wish to use. The unit number must be a
     decimal number in the range 0 to 7. The prompt will be
     reissued to allow you to enter the correct unit number.


Please enter error number (or QUIT)
Carriage return re-displays the main menu : QUIT
OK,
```

Example Sequence of HELP Error Menus
Figure 21-1

Alternatively, you can display a series of menus that guide you to the error text. There is a main error menu for each command, and below this main menu there are two submenus.

To display the main error menu for a command, type

```
OK, command -HELP ERROR
```

The main menu shows ranges of error numbers associated with the types of error. From this menu you can select a sub-menu that lists the error numbers for each type of error, and gives a one-line explanation of the cause of each error. You are prompted to select one of the displayed error numbers for a detailed explanation of the reason for the error.

As an example of error menus, Figure 21-1 shows a sequence of menus generated for the command ARCHIVE_RESTORE. In response to the prompt at the end of the main menu, the user has requested a submenu for error group 3 (catalog, index or tape unit errors), and next has selected information about error number 3037.

22
Releasing Tapes

INTRODUCTION

This chapter describes how to use the following three commands

- TRANSPORT_RELEASE releases TRANSPORT tapes
- ARCHIVE_RELEASE releases ARCHIVE tapes
- BACKUP_RELEASE releases BACKUP tapes

The following paragraphs summarize the chapter contents.

OVERVIEW OF THE TAPE RELEASE COMMANDS explains why you need to release tapes, and outlines the function of the tape release commands.

PREPARATION describes the steps that you should take before you attempt to release a tape.

RELEASING A TRANSPORT TAPE describes the format of the TRANSPORT_RELEASE command, and explains how to use the command to release TRANSPORT tapes.

RELEASING AN ARCHIVE TAPE describes the format of the ARCHIVE_RELEASE command, and explains how to use the command to release ARCHIVE tapes.

RELEASING A BACKUP TAPE describes the format of the BACKUP_RELEASE command, and explains how to use the command to release BACKUP tapes.

RELEASING A 60MB CARTRIDGE TAPE explains the additional prompts that you may receive when you release a 60Mb cartridge tape drive.

OVERVIEW OF THE TAPE RELEASE COMMANDS

The first time that you transport, archive or backup data to a tape, that tape is labeled with the volume id, and according to the function it is serving; as an ARCHIVE, a TRANSPORT, or a BACKUP tape.

If you want to use an ARCHIVE, TRANSPORT or BACKUP tape for another purpose, or if you want to overwrite the tape (new volume id), you must first release the tape: this labels the tape as free.

PREPARATION

This section describes the steps that you should take before you attempt to release a tape.

Begin by assigning a tape drive and mounting a tape on that drive.

If you are not sure about the contents of the tape, run LIST_TAPE. Providing you are either the owner or the System Administrator, this command lists the contents of the tape: if there are any files that you require, ensure that copies are stored elsewhere on your system. Chapter 25, LISTING A TAPE: LIST_TAPE, describes the procedure for running LIST_TAPE.

When you release either a BACKUP or ARCHIVE tape, you need delete rights to the catalog directory (to delete the catalog when it is empty), and read and write access to the catalog. In the case of a BACKUP tape the catalog directory is always BACKUP*>CATS*. For information about catalogs, refer to Chapter 2, BRMS OVERVIEW.

RELEASING A TRANSPORT TAPE

The command TRANSPORT_RELEASE enables you to recycle a TRANSPORT tape. It labels the tape as free so that you can reuse it.

TRANSPORT tapes are not owned, so that any user can release a TRANSPORT tape.

▶ TRANSPORT_RELEASE

The format of the TRANSPORT_RELEASE command is

```
TRANSPORT_RELEASE -MT n [options]
```

Descriptions of the arguments and options follow.

Argument	Description
-MT n	Identifies the unit number of the tape drive on which the reel is mounted. The tape drive should already be online and assigned to you.

Option	Description
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-NO_QUERY -NQ	Suppresses command prompts when the user's response can be assumed: is used for unattended operation. Aborts the command if user interaction is required.
-REEL n	Specifies which reel of a volume you want to release: n can be in the range 0-255. If you do not specify a reel, the command assumes that you want to release reel 1. When n is in the range 1-255, the loaded reel must be reel n, otherwise the command aborts. Specify -REEL 0 to release a multireel volume.

-VOLID volume-name	Specifies the volume name of the tape to be released. If the mounted reel does not belong to the specified volume, you are prompted to mount the correct reel. If you do not give a volume name, the command releases the reel mounted on the specified MT unit. The volume name must be a valid object name, and can be a maximum of 28 characters long.

How to Use TRANSPORT_RELEASE

This subsection gives examples of how to use the TRANSPORT_RELEASE command.

Releasing Reel 1 of a TRANSPORT Volume: You can release reel 1 of a volume by invoking TRANSPORT_RELEASE without any options. In the following example TRANSPORT_RELEASE releases reel 1, mounted on drive MT0.

```
OK, TRANSPORT_RELEASE -MT 0

[TRANSPORT_RELEASE Rev. 20.2 ..... ]
Reading Label
MT0 rewinding
Writing Label
MT0 rewinding
OK,
```

TRANSPORT_RELEASE reads the TRANSPORT label on the tape, positions the tape, labels it as free, and rewinds it. The tape is free, and ready for use.

Releasing a Specific Reel from a Specific Volume: The following example shows how you can release a specific reel from a specific volume. The command

```
OK, TRANSPORT_RELEASE -MT 0 -VOLID SYST.TRAN -REEL 3
```

releases reel 3 from volume SYST.TRAN, assuming that reel 3 is mounted on drive 0.

If you specify a reel that is not mounted on the assigned drive, you are prompted to mount the correct reel.

Releasing a Multireel TRANSPORT Volume: To release all the reels in a multireel volume, include the option -REEL 0 in the command line. The following example assumes that volume BETA consists of two reels. Begin by mounting the first reel on the drive (MT0 in this example), and then issue the TRANSPORT_RELEASE command. Your screen display is as shown below.

```
OK, TRANSPORT_RELEASE -VOLID BETA -MT 0 -REEL 0

[TRANSPORT_RELEASE Rev. 20.2 ..... ]
Reel 1 is required on MT0
Do you wish to continue? yes
Reading Label.
MT0 rewinding.
Writing Label.
Reel 2 is required on MT0.
Do you wish to continue? yes
Reading Label.
MT0 rewinding.
Writing Label.
Reel 3 is required on MT0
Do you wish to continue? no
OK,
```

If you attempt to release more reels than in use, you receive an error message. In this example the user responded no to the prompt for a third reel, because there were only two reels in the volume.

RELEASING AN ARCHIVE TAPE

The ARCHIVE_RELEASE command enables you to recycle an ARCHIVE tape. It labels the tape as free, and deletes the reel's catalog entry. You can then overwrite the tape. If the reel is the last remaining reel of a volume, the catalog is deleted.

Only the owner of an ARCHIVE tape, or a user with access rights to its catalog, can use the ARCHIVE_RELEASE command to release the tape.

If the reel is either lost or damaged so that it cannot be mounted on the tape drive, you can still use ARCHIVE_RELEASE to release the reel entry from the catalog. You need delete rights to the catalog directory, and read and write access to the catalog.

An operator, or another user can delete a reel entry from a catalog for you by using the -OWNER option, which is described below.

▶ ARCHIVE_RELEASE

The format of the ARCHIVE_RELEASE command is

```
ARCHIVE_RELEASE -VOLID volume-name [options]
```

Descriptions of the command-line argument and options follow.

Argument	Description
-VOLID volume-name	Specifies the volume name of the tape to be released. The volume name must be a valid object name, and can be a maximum of 28 characters.

Option	Description
{ -CATALOG_PATHNAME pathname -CAPA }	Specifies the location of your ARCHIVE catalog directory if it is other than your origin-directory>CATS*. The directory must already exist. The catalog found at pathname is checked for the correct owner: if you are not the owner, the owner's user-id must be specified by the -OWNER option. The -CATALOG_PATHNAME option is required if the directory uses passwords: the password becomes part of the pathname and you must enclose the pathname and password in single quotes.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-MT n	Specifies the unit number of the tape drive that you wish to use. The unit must be online and assigned to you.
{ -NO_QUERY -NQ }	Suppresses command prompts when the user's response can be assumed, and is used for unattended operation. Aborts the command if user interaction is required.

{ -OWNER user-id -OWN }	Identifies the tape's owner: user-id is the owner's user id. Allows you or the operator to release another user's ARCHIVE tape, providing you have delete and write access rights to the catalog for that tape. The command expects to find the catalog in the owner's origin-directory>CATS*, unless you have used the -CAPA option to specify another pathname for the catalog directory. If -OWNER is not specified, the command assumes that you are the tape owner.
-REEL n	Specifies which reel of a volume you want to release: n can be in the range 0-255. If you do not specify a reel, the command assumes that you want to release reel 1. When n is in the range 1-255, the loaded reel must be reel n, otherwise the command aborts. Specify -REEL 0 to release a multireel volume.

How to Use ARCHIVE_RELEASE

This subsection gives examples of how to use the ARCHIVE_RELEASE command.

Releasing Reel 1 of an ARCHIVE Volume: The following example shows how you can release reel 1 of an ARCHIVE volume. In this example the reel is the only one in the volume, and the catalog is therefore also deleted.

```
OK, ARCHIVE_RELEASE -VOLID BETA -MT 0

[ARCHIVE_RELEASE Rev. 20.2 ..... ]
MTO rewinding
Reading Label
MTO rewinding
Writing Label
MTO rewinding
Empty catalog BETA deleted
OK,
```

Catalog BETA.CAT no longer exists, and you can overwrite the reel.

This example assumes that the catalog directory is your origin-directory>CATS*. If the catalog directory has a different pathname, you must specify the pathname by using the -CATALOG_PATHNAME option.

Releasing a Specific Reel From Another User's Volume: This section shows how you can release a specific reel from a volume that is owned by another user. You use the -OWNER option to identify the owner, and the -REEL option to identify the reel. For example, the command

```
OK, ARCHIVE_RELEASE -VOLID TFILES.ARCH -MT 0 -OWNER TOM -REEL 2
```

releases reel 2 from volume TFILES.ARCH, where TFILES.ARCH belongs to user TOM. This assumes that you have delete and write access to the catalog. If the catalog were not in directory CATS*, in TOM's origin directory, you would also need to include the -CATALOG_PATHNAME option in the command line.

Releasing a Multireel ARCHIVE Volume: To release all the reels in a multireel volume, include the option -REEL 0 in the command line. The following example assumes that volume MFILES.ARCH consists of two reels. Begin by mounting the first reel on the drive (MT0 in this example), and then issue the ARCHIVE_RELEASE command. Your screen would be as shown below.

```
OK, ARCHIVE_RELEASE -VOLID MFILES.ARCH -MT 0 -REEL 0

[ARCHIVE_RELEASE Rev. 20.2 ..... ]
Reel 1 is required on MT0
Do you wish to continue? yes
Reading Label.
MT0 rewinding.
Writing Label.
Reel 2 is required on MT0.
Do you wish to continue? yes
Reading Label.
MT0 rewinding.
Writing Label.
Empty catalog MFILES.ARCH deleted.
OK,
```

The message "Empty catalog <volid> deleted" signals that all reels of the volume have been released.

RELEASING A BACKUP TAPE

The BACKUP_RELEASE command enables either operators or the System Administrator to overwrite a BACKUP tape, or recycle a BACKUP tape for another purpose. The command deletes the reel entry from the catalog, and labels the tape as free. If the reel that you release is the last remaining reel of a volume, the catalog is also deleted.

If the catalog does not exist, only the System Administrator or the operator who created the tape can release it.

▶ BACKUP_RELEASE

The format of the BACKUP_RELEASE command is

```
BACKUP_RELEASE -VOLID volume-name [options]
```

Descriptions of arguments and options follow.

Argument	Description
-VOLID volume-name	Specifies the volume name of the tape to be released. The volume name must be a valid object name, and can be a maximum of 28 characters.

Option	Description
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-MT n	Specifies the unit number of the tape drive on which the reel is mounted. The unit should be online and assigned to you. This option is mandatory for all users except the System Administrator and the owner of the tape. If the command line does not specify -MT, BACKUP_RELEASE assumes that the reel is either lost or damaged, and cannot be mounted: in this case, the command only releases the reel entry from the catalog.
{ -NO_QUERY -NQ }	Suppresses command prompts when the user's response can be assumed: is used for unattended operation. Aborts the command if user interaction is required.

If the catalog does not exist, but the user is the System Administrator, the reel is automatically released. Without this option, the System Administrator is queried before the tape is released.

-REEL n — Specifies which reel of a volume you want to release: n can be in the range 0-255. If you do not specify a reel, the command assumes that you want to release reel 1. When n is in the range 1-255, the loaded reel must be reel n, otherwise the command aborts. Specify -REEL 0 to release a multireel volume.

How to Use BACKUP_RELEASE

This subsection gives examples of how to use the BACKUP_RELEASE command.

Releasing a Reel From a BACKUP Volume: This example illustrates how you can release a reel from a BACKUP volume, called SYS1.BAK. In this example the tape catalog is also deleted, because the reel is the only one remaining in the volume.

```
OK, BACKUP_RELEASE -VOLID SYS1.BAK -MT 0

[BACKUP_RELEASE Rev. 20.2 ..... ]
MT0 rewinding.
Reading Label.
MT0 rewinding.
Writing Label.
MT0 rewinding.
Empty catalog SYS1.BAK deleted.
OK,
```

The command reads the tape label, labels the tape as free, rewinds it, and deletes the reel entry from the catalog. When, as in this example, the reel is the last remaining reel of the volume, BACKUP_RELEASE deletes the empty catalog. The reel is then free and ready for use.

Releasing a Multireel BACKUP Volume: To release all the reels in a multireel volume, include the option -REEL 0 in the command line. The following example assumes that volume SYS.BAK consists of two reels. Begin by mounting the first reel on the drive (MT0 in this example), and then issue the BACKUP_RELEASE command. Your screen would be as shown below.

```
OK, BACKUP_RELEASE -VOLID SYS.BAK -MT 0 -REEL 0

[BACKUP_RELEASE Rev. 20.2 ..... ]
Reel 1 is required on MT0
Do you wish to continue? yes
Reading Label.
MT0 rewinding.
Writing Label.
Reel 2 is required on MT0.
Do you wish to continue? yes
Reading Label.
MT0 rewinding.
Writing Label.
Empty catalog SYS.BAK deleted.
OK,
```

The message "Empty catalog <volid> deleted" signals that the tape is released.

RELEASING A 60Mb CARTRIDGE TAPE

If you wish to release a 60Mb cartridge tape, use the same commands as described above. You may, however, receive two additional messages, not shown in the previous examples.

If there is data on the cartridge that you wish to release, you may receive the messages

```
Tape initializing, please wait ....

Tape initialization complete.
```

The release procedure continues as described in the previous examples of how to release tapes.

23

Regenerating and Validating Catalogs: GENERATE_CATALOG

INTRODUCTION

This chapter describes how to use GENERATE_CATALOG to regenerate or validate a catalog. It provides an overview of GENERATE-CATALOG, describes the command format and options, and explains in detail how to use the command.

The following paragraphs summarize the chapter contents.

OVERVIEW OF GENERATE_CATALOG introduces GENERATE_CATALOG. It explains who can use the command, describes the function of the default command, and summarizes the command options.

GENERATE_CATALOG describes the command format, arguments and options.

REGENERATING YOUR OWN CATALOG explains how to regenerate one of your own catalogs.

REGENERATING ANOTHER USER'S CATALOG explains how to regenerate a catalog that belongs to another user. This section also has an example of how to specify the catalog directory pathname.

VALIDATING A CATALOG explains how to validate one of your catalogs.

OVERVIEW OF GENERATE_CATALOG

The GENERATE_CATALOG command enables you to

- Regenerate a damaged ARCHIVE or BACKUP tape catalog
- Validate a catalog against its associated tape

You cannot perform both of these functions simultaneously.

To use GENERATE_CATALOG on an ARCHIVE catalog, you must have add, list and use rights to the catalog directory, and read and write rights to the catalog.

Only the System Administrator or an operator can run GENERATE_CATALOG on a BACKUP catalog.

Default GENERATE_CATALOG Command

You can regenerate one of your catalogs by mounting reel 1 of the volume and specifying the tape drive identifier on the command line. For example:

```
OK, GENERATE_CATALOG -MT 0
```

regenerates one of your ARCHIVE catalogs from the reel mounted on tape drive MT0. If the tape volume consists of more than one reel, GENERATE_CATALOG prompts you to mount the next reel. GENERATE_CATALOG assumes that your catalog directory pathname is origin-directory>CATS*.

GENERATE_CATALOG Options

When you regenerate or validate a catalog, there are GENERATE_CATALOG options that enable you to

- Specify the pathname of the catalog directory, if it is not in the default location
- Suppress the generation of command prompts
- Specify the name of the catalog owner, if you are not the owner
- Identify the number of the reel from which you wish to perform the regeneration or validation
- Specify the name of the tape for which the catalog is to be regenerated or validated
- Display help text about the command's syntax, arguments and options

Regenerating the Catalog Entry of a Released Reel

It is possible to release a reel from a catalog without that reel being mounted on an assigned drive. The entry in the catalog for the released reel may be subsequently overwritten, although the physical reel remains. If you use that reel to regenerate the catalog, and thus reactivate the reel after the reel entry has been overwritten, GENERATE_CATALOG prompts you for confirmation that you want to regenerate the reel entry in the catalog.

▶ GENERATE_CATALOG

This section describes the format of the GENERATE_CATALOG command, and summarizes the functions of the command-line arguments and options.

The format of the GENERATE_CATALOG command is

```
GENERATE_CATALOG -MT n [options]
```

Descriptions of command-line arguments and options follow.

Argument	Description
-MT n	Identifies the unit number of the tape drive on which the reel is mounted. The unit must be online and assigned to you.

Option	Description
{ -CATALOG_PATHNAME pathname -CAPA }	Gives the location of the catalog directory if other than the default location. For an ARCHIVE catalog, the default pathname is origin-directory>CATS*. The location of the BACKUP catalog directory is always MFD>BACKUP*>CATS*. When you use this option, the catalog found at pathname is checked for the correct owner. This option is required if the directory uses passwords; the password becomes part of the pathname and you must enclose the pathname and password in single quotes.

-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
{ -NO_QUERY -NQ }	Used for unattended operation. Terminates the command after it has generated or validated the catalog for a reel: the default is for the command to request a new reel. The command aborts if the reel number that is selected for catalog generation is already in the catalog.
{ -OWNER user-id -OWN }	Identifies the ARCHIVE catalog's owner: user-id is the owner's user id. To use this option you must have add, list and use access to the other user's catalog directory, and read and write access to the catalog. -OWNER allows a System Administrator to generate a catalog on behalf of a user. The command expects to find the catalog directory in the default location, unless you have used the -CAPA option to identify another pathname. If -OWNER is not specified, GENERATE_CATALOG assumes that you are the owner.
-REEL n	Selects the reel number n of the catalog to be regenerated or validated. Values for n are 1 through 255. The command aborts unless the mounted reel is reel n. If you specify a reel number that is already in the catalog, you are asked whether you wish to overwrite the catalog reel entry. If this option is not used, the command assumes that the reel number is reel 1.
{ -VALIDATE -VAL }	Validates the catalog entry for a reel by comparing it with the existing reel. If the catalog reel entry is marked as Reel released, it is changed to indicate that the reel is Not released. If the reel entries have been overwritten, the -VALIDATE option causes GENERATE_CATALOG to automatically regenerate the reel entries in the catalog. -VALIDATE is not a valid option if you use a 60Mb cartridge tape drive.

-VOLID volume-name	Identifies the catalog to be regenerated or validated. The command aborts if the mounted reel is not part of the specified volume. If this option is not given, GENERATE_CATALOG regenerates or validates any mounted reel. The volume name must be a valid object name, and can consist of a maximum of 28 characters.

REGENERATING YOUR OWN CATALOG

To regenerate a catalog for all the reels of a volume, start with reel 1 and continue to mount the reels, when prompted, in ascending order. If you omit a reel, it is entered in the catalog as a released reel.

You can regenerate one of your catalogs by mounting reel 1 on the assigned drive (MT0 in this example) and then issuing the command

```
OK, GENERATE_CATALOG -MT 0
```

An example screen display is shown below. In this example the reel entry already exists in the catalog, and you are asked whether you wish to overwrite the catalog. This example also assumes that the volume consists of one reel.

```
OK, GENERATE_CATALOG -MT 0

[GENERATE_CATALOG Rev. 20.2 ..... ]
MT0 rewinding.
The reel already exists.  Do you want to overwrite the catalog? yes
Beginning generation of catalog SYS1.BAK for reel 1.
Generation of catalog successfully completed.
Do you want to process another reel? no
OK,
```

GENERATE_CATALOG reads the name of the volume, SYS1.BAK, direct from the reel, because in this example you have not specified the volume name via the -VOLID option.

REGENERATING ANOTHER USER'S CATALOG

This subsection explains how to regenerate the ARCHIVE catalog of another user, when the catalog directory does not have the default pathname. The example command assumes that the owner's id is BOB, and that the catalog directory has the pathname BOB>ARCH>CATS*. The tape name is ARCH1. If you have add, list and use access to the catalog

directory, and read and write access to the tape catalog, the following command regenerates the catalog entry of the reel mounted on MT0:

```
GENERATE_CATALOG -MT 0 -CAPA BOB>ARCH>CATS* -OWNER BOB -VOLID ARCH1
```

If the mounted reel did not belong to volume ARCH1, the command would abort.

VALIDATING A CATALOG

The following example shows how to validate a catalog. Before you issue the command, mount reel 1 on the assigned drive (MT0 in this example). When the command has validated the first reel, GENERATE_CATALOG prompts the user to mount the next reel. In this example the tape volume consists of one reel.

```
OK, GENERATE_CATALOG -MT 0 -VALIDATE

[GENERATE_CATALOG Rev. 20.2 ..... ]
Beginning validation of catalog TEST_LIST for reel 1.
Catalog validation successfully completed
Do you want to process another reel? no
OK,
```

24
Listing a Catalog: LIST_CATALOG

INTRODUCTION

This chapter describes how to use the LIST_CATALOG command to list the information contained in either an ARCHIVE or BACKUP catalog. It also provides an overview of the command, and describes the command format and options.

The following paragraphs summarize the chapter contents.

OVERVIEW OF LIST_CATALOG introduces LIST_CATALOG. It describes the function of the default command, and summarizes the command options. This section includes example listings of ARCHIVE and BACKUP catalogs.

LIST_CATALOG describes the command format, arguments and options.

HOW TO USE LIST_CATALOG explains how to use each of the command options to extend the command's functions. It includes an example of a detailed listing, and an example listing of reel statistics.

OVERVIEW OF LIST_CATALOG

LIST_CATALOG enables you to locate objects on tape quickly, by checking the online catalog listing. If you do not know which reel to mount, LIST-CATALOG saves you from having to mount a tape and read it item by item to find a certain object.

To be able to use LIST_CATALOG, you need list and use access to CATS*, and read access to the catalog. Only the System Administrator or a member of privileged group .BACKUP$ can list a BACKUP catalog.

Default LIST_CATALOG Command

You can run LIST_CATALOG by simply entering the command on its own. You do not have to specify either the command-line argument or any options. For example:

```
OK, LIST_CATALOG
```

lists, on your screen, the object pathnames from all the ARCHIVE catalogs held in your catalog directory (default pathname origin-directory>CATS*). It also gives the date the catalog was created, and the number of saves on each reel. The listing covers all the reels in each catalog, and every save of an object.

Figure 24-1 shows an example listing, where there is only one catalog in the catalog directory: if there were more than one catalog, this LIST_CATALOG command would automatically generate a listing for each catalog.

To list a BACKUP catalog, you must include the -BACKUP option on the command line, and must be either the System Administrator or a member of privileged group .BACKUP$. For example, to list the contents of all the catalogs in BACKUP*>CATS* issue the command

```
OK, LIST_CATALOG -BACKUP
```

Figure 24-2 shows, as an example, the listing of the catalog for a BACKUP volume called SYS1.BAK.

LIST_CATALOG Options

Command-line options allow you to shape the LIST_CATALOG command to your needs. You can

- Specify that you want to list a BACKUP catalog
- Select the catalogs and/or reel entries to be included in the listing
- Select the file system objects to be included in the listing
- Specify which saves you wish to list
- Specify the level of information you want to display: you can, for example, obtain a more detailed listing than those shown in Figures 24-1 and 24-2
- Display statistics about the reels
- List a catalog belonging to another user
- Specify a pathname for the ARCHIVE catalog directory, other than the default pathname
- Control the screen display
- Direct the listing to a file
- Suppress some command prompts
- Display help text about the command's syntax, arguments and options

```
OK, LIST_CATALOG

[LIST_CATALOG Rev. 20.2 ..... ]
========================================
for user MARK on Wednesday 3rd June 1987
========================================

User input " "

**** Processing catalog : TEST_FILES ****
ARCHIVE catalog  TEST_FILES  created on Monday 1st June 1987.
Owner :  MARK

REEL 1     SAVE NUMBER(S) 1,2,4

<TESTS>MARK>MY_FILES

4 Files.

TP_RUN1  TP_RUN2   TEST_FILE1  SOURCE1

2 Segment Directories.

PASS.SEG    FAIL.SEG

2 Directories.

DIRECTORY1  DIRECTORY2

1 Access Category.

OPS.ACAT

************* End of reel 1 **********
************* End of catalog TEST_FILES ***********
************* End of LIST_CATALOG *************

OK,
```

Example Listing of an ARCHIVE Catalog
Figure 24-1

```
OK, LIST_CATALOG -BACKUP -VOLID SYS1.BAK

[LIST_CATALOG Rev. 20.2 ..... ]
========================================
For user SARAH on Wednesday 10th June 1987
========================================

User input "-BACKUP -VOLID SYS1.BAK"

**** Processing catalog : SYS1.BAK ****
BACKUP catalog SYS1.BAK created on Monday 1st June 1987
REEL 1    SAVE NUMBER(S) 1, 2


<DSK2>MFD

2 Files.

STARTUP.EFASL    SYSTM3

23 Directories.

BACKUP*          BATCHQ           CMDNC0           CMDNC9
DOS              EMACS*           HELP*            INTCOM*
LIB              LOGREC*          OPER             OPSYS
PRIMENET*        SAD              SARAH            SEG
SEGRUN*          SYSCOM           SYSOVL           SYSTEM
TAPES            TOOLS            VISTA*

********** End of reel 1 **********
********** End of catalog SYS1.BAK **********
********** End of LIST_CATALOG **********

OK,
```

Example Listing of a BACKUP Catalog
Figure 24-2

▶ LIST_CATALOG

This section describes the format of the LIST_CATALOG command, and summarizes the function of the command-line argument and options.

The format of the LIST_CATALOG command is

```
LIST_CATALOG [pathname] [options]
```

Descriptions of arguments and options follow.

Argument	Description
pathname	Identifies the objects to be listed. You can use wildcards, iteration and treewalking. If you do not specify a pathname, LIST_CATALOG lists all the file system objects saved in the catalogs.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Lists only those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Lists only those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Lists only those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

{-BACKEDUP_BEFORE [date] / -BKB}

Lists only those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

-BACKUP

Lists BACKUP catalogs. The default is to list a user's ARCHIVE catalogs.

{-CATALOG_PATHNAME pathname / -CAPA}

Use only with ARCHIVE catalogs. Specifies the location of the catalog directory, if it is other than the tape owner's origin-directory>CATS*. The directory must already exist. The catalog found at pathname is checked for the correct owner. This option is required if the directory uses passwords; the password becomes part of the pathname and you must enclose the pathname and password in single quotes. Not valid with -BACKUP.

{-CREATED_AFTER [date] / -CRA}

Lists only those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

{-CREATED_BEFORE [date] / -CRB}

Lists only those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

{-DETAIL / -DET}

Lists all the information held for each object in a reel, including the pathname, size, DTM, DTB, DTW, type of file system object, and the save number. For information on save numbers see Chapter 5, ARCHIVING DATA: ARCHIVE.

-DTA

Displays the date and time each object was last accessed.

-DTB	Displays the date and time each object was last backed up (to a BACKUP tape).
-DTC	Displays the date and time each object was created.
-DTM	Displays the date and time each object was last modified.
-DTW	Displays the date and time each object was written to this tape.
{ -FROM_SAVE_NUMBER n -FSN }	Lists the catalog from save number n. Values for n are 1-255. The command default is to list from the first save on a reel.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-LATEST	Displays information about only the most recent save of the file system object. The default is to display information about each save of the selected object(s).
{ -MODIFIED_AFTER [date] -MDA -AFTER }	Lists only those objects in the catalog that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a DTM on or after date, the command lists the directory's subordinate objects that have been modified on or after this date.
{ -MODIFIED_BEFORE [date] -MDB -BEFORE }	Lists only those objects in the catalog that have been modified before the specified date or, if date is not given, before 00:00 AM today. If the object is a directory that does not have a DTM before date, the command lists the directory's subordinate objects that have been modified before this date.

-NO_QUERY -NQ	Suppresses command prompts when the user's response can be assumed: is used for unattended operation. If you specify this option and the command then requires some user action, the command aborts.
-NO_SORT -NSORT	Displays the objects in the order they appear in the catalog. The default is to display the objects in alphabetical order.
-NO_WAIT -NW	Suppresses the paging of the display, so that the listing does not pause every 20 lines: there is no "--More--" prompt.
-OUTPUT pathname -OUT	Directs the listing to the file specified by pathname. If this file already exists, the new information is appended to pathname. If the file exists, but is inaccessible, the command aborts. The default is to display the listing on your terminal screen.
-OWNER user-id -OWN	Identifies the owner of an ARCHIVE tape: user-id is the tape owner's user id. To be able to list this user's catalog you must have list and use access to the catalog directory, and read access to the catalogs. LIST_CATALOG expects to find the catalog in the owner's origin-directory>CATS*, unless you have used the -CAPA option to specify another pathname for CATS*. The -OWNER option is not valid for a BACKUP tape. If -OWNER is not specified, LIST_CATALOG assumes that you are the tape owner.
-REEL n	Selects the catalog reel number n to be listed. Values for n are 1-255. If you specify a reel not in the catalog, the command aborts. The default lists all the reels in a catalog.
-SIZE	Displays the size of each object saved.
-TAPE_INFORMATION -TI	Lists statistics for each reel, including the date it was last written to, the type of tape (BACKUP or ARCHIVE), the tape name, the density, the block size of saved objects, the number of recoverable errors on the reel, and times the reel has been used.

{ -TO_SAVE_NUMBER n } Ends the listing when save number n is reached, without listing save n. Values for n are 1-255. The default is to continue to the end of the catalog.
{ -TSN }

-VOLID volume-name1...volume-name10
Identifies the catalogs to be listed. You can specify a maximum of 10 volume names. The command default is to list the catalogs for all volumes. The volume name must be a valid object name, and can be a maximum of 28 characters.

{ -WRITTEN_AFTER [date] }
{ -WRA }

Lists only those objects that were written to the catalog on or after date or, if date is not given, after 00:00 AM today. If the object is a directory and was not written to tape on or after the given date, the command lists the directory's subordinate objects written to tape on or after this date.

{ -WRITTEN_BEFORE [date] }
{ -WRB }

Lists only those objects that were written to the catalog before date or, if date is not given, before 00:00 AM today. If the object is a directory and was not written to tape before the given date, the command lists the directory's subordinate objects written to tape before this date.

HOW TO USE LIST_CATALOG

This section describes, with examples, how to use LIST_CATALOG. It consists of the following subsections:

- Listing the Contents of all Your Catalogs explains the function of the basic LIST_CATALOG command, without any command line options except -BACKUP
- Selecting the Catalogs and/or Reel to List describes how to limit the listing to specified catalogs and/or specified reels
- Selecting Objects to List describes how you can limit the listing to certain categories of file system objects

- Selecting the Saves to List explains how to limit the listing to certain saves
- Selecting the Level of Information shows how you can control the amount of information displayed about each file system object
- Displaying Reel Statistics describes how to obtain general statistics about each reel in the selected catalogs
- Locating the Catalog explains how to list a catalog when the catalog directory is not in the default location
- Listing Another User's Catalog describes how to list a catalog that you do not own
- Controlling the Display shows how to obtain a continuous listing, without pauses, and how to list the objects in the order in which they occur in the catalog
- Sending the Listing to a File explains how to file the listing
- Suppressing Command Queries describes how to suppress those command prompts where the user's response can be assumed

Listing the Contents of all Your Catalogs

The basic LIST_CATALOG command

```
OK, LIST_CATALOG
```

displays the pathnames of all file system objects in all your ARCHIVE catalogs. The command assumes the default pathname for the catalog directory.

If you are an operator, you can display the contents of all your BACKUP catalogs by adding the -BACKUP option to the command line. For example:

```
OK, LIST_CATALOG -BACKUP
```

The following sections describe how to use the command argument and options to modify the operation of the basic command.

Selecting the Catalogs and/or Reel to List

The command default is to list all the reel entries in all catalogs in the catalog directory. If you wish to list the catalog of only a limited number of volumes, use the -VOLID option. If you want to list the entry for a specific reel, use the -REEL option

For example, to list the ARCHIVE catalogs of volumes ARCH1 and ARCH2, issue the command

```
OK, LIST_CATALOG -VOLID ARCH1 ARCH2
```

This example assumes that the catalogs are in the default directory, origin-directory>CATS*.

To list BACKUP catalogs, include the -BACKUP option on the command line. Figure 24-2, above, shows an example listing of the catalog for a BACKUP tape SYS1.BAK.

As an example of the -REEL option, the command

```
OK, LIST_CATALOG -VOLID ARCH1 -REEL 4
```

lists only the entry for reel 4 in the ARCH1 catalog.

Note that if you use the -REEL option without specifying a tape volume (-VOLID), LIST_CATALOG lists the entries for that reel number from all your catalogs.

Selecting Objects to List

This subsection describes ways to control which file system objects are listed. You can

- Specify the pathname of the objects you wish to list
- Select objects according to the date on which they were created, last accessed, last backed up, last modified, or last written to tape

Specifying the Pathname: The LIST_CATALOG argument pathname enables you to specify the pathname of the file system object that you wish to list.

For example:

```
OK, LIST_CATALOG BOB>NET
```

initiates a search of all your ARCHIVE catalogs, and lists occurrences of file system object BOB>NET.

You can use wildcards, iteration and treewalking with the pathname.

When you use wildcards, you can include wildcard options in the command line to

- Select only file system objects of particular types
- Select objects according to when they were created, last accessed, last backed up, last modified, or last written to tape
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, LIST_CATALOG BOB>NET@@ -DIR
```

searches your ARCHIVE catalog for subdirectories in BOB whose names begin with NET.

Treewalking options make the command act on designated objects within a directory tree. You can only use these options when you specify a wildcard in an intermediate position in the pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. You can obtain online HELP about how to use these options with LIST_CATALOG by issuing the command

```
OK, LIST_CATALOG -HELP WILDCARDS
```

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up
- Created
- Last modified
- Last written to tape

For each of the above events, you can select objects for listing on the basis of whether the event took place before, on, or after a specified date.

The LIST_CATALOG options are

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]
- -WRITTEN_AFTER [date] and -WRITTEN_BEFORE [date]

The options suffixed with _AFTER cause LIST_CATALOG to list only objects that have been created, last accessed, last backed up, last modified or last written to tape on or after the specified date.

The options suffixed with _BEFORE cause LIST_CATALOG to list only objects that have been created, last accessed, last backed up, last modified or last written to tape before the specified date.

Note that these options are not exclusive: you can select objects for listing on the basis of more than one of the file attributes.

You can specify date in any one of the following formats:

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as two digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zero. Thus if you do not specify date, it defaults to 00:00 AM TODAY.

The following example command lists any object on the mounted reel that has been modified before 00:00 AM TODAY. This example uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, LIST_CATALOG -MDB
```

As another example, the following command lists those objects that were backed up (to a BACKUP tape) after 9.00 a.m. on 19th May 1986

```
OK, LIST_CATALOG -MT 0 -BACKEDUP_AFTER 05/19/86.09:00:00.MON
```

Selecting the Saves to List

The default for LIST_CATALOG is to begin at the first save on a reel, and to continue through to the last save on the reel, listing every save. However, LIST_CATALOG options enable you to

- Begin the listing at a specific save (-FROM_SAVE_NUMBER n)
- End the listing at a specific save (-TO_SAVE_NUMBER n)
- List only the most recent save of each file system object (-LATEST)

For example, the command

```
OK, LIST_CATALOG -VOLID ARCH1 -FSN 3 -TSN 7 -LATEST
```

lists the most recent save of each object on your ARCHIVE catalog ARCH1, beginning at save 3 and ending after save 6. This example uses

the abbreviated names of the options. Note that a listing stops at the specified -TSN number, and does not list that save: thus to end the listing after save 6, the example specifies -TO_SAVE_NUMBER 7.

Selecting the Level of Information

The standard LIST_CATALOG listing gives the dates the selected catalogs were created, the pathnames of the objects in the catalogs, and the save numbers on each reel. In addition to this information you can use the LIST_CATALOG options to display

- The date and time that each selected file system object was last accessed (-DTA).
- The date and time that each selected file system object was created (-DTC).
- The date and time that each selected file system object was last backed up (-DTB).
- The date and time that each selected file system object was last modified (-DTM).
- The date and time that each selected file system object was last written (-DTW).
- The size of each object saved (-SIZE).
- A detailed listing that provides all the above items of information about the selected file system objects (-DETAIL). If you specify the -DETAIL option, you do not need to use any of the other options described in this section.

Obtaining a Detailed Listing: You use the -DETAIL option to generate a detailed listing. Figure 24-3 shows a detailed catalog listing for reel 7 of a volume called OLD_FILES. This example listing is generated by the command

```
OK, LIST_CATALOG -VOLID OLD_FILES -REEL 7 -DETAIL
```

```
OK, LIST_CATALOG -VOLID OLD_FILES -REEL 7 -DETAIL

[LIST_CATALOG Rev. 20.2 ..... ]
========================================
for user SARAH on Tuesday 16th June 1987
========================================

User input "-VOLID OLD_FILES -REEL 7 -DETAIL"

ARCHIVE catalog OLD_FILES created on Thursday 21st May 1987
Owner: SARAH

REEL 7    SAVE NUMBER(S) 1

<DSK2>OLD_DIRECTORY>NOT_NEEDED

    name
                 size        date/time modified
      type       save        date/time backed up    date/time written
                             date/time created      date/time accessed
    ------------------------------------------------------------------
    2 files

    FILE_NAME1
                    1        18 Oct 86 14:49:32
      dam           1        20 May 87 10:10:20     21 May 87 13:13:20
                             10 Sep 86 15:15:36     23 May 87 09:30:24
    FILE_NAME2
                    3        31 Sep 86 20:24:40
      sam           1        20 May 87 14:06:28     21 May 87 13:04:36
                             10 Sep 86 15:15:40     23 May 87 09:31:00

    2 directories

    DIRECTORY1
                  701        18 May 87 15:55:56
      pas dir       1        20 May 87 17:14:20     21 May 87 13:13:20
                             10 Sep 86 15:15:32     23 May 87 09:30:24
    SANTA
                   90        19 May 87 12:43:04
      acl dir       1        20 May 87 09:04:40     21 May 87 13:04:36
                             10 Sep 86 15:50:40     23 May 87 09:30:00

    ********** End of reel 7 **********
    ********** End of catalog OLD_FILES **********
    ********** End of LIST_CATALOG **********

    OK,
```

Example LIST_CATALOG Display Generated by the -DETAIL Option
Figure 24-3

Displaying Reel Statistics

The option -TAPE_INFORMATION displays statistical information about each reel. This includes

- The date the reel was last written to
- How many times the reel has been used
- The number of recoverable errors on the reel
- The block size of saved objects
- The type of tape (ARCHIVE or BACKUP)
- The tape name
- The tape density

Figure 24-4 shows the output format when you select -TAPE_INFORMATION. It shows the catalog listing for a BACKUP volume SYS1.BAK. The volume consists of one reel, and the statistics for this are displayed after the catalog listing.

The reel statistics in this example have blank "Remark" lines under the save numbers. You define a remark by using the -REMARK options to the BACKUP, ARCHIVE and TRANSPORT commands: the remark can be a maximum of 80 characters long.

Locating the Catalog

The default LIST_CATALOG command assumes that the pathname of the ARCHIVE catalog directory is origin-directory>CATS*. If the catalog directory is located elsewhere, you must inform LIST_CATALOG of that location by using the -CATALOG_PATHNAME option. For example, if your ARCHIVE catalogs are held in <disk>BOB>ARCHIVE1>CATS*, the command

```
OK, LIST_CATALOG -VOLID TEST_FILES -CAPA BOB>ARCHIVE1>CATS*
```

generates a standard listing of tape catalog TEST_FILES.

Note that you cannot specify an alternative pathname for the BACKUP catalog directory: thus you cannot use -CATALOG_PATHNAME and -BACKUP on the same command line.

```
OK, LIST_CATALOG -BACKUP -VOLID SYS1.BAK -TAPE_INFORMATION

[LIST_CATALOG Rev. 20.2 ..... ]
========================================
for user SARAH on Wednesday 3rd June 1987
========================================

User input "-BACKUP -VOLID SYS1.BAK -TAPE_INFORMATION"

**** Processing catalog : SYS1.BAK ****
BACKUP catalog SYS1.BAK created on Monday 1st June 1987


REEL 1     SAVE NUMBER(S) 1, 2

<DSK3>MFD

2 Files.

STARTUP.EFASL     SYSTM3
8 Directories.

BACKUP*           BATCHQ            CMDNCO            CMDNC9
DOS               EMACS*            HELP*             INTCOM*

Statistics for reel 1
=====================

Date Last Written - 22 May 87 09:51:16 Friday
Command - BACKUP revision 20.2
Density - 1600
Block Size - 5141
Reel used - 9 times

                    RECOVERABLE         BLOCKS       NUMBER
SAVE_NUMBER           ERRORS          OF TAPE      OF FILES
-------------------------------------------------------------
    1                    1             10650          2731
Remark :
    2                    3               950           200
Remark :

Total for reel           4             11600          2931

********** End of reel 1 **********
********** End of catalog SYS1.BAK **********
********** End of LIST_CATALOG **********

OK,
```

Example of a Catalog Listing With Reel Statistics
Figure 24-4

Listing Another User's Catalog

LIST_CATALOG assumes that you want to list your own catalogs. However, you can list another user's ARCHIVE catalogs if you have list and use rights to their catalog directory and read rights to their catalogs. You give LIST_CATALOG the name of the catalog owner by using the -OWNER user-id option. For example, to list the catalog for tape MYFILES, owned by user TOM, issue the command

```
OK, LIST_CATALOG -VOLID MYFILES -OWNER TOM
```

This example assumes the default pathname for the catalog directory, TOM's origin-directory>CATS*.

Controlling the Display

LIST_CATALOG allows the listing to be displayed either on your screen or directed to a file.

Normally LIST_CATALOG displays the listing on your screen. The listing is in paged format: it pauses every 20 lines and prompts "--More--". The catalog contents are grouped under the following headings: files, segment directories, directories, and access categories. Objects are listed in alphabetical order under each of these headings.

You can use LIST_CATALOG options to

- Obtain a continuous listing on your screen, with no pauses (-NO_WAIT)
- List file system objects in the order in which they occur in the catalog (-NO_SORT)

You can also direct the listing to a file, instead of to your screen: this is described below in the section Sending the Listing to a File. LIST_CATALOG ignores the -NO_WAIT option if you send the listing to a file.

As an example of how you can use these two options, the command

```
OK, LIST_CATALOGS -NO_WAIT -NO_SORT
```

lists your ARCHIVE catalogs on your screen without pausing, and lists file system objects in the order in which they occur in the catalogs.

Sending the Listing to a File

The default LIST_CATALOG command displays the catalog details on your terminal screen. However, the -OUTPUT pathname option enables you to file the listing, instead of it being displayed on your screen. The pathname identifies the file that is to hold the listing. If this file already exists, LIST_CATALOG appends the listing to the end of the file.

For example, if you have adequate access rights to directory IAN and file TESTS, the command

```
OK, LIST_CATALOG -VOLID TEST_FILES -OUTPUT IAN>TESTS
```

files the listing of the ARCHIVE catalog TEST_FILES in file IAN>TESTS.

Suppressing Command Queries

The -NO_QUERY option suppresses any command prompts to which a user response can be assumed. If user action is required, the command aborts. You should therefore only use this option if you are confident that no user action is required.

25
Listing a Tape: LIST_TAPE

INTRODUCTION

This chapter describes how to use the LIST_TAPE command to list the contents of an ARCHIVE, TRANSPORT, BACKUP or MAGSAV tape. The following paragraphs summarize the chapter contents.

OVERVIEW OF LIST_TAPE introduces LIST_TAPE. It describes the default command, gives an example listing, and summarizes the command options.

LIST_TAPE describes the command format, arguments and options.

HOW TO USE LIST_TAPE explains how to use each of command options to extend the command's functions. It includes an example of a detailed listing, and an example listing of reel statistics.

OVERVIEW OF LIST_TAPE

LIST_TAPE enables you to find out what is on a reel, even without knowing the name of the tape.

Any user can list a TRANSPORT tape. However, only the tape owner or System Administrator can list an ARCHIVE tape, and only the System Administrator or operator can list a BACKUP tape.

Default LIST_TAPE Command

You can run LIST_TAPE on an ARCHIVE, TRANSPORT or BACKUP tape without specifying any command argument or option, except the number of the tape drive on which the reel is mounted. The tape drive must be online and assigned to you.

For example, the command

```
OK, LIST_TAPE -MT 0
```

lists on your screen the contents of the reel mounted on MT0.

An example listing for an ARCHIVE tape, ARCH.SYS1, is shown in Figure 25-1. At the end of the first reel, LIST_TAPE asks if you wish to list the contents of another reel: type yes or y to continue, no or n to end the LIST_TAPE session.

LIST_TAPE Options

Command-line options allow you to shape the LIST_TAPE command to your needs. You can

- Specify the name of the tape that is to be listed
- Select the file system objects to be included in the listing
- Specify which saves you wish to list
- Specify the level of information to be displayed about the selected objects: you can, for example, obtain a more detailed listing than that shown in Figure 25-1
- Display statistics about a reel
- Direct the listing to a file
- Control the screen display

- Suppress some of the command prompts
- Display help text about the command's syntax, arguments and options

```
OK, LIST_TAPE -MT 0

[LIST_TAPE Rev. 20.2 ..... ]
=======================================
for user JENKINS on Tuesday 16th June 1987
=======================================

User input "-MT 0"

MT0 rewinding.
ARCHIVE tape TEST_LIST created on Tuesday 16th June 1987
Owner : JENKINS

********** Start of reel 1 **********

acl dir  <DK1>JENKINS>DIR1
sseg     <DK1>JENKINS>DIR1>INDEX.SEG
sam      <DK1>JENKINS>DIR1>INDEX
sam      <DK1>JENKINS>DIR1>YY.CPL
acl dir  <DK1>JENKINS>DIR1>TEST_FILES
sam      <DK1>JENKINS>DIR1>TEST_FILES>FILE1.PLP
sseg     <DK1>JENKINS>DIR1>TEST_FILES>FILE3.SEG
********** End of reel 1 **********
Do you wish to list another reel ? N
********** End of tape TEST_LIST **********
********** End of LIST_TAPE **********
OK,
```

Example Listing of an ARCHIVE Tape
Figure 25-1

▶ LIST_TAPE

This section describes the format of the LIST_TAPE command, and summarizes the function of the command-line argument and options.

The format of the LIST_TAPE command is

```
LIST_TAPE [pathname] -MT n [options]
```

Descriptions of arguments and options follow.

Argument	Description
pathname	Identifies the objects to be listed. You can use wildcards, iteration and treewalking. LIST_TAPE lists the tapes and reel numbers that have the specified object(s). If you do not specify a pathname, LIST_TAPE lists all the file system objects saved on the tape.
-MT n	Identifies the unit number of the tape drive on which the reel is mounted. The drive must be online and assigned to you.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Lists only those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Lists only those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.

{-BACKEDUP_AFTER [date]
-BKA}

Lists only those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

{-BACKEDUP_BEFORE [date]
-BKB}

Lists only those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

{-CREATED_AFTER [date]
-CRA}

Lists only those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

{-CREATED_BEFORE [date]
-CRB}

Lists only those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

{-DETAIL
-DET}

Lists all the information held for each object in a reel, including the pathname, size, DTM, DTB, DTW, type of file system object, and the save number. If -DETAIL is not specified, LIST_TAPE lists only the pathnames of the objects.

-DTA

Displays the date and time each object was last accessed.

-DTB

Displays the date and time each object was last backed up (to a BACKUP tape).

-DTC

Displays the date and time each object was last created.

-DTM

Displays the date and time each object was last modified.

-DTW	Displays the date and time each object was written to this tape.
-FROM_SAVE_NUMBER n -FSN	Starts listing the tape at save number n. Values for n are 1-255. The command default is to begin at the first save on a reel. This option is not valid when you use a 60Mb cartridge tape drive.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-MODIFIED_AFTER [date] -MDA -AFTER	Lists only those objects in the catalog that have been modified on or after the specified date or, if date is not given, after 00:00 AM today. If the object is a directory that does not have a DTM on or after date, the command lists the directory's subordinate objects that have been modified on or after this date.
-MODIFIED_BEFORE [date] -MDB -BEFORE	Lists only those objects in the catalog that have been modified before the specified date or, if date is not given, before 00:00 AM today. If the object is a directory that does not have a DTM before date, the command lists the directory's subordinate objects that have been modified before this date.
-NO_QUERY -NQ	Suppresses command prompts when the user's response can be assumed: is used for unattended operation. Causes LIST_TAPE to list the contents of the mounted reel and then exit. If you specify this option and the command then requires some user action, the command aborts. If you do not specify -NQ, LIST_TAPE lists the contents of the mounted reel, and then asks whether you wish to mount another reel.

{ -NO_WAIT -NW }	Suppresses the paging of the display, so that the listing does not pause every 20 lines: there is no "--More--" prompt.
{ -OUTPUT pathname -OUT }	Directs the listing to the file specified by pathname. If this file already exists, the new information is appended to pathname. If the file exists, but is inaccessible, the command aborts. The default is to display the listing on your terminal screen.
-REEL n	Selects the reel number n to be listed. Values for n are 1-255. If you specify a reel that is not loaded, the command aborts. The default lists the contents of any mounted reel.
-SIZE	Displays the size of each object saved.
{ -TAPE_INFORMATION -TI }	Lists statistics for each reel, including the date it was last written to, the type of tape, (BACKUP, ARCHIVE, or TRANSPORT), the tape name, the density, the block size of saved objects, the number of recoverable errors on the reel, and how many times the reel has been used.
{ -TO_SAVE_NUMBER n -TSN }	Ends the listing when save number n is reached, without listing save n. Values for n are 1-255. The default is to continue to the end of the tape volume. This option is not valid when you use a 60MB cartridge tape drive.
-VOLID volume-name	Specifies the tape volume to be listed. The volume name must be a valid object name, and can be a maximum of 28 characters. The command aborts if the loaded reel is not part of this volume. The command default is to list the mounted tape.

{-WRITTEN_AFTER [date] / -WRA}

Lists only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today. If the object is a directory and was not written to tape on or after the given date, the command lists the directory's subordinate objects written to tape on or after this date.

{-WRITTEN_BEFORE [date] / -WRB}

Lists only those objects that were written to the tape before date or, if date is not given, before 00:00 AM today. If the object is a directory and was not written to tape before the given date, the command lists the directory's subordinate objects written to tape before this date.

HOW TO USE LIST_TAPE

This section describes, with examples, how to use LIST_TAPE. It consists of the following subsections:

- Listing all Objects on the Mounted Reel describes how you can use the basic LIST_TAPE command to display the pathnames of all objects on the mounted reel
- Specifying the Volume and/or Reel to List describes how to restrict the listing to the desired volume, or to a specific reel
- Selecting Objects to List describes how you can limit the listing to certain categories of file system objects
- Selecting the Saves to List explains how to limit the listing to certain saves
- Selecting the Level of Information shows how you can control the amount of information displayed about each file system object
- Displaying Reel Statistics describes how to obtain general statistics about a reel
- Controlling the Display shows how to obtain a continuous listing, without pauses

- Sending the Listing to a File explains how to file the listing
- Suppressing Command Queries describes how to suppress those command prompts where the user's response can be assumed

Listing all Objects on the Mounted Reel

The basic LIST_TAPE command displays the pathnames of all the file system objects on the reel mounted on the specified drive, regardless of the tape name or reel number. For example:

```
OK, LIST_TAPE -MT 1
```

lists the contents of the ARCHIVE, BACKUP, or TRANSPORT reel on drive MT1.

Specifying the Volume and/or Reel to List

The command default is to list the mounted reel, whatever it's tape name or reel number. If you wish to ensure that you only list a tape from a specific volume, use the -VOLID option. If you wish to list a specific reel, rather than whatever reel is mounted, use the -REEL option.

For example, the following command lists the tape on MT0 only if it is part of volume ARCH1

```
OK, LIST_TAPE -MT 0 -VOLID ARCH1
```

Note that you must be the tape owner or System Administrator to list an ARCHIVE tape, and the System Administrator or operator to list a BACKUP tape.

As an example of the use of the -REEL option, the command

```
OK, LIST_TAPE -MT 0 -VOLID ARCH1 -REEL 4
```

lists only reel 4 from volume ARCH1.

Note that if you use the -REEL option without also specifying a tape volume (-VOLID), the command displays the specified reel from all your volumes.

Selecting Objects to List

This section describes how you can control which file system objects are listed. You can

- Specify the pathname of the objects you wish to list
- Select objects according to the date on which they were created, last accessed, last backed up, last modified and last written to tape

Specifying the Pathname: The LIST_TAPE argument pathname enables you to specify the pathname of the file system object that you wish to list. For example:

```
OK, LIST_TAPE BOB>NET -MT 0
```

lists, from the reel on MT0, occurrences of the file system object BOB>NET.

You can use wildcards, iteration and treewalking with the pathname.

When you use wildcards, you can include wildcard options on the command line to

- Select types of file system objects
- Select objects according to when they were created, last accessed, last backed up, last modified, or last written to tape
- Enable or disable verification

For example, by including the wildcard option -DIR, the command

```
OK, LIST_TAPE BOB>NET@@ -MT 0 -DIR
```

lists, from the reel on MT0, any subdirectories in BOB whose names begin with NET.

Treewalking options make the command act on designated objects within a directory tree. You can only use these options when you specify a wildcard in an intermediate position in the pathname.

Valid treewalking options are

- -WALK_FROM
- -WALK_TO

For more information about wildcard and treewalking options, refer to the Prime User's Guide and the PRIMOS Commands Reference Guide. You can obtain online HELP about how to use treewalking and wildcard options with LIST_TAPE by issuing the command

```
OK, LIST_TAPE -HELP WILDCARDS
```

Selecting Objects by Dated File Attributes: You can select objects according to the date when they were

- Last accessed
- Last backed up
- Created
- Last modified
- Last written to tape

For each of the above events, you can select objects for listing on the basis of whether the event took place before, on, or after a specified date.

The LIST_TAPE options are

- -ACCESSED_AFTER [date] and -ACCESSED_BEFORE [date]
- -BACKEDUP_AFTER [date] and -BACKEDUP_BEFORE [date]
- -CREATED_AFTER [date] and -CREATED_BEFORE [date]
- -MODIFIED_AFTER [date] and -MODIFIED_BEFORE [date]
- -WRITTEN_AFTER [date] and -WRITTEN_BEFORE [date]

The options suffixed with _AFTER cause LIST_TAPE to list only objects that have been created, last accessed, last backed up, last modified or last written to tape on or after the specified date.

The options suffixed with _BEFORE cause LIST_TAPE to list only objects that have been created, last accessed, last backed up, last modified or last written to tape before the specified date.

Note that these options are not exclusive: you can select objects for listing on the basis of more than one of the file attributes.

You can specify date in any one of the following formats:

Format	Example
MM/DD/YY.hh:mm:ss.day-of-week	05/18/86.09:45:00.TUE
YY-MM-DD.hh:mm:ss.day-of-week	86-05-18.09:45:00.TUE
'DD MMM YY hh:mm:ss.day-of-week'	'18 MAY 86 09:45:00.TUE'
'DD MMM YY.hh:mm:ss.day-of-week'	'18 MAY 86.09:45:00.TUE'

where

MM is the month, specified as 1 or 2 digits in the range 01-12
MMM is the month name, identified by its first 3 characters
DD is the day, specified as 1 or 2 digits in the range 01-31
YY is the year, specified as two digits
hh is the hour, specified as 1 or 2 digits in the range 00-23
mm is the minutes, specified as 1 or 2 digits in the range 00-59
ss is the seconds, specified as 1 or 2 digits in the range 00-59
day-of-week is the name of the day, identified by its first 3 characters

The date and day-of-week fields default to the current date and day, while the time fields default to zeroes.

Thus if you do not specify date, it defaults to 00:00 AM TODAY.

For example, the folowing command lists any object on the mounted reel that has been modified before 00:00 AM TODAY. This example uses the abbreviated name for the -MODIFIED_BEFORE option.

```
OK, LIST_TAPE -MT 0 -MDB
```

As another example, the following command lists any object on the mounted reel that has been backed up after 18th May 1986

```
OK, LIST_TAPE -MT 0 -BACKEDUP_AFTER 05/18/86
```

Selecting the Saves to List

The default for LIST_TAPE is to begin at the first save on a reel, and to continue through to the last save on the reel, listing every save. However, LIST_TAPE options enable you to

- Begin the listing at a specific save (-FROM_SAVE_NUMBER n)
- End the listing at a specific save (-TO_SAVE_NUMBER n)

For example, to begin the listing of tape ARCH1 at save 3 and end the listing after save 6, issue the command

```
OK, LIST_TAPE -VOLID ARCH1 -FSN 3 -TSN 7
```

This shows how you can use the abbreviated names of the options. Note that the listing stops at the specified -TSN number, and does not list that save: thus to end the listing after save 6, the example specifies -TO_SAVE_NUMBER 7.

Selecting the Level of Information

The standard LIST_TAPE listing gives the tape type, the date the tape was created, the tape name, the reel number, and the pathnames of the objects on the reel.

In addition to this information you can use the LIST_TAPE options to display

- The date and time that each selected file system object was last accessed (-DTA).
- The date and time that each selected file system object was created (-DTC).
- The date and time that each selected file system object was last backed up (-DTB).
- The date and time that each selected file system object was last modified (-DTM).
- The date and time that each selected file system object was last written (-DTW).
- The size of each object saved (-SIZE).
- A detailed listing that provides all the above items of information about the selected file system objects (-DETAIL). If you specify the -DETAIL option, you do not need to use any of the other options described in this section.

Obtaining a Detailed Listing: Figure 25-2 shows how to use the -DETAIL option to obtain a detailed tape listing.

```
OK, LIST_TAPE -MT 0 -DETAIL

[LIST_TAPE Rev. 20.2 ..... ]
========================================
for user JENKINS on Tuesday 16th June 1987
========================================

User input "-MT 0 -DETAIL"

ARCHIVE tape TEST_LIST created on Tuesday 16th June 1987
Owner : JENKINS

********** Start of reel 1 **********

path name
                size        date/time modified    protection
type            rwlock      date/time backed up   date/time written  save number
                            date/time created     date/time accessed
-------------------------------------------------------------------------------
<DK1>JENKINS>DIR1
                  15        16 Jun 87 13:32:00      (Default)
  acl dir                   16 Jun 87 08:43:32    16 Jun 87 13:34:16        1
                            15 Jun 87 16:13:24    16 Jun 87 13:32:00
<DK1>JENKINS>DIR1>INDEX.SEG
                   2        15 Jun 87 17:11:08      (Default)
  sseg            sys       16 Jun 87 08:43:28    16 Jun 87 13:34:16        1
                            15 Jun 87 17:10:56    16 Jun 87 13:32:52
<DK1>JENKINS>DIR1>INDEX
                   1        15 Jun 87 16:29:16      (Default)
  sam             sys       16 Jun 87 08:43:28    16 Jun 87 13:34:16        1
                            15 Jun 87 16:29:12    15 Jun 87 17:31:16
<DK1>JENKINS>DIR1>YY.CPL
                   1        15 Jun 87 16:31:08      (Default)
  sam             sys       16 Jun 87 08:43:28    16 Jun 87 13:34:16        1
                            15 Jun 87 16:31:08    15 Jun 87 17:31:16
<DK1>JENKINS>DIR1>TEST_FILES
                   7        16 Jun 87 13:32:52      (Default)
  acl dir                   ** not set **         16 Jun 87 13:34:16        1
                            16 Jun 87 13:32:00    16 Jun 87 13:32:52
<DK1>JENKINS>DIR1>TEST_FILES>FILE1.PLP
                   1        16 Jun 87 13:32:32      (Default)
  sam             sys       ** not set **         16 Jun 87 13:34:16        1
                            16 Jun 87 13:32:32    16 Jun 87 13:32:40
<DK1>JENKINS>DIR1>TEST_FILES>FILE3.SEG
                   2        16 Jun 87 13:32:52      (Default)
  sseg            sys       ** not set **         16 Jun 87 13:34:16        1
                            16 Jun 87 13:32:52    16 Jun 87 13:32:52
********** End of reel 1 **********
Do you wish to list another reel ? N
********** End of tape TEST_LIST **********
********** End of LIST_TAPE **********
```

Example LIST_TAPE Display Generated by the -DETAIL Option
Figure 25-2

Displaying Reel Statistics

The option -TAPE_INFORMATION displays statistical information about each reel. This includes

- The date the reel was last written to
- How many times the reel has been used
- The number of recoverable errors on the reel
- The block size of saved objects
- The type of tape (ARCHIVE, BACKUP, or TRANSPORT)
- The tape name
- The tape density

Figure 25-3 is an example listing that shows the format of the statistics display. In this example, the statistics are for reel 5 of volume ARCH1.

The reel statistics have "Remark" lines under the save numbers. You define a remark by using the -REMARK options to the BACKUP, ARCHIVE and TRANSPORT commands: the remark can be a maximum of 80 characters long.

Controlling the Display

LIST_TAPE allows the listing to be either displayed on your screen or directed to a file. This subsection explains how to control the format of the screen display, while the next section, Sending the Listing to a File, explains how to direct the listing to a file.

Normally LIST_TAPE displays the listing on your screen. The listing is in paged format: it pauses every 20 lines and prompts "—More--".

You can use the LIST_TAPE option -NO_WAIT to obtain a continuous listing on your screen, with no pauses.

For example:

```
OK, LIST_TAPE -MT 0 -NO_WAIT
```

lists the contents of the reel on MT0 on your screen, without pausing with the "--More--" prompt.

```
Statistics for Reel 5
=====================

Date Last Written -  18 Jun 1987 10:30:11 Thursday
Command - ARCHIVE Revision 20.2
Density - 1600
Block Size - 5141
Reel used - 15 times

                        RECOVERABLE          BLOCKS         NUMBER
SAVE NUMBER               ERRORS            OF TAPE       OF FILES
-------------------------------------------------------------------
    1                       2                 300           435
Remark : Inactive file
    2                      10                 900           892
Remark :

Total for reel             12                1200          1327

********** End of reel 5 **********
********** End of tape ARCH1 **********
********** End of LIST_TAPE **********

OK,
```

Example Listing of Reel Statistics
Figure 25-3

Sending the Listing to a File

The LIST_TAPE default command displays the listing on your terminal screen. However, the -OUTPUT pathname option enables you to file the listing instead. The pathname identifies the file that is to hold the listing. If this file already exists, LIST_TAPE appends the listing to the end of the file.

For example, the command

```
OK, LIST_TAPE -MT 0 -VOLID TEST_FILES -OUTPUT IAN>TESTS
```

writes the listing of the ARCHIVE volume TEST_FILES to file IAN>TESTS. This example assumes that you have access rights to directory IAN and file TESTS.

Suppressing Command Queries

The -NO_QUERY option suppresses any command prompts that assumes a user response. If you specify this option, and a situation arises in which user action is required, the command aborts. The command default is to list the contents of the mounted reel, and to ask whether you want to list another reel. When you specify -NO_QUERY, LIST_TAPE lists the contents of the mounted reel, and exits.

26
Error Recovery

INTRODUCTION

This chapter describes the error-management facilities that the BRMS utilities provide, and explains how you can use these utilities to recover from errors.

The following paragraphs summarize the chapter contents.

RECOVERABLE ERRORS describes how the BRMS utilities handle error recovery. It includes an explanation of how you can temporarily exit from, and reenter, the BRMS utilities.

UNRECOVERABLE ERRORS describes the type of error from which the BRMS utilities are unable to recover.

ROAM ERRORS describes how the BRMS utilities handle a ROAM file read or write error.

RECOVERABLE ERRORS

There are three categories of recoverable error

- Events that do not require any user action, and that occur with sufficient regularity to justify only a warning to the user
- Events that do not require any user action, but are unusual enough for BRMS to offer the user help and the opportunity to abort the command
- Events that require user action to effect a recovery

The BRMS utilities attempt, whenever possible, to recover from an error without the help of any user action. To do this, they use a technique of checkpointing. At the beginning of every new save, and after every 100 blocks on a tape, the BRMS save command writes a marker called a checkpoint. If an unrecoverable write error occurs, the BRMS command uses the checkpoint to attempt a recovery.

Warnings of Recoverable Errors

Some events, such as a recoverable write error warrant only a warning to the user. The warning includes an error number. If you wish to obtain more information about the error, use the command's -HELP ERROR option.

Events Not Requiring User Action

When a recoverable error is too significant for just a warning, but does not require any user action for recovery, you receive an error message and are asked whether you require further help. If you answer yes, you receive a block of explanatory text about the error. For example, if you attempt to list a catalog that does not exist, you receive the message shown in Figure 26-1. In this example, the user answers yes to the offer of help. Note that if the command line had included the -NO_QUERY option, help would not have been offered.

Events Requiring User Action

Events sometimes occur from which BRMS is unable to recover until the user has taken action, such as mounting a new reel, or assigning a tape drive. When such a condition arises, the command prompts you to take the appropriate action. If necessary, you can temporarily exit from the command, and reenter the command after you have completed the recovery operation.

```
OK, LIST_CATALOG -VOLID ALPHA

[LIST_CATALOG Rev. 20.2 ..... ]
=========================================
for user ROBERT on Tuesday 16th June 1987
=========================================

User input "-VOLID ALPHA"

**** Processing catalog : ALPHA ****
Error 7007:
Unable to open catalog ALPHA: Not found. (LIST_CATALOG)
Do you want help ? yes

      Error 7007
      ----------
      Unable to open catalog <name> : <reason>
      ----------------------------------------

      The command  has  located the catalog <name> but is unable
      to open it;  the reason is supplied by PRIMOS.  If you are
      using the  command  to  list  more than one catalog,  this
      catalog will be ignored and the command will continue with
      the next;  otherwise the command will abort.

      When this  condition  occurs  check that the catalog which
      failed is not corrupt, further to this contact your System
      Administrator.

********** End of catalog ALPHA **********
********** End of LIST_CATALOG **********

OK,
```

Error That Does Not Require User Action
Figure 26-1

If, during a write to tape, the end of the reel is reached, or the command makes the maximum 20 write attempts without success, the command

1. Backtracks to the last checkpoint
2. Places an end-of-reel marker
3. Requests a new reel

Commands also request another reel when they are unable to write an end-of-reel marker because of an unrecoverable error on that reel. When you have mounted a new reel, any information lost on the first reel is automatically written to the new reel.

Another example of how BRMS prompts for a new reel is where a save operation spans more than one reel. In this instance the BRMS command pauses at the end of the first reel and asks you to mount a new reel:

```
End of reel has occurred, mount new reel.
Enter new tape unit or PAUSE:
```

If you wish to use the same drive unit as for the first reel, you simply mount the new reel on that drive, and enter the drive number in response to the above prompt. You may, however, want to save to a reel on a drive that you have not yet assigned to yourself. In that case you have to temporarily exit from the save operation, invoke the PRIMOS ASSIGN command, and reenter the save operation. The following section describes how to do this.

How to Exit and Reenter BRMS Commands: This subsection explains how you can temporarily exit from, and reenter, a BRMS command.

To exit, type either pause or pa when you are prompted to pause. You can then perform any recovery operations. When these operations are complete, reenter the BRMS command by typing either ren or s.

The following example shows the dialog that occurs when a save command has reached the end of the first reel, and you want to continue the save on another tape drive (MT1 in this example) that is not yet assigned to you. You exit, assign MT1, reenter the save, and give the new drive number.

```
End of reel has occurred, mount new reel.
Enter new tape unit or PAUSE : pa
Type "START" or "REN" to continue, or "RLS" to abort.
OK, ASSIGN MT1
Device MT1 assigned.
OK, ren
Re-entering Get_unit.
Enter new tape unit or PAUSE : 1
```

UNRECOVERABLE ERRORS

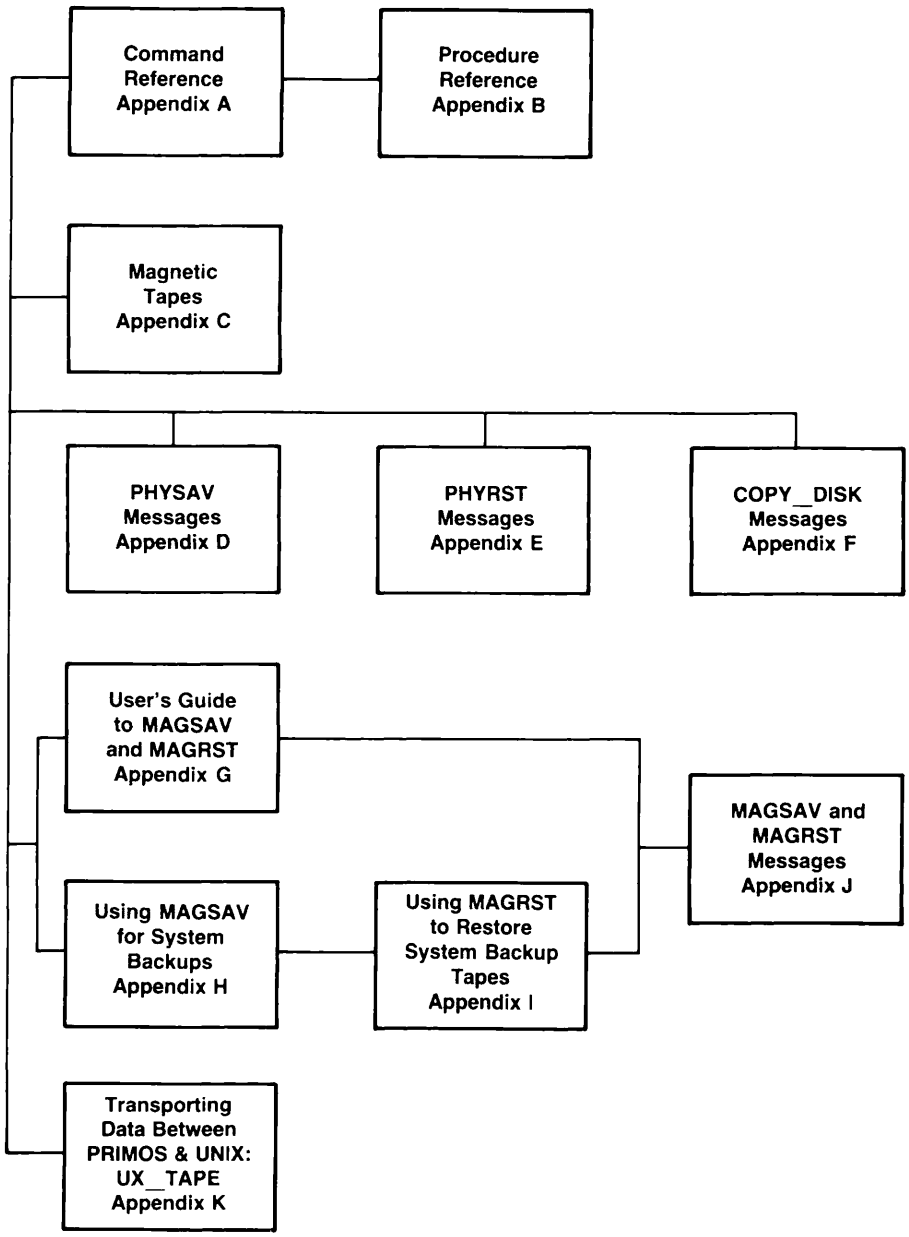
Sometimes a command is unable to recover an error. For example, if a tape is damaged, it might not be possible to read some of the records. The command makes a maximum of 20 attempts to read the damaged data, and if these attempts fail, it aborts.

Errors that result from physical damage to a tape cannot be corrected. However, if the error is caused by a piece of tape oxide stuck on either the tape or read/write head, you might be able to recover from the error by cleaning the tape or head.

ROAM ERRORS

If an error occurs when you attempt to read or write ROAM files, the BRMS command displays an error message generated by ROAM. The command itself takes no action to recover from the error, but carries on and ignores the ROAM file.

APPENDICES


Command Reference Appendix A
Procedure Reference Appendix B
Magnetic Tapes Appendix C
PHYSAV Messages Appendix D
PHYRST Messages Appendix E
COPY_DISK Messages Appendix F
User's Guide to MAGSAV and MAGRST Appendix G
MAGSAV and MAGRST Messages Appendix J
Using MAGSAV for System Backups Appendix H
Using MAGRST to Restore System Backup Tapes Appendix I
Transporting Data Between PRIMOS & UNIX: UX_TAPE Appendix K

A

Command Reference

INTRODUCTION

This appendix summarizes the backup and recovery commands, in alphabetical order. It is an aide-memoire for experienced users and does not provide a detailed description of every argument and option: before you use this appendix, you should already be conversant with the backup and recovery commands and with the associated procedures. For a detailed explanation of a command's arguments and options, and of the procedures, refer to the appropriate chapter in this book.

▶ ARCHIVE

Archives files and directories from disk to tape. See also Chapter 5, ARCHIVING DATA: ARCHIVE.

ARCHIVE pathname -MT n -VOLID volume-name [options]

Argument	Description
pathname	Identifies the location of the objects on disk that you wish to archive.
-MT n	Specifies the unit number n of the drive on which the reel is mounted.
-VOLID volume-name	Identifies the name of the volume.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Writes to tape those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Writes to tape those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Writes to tape those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.
{ -BACKEDUP_BEFORE [date] / -BKB }	Writes to tape those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

-CAM_TO_DAM -CTD	Writes to tape as DAM files, any CAM files among the selected objects.
-CATALOG_PATHNAME pathname -CAPA	Specifies the pathname of the ARCHIVE catalog directory, if it is other than the tape owner's origin-directory>CATS*.
-COMPATIBLE_VERSION [rev] -CVN	Specifies that data is to be written to tape in rev format, where rev identifies a revision of PRIMOS. The format of rev is nn or nn.n; for example 19.4. Used in a post-Rev.19 system to save data to a Rev.19 tape. rev defaults to Rev.19.
-CREATED_AFTER [date] -CRA	Writes to tape those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
-CREATED_BEFORE [date] -CRB	Writes to tape those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-DELETE -DL	Deletes file system objects from disk after you have saved them to tape.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INDEX [pathname]	Creates an index of all the objects that are written to tape.

{ -INDEX_LEVELS [n] | -IXL }

Specifies the number n of levels of a directory structure that you want to include in the index, and displays the index on your screen. The default value for n is 99. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen.

{ -LEVELS n | -LV }

Specifies the number of levels of the directory structure that you want to archive. The command default is to save all levels.

{ -MODIFIED_AFTER [date] | -MDA | -AFTER }

Writes to tape those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.

{ -MODIFIED_BEFORE [date] | -MDB | -BEFORE }

Writes to tape those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.

{ -NO_QUERY | -NQ }

Suppresses command prompts when the user's response can be assumed: is used for unattended operation.

{ -OWNER user-id | -OWN }

Identifies the owner of an ARCHIVE tape: user-id is the tape owner's user id. If -OWNER is not specified, ARCHIVE assumes that you are the tape owner.

-REMARK [character string]

Lets you add a comment to your tape and catalog each time that you archive data. If spaces are included, you must enclose the entire character string in single quotation marks.

{ -TTY | -T }

If you run ARCHIVE from either a CPL program or a command input file, this option enables you to specify the tape drive number from your terminal at the end of each reel.

-VALIDATE -VAL	Checks the objects that you save against the original objects on disk, and informs you of any discrepancies as the save proceeds. -VALIDATE is not a valid option if you archive to a 60Mb cartridge tape.
-VERIFY -VFY	Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to save every object that matches the pathname.

ARCHIVE_RELEASE

Releases an ARCHIVE tape. See also Chapter 22, RELEASING TAPES.

```
ARCHIVE_RELEASE -VOLID volume-name [options]
```

Argument	Description
-VOLID volume-name	Specifies the volume name of the reel to be released.

Option	Description
{-CATALOG_PATHNAME pathname -CAPA}	Specifies the location of your ARCHIVE catalog directory if it is other than your origin-directory>CATS*.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-MT n	Specifies the unit number of the tape drive that you wish to use.
{-NO_QUERY -NQ}	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
{-OWNER user-id -OWN}	Identifies the tape's owner: user-id is the owner's user id. If -OWNER is not specified, the command assumes that you are the tape owner.
-REEL n	Specifies which reel of a volume you want to release: n can be in the range 0-255. If you do not specify a reel, the command assumes that you want to release reel 1. Specify -REEL 0 to release a multireel tape.

▶ ARCHIVE_RESTORE

Restores files and directories saved to tape by the ARCHIVE command. See also Chapter 6, RESTORING ARCHIVED DATA: ARCHIVE_RESTORE.

```
ARCHIVE_RESTORE pathname [new-pathname] -MT n [options]
```

Argument	Description
pathname	Identifies the objects on tape that you wish to restore.
new-pathname	Identifies the pathname of the objects when restored to disk. If you do not give a new pathname, the object being restored is copied into your current attach point, and has the same name as on tape.
-MT n	Specifies the unit number n of the drive on which the reel is mounted.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Restores those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Restores those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Restores those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

{ -BACKEDUP_BEFORE [date] }
{ -BKB }

Restores those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

{ -CAM_RBF } Restores any DAM RBF files as CAM files.
{ -CRBF }

{ -CATALOG_PATHNAME pathname }
{ -CAPA }

Specifies the pathname of the ARCHIVE_RESTORE catalog directory, if it is other than the tape owner's origin-directory>CATS*.

{ -COMBINE } Only restores objects that do not
{ -COMB } already exist on disk.

{ -CREATED_AFTER [date] }
{ -CRA }

Restores those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

{ -CREATED_BEFORE [date] }
{ -CRB }

Restores those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

{ -DAM_RBF } Restores any CAM RBF files as DAM files.
{ -DRBF }

{ -FROM_SAVE_NUMBER n } Starts the restore at save number n.
{ -FSN } Values for n are 1-255. The command default is to begin at the first save on the reel. This option is not valid when you restore from a 60Mb cartridge tape drive.

-HELP Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.

-INDEX [pathname]	Creates an index of all the objects that are restored to disk.
{ -INDEX_LEVELS [n] } { -IXL }	Specifies the number n of levels of a directory structure that you want to index, and displays the index on your screen. The default value for n is 99. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen.
{ -MODIFIED_AFTER [date] } { -MDA } { -AFTER }	Restores those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.
{ -MODIFIED_BEFORE [date] } { -MDB } { -BEFORE }	Restores those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.
{ -NO_QUERY } { -NQ }	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
{ -OWNER user-id } { -OWN }	Identifies the tape owner: user-id is the tape owner's user id. This option allows you to restore from another user's tape if you have access rights to the catalog. If -OWNER is not specified, ARCHIVE_RESTORE assumes that you are the tape owner.
-REEL n	Specifies the reel from which to restore objects. The command default is to restore all reels of a tape in sequence.
-REPLACE	Only restores those objects that already exist at the restore point: that is, the command overwrites existing objects.

{-TO_SAVE_NUMBER n / -TSN}

Ends the restore when save number n is reached, and does not restore from save n. Values for n are 1-255. The command default is to continue to the end of the tape volume. This option is not valid when you restore from a 60Mb cartridge tape drive.

{-TTY / -T}

If you run ARCHIVE_RESTORE from either a CPL program or a command input file, this option enables you to specify the tape drive identifier from your terminal at the end of each reel.

{-VERIFY / -VFY}

Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to restore the latest saves of every object that matches the pathname.

-VOLID volume-name1...volume-name10

Identifies the volumes from which to restore objects. You can specify a maximum of 10 volume names.

{-WRITTEN_AFTER [date] / -WRA}

Restores only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today.

{-WRITTEN_BEFORE [date] / -WRB}

Restores only those objects that were written to tape before date or, if date is not given, before 00:00 AM today.

▶ ASSIGN

Gives you control over a tape drive. See also Chapter 3, USER CONTROL OF TAPE DRIVES.

```
{ ASSIGN }     {     MTpdn          }     [options]
{ AS     }     { MTX   -ALIAS MTldn }
```

Argument	Description
MTpdn	Specifies the physical device number (pdn) of the tape drive you want to use, in the range 0-7 inclusive.
MTX	Assigns any available drive: must be accompanied by the -ALIAS MTldn option, which assigns a number (alias) to the drive for reference. The drive that is assigned depends on the other options that you specify on the command line.

Option	Description
-7TRK -9TRK	Indicates seven-track or nine-track tape drive; default is nine-track.
-ALIAS MTldn	Specifies the logical device number ldn of the tape drive you wish to use, in the range 0-7 inclusive.
-DENSITY n	Requests a tape density setting, and may require operator intervention. The value of n specifies the tape density in bpi (bits per inch). Valid values for n are 800, 1600, 3200, and 6250. If you do not specify -DENSITY, it defaults to 1600 bpi.
-MOUNT	Instructs the operator to mount a new tape reel on an already assigned tape drive. This option is usually accompanied by the -TPID option.
-RETENSION	This option should only be used with cartridge tape drives (Version 5 drives). It runs the tape fast-forward to the end of the tape, and then rewinds to the beginning of the tape.

-RINGOFF	Instructs the operator to remove the write ring from the tape, so that it can be read, but not written.
-RINGON	Instructs the operator to place the write ring on the tape, so that it can be both read and written.
-SPEED { 25 | 100 }	Selects speed for a streamer tape drive (in inches-per-second) running at 1600 bpi. The default is 25 ips.
-TPID id	Requests the operator to mount a particular reel of tape, identified by a tape id: the id can be a maximum of eight characters.
-WAIT	Indicates that you can wait until the requested drive is available.

▶ BACKUP

Used by the system operator to save files and directories to tape. See also Chapter 12, LOGICAL SAVE TO TAPE: BACKUP.

```
BACKUP  pathname  -MT n  -VOLID volume-name  [options]
```

Argument	Description
pathname	Identifies the location of the objects on disk that you wish to archive.
-MT n	Specifies the unit number n of the drive on which the reel is mounted.
-VOLID volume-name	Identifies the name of the volume.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Writes to tape those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Writes to tape those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Writes to tape those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.
{ -BACKEDUP_BEFORE [date] / -BKB }	Writes to tape those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

-CAM_TO_DAM -CTD	Causes any CAM files among the selected objects to be written to tape as DAM files.
-COMPATIBLE_VERSION [rev] -CVN	Specifies that data is to be written to tape in rev format, where rev identifies a revision of PRIMOS. The format of rev is nn or nn.n; for example 19.4. Used in a post-Rev.19 system to save data to a Rev.19 tape. rev defaults to Rev.19.
-CREATED_AFTER [date] -CRA	Writes to tape those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
-CREATED_BEFORE [date] -CRB	Writes to tape those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INCREMENTAL -INC	Saves only those objects that have been modified since the last backup. This option is required for an incremental backup.
-INDEX [pathname]	Creates an index of all the objects that are written to tape.
-INDEX_LEVELS [n] -IXL	Specifies the number n of levels that you want to include in the index, and displays the index on your screen. n defaults to 99. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen.
-LEVELS n -LV	Specifies the number of levels of the tree structure that you want to save. The command default is save all levels.

{-MODIFIED_AFTER [date] | -MDA | -AFTER}

Writes to tape those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.

{-MODIFIED_BEFORE [date] | -MDB | -BEFORE}

Writes to tape those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.

{-NO_CATALOG | -NOCAT}

Suppresses the generation of a new catalog.

{-NO_QUERY | -NQ}

Suppresses command prompts when the user's response can be assumed: is used for unattended operation.

-REMARK [character string]

Lets you add a comment to your tape and catalog each time that you backup data. If spaces are included, you must enclose the entire character string in single quotation marks.

{-TTY | -T}

If you run BACKUP from either a CPL program or a command input file, this option enables you to specify the tape drive number from your terminal at the end of each reel.

{-VALIDATE | -VAL}

Checks the objects that you save against the original objects on disk, and informs you of discrepancies as the save proceeds. -VALIDATE is not a valid option if you archive to a 60Mb cartridge tape.

-VERIFY

Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to save every object that matches the pathname.

▶ BACKUP_RELEASE

Releases a BACKUP tape. See also Chapter 22, RELEASING TAPES.

BACKUP_RELEASE -VOLID tapename [options]

Argument	Description
-VOLID volume-name	Specifies the volume name of the reel to be released.

Option	Description
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-MT n	Specifies the unit number of the tape drive on which the reel is mounted. This option is mandatory for all users except the System Administrator and the owner of the tape. If the command line does not specify -MT, BACKUP_RELEASE assumes that the reel is either lost or damaged, and cannot be mounted: in this case, the command only releases the reel entry from the catalog.
{ -NO_QUERY { -NQ	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
-REEL n	Specifies which reel of a volume you want to release: n can be in the range 0-255. If you do not specify a reel, the command assumes that you want to release reel 1. Specify -REEL 0 to release a multireel tape.

▶ BACKUP_RESTORE

Used by system operators to restore files and directories from BACKUP tapes. See also Chapter 13, RESTORING A BACKUP TAPE: BACKUP_RESTORE.

```
BACKUP_RESTORE pathname [new-pathname] -MT n [options]
```

Argument	Description
pathname	Identifies the objects on tape that you wish to restore.
new-pathname	Identifies the pathname of the objects when restored to disk. If you do not give a new pathname, the object being restored is copied into your current attach point, and has the same name as on tape.
-MT n	Specifies the unit number n of the drive on which the reel is mounted.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Restores those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Restores those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Restores those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

-BACKEDUP_BEFORE [date] -BKB	Restores those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.
-CAM_RBF -CRBF	Restores any DAM RBF files as CAM files.
-COMBINE -COMB	Only restores objects that do not already exist on disk.
-CREATED_AFTER [date] -CRA	Restores those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
-CREATED_BEFORE [date] -CRB	Restores those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-DAM_RBF -DRBF	Restores any CAM RBF files as DAM files.
-FROM_SAVE_NUMBER n -FSN	Starts the restore at save number n. Values for n are 1-255. The command default is to begin at the first save on the reel. This option is not valid when you restore from a 60Mb cartridge tape drive.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INDEX [pathname]	Creates an index of all the objects that are restored to disk.
-INDEX_LEVELS [n] -IXL	Specifies the number n of levels of a directory structure that you want to index, and displays the index on your screen. n defaults to 99. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen.

{ -MODIFIED_AFTER [date] -MDA -AFTER }	Restores those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.
{ -MODIFIED_BEFORE [date] -MDB -BEFORE }	Restores those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.
{ -NO_QUERY -NQ }	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
-RECOVER	Used to recover data from an incremental backup, typically after you have lost a disk. This option overrides all options except -VOLID, -INDEX, and -INDEX_LEVELS. It is not used to restore a single file.
-REEL n	Specifies the reel from which to restore objects. n defaults to 1, and the command default is to restore all reels of a volume in sequence.
-REPLACE	Only restores those objects that already exist on disk.
{ -TO_SAVE_NUMBER n -TSN }	Ends the restore when save number n is reached, without restoring from save n. Values for n are 1-255. The command default is to continue to the end of the tape volume. This option is not valid when you restore from a 60Mb cartridge tape drive.
{ -TTY -T }	If you run BACKUP_RESTORE from either a CPL program or a command input file, this option enables you to specify the tape drive identifier from your terminal at the end of each reel.

{ -VERIFY | -VFY }

Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to restore the latest save of every object that matches the pathname.

-VOLID volume-name1...volume-name10

Identifies the volumes from which objects are to be restored. You can specify a maximum of 10 volume names.

{ -WRITTEN_AFTER [date] | -WRA }

Restores only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today.

{ -WRITTEN_BEFORE [date] | -WRB }

Restores only those objects that were written to tape before date or, if date is not given, before 00:00 AM today.

▶ BOOT_CREATE

Creates a system boot tape. See also Chapter 18, CREATING A SYSTEM BOOT TAPE.

BOOT_CREATE [pathname] [options]

Argument	Description
pathname	Specifies the pathname of the list file. If you have created the list file in a password-protected directory and you want to use the -NO_QUERY option, you must include the password in the pathname: enclose list filename in single quotes, write it in upper case, and separate the password from the directory name by one space.

Options	Description
{-HELP / -H}	Displays a help text that shows you the calling sequence of BOOT_CREATE and explains the options available.
-MT [n]	This option suppresses the prompt for the magnetic tape drive. If you omit n, the default is Drive 0.
{-NO_QUERY / -NQ}	Suppresses any prompt for the list file password.

▶ COPY

Creates online copies of files and directories. See also Chapter 17, LOGICAL COPY BETWEEN DISKS: COPY.

COPY source-pathname [target-pathname] [options]

Argument	Description
source-pathname	Specifies the pathname of the object that you want to copy.
target-pathname	Specifies the pathname to be given to the object when copied.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Copies only those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Copies only those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -COPY_ALL / -CA }	Copies all the attributes of the source object.
{ -CREATED_AFTER [date] / -CRA }	Copies only those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
{ -CREATED_BEFORE [date] / -CRB }	Copies only those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

-DAM	Copies SAM files as DAM files.
-DELETE -DL	Deletes the source object after it has been copied.
-DTM	Copies the source object DTM to the target object.
-FORCE	Forces the deletion of delete-protected objects.
-HELP	Displays Help text about the command.
-INCREMENTAL -INC	Copies only objects that have not been backed up. If you copy a directory, all its entries are automatically copied.
-LEVELS n -LV	Copies a directory tree down to the level indicated by n.
-MERGE	Merges the source object with the target object.
-MODIFIED_AFTER [date] -MDA -AFTER	Copies only those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.
-MODIFIED_BEFORE [date] -MDB -BEFORE	Copies only those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.
-NO_CHECK	Disables the check by COPY that source and target objects are the same object.
-NO_CMLV	Prevents COPY from invoking a new command level when a disk full or maximum quota exceeded condition occurs. COPY aborts.
-NO_QUERY -NQ	COPY does not query you: assumes the user response, or aborts.
-PROTECT -PRO	Copies the source object's protection attributes to the target object.

-QUERY -Q	COPY queries you to resolve situations that arise during the copy.
-QUOTA	Sets the maximum quota of a copied directory and its subdirectories to be the same as the source object.
-REPLACE	Deletes an object named target-pathname from the target directory, and copies the source object to the target directory under the name target-pathname.
-REPORT -RPT	Reports a successful copy operation.
-RWLOCK -RWL	Sets the concurrency lock setting of the target object the same as that of the source object.
-SAM	Copies SAM files as DAM files.
-SAVE_UFD -SUFD	Used in conjunction with the -INC option. Tells COPY to always copy directories, regardless of whether they have been modified.

▶ COPY_DISK

Copies physical disk partitions to other physical disk partitions. See also Chapter 16, PHYSICAL COPY BETWEEN DISKS: COPY_DISK.

COPY_DISK [options]

Option	Description
-DO_VERIFY	Enables COPY_DISK verification of the copy.
-NO_BADS	Turns off badspot handling by COPY_DISK: use this option with care (see Chapter 16, PHYSICAL COPY BETWEEN DISKS).
-NO_RAT	Instructs COPY_DISK not to refer to the Record Availability table: COPY_DISK copies all tracks on the selected partitions.
-TTY	All prompts issued by COPY_DISK that require a yes or no answer take their answer from the terminal, even if other COPY_DISK input comes from a CPL program or a command input file.

▶ GENERATE_CATALOG

Regenerates a damaged ARCHIVE or BACKUP catalog, or validates a catalog against its associated tape. See also Chapter 23, REGENERATING AND VALIDATING CATALOGS: GENERATE_CATALOG.

```
GENERATE_CATALOG -MT n [options]
```

Argument	Description
-MT n	Identifies the unit number of the tape drive on which the reel is mounted.

Option	Description
{ -CATALOG_PATHNAME pathname -CAPA }	Gives the location of the ARCHIVE catalog directory if other than the default location.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
{ -NO_QUERY -NQ }	Used for unattended operation. Terminates the command after it has generated or validated the catalog for a reel: the default is for the command to request a new reel.
{ -OWNER user-id -OWN }	Identifies the ARCHIVE catalog's owner: user-id is the owner's user-id. If -OWNER is not specified, GENERATE_CATALOG assumes that you are the owner.
-REEL n	Selects reel number n of the tape catalog to be regenerated or validated. Values for n are 1 through 255. The command aborts unless the mounted reel is reel n. If this option is not used, the command assumes that the reel number is reel 1.
{ -VALIDATE -VAL }	Validates the catalog entry for a reel by comparing it with the existing reel. -VALIDATE is not a valid option if you use a 60Mb cartridge tape drive.

-VOLID volume-name	Identifies the catalog to be regenerated or validated. If this option is not given, GENERATE_CATALOG regenerates or validates any mounted reel.

▶ LIST_CATALOG

Lists the information contained in either an ARCHIVE or BACKUP catalog. See also Chapter 24, LISTING A CATALOG: LIST_CATALOG.

```
LIST_CATALOG [pathname] [options]
```

Argument	Description
pathname	Identifies the objects to be listed. If you do not specify a pathname, LIST_CATALOG lists all the file system objects saved in the catalogs.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Lists only those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Lists only those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Lists only those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.
{ -BACKEDUP_BEFORE [date] / -BKB }	Lists only those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.
-BACKUP	Lists BACKUP catalogs. The default is to list a user's ARCHIVE catalogs.

-CATALOG_PATHNAME pathname -CAPA	Use only with ARCHIVE catalogs. Specifies the location of the catalog directory, if it is other than the tape owner's origin-directory>CATS*. Not valid with -BACKUP.
-CREATED_AFTER [date] -CRA	Lists only those objects that were created up on or after the specified date or, if date is not given, after 00:00 AM today.
-CREATED_BEFORE [date] -CRB	Lists only those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-DETAIL -DET	Lists all the information held for each object in a reel.
-DTA	Displays the date and time each object was last accessed.
-DTB	Displays the date and time each object was last backed up (to a BACKUP tape).
-DTC	Displays the date and time each object was created.
-DTM	Displays the date and time each object was last modified.
-DTW	Displays the date and time each object was written to this tape.
-FROM_SAVE_NUMBER n -FSN	Lists the catalog from save number n. Values for n are 1-255. The command default is to list from the first save on a reel.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.

-LATEST	Displays information about only the most recent save of the file system object. The default is to display information about each save of the selected object(s).
-MODIFIED_AFTER [date] -MDA -AFTER	Lists only those objects in the catalog that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.
-MODIFIED_BEFORE [date] -MDB -BEFORE	Lists only those objects in the catalog that have been modified before the specified date or, if date is not given, before 00:00 AM today.
-NO_QUERY -NQ	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
-NO_SORT -NSORT	Displays the objects in the order they appear in the catalog. The default is to display the objects in alphabetical order.
-NO_WAIT -NW	Suppresses the paging of the display, so that the listing does not pause every 20 lines: there is no "--More--" prompt.
-OUTPUT pathname -OUT	Directs the listing to the file specified by pathname. The default is to display the listing on your terminal screen.
-OWNER user-id -OWN	Identifies the owner of an ARCHIVE tape: user-id is the tape owner's user id. The -OWNER option is not valid for a BACKUP tape. If -OWNER is not specified, LIST_CATALOG assumes that you are the tape owner.
-REEL n	Selects the catalog reel number n to be listed. Values for n are 1-255. The default lists all the reels in a catalog.

-SIZE
Displays the size of each object saved.

{-TAPE_INFORMATION / -TI}
Lists statistics for each reel.

{-TO_SAVE_NUMBER n / -TSN}
Ends the listing when save number n is reached, without listing save n. Values for n are 1-255. The default is to continue to the end of the catalog.

-VOLID volume-name1...volume-name10
Identifies the volumes to be listed. You can specify a maximum of 10 names. The command default is to list all the catalogs.

{-WRITTEN_AFTER [date] / -WRA}
Lists only those objects that were written to the catalog on or after date or, if date is not given, after 00:00 AM today.

{-WRITTEN_BEFORE [date] / -WRB}
Lists only those objects that were written to the catalog before date or, if date is not given, before 00:00 AM today.

▶ LIST_TAPE

Lists the contents of an ARCHIVE, TRANSPORT, or BACKUP tape. See also Chapter 25, LISTING A TAPE: LIST_TAPE.

LIST_TAPE [pathname] -MT n [options]

Argument	Description
pathname	Identifies the objects to be listed. LIST_TAPE lists the tapes and reel numbers that have the specified object(s). If you do not specify a pathname, LIST_TAPE lists all the file system objects saved on the tape.
-MT n	Identifies the unit number of the tape drive on which the reel is mounted.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Lists only those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Lists only those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Lists only those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.
{ -BACKEDUP_BEFORE [date] / -BKB }	Lists only those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

-CREATED_AFTER [date] -CRA	Lists only those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
-CREATED_BEFORE [date] -CRB	Lists only those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-DETAIL -DET	Lists all the information held for each object in a reel. If -DETAIL is not specified, LIST_TAPE lists only the pathnames of the objects.
-DTA	Displays the date and time each object was last accessed.
-DTB	Displays the date and time each object was last backed up (to a BACKUP tape).
-DTC	Displays the date and time each object was last created.
-DTM	Displays the date and time each object was last modified.
-DTW	Displays the date and time each object was written to this tape.
-FROM_SAVE_NUMBER n -FSN	Starts listing the tape at save number n. Values for n are 1-255. The command default is to begin at the first save on a reel. This option is not valid when you use a 60Mb cartridge tape drive.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.

-MODIFIED_AFTER [date] -MDA -AFTER	Lists only those objects in the catalog that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.
-MODIFIED_BEFORE [date] -MDB -BEFORE	Lists only those objects in the catalog that have been modified before the specified date or, if date is not given, before 00:00 AM today.
-NO_QUERY -NQ	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
-NO_WAIT -NW	Suppresses the paging of the display, so that the listing does not pause every 20 lines: there is no "--More--" prompt.
-OUTPUT pathname -OUT	Directs the listing to the file specified by pathname. The default is to display the listing on your terminal screen.
-REEL	Selects the reel number n to be listed. Values for n are 1-255. The default lists the contents of any mounted reel.
-SIZE	Displays the size of each object saved.
-TAPE_INFORMATION -TI	Lists statistics for each reel.
-TO_SAVE_NUMBER n -TSN	Ends the listing when save number n is reached, without listing save n. Values for n are 1-255. The default is to continue to the end of the tape volume. This option is not valid when you use a 60MB cartridge tape drive.
-VOLID volume-name	Specifies the volume to be listed. The command default is to list the mounted tape.

{ -WRITTEN_AFTER [date] }
{ -WRA }

Lists only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today.

{ -WRITTEN_BEFORE [date] }
{ -WRB }

Lists only those objects that were written to the tape before date or, if date is not given, before 00:00 AM today.

▶ PHYRST

Restores physical partitions from a PHYSAV tape. See also Chapter 15, RESTORING A PHYSAV TAPE: PHYRST.

PHYRST [options]

Option	Description
-NO_BADS	Disables badspot handling by PHYRST, and causes PHYRST to ignore any badspots on the output disk: use this option with care.
-SPEED { 25 | 100 }	Used only when writing to a streamer tape drive: specifies the tape speed.
-TTY	Causes PHYRST to ask for the tape drive unit number at the terminal when you run PHYRST from a CPL program or a command input file.
-UNMOD	Prevents system hangs caused by incorrect recovery from DMX overruns.

▶ PHYSAV

Saves physical disk partitions to tape. See also Chapter 14, PHYSICAL SAVE TO TAPE: PHYSAV.

PHYSAV [options]

Option	Description
-COMDEV	Physically saves the command device. No operator intervention is required.
-SPEED { 25 | 100 }	Used only when writing to a streamer tape drive: specifies the tape speed.
-TTY	Causes PHYSAV to ask for the tape drive unit number at the terminal when you run PHYSAV from a CPL program or a command input file.
-UNMOD	Prevents system hangs caused by incorrect recovery from DMX overruns.

▶ TRANSPORT

Saves files and directories to tape, in a format that makes it easy for any user to restore them. See also Chapter 7, TRANSPORTING DATA: TRANSPORT.

```
TRANSPORT  pathname  -MT n  [options]
```

Argument	Description
pathname	Identifies the location of the objects on disk that you wish to transport.
-MT n	Specifies the unit number n of the drive on which the reel is mounted.

Option	Description
{ -ACCESSED_AFTER [date] / -ACA }	Writes to tape those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] / -ACB }	Writes to tape those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] / -BKA }	Writes to tape those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.
{ -BACKEDUP_BEFORE [date] / -BKB }	Writes to tape those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.

{ -CAM_TO_DAM | -CTD }

Causes any CAM files among the selected objects to be written to tape as DAM files.

{ -COMPATIBLE_VERSION [rev] | -CVN }

Specifies that data is to be written to tape in rev format, where rev identifies a revision of PRIMOS. The format of rev is nn or nn.n; for example 19.4. Used in a post-Rev.19 system to save data to a Rev.19 tape. rev defaults to Rev.19.

{ -CREATED_AFTER [date] | -CRA }

Writes to tape those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.

{ -CREATED_BEFORE [date] | -CRB }

Writes to tape those objects that were created before the specified date or, if date is not given, before 00:00 AM today.

-HELP

Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.

-INDEX [pathname]

Creates an index of all the objects that are written to tape.

{ -INDEX_LEVELS [n] | -IXL }

Specifies the number n of levels of a directory structure that you want to include in the index, and displays the index on your screen. The default value for n is 99. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen.

{ -LEVELS n | -LV }

Specifies the number of levels of the directory structure that you want to transport. The command default is to save all levels.

{ -MODIFIED_AFTER [date] | -MDA | -AFTER }

Writes to tape those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.

{ -MODIFIED_BEFORE [date] | -MDB | -BEFORE }

Writes to tape those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.

{ -NO_QUERY | -NQ }

Suppresses command prompts when the user's response can be assumed: is used for unattended operation.

-REMARK [character string]

Lets you add a comment to your current reel each time that you transport data. If spaces are included, you must enclose the entire character string in single quotation marks.

{ -SAVE_PROTECTION | -SAVEP }

Saves security protection information to tape. The command default is to write file system objects to tape without saving access categories, ACLs, or passwords.

{ -TTY | -T }

If you run TRANSPORT from either a CPL program or a command input file, this option enables you to specify the tape drive identifier from your terminal at the end of each reel.

{ -VALIDATE | -VAL }

Checks the objects that you save against the original objects on disk, and informs you of any discrepancies as the save proceeds. -VALIDATE is not a valid option if you archive to a 60Mb cartridge tape.

{ -VERIFY | -VFY }

Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument. The command default is to save every object that matches the pathname.

-VOLID volume-name	Identifies the volume to which you are going to save objects.

▶ TRANSPORT_RELEASE

Releases a TRANSPORT tape. See also Chapter 22, RELEASING TAPES.

```
TRANSPORT_RELEASE -MT n [options]
```

Argument	Description
-MT n	Identifies the unit number of the tape drive on which the reel is mounted.

Option	Description
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
{ -NO_QUERY -NQ }	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
-REEL n	Specifies which reel of a volume you want to release: n can be in the range 0-255. If you do not specify a reel, the command assumes that you want to release reel 1. Specify -REEL 0 to release a multireel tape.
-VOLID volume-name	Specifies the volume name of the reel to be released. If you do not give a volume name, the command releases the reel mounted on the specified MT unit.

▶ TRANSPORT_RESTORE

Restores files and directories from a TRANSPORT tape. See also Chapter 8, RESTORING A TRANSPORT TAPE: TRANSPORT_RESTORE.

```
TRANSPORT_RESTORE pathname [new-pathname] -MT n [options]
```

Argument	Description
pathname	Identifies the objects on tape that you wish to restore.
new-pathname	Identifies the pathname of the objects when restored to disk. If you do not give a new pathname, the object restored is copied into your current attach point, and has the same name as on tape.
-MT n	Specifies the unit number n of the drive on which the reel is mounted.

Option	Description
{ -ACCESSED_AFTER [date] -ACA }	Restores those objects that were last accessed on or after the specified date or, if date is not given, after 00:00 AM today.
{ -ACCESSED_BEFORE [date] -ACB }	Restores those objects that were last accessed before the specified date or, if date is not given, before 00:00 AM today.
{ -BACKEDUP_AFTER [date] -BKA }	Restores those objects that were last backed up on or after the specified date or, if date is not given, after 00:00 AM today.

-BACKEDUP_BEFORE [date] -BKB	Restores those objects that were last backed up before the specified date or, if date is not given, before 00:00 AM today.
-COMBINE -COMB	Only restores objects that do not already exist on disk.
-CREATED_AFTER [date] -CRA	Restores those objects that were created on or after the specified date or, if date is not given, after 00:00 AM today.
-CREATED_BEFORE [date] -CRB	Restores those objects that were created before the specified date or, if date is not given, before 00:00 AM today.
-FROM_SAVE_NUMBER n -FSN	Starts the restore at save number n. Values for n are 1-255. The command default is to begin at the first save on the reel. This option is not valid when you restore from a 60Mb cartridge tape drive.
-HELP	Lists the command's syntax, arguments and options. For details of the Help facilities, refer to Chapter 21, BRMS HELP.
-INDEX [pathname]	Creates an index of all the objects that are restored to disk.
-INDEX_LEVELS [n] -IXL	Specifies the number n of levels of a directory structure that you want to index, and displays the index on your screen. The default value for n is 99. You can use this option with -INDEX pathname, in which case the index is filed in pathname, and is not displayed on your screen.

{ -MODIFIED_AFTER [date] -MDA -AFTER }	Restores those objects that have been modified on or after the specified date or, if date is not given, after 00:00 AM today.
{ -MODIFIED_BEFORE [date] -MDB -BEFORE }	Restores those objects that have been modified before the specified date or, if date is not given, before 00:00 AM today.
{ -NO_QUERY -NQ }	Suppresses command prompts when the user's response can be assumed: is used for unattended operation.
-REEL n	Specifies the reel from which to restore objects. Default value for n is 1, and the command default is to restore all reels of a tape in sequence.
-REPLACE	Only restores those objects that already exist on disk.
{ -TO_SAVE_NUMBER n -TSN }	Ends the restore when save number n is reached, and does not restore from save n. Values for n are 1-255. The command default is to continue to the end of the tape volume. This option is not valid when you restore from a 60Mb cartridge drive.
{ -TTY -T }	If you run TRANSPORT_RESTORE from either a CPL program or a command input file, this option enable you to specify the tape drive identifier from your terminal at the end of each reel.
{ -VERIFY -VFY }	Allows you to confirm the selection of specific objects when you use wildcards in the pathname argument.
-VOLID volume-name	Identifies the tape volume from which objects are to be restored.

{ -WRITTEN_AFTER [date] }
{ -WRA }

Restores only those objects that were written to the tape on or after date or, if date is not given, after 00:00 AM today.

{ -WRITTEN_BEFORE [date] }
{ -WRB }

Restores only those objects that were written to tape before date or, if date is not given, before 00:00 AM today.

▶ UNASSIGN

Unassigns control of a tape drive. See also Chapter 3, USER CONTROL OF TAPE DRIVES.

```
{ UNASSIGN }     { MTpdn          }   [-UNLOAD]
{ UN       }     { -ALIAS MTldn   }
```

Argument	Description
MTpdn	Specifies the physical device number pdn of the tape drive you want to use, in the range 0-7 inclusive.

Option	Description
-ALIAS MTldn	Specifies the logical device number ldn of the tape drive you wish to use, in the range 0-7 inclusive.
-UNLOAD	Rewinds the tape onto your reel. Not available on all systems.

▶ UX_TAPE

Writes PRIMOS files to tape in a format that can be read on a UNIX system, and restores UNIX files from tape onto a Prime 50 Series system. See also Appendix K, TRANSPORTING DATA BETWEEN PRIMOS AND UNIX: UX_TAPE.

```
                                   { -LIST                   }
UX_TAPE source-pathname -MT n      { [ { -RESTORE } ]        }    [options]
                                   { [ { -SAVE    } ]        }
```

Argument	Description
source-pathname	Identifies the objects you want to save or restore. You can use wildcarding and iteration.
-MT n	Specifies the unit number n of the tape drive on which the reel is mounted. The drive must be online and assigned to you.

Option	Description
-APPEND	Save only: appends the files to the tape. The write must be in the same format (CPIO-readable or TAR-readable) as the files already on the tape.
-BLOCK_SIZE n	Save only: specifies the block size n in bytes. The default for n is 10K bytes. This option is an alternative to the -BLOCKING_FACTOR option. A block size of 512 bytes is equivalent to a blocking factor of 1. Do not use -BLOCK_SIZE and -BLOCKING_FACTOR on the same command line.
{ -BLOCKING_FACTOR n / -BF }	Save only: specifies the blocking factor n to use when writing. n is in the range 1-20, and the default value is 20. This option is an alternative to the -BLOCK_SIZE option. A blocking factor of 1 is equivalent to a block size of 512 bytes. Do not use -BLOCKING_FACTOR and -BLOCK_SIZE on the same command line.

-CPIO

Save: writes the tape in a format that the UNIX CPIO utility can read.

Restore: reads a tape written in CPIO format.

-LCASE

Save: UX_TAPE uses the default PRIMOS to UNIX filename translation rules. For example, PRIMOS pathname FILEA converts to UNIX pathname filea, and /F/I/L/E/A converts to FILEA.

Restore: UX_TAPE uses the default UNIX to PRIMOS filename translation rules. For example, UNIX pathname filea converts to PRIMOS pathname FILEA, and FILEA converts to /F/I/L/E/A.

-LIST

This is a mandatory option if you do not include the -SAVE or -RESTORE option on the command line. When you use -LIST on a command line that does not include either -SAVE or -RESTORE, -LIST lists at your terminal the contents of the tape, but does not restore them. If you use -LIST in conjunction with -SAVE or -RESTORE, the results are as follows:

Save: lists, at your terminal, the PRIMOS name of each file that is successfully saved to tape.

Restore: lists, at your terminal, the PRIMOS name of each file that is successfully restored from tape.

-NO_QUERY

Restore only: suppresses queries when a restored file has the same name as a file already in the current directory. The restored file automatically overwrites any file that has the same name.

-NO_REWIND

Save and restore: suppresses tape rewind after the save or restore has ended.

-NO_TRANSLATE

Save and restore: suppresses the text translation function. It is used when the data is in binary format.

-POS n	Save and restore: positions the tape n filemarks from the beginning of the tape, before the save or restore begins. This option is not valid for a 60Mb cartridge tape drive.
-RESTORE	Restore only: mandatory option to restore objects from tape. This option tells UX_TAPE to do a restore.
-SAVE	Save only: mandatory option to save objects to tape. This option tells UX_TAPE to do a save.
-SWAP	Save and restore: reverses the order of the bytes in each word. This option provides compatability with systems on which data words have the least significant byte first.
-TAR	Save: writes the tape in a format that the UNIX TAR utility can read. This is the command default for a save. Restore: reads a tape in TAR format. This is the command default for a restore.
-UPCASE	Save: all PRIMOS pathnames convert to uppercase UNIX pathnames. For example, PRIMOS pathnames FILEA and /F/I/L/E/A both convert to UNIX pathname FILEA. Restore: all UNIX pathnames convert to uppercase PRIMOS pathnames. For example, UNIX pathnames filea and FILEA both convert to PRIMOS pathname FILEA.

B

Procedure Reference

INTRODUCTION

This appendix summarizes the procedures to backup and restore data using the following utilities.

- BACKUP (Tables B-1, B-2 and B-3)
- BACKUP_RESTORE (Tables B-4 and B-5)
- PHYSAV and PHYRST (Table B-6)
- COPY_DISK (Tables B-7 and B-8)
- COPY (Tables B-9, B-10 and B-11)

The tables are aide-memoires for experienced operators, and you should already be fully conversant with the backup and recovery procedures before you use these tables.

Table B-1
BACKUP Procedure: Entire System Closed to Users

- Issue warning message
- Prevent new users logging in: MAXUSR 0
- Shut down subsystems
- Reminder warning message
- Force log out users: LOGOUT ALL
- Set priority access on backup partition:
  SPAC diskname user-id:ALL $REST:NONE

- If necessary set all access to BACKUP*:
  SPAC diskname user-id:ALL

- If desired: MAXUSR
  LOGIN user-id

  otherwise: MAXUSR 1

- ASSIGN MTn
- Mount reel
- Invoke BACKUP
- Dismount final reel
- UNASSIGN MTn

- If necessary remove priority access to BACKUP*:
  RPAC diskname

- RPAC diskname
- Start subsystems

- If necessary: MAXUSR

- Message to users

Table B-2
BACKUP Procedure: Only Partition Closed to Users

• Issue warning messages • SHUTDN pdev • ADDISK pdev; SPAC diskname user-id:ALL $REST:NONE
• If necessary set all access to BACKUP*: SPAC diskname user-id:ALL • If desired: LOGIN user-id • ASSIGN MTn • Mount reel • Invoke BACKUP • Dismount final reel • UNASSIGN MTn • If necessary remove priority access to BACKUP*: RPAC diskname
• RPAC diskname • Message to users

Table B-3
BACKUP Procedure:
System and Partition Kept in Service

- SPAC diskname user-id:ALL
- If necessary set all access to BACKUP*:
  SPAC diskname user-id:ALL
- If desired: LOGIN user-id
- ASSIGN MTn
- Mount reel
- Invoke BACKUP
- Dismount final reel
- UNASSIGN MTn
- If necessary remove priority access to BACKUP*:
  RPAC diskname
- RPAC diskname

Table B-4
BACKUP_RESTORE Procedure:
Entire System or Partition Closed to Users

<table>
<tr><th>CLOSING SYSTEM TO USERS</th><th>CLOSING PARTITION TO USERS</th></tr>
<tr><td>• Issue warning message
• Prevent new users logging in: MAXUSR 0
• Shut down subsystems
• Reminder warning message
• Force log out users: LOGOUT ALL
• SPAC diskname user-id:ALL $REST:NONE

• If desired: MAXUSR
LOGIN user-id</td><td>• Warning messages
• SHUTDN pdev
ADDISK pdev; SPAC diskname user-id:ALL $REST:NONE

• If desired:
LOGIN user-id</td></tr>
<tr><td colspan="2">• If necessary set all access to BACKUP*:
SPAC diskname user-id:ALL

• ASSIGN MTn
• Mount reel
• Invoke BACKUP_RESTORE
• Dismount final reel
• UNASSIGN MTn

• If necessary remove priority access to BACKUP*:
RPAC diskname

• RPAC diskname</td></tr>
<tr><td>• Start subsystems

• If necessary: MAXUSR

• Message to users</td><td>• Message to users</td></tr>
</table>

Table B-5
BACKUP_RESTORE Procedure:
System and Partition Kept in Service

- If necessary set all access to BACKUP*:
  SPAC diskname user-id:ALL
- SPAC diskname user-id:ALL
- If desired: LOGIN user-id
- ASSIGN MTn
- Mount reel
- Invoke BACKUP_RESTORE
- Dismount final reel
- UNASSIGN MTn
- RPAC diskname
- If necessary remove priority access to BACKUP*:
  RPAC diskname

Table B-6
PHYSAV and PHYRST Procedures

<table>
<tr><th>CLOSING SYSTEM TO USERS</th><th>CLOSING PARTITION TO USERS</th></tr>
<tr><td>• Issue warning message
• Prevent new users logging in: MAXUSR 0
• Shut down subsystems
• Reminder warning message
• Force log out users: LOGOUT ALL
• SHUTDN pdev
• DISKS pdev

• If desired: MAXUSR
LOGIN user-id</td><td>• Issue warning messages
• SHUTDN pdev
• DISKS pdev

• If desired: LOGIN user-id</td></tr>
<tr><td colspan="2">• ASSIGN DISK pdev
• ASSIGN MTn
• Mount reel
• Invoke PHYSAV or PHYRST
• Dismount last reel
• UNASSIGN MTn
• UNASSIGN DISK pdev
• DISKS NOT pdev
• ADDISK pdev</td></tr>
<tr><td>• Start subsystems

• If necessary: MAXUSR

• Message to users</td><td>• Message to users</td></tr>
</table>

Table B-7
COPY_DISK Procedure: Entire System Closed to Users

PARTITION TO BACKUP OR RESTORE	BACKUP DRIVE AND PARTITION
• Issue warning message • Prevent new users logging in: MAXUSR 0 • Shut down subsystems • Reminder warning message • Force log out users: LOGOUT ALL	
• SHUTDN pdev • DISKS pdev	• If necessary: SHUTDN pdev Remove pack from drive • Mount backup pack • DISKS pdev
• If desired: MAXUSR LOGIN user-id	
• ASSIGN DISK pdev	• ASSIGN DISK pdev
• Invoke COPY_DISK	
• UNASSIGN DISK pdev • DISKS NOT pdev • ADDISK pdev	• UNASSIGN DISK pdev • DISKS NOT pdev • Remove backup pack • If necessary: Mount normal pack on drive ADDISK pdev
• Start subsystems • If necessary: MAXUSR • Message to users	

Table B-8
COPY_DISK Procedure: Only Partitions Closed to Users

PARTITION TO BACKUP OR RESTORE	BACKUP DRIVE AND PARTITION
• Issue warning messages	
• SHUTDN pdev • DISKS pdev	• If necessary: SHUTDN pdev Remove pack from drive • Mount backup pack • DISKS pdev
• If desired: LOGIN user-id	
• ASSIGN DISK pdev	• ASSIGN DISK pdev
• Invoke COPY_DISK	
• UNASSIGN DISK pdev • DISKS NOT pdev • ADDISK pdev	• UNASSIGN DISK pdev • DISKS NOT pdev • Remove backup pack • If necessary: Mount normal pack on drive ADDISK pdev
• Message to users	

Table B-9
COPY Procedure: Entire System Closed to Users

PARTITION TO BACKUP OR RESTORE	BACKUP DRIVE AND PARTITION
• Issue warning message • Prevent new users logging in: MAXUSR 0 • Shut down subsystems • Reminder warning message • Force log out users: LOGOUT ALL	
• SPAC diskname user-id:ALL $REST:NONE	• If necessary: SHUTDN pdev Remove pack from drive • Mount backup pack • ADDISK pdev -RENAME diskname; SPAC diskname user-id:LUR $REST:NONE
• If desired: MAXUSR LOGIN user-id	
• Invoke COPY	
• RPAC diskname	• SHUTDN -RENAME diskname • Remove backup pack • If necessary: Mount normal pack on drive ADDISK pdev
• Start subsystems • If necessary: MAXUSR • Message to users	

Table B-10
COPY Procedure: Only Partitions Closed to Users

PARTITION TO BACKUP OR RESTORE	BACKUP DRIVE AND PARTITION
• Issue warning messages	
• SHUTDN pdev • ADDISK pdev; SPAC diskname user-id:ALL $REST:NONE	• If necessary: SHUTDN pdev Remove pack from drive • Mount backup pack • ADDISK pdev -RENAME diskname; SPAC diskname user-id:LUR $REST:NONE
• If desired: LOGIN user-id • Invoke COPY	
• RPAC diskname	• SHUTDN pdev -RENAME diskname • Remove backup pack • If necessary: Mount normal pack on drive ADDISK pdev
• Message to users	

Table B-11
COPY Procedure: Partitions Kept Open to Users

PARTITION TO BACKUP OR RESTORE	BACKUP DRIVE AND PARTITION
• SPAC diskname user-id:ALL	• If necessary: SHUTDN pdev Remove pack from drive • Mount backup pack • ADDISK pdev -RENAME diskname; SPAC diskname user-id:LUR
• If desired: LOGIN user-id • Invoke COPY	
• RPAC diskname	• SHUTDN pdev -RENAME diskname • Remove backup pack • If necessary: Mount normal pack on drive ADDISK pdev
• Message to user	

C
Magnetic Tapes

INTRODUCTION

This appendix explains briefly some of the concepts and terminology associated with magnetic tapes. It gives new users of the backup and recovery utilities a basic understanding of magnetic tapes. Also, it explains how to initialize magnetic tapes with the PRIMOS LABEL command.

For details of tape record and label formats, refer to the MAGNET User's Guide.

TAPE REELS

Magnetic tape is held on reels, the main features of which are illustrated in Figure C-1. There is usually a removable ring, called the write-enable ring, on one side of a reel of tape. When the write-enable ring is in place, the tape can be read or written to. When you remove the ring, it is not possible to write information to the tape, but the tape can be read.

The tape is not threaded into the reel; instead, it is wound onto the reel until there is sufficient friction to prevent the tape from slipping.

The tape on a standard reel is 1/2 inch wide and ranges from 600 through 2400 feet long: the usual lengths are 600, 1200, or 2400 feet. On a 60Mb tape cartridge, the tape is 1/4 inch wide.

TAPE DRIVES

The data on tape is read and written as it passes under the read/write head on the tape drive. In addition to the read and write operations, tape drives rewind to the beginning of the tape, move forward or backward at several different speeds, and provide status information about tape operations.

The speed at which the drive can move the tape is measured in inches per second (ips). Typical speeds are 45, 75 and 125 ips.

Cartridge Tape Drives

Some Prime machines have a cartridge tape drive. On such a drive, both reels are contained within a single cartridge. There is no threading involved with cartridge tape drives; you simply load the cartridge, and the tape is automatically wound to the correct point.

Streamer Tape Drives

Some systems use a streamer tape drive instead of the standard tape drive. The streamer drive uses a supply reel and a takeup reel, as on a standard tape drive, but the takeup reel is not visible. After you have inserted the supply reel into the drive opening, the streamer tape drive automatically threads the tape and puts it at load point. You can select a high, or low, tape speed.

DENSITY, TRACKS, AND FRAMES

The density of the information on tape is measured in terms of bits per inch (bpi): the most common densities are 800, 1600, and 6250 bits per inch. Tape density can be set either by a switch on the tape drive or by software.

A tape contains nine parallel tracks, running the length of the tape. Each character written onto magnetic tape consists of nine bits, written across the tape, one bit per track. The section across a tape that can hold a single character is called a tape frame.

RECORDS, GAPS, AND BLOCKS

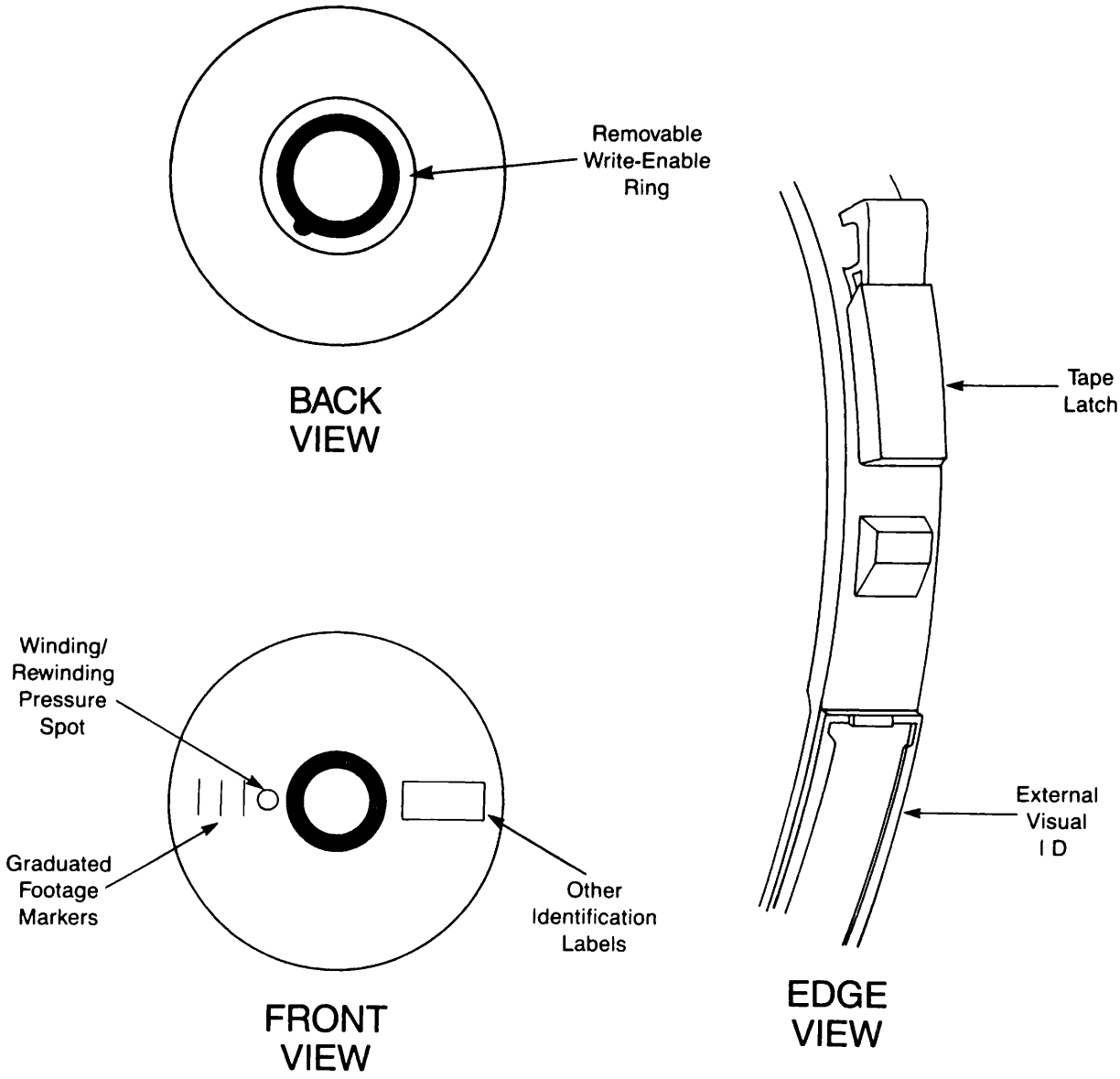
Computers can read and write only a certain number of characters during a single read or write operation. A group of characters read or written at one time is called a physical tape record or physical block. Physical records are separated by inter-record gaps (IRGs).

If you write many small records to tape, you also create a large number of inter-record gaps. For example, if you write 80-character records at a density of 800 bpi, each record will occupy 1/10 of an inch. Each IRG will be at least five times as large as each record, so you waste space. This problem can be solved by blocking the 80-character logical records together to form a smaller number of physical records.

The maximum size of Prime physical tape records is defined by the Maximum Tape Record Size (MTRS) configuration directive. The maximum value for MTRS is 32K bytes, and the default value is 6K bytes. If the maximum size is configured as 32K bytes (32,768 characters), the 80-character logical records mentioned above could be blocked so that 409 fit into each physical record. The blocking factor in this case is 409. Each physical record written is 32,720 characters long (409 * 80), and 48 characters are unused.

The characters in a physical tape record appear to the tape drive to be one large record. User programs must perform the blocking and unblocking of physical-to-logical and logical-to-physical translations.

Records are either fixed-length or variable-length. Fixed-length records are all the same size. If user data does not completely fill a fixed-length record, empty character positions are usually set to blanks or 0's; however, variable-length records can range in size from zero characters to the system maximum. Both fixed-length and variable-length magnetic tape records can be blocked.



External Features of a Tape Reel
Figure C-1

TAPE MARKERS AND LABELS

The physical beginning and end of a reel of tape is signalled by metallic strips across the tape. Tape drives automatically sense these markers, to detect when they are at the beginning or end of the reel.

Control characters on a tape signal the start and end of tape files, reels and volumes. These characters are called tape markers.

Labels are records that hold information about the tape and about files on the tape. For details of tape label formats, refer to the MAGNET User's Guide. There are several different label types:

- Volume labels
- Header labels
- Trailer labels

Volume labels are positioned at the beginning of each reel of a volume, and identify the reel and the owner of the reel.

Header and trailer labels identify and provide information about each file on a tape. This information can include the file-identifier, the creation and expiry dates, block counts, generation and sequence numbers.

PARITY

Most computers, including Prime machines, store information in eight-bit packets called bytes, and there is thus one more track on the tape than there is in the computer byte. This extra track is called the parity track, and the extra bit in each tape frame is called the parity bit.

The parity bit is used as an additional check on the validity of the information stored on the tape, and can be set in one of four ways

- Always 1
- Always 0
- Even parity. The data bits in a frame are added together: if the result is even, the parity bit is set to 0, otherwise it is set to 1.
- Odd parity. The data bits in a frame are added together: if the result is even, the parity bit is set to 1, otherwise it is set to 0. Prime systems use odd parity.

If a check of the parity bit in a tape frame reveals that the bit is set incorrectly, the data in the frame is probably corrupted.

INITIALIZING TAPES

This section describes how to initialize magnetic tapes with the PRIMOS LABEL command. LABEL writes IBM (9-track EBCDIC or 7-track BCD), ANSI (9-track ASCII), or Prime nonstandard volume labels followed by a dummy HDR1 label and two file markers. You can also use LABEL to read existing VOL1 and HDR1 labels. You have a choice of two ANSI standards for writing labels: X3.27-1978 and X3.27-1987. IBM labels are written in accordance with IBM's specifications (IBM manual GC28-6680-5).

The LABEL command also detects BRMS tapes. You cannot read these tapes, but you can overwrite them using the -OVERWRITE option. There are four types of BRMS tapes: ARCHIVE, BACKUP, TRANSPORT, and free. If a BRMS tape is free, LABEL overwrites it without the -OVERWRITE option. Use the ARCHIVE_RELEASE, BACKUP_RELEASE, or TRANSPORT_RELEASE command to convert BRMS tapes of type ARCHIVE, BACKUP, or TRANSPORT to free tapes.

For detailed information about the format of magnetic tape labels, see the MAGNET User's Guide, Appendix B, MAGNETIC TAPE LABEL FORMATS.

▶ LABEL

The command line format for LABEL is:

```
LABEL MTn [-TYPE type] [ { -VOLSER } volume-id] [-OWNER owner]
                         { -VOLID  }
                         { -VOLUME }

      [-ACCESS access] [-option(s)]
```

Descriptions of the parameters and options follow.

Parameter	Description
MTn	The tape drive where the tape that you wish to label is located. n is a number 0 through 7. This keyword is mandatory and must be the first on the command line.
type	Specifies the type of tape that you are working with. You can specify one of five types: -TYPE Standard_1 ANSI X3.27-1978 standard labels S1 -TYPE ANSI87 ANSI X3.27-1987 standard labels

-TYPE PRIME P ANSI A	PRIME ASCII (this is the default)
-TYPE B	seven-track BCD (IBM)
-TYPE E	nine-track EBCDIC (IBM)

volume-id — A string that contains 1 through 6 characters, that uniquely identifies this tape reel. If you specify fewer than six characters, they are blank-padded to the right. You can substitute the keywords -VOLUME, -VOL, or -VOLSER for the keyword -VOLID.

owner — Identifies the owner of the tape. It is a string of 1 through 14 characters for ANSI labels, or 1 through 10 characters for IBM labels. If you specify fewer than 14 (or 10) characters, they are blank-padded to the right. If this keyword is omitted, the default is the user's login name. You can substitute the keyword -OWN for the keyword -OWNER.

access — A single character that defines access to this tape. The keyword ACCESS is not used by Prime software but is included for completeness. If it is omitted, it is left blank on ANSI labels. ACCESS is ignored for IBM labels.

Option	Description
-HELP	Displays information about the LABEL command.
-INIT	Necessary keyword for tapes previously unformatted. Also necessary for overwriting labeled tapes.
-OVERWRITE	Forces BRMS tapes to be overwritten.
-PARITY	Specifies either EVEN or ODD parity for BCD labels only (default = ODD).

To read existing labels, type the command:

```
LABEL MTn [-TYPE type]
```

To write labels, type the command:

```
LABEL MTn [-TYPE type] -VOLID volume-id [-OWNER owner]
          [-ACCESS access] [-INIT]
```

For example, the following command would create a scratch tape with an ANSI87 label, and volume serial ID DRB001, on device MT0.

```
OK, LABEL MT0 -TYPE ANSI87 -VOLID DRB001
```

The following example shows how you would use LABEL to write an ANSI VOL1 label on a new tape located on logical device number 3. The owner of the tape in this example is ROBINS, the volume serial ID is SP573, and the access is set to X:

```
OK, LABEL MT3 -TYPE A -VOLSER SP573  -OWNER ROBINS -ACCESS X -INIT
```

The next example shows how the command line is used to read 9-track IBM labels that already exist on the tape, which is located on logical device number 6:

```
OK, LABEL MT6 -TYPE E
```

LABEL Command Errors

When the LABEL command writes a label, the message "TAPE LABEL WAS WRITTEN SUCCESSFULLY" is displayed. On read operations, LABEL displays the volume and owner ID's, creation date, and access (for ANSI tapes only).

If you use the LABEL command incorrectly, a warning message or an error message is displayed. Errors are either the result of bad syntax in the LABEL command or a PRIMOS magnetic tape I/O error.

Warning Messages: The following LABEL command warning messages are listed and explained in alphabetical order.

- ***WARNING***
  ARCHIVE tapes cannot be overwritten. If you wish to write to this tape invoke LABEL with the -OVERWRITE option.
  LABEL will abort.

You have tried to overwrite an ARCHIVE tape. You must either use the -OVERWRITE option when you invoke LABEL, or first release the ARCHIVE tape, using the ARCHIVE_RELEASE command. This labels the tape as free. You can write to free tapes without using the -OVERWRITE option.

- ***WARNING***
  BACKUP tapes cannot be overwritten. If you wish to write to this tape invoke LABEL with the -OVERWRITE option.
  LABEL will abort.

  You have tried to overwrite a BACKUP tape. To overwrite a BACKUP tape, use the -OVERWRITE option when you invoke LABEL. Alternatively, you can release the tape using the BACKUP_RELEASE command. This labels the tape as free. You can write to free tapes without using the -OVERWRITE option.

- ***WARNING***
  BRMS tapes cannot be read.
  LABEL will abort.

  You cannot read BRMS-labelled tapes. Use the ARCHIVE_RESTORE, BACKUP_RESTORE, TRANSPORT_RESTORE, or LIST_TAPE command to read BRMS-labelled tapes.

- ***WARNING***
  TRANSPORT tapes cannot be overwritten. If you wish to write to this tape invoke LABEL with the -OVERWRITE option.
  LABEL will abort.

  You have tried to overwrite a TRANSPORT tape. To overwrite a TRANSPORT tape, use the -OVERWRITE option when you invoke LABEL. Alternatively, you can release the tape using the TRANSPORT_RELEASE command. This labels the tape as free. You can write to free tapes without using the -OVERWRITE option.

Error Messages: The following LABEL command error messages are listed in alphabetical order.

- -ACCESS values are ignored for type B and E labels.

  This is a warning only; Access values are ignored for IBM labels.

- A label block on the tape is not 80 characters long.

  The first record on the tape is not a valid VOL1 label.

- A VOL1 label already exists on this tape.

  Use -INIT if you wish to overwrite the existing VOL1 label.

- An error has occurred while allocating dynamic storage.

  LABEL cannot allocate dynamic memory for internal buffers. See your System Administrator.

- An error has occurred while translating.

  Internal LABEL error.

- An error has occurred while writing to the tape.

  You may have a bad tape, or the tape may be write-locked. Clean the tape, check that it has a write-enable ring in place, or rewind the tape.

- An error has occurred while freeing dynamic storage.

  LABEL cannot free dynamic memory that is assigned to the internal buffers. See your System Administrator.

- An error occurred while reading from the tape.

  The tape drive is not ready or online, or an uncorrectable error was detected while the tape was read.

- An error occurred while rewinding the tape.

  LABEL could not rewind the tape. Check that it is online and ready.

- An indeterminate i/o error occurred.

  A bad tape is suspected. Clean your tape, or the read/write heads on your tape drive, and try the operation again.

- Error while analyzing the -ACCESS command line option.

  You should specify access with a single character.

- Error while analyzing the -OWNER command line option.

  The owner ID can be no longer than 14 characters for ANSI labels.

- Error while analyzing the -PARITY command line option.

  You must set parity to either even or odd.

- Error while analyzing the -TYPE command line option.

  Label types must be one of the characters S1, A, P, B, E, or ANSI87.

- Error while analyzing the -VOLSER command line option.

  The volume id cannot be longer than six characters.

- Error while analyzing the logical device number.

  The logical device number must be in the range MT0 through MT7.

- Error while setting up default specifications for tape drive.

  Internal LABEL error.

- Error while writing terminating file marks on tape.

  You may have a bad tape, or the tape may be write-locked. Clean the tape, check that it has a write-enable ring in place, or rewind the tape.

- "HDR1" not contained in columns 1 - 4 of second record on tape.

  When reading a HDR1 label, the string HDR1 must appear at the beginning of the second record.

- No logical device number was specified.

  You must specify the logical device number (MT0 - MT7).

- The -OWNER value is too long for type B or E labels.

  The owner ID for IBM labels cannot be longer than 10 characters.

- -PARITY is ignored for type "A" and "E" labels.

  You need to set parity only for 7-track tape drive operations, for type B labels.

- The LABEL command typed at PRIMOS command level is invalid.

  Retype the command.

- The tape drive has not been assigned.

  You must ASSIGN a tape drive before you can use LABEL.

- The tape drive is not connected.

  The tape drive is not physically connected to your system.

- The tape drive is not ready or is offline.

  You have assigned a tape drive, but your tape is not mounted on the drive or the drive is not online.

- The tape is not write-enabled (no write ring).

  You cannot write to a tape unless a write ring is present.

- "VOL1" not contained in columns 1 - 4 of first record on tape.

  When reading a VOL1 label, the string VOL1 must appear at the beginning of the record.

- -VOLSER option MUST be specified when writing a new VOL1 label.

  The Volume ID is mandatory when writing labels. It may contain a maximum of six characters.

- Your user-login-name will be used as an owner-identification.

  This is only a warning. If -OWNER is omitted, the default is your login name.

D

PHYSAV Messages

INTRODUCTION

This appendix lists and explains, in alphabetical order, messages you may receive from PHYSAV.

- Aborting due to warmstart. Please re-save media.

The system has been warmstarted. You must restart the save, because the tape controller cannot recover from this condition.

- Bad header or tape

An error occurred while PHYSAV attempted to position to a logical tape greater than 1. There are three possibilities

  - The tape has been started in an incorrect position (not immediately before a header label).
  - The tape was written using a utility other than PHYSAV.
  - The tape header is unreadable.

You should rewind and try again, or restart the save on a new reel from logical tape 1.

- Badspot file on partition pdev has an equivalence block. Please run FIX_DISK.

The badspot file on the partition contains equivalence (or remap) entries, probably as a result of a previous PHYRST or COPY_DISK operation. You must run FIX_DISK on the partition before you restart the save.

- Cannot erase data/trailer/header/tape (HW status=<status>)

If there is a problem when writing to a block, PHYSAV attempts to rewrite the bad block up to 20 times. At each rewrite, PHYSAV erases three more inches of tape, to try to eliminate a possible bad section on the tape. If the tape cannot be erased, the latest section must be rewritten (from current reel or logical tape, whichever is most recent).

For an explanation of bit settings represented in the message (HW status=status), see Table D-1, Magnetic Tape Controller Hardware Status.

Table D-1
Magnetic Tape Controller Hardware Status

Setting	Meaning
100000	Parity error
040000	Runaway tape
020000	CRC error
010000	LRC error
004000	Low DMX range
002000	Permanent error
001000	Read-after-write error
000400	File marker detected
000200	Ready
000100	On-line
000040	End-of-tape detected
000020	Rewinding
000010	Beginning-of-tape (at load point)
000004	Tape is write-protected
000002	DMX overrun
000001	Rewind complete

Note

The settings are cumulative. For example, the setting 020300 signifies that the tape deck is ready and online, but you have encountered a CRC error.

- Cannot write header (HW status=status)

PHYSAV cannot write the header of a logical tape. You can either try again on the same reel (in which case PHYSAV winds the tape to the correct position), or mount a new reel.

For an explanation of bit settings, see Table D-1.

- Cannot write trailer labels (HW status=status)

If PHYSAV cannot successfully write trailer labels, the latest magnetic tape section must be rewritten (from current reel or logical tape, whichever is most recent).

For an explanation of bit settings, see Table D-1.

- Controller unable to handle IC mode partition pdev. Aborting.

You have attempted to save a partition that is in -Intelligent_Controller (-IC) mode, but the controller is unable to handle this mode.

- Disk Read Error. Record rec. Pdev: pdev

PHYSAV encountered an error while reading a disk record. (See also the supervisor terminal listing.) The disk record will not be saved on tape. If this is a known badspot, then this record does not form part of the file system. If it is a new badspot, you should use FIX_DISK on the partition after you restore it, to truncate the file whose record falls on this badspot.

- DMX overrun

DMX overrun occurred during the magnetic tape write. Restart the save. If it fails again, contact your local Prime service engineer.

- End of information. Last Log.Tape is n

PHYSAV detected the end of information before the requested logical tape was reached. You can either write the next logical tape in sequence, or be prompted again for unit number and logical tape number.

- End of reel, mount new reel

PHYSAV detected the end-of-physical-tape (EOT) marker and is ready to continue on the next physical reel.

- EOT detected when doing error recovery
  will continue with save

If the EOT was detected while PHYSAV was erasing tape after a recoverable write error, then the current block will not be written to the current tape. Instead, it will be the first block on the new tape. PHYSAV attempts to write trailer labels and continues on the next reel.

- Hardware Error (HW status=status)

There is an unrecoverable error. You must fix the problem before you attempt to restart the save (using REN to restart from the beginning of the latest reel or logical tape).

For an explanation of status bit settings, see Table D-1.

- Invalid tape speed setting n ips.

The tape speed that you set with the -SPEED command-line option is invalid. Valid speeds are 25, 50 and 100 ips.

- More than 10 partitions

You cannot save more than ten partitions at a time.

- More than 50 recovered errors

If PHYSAV detects more than 50 recovered errors for one physical magnetic tape reel, the tape is considered suspect. PHYSAV asks you if you wish to rewrite the current section, although the tape is readable and need not be rewritten.

- No partitions to save

No partitions have been specified. Type ren to continue.

- No. of partitions so far = n

You have used the REN command to reenter PHYSAV. It indicates the number of partitions for which details have already been accepted by PHYSAV.

- Not at B-O-T, tape being rewound

PHYSAV expects a magnetic tape to be positioned at the beginning-of-tape (B-O-T) each time you select a unit.

- Not same controller and unit

All partitions to be saved in one logical tape must be on the same disk (connected to the same controller and on the same unit).

- Only one logical tape possible on this drive type.

The tape drive that you are using cannot write more than one logical tape.

- Partition already specified

You have already defined the partition to PHYSAV, which prompts you to input another physical device number.

- Possible corrupt MFD, un-made partition or non PRIME file system disk. Pdev: pdev.

The MFD of the partition could not be verified. The disk has become corrupt, or it is a virgin disk.

- Robust partition not properly shut down. Please run FIX_DISK.

The partition was not shut down correctly, and may no longer be robust. You must run FIX_DISK on the partition before you restart the save.

- Tape is write protected

A write-enable ring is not on the current tape reel.

- This is a continuation of Log.Tape n

PHYSAV detected a problem while trying to position to a logical tape. The present reel is a continuation of the logical tape indicated.

- This is Beg. of Log.Tape n

The present reel starts with a logical tape number greater than the one you requested.

- Unit not ready or offline

You should put the unit on line or, if already on line, try another unit. This message also occurs if a magnetic tape runs off the end of reel (the EOT marker has not been detected, or there is no EOT marker), or if the tape breaks. If the tape breaks or runs off the reel, you

should rewind the tape and rewrite the latest section (from the start of logical tape or reel, whichever is the most recent) on a new magnetic tape reel or unit.

- Unrecovered Error (HWSTAT=status)

PHYSAV attempts to rewrite a magnetic tape block up to 20 times. At each rewrite PHYSAV erases three more inches of tape each time, to eliminate a local badspot. If PHYSAV is unsuccessful after 20 attempts, this error message is generated. You must rewrite the current section.

For an explanation of status bit settings, see Table D-1.

- Unrecovered write error, either retart this reel or exit PHYSAV.
  Rewrite current reel (Yes/No)?

PHYSAV encountered an unrecoverable error when it tried to write to the tape. You must restart the save from the beginning of the reel.

- Warning, log tape already exists
  Overwrite existing Log.Tape n (Yes/No)?

This is a warning message. PHYSAV attempted to position to the start of a logical tape. If you reply yes, PHYSAV overwrites the logical tape and cannot access any subsequent logical tapes previously overwritten. If you reply no, PHYSAV rewinds the tape, and prompts you for a unit number and a logical tape number.

E

PHYRST Messages

INTRODUCTION

This appendix lists and explains, in alphabetical order, messages you may receive from PHYRST.

- Bad command line parameter: param

You have entered an invalid option on the command line. Retype the command line correctly.

- Bad header or tape

A magnetic tape header cannot be read. The tape is

  - Not positioned correctly
  - Not written by the PHYSAV utility
  - Damaged

- Bad MFD entry length: partition is virgin or MFD is corrupt on partition pdev

The MFD of the partition could not be verified. The MFD has become corrupt, or it is a virgin disk.

- Badspots handled on partition pdev. Please run FIX_DISK.

PHYRST has handled badspots during its restore of partition pdev, remapping some records. You must run FIX_DISK on this partition before it is used for any reason other than as a target for PHYRST or COPY_DISK.

- Cannot copy robust to non-robust partition, or vice versa.

You have tried to restore a robust partition to a nonrobust partition, or vice versa. You can only restore a save of a robust partition onto another robust partition, and you can only restore a save of a nonrobust partition onto another nonrobust partition.

- Cannot restore to a partition with a larger dynamic badspot remap area.

You cannot restore to a partition that has a larger dynamic badspot remap area than the source partition. PHYRST aborts if you attempt such a restore.

- Controller unable to handle IC mode partition pdev. Aborting.

You have attempted to restore onto a partition that was made in Intelligent_Controller (-IC) mode, but the disk controller is unable to handle this disk.

- Disk geometry mismatch. Tape has n and disk has n recs per track. Aborting.

You have tried to restore onto a disk that has a different geometry to the one saved.

- Disk Read Error. Record rec. Partition pdev.

A disk read error occurred while trying to read the record rec from partition pdev.

- Disk Write Error. Record rec. Partition pdev.

PHYRST has encountered a new badspot, or the address of the record to be written was incorrectly read from the tape.

You should check the record address to see if it lies within the partition being restored, type quit, and retry the current reel by typing s 1000. Use FIX_DISK on the partition when the restore is complete.

- DMX overrun

DMX has overrun on a magnetic tape read. Restart the save. If it fails again, contact your local Prime service engineer.

- End of information
  Last Log.Tape = n

The logical tape you requested does not exist on this magnetic tape.

- End of reel, mount new reel

An end-of-tape (E-O-T) marker has been sensed while

- Positioning to a logical tape
- Restoring partition(s) from a logical tape
- Verifying a tape

The program is ready to continue with the next reel.

- Hardware Error (HW status=status)

An unrecoverable error. It is followed by the message

```
Restart current reel (Yes/No)?
            or
Restart Log.Tape (Yes/No)?
```

If you reply no, PHYRST continues by treating the error as recoverable. In other words, it backspaces five blocks, repositions to the block causing the problem, and attempts to read the block up to 20 times.

If this is unsuccessful, PHYRST prints

```
Unrecovered Error (HWSTAT=status), Block n

Restart current reel (Yes/No)?
            or
Restart Log.Tape (Yes/No)?
```

If you reply no, PHYRST tries to read up to 20 successive blocks in an attempt to find a good block from which to continue. For an explanation of status bit settings, see Table D-1. If still unsuccessful, PHYRST prints

```
More than 20 successive errors

Restart current reel (Yes/No)?
            or
Restart Log.Tape (Yes/No)?
```

If you reply no, PHYRST tries again to read up to 20 successive blocks.

- More than 20 successive errors

PHYRST detected an unrecovered error, continued, and discovered 20 successive bad blocks. You can either try the next 20 blocks or restart the current section on the same or a different magnetic tape unit.

- No free records available in RAT to allocate.

PHYRST has tried to map a record around a badspot, but no free record is available.

- No partitions to restore

You answered no when PHYRST asked you whether it should restore each of the partitions saved on tape.

- Not at B-O-T, tape being rewound

The program expects each magnetic tape to be at the load point when the unit number is selected. Unless you are sure that the tape is correctly positioned (that is, immediately before a magnetic tape header), the tape should be rewound.

- Not same reel

PHYRST has encountered problems, and is attempting to restart the latest section. However, the tape that it found mounted on the new unit is not the original one.

- Partition already specified

You have already entered either the partition to be restored or one to be restored from.

- This is a continuation of Log.Tape n

See next message.

- This is Beg. of Log.Tape n

A logical tape has been found with a number larger than the one you requested to be restored. PHYRST will print information about the tape, then ask "Correct tape (Yes/No)". If this is the correct tape, answer yes: PHYRST restores the tape as usual. If it is not the correct tape, answer no: PHYRST asks again for a tape unit number.

- This reel does not follow last
  Continue (Yes/No)?

You have mounted a continuation reel that is either out of sequence or is not part of the current set of save tapes.

- Unequal no. of heads

You can only restore a partition to one of equal size.

- Unit not ready or offline

A selected unit is not ready or is offline.

- Unrecovered block sequence error Block n

PHYRST has read a block whose sequence number does not follow that of the previous one. An incomplete dump without trailer labels may exist on the tape, and information written previously has now been read.

- Unrecovered Error (HWSTAT=status), Block n

An attempt has been made to read a block, and has been unsuccessful 20 consecutive times. You can either continue or restart the latest section on the same or a new unit.

For an explanation of the status bit settings in the HW status, see Table D-1.

- n Unrecovered Mag-Tape error(s). Please run FIX_DISK.

PHYRST has detected one or more unrecovered magnetic tape errors. You should run FIX_DISK to see if any vital information has been lost.

F

COPY_DISK Messages

INTRODUCTION

This appendix lists and explains, in alphabetical order, the error messages you may receive from COPY_DISK.

- Bad command line parameter: param

You have entered an invalid option on the command line. Retype the command line correctly.

- Bad MFD entry length: partition is virgin
or MFD is corrupt on partition pdev

You have attempted to use a virgin disk. Use the MAKE command to format the disk before restarting.

- Bad surface

The surface that you are attempting to copy from does not belong with the set of surfaces being copied. (CMDs only.)

- Badspots handled on partition pdev - Please run FIX_DISK.

Badspot or Dynamic Badspot handling has been invoked during the copy on the indicated target partition. You must run FIX_DISK on this partition before making it available to users of the system (using the ADDISK command).

- BADSPT file has equivalence block on partition pdev. Please run FIX_DISK.

The badspot file on the indicated source partition contains equivalence (or remap) entries, probably as a result of a previous COPY_DISK or PHYRST operation. You must run FIX_DISK on the partition before restarting the copy.

- Cannot copy a non-robust partition to a robust partition.

You have attempted to copy a nonrobust partition to a robust partition. A nonrobust partition may only be copied to another nonrobust partition.

- Cannot copy a robust partition to a non-robust partition.

You have attempted to copy a robust partition to a nonrobust partition. A robust partition may only be copied to another robust partition.

- Cannot copy to a partition with a larger dynamic badspot remap area.

You cannot copy to a partition that has a larger dynamic badspot remap area than the source partition. COPY_DISK aborts if you attempt such a copy.

- Cannot use IC format disks at PRIMOS II. Aborting.

The disk that you have attempted to use was made using the -Intelligent_Controller (IC) option to MAKE. Disks made in this way require the disk controller to be running in intelligent mode which is not possible at PRIMOS II.

- Controller unable to handle IC mode disks.

The disk that you have attempted to use was made using the -Intelligent_Controller (IC) option to MAKE. The drive that you have mounted the disk on is not connected to an intelligent controller and it is therefore not possible to continue.

- Disk Read Error. Record: rec. Pdev: pdev.

An unrecoverable disk read error occurred reading the specified record from the partition indicated.

- Disk Write Error. Record: rec. Pdev: pdev.

An unrecoverable disk write error occured writing the specified record to the partition indicated.

- ERROR - This is surface n

The surface that you are attempting to copy from is in the incorrect order from the set of surfaces being copied. (CMDs only.)

- ERROR: The disk is full.

There are no more free records on the target partition to use for remapping around badspots and/or the DBS/RMA area.

- Illegal Partition Pairing.

The target partition specified is of a different revision to the source partition. You should reformat the target partition for the correct revision using the MAKE command or use a different one.

- Invalid PDEV number.

The physical device number that you have entered is in some way invalid.

- Overlapping partitions detected.

The partition that you have specified overlaps one that you entered earlier.

- Remap handling discontinued on partition pdev

An error occurred during the handling of badspots on the indicated target partition, and remapping around badspots has therefore been disabled. Although the copy operation will continue to completion, the target partition should be checked for faults.

- Robust partition not properly shutdown. Please run FIX_DISK.

The partition specified was not correctly shutdown so its robustness may be suspect. You must run FIX_DISK on the partition before restarting the copy.

- Source and target partitions have different geometries. Aborting.

The target partition entered has a different geometry to the source partition, that is, it is on a different disk type. A partition may only be copied to another partition of exactly the same characteristics.

- Source partitions must be on same controller.

or

- Source partitions must be on same drive.

The partition specified is not on the same disk controller/drive as the other partitions entered earlier. All source partitions must be on the same disk drive (and hence controller).

- Unequal sized partition copy for CMDs only.

or

- Unequal sized, multi partition copy unavailable.

The target partition specified is of a different size to the source partition but is not a CMD. The target partition must be the same size as the source partition, except when copying to/from CMDs, in which case copies must be done one at a time.

- Verify failure. Source record: rec. Pdev: pdev. Target record: rec. Pdev: pdev.

A discrepancy has been detected at the indicated location during verification.

- You will need n surfaces to copy to, OK (yes/no)?

This message tells you how many removable surfaces you will require to complete the copy. Answer yes if it is OK to continue, or no if it is not. (CMDs only.)

G

User's Guide to MAGSAV and MAGRST

INTRODUCTION

This appendix describes how users can run MAGSAV and MAGRST, to backup and restore their data. The paragraphs below describe the contents of the appendix.

THE MAGSAV SUBSYSTEM explains the function of MAGSAV, describes how MAGSAV handles ACLs, and summarizes the command options.

MAGSAV describes the command format and the command options.

HOW TO USE MAGSAV explains how to invoke MAGSAV, and gives details of the appropriate responses that you should make to the MAGSAV prompts. This section also explains

- How to use MAGSAV to save to a 60Mb cartridge tape drive
- How to perform a multireel save
- How to move files to a Rev.19 system
- An example MAGSAV session

THE MAGRST SUBSYSTEM explains the function of MAGRST, describes how MAGRST handles ACLs, and summarizes the command options.

MAGRST describes the command format and the command options.

HOW TO USE MAGRST explains how to invoke MAGRST, and gives details of the responses that you should make to the MAGRST prompts. This section also describes how to restore from a sequence of reels, and gives an example MAGRST session.

THE MAGSAV SUBSYSTEM

MAGSAV saves file system objects from disk to tape, in logical format. That means that you can restore individual objects from a MAGSAV tape.

You can save to either 7-track or 9-track tape.

How MAGSAV Handles ACLs

MAGSAV always copies specific ACLs, unless you use the command-line option -NO_ACL to prevent the saving of ACLs. The command copies the ACLs immediately after the objects that they protect.

When you save a directory, MAGSAV automatically saves any access categories within the directory. However, when you save individual files by name, you must also specify the names of any access categories that you want to save, as MAGSAV does not save them automatically. Further, MAGSAV does not save ACL information for file system objects that use default protection.

MAGSAV Options

You can run MAGSAV without using any command options. There are, however, a number of options that you may find useful. You can

- Specify 7-track tape format, (instead of the default 9-track format)
- Specify a record size of 512 bytes, and suppress ACLs: required on Prime 300 machines
- Prevent the saving of ACLs
- Prevent the saving of Recovery Based Files
- Specify that you want to input the tape drive unit numbers from your terminal when you run MAGSAV from a CPL program or command input file

- Save all your CAM files as DAM files, so that you can restore them on a Rev.19 system
- Create a MAGSAV tape that can be read by Rev.19 MAGRST: this enables you to move files to a Rev.19 system

MAGSAV has other options that are useful to operators: -INC, -SAVE_UFD and -UPDT. These options are summarized below, and are described further in Appendix H, USING MAGSAV FOR SYSTEM BACKUPS.

▶ MAGSAV

The format of the MAGSAV command is

```
MAGSAV [options]
```

The options are described below.

Option	Description
-7TRK	Specifies 7-track tape format. The default is 9-track.
-CAM_TO_DAM -CTD	Saves all CAM files as DAM files, and is useful if you intend to restore the files on a Rev.19 system.
-INC	Specifies an incremental dump. Only files and directories with a reset (=0) DUMPED switch are saved. If you do not specify -INC, all files and directories are saved. Normally, only operators use -INC.
-NO_ACL -NA	Specifies that MAGSAV is not to save any ACLs or ACL references. Tapes saved with the -NO_ACL option can be restored by Rev.18 MAGRST onto a Rev.18 system. If this option is not specified, ACL information is saved to tape.
-NO_RBF	Specifies that MAGSAV is not to save RBFs (Recovery Based Files) if these are present on a disk. See the ROAM Administrator's Guide for more information.
-P300	Specifies 512-byte records, and suppresses ACLs: required on Prime 300 machines.

-REV19	Writes a tape label that can be read by Rev.19 MAGRST. Automatically saves CAM files as DAM files, because pre-Rev.20.0 systems cannot handle CAM files.
-SAVE_UFD -SUFD	Tells MAGSAV always to save directories, regardless of whether they have been modified. This option is used only with the -INC option.
-TTY -T	Takes the tape unit number from your terminal. All other information is taken from the current input stream. Use this option when you run MAGSAV from a CPL file or a command input file.
-UPDT	Specifies an update. The dumped switch in the UFD entry is set for files and directories that are saved from disk onto tape. If you do not specify this option, the dumped switch is not set. Normally, -UPDT is used only by operators.

HOW TO USE MAGSAV

This section describes how to use MAGSAV to save file system objects. It consists of the following subsections

- Running MAGSAV describes how to invoke MAGSAV, and explains what responses to make to the queries that MAGSAV presents
- Verifying a MAGSAV Tape summarizes how you can list the contents of your MAGSAV tape
- Performing a Multireel Save describes the prompts that MAGSAV displays when it reaches the end of a reel, and explains how you should respond
- Saving to a 60Mb Cartridge Drive explains how to run MAGSAV when you are saving data to a 60Mb catridge tape drive: the MAGSAV prompts and messages differ slightly from those it normally displays
- Moving Files to a Rev.19 System explains the use of the -REV19 option to create a MAGSAV tape that can be read by Rev.19 MAGRST
- Example MAGSAV Session shows a typical sequence of MAGSAV prompts and user responses

Running MAGSAV

This section shows how to invoke MAGSAV, and describes the responses that you should make to the series of questions that MAGSAV generates.

Before you invoke MAGSAV, assign a tape drive and mount a tape on the drive. For information about how to assign tape drives, refer to Chapter 3, USER CONTROL OF TAPE DRIVES.

To invoke MAGSAV, issue the command

```
OK, MAGSAV
```

(The section MAGSAV Options, above, describes how you can modify this basic command.)

When you invoke MAGSAV, it presents you with a series of prompts about the save. These questions, and the appropriate responses, are detailed below. Note that if you use MAGSAV to save to a 60Mb cartridge tape, the dialog is slightly different to that shown below: these differences are described in the section Saving to a 60Mb Cartridge Drive later in this chapter.

Prompt	Response
Tape unit:	Enter the physical or logical tape unit number (0-7).
Enter logical tape number:	Enter 1 for the first logical tape, 2 for the second, and so on, to divide your tape into logical units. MAGSAV rewinds the tape, and positions it correctly. If you enter the value 0, MAGSAV assumes that your tape is already positioned correctly.
Tape name:	Enter the name of the tape: it can be a maximum of six characters long.
Date:	Enter the date in the format MM DD YY. PRIMOS checks the date and rejects it if not valid. To use the current date, respond by pressing the CARRIAGE RETURN (CR) key.
Rev no:	Enter any decimal integer. This sets the revision number field, used for visual identification during restore operations. You may therefore wish to enter the revision of PRIMOS running on your system, for example 21. If you respond by pressing the CARRIAGE RETURN (CR) key, the field is set to 0.

Name or command: You can make any of the following responses, which are explained below

```
<filename>
*
MFD
$A pathname
$I [pathname] [n]
$INC OFF and  $INC ON
$Q
$R
$TTY
$UPDT OFF  and  $UPDT ON
```

If MAGSAV encounters an access problem during a save operation, then that file is abandoned, and MAGSAV continues with the next file or directory until there is no more. The "Name or command:" prompt is repeated until you make a response that returns you to PRIMOS.

<filename> causes MAGSAV to save the specified file or directory residing in the current directory.

* causes MAGSAV to save all the files and directories in the current directory.

MFD causes MAGSAV to save the entire partition. To use this response, you must be attached to the MFD of a partition.

$A pathname attaches you to the specified directory. Supply a password if needed.

$I [pathname] [n] prints, at your terminal, an index of the files and directories that MAGSAV saves. If you specify pathname, the index is written into that file. If the file that you specify in pathname already exists, the index is appended to this file. n indicates the number of levels to be included in the index: the default is two levels.

$INC OFF turns off incremented dump and saves files and directories whether or not their DUMPED switch is set. This command is the default.

$INC ON turns on incremented dump and saves only those files and directories with a set DUMPED switch. This action command has the same affect as the -INC command line option.

$Q terminates the logical tape and returns you to PRIMOS.

$R terminates the logical tape, rewinds the physical tape, and returns you to PRIMOS.

$TTY permits you to enter the tape unit numbers from your terminal, even when you have not specified -TTY on the command line. If MAGSAV is invoked within a CPL program, you can use the $TTY command to enter subsequent tape unit numbers that may otherwise cause the CPL program to fail.

$UPDT OFF turns off update and does not set the DUMPED switch for saved files and directories. This command is the default.

$UPDT ON turns on update and sets the DUMPED switch for all saved files and directories. This action command has the same affect as the -UPDT command line option.

Performing a Multireel Save

When MAGSAV encounters the physical end-of-tape (EOT) marker during a save, it displays the message

```
E-O-T has occurred, mount next tape
New Tape unit (9 Trk):
```

and rewinds the reel. You should mount the next reel on either the same tape drive or a different drive, and enter the drive unit number.

If the new tape drive is not at load point, you receive the message

```
(Tape not at load point)
Do you want to rewind the tape? (YES/NO):
```

If you receive this message for any reel except the first, you must answer yes: you cannot start the save from the middle of any reel except the first.

When you run MAGSAV from either a CPL program or a command input file, you may want to answer these questions from your terminal. If you do, you must either include the -TTY option on the command line, or issue the $TTY action command during the MAGSAV dialog.

Verifying a MAGSAV Tape

You can list the contents of a MAGSAV tape by running MAGRST as described in the section below, HOW TO USE MAGRST. When MAGRST prompts

```
Tree name:
```

respond by entering

```
NW [filename] [n]
```

MAGRST prints a tape index at your terminal, but does not restore any files or directories. If you specify filename, the index is written to that file. n specifies the number of levels that you want to index.

Saving to a 60Mb Cartridge Drive

To save to a 60Mb cartridge tape drive, invoke MAGSAV in the way described above in the section Running MAGSAV, and enter the tape number. MAGSAV prompts

```
Overwrite or Append (o/a):
```

You must either append a new logical tape to the end of the existing data or overwrite the entire contents of the tape with the new save.

Overwrite: In response to the prompt "Overwrite or Append", answer either overwrite or o to instigate an overwrite.

MAGSAV prompts for the tape name, date and revision number, in the same way as described above in Running MAGSAV. It then issues the new message

```
Tape initializing, please wait .....
```

Wait for approximately two minutes, while MAGSAV erases all the existing data from the tape. When the tape is clean, MAGSAV automatically returns to its normal sequence of prompts, beginning with

```
Name or Command:
```

To save specified files to tape, proceed in the manner described in Running MAGSAV, above.

Append: In response to the prompt "Overwrite or Append", answer either append or a to append a logical tape.

MAGSAV immediately returns a new message:

```
Verifying tape cartridge.....
```

This indicates that MAGSAV is checking that the end-of-tape markers have been written correctly at the end of the last logical tape. These markers will not be present if you aborted from the previous MAGSAV operation on this tape. If you are using a tape drive other than a 60Mb cartridge drive, the absence of end-of-tape markers prevents you appending another logical tape. However, with a 60Mb cartridge drive, you are able to recover. If MAGSAV does not find the end-of-tape markers, it displays the message

```
Error:  No end of logical tape found
******  Logical tape <tape-number> is not closed correctly
Do you want to close it and start next logical tape?
```

To append the end-of-tape markers to the end of the previous logical tape, answer yes.

MAGSAV immediately responds

```
Closing logical tape <tape-number>
```

and prompts for the name of the new logical tape that you wish to append. You can proceed to save files to the logical tape, in the manner described above in Running MAGSAV.

Moving Files to a Rev.19 System

You can use MAGSAV and MAGRST to transport files from a post-Rev.19 system to a Rev.19 system. From Rev.20 onwards, MAGSAV writes a larger tape label than most pre-Rev.20 versions of MAGRST can handle: only MAGRST at Revs. 19.3.12, 19.4.7 and above can read the post-Rev.19 tape label. If you intend eventually to restore under a pre-Rev.20 system, other than 19.3.12, 19.4.7 and above, include the option -REV19 on the MAGSAV command line.

The -REV19 option writes a label to the Rev.21 MAGSAV tape that is suitable for restoration under a Rev.19 system.

The -REV19 option automatically invokes the -CAM_TO_DAM option, to save all the files to tape in DAM format, because pre-Rev.20 systems cannot handle CAM files.

At PRIMOS Revision 19.3.12, 19.4.7 or above, MAGRST is able to read the Rev.21 tape label and you do not have to include the -REV19 option in the MAGSAV command line. However, if you do exclude the -REV19 option from the MAGSAV command, you must include the -CTD option whenever CAM files are saved.

Example MAGSAV Session

This subsection gives an example of the MAGSAV dialog. In this example, file DFILE is saved to tape DATATP, on tape drive MT7. When you press the CARRIAGE RETURN (CR) key in response to the "Date:" and "Rev no.:" prompts, the system supplies the current date and a zero revision number.

```
OK, MAGSAV
MAGSAV Rev.21.0 Copyright (c) Prime Computer, Inc. 1986]
Tape unit (9 Trk): 7
Enter logical tape number: 0
Tape name: DATATP
Date (MM DD YY): (CR)
Rev no: (CR)
Name or command:   DFILE
Name or command:  $Q
OK,
```

THE MAGRST SUBSYSTEM

MAGRST restores file system objects from a MAGSAV tape.

How MAGRST Handles ACLs and Passwords

MAGRST always tries to restore the ACL and access category information that protects the files and directories you want to restore. There are, however, exceptions to this.

- If an object that you want to restore already exists on disk, at the point to which you are restoring data, MAGSAV overwrites the disk object, but retains the disk object's ACL or password protection: the protection on the tape is ignored.
- When the disk and tape objects that share the same name are access categories, MAGSAV does not restore the tape object, and you receive a warning. Objects that were formerly protected by the tape access category will be protected by the disk access category.
- When you restore a file system object that is protected by an access category, MAGSAV does not automatically restore the access category. You receive an error message, and the object has default protection on disk. To restore specific files with their access categories, you should first restore the access categories and then the protected files.

Note

MAGSAV writes an object to tape before it saves the ACL information about that object. Therefore, MAGRST first restores the object to disk, and then restores the ACL information. This means that you can restore an object from tape even when you have no rights to the object, but you may not be able to use the restored object.

Whenever possible, MAGRST restores ACL directories as ACL directories, and password directories as password directories. However, if there is a directory on disk with the same name as a directory on tape, but one is an ACL directory and the other a password directory, MAGRST maintains the type of protection used by the disk directory. For example, if you restore ACL directory RICHARD, but a password directory called RICHARD aleady exists on disk, MAGRST converts the restored directory from an ACL to a password directory. Conversely, if you restore a password directory to an ACL directory, the restored directory becomes an ACL directory and its files and subdirectories take the default protection of the existing directory.

Segment Directories

Note

If you restore a segment directory, and the restore overwrites an existing directory, the subfiles in the two directories are combined. Therefore, before you restore a segment directory you should check whether a segment directory of the same name already exists at the restore point. If such a directory does exist, you should either delete it or change its name. This action ensures that the restored segment directory is an exact copy of the segment directory on tape.

MAGRST Options

You can run MAGRST without using any command options. There are, however, a number of options that you may find useful. You can

- Specify 7-track tape format, instead of the default 9-track format
- Ask to be prompted for new slave pathnames when you restore the master RBF file into a different directory to that from which it was saved
- Specify that you want to be able to input the tape drive unit number from your terminal when you run MAGRST from a CPL program or command input file
- Restore all your RBF subfiles as either CAM or DAM files, regardless of their format on tape

▶ MAGRST

The format of the MAGRST command is

```
MAGRST [options]
```

The options are described below.

Option	Description
-7TRK	Specifies 7-track tape format. The default is 9-track.
{ -CAM_RBF -CRBF }	Restores all RBF subfiles as CAM files, regardless of whether they were saved as CAM or DAM files. This option thus enables you to convert all your RBF files to CAM files.
{ -DAM_RBF -DRBF }	Restores all RBF subfiles as DAM files, regardless of whether they were saved as CAM or DAM files.
-QUERY	MAGRST asks you for a new slave pathname when you restore a master RBF file into another directory. You are also asked whether you want to deactivate existing active copies of the RBF file.

-TTY -T	Takes the tape unit number from your terminal. All other information is taken from the current input stream. Use this option when you run MAGRST from a CPL file or a command input file.

HOW TO USE MAGRST

This section describes how to use MAGRST to restore file system objects, or to list the contents of a MAGSAV tape. It consists of the following subsections

- Running MAGRST describes how to invoke MAGRST, and explains what responses to make to the prompts that MAGRST presents
- Restoring From a Sequence of Reels explains how to restore files and directories when the original save extends over more than one reel
- Example MAGRST Session shows a typical sequence of MAGRST prompts and user responses

Running MAGRST

This subsection shows how to invoke MAGRST, and describes the responses that you should make to the series of questions that MAGRST generates.

Before you invoke MAGRST, assign a tape drive and mount a tape on the drive. For information about how to assign tape drives, refer to Chapter 3, USER CONTROL OF TAPE DRIVES.

To invoke MAGRST, issue the command

```
OK, MAGRST
```

To modify this basic command see section MAGRST Options, above.

When you invoke MAGRST, it presents you with a series of prompts about the save. These prompts, and the appropriate responses, are detailed below.

Prompts	Response
Tape unit:	Supply a physical or logical device number (0 through 7). If you do not specify the -7TRK option on the MAGRST command line, the default is 9-track.
Enter logical tape number:	Supply a logical tape number from 1 through n (1 for the first logical tape, 2 for the second, and so on) if your tape is divided into several logical units. MAGRST positions your tape to the specified logical tape. If you enter 0, MAGRST assumes that your tape is already positioned correctly.

Note

A tape can runaway if there is only one logical tape on the currently mounted reel and you supply a number greater than 1 in response to this request. MAGRST searches endlessly for the nonexistent logical tape(s) and is not able to read the EOT (end-of-tape) marker. You must unassign your drive to abort the unsuccessful search.

MAGRST does not have to search all logical tapes when it restores sequential tapes. After MAGRST returns you to PRIMOS, the tape is not rewound. Instead, it is positioned before the beginning of the next logical tape in sequence. For sequential logical tapes, run MAGRST again and enter 0 in the response to the "Enter logical tape number:" prompt: MAGRST restores the next logical tape without rewinding and reading through the preceding logical tapes.

Ready to restore:

Respond with one of the following subcommands

yes restores the entire tape and returns you to PRIMOS. If MAGRST encounters an access problem during a restore operation, then that file is abandoned and MAGRST continues with the next file/directory, if there is one.

no requests a different tape unit and logical tape. MAGRST does not restore the previously specified tape.

$I [pathname] [n] prints, at your terminal, an index of all files and directories restored. If you specify pathname, the index is written into that file. If the file already exists, the index is appended to that file. n indicates the number of levels to include in the index: the default is two levels.

NW [filename] [n] prints a tape index at your terminal, but does not restore any files or directories. If you specify a filename, the index is written into that file. If filename already exists, the index is appended to the file. n indicates the number of levels to include in the index: the default value is is 100. This option is useful if you wish to determine the tape's contents. NW does not accept pathnames.

$A pathname attaches you to the specified directory. Supply a password if neeeded.

partial restores only certain files and directories. Supply pathnames in response to the "Tree name:" prompt.

Tree name: You receive this prompt only if you give the partial subcommand. Enter the pathnames of the files and directories that you want to restore. Replace the <partition> part of the pathname with MFD>. For example

```
MFD>PETER>FILE3
```

After you enter each pathname, MAGRST repeats the "Tree name:" prompt. You can specify up to ten pathnames in this way.

Do not specify the same file name as the final component in two pathnames: if you do, the second restore overwrites the first, even if the full pathnames are different.

If you want to restore more than ten files and directories, repeat the restore procedure.

Press the CARRIAGE RETURN (CR) key to begin the restore process. After each file or directory is restored, the message "File complete" prints at your terminal. The message "Restore complete" prints when the end of the logical tape is reached.

Restoring From a Sequence of Tapes

When MAGRST encounters the physical end-of-tape (EOT) marker, it displays the message

```
Mount Reel no: <n>
E-O-T has occurred, mount next tape
New Tape unit (9 Trk):
```

where n specifies the reel that you should mount.

You can either enter the same tape drive unit number as you used for the first reel or you can specify a different unit.

If the new tape drive is not at load point, you receive the message

```
(Tape not at load point)
Do you want to rewind the tape? (YES/NO):
```

If you receive this message for any reel except the first, you must answer yes: you cannot start the save from the middle of any reel except the first.

If you mount a continuation reel out of sequence, you receive the message

```
***WARNING -- Reel number not in sequence.
Continue with this reel (Y or N)?
```

Answer no to this question, and mount the correct reel: you must mount reels in sequence.

When you run MAGRST from either a CPL program or a command input file, you may want to answer the above questions from your terminal. If you do, you must include the -TTY option on the command line.

Example MAGRST Session

This section gives an example of the MAGRST dialog, in which the file DFILE is restored from to tape DATATP, on tape drive MT0.

```
OK, MAGRST
[MAGRST Rev.21.0 Copyright (c) Prime Computer, Inc. 1986]
YOU ARE NOT ATTACHED TO AN MFD
Tape unit (9 trk):0
Enter logical tape number: 1
Name: DATATP
Date(MM DD YY): 12-23-86
Rev. no.:     0
Reel no.:     1
Ready to restore: partial
Tree name: DFILE
Tree name:(CR)
*** STARTING RESTORE ***
*** END LOGICAL TAPE ***
*** RESTORE COMPLETE ***
OK,
```

H

Using MAGSAV for System Backups

INTRODUCTION

This appendix describes how to use MAGSAV to backup a partition to tape. The paragraphs below describe the contents of the appendix.

THE MAGSAV SUBSYSTEM explains the function of MAGSAV, describes how MAGSAV handles ACLs, and summarizes the command options.

MAGSAV describes the command format and the command options.

HOW TO BACK UP DATA describes the preparations for a backup, and the step-by-step MAGSAV procedure.

INVOKING MAGSAV describes

- The MAGSAV command lines to run full and incremental backups
- The MAGSAV dialog
- How to verify a MAGSAV tape
- An example MAGSAV session

The appendix does not provide a comprehensive description of all aspects of MAGSAV, in order to avoid unnecessary duplication of information given in Appendix G, USER'S GUIDE TO MAGSAV AND MAGRST. If

you need information about any of the following procedures, refer to Appendix G

- How to use MAGSAV to save to a 60Mb cartridge tape drive
- How to perform a multireel save
- How to move to files to a Rev.19 system

THE MAGSAV SUBSYSTEM

The MAGSAV command saves file system objects from disk to tape, in logical format. That means that you can restore individual objects from the tape, using MAGRST, ARCHIVE_RESTORE, TRANSPORT_RESTORE or BACKUP_RESTORE.

You can save to either 7-track or 9-track tape.

How MAGSAV Handles ACLs

MAGSAV always copies specific ACLs unless you use the command-line option -NO_ACL to prevent the saving of ACLs. The command copies the ACLs immediately after the objects they protect.

When you save an MFD, MAGSAV automatically saves any access categories within each directory. It saves the access category before any files and subdirectories in the directory. However, MAGSAV does not save ACL information for file system objects that use default protection.

The Dumped Bit

When you invoke MAGSAV with the -UPDT option, MAGSAV sets a dumped bit to 1 on all the files that it saves to tape.

When a user modifies or creates a file, the dumped bit is set to 0. The dumped bit thus indicates whether a file has been saved in its current form.

To perform an incremental backup, you use the -INC option. MAGSAV checks the dumped bit, and only saves files on which the bit is set to 0, that is, it saves only files that have been either modified or created after the most recent backup.

MAGSAV Options

If you simply want to perform full backups you can run MAGSAV without using any command options. There are, however, a number of options that you can use to extend the command. You can

- Specify that you want to perform an incremental backup
- Specify that the dumped bit should be set to 1 for all the saved files: this enables you to do subsequent incremental backups
- Request MAGSAV always to save directories, regardless of whether their dumped bit is set
- Specify 7-track tape format, instead of the default 9-track format
- Specify a record size of 512 bytes, and suppress ACLs: required on Prime 300 machines
- Prevent the saving of ACLs
- Prevent the saving of Recovery Based Files
- Specify that you want to be able to input the tape drive unit numbers from your terminal when you run MAGSAV from a CPL program or command input file
- Save all your CAM files as DAM files, so that you can restore them on a Rev.19 system
- Create a MAGSAV tape that can be read by Rev.19 MAGRST: this enables you to move files to a Rev.19 system

▶ MAGSAV

The format of the MAGSAV command is

```
MAGSAV [options]
```

The options are described below.

Option	Description
-7TRK	Specifies 7-track tape format. The default is 9-track.
-CAM_TO_DAM -CTD	Saves all CAM files as DAM files, and is useful if you intend to restore the files on a Rev.19 system.

-INC	Specifies an incremental dump. Only files and directories with a reset (=0) dumped switch are saved. If you do not specify -INC, all files and directories are saved.
-NO_ACL -NA	Specifies that MAGSAV is not to save any ACLs or ACL references. Tapes saved with the -NO_ACL option can be restored by Rev.18 MAGRST onto a Rev.18 system. If this option is not specified, ACL information is saved to tape.
-NO_RBF	Specifies that MAGSAV is not to save any RBFs (Recovery Based Files) if these are present on a disk. See the ROAM Administrator's Guide for more information.
-P300	Specifies 512-byte records, and suppresses ACLs: required on Prime 300 machines.
-REV19	Writes a tape label that can be read by Rev.19 MAGRST. Automatically saves CAM files as DAM files, because pre-Rev.20 systems cannot handle CAM files.
-SAVE_UFD -SUFD	Specifies that MAGSAV is always to save directories, regardless of whether they have been modified. Use this option only with the -INC option.
-TTY -T	Takes the tape unit number from your terminal. All other information is taken from the current input stream. Use this option when you run MAGSAV from a CPL file or a command input file.
-UPDT	Specifies an update. The dumped switch in the UFD entry is set for files and directories that are saved from disk onto tape. If you do not specify this option, the dumped switch is not set.

HOW TO BACK UP DATA

This section describes the preparatory and overall procedures for a system backup. It consists of the following subsections

- Preparation explains the preparations needed before you begin the backup
- MAGSAV Procedure describes how to make a backup

Preparation

You should first decide whether to close the entire system to users, or just the partition that you want to back up: you must follow one of these procedures, even if you are only performing an incremental backup. For a discussion of the factors that you should consider when deciding which approach to adopt, refer to Chapter 11, SYSTEM PREPARATION PROCEDURES.

MAGSAV Procedure

This subsection describes how to perform a system backup. Unless otherwise specified, perform the steps below from the supervisor terminal. The procedure does, however, allow you to run part of the backup from a user terminal.

Note that step 1 describes the procedure for closing the entire system to users. If you have decided to close only the backup partition(s), begin at step 2.

1. If you have decided to close the entire system to users, do this by following steps (a) through (f) below, and then continue at step 3.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
                .
                .
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

Wait until

- A BATCH -STATUS command shows no jobs running
- All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
- All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

c. Remind users about the impending shutdown.

d. Log out all users:

```
OK, LOGOUT ALL
```

e. Set priority access on the partition(s) you want to back up by issuing the following command for each partition:

```
OK, SPAC diskname user-id:ALL $REST:NONE
```

where user-id is SYSTEM if you intend to run the entire backup from the supervisor terminal, or is your user-id if you intend to run part of the backup from a user terminal.

f. It may be more convenient to run the backup from a user terminal. To do this, issue the MAXUSR command, and log into a user terminal close to the tape and disk drives.

```
OK, MAXUSR
OK, LOGIN user-id
```

You can execute steps 3 through 8 from either this terminal or the supervisor terminal.

2. If you have decided to close only the backup partitions to users, do this by following steps (a) through (c) below.

   a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN AT 14:00
HOURS TODAY
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITIONS <DSK1> AND <DSK3> CLOSING DOWN IN 1 MINUTE
```

   b. Remove users from the backup partitions and set priority access by issuing the following commands for each partition:

```
OK, SHUTDN pdev
OK, ADDISK pdev;  SPAC diskname user-id:ALL $REST:NONE
```

   where user-id is SYSTEM if you intend to run the entire backup from the supervisor terminal, or is your user-id if you intend to run part of the backup from a user terminal.

   c. It may be more convenient to run the backup from a user terminal. If you wish to do so, log into a terminal:

```
OK, LOGIN user-id
```

   Choose a terminal close to the tape and disk drives. You can execute steps 3 through 8 from either this terminal or the supervisor terminal.

3. Attach to the MFD of the partition that you want to save. For example, if the partition name is DSK4, issue the command

```
OK, ATTACH <DSK4>MFD
```

4. Assign the tape drive to which you are going to make the save. For example:

```
OK, ASSIGN MT1
```

5. Mount the first reel. It is recommended that before you mount the reel, you label it with the following information:

   - Your initials
   - The date and time
   - The name of the partition being saved
   - The name of the system
   - The recording density
   - The tape number of this set, as in 'Tape 1 of <n>' : fill in the value for n when you have finished the save and know how many reels have been used
   - The fact that MAGSAV has been used to save the data: include the PRIMOS revision level

6. Invoke MAGSAV.

   ```
   OK, MAGSAV
   ```

   This initiates the MAGSAV dialog, which is described in the following section INVOKING MAGSAV.

7. When MAGSAV has finished the save, dismount the last reel and fill in the blanks on the reel labels to indicate the number of reels in the set.

8. Unassign the tape drives you have used for the backup. For example:

   ```
   OK, UNASSIGN MT1
   ```

9. If you have closed the entire system to users, return the system to service in the following manner, at the supervisor terminal.

   a. Restore normal access to the backup partitions by issuing the following command for each partition:

      ```
      OK, RPAC diskname
      ```

b. Start up the subsystems. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

c. If you have performed all the backup from the supervisor terminal and did not issue the MAXUSR command at step 1(f), you must now allow users to log in:

```
OK, MAXUSR
```

d. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

10. If you have closed only the backup partitions, return them to service in the following manner, at the supervisor terminal:

a. Restore normal access to the backup partitions by issuing the following command for each partition:

```
OK, RPAC diskname
```

b. Issue a message to inform users that the partitions are available. For example:

```
OK, MESSAGE -ALL -NOW
PARTITIONS DSK1 AND DSK3 ARE NOW AVAILABLE
```

When the save has finished, you can use MAGRST to verify the save, as summarized below in the section Verifying a MAGSAV Tape.

INVOKING MAGSAV

This section explains how to invoke MAGSAV to perform full and incremental system backups, and describes the responses that you should make to the series of prompts that MAGSAV generates. It assumes that you have already performed steps 1-4 of the overall backup procedure described above.

The section consists of the following subsections:

- Performing a Full Backup describes the MAGSAV command line you use to back up a partition
- Performing an Incremental Backup describes the MAGSAV command line you use to do an incremental backup
- MAGSAV Dialog explains the prompts that MAGSAV generates, and the responses that you should give for either a full or an incremental backup
- Verifying a MAGSAV Tape summarizes how you can use MAGSAV to list the contents of a MAGSAV tape
- Example MAGSAV Session shows a typical sequence of MAGSAV prompts and your responses

If you require information about any of the following procedures, refer to Appendix G, USER'S GUIDE TO MAGSAV AND MAGRST:

- Performing a multireel save
- Saving to a 60Mb cartridge drive
- Moving files to a Rev.19 system

Performing a Full Backup

To perform a full backup, you can invoke MAGSAV without any options, for example:

```
OK, MAGSAV
```

However, if you intend to perform incremental backups of the partition at a later date, you must include the -UPDT option on the command line. For example:

```
OK, MAGSAV -UPDT
```

This invokes MAGSAV, and begins the dialog described below in the section MAGSAV Dialog.

The -UPDT option sets the dumped bits of all the saved files and directories to 1. This setting indicates that the files and directories have been backed up. When you request an incremental backup, MAGSAV only saves those files and directories that have dumped bits set to 0.

If you do not use the -UPDT option, the dumped bits are not set on any of the files that you backup, and MAGSAV is unable to identify the files and directories that it needs to save when you subsequently request an incremental backup.

Performing an Incremental Backup

When you perform an incremental backup, you must include the -INC and -UPDT options on the command line. For example:

```
OK, MAGSAV -INC -UPDT
```

This invokes MAGSAV, and begins the dialog described below in the section MAGSAV Dialog.

The -INC option tells MAGSAV that you want to perform an incremental backup, and MAGSAV therefore checks the dumped bits of the files and directories you want to save: only objects with a dumped bit set to 0 are saved. The -UPDT option then resets the dumped bit on these objects to 1, in preparation for the next incremental backup.

When you use the -INC option, you can also include the -SAVE_UFD (-SUFD) option on the command line. For example:

```
OK, MAGSAV -INC -UPDT -SUFD
```

The -SAVE_UFD option causes MAGSAV to save a skeleton directory structure along with the altered files: this allows you to eventually restore the files either into an existing directory, or onto a blank disk. If you do not use the -SAVE_UFD option with your incremental save, MAGSAV only saves the altered files: when you restore these files, you must copy them i nto an existing directory that has the same name as the directory from which they were backed up.

MAGSAV Dialog

When you invoke MAGSAV, it presents you with a series of prompts about the save. These prompts, and the appropriate responses, are detailed below. Note that if you use MAGSAV to save to a 60Mb cartridge tape, the dialog is slightly different to that shown below: these differences are described in the section Saving to a 60Mb Cartridge Drive, in Appendix G.

Prompt	Response
Tape unit:	Supply the physical or logical tape unit number number (0-7).
Enter logical tape number:	Enter 1 for the first logical tape, 2 for the second, and so on, to divide your tape into several logical units.
Tape name:	Supply the name of the tape, which can consist of a maximum of six characters.
Date(MM DD YY):	Supply the date. PRIMOS checks the date and rejects it if it is not valid. To use the current date, respond by pressing the CARRIAGE RETURN (CR) key.
Rev no:	Supply any decimal integer. This sets the revision number field, used for visual identification during restore operations. You may therefore wish to enter the revision of PRIMOS running on your system, for example 21. If you respond by pressing the CARRIAGE RETURN (CR) key, the field is set to 0.
Name or command:	If you wish to generate an index of the save, enter the command $I [pathname] [n] If you specify pathname, the index is sent to that file and is not displayed on your screen: when the file already exists, the index is appended to the file. If you do not specify pathname, the index is displayed only on your screen. You cannot specify passwords in pathname. n specifies the number of levels in the index: the default is two levels. After you request an index, MAGSAV repeats the "Name or command:" prompt.

Name or command: Enter MFD to begin the save of the disk partition. If MAGSAV reaches the end of the reel, it rewinds the reel and prompts you for a new tape drive unit.

When MAGSAV has finished the save, it reissues the "Name or command:" prompt.

Name or command: Enter $R, to tell MAGSAV to rewind the last reel and to return you to PRIMOS.

If you want to terminate the logical tape and return to PRIMOS, enter $Q.

For details of all the possible responses that you can make to the "Name or command:" prompt, refer to Appendix G, USER'S GUIDE TO MAGSAV AND MAGRST.

Verifying a MAGSAV Tape

You can list the contents of a MAGSAV tape by running MAGRST. When MAGRST prompts

```
Tree name:
```

respond by entering

```
NW [filename] [n]
```

MAGRST prints a tape index at your terminal, but does not restore any files or directories. If you specify filename, the index is written to that file. n specifies the number of levels that you want to index.

The section HOW TO USE MAGRST in Appendix G, USER'S GUIDE TO MAGSAV AND MAGRST, describes the full MAGRST procedure.

Example MAGSAV Session

This section gives an example of the MAGSAV dialog, in which the partition DSK4 is saved to tape BAK.4, on tape drive MT1. The system supplies the current date and a zero revision number, because CARRIAGE RETURN (CR) is entered in response to the "Date:" and "Rev. no.:" prompts. This example assumes that you have already closed either the system or the partition to users, assigned tape drive MT1, and attached to the MFD of the partition you want to back up.

```
OK, MAGSAV
MAGSAV Rev.21.0 Copyright (c) Prime Computer, Inc. 1986]
Tape unit (9 Trk): 1
Enter logical tape number: 1
Tape name: BAK.4
Date (MM DD YY): (CR)
Rev no:(CR)
Name or command:   MFD
*** Start of Save ***
*** End of Save ***
Name or command:  $R
OK,
```

I

Using MAGRST to Restore System Backup Tapes

INTRODUCTION

This appendix describes how operators can run MAGRST to restore either partitions or individual files and directories. The paragraphs below describe the contents of the appendix.

THE MAGRST SUBSYSTEM explains the function of MAGRST, describes how MAGRST handles ACLs, and summarizes the command options.

MAGRST describes the command format and the command options.

HOW TO RESTORE A PARTITION describes how to restore a complete partition from a MAGSAV tape: it explains the preparatory procedures, the overall restore procedure and the responses that you should make to the MAGRST prompts.

PARTIAL RESTORES describes how to restore individual files and directories from a MAGSAV tape: it explains the overall restore procedure and the responses that you should make to the MAGRST prompts.

MULTIREEL RESTORES describes the prompts you receive when the restore is from more than one reel, and explains what actions you have to take.

THE MAGRST SUBSYSTEM

MAGRST restores file system objects from a MAGSAV tape.

How MAGRST Handles ACLs and Passwords

MAGRST always tries to restore the ACL and access category information that protects the files and directories you want to restore. However, there are, exceptions to this.

- If an object that you want to restore already exists on disk, at the point to which you are restoring data, MAGSAV overwrites the disk object, but retains the disk object's ACL or password protection: the protection on the tape is ignored.

- When the disk and tape objects that share the same name are access categories, MAGSAV does not restore the tape object, and you receive a warning. Objects that were formerly protected by the tape access category are protected by the disk access category.

- When you restore a file system object that is protected by an access category, MAGSAV does not automatically restore the access category. You receive an error message, and the object has default protection on disk. To restore specific files together with their access categories, you should first restore the access categories, then the protected files.

Note

MAGSAV writes an object to tape before it saves the ACLs to that object. Therefore, MAGRST first restores the object to disk, and then restores the ACLs. This means that you can restore an object from tape even when you have no rights to the object, but you may not be able to use the restored object.

Whenever possible, MAGRST restores ACL directories as ACL directories, and password directories as password directories. However, if there is a directory on disk with the same name as a directory on tape, but one is an ACL directory and the other a password directory, MAGRST maintains the type of protection used by the disk directory. For example, if you restore ACL directory RICHARD, but a password directory called RICHARD aleady exists on disk, MAGRST converts the restored directory from an ACL to a password directory. Conversely, if you restore a password directory to an ACL directory, the restored directory becomes an ACL directory and its files and subdirectories take the default protection of the existing directory.

Segment Directories

Note

If you restore a segment directory, and the restore overwrites an existing directory, the subfiles in the two directories are combined. Therefore, before you restore a segment directory you should check whether a segment directory of the same name already exists at the restore point. If such a directory does exist, you should either delete it or change its name. This action ensures that the restored segment directory is an exact copy of the segment directory on tape.

MAGRST Options

You can run MAGRST without using any command options. There are, however, a number of options that you can use to extend the power of the command. You can

- Specify 7-track tape format, instead of the default 9-track format
- Ask to be prompted for new slave pathnames when you restore the master RBF file into a different directory to that from which it was saved
- Specify that you want to input the tape drive unit number from your terminal when you run MAGRST from a CPL program or command input file
- Restore all your RBF subfiles as either CAM or DAM files, regardless of their format on tape

▶ MAGRST

The format of the MAGRST command is

```
MAGRST [options]
```

The options are described below.

Option	Description
-7TRK	Specifies 7-track tape format. The default is 9-track.
-CAM_RBF -CRBF	Restores all RBF subfiles as CAM files, regardless of whether they were saves as CAM or DAM files. This option thus enables you to convert all your RBF files to CAM files.
-DAM_RBF -DRBF	Restores all RBF subfiles as DAM files, regardless of whether they were saved as CAM or DAM files.
-QUERY	MAGRST asks you for a new slave pathname when you restore a master RBF file into another directory. You are also asked whether you want to deactivate existing active copies of the RBF file.
-TTY -T	Takes the tape unit number from your terminal. Takes all other information from the current input stream. Use this option when you run MAGRST from a CPL file or a command input file.

HOW TO RESTORE A PARTITION

This section describes how to use MAGRST to restore an entire partition. It consists of the following subsections

- Preparation explains the preparations needed before you begin the restore.
- Procedure to Restore a Partition describes how to restore a partition.
- Invoking MAGRST to Restore a Partition describes how to invoke MAGRST, and explains what responses to make to the MAGRST prompts.

Preparation

It is not essential to close either the system or the partition to users before you restore a partition, but it is advisable to do so if the partition has a lot of origin directories, or holds information used by most of the system. For a discussion of the factors that you should consider when deciding which approach to adopt, refer to Chapter 11, SYSTEM PREPARATION PROCEDURES.

Before you restore the disk partition, you must delete its entire contents: the procedure for doing this is described in the section Procedure to Restore a Partition, below. The reason for deleting the contents is that if the partition contains many files and directories, inconsistencies may result when you restore an older version from tape, or a disk might become full. However, if you have just created the partition with the MAKE utility, this procedure is not necessary, because the partition will be almost empty.

Procedure to Restore a Partition

This section describes how to restore a partition, or separate files and directories from the partition. unless otherwise specified, perform the steps below from the supervisor terminal. The procedure does, however, allow you to run part of the restore from a user terminal.

1. Attach to the MFD of the partition you want to restore. For example

```
OK, ATTACH <DSK1>MFD
```

attaches you to the MFD of the partition called DSK3.

2. Delete the contents of the partition, unless you have just created the partition with MAKE. If you are restoring the command device (COMDEV) issue the command

```
OK, DELETE ^CMDNCO -NO_QUERY -NO_VERIFY -FORCE
```

The argument ^CMDNCO specifies that all files and directories except CMDNCO are to be deleted. If you are not restoring the command device, issue the same command, but without the ^CMDNCO argument.

The DELETE command causes several error messages to be displayed on your screen. You can ignore these messages; they are generated because the MFD contains several files that cannot be deleted.

3. Wait for the delete process to end. This is indicated by the prompt

```
ER!
```

Delete most of the contents of CMDNCO by issuing the command

```
ER! DELETE *>CMDNCO>^MAGRST -NO_QUERY -NO_VERIFY -FORCE
```

Ignore any error messages that you receive.

4. If you have decided to close the entire system to users, do this by following steps (a) through (f) below, and then continue at step 6.

a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users plenty of advance notice of the shutdown. For example:

```
OK, MESSAGE
SYSTEM CLOSING DOWN AT 18:00 HOURS TODAY
.
.
OK, MESSAGE ALL -NOW -FORCE
SYSTEM CLOSING DOWN IN 5 MINUTES - PLEASE LOG OUT
```

b. Prevent new users from logging in, and begin shutting down the subsystems. For example:

```
OK, MAXUSR 0
OK, PROP PRO -STOP
OK, FTOP -STOP_SRVR FTP
OK, BATCH -STOP
```

If you have any jobs running, you may want to shut them down yourself, to ensure a tidy shutdown.

Wait until

- A BATCH -STATUS command shows no jobs running
- All the spooler phantoms log themselves out (indicated by messages to the supervisor terminal)
- All the FTS servers log themselves out (indicated by messages to the supervisor terminal)

c. Remind users about the impending shutdown.

d. Log out all users:

```
OK, LOGOUT ALL
```

e. Set priority access on the partition you want to restore by issuing the command

```
OK, SPAC diskname user-id:ALL $REST:NONE
```

where user-id is SYSTEM if you intend to run the entire restore from the supervisor terminal, or is your user-id if you intend to run part of the restore from a user terminal.

f. It may be more convenient to run the restore from a user terminal. To do this, issue the MAXUSR command, and log into a user terminal close to the tape and disk drives.

```
OK, MAXUSR
OK, LOGIN user-id
```

You can execute steps 6 through 11 from either this terminal or the supervisor terminal.

5. If you have decided to close only the partition to users, do this by following steps (a) through (c) below.

a. Inform users of the impending shutdown by issuing a series of messages. The first message should give users advance notice of the shutdown. For example:

```
OK, MESSAGE
PARTITION <DSK1> CLOSING DOWN AT 14:00 HOURS TODAY
                    .
                    .
OK, MESSAGE ALL -NOW -FORCE
PARTITION <DSK1> CLOSING DOWN IN 1 MINUTE
```

b. Remove users from the partition and set priority access by issuing the following commands:

```
OK, SHUTDN pdev
OK, ADDISK pdev;  SPAC diskname user-id:ALL $REST:NONE
```

where user-id is SYSTEM if you intend to run the entire restore from the supervisor terminal, or is your user-id if you intend to run part of the restore from a user terminal.

c. It may be more convenient to run the restore from a user terminal. If you wish to do so, log into a terminal:

```
OK, LOGIN user-id
```

Choose a terminal close to the tape and disk drives. You can execute steps 6 through 11 from either this terminal or the supervisor terminal.

6. Assign the tape drive from which you are going to make the restore. For example:

```
OK, ASSIGN MT1
```

7. Mount the first reel, with the write ring removed, to protect against accidental erasure. This reel should have the label, "Reel 1 of <n>".

8. Invoke MAGRST:

```
OK, MAGRST
```

   This initiates the MAGRST dialog, which is explained in the following subsection, Invoking MAGRST to Restore a Partition.

9. When MAGRST has finished the restore, dismount the last reel.

10. If you made any incremental saves after the full backup that you have just restored, repeat steps 7 through 9, using each set of incremental tapes in the saved order.

11. Unassign the tape drives you have used for the restore. For example:

```
OK, UNASSIGN MT1
```

12. If you have closed the entire system to users, return the system to service in the following manner, at the supervisor terminal.

    a. Restore normal access to the partition by issuing the command

```
OK, RPAC diskname
```

    b. Start up the subsystems. For example:

```
OK, BATCH -START
OK, PROP PRO -START
OK, FTOP -START_MNGR
OK, FTOP -START_SRVR FTP
```

c. If you have performed all the restore from the supervisor terminal and did not issue the MAXUSR command at step 4(f), you must now allow users to log in:

```
OK, MAXUSR
```

d. Issue a message advising users that the system is back up. For example:

```
OK, MESSAGE ALL -NOW -FORCE
SYSTEM IS NOW UP AND RUNNING - PLEASE LOGIN
```

13. If you have closed only the partition, return it to service in the following manner, at the supervisor terminal:

a. Restore normal access to the partition by issuing the command

```
OK, RPAC diskname
```

b. Issue a message to inform users that the partition is available. For example:

```
OK, MESSAGE -ALL -NOW
PARTITION DSK1 IS NOW AVAILABLE
```

Invoking MAGRST to Restore a Partition

This section explains how to invoke MAGRST to restore a partition, and describes the responses that you should make to the series of prompts that MAGRST generates.

To invoke MAGRST, issue the command

```
OK, MAGRST
```

The section MAGRST Options, earlier in this chapter, describes the ways that you can modify this basic command.

When you invoke MAGRST, it presents you with a series of prompts about the save. These prompts, and the appropriate responses, are detailed below.

Prompt	Response
Tape unit:	Supply a physical or logical device number (0 through 7). If you do not specify the -7TRK option on the MAGRST command line, the default is 9-track.
Enter logical tape number:	Supply a logical tape number from 1 through n (1 for the first logical tape, 2 for the second, and so on) if your tape is divided into several logical units. MAGRST positions your tape to the specified logical tape. If you enter 0, MAGRST assumes that your tape is already positioned correctly.

Note

A tape can runaway if there is only one logical tape on the currently mounted reel and you supply a number greater than 1 in response to this request. MAGRST searches endlessly for the nonexistent logical tape(s) and is not able to read the EOT (end-of-tape) marker. You must unassign your drive to abort the unsuccessful search.

MAGRST does not have to search all logical tapes when it restores sequential tapes. After MAGRST returns you to PRIMOS, the tape is not rewound. Instead, it is positioned before the beginning of the next logical tape in sequence. For sequential logical tapes, run MAGRST again and enter 0 in the response to the "Enter logical tape number:" prompt: MAGRST restores the next logical tape without rewinding and reading through the preceding logical tapes.

Name: Date (MM DD YY): Rev no: Reel no:	Check that the information displayed by MAGRST is correct. It should give the partition name and the correct date, and the reel number should be 1.

Ready to restore:

Enter one of the following responses

yes begins the partition restore. If MAGRST reaches the end of a reel, it tells you, prompts for a new tape unit, and rewinds the reel. Mount the next reel, and enter the tape drive unit number. When the restore is finished, MAGRST returns you to PRIMOS.

no causes MAGRST to request a different tape unit and logical tape. MAGRST does not restore the previously specified tape.

PARTIAL RESTORES

This section describes how to use MAGRST to restore specific files and directories from a MAGSAV tape. It consists of the following subsections

- Preparation explains the preparations needed before you begin a partial restore
- Procedure for a Partial Restore describes how to restore specific files and directories
- Invoking MAGRST for a Partial Restore describes how to invoke MAGRST, and explains what responses to make to the MAGRST prompts

Preparation

It is not necessary to close either the system or the partition to users before you begin the restore.

Procedure for a Partial Restore

This section describes the steps that you must take before and after you invoke MAGRST to restore specific files and directories.

To make a partial restore, follow the steps below.

1. Attach to an empty directory on the partition: you may have to create one. For example:

```
OK, CREATE <DSK4>TEMP_DIR
OK, ATTACH <DSK4>TEMP_DIR
```

2. Assign the tape drive from which you are going to make the restore. For example:

```
OK, ASSIGN MT1
```

3. Mount the first reel, with the write ring removed to protect against accidental erasure. This reel should have the label, "Reel 1 of <n>".

4. Invoke MAGRST:

```
OK, MAGRST
```

   This initiates the MAGRST dialog, which is described in the following subsection, Invoking MAGRST for a Partial Restore.

5. When MAGRST has finished the restore, dismount the last reel.

6. Unassign the tape drives you have used for the restore. For example:

```
OK, UNASSIGN MT1
```

7. If you made any incremental saves after the full backup that you have just restored, repeat steps 3 through 5, using each set of incremental tapes in the order they were saved.

8. At this point the restored files and directories are in the temporary directory. Use the COPY command to copy each file and directory to the correct directories. When you do this, change the name of the destination object, so that you do not overwrite the existing objects. Include the -COPY_ALL and -DELETE options on your COPY command line. -COPY_ALL ensures that all the attributes are copied, and DELETE deletes the file or directory from the temporary directory. For example:

```
OK, COPY FILE1 <DSK4>RICHARD>FILE1.BAK -COPY_ALL -DELETE
```

   would copy FILE1 from the temporary directory to top-level directory RICHARD, and rename the file FILE1.BAK.

9. If you have to restore files and directories from any further MAGSAV volumes, repeat steps 3 through 8.

Invoking MAGRST for a Partial Restore

This section explains how to invoke MAGRST to perform a partial restore, and describes the responses that you should make to the series of prompts that MAGRST generates.

To invoke MAGRST, issue the command

```
OK, MAGRST
```

The section MAGRST Options, earlier in this chapter, describes the ways that you can modify this basic command.

When you invoke MAGRST, it presents a series of prompts about the save. These prompts, and the appropriate responses, are detailed below.

Prompts	Response
Tape unit:	Supply a physical or logical device number (0 through 7). If you do not specify the -7TRK option on the MAGRST command line, the default is 9-track.
Enter logical tape number:	Supply a logical tape number from 1 through n (1 for the first logical tape, 2 for the the second, and so on) if your tape is divided into several logical units. MAGRST positions your tape to the specified logical tape. If you enter 0, MAGRST assumes that your tape is already positioned correctly.

Note

A tape can runaway if there is only one logical tape on the currently mounted reel and you supply a number greater than 1 in response to this request. MAGRST searches endlessly for the nonexistent logical tape(s) and is not able to read the EOT (end-of-tape) marker. You must unassign your drive to abort the unsuccessful search.

MAGRST does not have to search all logical tapes when it restores sequential tapes. After MAGRST returns you to PRIMOS, the tape is not rewound. Instead, it is positioned before the beginning of the next logical tape in sequence. For sequential logical tapes, run MAGRST again and enter 0 in the response to the "Enter logical tape number:" prompt: MAGRST restores the next logical tape without rewinding and reading through the preceding logical tapes.

Name:
Date (MM DD YY):
Rev no:
Reel no.:

Check that the information displayed by MAGRST is correct. It should give the partition name and the correct date, and the reel number should be 1.

Ready to restore:

Enter one of the following responses

pa begins the partial restore

no causes MAGRST to request a different tape unit and logical tape.

Tree name:

Enter the pathnames of the files and directories that you want to restore. Replace the <partition> part of the pathname with MFD>. For example

```
MFD>PETER>FILE3
```

After you enter each pathname, MAGRST repeats the "Tree name:" prompt. You can specify up to ten pathnames in this way.

Do not specify the same file name as the final component in two pathnames. If you do, the second restore overwrites the first, even if the full pathnames are different.

If you want to restore more than ten files and directories, repeat steps 3-8 in the subsection Procedure for a Partial Restore.

Enter a CARRIAGE RETURN (CR) to begin the restore process. After each file or directory is restored, the message "File complete" is displayed at your terminal. The message "Restore complete" is displayed when the end of the logical tape is reached.

MULTIREEL RESTORES

When MAGRST encounters the physical end-of-tape (EOT) marker, it displays the prompt

```
Mount Reel no: <n>
E-O-T has occurred, mount next tape
New Tape unit (9 Trk):
```

where n specifies the reel that you should mount.

You can either enter the same tape drive unit number that you used for the first reel or you can specify a different unit.

If the new tape drive is not at load point, you receive the prompt

```
(Tape not at load point)
Do you want to rewind the tape?  (YES/NO):
```

You must answer yes if you receive this message for any reel except the first: you cannot start the save from the middle of any reel except the first.

If you mount a continuation reel out of sequence, you receive the prompt

```
***WARNING -- Reel number not in sequence.
Continue with this reel (Y or N)?
```

Answer no to this question, and mount the correct reel: you must mount reels in sequence.

When you run MAGRST from either a CPL program or a command input file, you may want to answer these prompts from your terminal. If you do, you must include the -TTY option on the command line.

J

MAGSAV and MAGRST Messages

INTRODUCTION

This appendix lists and explains, in alphabetical order, the messages you may receive from MAGSAV or MAGRST.

- ***** Disk is full *****
  Use 'DELETE' command to delete unnecessary files.
  Type 'S' to continue.

The partition to which you are restoring is full and MAGRST cannot continue until you delete some files.

- **** Disk is full *****
  Disk full has occurred during restore of an RBF file
  The RBF file will be deleted

There is insufficient room on the disk to restore the tape. You must delete unnecessary files. Use the DELETE, LD, and COPY commands, but not the AVAIL command, then type start to continue restoring. Subsequent disk full messages may occur.

- ***** Quota exceeded *****
  Use 'DELETE' command to delete unnecessary files. Type 'S' to continue.

The disk quota for a directory somewhere within the current tree is exceeded. After printing the error message, MAGRST exits to command level. Use the DELETE, LD, and COPY commands, but not the AVAIL command, then type start to continue restoring. Subsequent disk full messages may occur.

- ***** Quota exceeded *****
  Quota exceeded has occurred during restore of an RBF file
  The RBF file will be deleted

There is insufficient room on the directory to restore the tape. Either delete files or reset the quota. Use the DELETE, LD, and COPY commands, but not the AVAIL command, then type start to continue restoring. Subsequent disk full messages may occur.

- ***WARNING -- Reel number not in sequence.
  Continue with this reel (Y or N)?

A tape with an unexpected header is mounted. You may reject this tape and mount another. Respond with n if you mount another tape.

- ***WARNING***
  Unable to recover to beginning.
  Restarting at name : filename
  If you continue, you will have to keep the reel which failed.

There is an unrecovered error and MAGSAV is unable to recover to the beginning of the tape, therefore it will recover from filename.

- ACL could not be read: pathname
  ACL omitted on: pathname

MAGSAV was unable to read the ACL that protects pathname. The object will be saved with default protection.

- Bad ATTACH on: filename
  Omitting Tree-path: pathname

MAGRST was unable to attach to a directory while restoring it. Subordinate files and directories cannot be restored.

- Bad ATTACH: pathname
  The next command must be an ATTACH.

An attempt to illegally use $A. MAGSAV/MAGRST will not continue until a correct $A is performed. You have inadequate rights to the directory or the attach point does not exist.

- Bad filetype from tape: n

A pathname block containing an illegal file type has been read from tape n. MAGRST will abort.

- Bad label record id.

A new reel has been mounted, but the first record is not a MAGSAV label. MAGRST prompts you to load a new tape.

- BADSPT file already exists, file omitted: BADSPT

Cannot overwrite the BADSPT file.

- Can't open Index file.

The file you attempted to open for the index cannot be opened. MAGSAV repeats the "Name or Command:" prompt, MAGRST repeats the "Ready to Restore:" prompt.

- Cannot attach back to current ufd.

You have not been able to attach back to your current directory after RBF file handling.

- Cannot delete RBF master: filename
  File not restored

Unable to delete the RBF master to replace it. Restore of RBF file aborted.

- Cannot save home pathname
  Type it in

If the subroutine GPATH$ fails, then MAGSAV or MAGRST asks you to type in the pathname for the slave file. If you give a bad pathname, then the slave (and the rest of the RBF) is not restored.

- Cannot validate RBF file

Problems with restoring RBF files. Contact your System Administrator.

- Category ACL already exists: pathname omitted.

The access category pathname on the tape was not restored because it already exists on the disk. If you want to restore the category from the tape, you must delete the one currently on the disk. The filename or directory has been restored, but the access category was not.

- Contiguous file extent map block missing!

MAGRST has not been able to read the contiguous file extent map.

- Couldn't read first record.

The first record on your tape could not be read. Try a new tape.

- Couldn't read UFD record, File omitted: filename

A directory record on your tape could not be read. The directory and its subordinate files cannot be restored.

- Date (MM DD YY):

Date of the save. Input with MAGSAV (default = today's date), output by MAGRST.

- Disk file is RBF, tape file is not.
  Filetype mismatch, file omitted: filename

You have attempted to restore a non-RBF file onto an existing RBF file of the same name.

- Due to bad tape, additional tape marks were added to the end logical tape. Do not append other Magsav logical tapes to this reel.

More than one end-of-tape markers were put onto the tape; hence, no new data can be added to the end of the logical tape.

- E-O-T has occurred, mount next tape

The currently used tape has reached the end; you should mount another tape.

- Empty disk!

MAGSAV is operating on an empty disk. You may attach elsewhere using the $A command.

- Enter logical tape number:

Prompts you for the number of the logical tape to be read or written.

- Enter new pathname for slave

You have used the -QUERY option and a slave with the same name already exists. You should enter a new RBF slave pathname.

- ERROR - removing EOLT.
  Do extra saves on new tape.

When the $A command is given, an end-of-logical-tape (EOLT) marker is written in case there is an error in the $A command. If there is an error when an attempt is made to remove the EOLT, this message is sent to the user and the subsystem aborts.

- Error accessing file, file omitted: filename

MAGRST could not open or create the requested file. MAGRST ignores the file, and attempts to restore the next file you have specified.

- Error: Can't find entry in ufd: treename

The requested entry cannot be found in the directory.

- Error building up RBF treename: pathname
  File not saved

The RBF treename is incorrect. Contact your System Administrator.

- Error creating Category ACL: aclname
  Category ACL omitted: filename

The access category filename could not be created, because of an error. The category will be omitted. Note that this causes further error messages for objects that were protected by this category.

- Error: End of tape incomplete.

The end of the logical tape is incomplete: MAGSAV allows you to close the logical tape and append a new tape.

- Error: FM detected instead of label.

A file marker found where there should be a tape label: you cannot append to the tape, and should use a new tape.

- Error: Invalid tape label detected.

An invalid tape label found: you cannot append to the tape, and should use a new tape.

- Error: No end of logical tape found.

MAGSAV has not found the end-of-logical-tape marker: MAGSAV allows you to close the logical tape and append a new tape.

- Error: No FM after label found.

There is no file marker after the label: you cannot append to the tape, and should use a new tape.

- Error: No FM found at logical tape end.

There is no file marker at the end of the logical tape: you cannot append to the tape, and should use a new tape.

- Error: No FM or data found after label.

The file marker or data is missing from the tape: MAGSAV allows you to close the tape and append another logical tape.

- Error: No second FM found.

The second file marker is missing from the end of the tape: you cannot append another logical tape, and should use another tape.

- Error: No tape label found. Logical tape missing.

The tape label and associated data have not been found.

- Error opening current UFD: pathname
  ATTACH and type 'S'

Unsuccessful MAGRST's $A command or there was a "No ufd_attached" error. Issue an ATTACH command and type start.

- Error reattaching in tree.

A fatal error caused by attempting to attach during a restore.

- Error: Read error after first FM.

A read error has occurred after the first file marker: you cannot append to the tape, and should use a new tape.

- Error: Read error after label.

A read error has occurred after the label has been found: you cannot append to the tape, and should use a new tape.

- Error reading CATEGORY ACL: pathname
  Category ACL omitted: pathname

MAGSAV could not save the access category, which will therefore be ignored.

- Error reading DISK QUOTA: pathname
  QUOTA omitted on: pathname

MAGSAV encountered an unexpected error while reading the disk quota pathname. It has been saved as a non-quota directory.

- Error reading tape label.

The subsystem cannot read the label on the tape. Try another tape.

- Error setting MXL, continuing restore.

An error has occurred while setting the extent map size.

- Error setting Segdir size
  - on: pathname

An error occurred when setting the size of the segment directory. MAGRST does not restore the segment directory.

- Error setting Specific ACL: filename
  ACL omitted on: filename

Problems encountered with ACL protecting filename. Filename will be default protected.

- Error using Category ACL "aclname":
  ACL omitted on: filename

Filename should be protected by category aclname, but this category does not exist. This can happen when saving or restoring the object by name. The object will be default-protected.

- Error writing file: filename
  File truncated: filename

MAGRST encountered an unexpected error writing filename. Filename is truncated.

- Error: Cant find entry in UFD: filename

This is a fatal error.

- Exit from rbf failed
  Cannot attach back to current UFD

This is a fatal error. Contact your System Administrator.

- File complete.

Message when using partial recovery facility.

- File in use, file omitted: filename

A file already in use by other users is being either saved or restored. MAGSAV or MAGRST ignores the file, and the save or restore continues with the next file.

- File in use: filename
  Continuing with next file...

MAGSAV cannot open the file for reading because it is held open elsewhere. The file will not be saved.

- File not restored

Slave warning message.

- File omitted: filename

Error in pathname build.

- File protected, file omitted: filename

A file cannot be saved or restored, because it is protected. MAGSAV or MAGRST ignores the file, and the save or restore continues with the next file.

- File read-protected

You do not have sufficient access to the file to be able to read it.

- Filetype mismatch, file omitted: filename

The subsystem is unable to restore from tape an object that has the same name as, but is of a different type from, as an object on the disk. The file is ignored.

- Ignoring Acls and Quotas.

The message displayed when running under PRIMOS II.

- Ignoring Acls.

The message displayed when using -NO_ACL.

- Improper access of restricted file. filename (CODANL)
  Error accessing file, file omitted: pathname

An RBF file with this name already exists. You can restore an RBF file only if no such file already exists on disk.

- Invalid command.

Command not recognized from MAGRST Ready to restore: prompt.

- Invalid recid: n
  No end logical tape record!!

A bad data name or label fault was encountered. The subsystem will abort.

- Label written after n retries.

This is a warning message only, advising you of problems when writing the tape label.

- MAGRST cannot run under DOS! *****
  ****** Program run aborted! ******

From Revision 20.0 onwards, MAGRST does not run under PRIMOS II. PRIMOS II cannot handle hashed directories, and your directory would be corrupted if PRIMOS II were to write to it.

- Magsav unable to continue

MAGSAV cannot find a directory in a pathname. MAGSAV prints the PRIMOS error message, plus this message, and exits.

- Max number of file units already open

MAGSAV has reached the limit of the number of file units it can hold open.

- Mount Reel no: n

End of physical tape. The next reel is asked for.

- MT File Error n n n... (Recovered/Unrecovered)

Errors occurred in handling files. Each n is an octal number; an indicator of the state of error recovery is displayed.

- MT n is offline or not ready.

Drive n cannot be used. You must fix the drive to continue with your save or restore operation.

- MT Read Error n n n... (Recovered/Unrecovered)

Errors occurred in reading from tape. Each n is an octal number; an indicator of the state of error recovery is displayed.

- MT Rewind Error n n n... (Recovered/Unrecovered)

Errors occurred in rewinding the tape. Each n is an octal number; an indicator of the state of error recovery is displayed.

- MT Write Error n n n... (Recovered/Unrecovered)

Errors occurred in writing to tape. Each n is an octal number; an indicator of the state of error recovery is displayed.

- n Recovered MT IO errors.

n is the number of errors corrected on that tape.

- Name or command:

This is the MAGSAV prompt for user actions, and is issued as part of the MAGSAV dialog.

- New Tape unit

Request you for the number of the tape drive for the next tape.

- New version of EPF file filename.RUN now in place.
  Old version of active EPF file now named filename.RPx.

You have attempted to restore an in-use EPF. MAGRST changes the disk file name from filename.RUN to any one of the files from filename.RP0 through filename.RP9, depending on what is available. If all ten RPn files (0 through 9) are present, then MAGRST usually overwrites RP0. Use the -QUERY option to see the name to which the in-use EPF file has been changed or to force MAGRST to ask you which EPF file to delete when all ten RPn files are present.

- No EOF after label.

Problems reading tape labels, because the tape format is incorrect. MAGRST had expected to read a file marker after the tape label. MAGRST prompts for the next reel.

- No end logical tape record!!

The end-of-tape marker has not been found.

- Not an ACL UFD. ACL reference: pathname omitted.

Unable to set access categories in a password directory.

- Not an ACL UFD. Category ACL: pathname omitted.

Unable to set an access category in a password directory.

- Object already existed. ACL reference: pathname omitted.

MAGRST will not overwrite ACL protection on objects it did not create. The protection of the object remains unchanged.

- Object to set ACL on does not exist: pathname - ACL omitted.

MAGRST has found a data block that contains ACL information for pathname, but pathname itself does not exist. The ACL data block is ignored.

- Offline or not ready.

The tape drive you requested is not in an online usable state.

- OK to delete EPF file FILENAME.RPn?

This is asked when you select the -QUERY option with MAGRST. All ten possible RPn files (0 through 9) are present and you must delete one in order to change the in-use EPF to an RPn file. The tape file can then be restored to filename.RUN. Delete .RPn files as they accumulate.

- Old partitions are not supported

The partition is a pre-Rev. 12 partition. MAGSAV aborts.

- Password UFD restored as ACL UFD: pathname

This is a warning message; conflicts may arise with file access.

- Prob opening current UFD: pathname
  ATTACH and type 'S'

The current directory could not be opened for reading. Check to make sure that you have list access rights. Try to attach again, and type S.

- Problem with slave: slavename

An error reading the slave has occurred; the error is reported by a previous message. The rest of the RBF file will not be saved.

- ROAM cannot be re-invoked, you cannot restart

An error has occurred when re-invoking ROAM. Contact your System Administrator.

- RBF master name: filename exists, but is not an RBF file
  File not restored

Mismatch of file types. The restore of this non-RBF file is aborted.

- RBF slave pathname incorrect

The pathname of the slave held by ROAM is incorrect. Contact your System Administrator.

- Ready to restore:

MAGRST prompts you for additional input, as part of the MAGRST dialog.

- Recovery retries exceeded.

The maximum number of permitted attempts to correct write errors has been made.

- Restarting current logical tape.

Error recovery message.

- Restarting current reel (Reel n).

An unrecovered error has occurred and the current reel will be restarted.

- Restore aborted on: filename

Warning from bad attempted restore.

- Restoring ACL UFD as Password UFD: pathname

This is a warning that that the directory on tape is an ACL directory, but has been restored as a passworded directory: the ACL protection on the restored object has therefore been lost.

- Restoring Password UFD into existing ACL UFD: pathname

The directory on the tape is a password directory, but the one on the disk is an ACL directory. The objects restored into the directory will all be default-protected.

- Rev no:

MAGSAV prompts for the revision number of the tape, as part of the MAGSAV dialog.

- -SAVE_UFD may only be used with -INC

If you include the -SAVE_UFD option on the MAGSAV command line, you must also include the -INC option, otherwise MAGSAV aborts.

- Save of this RBF file aborted

Warns you that the file written to tape is incomplete.

- Slave resides on a nonlocal machine

The subsystem cannot locate a slave process that is on a remote machine: slaves must be on a local machine.

- Slavename already exists

You cannot duplicate processes with identical names. RBF will not be recovered.

- Syntax error - please reenter

This error is produced when an incorrect input was given for a name or command prompt.

- Syntax error - Treenames not allowed

You cannot give a pathname for the NAME OR COMMAND prompt given by MAGSAV. Specify only filenames or directories. Use the $A command to attach to the proper directory, then specify the filename or type "*" to save the entire directory.

- Tape file is RBF, disk file is not.
  Filetype mismatch, file omitted: filename

You have attempted to restore an RBF file onto an existing non-RBF file.

- Tape is Write protected.

The write ring is not on the tape and the tape may not be overwritten.

- Tape name:

Prompts you for a name (a maximum of 6 characters) for the tape header.

- (Tape not at load point)
  Do you want to rewind the tape? (YES/NO):

This is asked if the physical reel(s) of a save or restore are not at load point. If the physical reel of a save or restore is the second or subsequent reel, you must answer YES. You cannot save or restore from the middle of the second or subsequent reel(s).

- TAPEOF -- MT status error.

There was a fatal error from inside the routine for writing file markers.

- Token keyword is not a command option.

Extraneous characters (keyword) have been put on the command line.

- Token option is not a command option.

You have specified an invalid option.

- Too many levels.

MAGSAV has attempted to save more than 18 levels of subdirectories. MAGSAV ignores objects beyond level 18, returns to the previous level, and saves the files at that level. It saves the rest of the tree structure in the same manner, ignoring objects beyond level 18.

- Too many levels of nested segdir.

You have tried to restore a segment directory with more than 16 levels of nesting. MAGRST ignores the segment directory.

- Too many names -- Starting restore.

You have given too many names to the Tree name: prompt. The restore begins.

- Top level UFD ufdname does not exist, unable to restore the slave

You cannot use the RBF slave on a nonexistent directory.

- Tree name:

MAGRST issues this prompt as part of the MAGRST dialog when you make a partial restore.

- Unable to Backspace. (GAP)

Error in positioning tape. The subsystem may issue this message when it attempts error recovery. You are prompted to mount a new tape.

- Unable to determine whether slave is on local machine

Problems in locating slave processes: the save of the ROAM file is aborted.

- Unable to Erase Tape Mark. (GAP)

Error in positioning tape. The subsystem may issue this message when it attempts error recovery. You are prompted to mount a new tape.

- Unable to exit ROAM

This is a fatal error.

- Unable to find Tape Mark. (GAP)

Error in positioning tape. The subsystem may issue this message when it attempts error recovery. You are prompted to mount a new tape.

- Unable to position tape. (POSIT)

MAGSAV cannot move the tape to the correct position.

- Unable to process slave

Slave warning message.

- Unable to set QUOTA.
  QUOTA omitted on: ufd

MAGRST was unable to set the disk quota on ufd which it had just created. ufd is restored as a non-quota directory.

- Unable to write label. Mount new tape.

Hardware status: n

The subsystem cannot write a label on this tape. See Table D-1 for an explanation of n. Use another tape.

- Unable to write Tape Mark. (GAP)

Error in positioning tape. The subsystem may issue this message when it attempts error recovery. You are prompted to mount a new tape.

- Unexpected EOF encounted: filename
  Assuming End of log. tape

An end-of-file marker appeared where one was not expected.

- Unexpected EOF encountered: filename
  Assuming End of Reel.

An end-of-file marker appeared where one was not expected. You can mount a new reel.

- Unknown nondefault ACL type.
  ACL omitted on: pathname

The entry for pathname indicated that the object was default-protected, but did not indicate the protection type (specific or category). The object saved is default-protected.

- Unrecovered

An error occurred when using this tape or drive. Try another reel or unit.

- Unsupported option: option

You gave an unrecognized option on the command line.

- Usage: MAGRST -7TRK -TTY -QUERY -DAM_RBF -CAM_RBF
  -7TRK : Tape unit is 7-track.
  -TTY : Tape unit input from terminal.
  -QUERY : Query RBF file handling.
  -DRBF : Restore RBF subfiles as DAM files.
  -CRBF : Restore RBF subfiles as CAM files.

An invalid MAGRST option will produce this message.

- Usage: MAGSAV -7TRK -INC -UPDT -TTY -P300 -NO_ACL -SAVE_UFD
  -NO_RBF -CAM_TO_DAM -REV19
  -7TRK : Tape drive is 7-track.
  -INC : Save only changed files.
  -UPDT : Set the dumped switch.
  -TTY : Get unit number from Terminal.
  -P300 : Use 512 word fixed size records.
  -NO_ACL : Do not save ACLs.
  -SAVE_UFD : Save all directory headers if -INC
  -NO_RBF : Do not save RBF files.
  -CAM_TO_DAM: Convert contiguous files to DAM files
  -REV19 : Write a tape readable at Rev.19

An invalid MAGSAV option will produce this message.

- WARNING-saving file of sub-UFD called MFD.

An entry with the name MFD is being saved, but not at MFD level. This is only a warning. Your save operation will continue.

- WARNING: ROAM not invoked, RBF files will not be saved
  RBF file filename will not be saved

RBF (Recovery Based Files) files are not saved. Contact your System Administrator.

- WARNING: ROAM not invoked, RBF files will not be restored.

RBF files have not been recovered. Contact your System Administrator.

- WARNING: ROAM not shared, RBF files will not be saved
  RBF file filename will not be saved

RBF (Recovery Based Files) files are not saved. Contact your System Administrator.

- WARNING: ROAM not shared, RBF files will not be restored
  RBF file filename will not be restored

RBF (Recovery Based Files) files are not recovered. Contact your System Administrator.

- Writing index file.
  Index truncated and closed.

Index files are not held open after disk-full or max-quota errors.

- Wrong tape.

A new reel with a name different from the previous reel has been loaded and read. MAGRST prompts you to mount a reel from the correct volume.

- You are not attached to an MFD.

Warning that you are not at MFD level. Your operation continues.

K

Transporting Data Between PRIMOS and UNIX: UX_TAPE

INTRODUCTION

This appendix explains how to use the UX_TAPE command to transfer data by tape between 50 Series and PRIME EXL, MXCL, and PXCL Systems.

UX_TAPE saves files to tape in a format that the UNIX CPIO and TAR utilities can read, and it restores files from a tape created by either CPIO or TAR.

The appendix consists of the following sections.

UX_TAPE COMMAND FORMAT describes the UX_TAPE command format, arguments and options.

SAVING PRIMOS FILES explains how to save PRIMOS files to tape in a format that CPIO and TAR can read, for restoration on a UNIX system.

RESTORING UNIX FILES TO A 50 SERIES SYSTEM explains how to restore files from a tape in CPIO or TAR format onto a 50 Series system.

SAVING FILES ON A UNIX SYSTEM describes how you use CPIO and TAR to save files to tape in a format that UX_TAPE can read.

RESTORING FILES TO A UNIX SYSTEM describes how you restore files written by UX_TAPE onto a Unix system.

FILENAME TRANSLATION lists how UNIX characters map to PRIMOS characters, and details the filename translation rules.

UX_TAPE COMMAND FORMAT

The format of the UX_TAPE command is

```
UX_TAPE source-pathname -MT n { -LIST
                              [ { -RESTORE } ] }   [options]
                              [ { -SAVE    } ] }
```

The UX_TAPE command line must include at least one of the following options: -LIST, -RESTORE, -SAVE. You can use -LIST alone, or in conjunction with either -RESTORE or -SAVE. The -RESTORE and -SAVE options are mutually exclusive, that is, you can only include one of these options on the UX_TAPE command line.

Descriptions of the arguments and options follow.

Argument	Description
source-pathname	Identifies the objects you want to save or restore. You can use wildcarding and iteration.
-MT n	Specifies the unit number n of the tape drive on which the reel is mounted. The drive must be online and assigned to you.

Option	Description
-APPEND	Save only: appends the files to the tape. The write must be in the same format (CPIO-readable or TAR-readable) as the files already on the tape.
-BLOCK_SIZE n	Save only: specifies the block size n, in bytes, to use when writing. The default value for n is 10K bytes. This option is an alternative to the -BLOCKING_FACTOR option, and is for

users familiar with the PRIMOS concept of block size. A block size of 512 bytes is equivalent to a blocking factor of 1. -BLOCK_SIZE and -BLOCKING_FACTOR are mutually exclusive options: do not use both on the same command line.

{ -BLOCKING_FACTOR n | -BF }

Save only: specifies the blocking factor n to use when writing. n is in the range 1-20, and the default value is 20. This option is an alternative to the -BLOCK_SIZE option, and is for users familiar with the UNIX concept of blocking factors. A blocking factor of 1 is equivalent to a block size of 512 bytes. -BLOCK_SIZE and -BLOCKING_FACTOR are mutually exclusive options: do not use both on the same command line.

-CPIO

Save: writes the tape in a format that the UNIX CPIO utility can read.

Restore: reads a tape written in CPIO format.

-LCASE

Save: the filename translation rules are as documented in Table K-2. For example, PRIMOS pathname FILEA converts to UNIX pathname filea, and /F/I/L/E/A converts to FILEA

Restore: the filename translation rules are as documented in Table K-3. For example, UNIX pathname filea converts to PRIMOS pathname FILEA, and FILEA converts to /F/I/L/E/A.

This option is the UX_TAPE default for both saves and restores.

-LIST

This is a mandatory option if you do not include the -SAVE or -RESTORE option on the command line. When you use -LIST on a command line that does not include either -SAVE or -RESTORE, -LIST lists at your terminal the contents of the tape, but does not restore them. If you use -LIST in conjunction with -SAVE or -RESTORE, the results are as follows:

	Save: lists, at your terminal, the PRIMOS name of each file that is successfully saved to tape. Restore: lists, at your terminal, the PRIMOS name of each file that is successfully restored from tape.
-NO_QUERY	Restore only: suppresses queries when a restored file has the same name as a file already in the current directory. The restored file automatically overwrites a file with the same name.
-NO_REWIND	Save and restore: suppresses tape rewind after the save or restore has ended.
-NO_TRANSLATE	Save and restore: suppresses the text translation function. It is used when the data is in binary format.
-POS n	Save and restore: positions the tape n filemarks from the beginning of the tape, before the save or restore begins. This option is not valid for a 60Mb cartridge tape drive.
-RESTORE	Restore only: mandatory option to restore objects from tape. This option tells UX_TAPE to do a restore.
-SAVE	Save only: mandatory option to save objects to tape. This option tells UX_TAPE to do a save.
-SWAP	Save and restore: reverses the order of the bytes in each word. This option provides compatability with systems on which data words have the least significant byte first.
-TAR	Save: writes the tape in a format that the UNIX TAR utility can read. This is the command default for a save. Restore: reads a tape in TAR format. This is the command default for a restore.

-UPCASE	Save: all PRIMOS pathnames convert to uppercase UNIX pathnames. For example, PRIMOS pathnames FILEA and /F/I/L/E/A both convert to UNIX pathname FILEA. Restore: all UNIX pathnames convert to uppercase PRIMOS pathnames. For example, UNIX pathnames filea and FILEA both convert to PRIMOS pathname FILEA.

SAVING PRIMOS FILES

This section describes how to save files from a 50 Series machine to tape in a UNIX-compatible format.

Default UX_TAPE Command

The default command

```
UX_TAPE source-pathname -MT 0 -SAVE
```

saves the PRIMOS files and directories specified by source pathname to tape in a format that the TAR utility can read. source pathname is a PRIMOS pathname. The source pathname is converted to a UNIX pathname in accordance with the rules detailed in Table K-2, at the end of this appendix. The command automatically rewinds the tape at the start and end of the save, and the save starts from the beginning of the tape. The command translates all characters to ASCII-8 format on the tape.

Pathnames

UX_TAPE converts PRIMOS pathnames to UNIX pathnames when it saves files to tape. The section FILENAME TRANSLATION, later in this appendix, details the default UX_TAPE conversion rules, and lists how characters map between PRIMOS and UNIX. The UX_TAPE option -LCASE also invokes the default conversion rules. If you want all PRIMOS pathnames to convert to uppercase UNIX pathnames, use the -UPCASE option.

Directories: When you save a directory, UX_TAPE writes a UNIX-style pathname on the tape. For example, if PETER were a top-level directory, the default UX_TAPE command would convert the PRIMOS pathname PETER>TESTFILE>RESULTS to /peter/testfile/results. If PETER were not a top-level directory, the first / would be omitted and the default conversion would be to peter/testfile/results.

Note

The concept of a segment directory does not exist in UNIX, and therefore UX_TAPE does not save segment directories.

Filenames: The maximum length of a UNIX filename is 14 characters. If the PRIMOS filename exceeds 14 characters, UX_TAPE saves the file and issues a message to warn you that the filename has been truncated.

Note

The truncation of long PRIMOS filenames may result in several files on tape that share the same filename.

Access Rights

UX_TAPE does not save access categories, and if an access category is one of the objects you select to save, you receive an error message.

Command-line Options

When you use UX_TAPE to save data, the -SAVE option is mandatory. Other command-line options enable you to

- Append objects to the tape (-APPEND)
- Specify either the block size or the blocking factor (-BLOCK_SIZE) (-BLOCKING_FACTOR)
- Write objects to tape in a format that CPIO can read (-CPIO)
- Specify that you want UX_TAPE to follow the default rules for converting PRIMOS pathnames to UNIX pathnames (-LCASE)
- List saved objects at your terminal (-LIST)
- Suppress tape rewind at the end of the save (-NO_REWIND)
- Suppress the translation to ASCII-8 (-NO_TRANSLATE)

- Position the tape at a specific filemark before the save begins (-POS)
- Change the order of the most significant and least significant bytes (-SWAP)
- Specify that you want to write objects to tape in a format that TAR can read (-TAR)
- Specify that you want UX_TAPE to convert all PRIMOS pathnames to uppercase UNIX pathnames (-UPCASE)

The section UX_TAPE COMMAND FORMAT, earlier in this appendix, describes the function of each option in detail.

Examples of Saves

This section gives examples of how you use UX_TAPE to save files and directories.

Example 1: The following example saves the contents of your current directory to tape, in a format that the UNIX TAR utility can read. The -LIST option generates a listing of the save at your terminal.

```
OK, UX_TAPE @@ -MT 0 -SAVE -LIST
[UX_TAPE Rev. 22.0 Copyright (c) 1987, Prime Computer, Inc.]
MY_FILE
NEWPROG
DIR1>TEST_FILE1
DIR1>TEST_FILE2
4 files saved
OK,
```

The files are written to tape with the following UNIX pathnames:

```
my_file
newprog
dir1/test_file1
dir1/test_file2
```

If DIR1 were a top-level directory, the UNIX pathname would be preceded by the symbol /, for example /dir1/test_file1.

Table K-2, at the end of this appendix, details the default PRIMOS to UNIX filename translation rules.

Example 2: If the UX_TAPE command line includes the option -UPCASE, files are written to tape with upper case UNIX pathnames. For example, continuing Example 1, the command

```
OK, UX_TAPE @@ -MT 0 -SAVE -LIST -UPCASE
```

would write the files to tape with the following UNIX pathnames:

```
MY_FILE
NEWPROG
DIR1/TEST_FILE1
DIR1/TEST_FILE2
```

Example 3: The following example command appends PRIMOS files TEST2 and TEST3 from your current directory to the reel on drive MT0, translating the pathnames to test2 and test3 (see Table K-2 for the default UX_TAPE translation rules).

```
OK, UX_TAPE (TEST2 TEST3) -MT 0 -CPIO -APPEND
```

In this example, UX_TAPE writes the files in a format that the UNIX CPIO utility can read. All files already on the tape must also be in this format. If the existing files on the tape are not in CPIO format, you receive an error message.

Exiting From a Save

If you use <CONTROL>P to quit from the save, UX_TAPE terminates the save in a tidy manner, so that you can restore the saved objects, and returns you to PRIMOS. You cannot reenter the save from the point at which you quit by entering either ren or s; you must issue the UX_TAPE command again if you want to save more objects.

End-of-reel During a Save

The way in which UX_TAPE handles the end of a reel depends upon whether you are writing a tape for CPIO, or TAR to read.

CPIO-readable Tape: When it reaches the end of a reel, UX_TAPE truncates the tape at the end of the last file saved and asks you to mount another reel:

```
End of reel has occurred.
Last file name saved on this tape is <filename>.
Please enter new tape unit.
```

Mount a new reel and enter the tape drive unit number. UX_TAPE will continue the save.

TAR-readable Tape: The TAR format does not allow continuation reels. When UX_TAPE reaches the end of a reel it terminates the save. If an object has been partly saved when UX_TAPE reaches the end of the tape, you receive a warning message that the object has been truncated. To continue, mount another reel and reissue the UX_TAPE command.

If you think that a save may require more than one reel, include the -LIST option on the command line. This will allow you to monitor the progress of the save.

Tape Errors During a Save

If a PRIMOS file system error occurs, you receive an error message, and UX_TAPE attempts to continue with the save if there are any more objects to save.

In addition to the PRIMOS errors, you may receive one of the following error messages concerning the tape.

- Device not assigned

  The tape drive is not assigned to you, and the command will abort. Use the ASSIGN command to assign the tape drive.

- Device offline or not ready

  The tape drive is not online, and the command will abort. Put the drive online, and begin the save again.

- Device is write protected

  The reel does not have a write-permit ring, and the command will abort. Put a write-permit ring on the reel, and begin the save again.

- Unknown format tape

  You have attempted to append files written in a format different to the format of the files already on tape. A tape can only hold files in one format, CPIO or TAR.

- Unrecoverable error on tape. Please enter new tape unit.

  UX_TAPE cannot write to the tape. Mount a new reel and enter the tape drive unit number. UX_TAPE will start the save from the beginning.

RESTORING UNIX FILES TO A 50 SERIES SYSTEM

This section describes how to restore files from a UNIX tape, created by CPIO or TAR, to a 50 Series system.

Default UX_TAPE Command

The default command

```
UX_TAPE source-pathname -MT 0 -RESTORE
```

restores UNIX files and directories specified by source pathname from a TAR-format tape into the current directory. Use the -CPIO option to restore files written in CPIO-format. All files are restored as SAM files. The source pathname is converted to a PRIMOS pathname in accordance with the rules detailed in Table K-3. The command automatically rewinds the tape at the start and end of the restore, and the restore starts from the beginning of the tape. The command translates all characters to PRIMOS ASCII format when it restores the files.

If you attempt to restore a file with the same name as a file that already exists in the target directory, UX_TAPE prompts you to specify a new name for the restored file.

Pathnames

UX_TAPE converts UNIX pathnames to PRIMOS pathnames. The section FILENAME TRANSLATION, later in this appendix, details the default UX_TAPE translation rules, and lists how characters map between PRIMOS and UNIX. The UX_TAPE option -LCASE also invokes the default conversion rules. If you want all UNIX pathnames to convert to uppercase PRIMOS pathnames, use the -UPCASE option.

Access Rights

Access rights are not set during the restore, and restored objects take default protection from the parent directory.

Command-line Options

When you use UX_TAPE to restore data, the -RESTORE option is manadatory. Other command-line options enable you to

- Restore objects from a tape created by the UNIX CPIO utility (-CPIO)
- Specify that you want UX_TAPE to follow the default rules for converting UNIX pathnames to PRIMOS pathnames (-LCASE)
- List restored objects at your terminal (-LIST)
- Suppress the command query when you restore a file, and the filename already exists at the attach point (-NO_QUERY)
- Suppress tape rewind at the end of the restore (-NO_REWIND)
- Suppress the translation to ASCII-8 (-NO_TRANSLATE)
- Position the tape at a specific filemark before the restore begins (-POS)
- Specify that you want UX_TAPE to do a restore, rather than a save (-RESTORE)
- Change the order of the most significant and least significant bytes (-SWAP)
- Specify that you want to restore objects from a tape created by the UNIX TAR utility (-TAR)
- Specify that you want UX_TAPE to convert all UNIX pathnames to uppercase PRIMOS pathnames (-UPCASE)

The section UX_TAPE COMMAND FORMAT, earlier in this appendix, describes the function of each option in detail.

Examples of Restores

This section gives examples of the use of UX_TAPE to restore files.

Example 1: The following command restores the tape to your current directory and generates a listing of the restore at your terminal. The listing gives the PRIMOS names of the restored files. The example assumes that the tape is written in TAR format. It also assumes that the target directory does not already hold files with the same names as those you are restoring.

```
OK, UX_TAPE @@ -MT 0 -RESTORE -LIST
HISTORY_FILE
ORG.CPL
PETER>FILE1
PETER>FILE2
4 files restored.
OK,
```

In this example the pathnames of the files on tape would be:

```
history_file
org.cpl
peter/file1
peter/file2
```

If PETER were a top-level directory, the UNIX pathname would be preceded by the symbol /, for example /peter/file1.

Table K-3, at the end of this appendix, details the default UNIX to PRIMOS filename translation rules.

Example 2: If the UX_TAPE command line includes the option -UPCASE, UX_TAPE converts all UNIX pathnames to uppercase PRIMOS pathnames. For example, continuing Example 1, the command

```
OK, UX_TAPE @@ -MT 0 -RESTORE -LIST -UPCASE
```

would restore PETER/FILE1 or peter/file1 as PRIMOS file PETER>FILE1. (The default UX_TAPE command would restore PETER/FILE1 as /P/E/T/E/R>/F/I/L/E1.)

You should not create UNIX files whose pathnames differ only in that one pathname is in uppercase and the other in lowercase. If the UNIX tape held files peter/file1 and PETER/FILE1, the UX_TAPE command in Example 2 would restore whichever of these files it found first as PRIMOS file PETER>FILE1. When UX_TAPE found the second file, it would ask for confirmation that you wanted to overwrite the version of PETER/FILE1 that it had just restored. If the UX_TAPE command line included the -NO_QUERY option, UX_TAPE would overwrite the first occurence of PETER>FILE1 without querying you.

Example 3: The following command looks for files test2 and test3, written in CPIO format, and restores them as PRIMOS files TEST2 and TEST3 at your current attach point. If the tape has files named TEST2 and TEST2, UX_TAPE restores them as PRIMOS files /T/E/S/T2 and /T/E/S/T3. The default filename translation rules are detailed in Table K-3, at the end of this appendix.

```
OK, UX_TAPE (TEST2 TEST3) -MT 0 -CPIO -RESTORE -NO_QUERY
```

The inclusion of the -NO_QUERY option on the command line means that if the files already exist at the attach point, UX_TAPE overwrites them without querying you.

Exiting From a Restore

If you use <CONTROL>P to quit from the restore, UX_TAPE terminates the restore in a tidy mannner and returns you to PRIMOS. The result is a partial restore. You can reenter the restore from the point at which you quit by entering ren or s.

End-of-reel During a Restore

The way in which UX_TAPE handles the end of a reel depends upon whether you are reading a TAR or a CPIO tape.

CPIO Tape: When it reaches the end of a reel, UX_TAPE asks you to mount the next reel.

```
End of reel has occurred.  Please enter new tape unit (or quit):
```

If there is another reel to restore, mount the reel and enter the tape drive unit number. UX_TAPE will continue the restore.

TAR Tape: The TAR format does not allow continuation reels. When UX_TAPE reaches the end of a reel it terminates the restore and returns you to PRIMOS.

Tape Errors During a Restore

If a PRIMOS file system error occurs, you receive an error message, and UX_TAPE attempts to continue with the restore if there are any more objects to restore.

In addition to the PRIMOS errors, you may receive one of the following error messages concerning the tape:

- Device not assigned

  The tape drive is not assigned to you, and the command will abort. Use the ASSIGN command to assign the tape drive.

- Device offline or not ready

  The tape drive is not online, and the command will abort. Put the drive online, and begin the restore again.

- Unknown format tape

  You have attempted to restore a CPIO tape when UX_TAPE expected a TAR tape, or vice versa. Reissue the UX_TAPE command and ensure it specifies the correct tape format.

- Unrecoverable error on tape

  UX_TAPE cannot read the tape, and the command will abort. Create a new tape on the UNIX system and try the restore again.

SAVING FILES ON A UNIX SYSTEM

This section describes how you use CPIO and TAR to create tapes that UX_TAPE can read.

Using TAR to Save Files

It is advisable to use the b option with a blocking factor of 1, because on some UNIX machines the blocking factor otherwise defaults to 400 for a cartridge tape drive.

Using CPIO to Save Files

You must use the c option when you write a tape, because this option writes header information in ASCII. If you do not use the c option, UX_TAPE cannot read a CPIO tape.

If you save files from a UNIX machine that holds the least significant byte first, you can use the s option to swap the bytes. If you do not use this option, you must use the UX_TAPE option -SWAP when you restore the files onto a 50 Series machine.

RESTORING FILES TO A UNIX SYSTEM

This section describes how you restore files written by UX_TAPE to a UNIX system.

Using TAR to Restore Files

When you use TAR to restore a tape written by UX_TAPE, use the b option with the same blocking factor as was used to save the data from the 50 Series system. If the save specified a block size (-BLOCK_SIZE option), calculate the corresponding blocking factor. To convert a block size to a blocking factor, divide the block size, in bytes, by 512. For example, a block size of 5120 bytes is equivalent to a blocking factor of 10.

Using CPIO to Restore Files

You must use the c option when you restore a tape written by UX_TAPE. This option enables CPIO to read the header information, which UX_TAPE writes in ASCII. If you do not use this option, CPIO cannot restore the tape.

If you restore to a UNIX machine that holds the least significant byte first, you must use the s option unless the UX_TAPE command that saved the files included the -SWAP option.

FILENAME TRANSLATION

UNIX is case sensitive, and preserves any case distinction entered on the command line. In PRIMOS, input may be either uppercase or lowercase, but lowercase is mapped to uppercase. The following filenames would appear to PRIMOS to be identical, but would appear to UNIX to be different:

```
README
readme
ReadMe
Readme
```

The main filename differences between PRIMOS and UNIX are:

- UNIX is case sensitive, while PRIMOS is not.
- UNIX filenames can begin with any character, while PRIMOS filenames cannot begin with a number.

- UNIX filenames cannot include the / symbol, while PRIMOS filenames can include this symbol.

The following tables show the mapping between UNIX and PRIMOS characters, and list the default filename translation rules:

- Table K-1 details the mapping between UNIX and PRIMOS characters.
- Table K-2 summarizes the rules for translating filenames from PRIMOS to UNIX, and gives examples of filename translation.
- Table K-3 summarizes the rules for translating filenames from UNIX to PRIMOS, and gives examples of filename translation.

You can also use the UX_TAPE option -LCASE to specify that you want UX_TAPE to apply the default filename translation rules.

You can modify the filename translation rules by using the UX_TAPE option -UPCASE. During a restore, this option tells UX_TAPE to convert all UNIX filenames to uppercase PRIMOS filenames. For a save, it converts PRIMOS filenames to uppercase UNIX filenames. Refer to the section UX_TAPE COMMAND FORMAT for details of the -UPCASE option.

Table K-1
Character Mapping: UNIX - PRIMOS

Printing Characters

UNIX	PRIMOS
0	0
1	1
2	2
:	:
:	:
9	9
a	A
b	B
c	C
:	:
:	:
z	Z
A	/A
B	/B
:	:
:	:
Z	/Z

Special Characters

UNIX	PRIMOS	UNIX	PRIMOS
*	*	@	/#
_	-	]	/-
/	not used	|	&*
"	&7	$	$
(	/1	_	_
.	/4	!	&6
<	/7	'	/0
?	/_	+	/3
`	&#	;	/6
}	&-	>	/9
#	#	^	/.
.	.	{	&$
\	/*	~	&.
&	&9	%	&8
)	/2	[	/$
:	/5		
=	/8		

Table K-1 (continued)
Character Mapping: UNIX - PRIMOS

Nonprinting Characters			
UNIX	PRIMOS	UNIX	PRIMOS
del	= &_	dle	= &P
nul	= nul	dc1	= &Q
soh	= &A	dc2	= &R
stx	= &B	dc3	= &S
etx	= &C	dc4	= &T
eot	= &D	nak	= &U
enq	= &E	syn	= &V
ack	= &F	etb	= &W
bel	= &G	can	= &X
bs	= &H	em	= &Y
ht	= &I	sub	= &Z
nl	= &J	esc	= &0
vt	= &K	fs	= &1
np	= &L	gs	= &2
cr	= &M	rs	= &3
so	= &N	us	= &4
si	= &O	sp	= &5

Table K-2
PRIMOS to UNIX Filename Translation Rules

Rule	PRIMOS	UNIX
All uppercase letters are translated to lowercase letters.	ABC.1	abc.1
Numbers 0-9 within a name remain the same.	TEST2	test2
The symbols . _ - # $ within the name remain the same.	MYPROG_NEW.C	myprog_new.c
A / is removed, and the letter directly following the / is capitalized.	FILE/ONE /TEST	fileOne Test
Filenames up to 14 characters are accepted.	SPACE.PROJECTS	space.projects
Some character combinations are translated to one character. See Table K-1.	LOST/3FOUND	lost+found

Table K-3
UNIX to PRIMOS Filename Translation Rules

Rule	UNIX to	PRIMOS
All lowercase letters are translated to uppercase letters.	abc.1	ABC.1
Every uppercase letter remains uppercase, preceded by the / symbol.	THANKS	/T/H/A/N/K/S
Numbers 0-9 within the name remain the same.	test2	TEST2
The symbols _ - # $ * . within the name remain the same.	myprog_new.c	MYPROG_NEW.C
Numbers 0-9 or characters - or _ that begin the filename remain the same, preceded by /&.	4july	/&4JULY

INDEX

Index

Numbers

60Mb cartridge tape,
  ARCHIVE procedure, 5-10
  BACKUP procedure, 12-22
  MAGSAV procedure, G-8
  messages when releasing, 22-11
  PHYSAV procedure, 14-11
  TRANSPORT procedure, 7-10

A

ACLs,
  ARCHIVE command, saved by, 4-2
  ARCHIVE_RESTORE, restoration by, 6-2
  TRANSPORT command, saved by, 7-14
  TRANSPORT_RESTORE command, restoration by, 8-2

ARCHIVE command, (See also Archiving)
  catalogs, creation of, 5-2
  default command, using, 5-3, 5-8
  examples of, 5-9, 5-10
  function of, 4-2, 5-2
  help, 5-6, 21-1

ARCHIVE command (continued)
  options, 5-3, 5-4
  (See also ARCHIVE options)
  preparing to run, 5-8
  procedure for using, 4-4
  reference, A-2
  saves, 5-2
  syntax, 5-4, A-2
  tools for use with, 4-3
  treewalking options, 5-12
  wildcard options, 5-12

ARCHIVE options,
  -ACCESSED_AFTER, 5-4, 5-13
  -ACCESSED_BEFORE, 5-4, 5-13
  -AFTER, 5-6, 5-13
  -BACKEDUP_AFTER, 5-4, 5-13
  -BACKEDUP_BEFORE, 5-5, 5-13
  -BEFORE, 5-7, 5-13
  -CAM_TO_DAM, 5-5, 5-18
  -CATALOG_PATHNAME, 5-5, 5-16
  -COMPATIBLE_VERSION, 5-5, 5-18
  -CREATED_AFTER, 5-5, 5-13
  -CREATED_BEFORE, 5-6, 5-13
  -DELETE, 5-6, 5-17
  -HELP, 5-6, 21-1
  -INDEX, 5-6, 5-15
  -INDEX_LEVELS, 5-6, 5-15
  -LEVELS, 5-6, 5-13
  -MODIFIED_AFTER, 5-6, 5-13
  -MODIFIED_BEFORE, 5-7, 5-13

ARCHIVE options (continued)
-NO_QUERY, 5-7, 5-17
-OWNER, 5-7, 5-16
reference, A-2
-REMARK, 5-7, 5-17
treewalking options, 5-12
-TTY, 5-7, 5-17
-VALIDATE, 5-7, 5-18
-VERIFY, 5-8, 5-12
wildcard options, 5-12

ARCHIVE_RELEASE command,
examples of, 22-7
function of, 22-5
help, 21-1, 22-6
options, 22-6
(See also ARCHIVE_RELEASE options)
preparing to run, 22-2
reference, A-6
syntax, 22-6, A-6

ARCHIVE_RELEASE options,
-CATALOG_PATHNAME, 22-6
-HELP, 21-1, 22-6
-MT, 22-6
-NO_QUERY, 22-6
-OWNER, 22-7
-REEL, 22-7, 22-8
reference, A-6

ARCHIVE_RESTORE command, (See also Restoring archived data)
ACLs, restoration of, 6-2
catalogs, use of, 6-2
default command, using, 6-3, 6-9
examples of, 6-10, 6-12, 6-13
function of, 4-2, 6-2
help, 6-6, 21-1
options, 6-3, 6-4
(See also ARCHIVE_RESTORE options)
preparing to run, 6-9
procedure for using, 4-6
reference, A-7
syntax, 6-4, A-7
tools for use with, 4-3
treewalking options, 6-16
wildcard options, 6-16

ARCHIVE_RESTORE options,
-ACCESSED_AFTER, 6-4, 6-17
-ACCESSED_BEFORE, 6-5, 6-17

ARCHIVE_RESTORE options (continued)
-AFTER, 6-6, 6-17
-BACKEDUP_AFTER, 6-5, 6-17
-BACKEDUP_BEFORE, 6-5, 6-17
-BEFORE, 6-7, 6-17
-CAM_RBF, 6-5, 6-21
-CATALOG_PATHNAME, 6-5, 6-15
-COMBINE, 6-5, 6-16
-CREATED_AFTER, 6-6, 6-17
-CREATED_BEFORE, 6-6, 6-17
-DAM_RBF, 6-6, 6-21
-FROM_SAVE_NUMBER, 6-6, 6-19
-HELP, 6-6, 21-1
-INDEX, 6-6, 6-19
-INDEX_LEVELS, 6-6, 6-19
-MODIFIED_AFTER, 6-6, 6-17
-MODIFIED_BEFORE, 6-7, 6-17
-NO_QUERY, 6-7, 6-21
-OWNER, 6-7, 6-20
-REEL, 6-7, 6-14
reference, A-7
-REPLACE, 6-7, 6-16
-TO_SAVE_NUMBER, 6-7, 6-19
-TTY, 6-8, 6-21
-VERIFY, 6-8, 6-15
-VOLID, 6-8, 6-14
-WRITTEN_AFTER, 6-8, 6-17
-WRITTEN_BEFORE, 6-8, 6-17

Archiving, (See also ARCHIVE command)
access rights needed, 5-8
CAM to DAM files, conversion of, 5-18
catalog, specifying location of, 5-16
command queries, control of, 5-17
dated file attributes, use of, 5-13
default ARCHIVE command, using, 5-3, 5-8
definition of, 1-2, 4-2, 5-2
deleting objects after archiving, 5-17
directories, 5-9, 5-10
directory levels, controlling number saved, 5-13
files, 5-10
index, creation of, 5-15
preparations for, 5-8
procedure, 4-4
remark, adding to save, 5-17

Archiving (continued)
restoring archived data, 6-1
Rev.19 system, moving objects to, 5-18
ROAM files, 5-18
security, level of, 6-2, 6-9
selecting objects to save, 5-12
to 60Mb cartridge tape, 5-10
to another user's tape, 5-16
validating the save, 5-18
wildcard selections, verifying, 5-12

ASSIGN command, (See also Assigning tape drives)
default command, using, 3-5
examples of, 3-5
function of, 3-2
messages, 3-8
options, 3-3
(See also ASSIGN options)
reference, A-11
syntax, 3-3, A-11

ASSIGN options,
-7TRK, 3-3
-9TRK, 3-3
-ALIAS, 3-4
-DENSITY, 3-4
-MOUNT, 3-4
reference, A-11
-RETENSION, 3-4
-RINGOFF, 3-4
-RINGON, 3-4
-SPEED, 3-4
-TPID, 3-5
-WAIT, 3-5

Assigning tape drives, (See also ASSIGN command)
7-track or 9-track tape, specifying, 3-3
by logical device number, 3-3, 3-6
by physical device number, 3-5
default ASSIGN command, using, 3-5
mounting a new tape, 3-4, 3-8
requesting a tape density, 3-4
requesting tape drive characteristics, 3-7
retensioning cartridge tape, 3-4

Assigning tape drives (continued)
streamer tape speed, selecting, 3-4
tape identifier, specifying, 3-5
waiting for a tape drive, 3-5
write ring instructions, 3-4

B

Backup and Recovery Management Service (See BRMS)

BACKUP command, (See also Logical backup to tape)
catalogs, creation of, 12-2
default command, using, 12-3, 12-17
examples of, 12-17
file attributes set, 12-3
function of, 12-2
help, 12-6, 21-1
invoking, 12-17
maximizing the performance of, 10-5
options, 12-4, 12-5
(See also BACKUP options)
performance of, 10-4
preparing to run, 12-8
procedure for using, 12-9
procedure reference tables, B-2, B-3
reference, A-13
relative merits of, 10-4
saves, 12-3
syntax, 12-4, A-13
treewalking options, 12-24
wildcard options, 12-24

BACKUP options,
-ACCESSED_AFTER, 12-5, 12-25
-ACCESSED_BEFORE, 12-5, 12-25
-AFTER, 12-7, 12-25
-BACKEDUP_AFTER, 12-5, 12-25
-BACKEDUP_BEFORE, 12-5, 12-25
-BEFORE, 12-7, 12-25
-CAM_TO_DAM, 12-5, 12-29
-COMPATIBLE_VERSION, 12-5, 12-29
-CREATED_AFTER, 12-6, 12-25
-CREATED_BEFORE, 12-6, 12-25
-HELP, 12-6, 21-1

BACKUP options (continued)
-INCREMENTAL, 12-6, 12-20
-INDEX, 12-6, 12-18, 12-20, 12-27
-INDEX_LEVELS, 12-6, 12-27
-LEVELS, 12-6, 12-25
-MODIFIED_AFTER, 12-7, 12-25
-MODIFIED_BEFORE, 12-7, 12-25
-NO_CATALOG, 12-7, 12-28
-NO_QUERY, 12-7, 12-29
reference, A-13
-REMARK, 12-7, 12-28
treewalking options, 12-24
-TTY, 12-7, 12-29
-VALIDATE, 12-8, 12-29
-VERIFY, 12-24
wildcard options, 12-24

BACKUP_RELEASE command,
examples of, 22-10
function of, 22-9
help, 21-1, 22-9
options, 22-9
(See also BACKUP_RELEASE options)
preparing to run, 22-2
reference, A-16
syntax, 22-9, A-16

BACKUP_RELEASE options,
-HELP, 21-1, 22-9
-MT, 22-9, 22-10
-NO_QUERY, 22-9
-REEL, 22-10
reference, A-16

BACKUP_RESTORE command, (See also Restoring a BACKUP tape)
ACLs, how handled, 13-2
default command, using, 13-3, 13-16
DTB, how handled, 13-2
DTM, how handled, 13-2
examples of, 13-16
function of, 13-2
help, 13-5, 21-1
invoking, 13-16
options, 13-3, 13-4
(See also BACKUP_RESTORE options)
preparing to run, 13-8
procedure for using, 13-10
procedure reference tables, B-5, B-6

BACKUP_RESTORE command (continued)
reference, A-17
ROAM files, how handled, 13-2
syntax, 13-4, A-17
treewalking options, 13-21
wildcard options, 13-21

BACKUP_RESTORE options,
-ACCESSED_AFTER, 13-4, 13-22
-ACCESSED_BEFORE, 13-4, 13-22
-AFTER, 13-6, 13-22
-BACKEDUP_AFTER, 13-5, 13-22
-BACKEDUP_BEFORE, 13-5, 13-22
-BEFORE, 13-6, 13-22
-CAM_RBF, 13-5, 13-26
-COMBINE, 13-5, 13-22
-CREATED_AFTER, 13-5, 13-22
-CREATED_BEFORE, 13-5, 13-22
-DAM_RBF, 13-5, 13-26
-FROM_SAVE_NUMBER, 13-5, 13-24
-HELP, 13-5, 21-1
-INDEX, 13-6, 13-24
-INDEX_LEVELS, 13-6, 13-24
-MODIFIED_AFTER, 13-6, 13-22
-MODIFIED_BEFORE, 13-6, 13-22
-NO_QUERY, 13-6, 13-26
-RECOVER, 13-6, 13-26, 13-37
-REEL, 13-7, 13-20
reference, A-17
-REPLACE, 13-7, 13-22
-TO_SAVE_NUMBER, 13-7, 13-24
treewalking options, 13-21
-TTY, 13-7, 13-26
-VERIFY, 13-7, 13-21
-VOLID, 13-7, 13-19
wildcard options, 13-21
-WRITTEN_AFTER, 13-7, 13-22
-WRITTEN_BEFORE, 13-8, 13-22

Backups,
backup utilities, performance of, 10-2
backup utilities, relative merits of, 10-2
by operators, benefits of, 1-3
example backup strategies, 10-9
for users, benefits of, 1-2
full backup, definition of, 9-3
incremental backups, definition of, 9-3

Backups (continued)
logical backup to tape with BACKUP (See Logical backup to tape)
logical backup to tape with MAGSAV (See Logical save to tape)
logical backups, definition of, 1-3, 9-3
logical backups, description of, 10-4
logical save to disk (See Logical copy between disks)
overview of system backup utilities, 9-1
performance, how to maximize, 10-5
physical backups, definition of, 1-3, 9-3
physical backups, description of, 10-2
retaining, 10-8
saving a partition to disk (See Physical copy between disks)
saving a partition to tape (See Physical save to tape)
scheduling, 10-8
selecting a backup strategy, 10-1
system backup utilities, summary of, 9-4
system backups, types of, 9-2
system preparation (See System preparation procedures)

Boot tape,
creation of, 18-1
list file, creating, 18-2
restoring system from, 19-5
using to repair command device, 19-3

BOOT_CREATE command,
dialog, 18-5
example session, 18-6
function of, 18-2
help, 18-4
invoking, 18-5
options, 18-4
preparing to run, 18-5
reference, A-21
syntax, 18-4, A-21

BOOT_CREATE options,
-HELP, 18-4
-MT, 18-4
-NO_QUERY, 18-4
reference, A-21

BRMS,
catalogs, information in, 2-4
catalogs, introduction to, 2-4
error recovery, 26-1
exiting and reentering, 26-4
Help facilities, 21-1
(See also BRMS Help)
introduction to, 2-1
overview of utilities, 2-2
table of commands, 2-3
tape labels, 2-4
tape, definition of, 2-2
tapes, listing, 25-1
(See also Listing a tape)
tapes, releasing, 2-4, 20-3, 22-1
(See also Releasing BRMS tapes)
tools, introduction to, 20-1
volume, definition of, 2-2

BRMS error recovery,
exiting and reentering BRMS, 26-4
recoverable errors, how handled, 26-2
ROAM errors, how handled, 26-5
unrecoverable errors, 26-4

BRMS Help,
BRMS command descriptions, 21-4
BRMS command syntax, 21-4
error menus, 21-7
error numbers, 21-6
examples of BRMS command usage, 21-5, 21-6
introduction to, 21-1
invoking, 21-2
options, details of, 21-5
options, list of, 21-4
options, summary of, 21-4
wildcards, information about, 21-6

C

CAM files, converting to DAM files,
ARCHIVE command, 5-18
ARCHIVE_RESTORE command, 6-21
BACKUP command, 12-29
BACKUP_RESTORE command, 13-26
MAGRST command, G-12, I-4
MAGSAV command, G-3, H-3
TRANSPORT command, 7-17

Catalogs,
ARCHIVE_RESTORE, use by, 6-2
BACKUP_RESTORE, use by, 13-3
created by ARCHIVE, 5-2
created by BACKUP, 12-2
information in, 2-4
introduction to, 2-4
listing of, 24-1
(See also Listing a catalog)
regenerating, 23-1
(See also Regenerating a catalog)
suppressing BACKUP catalogs, 12-28
validating, 23-1
(See also Validating a catalog)

Command device,
recovering from a disk crash, 19-3
restoring from disk, 19-2
restoring from tape, 19-3
saving with PHYSAV, 14-3

Commands,
ARCHIVE, 5-1, A-2
ARCHIVE_RELEASE, 22-5, A-6
ARCHIVE_RESTORE, 6-1, A-7
ASSIGN, 3-2, A-11
BACKUP, 12-1, A-13
BACKUP_RELEASE, 22-9, A-16
BACKUP_RESTORE, 13-1, A-17
BOOT_CREATE, 18-1, A-21
COPY, 17-1, A-22
COPY_DISK, 16-1, A-25
GENERATE_CATALOG, 23-1, A-26
LIST_CATALOG, 24-1, A-28
LIST_TAPE, 25-1, A-32
MAGRST, G-11, I-1
MAGSAV, G-1, H-1
PHYRST, 15-1, A-36
PHYSAV, 14-1, A-37

Commands (continued)
STATUS, 3-2
TRANSPORT, 7-1, A-38
TRANSPORT_RELEASE, 22-3, A-42
TRANSPORT_RESTORE, 8-1, A-43
UNASSIGN, 3-9, A-47
UX_TAPE, A-48, K-1

COPY command, (See also Logical copy between disks)
default command, using, 17-2
function of, 17-2
invoking, 17-11
options, 17-3
(See also COPY options)
performance of, 10-4
preparing to run, 17-5
procedure for using, 17-6
procedure reference tables, B-10 to B-12
reference, A-22
relative merits of, 10-4
syntax, 17-2, A-22

COPY options,
-ACCESSED_AFTER, 17-3
-ACCESSED_BEFORE, 17-3
-AFTER, 17-4, 17-12
-BEFORE, 17-4
-COPY_ALL, 17-3, 17-11
-CREATED_AFTER, 17-3
-CREATED_BEFORE, 17-3
-DAM, 17-3
-DELETE, 17-3
-DTM, 17-3
-FORCE, 17-3
-HELP, 17-3
-INC, 17-13
-INCREMENTAL, 17-3
-LEVELS, 17-4
-MERGE, 17-4
-MODIFIED_AFTER, 17-4, 17-12
-MODIFIED_BEFORE, 17-4
-NO_CHECK, 17-4
-NO_CMLV, 17-4
-NO_QUERY, 17-4
-PROTECT, 17-4
-QUERY, 17-4
-QUOTA, 17-4
reference, A-22
-REPLACE, 17-4
-REPORT, 17-5
-RWLOCK, 17-5

COPY options (continued)
-SAM, 17-5
-SAVE_UFD, 17-5

COPY_DISK command, (See also Physical copy between disks)
default command, using, 16-3
function of, 16-2
invoking, 16-11
maximizing the performance of, 10-5
messages, F-1
options, 16-4
(See also COPY_DISK options)
performance of, 10-3
preparing to run, 16-5
procedure for using, 16-6
procedure reference tables, B-8, B-9
reference, A-25
relative merits of, 10-3
syntax, 16-4, A-25

COPY_DISK options,
-DO_VERIFY, 16-4
-NO_BADS, 16-4
-NO_RAT, 16-4
reference, A-25
-TTY, 16-4

Copying between disks,
logical copy, (See Logical copy between disks)
physical copy (See Physical copy between disks)

D

DAM files, converting to CAM files,
ARCHIVE_RESTORE command, 6-21
BACKUP_RESTORE command, 13-26
MAGRST command, G-12, I-4

Directories,
archiving, 4-4, 5-8
copying between disks, 17-1
listing catalog entries, 24-2
restoring from a BACKUP tape, 13-8, 13-35
restoring from a MAGSAV tape, G-11, I-1

Directories (continued)
restoring from a TRANSPORT tape, 4-8, 8-7
restoring from an ARCHIVE tape, 4-6, 6-9
saving with BACKUP, 12-8, 12-21
saving with MAGSAV, G-1, H-1
transporting, 4-7, 7-7
transporting between PRIMOS and UNIX, K-1, K-6

Disks,
logical copy between, (See Logical copy between disks)
physical copy between (See Physical copy between disks)
recovering (See Recovering a disk)

Dumped bit, 17-13, H-2, H-11

Dynamic badspot handling, 15-2, 16-1

E

Error messages,
ASSIGN command, 3-8
COPY_DISK command, F-1
MAGRST command, J-1
MAGSAV command, J-1
PHYRST command, E-1
PHYSAV command, D-1
UNASSIGN command, 3-11
UX_TAPE command, K-9, K-13

Error recovery, BRMS, 20-3, 26-1

F

Files,
  archiving, 4-4, 5-8
  converting CAM to DAM (See CAM files, converting to DAM files)
  converting DAM to CAM (See DAM files, converting to DAM files)
  copying between disks, 17-1
  listing catalog entries, 24-2
  restoring from a BACKUP tape, 13-8, 13-35
  restoring from a MAGSAV tape, G-11, I-1
  restoring from a TRANSPORT tape, 4-8, 8-7
  restoring from an ARCHIVE tape, 4-6, 6-9
  ROAM files (See ROAM files)
  saving with BACKUP, 12-8, 12-21
  saving with MAGSAV, G-1, H-1
  transporting, 4-7, 7-7
  transporting between PRIMOS and UNIX, K-1

Full backup (See Backups)

G

GENERATE_CATALOG command,
  default command, using, 23-2
  function of, 23-2
  help, 21-1, 23-3
  options, 23-2
  (See also GENERATE_CATALOG options)
  reference, A-26
  syntax, 23-3, A-26

GENERATE_CATALOG options,
  -CATALOG_PATHNAME, 23-3, 23-5
  -HELP, 21-1, 23-3
  -NO_QUERY, 23-4
  -OWNER, 23-4, 23-5
  -REEL, 23-4
  reference, A-26
  -VALIDATE, 23-4, 23-6
  -VOLID, 23-4, 23-5

Generating a catalog (See Regenerating a catalog)

H

Help, BRMS (See BRMS Help)

I

Incremental backup (See Backups)

Initializing tapes, C-6

L

LABEL, C-6, C-7
  error messages, C-9

List file for BOOT_CREATE, 18-2

LIST_CATALOG command, (See also Listing a Catalog)
  default command, using, 24-2, 24-11
  function of, 24-2
  help, 21-1, 24-8
  options, 24-3, 24-6
  (See also LIST_CATALOG options)
  reference, A-28
  syntax, 24-6, A-28
  treewalking options, 24-13
  wildcard options, 24-13

LIST_CATALOG options,
  -ACCESSED_AFTER, 24-6, 24-14
  -ACCESSED_BEFORE, 24-6, 24-14
  -AFTER, 24-8, 24-14
  -BACKEDUP_AFTER, 24-6, 24-14
  -BACKEDUP_BEFORE, 24-6, 24-14
  -BACKUP, 24-2, 24-5, 24-7, 24-11
  -BEFORE, 24-8, 24-14
  -CATALOG_PATHNAME, 24-7, 24-18
  -CREATED_AFTER, 24-7, 24-14
  -CREATED_BEFORE, 24-7, 24-14
  -DETAIL, 24-7, 24-16
  -DTA, 24-7, 24-16
  -DTB, 24-7, 24-16

LIST_CATALOG options (continued)
-DTC, 24-8, 24-16
-DTM, 24-8, 24-16
-DTW, 24-8, 24-16
-FROM_SAVE_NUMBER, 24-8, 24-15
-HELP, 21-1, 24-8
-LATEST, 24-8, 24-15
-MODIFIED_AFTER, 24-8, 24-14
-MODIFIED_BEFORE, 24-8, 24-14
-NO_QUERY, 24-8, 24-21
-NO_SORT, 24-9, 24-20
-NO_WAIT, 24-9, 24-20
-OUTPUT, 24-9, 24-21
-OWNER, 24-9, 24-20
-REEL, 24-9, 24-12
reference, A-28
-SIZE, 24-9, 24-16
-TAPE_INFORMATION, 24-9, 24-18
-TO_SAVE_NUMBER, 24-9, 24-15
treewalking options, 24-13
-VOLID, 24-10, 24-12
wildcard options, 24-13
-WRITTEN_AFTER, 24-10, 24-14
-WRITTEN_BEFORE, 24-10, 24-14

LIST_TAPE command, (See also Listing a tape)
default command, using, 25-2, 25-9
function of, 25-2
help, 21-1, 25-6
options, 25-2, 25-4
(See also LIST_TAPE options)
reference, A-32
syntax, 25-4, A-32
treewalking options, 25-10
wildcard options, 25-10

LIST_TAPE options,
-ACCESSED_AFTER, 25-4, 25-11
-ACCESSED_BEFORE, 25-4, 25-11
-AFTER, 25-6, 25-11
-BACKEDUP_AFTER, 25-5, 25-11
-BACKEDUP_BEFORE, 25-5, 25-11
-BEFORE, 25-6, 25-11
-CREATED_AFTER, 25-5, 25-11
-CREATED_BEFORE, 25-5, 25-11
-DETAIL, 25-5, 25-13
-DTA, 25-5, 25-13
-DTB, 25-5, 25-13
-DTC, 25-5, 25-13
-DTM, 25-5, 25-13
-DTW, 25-5, 25-13
-FROM_SAVE_NUMBER, 25-6, 25-12

LIST_TAPE options (continued)
-HELP, 21-1, 25-6
-MODIFIED_AFTER, 25-6, 25-11
-MODIFIED_BEFORE, 25-6, 25-11
-NO_QUERY, 25-6, 25-17
-NO_WAIT, 25-6, 25-15
-OUTPUT, 25-7, 25-16
-REEL, 25-7, 25-9
reference, A-32
-SIZE, 25-7, 25-13
-TAPE_INFORMATION, 25-7, 25-15
-TO_SAVE_NUMBER, 25-7, 25-12
treewalking options, 25-10
-VOLID, 25-7, 25-9
wildcard options, 25-10
-WRITTEN_AFTER, 25-8, 25-11
-WRITTEN_BEFORE, 25-8, 25-11

Listing a catalog, (See also LIST_CATALOG command)
access rights needed, 24-2
ARCHIVE catalog, example listing of, 24-4
ARCHIVE catalog, how to list, 24-2
BACKUP catalog, example listings of, 24-5, 24-19
BACKUP catalog, how to list, 24-2
catalog pathname, specifying, 24-18
command queries, control of, 24-21
dated file attributes, use of, 24-14
default LIST_CATALOG command, using, 24-2, 24-11
detailed listing, example of, 24-16
display format, control of, 24-20
filing the listing, 24-21
information listed, selecting level of detail, 24-16
listing all your catalogs, 24-11
listing another user's catalog, 24-20
reel, specifying which entry to list, 24-12
reels, statistical information about, 24-18
saves, selecting which to list, 24-15

Listing a catalog (continued)
selecting objects to list, 24-12
volume, specifying which to list, 24-12

Listing a tape, (See also LIST_TAPE command)
access rights needed, 25-2
ARCHIVE tape, example listing, 25-3
command queries, control of, 25-17
dated file attributes, use of, 25-11
default LIST_TAPE command, using, 25-2, 25-9
default listing, example, 25-3
detailed listing, example, 25-14
display format, control of, 25-15
filing the listing, 25-16
information listed, selecting level of detail, 25-13
listing all objects on mounted reel, 25-9
reel statistics, example listing, 25-16
reel statistics, how to list, 25-15
reel, specifying which to list, 25-9
saves, selecting which to list, 25-12
selecting which objects to list, 25-10
volume, specifying which to list, 25-9

Logical backup to tape (BACKUP),
CAM to DAM files, conversion of, 12-29
catalogs, suppressing generation of, 12-28
catalogs, use of, 12-2
command queries, control of, 12-29
dated file attributes, use of, 12-25
default BACKUP command, using, 12-3, 12-17
directory levels, controlling number saved, 12-25

Logical backup to tape (BACKUP) (continued)
file attributes, setting, 12-3
full backup, 12-18
incremental backup to tape, 12-20
index, creation of, 12-27
invoking BACKUP, 12-17
preparations, 12-8
privileged group .BACKUP$, 12-2
procedure, 12-9
procedure reference tables, B-2, B-3
remark, adding to save, 12-28
Rev.19 system, moving objects to, 12-29
ROAM files, 12-3, 12-29
saving individual directories, 12-21
saving individual files, 12-21
saving to 60Mb cartridge tape, 12-22
selecting objects to save, 12-23
supplementing by incremental backup to disk, 17-12
validating the save, 12-29
wildcard selections, verifying, 12-24

Logical backups,
definition of, 1-3
to disk (See COPY command)
to tape, using BACKUP (See BACKUP command)
to tape, using MAGSAV (See MAGSAV command)

Logical copy between disks, (See also COPY command)
copying a specific object, 17-11
default COPY command, using, 17-2
how to invoke, 17-11
incremental backups, 17-12
preparations for, 17-5
procedure for copying files and directories, 17-6
procedure reference tables, B-10 to B-12
supplementing BACKUP, 17-12

Logical copy between disks
(continued)
supplementing COPY_DISK, 17-13
supplementing MAGSAV, 17-13

Logical restores,
from a BACKUP tape, (See BACKUP_RESTORE command)
from a MAGSAV tape (See MAGRST command)
from a TRANSPORT tape (See TRANSPORT_RESTORE command)
from an ARCHIVE tape (See ARCHIVE_RESTORE command)
from disk (See COPY command)

Logical save to tape (MAGSAV),
ACLs, how handled, G-2, H-2
dumped bit, H-2, H-11
example MAGSAV session, G-10, H-13
full backup, H-10
incremental backup to tape, H-11
invoking MAGSAV, G-5, H-10
MAGSAV dialog, G-5, H-12
multireel save, G-7
Rev.19 system, moving files to, G-9
saving individual objects, G-4
supplementing by incremental backup to disk, 17-13
system backup, preparation, H-5
system backup, procedure, H-5
using a 60Mb cartridge tape, G-8
verifying a MAGSAV tape, G-8, H-13

M

MAGRST command, (See also Restoring a MAGSAV tape)
dialog, G-13, I-9, I-13
function of, I-2
invoking, G-13, I-9, I-12
messages, J-1
options, G-12, I-3
(See also MAGRST options)
syntax, G-12, I-3

MAGRST options,
-7TRK, G-12, I-3
-CAM_RBF, G-12, I-4
-DAM_RBF, G-12, I-4
-QUERY, G-12, I-4
-TTY, G-13, I-4

MAGSAV command, (See also Logical save to tape)
dialog, G-5, H-12
function of, G-2, H-2
invoking, G-5, H-10
messages, J-1
options, G-2, G-3, H-3
(See also MAGSAV options)
syntax, G-3, H-3

MAGSAV options,
-7TRK, G-3, H-3
-CAM_TO_DAM, G-3, G-9, H-3
-INC, G-3, H-3, H-11
-NO_ACL, G-3, H-4
-NO_RBF, G-3, H-4
-P300, G-3, H-4
-REV 19, G-3, G-9, H-4
-SAVE_UFD, G-4, H-4
-SUFD, H-11
-TTY, G-4, H-4
-UPDT, G-4, H-4, H-10, H-11

Messages,
archiving to 60Mb cartridge tape, 5-10
ASSIGN command, 3-8
BACKUP, saving to 60Mb cartridge tape, 12-22
COPY_DISK command, F-1
MAGRST command, J-1
MAGSAV command, J-1
MAGSAV, saving to 60Mb cartridge tape, G-8
PHYRST command, E-1
PHYSAV command, D-1
PHYSAV, saving to 60Mb cartridge tape, 14-11
transporting to 60Mb cartridge tape, 7-10
UNASSIGN command, 3-11
UX_TAPE command, K-9, K-13
when releasing 60Mb cartridge tape, 22-11

Moving objects to a Rev.19 system,
ARCHIVE command, 5-18
BACKUP command, 12-29
MAGSAV command, G-9
TRANSPORT command, 7-17

O

Operator utilities,
introduction to, 1-3

P

Partition modes, 15-2, 16-1

Partitions,
closing to users, 11-8
re-opening to users, 11-8
restoring from a MAGSAV tape, I-4
restoring from a PHYSAV tape (See Restoring a PHYSAV tape)
restoring from disk (See Physical copy between disks)
saving to disk (See Physical copy between disks)
saving to tape, using BACKUP (See Logical backup to tape)
saving to tape, using MAGSAV (See Logical save to tape(MAGSAV))
saving to tape, using PHYSAV (See Physical save to tape)

PHYRST command, (See also Restoring a PHYSAV tape)
default command, using, 15-3
function of, 15-2
invoking, 15-9
messages, E-1
options, 15-3, 15-4
(See also PHYRST options)
preparing to run, 15-5
procedure for using, 15-5
procedure reference tables, B-7
reference, A-36
syntax, 15-4, A-36

PHYRST options,
-NO_BADS, 15-4
reference, A-36
-SPEED, 15-4
-TTY, 15-4
-UNMOD, 15-4

PHYSAV command, (See also Physical save to tape)
default command, using, 14-2
function of, 14-2
invoking, 14-9
maximizing the performance of, 10-5
messages, D-1
options, 14-3
(See also PHYSAV options)
performance of, 10-3
preparing to run, 14-4
procedure for using, 14-5
procedure reference table, B-7
reference, A-37
relative merits of, 10-3
syntax, 14-3, A-37

PHYSAV options,
-COMDEV, 14-3
reference, A-37
-SPEED, 14-3
-TTY, 14-3
-UNMOD, 14-4

Physical backups,
definition of, 1-3
to disk (See Physical copy between disks)
to tape (See Physical save to tape)

Physical copy between disks,
(See also COPY_DISK command)
checking input and output partitions, 16-4
command dialog, 16-11
command queries, control of, 16-4
default COPY_DISK command, using, 16-3
disabling badspot handling by COPY_DISK, 16-4
disk formats, 16-2
disk mirroring, 16-2
dynamic badspot handling, 16-2
example sessions, 16-12, 16-13

Physical copy between disks (continued)
incremental save using COPY, 17-13
invoking COPY_DISK, 16-11
nonrobust partitions, 16-3
preparations, 16-5
procedure, 16-6
procedure reference tables, B-8, B-9
Record Availability Table, optional use of, 16-3, 16-4
restoring the command device, 19-2
robust partitions, 16-3

Physical restores,
from disk, (See Physical copy between disks)
from tape (See Restoring a PHYSAV tape)

Physical save to tape, (See also PHYSAV command)
command dialog, 14-9
command queries, control of, 14-3
default PHYSAV command, using, 14-2
example session, 14-11
handling DMX overruns, 14-4
invoking PHYSAV, 14-9
preparations, 14-4
procedure for saving a partition, 14-5
procedure reference tables, B-7
Record Availability Table, use of, 14-2
reentering PHYSAV, 14-12
saving the command device, 14-3
saving to 60Mb cartridge tape, 14-11
streamer tape drive, specifying speed of, 14-3
verifying PHYSAV tapes, 14-13

Privileged group .BACKUP$, 12-2, 13-2

Procedures,
ARCHIVE command, 4-4
ARCHIVE_RESTORE command, 4-6
BACKUP command, 12-9, B-2, B-3
BACKUP_RESTORE command, 13-10, B-5, B-6
COPY command, 17-6, B-10 to B-12
COPY_DISK command, 16-6, B-8, B-9
MAGRST command, I-4, I-11
MAGSAV command, H-5
PHYRST command, 15-5, B-7
PHYSAV command, 14-5, B-7
recreating a system, 19-5
restoring the command device, 19-2, 19-3
TRANSPORT command, 4-7
TRANSPORT_RESTORE command, 4-8

R

RAT (See Record Availability Table)

Record Availability Table,
use with COPY_DISK command, 16-3, 16-4
using with PHYSAV, 14-2

Recovering a disk, 13-26
from a full backup, 13-27
from an incremental backup, 13-28
when all catalogs exist, 13-31
when no catalogs exist, 13-34
when only some catalogs exist, 13-34

Reels,
description of, C-2, C-4
information in catalog, 2-5
listing catalog entries for, 24-12
listing from tape, 25-9
statistical information, listing from catalog, 24-18
statistical information, listing from tape, 25-15

Reentering a utility,
BRMS utilities, 26-4
PHYRST, 15-11
PHYSAV, 14-12

Regenerating a catalog, (See also GENERATE_CATALOG command)
access rights needed, 23-2
command queries, control of, 23-4
default GENERATE_CATALOG command, using, 23-2, 23-5
reel, specifying which entry to regenerate, 23-4
regenerating another user's catalog, 23-5
regenerating your own catalog, 23-5

Releasing BRMS tapes, 22-2
60Mb cartridge tape, 22-11
access rights needed, 22-2
ARCHIVE tape, 22-5, 22-7
BACKUP tape, 22-9, 22-10
introduction to tape-release commands, 20-3, 22-2
preparations, 22-2
TRANSPORT tape, 22-3, 22-4

Restoring a BACKUP tape, (See also BACKUP_RESTORE command)
access rights needed, 13-8
adding disk objects, 13-22
command queries, control of, 13-26
converting between CAM and DAM files, 13-26
dated file attributes, using, 13-22
default BACKUP_RESTORE command, using, 13-3, 13-16
examples of, 13-35
index, creation of, 13-24
invoking BACKUP_RESTORE, 13-16
preparations, 13-8
privileged group .BACKUP$, 13-2
procedure, 13-10
procedure reference tables, B-5, B-6
recovering a disk, 13-35
(See also Recovering a disk)
reel, specifying which to restore, 13-20
replacing disk objects, 13-22
restoring directories, 13-8, 13-17, 13-19, 13-35

Restoring a BACKUP tape (continued)
restoring files, 13-8, 13-18, 13-19, 13-35
ROAM files, 13-2, 13-26
saves, selecting which to restore, 13-24
selecting objects to restore, 13-20
volume, specifying which to restore, 13-19
wildcard selections, verifying, 13-21

Restoring a MAGSAV tape, (See also MAGRST command)
ACLs, how handled by MAGRST, G-11, I-2
example MAGRST session, G-17
invoking MAGRST, G-13, I-9, I-12
MAGRST dialog, G-13, I-9, I-13
multireel restore, G-16, I-14
partial restore, I-11
passwords, how handled by MAGRST, G-11, I-2
restoring a partition, I-4
restoring individual objects, G-13
segment directories, handling of, I-3
segment directories, how handled, G-12

Restoring a PHYSAV tape, (See also PHYRST command)
badspot handling by PHYRST, 15-4
command queries, control of, 15-4
default PHYRST command, using, 15-3
disk formats, 15-2
disk mirroring, 15-2
dynamic badspot handling, 15-2
example session, 15-12
handling DMX overruns, 15-4
invoking PHYRST, 15-9
nonrobust partitions, 15-2
PHYRST dialog, 15-9
preparations, 15-5
procedure, 15-5
procedure reference tables, B-7

Restoring a PHYSAV tape
(continued)
reentering PHYRST, 15-11
robust partitions, 15-2
streamer tape drive, specifying speed of, 15-4

Restoring a TRANSPORT tape, (See also TRANSPORT_RESTORE command)
access rights needed, 8-2, 8-7
adding disk objects, 8-14
command queries, control of, 8-18
dated file attributes, use of, 8-14
default TRANSPORT_RESTORE command, using, 8-2, 8-7
directories, 8-7
files, 8-7
index, creation of, 8-17
preparations, 8-7
procedure, 4-8
reel, specifying which to restore from, 8-12
replacing disk objects, 8-14
saves, selecting which to restore, 8-16
selecting objects to restore, 8-13
volume, specifying which to restore from, 8-12
wildcard selections, verifying, 8-13

Restoring archived data, (See also ARCHIVE_RESTORE command)
access rights needed, 6-9
adding disk objects, 6-16
catalog, specifying location of, 6-15
command queries, control of, 6-21
converting between CAM and DAM files, 6-21
dated file attributes, use of, 6-17
default ARCHIVE_RESTORE command, using, 6-3, 6-9
directories, 6-9
files, 6-9
index, creation of, 6-19
preparations, 6-9
procedure, 4-6

Restoring archived data
(continued)
reel, specifying which to restore from, 6-14
replacing disk objects, 6-16
restoring from another user's tape, 6-20
ROAM files, 6-21
saves, selecting which to restore, 6-19
selecting objects to restore, 6-15
volume, specifying which to restore from, 6-14
wildcard selections, verifying, 6-15

Restoring data,
from a BACKUP tape, (See Restoring a BACKUP tape)
from a MAGSAV tape (See Restoring a MAGSAV tape)
from a TRANSPORT tape (See Restoring a TRANSPORT tape)
from an ARCHIVE tape (See Restoring archived data)
logical restore from disk (See Logical copy between disks)
restoring partitions from a PHYSAV tape (See Restoring a PHYSAV tape)
restoring partitions from disk (See Physical copy between disks)
restoring the command device, 19-1
restoring the system, 19-1, 19-5
system backups, types of restore from, 9-3
system restore utilities, summary of, 9-4

Restoring from a UNIX tape to a 50 Series system, K-10

ROAM files,
restoring with the ARCHIVE_RESTORE command, 6-21
restoring with the BACKUP_RESTORE command, 13-2, 13-26

ROAM files (continued)
saving with the ARCHIVE command, 5-18
saving with the BACKUP command, 12-3, 12-29

Robust partitions, 15-2, 16-3

S

Saves,
listing from catalog, 24-15
listing from tape, 25-12
on a BACKUP tape, 12-3
on a TRANSPORT tape, 7-2
on an ARCHIVE tape, 5-2
restoring from a BACKUP tape, 13-24
restoring from a TRANSPORT tape, 8-16
restoring from an ARCHIVE tape, 6-19

Saving data,
logical save to disk, (See Logical copy between disks)
physical save to disk (See Physical copy between disks)
physical save to tape (See Physical save to tape)
to a BACKUP tape (See Logical backup to tape)
to a MAGSAV tape (See Logical save to tape)
to a TRANSPORT tape (See Transporting)
to an ARCHIVE tape (See Archiving)

Scheduling backups, 10-8

Security,
of ARCHIVE tape, 6-9
of BACKUP tape, 13-8
of TRANSPORT tape, 7-2, 7-14, 8-2

STATUS DEVICE command,
example display, 3-2
function of, 3-2

System backups (See Backups)

System crash, recovery from, 19-5

System preparation procedures,
closing a partition to users, 11-8
closing the system to users, 11-3
re-opening a partition to users, 11-8
re-opening the system to users, 11-3
selecting a procedure, 11-2
why required, 11-2

T

Table,
BACKUP procedure, B-2, B-3
backup schedule, example of, 13-36
BACKUP_RESTORE procedure, B-5, B-6
BRMS commands, 2-3
BRMS Help options, 21-3
character mapping, UNIX-PRIMOS, K-17
COPY procedure, B-10 to B-12
COPY_DISK procedure, B-8, B-9
PHYRST procedure, B-7
PHYSAV procedure, B-7
PRIMOS to UNIX filename translation rules, K-19
restoring incremental backups, 13-29, 13-30
streamer tape drives, recommended speed and density settings, 10-7
system backup and recovery utilities, 1-4
system backup and restore utilities, 9-2
UNIX to PRIMOS filename translation rules, K-20
user backup and recovery utilities, 1-2

Tape drives,
assigning, (See Assigning tape drives)
checking availability, 3-2
introduction to, C-2
unassigning, 3-9

Tapes,
blocking factor, C-3
BRMS definition of, 2-2
BRMS labelling, 2-4
density, C-3
frames, C-3
introduction to, C-1
labels, C-5
listing (See Listing a tape)
markers, C-5
mounting with ASSIGN command, 3-8
parity, C-5
records, C-3
reels, description of, C-2, C-4
releasing (See Releasing BRMS tapes)
system boot tape (See Boot Tape)
tracks, C-3
UNIX CPIO tape (See Transporting between PRIMOS and UNIX)
UNIX TAR tape (See Transporting between PRIMOS and UNIX)

TRANSPORT command, (See also Transporting)
default command, using, 7-3, 7-7
examples of, 7-9
function of, 4-3, 7-2
help, 7-5, 21-1
options, 7-3, 7-4
(See also TRANSPORT options)
preparing to run, 7-8
procedure for using, 4-7
reference, A-38
saves, 7-2
syntax, 7-4, A-38
tools for use with, 4-3
treewalking options, 7-12
wildcard options, 7-12

TRANSPORT options,
-ACCESSED_AFTER, 7-4, 7-13
-ACCESSED_BEFORE, 7-4, 7-13
-AFTER, 7-13
-BACKEDUP_AFTER, 7-4, 7-13
-BACKEDUP_BEFORE, 7-5, 7-13
-BEFORE, 7-13
-CAM_TO_DAM, 7-5, 7-17
-COMPATIBLE_VERSION, 7-5, 7-17
-CREATED_AFTER, 7-5, 7-13
-CREATED_BEFORE, 7-5, 7-13
-HELP, 7-5, 21-1
-INDEX, 7-5, 7-15
-INDEX_LEVELS, 7-5, 7-15
-LEVELS, 7-6, 7-12
-MODIFIED_AFTER, 7-6, 7-13
-MODIFIED_BEFORE, 7-6, 7-13
-NO_QUERY, 7-6, 7-16
reference, A-38
-REMARK, 7-6, 7-16
-SAVE_PROTECTION, 7-7, 7-14
treewalking options, 7-12
-TTY, 7-7, 7-16
-VALIDATE, 7-7, 7-17
-VERIFY, 7-7, 7-11
-VOLID, 7-7, 7-11
wildcard options, 7-12

TRANSPORT_RELEASE command,
default command, example, 22-4
examples of, 22-4
function of, 22-3
help, 21-1, 22-3
options, 22-3
(See also TRANSPORT_RELEASE options)
preparing to run, 22-2
reference, A-42
syntax, 22-3, A-42

TRANSPORT_RELEASE options,
-HELP, 21-1, 22-3
-NO_QUERY, 22-3
-REEL, 22-3, 22-4
reference, A-42
-VOLID, 22-3, 22-4

TRANSPORT_RESTORE command, (See also Restoring a TRANSPORT tape)
default command, using, 8-2, 8-7
examples of, 8-8
function of, 4-3, 8-2

TRANSPORT_RESTORE command (continued)
help, 8-5, 21-1
options, 8-3, 8-4
(See also TRANSPORT_RESTORE options)
preparing to run, 8-7
procedure for using, 4-8
reference, A-43
syntax, 8-3, A-43
tools for use with, 4-3
treewalking options, 8-13
wildcard options, 8-13

TRANSPORT_RESTORE options,
-ACCESSED_AFTER, 8-4, 8-14
-ACCESSED_BEFORE, 8-4, 8-14
-AFTER, 8-5, 8-14
-BACKEDUP_AFTER, 8-4, 8-14
-BACKEDUP_BEFORE, 8-4, 8-14
-BEFORE, 8-5, 8-14
-COMBINE, 8-4, 8-14
-CREATED_AFTER, 8-4, 8-14
-CREATED_BEFORE, 8-5, 8-14
-FROM_SAVE_NUMBER, 8-5, 8-16
-HELP, 8-5, 21-1
-INDEX, 8-5, 8-17
-INDEX_LEVELS, 8-5, 8-17
-MODIFIED_AFTER, 8-5, 8-14
-MODIFIED_BEFORE, 8-5, 8-14
-NO_QUERY, 8-6, 8-18
-REEL, 8-6, 8-12
reference, A-43
-REPLACE, 8-6, 8-14
-TO_SAVE_NUMBER, 8-6, 8-16
treewalking options, 8-13
-TTY, 8-6, 8-18
-VERIFY, 8-6, 8-13
-VOLID, 8-6, 8-12
wildcard options, 8-13
-WRITTEN_AFTER, 8-7, 8-14
-WRITTEN_BEFORE, 8-7, 8-14

Transporting, (See also TRANSPORT command)
access rights needed, 7-2, 7-8
CAM to DAM files, conversion of, 7-17
command queries, control of, 7-16
dated file attributes, use of, 7-13
default TRANSPORT command, using, 7-3, 7-7

Transporting (continued)
definition of, 1-3, 4-3
directories, 7-7
directory levels, controlling number saved, 7-12
files, 7-7
index, creation of, 7-15
preparations, 7-8
procedure, 4-7
remark, adding to save, 7-16
Rev.19 system, moving objects to, 7-17
security information, saving to tape, 7-14
security of, 7-2, 7-14
selecting objects to save, 7-11
to a 60Mb cartridge tape, 7-10
validating the save, 7-17
volume, specifying which to save, 7-11
wildcard selections, verifying, 7-11

Transporting between PRIMOS and UNIX, (See also UX_TAPE command)
access rights needed, K-6, K-10
character mapping table, K-17
default UX_TAPE command, using, K-5, K-10
directories, K-6
end of reel, handling of, K-8, K-13
examples of 50 Series restores, K-11
examples of 50 Series saves, K-7
exiting from restore, K-13
exiting from save, K-8
filename translation tables, K-20
filenames, K-5, K-6, K-10, K-15
restoring data to a 50 Series system, K-10
restoring data to a UNIX system, K-15
saving data on a 50 Series system, K-5
saving data on a UNIX system, K-14
tape error messages, K-9, K-13

Transporting between PRIMOS and UNIX (continued)
UX_TAPE command, options, K-2
UX_TAPE command, syntax of, A-48

Treewalking options,
ARCHIVE command, 5-12
ARCHIVE_RESTORE command, 6-16
BACKUP command, 12-24
BACKUP_RESTORE command, 13-21
LIST_CATALOG command, 24-13
LIST_TAPE command, 25-10
TRANSPORT command, 7-12
TRANSPORT_RESTORE command, 8-13

U

UNASSIGN command,
invoking, 3-10
messages, 3-11
reference, A-47
syntax, 3-9, A-47

UNASSIGN options,
-ALIAS, 3-9
reference, A-47
-UNLOAD, 3-9

Unassigning tape drives, 3-9

UNIX, transporting data to 50 Series system, K-1

User utilities,
introduction to, 1-2

UX_TAPE command, (See also Transporting between PRIMOS and UNIX)
default command, using, K-5, K-10
filename translation, K-15
function of, K-1
options (See UX_TAPE options)
reference, A-48
restoring files to a UNIX system, K-15
restoring UNIX files to PRIMOS, K-10

UX_TAPE command (continued)
saving PRIMOS files to tape, K-5
saving UNIX files to tape, K-14
syntax, A-48, K-2

UX_TAPE options,
-APPEND, K-2
-BLOCK_SIZE, K-2
-BLOCKING_FACTOR, K-3
-CPIO, K-3
-LCASE, K-3
-LIST, K-3
-NO_QUERY, K-4
-NO_REWIND, K-4
-NO_TRANSLATE, K-4
-POS, K-4
-RESTORE, K-4
-SAVE, K-4
-SWAP, K-4
-TAR, K-4
-UPCASE, K-5

V

Validating a catalog, (See also GENERATE_CATALOG command)
access rights needed, 23-2
command queries, control of, 23-4
example of, 23-6
reel, specifying which entry to validate, 23-4

Volume,
definition of, 2-2
information in catalog, 2-4
listing catalogs of, 24-2
listing from tape, 25-9

W

Wildcard options,
ARCHIVE command, 5-12
ARCHIVE_RESTORE command, 6-16
BACKUP command, 12-24
BACKUP_RESTORE command, 13-21
BRMS Help text, 21-6
LIST_CATALOG command, 24-13

Wildcard options (continued)
LIST_TAPE command, 25-10
TRANSPORT command, 7-12
TRANSPORT_RESTORE command, 8-13

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