FORTRA

Robot Save 13.04

User Guide

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Introduction

About This Guide

This user guide is a reference to Robot Save, the complete backup, recovery, and media management software for your IBM i servers. The guide describes Robot Save program features, commands, the user interface, and provides some examples of how you can use them to automate your disaster protection and media management tasks.

Who Should Use This Guide

This user guide is for IBM i users who are responsible for setting up and performing backup/recovery and media management tasks on your systems. This can be an operator or data center manager. You should be familiar with the following:

- Your company's disaster recovery needs. Use this information to determine the data that needs to be backed up and develop a save strategy.
- The window available for a backup on a nightly, weekly, and monthly basis.
- Your data center's hardware configuration and available devices. You must know this information to set up Robot Save properly in a data center.
- IBM i backup and recovery procedures and principles.
- Basic IBM i operations.
- Other Robot software installed on your systems.

How This Guide is Organized

This user guide is organized into the following sections. Each section begins with a description of the topic, followed by a discussion of the user interface panels and how to complete them to set up each Robot Save function. The panel descriptions provide detailed information on valid values, the function of each field, and any additional information that can help you when using Robot Save. The topics within each section follow the Robot Save menu system.

- Getting Started
- System Setup
- Backup Classes
- Backup Sets
- Backup Operations

- Robot Save Restricted Save Utility (RSU)
- Save Media Management
- Object Archive
- System Restoration
- Reports
- Disaster Planning
- Volume Management
- Data Sets

How to Use This Guide

This user guide is not meant to be read topic for topic. Instead, you should become familiar with the introductory material to get a feel for the product and to think about how you plan to use it. Afterwards, when you are setting up Robot Save (or for more detailed information anytime), refer to the appropriate section of the guide for reference.

You can also access help that is built into the green screen interface on any panel or command prompt by pressing **F1**.

Additional Support

If you don't find the answers you need in this user guide, try Robot Technical Support. Here you can find additional information in the Robot Support Self-Service topics or use the live chat window. You can also find our support email address and the phone numbers to contact a Technical Consultant.

About Robot Save

Robot Save is an important component of the Robot product line, offering a backup and recovery solution for your IBM Power Systems servers (System i, iSeries, AS/400) running IBM i (OS/400, i5/OS). Robot Save automates backing up your disk drives and restoring the system when a disk drive fails. It automates the management of save media and even tells your operator where to move the save media next.

The full power of Robot Save will help you recover from unlucky events. This user guide shows how Robot Save can protect you, your system, and your company.

Robot Save offers:

- Automatic backup and recovery
- Data encryption to tape
- Save media management
- Object archive system
- Data center management
- Domino online backup

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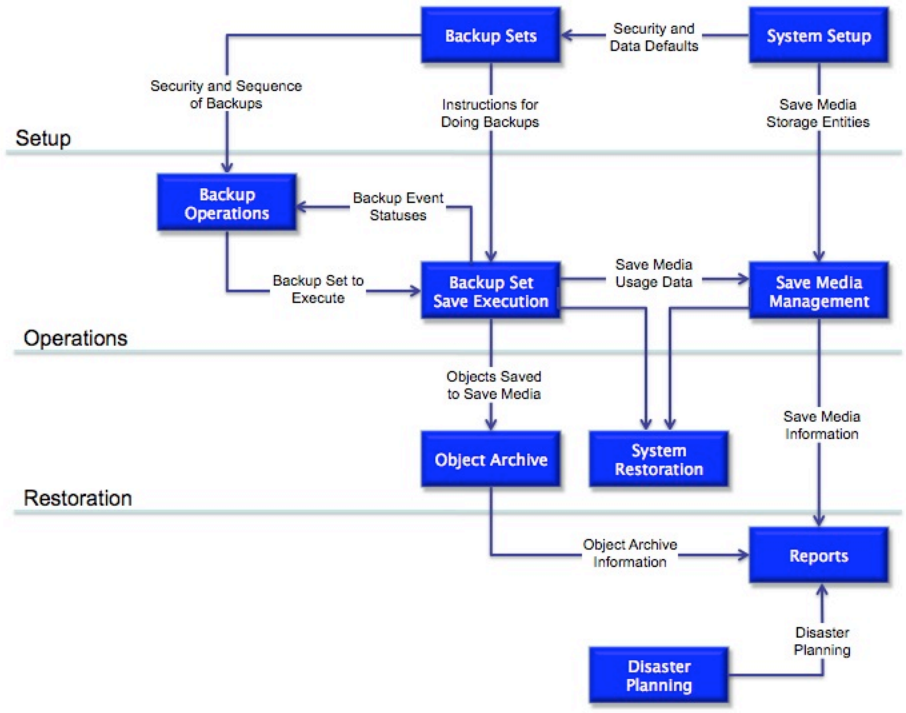
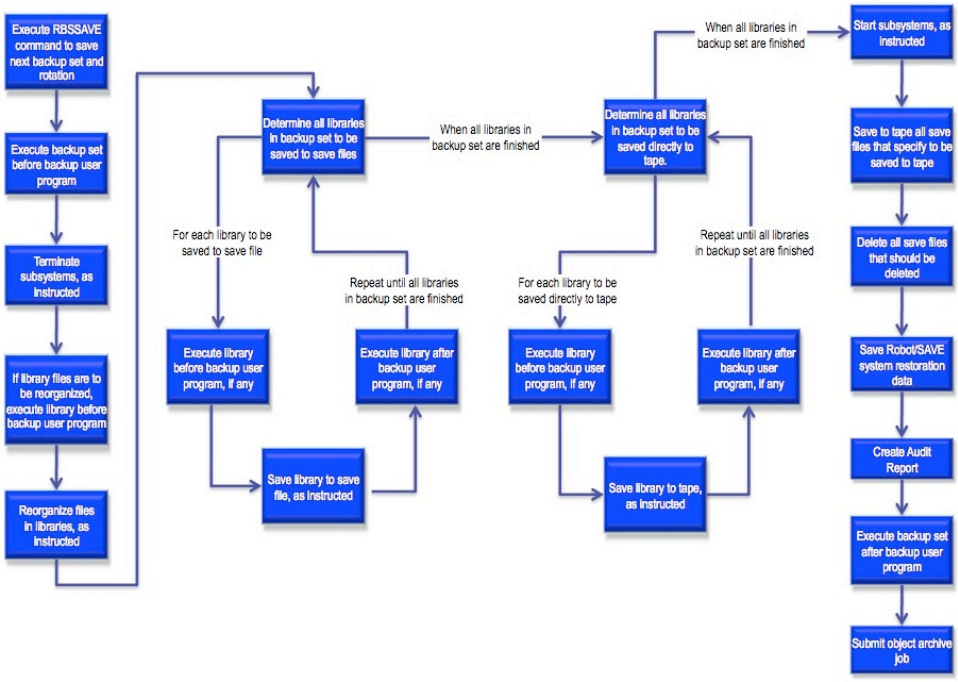
Robot Save System Flow Diagram



Robot Save Save Process



How a Robot Save Save Works

This topic briefly describes each step in the process that Robot Save follows automatically when it saves a library or an object list. This process takes place after you have defined the backup class and set information. You can use this discussion to guide you in setting up Robot Save to do exactly what you want. The steps here follow the Robot Save Save Process diagram.

Execute the RBSSave command to start the save

If the RBSSave parameters for backup set and rotation are *NEXT, Robot Save determines the next set and rotation to be executed and proceeds with the save.

A Robot Save status message record is created for each backup set save session (see the Status Messages section for more information). The starting date and time are placed in the status record.

If you specified that you want to add undefined libraries to the backup set on the Extended Backup Set Information panel, Robot Save finds unassigned libraries and adds them, based on the criteria you specified on the System Defaults panel during system setup.

Execute the backup set before backup user program

If you have certain procedures that should be done before the save session starts, you can put them in a before backup user program and enter the program name on the Extended Backup Set Information panel. That program will be executed before the save session starts.

Terminate subsystems

Robot Save cannot save files that users or batch programs are using. To ensure that there are no file locks during the save process, have Robot Save terminate the user subsystems. Robot Save will terminate the subsystems specified for this backup set. Any jobs running in these subsystems will be ended.

Execute the library before backup user program (only if the library has files to reorganize)

If you have certain procedures that should be done before the save of a library starts, put them in a library before backup user program and enter the program name on the Extended Library Save Information panel. That program will be executed before the library save if files are to be reorganized.

A great use for this feature is to vary off workstations that might be using a library. Then, use a library after backup user program to vary them back on immediately after the library is saved. You can do this instead of terminating subsystems to minimize the downtime your users have to suffer.

If the library before backup user program is not executed in this step because there are no files to be reorganized, it will be executed at Step 7 or 11, as appropriate.

Reorganize files

At your option, Robot Save can reorganize a library's files that exceed a certain percentage of deleted records. It's important to save a journaled file immediately after reorganization because its journal records are worthless after reorganization. This option increases your save time, so files should not be reorganized on days you must minimize downtime.

Determine libraries to save to save files

Robot Save reads through the libraries to be saved by this backup set and selects the libraries that are to be saved to save files. Libraries with the following save codes are saved to a save file at this point:

```
SLSS SCSS SLSD SCSD SLSF SCSF
```

When Robot Save finds a library with one of these save codes, it executes Steps 7, 8, and 9 for that library. When no more libraries remain to be saved to a save file, Robot Save proceeds to Step 10.

Execute the library before backup user program

If the library before backup user program was not executed in Step 4, it is executed here. Let your imagination run with this function. There are many procedures you might want to do before a library is saved. Remember, no users should be using the library at this point.

Save the library to save file

When doing a save file operation, Robot Save creates the save file in a special library assigned to each backup class. Robot Save can save either entire libraries or just changed objects.

Execute library after backup user program

If you had a library before backup user program, the after backup user program should undo what the before backup user program did. For example, if your before backup user program varied off workstations, your after backup user program should vary them back on.

When the library after backup user program is executed, the save procedure returns to Step 6 to check for the next library.

Determine the libraries to save to tape

Robot Save reads through the libraries to be saved by this backup set and selects the libraries that are to be saved to tape. The libraries with the save codes “SL” and “SC” are saved to tape at this point.

When Robot Save finds a library with one of these save codes, it executes Steps 11, 12, and 13 for that library. When no more libraries remain, Robot Save proceeds to Step 14.

Execute the library before backup user program

See Step 7.

Save the library to tape

Robot Save does a normal save to tape with the following additional enhancements:

- It intercepts all device messages and tells you what to do next, rather than giving you dangerous options.
- It handles all the messages necessary for the unattended operation of the cartridge stacking mechanisms on magazine tape drives.
- If you have Robot Alert, our optional paging software, Robot Save sends a pager message if a tape mount is needed or if the tape device jams.
- It automatically records any scratch tape that you mount.
- At your option, Robot Save tells you the proper volume to mount next and does not allow you to mount volumes out of order.

Execute the library after backup user program

See Step 9. When the library after backup user program is executed, the save procedure returns to Step 10 to check for the next library.

Start subsystems

Robot Save starts all subsystems that were terminated when the backup session started.

Save all the save files to tape

Robot Save reads through the libraries to be saved by this backup set and selects the libraries with save files that should be saved to tape. Libraries with the following save codes have their save files saved to tape at this point:

```
SLSS SCSS SLSD SCSD SF SFD
```

Delete all save files that should be deleted

Robot Save reads through the libraries to be saved by this backup set and selects the libraries with save files that should be deleted. Libraries with the following save codes have their save files deleted at this point:

```
SLSD SCSD SFD
```

Save Robot Save system restoration data

At the completion of a backup and restore class-type backup set, Robot Save automatically saves the library RBSDTALIB onto the last tape. This library contains the files necessary to print the system restoration instructions as of this save session. This lets you restore the RBSDTALIB and RBSPGMLIB libraries while Robot Save guides you through the restoration process.

Create Audit Report

The Robot Save status message record created for this backup set save session in Step 1 is updated with the ending date and time. Robot Save then creates the Audit Report. (You must schedule the save of RBSPGMLIB to save the object archive.)

Execute the backup set after backup user program

If you had a backup set before backup user program, the after backup user program should undo what the before backup user program did.

Create Object Archive

Robot Save submits a job to create the object archive, if one has been specified. **Note:** You must schedule the save of RBSPGMLIB to save the object archive.

Getting Started

Setup Options

Setting Up Robot Save

Robot Save Setup Options

The topics in this section describe how to use Robot GUIDE, Robot Save's automated setup option. You can use Robot GUIDE to set up our recommended backup strategy or to create a customized backup strategy that specifies how you want to back up your system.

- Robot Guide Automatic Setup
- Recommended Setup
- Customized Setup

It may benefit you to read the section on issues and recommendations for tape management before you actually install Robot Save. Although you do not need to follow these recommendations to set up Robot Save, they provide practical information on how to manage your tapes and your computer operations.

Robot Save Panels

Every Robot Save panel has an identification line at the top and one or two function key prompt lines at the bottom.

Press **F1** from any panel to display help for that panel.

On most Robot Save panels, you can press **F6** to define a new Robot Save record. On a list panel, you can enter an **A** next to a current record to display the Add/Copy/Delete window. Use this window to choose to copy or delete the current Save job record or add a new record.

If you choose Copy Record or Add Record, that option becomes the default until you change it. This makes it easier for you to perform the add or copy function again and again. For example, if you are adding many new records, simply set the option to Add Record. Then, all you have to do to add a new record is press **F6**, enter your new information, and press Enter. (The Delete Record option does not remain as a default; this is a safety feature to prevent you from deleting records accidentally.)

Robot GUIDE Automatic Setup

The Robot GUIDE automated setup process allows you to create backup classes and sets for performing your daily and weekly backups. You can back up libraries, security data, user profiles, configuration data, documents, the IFS, and Domino databases; and the entire system.

The Robot GUIDE Automatic Setup panel displays at the end of the installation process. Prior to displaying the Robot GUIDE Automatic Setup panel, the automatic setup process does the following:

- Defines the save devices on your system to Robot Save
- Creates the save media types for each defined save device

- Loads a list of the libraries on the system
- Creates a list of Domino servers on the system

You can select from two automatic setup options or exit Robot GUIDE and perform the setup at a later time.

On the Robot GUIDE Automatic Setup panel, press F4 to select the default save device to be used for your backups. When the Save Device Finder panel displays, enter a 1 to select from a list of devices that were defined to Robot Save. Press Enter to display the Save Media Finder panel.

Note: You must specify a default save device to run Robot GUIDE.

The Save Media Finder panel displays a list of save media types that are supported for the save device you selected. Enter a 1 to select a media type and press Enter to return to the Robot GUIDE Automatic Setup panel.

Note: You must specify a save media type to run Robot GUIDE.

You can specify if you want to allow tapes to be initialized from a command line using the INZTAP CHECK(*NO) VOL(*MOUNTED) command. The default value is N (No) to protect tapes from being overwritten accidentally.

Warning: Changing this field to Y (Yes) will allow Robot Save media to be initialized from a command line. You should keep this in mind when deciding whether or not to change this value. See the Media Defaults section of the Robot Save User Guide for more information on protecting media from being overwritten.

Select an automatic setup option from the following:

1. I want Robot Save to create the recommended setup

   Select this option if you want Robot Save to create a backup strategy based on IBM recommendations.
2. I want to fill out a grid based on my current strategy

   Select this option if you currently have a backup strategy and want to duplicate it using Robot Save. You will be asked to complete a grid specifying how you want your system backed up.
3. I do not want to do setup right now

   Select this option if you want to run Robot GUIDE automatic setup at a later time. To return to the Robot GUIDE Automatic Setup panel, enter the following command on a command line:

   RBSPGMLIB/RBSCLR

Recommended Setup

Selecting the Robot GUIDE recommended setup option (option 1) creates the following on your system:

- A weekly backup class, WEEKLY, with a backup set, WEEKLY, that saves the entire system.
- A daily backup class, DAILY, with 2 backup sets, DAILY1 and DAILY2. Set DAILY1 performs a SAVLIB *ALLUSR. Set DAILY2 does the following: SAVSECDTA, SAVCFG, SAVDLO, save all IFS (SAV), and save all Domino databases (if they exist on the system). Backup set DAILY2 is an alternate set of set DAILY1; both backup sets use the save media of set DAILY1. Thus, set DAILY2 should be run after DAILY1 completes.
- A test backup class, TEST, with a backup set, TEST, that saves the Robot Corral library, RBTROLLIB. You can use this set to test your backups.

To create the recommended setup:

1. Select **option 1** on the Robot GUIDE Automatic Setup panel.
2. A confirmation window displays asking if you want to create the recommended setup.

   If you have Robot Schedule, the automatic job scheduler, installed on your system, you can choose to schedule your backup jobs in Robot Schedule. The default value is N (No).
3. Press Enter to complete the setup. If you want to review or make any changes to your selections before completing the setup, press **F12** to return to the Robot GUIDE Automatic Setup panel.

When the setup process completes, the Automated Setup - Recommended Setup report (RBS2302) displays showing the backup classes and sets that were created. Robot GUIDE also creates the following reports at the end of the setup process:

- System Setup Information Report
- Backup Class Information Report
- See Reports for complete information on these reports.

Customized Setup

If you select **option 2** on the Robot GUIDE panel, you can set up a customized backup strategy. Select this option if you currently have a backup strategy and want to duplicate it using Robot Save. You then complete a grid specifying how you want to back up your system.

To create a customized backup strategy:

1. Select **option 2** on the Robot GUIDE Automatic Setup panel.
2. Fill out the grid based on the strategy you want to use. Enter an **X** in each column for the type of backup you want to perform.
3. When grid is filled out, press **F10** to finish the setup.
4. The confirmation window displays asking if you want to create your customized setup.

   If you have Robot Schedule, the automatic job scheduler, installed on your system, you can choose to schedule your backup jobs in Robot Schedule. The default value is N (No).
5. Press Enter to complete the setup. If you want to make any changes to your selections before completing the setup, press F12 to return to the Robot GUIDE Automatic Setup panel.

When the setup process completes, the Automated Setup - Customized Setup report (RBS2302) displays showing the backup classes and sets that were created. Robot GUIDE also creates the following reports at the end of the setup process:

- System Setup Information Report
- Backup Class Information Report
- See Reports for complete information on these reports.

System Setup

System Setup Menu

The System Setup menu allows you to define options for managing Robot Save—from selecting the save media to use to defining security. You can enter save media storage locations and containers and identify save devices. The System Setup menu also allows you to define default values for creating backup sets.

You typically only have to define this information when you first start using Robot Save. After that, you should only have to modify the information if you make changes to your system.

Related Topics

- Device Groups
- Automated Media Library Maintenance
- Automated Media Library Support
- Support for StorageTek AMLs

- Defining AML Ports
- Media Attribute Management Overview
- Defining Defaults and Controls
- Encryption Defaults
- Security Overview
- Data Center Management

Device Groups

A device group associates two or more save devices as a group. Robot Save allows two different types of device groups: non-AML device groups and Automated Media Library (AML) device groups. This section discusses non-AML device groups. AML device groups are discussed in the AML Maintenance section, later in this User Guide.

Each device in the group must be of the same type and use the same media type and density. You create a device group during system setup using the Device Group Maintenance option. You then specify the device group name on the Save Device Entry panel.

Non-AML device groups are designed to be used with a single system that has multiple drives of the same type configured. With a device group, you can use the drives for the same backup. The first drive writes to a tape until the tape is full. The backup then continues on the second drive while the volume used on the first drive rewinds and unloads.

When a save starts, Robot Save looks at the Backup Set Information panel for the save devices to be used. Robot Save attempts to vary on the first device specified for the set. If that device is not available, Robot Save tries to vary on the next device for the set, and so on. If none of the devices specified for the set are available and if the devices are members of a device group, Robot Save then checks the next device in the device group and attempts to vary it on. When a device is found to be available, Robot Save updates the Backup Set Information panel with the proper device name, sends a message to QSYSOPR, and updates the completion history with the name of the device being used.

After the save is done, all the devices that were used for the save remain on the Backup Set Information panel. Thus, the next time this backup set is run, the save devices listed on the panel may be different from those originally entered.

Robot Save always tries to place the same number of devices on the Backup Set Information panel as originally were specified. For example, suppose you specify TAP03, TAP05, and TAP06 on the Backup Set Information panel. When the save starts, Robot Save checks each of the devices listed for availability. If TAP06 is not available, but TAP08 also is part of the device group and found to be available, the Backup Set Information panel is updated to show TAP03, TAP05, and TAP08. The next save of the backup set will start with TAP03, TAP05, and TAP08 as the devices for the set. If only two devices were found to be available,

the panel is updated to show only those two devices. Thus, it is possible to start a save with fewer devices specified for a set than you originally intended.

If none of the devices entered for a set or in the group are available, no changes in devices are made and the save continues, resulting in a “Device Not Ready” message.

Note: Device groups are not supported for restore operations. However, you can change the device to be used for the restore.

Media Attribute Management Overview

Robot Save uses various storage entities as part of its media management system to help track your save media. You can specify locations (such as the computer room, loading dock, and so on.) and containers (such as a rack or a box) where your media will stay during the save cycle. You also can document the sequence of locations that volume movement should follow by creating move sets. If you are using locations and containers in a data center, the location and container names are shared by all systems in the data center.

Stricter Control or Ease-of-Use

You can enter as many (or as few) locations and containers as you want. The more you enter, the stricter control you will have. Robot Save’s auto move processing lets you maintain strict control with a minimum of effort. Once you have determined the sequence of moves, you can let Robot Save take over the media management. Auto move processing is discussed in detail later in this section.

Locations

A Storage Location is any place a tape stays during the movement cycle. Enter the number of locations you need to provide the degree of control you and your staff want to achieve. Each location must have a unique name.

Automated media libraries (AMLs) require a single location. The AML location represents tapes actually inside the AML. Thus, if the storage location specified for a volume is attached to an AML, the volume is assumed to be in the AML. When a volume is moved from an AML location to another location, the volume is physically ejected from the AML or queued for ejection from the AML.

You should enter the tape storage service contacts and the procedures for retrieving tapes in Robot Save’s Disaster Plan.

- See Defining Locations for more information about defining storage locations.

Containers

In addition to locations, you can specify a container for volumes. A Robot Save container represents the physical container in which tapes can be stored. Containers typically are either racks for on-site storage, or boxes for off-site storage.

Containers are optional in Robot Save; you do not need to create them. Containers are not used by automatic volume movement processing. However, you can move volumes from one container to another using the Robot Save panels. When you move the volumes in a container to a new location, the container also appears to move.

You can create a container for every tape rack, or for every shelf in your tape racks, or every foot of shelf in your tape racks.

For off-site storage, you should have permanent, sealable tape boxes or cases. Each tape box must have a serial number. You and the tape storage service personnel then can control containers rather than volumes. This method is safer and less prone to error. Create a container record for each serial numbered tape box.

- See Defining Containers for more information on specifying containers for volumes.

Move Sets

A move set is a sequence of locations that tape volume movement should follow. The move set documents a tape's movement cycle from backup to storage and to backup again. Each list of locations (move set sequence) is given a move set name. You can create as many move sets as you want. Each backup set can have its own move set or can reference a common move set.

The systems in a data center share move sets. Any changes you make to a move set from one system affect all other systems in the data center. This provides a common reporting system for media management across the systems in a data center.

Robot Save's move set feature provides three benefits:

- If you are using manual move sets, the next location where the volumes should be moved is shown when the operator needs to move a rotation to a new location.
- You can enter the number of days the volumes will be at each location or the number of rotations that can be in a location. If your move set uses the number of days at a location, the Volumes to be Moved report lists the volumes that are to be moved. The report can highlight any tape movement logging errors or possible lost tapes.
- The backup class has an option to release expired tapes automatically to the scratch tape pool. You can designate a specific location in the move set where expired tapes should be released automatically from the backup set rotation to the scratch tape pool. After a tape volume is released to the scratch pool, it no longer is moved by the move set.

Move sets can be one of three types: Manual Move Only, Maximum Days at Location, or Maximum Rotations at Location.

- See Defining a Move Set and its Sequences for more information on setting up move sets.

Auto Move Processing

Robot Save's Auto Move processing completely automates the movement of tapes through the locations in a move set. You can specify the type of auto move processing each backup set will use—either Maximum Days at Location or Maximum Rotations at Location. Auto move processing consists of three steps:

1. When a save starts, Robot Save checks the backup set rotation for a move set name.
2. If the backup set rotation has a move set type of Max Days at Location or Max Rotations at Location, all volumes attached to the set rotation are moved automatically to the first location in the move set, sequence 01. Sequence 01, In Use, is always the starting point for an auto move move set. It is added automatically to the move set during setup and cannot be deleted.
3. At the end of the save, the set rotation for the current save is moved automatically to the next location in the move set. All other rotations eligible to be moved also are moved at this time. If the save does not complete properly, the rotation and the volumes in the rotation remain in the In-Use location.

On days when a backup is not run, you can move rotations using the RBSAUTOMOV command. Schedule the RBSAUTOMOV command on Robot Schedule so that the movement of tapes proceeds on schedule.

Note: If you are using containers for your media volumes, the container also follows to the next location. Volumes are not moved to another container automatically. You must move them manually if you want to change containers.

Auto move processing also creates a history file that provides a detailed audit trail of the movement of tape volumes. You can display the history or print a report showing the movement history.

Auto Move Processing - Maximum Days at Location

When a move set uses the Maximum Days at Location option, you specify the number of calendar days a rotation remains at each location (this includes weekends). A rotation becomes eligible to be moved when it has been at a location the number of days specified in the move set sequence. The next time a save is run, the rotation is moved to the next location.

Auto Move Processing - Maximum Rotations at Location

A move set that specifies the Maximum Rotations at Location uses first-in-first-out (FIFO) logic. You define the maximum number of rotations of a single backup set that can be at each location. When that number is reached, Robot Save moves the rotation that has been at the location the longest (and its attached volumes) to the next location.

Suggestions for Using Auto Move Processing

Use the following suggestions to help you set up and use auto move processing.

- To use auto move processing, you must specify **Y** (Yes) in the Auto Move Set processing enabled? field on the Media Defaults panel.
- The recommended minimum number of locations for an auto move set is four.
- You cannot change the auto move type after it has been defined. Switching a move set from Maximum Days at Location to Maximum Rotations at Location is not allowed. If you want to change a move set type, you must create a new move set of the appropriate type and add the move set sequences into the new set.
- Only one sequence can be specified as Release to Scratch. We recommend that if you do plan to release volumes to the scratch pool, that you do this at the last sequence of the move set. The location must be on-site.
- You can choose to move one or more volumes manually to another location, even though a rotation is controlled by a move set. For example, you might need to use a volume to restore a library or object. When you move a volume out of the move set sequence, it is no longer moved with the rest of the rotation. To get the volume back into the auto move sequence, you must move it manually to the same location as the rest of the rotation. It then will be moved with the rotation for the remainder of the auto move sequence.
- If you don’t move the volume to the same location as the rest of the rotation, the volume will be moved to sequence 01 the next time the rotation is used for a save. See Overriding Automatic Volume Movement in the Save Media Management section for a discussion of how to move volumes manually.

Defining Defaults and Controls

The Defaults and Controls section of the System Setup Menu lets you enter the defaults used throughout Robot Save. These include basic defaults used by the system; defaults that indicate the type of media and the device you use; database and save file defaults that determine how Robot Save handles and saves files; disaster planning defaults that specify print attributes; and default encryption settings.

If you used Robot GUIDE to set up Robot Save, it filled in default values for your system. You can change these at any time using the Defaults and Controls panels.

When parameters are available at the system level, they can, in most cases, be overridden at the class, set, or library level. The standard hierarchy for overriding parameters is: library overrides set, set overrides class, and class overrides system.

To access the System Setup Menu, enter **option 7** on the Robot Save Main Menu. Press **F1** from this panel for detailed descriptions of the fields.

Encryption Defaults

Robot Save allows you to encrypt data as it is saved to tape. Encryption converts the data to an unreadable form. Decrypting the data converts it back to its original form. Data encryption protects your tape volumes in case they are lost or stolen. Encrypted data cannot be restored outside of Robot Save unless the user knows the encryption key that was used to save the data and is using the Robot Save restore commands.

You specify the items to be encrypted at the backup set level. For libraries, you can select default objects that always are saved encrypted by any backup set that saves the library. The encryption defaults you define at system setup specify the level of encryption to use when encrypting selected data and the encryption key used by Robot Save. The encryption level and encryption key also are used (unless they are overridden) when saving from a command using Robot Save encryption commands or for an ad hoc save.

Note: You must have IBM licensed program 5722AC3, Cryptographic Access Provider 128-bit for the iSeries, installed to use Robot Save encryption.

- See About Robot Save Encryption for more information and working with Robot Save Encryption

Encryption Levels

To set up Robot Save encryption, you must specify the level of encryption (or no encryption) to use during system setup. You also define the encryption key that Robot Save will provide to the encryption algorithm. An encryption key is an 8- to 32-character password that the encryption algorithm uses to encrypt data. Robot Save allows five levels of encryption:

- No encryption. No data is encrypted and all backups process as usual.
- Low-level encryption. Robot Save uses an internally defined algorithm to encrypt data. This provides the fastest processing, but it is the least secure level of encryption. Low-level encryption uses a 32-character encryption key.
- Medium-level encryption. Robot Save uses the Data Encryption Standard (DES) cryptographic algorithm for encryption. A unique 8-character key provides security for the encrypted data.
- High-level (128-bit) encryption. Robot Save uses the Advanced Encryption Standard (AES) for data encryption. High 128 uses a 16-character encryption key.

- High-level (256-bit) encryption. Robot Save uses the Advanced Encryption Standard (AES) for data encryption. High 256 uses a 32-character encryption key.

Encryption Key Management

Robot Save manages the keys used to encrypt data. Key management allows Robot Save to track the keys used to encrypt data and know the correct key required to restore the encrypted data. Encrypted files cannot be restored using the IBM restore commands. You can restore encrypted files only through Robot Save or by using the Robot Save restore encrypted data commands and entering the encryption key used for the data being restored.

When you install Robot Save, the encryption level is set to 0 (None) and there is no encryption key. You must enter an encryption key to set an encryption level.

You enter the encryption key during system setup. The key is encrypted and stored in the RBSKEYLIB library, which is saved in encrypted format to prevent unauthorized users from accessing the key. Encryption keys are never displayed, printed, or stored in clear text.

You can change the encryption key used to save your data as often or as rarely as you wish. We recommend that you follow your password security rules and change the encryption key on the same schedule that you change other system passwords.

To change the encryption key, you must know the current key value. If you forget the current encryption key value, you must sign on as QSECOFR to reset the key without entering the current value.

Select option **12** from the System Setup panel to display the Save Encryption Key panel.

Note: You can perform ad hoc encrypted saves and restores using Robot Save commands without entering a default encryption level and key. The commands allow you to specify the encryption level and encryption key.

Security Overview

The Robot Save security system allows you to secure menu options and each backup class and backup set. Robot Save's menu option security is easy to understand. Authorization to Use a menu option allows you to view all records and to perform the menu option, unless it is a setup function.

To display the Secured Objects panel, select option **14** from the System Setup Menu.

Backup Class Security

You can specify backup class security for all backup classes or just for an individual class. The authorities valid for all backup classes and the functions you are allowed to perform are:

Use authority:

- Run any backup set unless it is excluded by an individual class or set record.
- View information on the classes or sets.
- Run a backup set by executing the command RBSSave, scheduling it in Robot Schedule, or selecting the proper option on the Backup Operations Menu.
- Add or delete tape volumes using the Backup Set Rotations panel.

  Note: You cannot change any backup class or set information.

Change, Add, or Delete authorities:

- Add or delete backup classes and sets.
- Change any information on backup classes or sets.

Individual Backup Class Security

If you are granted authority to specified backup classes, each authority allows the following:

Use authority:

- Run any backup set within the specific class, unless excluded by an individual set record.
- View information on the class or its sets.
- Add or delete tape volumes for the backup set's rotations.

Change authority:

- Add or delete sets within the class.
- Change any information on the backup class.

  Note: You cannot change any backup class or set information.

Backup Set Security

You can have the same security on backup sets or have security on each individual set. Before you set up security on the sets, restrict security on the backup class. A user must have Use rights to a class to have any rights for the sets. If you have authority for all backup sets, you are allowed to do the following:

Use authority:

- Run any backup set unless excluded by an individual class or set record.
- View information on the sets.

- Add or delete tape volumes on the backup set rotations.
  Note: You cannot add or delete any backup classes.

Change, Add, Delete authorities:

- Add or delete backup sets.
- Change any information on backup sets.
  Note: You cannot change any backup set information.

Individual Backup Set Security

If you are granted authority to a specified backup set, you are allowed to:

Use authority:

- Run the specified backup set. View information on the set.
- Add or delete tape volumes on the backup set's rotations.
  Note: You cannot run any other sets or change any backup set information.

Change authority:

- Change any information on the backup set.
  Note: You cannot add or delete any backup set.

Restricting Initialization of Tape Volumes

You can ensure that all tape volumes created on your system are controlled by Robot Save. Just revoke authority to the IBM command INZTAP for all or most of your users. Robot Save's initialize program is owned by a Security Officer so it always has the authority to initialize tapes. After Robot Save initializes the tape, it adds the volume to the tape management system where you have control.

Putting IBM i Security on the Robot Save Security System

Although all of the security information used by Robot Save is encrypted in the database files, you may want to restrict Change rights to the security program and files. Do not restrict Use rights or no one can use Robot Save.

You should revoke authority to add, change, or delete on the following objects:

- The program RBS810
- The files RBSQO, RBSQR, RBSQU

Developing a Save Strategy

Developing a Save Strategy

This section is designed to help you develop a save strategy for your backups. It discusses how often to save, when to perform backups based on your system availability, and the types of saves Robot Save can perform.

Related Topics

- Data Loss Risks
- Save Frequency Recommendations
- Available Types of Saves
- Available Types of Media Operations
- Library Save Codes
- Automatic Coding of Libraries for Backup

Available Types of Saves

Before you choose your backup strategy, you need to understand the types of saves Robot Save can perform:

- Robot Save can save entire libraries. Library saves done outside Robot Save do not affect your normal backup routines.
- Robot Save can save document library objects (SAVDLO), system libraries (SAVSYS), user profiles (SAVSECDTA), the Integrated File System (SAV), device configuration data (SAVCFG), and Domino databases and transaction logs using Domino online backup (SAV). For a detailed explanation of the save process, see How Robot Save's Save Works, earlier in this user guide.
- Robot Save can save individual objects in one or more libraries. Use an object list created using Robot Corral, our object selection manager, to specify just the objects you want to save. Saving object lists is discussed in detail in Using the Navigator to Set Up Backup Classes and Sets.
- Optionally, you can code a data set program that includes Robot Save data set commands. See Data Sets for more information.

Data Loss Risks

Robot Save can protect you against the following risks. You should decide the magnitude of these risks based on your local conditions. The risks are listed in order of expected occurrence:

- An application or human error ruins an object.
- Your system loses one disk drive. Either the Auxiliary Storage Pool (ASP) or the regular drives are still working.
- Your system is destroyed.
- Your system and on-site tapes are destroyed.
- Your system and on-site tapes are destroyed and one copy of the backup tapes stored off-site cannot be read.

To protect yourself against these risks, you should back up your disk drives to tape regularly. Store at least two copies of the objects on your system off-site. You also should journal the changes to your important files onto an ASP.

Another risk of data loss occurs if your system loses power. Depending on machine activity, the system could lose all of the database changes for the last 2 to 30 minutes if power fails. Protect yourself by installing a UPS hardware system of appropriate size.

Save Frequency Recommendations

We recommend the following save frequencies based on our experiences with the data loss risks:

1. Perform a SAVSYS once a month and store it off-site. Use at least two tape rotations. If you install a new version of IBM i or install a large number of PTFs, do a SAVSYS as soon as practical.
2. Save the User Profile data once a week. Save it every day if you are changing user profiles and adding new objects daily. You can do the save during the day; it will not interfere with your users.
3. Save the iSeries device configuration data once a week. Save it every day if you change your configuration on a daily basis.
4. Save IBM Licensed Program Libraries or other purchased software program-only libraries once a month. Store the tapes off-site. Use at least two tape rotations. If you are making changes to the programs in the libraries, you might save the changes weekly or daily, depending on the frequency of your changes.
5. Save our program library, RBSPGMLIB, at least weekly; save it daily if you are creating an object archive. This library contains the Robot Save programs, the Object Archive, and the Disaster Plan. If the Object Archive and the Disaster Plan are not that important to you, save the library changes less frequently. The remaining files are

stored in library RBSDTALIB, which is saved automatically onto the last tape of a backup session. If you are running concurrent saves, RBSDTALIB is saved only once when the last backup session completes.

When you save RBSPGMLIB, it is saved to a save file first, then saved to tape. This is done automatically when you do a NONSYS, *ALLUSR, or save entire system save. If you want to save RBSPGMLIB in any other type of save, you must add it to your backup set. You cannot save RBSPGMLIB directly to tape. When you save RBSPGMLIB with Robot Save, it is saved at the end of the backup to save file and then to tape, right before RBSDTALIB is saved.

The following situations could prevent the save of RBSPGMLIB from completing normally:

- Another save or an archive job currently is running.
- The percentage of system auxiliary storage used is over the threshold you have set. Robot Save checks the threshold value and ends the save of RBSPGMLIB if the threshold has been exceeded.

If the save is not completed, Robot Save sends a message to the QSYSOPR message queue and records the information on the Robot Save Status and Completion Inquiry panel.

6. Save RBTSYSLIB once a month. You will need it should you ever have to restore Robot Save.
7. Save all other user libraries completely at least once a week. These include QUSRSYS, QGPL, and QDOC. Save changes to those libraries daily.
8. Save the Integrated File System (IFS) at least once a week. You also can save individual directories with object lists created using Robot Corral.
9. Save your Domino databases and transaction logs daily.
10. If your journal receivers are on an Auxiliary Storage Pool (ASP), switch and save journal receivers at least once a day. If you don’t use an ASP for journal receivers, switch and save them two or three times a day.

Any tape rotation over seven days old should be stored off-site. You should have two complete rotations stored off-site.

Available Types of Media Operations

Robot Save can save directly to any tape device or save file. Robot Save also can do a save to a save file and then save the save file to a tape device.

If you want to save to save files, we recommend that you use an ASP on your disk drives. This gives you extra protection in case the disk drive fails before you can save a save file to tape. However, the save file definition must be saved to tape or you cannot recover the

contents of that ASP save file. Robot Save does this for you automatically when it saves its data library RBSDTALIB to tape after every save (Note: RBSDTALIB is not saved if the backup saves to a save file.)

When doing a save file operation, Robot Save creates a save file with the same name as the library being saved in a special library for each backup class.

Robot Save can save entire libraries or just changed objects in the following save media operations:

Normal save directly to tape devices.

This is a normal save to tape that you probably perform now.

Save to save file and then to tape, then delete save file.

After the save to save file is completed, Robot Save copies the save file to tape.

Save files use a lot of disk space, so you must have extra disk capacity to do this operation. Because Robot Save deletes the save file after it is copied to tape, the extra disk usage is temporary. However, the excess capacity must be available at the time of the save operation.

Save to save file and then to tape.

This save media operation is exactly the same as the one above except the save file is not deleted. The save file is left on the system in case you need a fast restore or you want to make multiple copies of the save file. Robot Save replaces an existing save file for a library when it does the next save file operation for the same library.

Save to save file only.

Use this save media operation for very fast, unattended backups at night. Then during the day, use Robot Save to save the save file to tape using the save media operation described below. You might use this option if your tape drive requires operator intervention during the day.

Save to tape the save files created by Robot Save in a prior save operation.

This save media operation copies to tape the save files created by a save to save file only operation. This operation can be done during the day when a person is available to change tapes. You can make multiple copies of the backup if you wish.

Library Save Codes

Save codes tell Robot Save how to save your libraries and to what media they should be saved. Robot Save supports the following save codes for libraries.

Normal save directly to tape devices	
SL	Save entire library
SC	Save objects changed in library since the last save library was done by Robot Save
Save to save file and then to tape	
SLSS	Save entire library
SCSS	Save objects changed in library since the last save library was done by Robot Save
Save to save file and then to tape, then delete save file	
SLSD	Save entire library
SCSD	Save objects changed in library since the last save library was done by Robot Save
Save to save file only	
SLSF	Save entire library
SCSF	Save objects changed in library since the last save library was done by Robot Save
Save to tape the save files created by Robot Save in a prior save operation	
SF	Save the existing Robot Save save file for this library
SFD	Save the existing Robot Save save file for this library, and then delete the save file
Do not save library	
NO	Library is omitted from the save operation

Note: Not all save codes are used for all types of saves that Robot Save can perform.

Automatic Coding of Libraries for Backup

Robot Save can enter save codes automatically for libraries in the backup sets of the same backup class. Use the Backup Class worksheet to select a save strategy and let Robot Save complete the worksheet for you. You then can adjust the worksheet as necessary.

Because Robot Save can add new libraries to a backup set that runs at night, your backup sets can get out of sync with your save strategy. You can use the worksheet to redistribute the libraries according to your selected save strategy. Or, schedule the command RBSRDSTLB (Redistribute Libraries) on weekends to redistribute the libraries for you automatically. This command is especially useful on remote systems that run unattended.

Performance Tips

Save performance can be a reflection of how you have completed the Robot Save setup panels. This document is meant to explain why saves can have different performance results depending on how you have supplied these values.

In general, the following items affect the performance of a save. See below for tips on controlling these issues with Robot Save.

1: Processor or Tape Drive

Obviously, you can always invest more money into your hardware to resolve performance issues. The tape technology on the AS/400 has improved drastically over the years, as has the AS/400 processor. The capacity of individual tape drives has certainly increased over the years. And, the costs of these tape drives has decreased considerably over time.

For instance, with an IBM 8mm Automated Tape Library (ATL) (20 cartridges), each cartridge can hold as much as 5 GB per tape, uncompressed. Or, if you use an IBM 3590 Magstar 10-cartridge stacker, each tape can hold 20 GB of uncompressed data. The IBM 3570 Magstar MP holds 20 cartridges each of which can hold about 7 MB of uncompressed data. The IBM 3580 LTO Ultrium drive is sold as a standalone unit or as part of the 358x series of AMLs. Each cartridge can hold 100 GB of uncompressed data.

In addition to the IBM tape drives, StorageTek Corporation offers several drive units that are compatible with the AS/400. TimberLine drives use 3490 tapes and hold about 800 MB of uncompressed data. The drives are found in the Wolfcreek, PowderHorn, and TimberWolf tape librarians or can be purchased separately. Or, consider the Twin Peaks drives found in the TimberWolf or as standalone units. These drives also use 3490 tapes holding 800 MB of uncompressed data.

2: Size and Activity Level of the Memory Pool

Save operations on the AS/400 do need more resources than most other tasks. Your performance monitoring process should review performance of the memory pools in which save activities are running. You should make the memory pool for the save as large as possible.

The number of activity levels within the memory pool also can affect the performance of a save. Because saves normally run in batch, it is recommended that you run them in their own memory pool with at least one activity level. If you do run your saves interactively or in a multi-job memory pool, you should make sure that your memory pool always has one activity level available for your save operation.

If you are running in a restricted state, you don’t need to worry about tuning these features of the AS/400.

Time slice is another feature that can be tuned for save operations. In general, large time slice values should be used for save operations. You can easily double the size of the normal

batch time slices. Time slices are defined on the AS/400 object, CLASS. You can use the WRKCLS command to modify these objects.

3: Size of the Machine Pool

The size of the machine pool can affect the speed of the save process. If your machine pool is too small, you need to increase the memory pool size during backups. Your machine pool is not performing well if the non-database faults are greater than 2.0 on a CISC machine or 10.0 on a RISC machine. You can determine this by monitoring the machine pool using the WRKSYSSTS command during the save operation. You can schedule this command using Robot, the job scheduler.

4: Size of the Data Being Saved

What can you do? You need to back up your data. We suggest that you make sure the data you are backing up needs to be backed up. On a daily basis, you should only back up the data that changes often. On a weekly basis, back up data that changes occasionally during the week. Once a month, back up your
operating system and the rest of the your data.

So, to help your backups become more efficient, spread them out during the month to back up the most frequently changed data most often. SAVLIB *NONSYS and SAVSYS should be done once a month unless you can afford the downtime more frequently.

5: Types of Objects

Multi-member files—either database or source files—take longer to back up than does a single object with just one member. The system has to check each member of the object for authorization, change dates, locks, and so on. Documents in the QDOC library saved with the SAVDLO operation also are slow to back up. On V4R4 or higher systems, consider storing all PC data in the root directories, not in the QDLS directory.

6: Number of Objects

Similar to the problem with multi-member files is the number of objects in the library. A library with a lot of objects will take longer to back up than a library with a few large objects.

7: Restricted State Saves

These types of saves perform the fastest. The main reason is that, in restricted state, the save operation does not have to check for object locks. A library with many small objects will save much faster during restricted state.

8: Authority of the Users

If the user running a save has *ALLOBJ authority, the operating system does not have to check each object on the system for whether or not the user is authorized. If a user runs a save without *ALLOBJ authority, each object will be checked to see if the user has authorization to the object, slowing down the save. So, all saves should be executed with a profile that has *ALLOBJ authority.

9: Other Activity on the System.

It goes without saying that other activity on the system will adversely affect your save process. It is always best to have no other system activity, if possible. Obviously, it is not always an option to have all other activity halted during your saves.

10: Save While Active

This is a nice feature of the IBM i that allows you to back up libraries while they are being used. Save while active will cause your saves to last longer than normal, but users can be using the library during the save. Save while active has limitations, however. Only record manipulations can be performed while the save is being run. No object manipulations, such as ALCOBJ, RGZPFM, ADDPFM, RNMOBJ, and so on, are allowed. Use the save while active feature to save libraries while users are in the application. You also can use save while active to limit the amount of downtime for a user. To do this, monitor for a message that states the save operation has successfully grabbed a snapshot of the library being backed up. The end user can then be allowed to use the application again, as long as they only do record manipulations (change, add, delete).

For example, assume your save now runs for 2 hours, from 8:00 to 10:00 p.m. If you want to reduce your downtime, you could do the following. At 8:00 p.m, shut down the QINTER subsystem. At 8:02, start the save operation with save while active specified. At 8:10, the save operation sends a message to a user-defined message queue saying it has a snapshot of the library. Your application, which is monitoring the message queue, sees the message and restarts the QINTER subsystem. The end user can sign on at 8:11 p.m. and continue working. The save continues until 10:15 p.m. In this example, the end user has only 11 minutes of downtime. Of course, the actual time frame will vary depending on your library sizes, and so on.

Because save while active does cause saves to run longer; you should use it only when you know for a fact that you will have users using critical files during the save and have no choice.

When you use save while active, specify either *LIB or *SYNC. Use *LIB when backing up one library with the SAVLIB or SAVCHGOBJ commands. Use *SYNC for multi-library backups.

11: Output Parameter

This is a feature for all save commands that has existed on the AS/400 since release V2R3. This option can produce a database file or report that tells you what was saved during the save operation. However, this can affect performance of the save because the file or report has to be built for each library, object, or member, depending on how you specify the parameters.

We recommend you do not use this parameter for libraries other than database libraries, documents, and source file libraries. Some exceptions can be made for program libraries that change frequently due to development changes.

12: Software Data Compression and Hardware Compaction

Software data compression is extremely slow and should be used only in conjunction with writing data to a save file first. The only reason to use it with save files is because you want to conserve disk space on your AS/400. Do not use this parameter to save space on your tapes. Tapes are generally cheap and most drives now support hardware compaction, which is a much better choice.

Hardware compaction will save tape space and it is fast. Consequently, it will not degrade the speed of writing to tape. You should always use hardware compaction if it is available.

Both of these parameters are supported by all save commands.

13: Save Access Paths

This parameter can be specified on both the SAVLIB and SAVCHGOBJ commands. Saving access paths will slow down saves, but you should still specify *YES for this parameter. When you try to restore physical files from tape you will soon understand why you need the access paths. Upon restoration of a physical file, the system has to rebuild the access paths for any index over a logical file if you did not save the access paths. This can take hours, or maybe even days, if your files are very large.

14: SAVLIB *NONSYS or SAVCHGOBJ *ALLUSR

Using either of these operations is faster than saving one library at a time. The AS/400 can work on the next library being saved while saving the previous library. As the administrator of a save, you must make a decision on what is faster. There is a break even point where you should just save everything because you can do it in the same amount of time.

Controlling these Performance Issues with Robot Save

Issues 1, 2, 3, 5, 6, 8, and 9

These issues are the same for save operations with or without Robot Save. You control them outside of Robot Save. Issues 4, 7, 10, 11, 12, 13, and 14 can be controlled a little differently with Robot Save.

Issue 4—Size of the Data Being Saved

This issue can be administered easily with Robot Save. The product allows you to spread out your library backups efficiently. You can set up a strategy to back up only the data libraries that have changed on a nightly basis. Each set definition within Robot Save can have different save operations and different libraries specified. Robot Save also has an option to add any new libraries to a backup set so that no libraries are missed.

Issue 7—Restricted State Saves

This issue can be resolved from the console without an operator by using the Robot Save feature called the Restricted State Utility (RSU). The best results are achieved when you can do a SAVSYS, SAVDLO, SAVLIB *NONSYS, and SAV to your tape drive stacker unit or 8mm drive without having to mount new tapes. The idea is to start RSU at the console, mount your tapes, go home, and have Robot Schedule kick off the saves from console. Robot Alert can be added to page you if the save operation gets an inquiry message, such as an equipment check, out of tapes, and so on.

Issue 10—Save While Active

You can specify save while active on the Backup Class Entry or Backup Set Information panels in Robot Save. Robot Save allows the same options for save while active as IBM commands.

Issue 11—Output Parameter

This issue concerns the output options parameter on the save commands. Robot Save uses this parameter to build its object archive inventory. Object archive is optional; if you do not need a full inventory of every object that was ever backed up, you can turn it off. We recommend that you turn on object archive only for the libraries that contain database files strategic to your business, source files for programs, and documents in QDOC. Object archive in Robot Save can take up lots of extra disk and cause performance degradation. So, make sure you use it wisely. It is a great feature when used appropriately.

Use the System Defaults panel to turn off object archive at the system setup level. Just set the flag to **N** to turn it off for all libraries.

The Modify Library Save Information panel allows you to turn off object archiving at the library level. Just change the flag to **N** to turn off the object archive for any of the libraries on your system.

Issue 12—Software Data Compression and Hardware Compaction

These issues are controlled on the Backup Set Information panel. You can turn hardware data compaction on or off by a Y or N flag. You can set software data compression to **Y**, **N**, or **D**:

Y=*YES

If you are saving to tape and the target device supports compression, hardware compression is performed. If compression is not supported, or if the save data is written to a save file or disk, software compression is performed.

N=*NO

No data compression is performed.

D=*DEV

If you are saving to tape and the target device supports compression, hardware compression is performed. Otherwise, no data compression is performed.
Do not set both flags to Y. If a save is running while other jobs on the system are active and software compression is used, the overall system performance can be affected.

If you have hardware compaction, then set it to **Y** and set software compression to **D**. The panel below shows these fields.

Issue 13—Save Access Paths

You control the Save Access Paths option on the Backup Set Information panel. This parameter should be set to Y. Saves done outside of Robot Save also should have this flag set to Y.

Issue 14 —SAVLIB *NONSYS or SAVCHGOBJ *ALLUSR

SAVLIB *NONSYS and SAVCHGOBJ *ALLUSR perform faster than saving individual libraries. When you compare the performance of Robot Save to your old method of saving, make sure that you are comparing the same commands. Often, customers compare two unlike operations. The following panel
shows how to specify a SAVLIB *NONSYS in Robot Save.

Summary

Robot Save is a very flexible product. There are many different setup combinations that can affect performance negatively. The product is designed to handle both simple and complex setup. When you do compare Robot Save to your existing backup strategy, make sure you compare the same exact setup. If you don’t know, look at the job log of the save operation to see which parameters Robot Save is using.

Displaying the Status

Robot Save writes a status message for each save or restore operation that it performs. The message contains the name and rotation of each backup set, the time and date the set ran, whether or not the save or restore completed successfully, and whether there are additional warning messages.

To display the status messages, select **option 2** from the Operations Menu.

The Status and Completion Inquiry panel displays a status message for each backup set that has been executed. From this panel you can select from a number of options to display additional information about the message or work with the job that issued the message. Press **F4** to display the Status Message Options window.

If the Warn column displays a Y, it indicates there are additional messages. Enter a **1** next to the message to display the Warning Messages panel.

The Warning Messages panel shows all the messages that occurred during the running of the backup set. From this panel you can select from a number of options to display additional information or work with the job that issued the message. Some of these options are the same as those found on the Status and Completion Inquiry panel. Press F3 to exit.

In addition to the status messages, you can select to view the activity log for an operation. The activity log is a complete list of every step performed during a save or restore. You can select to view the activity log from either the Status and Completion Inquiry or Warning Messages panels.

Import Forecast Report Overview

The Import Forecast report helps you identify conflicts that can arise when you combine systems into a data center. When Robot Save includes a system into a data center, it renames any objects on the system being included if the name already exists in the data center with a different definition. (If the objects have the same name and the same definition, nothing is renamed.) Although the actual inclusion process proceeds normally, the objects that have been renamed can cause confusion. Some of the objects that need to be looked at include:

- AML definition names
- Media format definitions
- Volume naming strategies
- Move set names
- Location names
- Container names

In addition, there can be objects on the systems that should be renamed but do not appear on the report as projected to be renamed. For example, two systems can each have a location, RACK, that is system-specific. If you want the location to remain system-specific, one location should be renamed or the inclusion will combine them.

If you've already been managing volumes (and other objects) for several systems, you might already have thought about some of these issues.

We recommend that you use the Import Forecast report to prepare your systems for inclusion into a data center. You should carefully examine the information in the report and not include any systems that show projected renaming. If a system shows that one or more object types will be re- named, you should rename them manually before proceeding with the inclusion.

Use the report to think about inconsistencies in the objects on the report. Although you are not required to make changes, doing so before inclusion is much easier than correcting problems afterwards. If your goal is to manage your saves centrally, it is best to make the necessary changes before creating your data center.

AML Considerations

If your systems are connected to one or more AMLs, you should take the following into consideration:

- Before including a system in a data center, review the AML definitions you currently have defined. If there is an AML on the system being included, and a different physical AML already exists in the data center with the same name, you must manually rename the AML definition to indicate that it is a different unit. Robot Save cannot tell the difference between them physically as they are defined to OS/400.

  Similarly, one AML shared by two iSeries systems using two different names must use the same AML definition on both systems. If you don't make these changes prior to including a system in the data center, you may not be able to use your AML after the inclusion.
- Each AML must have its own assigned storage location. The location assigned to a particular AML should never be assigned to any other AML definition or AML port. Robot Save cannot correct any location assignments during inclusion of a system, so you must maintain these relationships.

  Before including a system in a data center, review the locations assigned to your AML definitions. If there is an AML on the system being included, and the storage location assigned to the AML is the same as one assigned to a different AML already in the data center, you must rename that storage location manually. Since the AML name must be unique, it might be easiest to name the location for each AML the same as the AML unit.

Note: You must create one storage location for each AML unit; not one for each drive or one for each system. This location must be used for every tape, managed by Robot Save, that is actually In the AML.

- See Using the Import Forecast Report.

Using the Import Forecast Report

Use the Import Forecast report to help you get your systems ready to include in a data center. The report shows you any projected conflicts in the names of objects among the systems in the data center. If you do not want to use the name selected in the forecast report, you can do one of the following:

- Change the definition of the item on the candidate system so it is the same as the item in the data center.
- Rename the item on the candidate system before proceeding with the inclusion. You can use the rename commands to do this: RBSRNMAML (Rename an AML), RBSRNMCLS (Rename a Backup Class), RBSRNMCTN (Rename a Container), RBSRNMLOC (Rename a Location), RBSRNMMSET (Rename a Move Set), RBSRNMSET (Rename a Backup Set), RBSRNMSVMD (Rename Save Media), and RBSRNMSYS (Rename a system).

Using the report to help you coordinate and resolve these conflicts before including a system is much easier than having to correct problems after the system is included in the data center. The following sections are included in typical reports.

Serial Naming Prefix

The candidate system cannot have the same serial naming prefix as any other system in the data center. You must change the prefix so that it is unique within the data center. The report shows what the prefix will be changed to; you can select a different prefix value. If a new Serial Naming Prefix cannot be determined because all possible combinations or characters are in use in Robot Save, it creates an error and the inclusion cannot proceed. If the new value shown is equal to the old value, no changes are needed.

Auto-release Adhoc to scratch pool

The candidate system must be at Robot Save 10.0 to allow ad hoc tapes to be released to the scratch pool when they expire. All systems in the data center must have the same value in this field. If the candidate system has a previous version of Robot Save installed, you must change the value to No on all other systems in the data center before including the system.

Backup Sets

Backup sets in backup classes that use logical naming appear on the report. The logical naming prefix on each backup set must be unique in the entire data center. If a backup set on the candidate system uses a prefix that is already used by another system in the data center, the prefix will be changed automatically to a value that is unique in the data center. The prefix value is used to create volume IDs for the volumes attached to logical backup class rotations. Existing tapes are not changed; however, any new tapes created for these rotations will use the new prefix value. If a new logical naming prefix cannot be determined because all possible combinations or characters are in use in Robot Save, it creates an error and the inclusion cannot proceed.

Storage Locations

Storage locations that have the same name must have the same definition. If a conflict is found, the report shows how the storage location will be renamed; you can rename the location using any unique value. The sample report shows that storage location TAPMLB01 will be renamed on the candidate system to TAPMLB0100001. The name is changed only on the candidate system. When a storage location is renamed, all references to it also are renamed in the Robot Save database on the candidate system.

AML Definitions

You must check and verify all AML definitions before including a system. If the candidate system has an AML definition with the same name as one that already exists in the data center, the definitions must be exactly the same. Any differences, such as different locations specified for the AML, indicates that the AML was not properly configured and the inclusion will not proceed. See AML Import Forecast Messages, at the end of this section, for a list of the possible error message that can appear in the report.

Save Media

Save media types are shared by all tape operations in the data center. If the DCMS and the candidate system both have a save media type with the same name, it must have the same definition. If they don’t, the save media type on the candidate system will be renamed as shown in the report. You can rename the save media type to any unique value. The sample report shows that the media type CARTRIDGE on the candidate system will be renamed to CARTRIDGE1 because there is already a save media type in the data center with the name CARTRIDGE, but it is defined differently than the one on the candidate system. The name is changed only on the candidate system. When a save media type is renamed, all references to it also are renamed in the Robot Save database on the candidate system.

Containers

Containers with the same name must have the same definition. If a conflict is found, the report shows how the container will be renamed; you can rename the container using any unique value. The sample report shows that container GREY BOX will be renamed on the

candidate system to GREY BOX00001. The name is changed only on the candidate system. When a container is renamed, all references to it also are renamed in the Robot Save database.

Move Sets

Move sets that have the same name must have the same definition. The definition of a move set includes its type and all the move set sequences associated with it. Move sets are renamed when a conflict is found. A 1 in the Sequences column of the report indicates that there are problems in the move set sequences. This helps you determine why the move set should be renamed even though the move set type and description are the same.

The sample report shows that move set MONTHLY on the candidate system will be renamed to MONTHLY001 because the sequences defined in the move set differ (for example, there could be a different number of move set sequences or they have different locations or other values). The name is changed only on the candidate system. When a move set is renamed, all references to it also are renamed in the Robot Save database on the candidate system.

Volumes

The report lists all the volumes that exist on the candidate system. The Notes column indicates if importing a volume will cause an event error in Robot Save. You cannot prevent the creation of the error unless you delete one of the volumes, either from the candidate system or the DCMS. The report just notifies you of the event errors that will occur when the system is included. See the Error Resolution section of this manual for complete information on resolving errors.

Messages

There may be several messages at the end of the report. The messages indicate whether any errors occurred and whether an inclusion would be prevented due to those errors. For example, any AML errors will prevent inclusion. If any errors appear at the end of the report, you should review the report and the joblog carefully before proceeding to include the system into the data center.

Disaster Planning

Robot Save provides a fill-in-the-blank Disaster Planning system. It allows you to enter a list of all disasters or emergencies that your company might encounter, such as fire, flood, or air conditioning failure. You also can enter the strategic suppliers of important equipment or forms.

Then, for each disaster or strategic supplier, you specify the people to contact in the order they should be contacted. If you need more information, you can enter additional

documentation for each disaster or supplier. Robot Save lets you display the Disaster Plan or print it out in a letter-size report format.

To begin creating your disaster plan, display the Disaster Planning Menu. To display the menu, select option **6** from the Robot Save Main Menu.

People to Contact

The primary information in a disaster plan is lists of emergency contacts and critical supplies. You enter the people to contact for each type of emergency. You also enter how to acquire the supplies critical to continuing operations.

Your plan should have a record for each type of emergency. An emergency is any type of disaster that could interrupt your operations. Each type of emergency should have its own record because each can have a different list of people to contact.

If you have Robot Alert installed, you can send pager messages to contacts. To send a pager message when an emergency occurs, enter a **2** in the Opt column next to the contact. Robot Alert then sends a pager message to the pager name specified in the contact record. It sends the Emergency description as the pager message.

Critical Supplies

Your plan also needs a record for each type of critical supply. A critical supply is any item that your company must have to operate (for example, computers, phone service, office space, forms, and so on). Create a separate record for each item (or group of items) that requires a different set of contacts.

If you have Robot Alert installed, you can send your contacts email, text, or pager messages when an emergency occurs. To send a message to a contact, just enter the device information on the proper Robot Save panel.

Additional Information

You might have additional information that would be useful when recovering from a disaster. It could be more information about the people to contact or about the critical supplies needed. To include this information in the plan, you can attach text to the emergency or critical supply record using the Disaster Planning Text Entry panel.

Once text is attached to a record, you cannot delete the link between the text and the record. However, you can change the text so it is blank or you can re-create the record. To re-create a record, add a new record with a slightly different name, add the contacts from the old record using the Contact Finder, and then delete the old record. You then can attach text to the new record.

To enter new text for an emergency or critical supply record, enter a **2** in the Opt column next to the record. To attach text that has already been entered for another record, enter a **3**.

Attaching Existing Text

You can attach existing text to a record to save both entry time and maintenance time. You enter the text just once, and changes you make to the text are reflected in all records to which it is attached. Any text you attach, however, must be generic enough to apply to every record to which it is attached. You cannot customize the text for individual emergencies or critical supplies because if you change the text for one record, it changes for all records to which the text is attached.

Customizing Generic Text

If you attach the same text to more than one record as described on the preceding page, you cannot customize it for each record. If you want to enter text only once, yet add details specific to each record, do the following:

1. Enter the generic text for one record.
2. Copy the record. Enter the name and description for the new record. Robot Save then copies the contact list and text to the new record. It assigns a new reference number to the text for the new record.
3. Customize the copies. Edit the contact list and the text. Because the text has its own reference number, you can change it without changing the other copies of the text.

Cover Page

Create a cover page, or series of pages, to introduce your disaster plan. The cover page could list the disaster plan title with your company name and address. Add as many pages of introductory text as you want. You might include a detailed list of the emergency teams and team leaders. You also could include a profile of the company and general information about the business.

Printing the Disaster Plan

You should print your disaster plan after you create it and each time you update it. Keep copies both on-site and off-site so that you have it when an emergency occurs. You may even want to post portions of it in the computer room and other common areas.

To change the default print attributes, select option **11** on the System Setup Menu to display the Disaster Planning Defaults panel.

You can print either the entire plan or selected emergencies or strategic supplies from the plan. After updating the plan, you can print just the records you have updated. Each emergency or critical supply starts a new page so you can separate them easily. The contacts are listed first, followed by any text entered for the record.

To print the entire plan, select option **2** on the Disaster Planning Menu. The print job is submitted to batch. To print selected records, enter a **6** in the Opt column next to the records you want to print on the Disaster Planning Maintenance panel.

Robot Save Commands

This topic lists the Robot Save commands you can use to manage your backups and Robot Save.

RBS	Displays the Robot Save Main Menu.
RBSACTLOG	Displays the activity log.
RBSADDALL	Continues processing the volumes whose archive history is being added by the RBSADDTAP command.
RBSADDCLS	Adds a Robot Save backup class.
RBSADDLIB	Adds a library to an existing backup class and set. You then can save the library as part of that set.
RBSADDLIBS	Adds multiple libraries to multiple backup sets.
RBSADDSET	Adds a Robot Save backup set.
RBSADDTAP	Adds archive history from volumes used outside of Robot Save.
RBSADDVOL	Adds pre-existing volumes to the Robot Save database.
RBSAMLEJT	Ejects volumes from an AML.
RBSAMLLRN	Inserts volumes into an Automated Media Library (AML).
RBSAMLSYNC	Synchronizes an AML with the volume information in Robot Save on a system in a data center after tapes have been added using the RBSAMLLRN command. Run the command on each system connected to the AML.
RBSAUTOMOV	Moves backup set volumes that are controlled by auto move-type move sets to the next location. This command runs automatically after each backup that uses move sets. You can set up this command in Robot Schedule to run on the days a backup doesn't run.
RBSCHGOWN	Changes the owner of objects in a library. Use this command when the user profile that created the objects is not on the system and the owner of the objects has been changed to a default owner when the object was restored.
RBSCHGTAP	Changes the save device used by a backup class or a backup set.
RBSCHGVOL	Changes the location of a single volume.

RBSCHKINV	Checks the inventory levels of volumes in the scratch pool and sends a pager message if the level drops below a specified minimum.
RBSCLR	Starts the Robot GUIDE automatic setup process. The command clears all Robot Save files. **Warning:** Use this command only if you're going to set up Robot Save. Once the files have been cleared, you cannot recover any data.
RBSCRTMDFN	Creates media definitions for parallel operations that use more than one tape device simultaneously. Robot Save uses an IBM API to create media definitions specifying the tape drives, volumes, and sequences needed to run the operation.
RBSCRTRST	Creates a save file that contains the programs and restore encrypted data commands required to restore any object encrypted by Robot Save on a system that does not have the current version of Robot Save installed.
RBSDLTCLS	Deletes a class and all of its related information.
RBSDSPLOG	Displays the job log of the current RBSSave job. If more than one job is running, you can pick which job log you want to display.
RBSDSPMDFN	Displays a media definition.
RBSDUPROT	Duplicates all volumes in a specific class/set/rotation combination. Use the RBSDUPASN parameters within this command to assign the duplicate volumes to a class/set/rotation. Otherwise, they'll be tracked as *ADHOC volumes.
RBSDUPASN	Assigns the duplicate volumes created by RBSDUPROT to a specific class/set/rotation combination. Can be used within the RBSDUPROT command.
RBSEJQVOL	Ejects volumes queued for ejection in an AML.
RBSENDDCMS	Ends the Robot Save data center monitor jobs.
RBSENDSBS	This data set command ends all subsystems defined to a backup class and set.
RBSGENOMIT	Allows you to omit libraries from backup set types 7 (SAVLIB *ALLUSR) and A (SAVCHGOBJ *ALLUSR) saves by using a wildcard character to specify generic library names.
RBSINZ	Initializes new tapes and add them to a backup class, set, and rotation.
RBSINZOPT	Specifies whether applications outside of Robot Save will be allowed to initialize mounted volumes. **Note:** If you choose to allow mounted volumes to be initialized, it is possible to overwrite valid Robot Save data.

RBSINZAML	Allows you to initialize all AML volumes in the scratch pool that have been marked for initialization. Marking a volume for initialization changes the reserved system name to *INZTAP. The RBSINZAML command initializes the volumes with a reserved system name of *INZTAP.
RBSINZTAP	Initializes media volumes. This command allows you to override any warnings about a volume and proceed with the initialization.
RBSLIBMNT	Displays the Robot Save Library Maintenance panel, which displays Robot Save library information.
RBSLOC2LOC	Moves volumes from one location to another.
RBSLOGCPY	Archives the CPYTOTAP command to an output file member.
RBSLOGLVL	Turns Robot Save activity logging on or off.
RBSMOVVOL	Move volumes from one location or container to another.
RBSMRKPRT	Marks volume labels used in tape operations for printing.
RBSMTMSG	Notify the user to mount the tapes for the backup set rotation for the save operation. The command suspends the job and waits for the user to mount the tapes and respond that the tapes have been mounted before it continues with the job.
RBSNOAUTO	Prevents Robot Save from automatically initializing tape volumes that currently are not defined to Robot Save. See the appendix for a complete discussion of the rules for automatic assignment of tapes.
RBSOPR	Displays the Robot Save Main Menu with just the first four operator options, excluding the system setup options.
RBSOPRMNU	Displays the Backup Operations Menu from any command entry line.
RBSOVREXP	Changes the expiration date for volumes used in ad hoc tape operations.
RBSPRTMRKL	Prints labels that have been marked for printing.
RBSRDSTLB	Displays the Redistribute Libraries panel, which allows you to select a save strategy while bypassing the backup class worksheet. Robot Save then sets up the strategy you selected.
RBSRDVOLTP	Adds an on-site preexisting volume to a rotation or the scratch pool. You must load the tape before issuing this command, which then reads the tape and adds it to the class, set, and rotation.
RBSRECEND	Use this command in conjunction with the RBSRECORD command to end the automatic tracking of tapes.
RBSRECORD	Allows volumes to be tracked for saves performed outside of Robot Save.
RBSRELATE	Relates all the freed objects of type *FILE in an object list to the object list.

RBSRESTORE	Allows you to restore any library object that has been saved by Robot Save, including the Robot Reports archive saved using the Robot Reports backup class.
RBSRLSEXTP	Releases all expired, on-site volumes to the scratch pool from those classes set up as automatic release. You can set up this command on Robot Schedule to be run automatically. The command does not run if a save is executing.
RBSRMVLIB	Removes unused libraries from Robot Save. The command also removes libraries from a backup class and backup set and updates the restoration lists.
RBSRMVLIBS	Removes one or more libraries from a backup class and set.
RBSRMVLRT	Removes all volumes from a rotation at once.
RBSRNMAML	Renames an AML in all files. Use this command when setting up a data center.
RBSRNMCLS	Renames a backup class.
RBSRNMCTN	Renames a container in all files. Use this command when setting up a data center.
RBSRNMLOC	Renames a location in all files. Use this command when setting up a data center.
RBSRNMMSET	Renames a move set in all files. Use this command when setting up a data center.
RBSRNMSET	Renames a backup set.
RBSRNMSVMD	Renames a save media type in all files. Use this command when setting up a data center.
RBSRNMSYS	Renames a system. Use this command when setting up a data center or at a disaster recovery site.
RBSRST	Restores encrypted IFS objects.
RBSRSTDOMD	Restores a Domino database. You also can specify recovery dates to recover the database to a specific point in time.
RBSRSTLIB	Restores encrypted and nonencrypted objects in libraries that were saved to the same tape.
RBSRSTOBJ	Restores encrypted and nonencrypted objects that were saved to the same tape.
RBSRSTOBJL	Restores an object list.
RBSRSTSAVF	Use this command in conjunction with the Robot Save restoration reports when restoring your system after a disk failure.
RBSRSUCMD	Use this command to specify the commands that should be run under the Restricted State Utility.
RBSRSUEND	Ends the Restricted State Utility.
RBSRSURDY	Puts the console in a ready state for the Restricted State Utility.
RBSRSUSTR	Starts the Restricted State Utility.
RBSRSUTCP	Tests the validity of your restricted state TCP/IP setup.

RBSRTVBSD	Retrieves information stored on the Backup Set definition. Use the information returned in the execution of your save or restore commands.
RBSRTVBSL	Retrieves all the libraries associated with a backup set.
RBSRTVDF	Retrieves Robot Save system defaults.
RBSRTVSES	Retrieves information on the current Robot Save session.
RBSRTVVOL	Retrieves volume information.
RBSSAV	Saves the Integrated File System (IFS) with encryption.
RBSSAVCHG	Saves changed objects with encryption.
RBSSave	Executes a Robot Save backup.
RBSSAVLIB	Saves libraries with encryption.
RBSSAVOBJ	Saves a single object or group of objects with encryption.
RBSSAVSAVF	Encrypts objects that are of the type specified in the command as it saves the contents of a save file to tape. The data in the save file is not encrypted until the save file is saved to tape.
RBSSKIPLIB	Skips a library save during a backup. Use this command when a library is tied up in work too important to cancel, but you still want to do the daily backup. After Robot Save skips saving the library, it removes the skip entry automatically.
RBSSTRDCMS	Starts the Robot Save data center monitor jobs.
RBSSTRSBS	This data set command starts all subsystems defined to a backup class and set.
RBSSVSMSG	Creates save status or completion messages. It allows you to document every tape operation done on the IBM i and tells you whether or not the tape operation was successful.
RBSUPDBSD	Updates the volumes used information in a backup set rotation. This command updates all information needed by the Robot Save tape management system.
RBSUPDCMD	Updates the Advanced Save Command templates for a backup class and set.

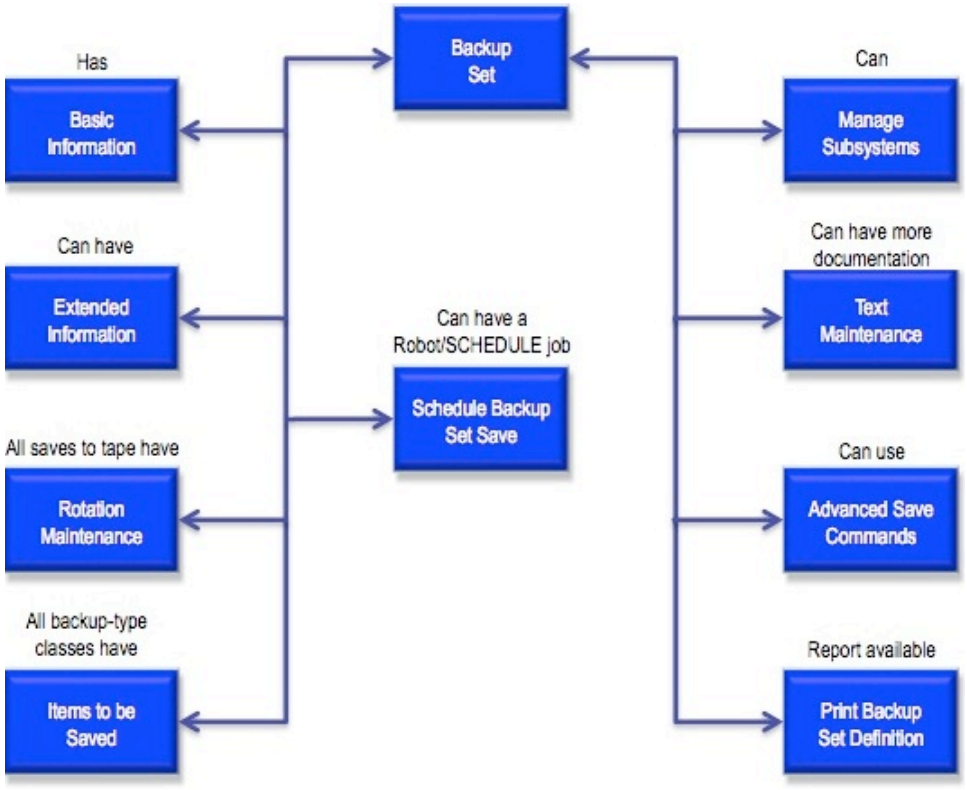
Backup Sets

About Backup Sets

Robot Save uses backup sets to perform its saves. Each backup set contains the procedures necessary to complete a save session. You tell Robot Save how to save the items you want (libraries, object lists, documents, the IFS, IFS Groups, or Domino databases) when you create the backup set. Backup sets are grouped by backup class. A backup class is simply a

logical group of backup sets. You can create as many backup classes as you want or need (see the Backup Classes Overview for more information).

Once you've set up Robot Save and defined your backup sets, you can team Robot Save with Robot Schedule, and your backups will be done automatically.



How Many Backup Sets Do You Need

Each unique tape operation must have its own backup set. If you back up the same libraries in exactly the same way every night, you only need one backup set. If you save different items every night, you need a backup set for each night. You also need a backup set for each data set tape operation you use.

Since you can copy existing backup sets within the same class, it's very easy to create new sets when you need them. All backup sets within a class should have the same number of rotations and the same execution schedule.

Backup Classes

About Backup Classes and Sets

Robot Save's automated backup process uses a structure made up of backup classes and their corresponding backup sets. This is a unique concept in automatic backups.

A Robot Save backup set describes all the procedures required to do a recurring backup, including what to save, customized tape management procedures, before- and after-save processing instructions, and more. You create a unique backup set for each recurring backup.

A backup class is simply a logical grouping of backup sets. It contains default information that is used by each backup set in the class. You can create as many backup classes as you want. Each backup class can have as many backup sets as you want.

To add or maintain backup classes and backup sets, you use the Automated Backup Setup Menu. From this menu, you select options to set up and modify backup classes and their backup sets, modify library save information, print system reports, use procedures for restoring your system, and work with object lists.

To display the Automated Backup Setup Menu, select option **5** on the Robot Save Main Menu. Press **F1** from any panel for additional help.

Types of Backup Classes

Robot Save uses six types of backup classes:

- Backup and Restore
- Backup Only, No Restore
- Data Set Management Only
- Object Lists
- Robot Reports

Each of these backup class types serves a specific purpose in the backup and recovery of your systems.

Backup and Restore Type Classes

Backup sets in the Backup and Restore-type class are used to save the system so that it can be restored easily in the case of a disk drive failure. The saves done by these classes create the Robot Save Guided Restoration Procedures and entries in the object archive system.

You can have as many backup and restore-type classes as you find necessary. We recommend that you set up the following classes:

- Daily Backup (use backup set usage type 7)
- Weekly (use backup set usage type 7; add SAVDLO, SAVSECDTA, SAVCFG, and Save All IFS to the backup set)
- Monthly (use backup set usage type 9)
- Quarterly (use backup set usage type 9)
- Yearly (use backup set usage type 9)

Backup Only, No Restore Type Classes

Backup sets in the Backup Only, No Restore-type class save the items you specify, but are NOT used to create Robot Save restoration instructions. The backup sets in this class may be sent to other sites, or used to create entries in the object archive system.

For example, the tape volumes from your regular source file backups probably are stored off-site. One common use of a Backup Only, No Restore-type class is to create an extensive archive for your source members. You can create a backup set that saves just the daily changes to your source libraries and schedule the backup set in Robot Schedule to run every workday at noon. By keeping the resulting tapes on-site at all times, you can use these tapes to restore members when needed, such as when a source member is damaged.

You still will rely on the source member saves done by the sets in the backup and restore-type classes to restore your source files in case of disk drive failure.

Data Set Management Only Type Classes

Use the Data Set-type class to manage backups (and their tape volumes) performed outside of Robot Save's backup and restore-type classes. Robot Save lets you manage these tape volumes along with the volumes managed automatically by other Robot Save backup classes. Data set backups also allow you to use Robot Save's object archive.

All data sets are assigned to Data Set Management Only-type classes. These are tape read and write operations where files are stored off-line on tape. Data sets also are used to copy files to tape to be further processed by payroll or microfiche services. You must create a backup set for each of your data set operations.

Robot Save provides commands you code into your data set program to do the following:

- Record all volumes used for a save
- Create object archive entries
- Tell operators which tapes to mount
- Ensure that operators mount tapes in the right order
- Update tape usage data

- Create save status records
- Print tape labels

The saves done by backup sets in a Data Set only-type class are NOT used to create the Robot Save restoration instructions.

Note: Robot Save automatically tracks the media volumes used for tape operations performed outside of Robot Save (called ad hoc operations). However, only data set-type classes create an object archive.

Object Lists Type Classes

Backup sets in the Object Lists-type class are used to save objects across several libraries. An object list consists of any number of objects that meet specified criteria. You create object lists using Robot Corral, our object selection manager. Once your object list is created, you can use Robot Save to save and restore the list. The saves done by object lists-type classes are not included in the Robot Save restoration instructions. However, object archive entries are created.

Robot Reports Backup Type Classes

The Robot Reports backup class is designed specifically for Robot Reports users who want to archive their reports using Robot Save. Robot Reports is our report management software. The Robot Reports backup class and its associated backup sets allow you to define multiple rotations for your Robot Reports archive backup, providing flexibility to your archiving strategy. Using Robot Save to archive your reports allows the reports to span multiple volumes, making it easy to archive large reports and minimizing the time necessary to complete the archive. See Using Robot Save to Archive Reports for complete information on how to set up your backup class and sets and use them to archive your reports.

Examples of Backup Classes and Backup Sets

The following diagram illustrates how you might use the backup class types and their backup sets to define a complete backup strategy for your IBM i. See Developing a Save Strategy for more information.

Viewing Backup Classes and Sets

After you've set up your backup class, you can define backup sets within the class. The backup sets contain the detailed information for the save. If you used Robot GUIDE to set up Robot Save, some backup sets are defined for you. You can define additional backup sets within a class.

To see the backup classes and sets you created using Robot GUIDE, enter the command RBO on a command line and select the option for Robot Save. On the Robot Save Main Menu, select option **5**, Automated Backup Setup Menu. On the Automated Backup Setup Menu, select option **1**, Maintain Backup Classes and Sets.

The Backup Class Maintenance panel shows the backup classes that were defined to Robot Save by Robot GUIDE.

To see the backup sets you created for the Daily backup class, press **F4** and select option **2** from the Backup Class Maintenance window. The Backup Set Definition Maintenance panel lists the backup sets defined to the Daily backup class.

Similarly, you can see the backup set for the Weekly and Test backup classes.

Adding or Maintaining Backup Classes and Sets

To add or maintain backup classes and backup sets, you use the Automated Backup Setup Menu. From this menu, you select options to set up and modify backup classes and their backup sets, modify library save information, print system reports, use procedures for restoring your system, and work with object lists.

To display the Automated Backup Setup Menu, select option **5** on the Robot Save Main Menu.

Using the Navigator to Set Up Backup Classes and Sets

Use Robot Save's Navigator to set up a new backup class and its backup sets, or modify existing classes and sets, quickly and easily. After you've used Robot GUIDE Automatic Setup to set up your daily back- ups, you'll probably want to define additional backup classes and sets to perform other types of saves on your system. By using the Navigator, you can navigate to the panels that are essential for setting up a backup class and set.

1. On the Robot Save Main Menu, select option **5**, Automated Backup Setup Menu.
2. On the Automated Backup Setup Menu, select option **1**, Maintain Backup Classes and Sets.
3. On the Backup Class Maintenance panel, press **F6** to define a new backup class. Complete the Backup Class Entry panel with the information for the new backup class you are adding.
4. Press **F10** to start the Navigator and continue to the next panel in the sequence.
5. The Backup Set Definition Maintenance panel displays. Press **F6** to add a backup set to the backup class.

   Note: If backup sets already are defined to the backup class, enter a **1** next to the backup set to modify the set definition.

6. Complete the Backup Set Information panel with the information for the backup set. (For a complete discussion of the fields on this panel, press **F1**.)
7. When you are done entering the information, press **F10** to save your changes and proceed to the next panel in the sequence.
8. Use the Extended Backup Set Information panel to enter any additional information for the backup set. Press **F10** to continue to the next panel.
9. When the Items to be Saved Within a Backup Set panel displays, press **F6** to display the Item Type Selection panel.
10. Enter a **1** to select the type (or types) of items the backup set will save. If you select Libraries, the Library Name Selection panel displays so you can select the libraries to include in the backup set. Press Enter to return to the Items to be Saved Within a Backup Set panel.

    Note: If the backup class is defined to back up an object list, the Object List Saved Within a Backup Set displays.
11. The libraries you selected display on the Items to be Saved Within a Backup Set panel. For each library, you can specify the save code to be used for the save. Press F4 in the Save Code column to select from a list of save codes.
12. Press **F10** to continue to the next panel in the sequence.
13. To encrypt a library or objects in the library, enter option **2** next to the library name to display the Modify Encrypted Objects in a Library Save Information panel.
14. Press **F6** to add individual objects or specify the entire library for encryption. The Items to be Saved Within a Backup Set panel displays a Y in the Encrypt column for a library specified for encryption.

    Notes:

    - Encryption must be enabled at System Setup.
    - Data encryption requires additional backup time and disk space. See the Encryption Appendix in the Robot Save User Guide for more information on the impact of encryption on your system.
15. Press **F10** to continue to the next panel in the sequence.
16. If you chose to Terminate Subsystems on the Extended Backup Set Information panel, the Manage Subsystems panel displays. (**Note:** The default value on the Extended Backup Set Information panel is No, do not terminate subsystems. If you did not select to terminate subsystems, this panel does not display.) Press **F6** to add one or more subsystems to be terminated.
17. Press **F10** to end the Navigator sequence.
18. The Backup Set Definition Maintenance panel displays so that you can define additional backup sets, following the Navigator sequence. When you are done, press **F3** to return to the Backup Class Maintenance panel.

Your new backup class now appears on the Backup Class Maintenance panel. You can continue to use the Navigator to define additional backup classes and backup sets or modify existing ones.

Backup Set Definition and Procedures

A backup set consists of a number of elements. Not all backup sets use all the elements, or even the same elements. The following elements can make up a backup set:

Backup Set Definition

This specifies basic information about the backup set, including the type of save to be performed, general save options, tape management information, and the tape devices to be used. This is required for the backup set.

Extended Backup Set Information

Robot Save can perform many duties before and after the save portion of the backup set. For example, you can have Robot Save reorganize files, execute your own programs, or use Robot Alert to send a text, email, or pager message. This is optional.

Rotation Maintenance

A rotation is a group of tapes that is used by the backup set to do its save. To protect yourself and your career from tape loss or destruction, you should have several rotations of tapes for each set. Use rotation maintenance to assign volumes to the backup set's tape rotations or, have Robot Save attach them automatically during the save process. This is required for the backup set.

Items Saved by Set

Just as an operator must know which libraries, object lists, or IFS Groups to save in a backup session, a backup set also needs to know the items to save. A backup set can save the following: libraries, object lists created by Robot Corral, the system (SAVSYS), document library objects (SAVDLO), user profile information (SAVSECDTA), the Integrated File System (IFS), configuration information (SAVCFG), and Domino databases and transaction logs. Depending on the backup set usage type, this information may be required for the backup set.

Schedule Backup Set Save

You can use this option to schedule the backup set save on Robot Schedule. This is optional.

Subsystem Management

You can specify a list of subsystems that you want Robot Save to end before the save and restart following the save. This is optional.

Backup Set Text

You can provide additional documentation for the backup set; this option allows you to enter as much text as you want. This is optional.

Advanced Save Commands

Robot Save allows you to just fill in the blanks for most save options available on the system. If you need additional options, you can use this option to change the save commands the backup set uses. This is optional.

Print Backup Set Documentation

You can print out a report that documents the backup set definition and procedures. This is optional.

Alternate Backup Sets

Using Alternate Backup Sets

As tape technology advances, tapes can hold increasing amounts of data. This increased capacity, and the increased cost of individual tapes, makes the ability to put several save sessions during the day on one tape volume extremely attractive to users. This ability is referred to as tape stacking.

Robot Save offers an option that allows you to make use of the new, high-capacity tapes. By specifying an alternate backup set, you can override the save media information for one or more backup sets to use a single backup set. This allows you to use the rotations for the alternate set for your backups. For example, you might do this if you back up your journal receivers every three hours.

As a safety precaution, each backup set normally should have its own tape rotations. However, using an alternate backup set allows Robot Save to handle multiple backup sets using the same tape rotations. The Extended Backup Set Information panel contains a field, Use Save Media of Alternate Backup Set, that lets you specify an alternate backup set name. The alternate backup sets can be from different classes.

For example, the following scenario describes how you could save journal receivers three times during the day to the same tape volume.

1. Set up the first backup set to run during the day and name it JOURNAL1. Schedule the backup set on Robot Schedule to run at 10:00 a.m.
2. Set up the second backup set to run during the day and name it JOURNAL2. JOURNAL2 must have the same number of rotations and days between rotations as JOURNAL1. Enter JOURNAL1 in the Use Save Media of Alternate Backup Set field. Schedule this backup set on Robot Schedule to run at 1:00 p.m.
3. Similarly, set up the third backup set to run during the day and name it JOURNAL3. Enter JOURNAL1 in the Use Save Media of Alternate Backup Set field. Schedule it on Robot Schedule to run at 4:00 p.m.

When the second or third backup set runs, it will search for the end of the data on the tape and write from that point forward. The tape remains loaded after each save.

Notes:

- To manage backup sets, Robot Save automatically updates the rotation code for any backup sets that were skipped to the rotation code of the current set. This process is called leveling. When you use alternate sets, the rotation code is leveled based on the rotation code of the primary set. For example, if you want to use rotation 2 of an alternate set, you must first mark the rotation code of the primary set to 2. See the section, Marking the Next Set/Rotation to Use, for information on how to change the rotation code.
- You must run the first (or primary) backup set before running any of the other sets that point to it.
- If a backup set has already been run, you cannot modify its definition to point to the media of an alternate set. A child (or secondary) backup set cannot have volumes already attached to it. Thus, if a backup set has been run, Robot Save will have attached volumes to the set's rotations and the set cannot point to an alternate set.
- A child (secondary) backup set always must load the primary (parent) set's first tape until it is full. Make sure the volume is available to the child set. If you attempt to use another volume for the backup, unpredictable results may occur.
- If you are using move sets, define the move set on the primary (parent) set only.

Tips for Using Backup Sets

Use these helpful tips to help you start using alternate backup sets.

Tip #1

When you use alternate backup sets, you must use the same rotation in each set. The backup sets can be in different classes or in the same class. However, you must run the same rotation for each set.

Example

Backup Class: TESTALTERNATE

Backup Set	Name	Sequence	Save	Rotation
TESTA	parent set name	10	0/00/00	A
TESTB	first child set name	200	0/00/00	A
TESTC	second child set name	300	0/00/00	A

Backup Class: TESTALTER1

Backup Set	Name	Sequence	Save	Rotation
TESTA	parent set name	10	0/00/00	A
TESTB	first child set name	200	0/00/00	A
TESTC	second child set name	300	0/00/00	A

Tip#2

All child sets must point to the parent set. You specify the name of the parent backup set on the Extended Backup Set Maintenance panel.

Tip #3

The alternate backup sets can be from different backup classes.

Tip #4

The parent backup set tracks all volume information, such as, move locations, volumes used, object history, expiration dates, and next usage date.

Tip #5

If you use an Automated Media Library (AML), bar code labels must match internal tape volume IDs.

Tip #6

When you use alternate backup sets, the tape remains loaded after the save has completed. You can specify an after-backup program on the child backup set to call a program to run the command **CHKTAP ENDOPT(*UNLOAD)**.

Note: This does not apply to AMLs.

Tip #7

If the backup sets are all from the same backup class, Robot Save automatically updates the rotation code for any backup set that was skipped to the rotation code of the current set. This process is called leveling. When you use alternate backup sets, the rotation code is leveled based on the rotation code of the parent set. See the Robot Save User Guide for more information on leveling.

Defining an Alternate Backup Set

When you specify an alternate backup set, you use another set's volumes for your saves. Any volume information you display thus directs you to the alternate set. The following describes how to set up alternate backup sets.

1. Start by setting up a backup class that will be using alternate backup sets. When you complete the Backup Class Entry panel, press **F10** to proceed to the next panel, Backup Set Definition Maintenance.

   Note: This example sets up a separate backup class for alternate backup sets. You can use any backup class you have defined to Robot Save.
2. Press **F6** to define the first backup set you will be using, JOURNAL1. You do not need to specify anything in the Use Media of Alternate Backup Set field for this backup set.
3. Define the second backup set in the backup class, JOURNAL2. Display the Extended Backup Set Information panel and enter JOURNAL1 in the Use Media of Alternate Backup Set field.
4. Continue defining as many backup sets as you need for the backup class.

Displaying Volume Information

Note: These instructions are based on the example in Using Alternate Backup Sets.

When backup set JOURNAL1 has been saved, you can see the rotation and volume information for the set.

1. To display the volume information for the first backup set in the class, JOURNAL1, select option **2**, Save Media Management, from the Robot Save Main Menu. Then, select option **1**, By Backup Set Rotations from the Save Media Management Menu.

When the Backup Class Selection panel displays, enter a **1** next to the class, ALTERNATE.

2. The Rotation Maintenance panel displays showing the backup sets in the class. Enter a **1** next to the backup set, JOURNAL1, to see the Volumes Used by the backup set.
3. When you display volume information for JOURNAL1, you see the media volume used and its rotation information. The information on this panel does not change as a result of its being an alternate set. However, because JOURNAL1 was specified as the alternate set for set JOURNAL2, the tape volume remained mounted in preparation for the next save.

When set JOURNAL2 was saved, it was placed on the same volume as JOURNAL1 (its alternate set). When you display the Volumes for the Next Rotation of JOURNAL2, it points you to the alternate backup set and class, JOURNAL1.

1. Select option **1**, Operations Menu, from the Robot Save Main Menu. Then, select option **1**, Operations by Backup Class. When the Operations by Backup Class panel displays, enter a **1** next to the ALTERNATE backup class.
2. On the Backup Set Selection panel, select option **6** from the options window to display the volumes for the next rotation of JOURNAL2.
3. The media volume shown is the same one used for JOURNAL1. Thus, the next time you save JOURNAL2, you would use the rotation and volumes for JOURNAL1.

If you select to display the Volumes Used for JOURNAL2, no information is shown. This is because no volumes are attached to the set JOURNAL2. Again, the alternate set and class information directs you to the designated alternate set, JOURNAL1.

1. To display the volume information for JOURNAL2, select option **2**, Save Media Management, from the Robot Save Main Menu. Then, select option **1**, By Backup Set Rotations from the Save Media Management Menu. When the Backup Class Selection panel displays, enter a **1** next to the class, ALTERNATE.
2. When the Rotation Maintenance panel displays, enter a **1** next to the backup set, JOURNAL2, to see the Volumes Used by the backup set..
3. No volume information appears for set JOURNAL2 because no volumes are attached to the set. The alternate set and class information directs you to the designated alternate set, JOURNAL1.

Saving Multiple Libraries

Robot Save lets you save multiple libraries with a single SAVLIB or SAVCHGOBJ command. This option can increase the performance of your backups by placing up to 300 libraries on each SAVLIB or SAVCHGOBJ command.

A field on the Backup Set Information panel allows you to specify if you want to allow multiple library saves. The field is set to Y (Yes) automatically for all new backup sets except for certain types of backup sets, such as object lists.

Note: If you've specified a value of No in the Continue with next library if save fails field on the System Defaults panel, this field is set to No.

How Multiple Library Saves Work

Backup sets that specify multiple library saves process libraries in sequence number order by library name. You specify the sequence number for each library when you select the libraries to be saved by the backup set. For example, you might want to specify that the largest libraries are saved first by entering a lower sequence number.

A multiple library save attempts to save all the libraries in the backup set using as few SAVLIB or SAVCHGOBJ commands as possible. Libraries are processed in increments of 300 (this is the current IBM maximum). If a backup set contains more than 300 libraries, additional commands are issued for the remaining libraries.

If you have specified that files be reorganized on the Extended Backup Set Information panel, this process is done as a group before the libraries are saved.

Restrictions

Multiple library saves are not supported for the following:

- Libraries that have a before- or after-backup program specified. These libraries will be saved using a separate SAVLIB or SAVCHGOBJ command.
- Libraries that are saved to a save file. Save file processing does not allow multiple libraries to be placed in a single save file. Libraries being saved to a save file are processed before libraries included in a multiple library save.
- Data set processing.
- Domino online backup.

You also should be aware of the following when setting up multiple library saves:

- Multiple library saves are valid only for user-defined-type saves (backup set type 1).
- Undefined libraries are added to the backup set at run time, following the criteria you've specified on the System Defaults panel, and the Extended Backup Set Information panel in the Add undefined libraries field.
- If you have specified save while active processing for some libraries, using multiple library saves could result in several save commands being issued instead of just one. Robot Save groups the libraries based on the save while active code used.

Save While Active Processing

Robot Save allows you to take advantage of IBM's save while active feature. When you specify to use save while active, you can save an object while it is in use. The save is done by maintaining an image of the object being saved as it existed at a single point in time, called the checkpoint. The image is called the checkpoint image.

Objects cannot actually be changed during save while active processing; the system locks the object while it obtains the checkpoint image. However, the operating system, in effect, maintains two copies of the object being saved: the image at the time the checkpoint was established and another one that contains changes to the object. Any changes made to the object are stored and applied after the checkpoint image has been saved.

Because you can continue to use objects while a save is in progress, using save while active as part of your backup strategy can help reduce your backup window.

Save While Active Options

You can select from several options to obtain a checkpoint when you use save while active processing.

Full synchronization—*SYNCLIB or *SYNC(IFS)

Sets the checkpoint for all objects in all libraries defined to the backup to occur at the same time. Thus, all objects in all libraries are saved in a consistent state in relationship to each other.

This may be the best option to select, because it will usually reach checkpoint processing in the shortest amount of time and has the least impact on recovery procedures. However, because it allocates all objects being saved before obtaining a checkpoint image, it usually keeps objects locked longer then the other options. This option also uses the most additional storage. In Robot Save, specify save while active type **C** to select *SYNCLIB processing.

Library synchronization—*LIB

Sets the checkpoint for all objects in a library to occur at the same time. The objects in the library are saved in a consistent state in relationship to each other. Different libraries reach checkpoints at different times. Once two libraries have been checkpointed, one library is saved to media before a third library is checkpointed.

You should use this option if you are saving only one library; each of your applications is dependent on only one library; or if you do not have the storage or time available for full synchronization. In Robot Save, specify save while active type **Y** or ***YES**.

Note: If you plan to use Save While Active when encrypting data, specify this option.

System-defined synchronization—*SYSDFN

Objects in a library reach a checkpoint at different times and may not be saved in a consistent state to each other. The objects in a library are separated into different groups to be checkpointed. After two groups have been checkpointed, one group is saved to media before the next group is checkpointed.

This option usually keeps objects locked for the shortest period of time and uses the least amount of storage. However, it also takes the longest time to complete checkpoint processing. It also can complicate recovery procedures if you do not end your applications during the checkpoint processing. In Robot Save, specify save while active **D** to select *SYSDFN processing.

Note: Specifying *SYSDFN can eliminate size restrictions on the library being saved, allowing you to save libraries containing thousands of objects.

No save while active processing—*NO

Objects that are in use during the backup are not saved and objects cannot be updated while the save is in progress. If you do not want to use the save while active feature, select **N** or ***NO**.

Monitoring for Save While Active Messages

If you want to use save while active to reduce your backup window, we recommend that you end any applications that change objects until after the checkpoint images have been acquired. Send a message to notify users when checkpoint processing is complete and it’s safe to start applications again. Monitor for the following message IDs to know when save while active processing is in progress or complete:

Message ID	Message Text	Used For
CPI3712	Save-while-active checkpoint processing complete.	*SYNCLIB or *SYSDFN
CPI3710	Save-while-active checkpoint processing for library &1.	*LIB or *SYSDFN
CPI3711	Save-while-active request ended abnormally on library &1.	Abnormal termination
CPI3722	Save-while-active request ended abnormally.	Abnormal termination

CPI3724	&2 of &3 libraries processed. Started &1 at &4.	*SYNCLIB
CPI3725	Save-while-active checkpoint processing in progress.	*SYNCLIB

Save While Active Restrictions

You should keep the following restrictions in mind when you use save while active processing.

- You can save while active only with the following commands:
Command	**Function**
SAVLIB	Save library
SAVOBJ	Save object
SAVCHGOBJ	Save changed objects
SAVDLO	Save document library object
SAV	Save IFS objects
SAVRSTLIB*	Save/restore library
SAVRSTOBJ*	Save/restore object
SAVRSTDLO*	Save/restore document library object
SAVRST*	Save/restore IFS
RBSSAVLIB	Save library encrypted
RBSSAVOBJ	Save object encrypted
RBSSAVCHG	Save changed objects encrypted
RBSSAV	Save IFS objects encrypted

  * These commands are not used by Robot Save. However, you can use them in a Data Set program.

- You cannot use save while active in the following situations:
  - With save operations that require a restricted state. Since a restricted state ends all subsystems, the save operation is the only job active on the system and must complete before starting other subsystems and jobs. Restricted state operations include:
    - Saving the system library
    - Saving all libraries

    - Saving the entire system
  - If you specify STG(*FREE) during a save operation.
- Do not use save while active when the system activity is high or when disk space is low.
- Do not load, apply, or remove an IBM program temporary fix (PTF) during save while active processing.
- Objects created after the save operation begins may not be saved.
- Objects that are in use by other jobs during checkpoint processing may not be saved.
- System Service Tools (SST) functions should not be used for objects currently being saved by a save while active operation.
- Full synchronization (*SYNCLIB) is not available when using the SAVLIB LIB(*IBM) or SAVDLO commands.

Performance Considerations

For better performance during save while active processing, we recommend that system activity be low. Jobs that are primarily read-only are good examples of the type of activity that allows for better system performance during a save while active operation.

Another consideration is the size of the machine pool. Adding an additional 1200KB of memory can reduce paging during save while active processing. Disk usage should be less than 30 percent. If necessary, move the job to a separate pool to run by itself and have at least 4MB of memory available in the pool. If you are using full synchronization (*SYNCLIB), an additional 1 or 2 MB of memory is required. If you are saving thousands of objects, additional memory may be required. If you are saving documents (library QDOC), make sure all users are out of the product until a checkpoint has been reached.

Generally, save while active checkpoint processing is performed faster for a small number of larger objects than for a larger number of small objects.

Note: Encrypting data with save while active set to *LIB can increase the time it takes to save or restore your data.

Save While Active Example

The following example illustrates how you can use save while active processing in Robot Save to reduce the time required to complete your backups.

An application uses two libraries, PRODLIB1 and PRODLIB2. Both of these libraries contain objects that are saved daily. The current save strategy ends all jobs that make changes to the libraries for the entire time that the libraries are being saved. This requires a backup window of several hours.

To reduce the time required for the backup, do the following:

- On the Robot Save Extended Backup Set Information panel, specify a Before backup user program. Have the program end all applications that make changes to PRODLIB1 and PRODLIB2.
- On the Robot Save Backup Set Information panel, specify C (*SYNCLIB) in the Save while active field. Specify QSYSOPR as the Save while active message queue.

When the backup runs, the objects in PRODLIB1 and PRODLIB2 will reach the checkpoint together and the libraries will be saved as specified by the backup set. A message (CPI3712) will be sent to QSYSOPR stating the checkpoint processing is complete.

If you use Robot Console, our message management software, you can monitor for the message ID CPF3712 and have Robot Console restart the applications that make changes to the (now-saved) libraries PRODLIB1 and PRODLIB2.

The objects are saved as they were at the time the application jobs were ended, prior to the backup set being executed. And, the backup window has been reduced to only the time required for the libraries to reach the checkpoint.

Rotation Maintenance

Rotation Maintenance

A backup set rotation is the group of tapes you need to complete a backup session. If it takes seven tape volumes to complete Monday's backup session, then Monday's backup set has seven tapes in its rotation.

For each backup session, you will have more than one rotation or group of tapes. Don't bet your company on just one copy of your libraries on tape.

To help you save time, read the recommendations in the Save Media Management section before you start this section.

The Rotation Maintenance panel shows you the backup set rotations that are created automatically by Robot Save. The number of rotations is determined by the value you specified at the system setup, class, or set level. The rotations are named numerically starting with the number 1. Robot Save supports up to 99,999 rotations.

To access the Rotation Maintenance panel, enter option **3** on the Backup Set Definition Maintenance panel next to the name of the backup set name you want to update. Or, you can select Rotation Maintenance on the Backup Set Options window, as shown below.

How Many Rotations of Tapes Should You Have?

Your tape usage strategy should depend on how much safety you want and how much space you have to store the tapes, both on- and off-site.

We recommend that you have seven rotations of tapes for your daily backup set, one for each day of the week. You can have fewer, depending on how you do your daily backups, or more—Robot Save allows up to 99,999 rotations per backup set.

Another consideration for the number of rotations to use is Robot Save's object archive. As long as a tape volume is assigned to a rotation, entries are kept in the archive for the objects on that tape. You may want access to many prior versions of those objects if you are constantly changing source members, documents, and so on. In that case, more rotations would be sensible.

Automatic Attachment from a Scratch Pool

Tapes from the scratch tape pool can be attached to a rotation automatically. You simply mount any on-site expired tape from the scratch pool and Robot Save attaches it to the rotation and records its use.

Data Set Commands and Attaching Volumes

The RBSRECORD command allows data set-type backup classes that perform saves outside of Robot Save to function the same as Robot Save backup and restore-type classes. The command automatically records the volumes used in a save, enforces Robot Save rules for volume usage, and creates object archive entries.

Attaching Volumes to a Rotation Without a Scratch Tape Pool

Managing Tapes By Backup Set - With a Scratch Pool explains how Robot Save uses scratch tape pools. If you do not use a scratch tape pool, the tape volume is given a new volume name when it is attached to a backup set rotation. If a volume is needed for a save and there are no tapes left in the rotation, you can mount any unused tape that is expired and not assigned to another rotation. If you are using serial or logical naming, Robot Save automatically initializes the tape with a volume name and adds it to the rotation. If you are using manual naming, Robot Save does not initialize the volume automatically.

When a tape is assigned to a rotation, either it is initialized and given a volume name automatically by Robot Save, or you enter the volume name depending on the naming method you are using.

Attaching Volumes to a Rotation Using a Scratch Tape Pool

You can attach volumes to a rotation simply by placing the scratch tape volumes in your drive. Robot Save assigns the volumes to the rotation automatically during the save, as needed. See Save Media Management for more information on using a scratch pool.

When you use a scratch pool, Robot Save attaches the volumes to the backup set rotations automatically when you mount an expired tape. You also can attach volumes to the rotation before the backup session starts. When you attach a volume to a rotation, you see the list of volumes in the scratch tape pool. Pick the first volume on the list to attach it to the rotation. The volume is removed from the scratch tape pool and placed in the rotation volume list.

Because a volume is initialized with a permanent volume serial number when it is assigned to the scratch tape pool, initialization is not required when the volume is attached to a rotation.

Automatic Release to the Scratch Tape Pool

If you want to release expired tapes back to the scratch pool automatically, you can enter a Y in the Automatic Release field on the Backup Class Entry panel. From then on, automatic release to the scratch tape pool takes place when you do any of the following:

1. Designate a location on your move sets as an automatic release location. An expired volume is released whenever it is logged into that site.
2. Run the **RBSRLSEXTP** command on Robot Schedule every morning to release the tapes that expired that day or earlier.
3. Select the option to Move Expired Tapes to Scratch Pool on the Save Media Management panel.

Changing Save Dates

Changing save dates manually is necessary only if you are using Robot Save to track saves that are being performed outside of Robot Save, or if you are using a data set backup class. When you manually change the save date on the Rotation Maintenance panel, the following is recorded:

- All backup set and backup set rotation data as to last save date and next expected usage date.
- Usage data on all volumes attached to the backup set rotation including expiration date.

The following are not affected:

- The library save information
- The guided restoration procedures
- The object archive

Changing Set Sequences

You may find it necessary at times to skip a backup set that Robot Save normally would perform. This situation can occur due to a holiday or other special event. Backups typically are run in set sequence order. There are three methods for modifying the normal backup set sequence order:

- Manually—Simply perform the save operation on the backup set that should run after a holiday (see Executing the Save in the Backup Operations section).
- Automated—Execute the RBSSave command specifying the next backup set name that should be performed by Robot Save.

  An example of this command is:

  RBSSave CLASS(DAILY) BACKUP_SET(DAILY1) ROTATION(*NEXT)
- Mark the next backup set and rotation that Robot Save should perform (see Marking the Next Set/Rotation to Use). This is necessary only if you are executing the RBSSave command without a specific backup set defined to it. This indicates to Robot Save to run the backup set with the next set sequence number.

When you use any of these three methods, Robot Save automatically keeps the backup sets in order by updating the last rotation used on all sets that were skipped with the current rotation code; this is called leveling. The last save date is not updated, so this information remains accurate.

Marking Backup Sets for Special Events

If you are not going to be available to back up your system due to a holiday, Robot Save allows you to skip the save. To do this, you can use the Rotation Maintenance options and mark the next backup set and rotation to use. This generates messages indicating that all skipped sets and rotations have been leveled. You also should notify your off-site storage company that there is no backup scheduled on the holiday.

The following example shows how Company XYZ might run its daily backups over the Christmas and New Year's holidays. The backups normally run five days a week, Monday through Friday, and three rotations of tape volumes are used. The following calendar shows the rotations scheduled for December.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Rotation 2	1	2	3	4	5	6	7
Rotation 3	8	9	10	11	12	13	14

Rotation 1	15	16	17	18	19	20	21
Rotation 2	22	23	24	25	26	27	28
Rotation 3	29	30	31	1	2	3	4

Week of December 15 - 21: The backups follow their normal schedule of Monday through Friday. Tape volumes used are from rotation “1.”

Week of December 22 - 28: The tape volumes from rotation “2” are used this week. Monday is a normal backup. Tuesday and Wednesday backups should not be run because of the Christmas holiday. Note: If these backups are scheduled to run in Robot Schedule, make sure they are set up to not run on nonworking days.

Use one of the three functions described on the previous page to signal Robot Save to skip Tuesday and Wednesday and process Thursday’s backup next. Using the first or second method to execute the backup set “Thursday” would cause Tuesday and Wednesday’s rotation code to be updated automatically. Marking Thursday’s backup set rotation “2” as the next to use (as described in the third method), also would cause the rotation codes of Tuesday and Wednesday to be updated with a “2.” (Robot Save automatically updates the rotation code for any backup sets that were skipped to the rotation code of the current set. This process is called leveling.) In these instances, Robot Save does not change the last save dates for Tuesday and Wednesday. Thursday and Friday backups run normally.

Week of December 29 - January 4: The tape volumes from rotation “3” are used during this week. Monday and Tuesday run as normal backups. Wednesday’s backup should not be run because of New Year’s Day. Once again, use one of the functions described on the previous page to signal Robot Save to skip Wednesday and process Thursday’s backup next. Wednesday’s rotation code will be updated to 3, but the last save date is not affected. Thursday and Friday backups run normally.

Week of January 5 - 11: The tape volumes from rotation “1” are used again. Daily backups once again run normally as scheduled every night this week.

The shaded areas in the chart below represent rotation codes changed by Robot Save in this example.

Day of the Week	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Set Sequence Number	-	10	20	30	40	50	-
Week of Dec 15-21	-	1	1	1	1	1	-
Week of Dec 22-28	-	2	2	2	2	2	-

Week of Dec 29-Jan 4	-	3	3	3	3	3	-
Week of Jan 5-11	-	1	1	1	1	1	-

Using the Change Last Save Date Option

Use this option only if you are maintaining the tape management information on this particular set manually. This also will update all the volume usage data for all of the tape volumes attached to this rotation, including the expiration date of the volume, which is recalculated based on the days before media expires specified for the backup set.

To display the Change Last Save Date window, enter a **2** next to the backup set you want to change and press Enter. Or, you can press **F4** in the Opt column and enter a **1** next to Change Last Save Date on the Rotation Maintenance window.

Marking the Next Set/Rotation to Use

If you follow your backup schedule and execute backups at the set level, you never will need to use this option. However, should you need to change the next set/rotation to execute because of a holiday or special event, use this option to resequence your save schedule. For an example of how this option works, see Marking Backup Sets for Special Events.

To mark a backup set and rotation, press **F4** next to the backup set you want to use next and select option **3** from the Rotation Maintenance window.

Note: You can mark only one rotation at a time per class. The last rotation marked will be the one executed next.

Using the Rotation Auto Move Maintenance Option

The Rotation Auto Move Maintenance option lets you change the date and time a rotation was last moved. You may never need to use this option if you follow your backup schedule and let Robot Save move your rotations as specified by the move set selected for the backup set. However, there might be an occasion when you want a rotation to move twice in the same day or you want a rotation to stay at a location longer than the time specified by the move set. You can use this option to override the move set.

To change the move date and time for a rotation, press **F4** in the opt column next to the rotation name and select option **4** on the Rotation Maintenance window.

Items Saved By a Backup Set

Robot Save allows you to specify which items are to be saved by a backup set. Depending on the backup set type, the backup set can save the following:

- Libraries
- Security data (SAVSECDTA)
- Configuration data (SAVCFG)
- Integrated File System (IFS)
- Domino databases and transaction logs
- Document library objects (SAVDLO)
- System libraries (SAVSYS)
- Object lists created by Robot Corral
- Advanced Save Commands

When you select the items to be saved by the backup set, you can specify additional save information to be used for the backup. This includes specifying the save code to use, whether to save journaled files and access paths, changing save-while-active options, and entering procedures to perform before and after the backup. In addition, for libraries, object lists, and Domino backups, you can specify if you want to encrypt the data being saved.

Note: For backup set types A, 6, 7, 8, or 9, this panel is only used with a save code of NO or EXT. The NO save code allows omitting an item from the backup. The EXT save code is used if files in a library are set up to be reorganized.

on the IBM i. If you need additional options, you can change the save commands using the Backup Set Save Command Template.

You can access the Set Save Command Template from the Items Saved WIthin a Backup Set panel by placing the cursor on the item you wish to change and pressing **F17**.

Specifying Items for Encryption

Robot Save encryption is turned on during system setup. At setup, you specify whether you want to encrypt data as it is saved, and the level of encryption to use. See About Robot Save Encryption for complete information on how Robot Save handles data encryption.

If encryption was enabled during system setup, you can select the items to be saved encrypted as you set up your backup sets. Items selected for encryption on the backup set are encrypted as they are saved to tape.

Note: The level of encryption used is determined at system setup and cannot be modified at the backup set level.

You also can select default objects in a library always to be saved with encryption. See The Modify Library Save Information Panel for complete information on specifying default objects for encryption.

Accessing the Items to Be Saved Within a Backup Set Panel

To see a list of the items a backup set is saving, enter option **4** on the Backup Set Definition Maintenance panel next to the backup set you want. Depending on the type of the backup set, one of three panels will display listing the items, or object lists the backup set is saving. Optionally, you can enter **1** next to the Items saved within set option on the Backup Set Options window.

This panel identifies the items to be saved by the backup set and shows how they are to be saved. Press **F1** for help.

Domino Online Backups

Domino Online Backups

A Domino Online Backup allows you to save Domino databases while the Domino server is active and the database files are in use. If you use Domino and can't afford the time to end the Domino server to back it up, Robot Save's Domino online backups are the answer you've been looking for.

Domino databases are part of the integrated file system (IFS). You can back up these databases by selecting Save All IFS to save the entire IFS, but that requires the Domino server to be ended.

Transaction Logging Formats

To perform a Domino online backup, the Domino administrator must turn on transaction logging on the Domino server (this is similar to journaling physical files in IBM i). Domino allows three types of transaction logging formats: Archived, Circular, and Linear.

Archived

Continues to add changes made to the Domino databases to the log files. The log files are not overwritten until they are backed up. Archived transaction logging allows you to recover your Domino databases to a selected point in time. Without archived logging, you can only restore the database as it was at the time it was saved.

Restoring a Domino database restores the database as it was when it was saved. It does not apply any changes made to the database after it was saved. Recovering a Domino database restores the database and then applies the saved transaction logs to recover data to a date and time you specify.

Note: Your Domino software must be at release 6.0.2 or higher to allow you to recover your databases.

Circular

Reuses the log file when it fills the user-defined amount of storage. You can restore your Domino database if you use circular transaction logging; however, you cannot recover the database to a specific date and time by applying the transaction log records.

Linear

This is similar to circular logging, but allows you to define a greater amount of storage for the logs.

Caution: When archived logging is on, the logs can rapidly grow in size depending on how much activity occurs in the Domino databases. The only way to delete the transaction logs is to save them as part of your backup. Thus, we recommend saving the Domino transaction logs daily to prevent serious storage problems. This is similar to saving journal receivers; after it is saved, the journal receiver can be deleted. After the transaction logs are saved, Domino deletes them from the system automatically.

Setting Up Domino Online Backups

If you are using Domino online backup, we recommend you do the following to complete a full IFS backup:

- Domino Online Backup—daily
- Domino Transaction Logs—daily
- IFS plus Domino databases—weekly, with the Domino server ended

  Note: Transaction logs should be saved after the IFS plus Domino backup.

Saving your Domino databases by doing a Domino online backup provides the following benefits:

- The Domino Online Backup Archive Inquiry panel allows you to locate Domino databases to restore.
- If you use archived transaction logging, you can recover your Domino database to

any point in time.
- You can back up Domino databases while the server is active and the files are in use.

Notes:

- Robot Save's Domino online backup saves only Domino databases. Although there are many other non-database files in the Domino data directory, only the databases are saved.
- Because Robot Save Domino online backup saves all the Domino databases on the selected server, you cannot select individual databases to back up or omit from a save.

Robot Save is shipped with a default setting that saves five Domino databases at a time until all databases have been backed up. During a backup, a copy of each database is made, and the copy is saved and then deleted. You can modify the number of Domino databases saved based on the amount of storage available for the database copies and the time available for the backup.

After the Domino online backup completes, the System Restoration Report shows how to use the Restore Domino Database (RBSRSTDOMD) command to restore the databases to your system. You also should check the Save History Audit Report to see whether the Domino online backup and transaction log saves were successful. The Status and Completion Inquiry panel also lists status messages for the save.

Common Domino Online Backup Scenarios

The following scenarios describe possible ways you could set up your Domino online backups.

Scenario 1

With archived transaction logging turned on, perform a Domino online backup and save the transaction logs daily in the same backup set. Weekly, end the Domino server and do a save "IFS plus Domino databases" to save your entire IFS, and save the transaction logs in the same backup set.

Because both the databases and the transaction logs are saved every day, recovering your database to a specific date and time should take less time. However, the backups may take longer than backing up just the transaction logs every day.

We recommend using this scenario for the following reasons:

- You can run the backup at night so it won't affect users
- It gives you the most thorough backup
- It is much easier to restore or recover your databases

Scenario 2

With archived transaction logging turned on, perform a Domino online backup once a week and save the transaction logs every day.

This is the quickest way to back up your Domino databases and still have a complete backup. The Domino online backup must be done weekly and the volumes containing the logs cannot expire until after the next Domino online backup. Because the transaction logs are backed up every day, you can recover your database to a specific date and time. The daily backups complete more quickly than a Domino online backup, but the recovery could take longer. The backup copy of the database must be restored before the saved transaction logs are applied to the database. You also might have to mount more than one tape to restore several transaction logs.

No matter which scenario you select, you must make sure to manage the media containing the transaction logs properly. Do not allow the media to expire until after the Domino online backup they will be used for has expired. If you do a Domino online backup weekly, we recommend you retain the media for at least one month.

Rules for Domino Online Backups

You should perform a Domino online backup every time you do any of the following:

- Start transaction logging for the first time
- Run the Domino Compact Server task
- Run the Domino Fixup task on corrupt databases
- Change the log path or maximum log size after initial setup
- Move a Domino Release 5 database from one logged server to another, or from an unlogged server to a logged server
- Change the path of the Domino server

You should be aware of the following when performing Domino online backups:

- Do not restore transaction logs outside of Robot Save. Robot Save creates archive information for the transaction logs so it can locate them to perform recovery.
- A Domino online backup is not allowed in restricted state or during a Save Entire system backup.

- A Domino online backup creates a multi-threaded job and cannot be run in a Robot Autotune dynamic pool.
- A Save Entire AS/400 (backup set type 9) backup saves the IFS, but does not perform a Domino online backup.
- The only save codes allowed for a Domino online backup or to save Domino transaction logs are SL and NO.
- You cannot perform concurrent Domino online backup saves for the same server, but can do concurrent Domino online backup saves for different servers.

Encrypting Domino Databases

You can specify that your Domino databases and transaction logs are saved encrypted. You can select *ALL Domino databases, a specific Domino database, or a database log to encrypt. Encryption is available only if it is specified at the system defaults level.

Adding a Domino Online Backup and Transaction Logs to a Backup Set

When you select Domino Online Backup on the Item Type Selection panel, the Domino Server Finder panel displays. The panel lists all the Domino servers defined on your system. You can select to back up all the databases on all the Domino servers, or select only the servers whose databases you want backed up.

If you are performing a Domino online backup, you also should back up the Domino transaction logs for the databases you are saving. Backing up the transaction logs allows you to recover the database to any point in time. A Domino online backup assumes that the transaction logs are being backed up. You can select the transaction logs to back up on the Domino Server Finder panel.

From the Item Type Selection window, enter a **1** next to Domino Online Backup or Domino Transaction Logs. The Domino Server Finder panel displays. Press **F1** for help on this panel.

Object Lists

Object Lists

In addition to saving entire libraries or the changed objects in a library, Robot Save gives you the option of saving specific objects or objects across several libraries, documents, or files in the Integrated File System (IFS). By creating an object list, you can save only what you need.

An object list consists of a set of criteria that define what should appear in the list and the names of the objects that meet the selection criteria. You use Robot Corral, our object selection manager, to collect the objects into a list and then work with the objects as if they are a single entity.

After you've created your object lists using Robot Corral, you can save them with Robot Save. Robot Save has a backup class type specifically for object lists. When you define your backup sets, you specify the object list that should be backed up. Robot Save creates an archive record for the objects in the list. You can view this information using the Object Archive.

You restore the objects saved by an object list using the object archive panels. See the Object Archive section for complete information.

You should be familiar with object lists, and how to create them, before using Robot Save. See the Robot Corral User Guide for complete information on creating object lists.

Why Use Object Lists with Robot Save

The ability to save object lists using Robot Save gives you several options for freeing disk space on your system. Possible scenarios include:

- Create an object list in Robot Corral that includes the objects (files, programs, and so on) that are used for a monthly accounting function. Save the list using Robot Save with the Object Transfer option set to Free. This saves the objects to tape and frees the system storage occupied by the data in the files. The next time the objects in the list are needed, restore the list, run your accounting function, and then save the object list again. You gain system storage during the month, yet your programs and files remain available when you need them. See Using IBM Media and Storage Extensions for information on how you can quickly restore an object list whose storage has been freed.

  Note: You should only free objects during a save using Robot Save. This ensures that the objects are available for restoration.
- Create an object list in Robot Corral whose criteria specify that it selects all objects older than a specified date. Save the object list using Robot Save and then delete the objects from the system.

Object List Save Codes

Object list save codes tell Robot Save how to save your object list and the media where they should be saved. The following save codes are valid for object lists:

- **SL** Save to save device
- **SLSF** Save to save file
- **SLSS** Save to save file, then to device
- **SLSD** Save to save file, then to device, then delete save file
- **SF** Save existing Robot Save save file for this object list
- **SFD** Save existing Robot Save save file for the object list, then delete save file

Save codes that save changed objects only are not valid for object lists. However, you can save changed objects by creating an object list in Robot Corral whose selection criteria specify only objects that have been updated or created since a specific date.

Encrypting an Object List

Robot Save encryption works with object lists to allow you to encrypt selected objects or directories in the IFS. You select the objects to include in the object list and specify the list for encryption. To encrypt an IFS directory, select it for the object list and specify encryption.

Note: If you select to encrypt an object list, the entire list is saved encrypted; you cannot select individual objects in the list for encryption. Encryption is available only if it is specified at the system defaults level.

Identifying Object Lists to be Saved by a Backup Set

Use the Object List Saved Within a Backup Set panel to identify the object list to be saved by a backup set. To display the panel, enter **option 4** on the Backup Set Definition Maintenance panel next to the backup set.

- When the Backup Set type is 2, Object Lists, selecting option **4** on the Backup Set Options window displays the Object List Saved Within a Backup Set panel. Use the panel to specify the object list to be saved by the backup set.
- Enter the name of the object list to be backed up. The object list must exist in Robot Corral. To see a list of object lists defined in Robot Corral, press **F4**. You can select a list from the Object Lists panel, or create a new object list and then select it.
- Enter the save code to be used for the backup set. Press **F4** to display a window from which you can select a save code.

  Note: Only SLxx and SFxx save codes are allowed for object lists. You cannot select a save code that saves changes only.

- Specify if you want to encrypt the object list. If you specify **Y** (Yes), the entire object list is encrypted; you cannot select specific objects within the list to encrypt. Enter **N** if you don't want the object list to be saved encrypted.
- Specify if you want to update the object list before the save takes place. You can select from the following options:
  - Rebuild: Clears the object list and builds it again based on the criteria defined in Robot Corral.
  - Refresh: Removes objects that no longer meet the selection criteria, adds new objects that meet the selection criteria, and retains any existing objects that still meet the criteria.
  - None: The object list is used as it exists at run time.
- Specify how you want the saved objects handled:
  - Copy: Save the objects to tape.
  - Move: Save the objects to tape and then delete the objects.
  - Free: Save the objects to tape with the STG(*FREE) keyword in effect. This leaves the object description on the system, but moves the data to tape.

IFS Groups

IFS Groups

Robot Save lets you create, maintain, backup, and restore IFS Groups—logical groupings of IFS directories and files that you specify.

You can create IFS Groups to match your software applications, user groups, and projects—whatever makes sense for your business needs.

After you've created your IFS Group, you can include it in a backup set and backup class.

Setting Up IFS Groups

Use the IFS Group Selection panel to identify the object list to be saved by a backup set. To display the panel, select option **7** from the Automated Backup Setup Menu. The IFS Group Selection panel displays a list of the current IFS Groups and their descriptions.

1. Press **F6** to create a new IFS Group. The IFS Group Maintenance panel displays.
2. Enter the IFS Group name and Description.
3. Press Enter to save the IFS Group.

4. Enter **option 2** next to your IFS Group to select directories to include in the group. Depending on the number of directories in your IFS, this may take a few moments.
5. Enter a **1** next to a directory if you want to include it. Enter a **5** to drill down into a directory to select subdirectories.

   Press **F1** to display the online help.

Saving Document Library Objects, User Profiles, IFS, and Configuration Data

You can save your document library objects (DLOs), user profiles, the Integrated File System (IFS), and configuration data in two ways.

- If you used Robot GUIDE to set up your backups, these items were added to the DAILY2 backup set automatically.
- If you are setting up your own backup set, you can save document library objects, user profiles, the IFS, and configuration data by including them in the Items to be Saved Within a Backup Set list. The backup set must be backup set type 1 (User Defined).

To add these items to your backup set, do the following:

1. On the Backup Set Definition Maintenance panel for the backup set you are using, select option **4** to display the Items to be Saved Within a Backup Set panel. Press **F6** to add an item.
2. On the Item Type Selection panel, select the items you want to save:
   - Save All IFS: Saves the integrated file system using the SAV command
   - Security Data (SAVSECDTA): Saves user profile information
   - Configuration Data (SAVCFG): Saves configuration information
   - Document Lib Objects (SAVDLO): Saves document library objects

Saving QUSRSYS

For Robot Save to save QUSRSYS, you must put QSNADS in your Manage Subsystems list to be terminated, or use the Robot Save before and after programs to terminate and restart it. To guarantee a complete save of QUSRSYS, you should terminate QSNADS.

If you want QSNADS to be down only during the save of QUSRSYS, do the following on the Extended Library Save Information panel:

- Enter RBSTRMSNAD as the before program; this ends the QSNADS subsystem.
- Enter RBSSTRSNAD as the after program; this starts the QSNADS subsystem.

To execute the save, see the Backup Operations section.

Other Backup Set Types

Save System Libraries (SAVSYS)

You should have a backup class and set that saves just the system software. Because this type of save requires your system to be in a restricted state, some additional considerations are necessary.

Note: To run the save unattended, you can use Robot Save's Restricted State Utility (RSU) and schedule a Robot Schedule job to run the backup. See Using an RSU Job to Run a Full System Backup for more information.

Use the following steps to set up a SAVSYS backup:

1. On a blank Backup Class Entry panel, create a new backup class and give it a meaningful name. For example, you might use the name SAVSYS.
2. On the Backup Class Maintenance panel, enter a **2** next to the SAVSYS backup class. A blank Backup Set Definition Maintenance panel appears.
3. Press **F6** to add a set. When the Backup Set Information panel displays, enter a name for the new backup set. Enter **5** (SAVSYS) as the Backup Set Type.

   Make sure that the tape drive assigned to this set is your alternate IPL tape drive. Restoring a SAVSYS requires the tape to be on the alternate IPL device. The alternate IPL device is determined by where the I/O adapter card is located in the CPU. If you need more information, contact your local IBM service representative.

You can run the save from a command line at the system console or use the Robot Save menu system. When you select a SAVSYS backup, the system enters a restricted state automatically.

Save User Libraries Using Robot Save's NONSYS Function

Robot Save offers a backup set type that performs a simulated NONSYS save (save all user libraries). A Robot Save NONSYS save creates a save command for each library to be saved. Follow these steps to use Robot Save's NONSYS function:

1. On the Backup Class Maintenance panel, enter a **2** next to a backup class.
2. On the Backup Set Definition Maintenance panel, press **F6** to add a set. Enter a name for the backup set on the Backup Set Information panel. Enter **4** (Robot Save NONSYS) as the Backup Set Type.

   During the save, if Robot Save finds a new library, it creates a save library (SL) record for that library within the set.
3. Make sure that any subsystems that may have libraries locked from being saved are specified for managing.
4. To save documents and user profiles with this save, **Document Lib Objects (SAVDLO)** and **Security Data (SAVSECDTA)**, you will need to create an alternate backup set (see Defining an Alternate Backup Set). You will need to have the alternate backup set append its data to the volume for the Robot Save NONSYS set (created above) by entering the name of the NONSYS set in the parameter 'Use Save Media of Alternate Backup Set' on the Extended Backup Set Information panel when creating the alternate set.

You would then need to run the backups one after the other. You can run them from the Operations menu or they can be scheduled in the same Robot Schedule job.

Save Non-System LIbraries Using the IBM SAVLIB LIB (*NONSYS) Command

As another option, a Robot Save backup set can perform a *NONSYS save (saves IBM non-system libraries and all user libraries) using the IBM SAVLIB LIB(*NONSYS) command. Follow these steps to save nonsystem libraries:

1. On the Backup Class Maintenance panel, enter a **2** next to a backup class.
2. On the Backup Set Definition Maintenance panel, press **F6** to add a set.
3. Give the set a meaningful name on the Backup Set Information panel.
4. Enter **6** (SAVLIB LIB(*NONSYS)) as the Backup Set Type.

You can run the save from a command line at the system console or use the Robot Save menu system. When you select a SAVLIB LIB(*NONSYS) backup, the system enters a restricted state automatically.

Note: To run the save unattended, you can use Robot Save's Restricted State Utility (RSU) and schedule a Robot Schedule job to run the backup. See Using an RSU Job to Run a Full System Backup for more information.

Save System Libraries Using the IBM SAVLIB LIB(*IBM) Command

Another possible backup set performs a *IBM save (omit IBM libraries that contain user data, for example, QGPL, QUSRSYS, etc.). This set uses the IBM SAVLIB LIB(*IBM) command. Follow these steps to save IBM libraries:

1. On the Backup Class Maintenance panel, enter a **2** next to a backup class.
2. On the Backup Set Definition Maintenance panel, press **F6** to add a set. Name the set on the Backup Set Information panel. Enter **8** (SAVLIB LIB(*IBM)) as the Backup Set Type.

Save Changes to User Libraries Using the IBM SAVCHGOBJ LIB (*ALLUSR) Command

You also can set up a Robot Save backup set to save all changed objects in user libraries using the IBM SAVCHGOBJ LIB(*ALLUSR) command. Follow these steps to save changes to user libraries:

1. On the Backup Class Maintenance panel, enter a **2** next to a backup class.
2. On the Backup Set Definition Maintenance panel, press **F6** to add a set. Name the set on the Backup Set Information panel. Enter **A** (SAVCHGOBJ LIB(*ALLUSR)) as the Backup Set Type.

Using Robot Save to Archive Reports in Robot Reports

Robot Reports works with Robot Save to archive its reports. Robot Save includes a backup class usage type designed specifically for the Robot Reports archive. The backup class and its associated backup sets allow you to define multiple rotations for your Robot Reports archive backup, providing flexibility to your archiving strategy. For example, each rotation might include archived reports for a period of time, such as a week or month. In addition, using Robot Save to archive your reports allows the reports to span multiple volumes, making it easier to archive large reports and minimizing the time necessary to complete the archive.

This topic describes how to create the backup class and backup sets in Robot Save, allowing you to archive your Robot Reports reports using Robot Save.

Note: Do not delete any current Robot Save backup classes and sets that you've used to save your Robot Reports archive in the past. You will need them to restore any reports that already are archived.

Requirements

You must be at the following release/modification levels to define and use the Robot Save Robot Reports usage type to archive your Robot Reports reports:

- Robot Reports R07M21, or higher
- Robot Save R11M06, or higher

If you use Robot Save R10M17 with Robot Reports R07M21 or higher, the RBSMRKVOL command is no longer valid. You do not need to mark volumes as full. Remove this command from any CL programs or jobs that currently use it to mark tape volumes as full. If you run a job or program that contains the command, the job will end with the following error message: RS86103, Command RBSMRKVOL is no longer valid.

A new command, REPCHGROT (Change rotation in Robot Save), added in Robot Reports R07M21, replaces the RBSMRKVOL command. The REPCHGROT command changes the backup set rotation used for the archive, which automatically starts the next archive backup on a different volume.

Example: Using Rotations to Archive Reports

For this example, assume you have set up an archiving strategy that uses one rotation per month. Each month, all of that month's reports will be archived on tape volumes belonging to the rotation. Robot Save will archive the reports using as many tape volumes as necessary, including multiple volumes for large reports that span tapes. Robot Save will continue to attach volumes to the current rotation until the end of the month. At the beginning of the next month, run the REPCHGROT command to start a new rotation and begin archiving on a new tape volume.

Determining the number of rotations. To determine how many rotations you need to define to your Robot Save backup set, decide the number of rotations you need each year and the number of years of rotations you want to keep. In this example, one rotation per month equals 12 rotations per year. If you need to keep reports for seven years, set up your backup sets with 84 rotations (12 rotations/year x 7 years). Each month, run the REPCHGROT command to change to the next rotation (*NEXT). At the end of 7 years (84 rotations), you can begin expiring the reports archived on the first rotation. At that time, you can start the cycle over again using the REPCHGROT command to specify the first rotation (*FIRST).

See Using the REPCHGROT Command below for more information.

Creating a Backup Class and Backup Sets

Robot Save uses backup classes, backup sets, rotations, and volumes to archive your reports. To archive your Robot Reports reports, you must define a Robot Save backup class with a Usage type of Robot Reports, and its associated backup sets.

1. In Robot Save, display the Backup Class Entry panel. Use this panel to define the backup class. Specify a backup class name and description. Select Robot Reports as the backup class Usage type.

   Note: The number of rotations specified on the Backup Class Entry panel will be overridden when you define your backup sets.

   - Select a Usage type of Robot Reports for the backup class.
2. Display the Backup Set Information panel to define the backup sets for your reports. Define backup sets for both your short-term and long term archives.
   - Enter a name and description for the backup set.
   - Specify the Backup Set Type: S Short Term or L Long Term
   - Enter the number of rotations you want to define to the backup set.
   - Make sure the Save file data field is set to Y to prevent data loss.
3. After you've defined your backup sets, go to the Robot Reports System Defaults panel and enter the names of the new backup class and short- and long-term backup sets.

Robot Save will use as many volumes as necessary to complete the archive. When it's time to change to the next backup set rotation, run the REPCHGROT command by scheduling it in a Robot Schedule job or from a command line.

Using the REPCHGROT Command

The REPCHGROT (Change rotation in Robot Save) command changes the rotation used by your backup set. Run this command when you want to change your archive to the next rotation, for example, at the beginning of each month.

To execute the REPCHGROT command, specify the following parameters:

Backup Set type to change	Enter the backup set type whose rotation you want to change: • ***LONG** Change the long-term backup set rotation; this is the default value • ***SHORT** Change the short-term backup set rotation • ***BOTH** Change the rotation for both backup sets

Rotation Code to use	Enter the rotation code to use for the backup set: • ***NEXT** Use the next rotation; this is the default value • ***FIRST** Use the first rotation; you can return to the first rotation when the reports archived on its volumes have been expired • *char value* Enter a specific rotation number to use

Note: If you specify a previous rotation, Robot Save will append the reports to the last tape used for that rotation.

Backup Operations

Backup Operations

Use the Operations menu to submit your backups and data set operations manually. Just select the backup set you want to run.

Robot Save documents each save or restore operation in a status message. Each message contains information such as the name and rotation of the backup set, the time and date the backup set ran, the completion status of the save or restore, and whether there are additional messages. Robot Save notifies you of unsuccessful save or restore operations, and allows you to resume incomplete saves. You can display or print the status messages for any date you select.

This section describes how to submit your backups for execution. You'll see how to submit a save manually, how to schedule a save in Robot Schedule, how to check the completion status of your save or restore operation, how to resume an incomplete save, and how to resolve errors that occur. This section also describes the Restricted State Utility (RSU), which allows you to run restricted state saves unattended. **Note:** You can run restricted state TCP/IP using the RSU.

Encrypting Data

Introduction

Understanding the basics of encryption is the first step toward setting up a good encryption strategy. This document provides an overview of encryption and answers some frequently asked questions to help you get started protecting your critical data through encryption.

Facts About Encryption

Encrypting data takes time and can increase your backup window.

- This is true for most hardware and software encryption solutions. You need to think about what you really need to protect using encryption. What files are you required to protect? Consider privacy laws (such as HIPAA, Visa's Cardholder Information Security Program [CISP], and more), and the privacy of customers and employees when evaluating what you need to encrypt. Encrypting unnecessary objects (application programs, query definitions, SQL packages, QSYS objects, and so on) adds to the backup time and serves no useful purpose.
- The level of encryption you select affects speed. The stronger the encryption, the slower the save/restore time. If you want the fastest save and restore time, use the lowest level of encryption possible.

Not all software encryption solutions are the same.

- Some are faster than others. Encryption solutions typically take from 2 to 100 times longer than a regular save. Robot Save has been benchmarked to perform better than typical methods of saving data to a save file, encrypting selected data, and then writing to tape. Encrypting your data using Robot Save will only extend your backup 2 to 10 times.
- Some solutions require you to write code. They give you just the encryption/decryption process. Robot Save does much more by managing your entire encryption environment:
  - Ease-of-use—You don't have to remember a bunch of steps to recover data. Robot Save handles it automatically.
  - Tape tracking—Robot Save tracks which tapes contain encrypted objects and what tapes you used last Thursday (or last month).
  - Restore tracking—Robot Save lets you know when files are restored to your system.
  - Security—Robot Save can secure who is allowed to change an encryption key (password).
- Some encryption solutions require you, or a piece of hardware, to manage encryption keys (passwords). Robot Save manages keys for you. Select an object to restore and it applies the necessary key. If you use Robot Save for restoration, you don't have to remember which encryption key you used when you saved an object.

Frequently Asked Questions

Q: I just want to be on the safe side. Aren’t there hardware solutions that handle encrypting everything that goes to tape?

A: Everyone wants their data to be safe. But, consider the following:

- Will you ever need to restore that information to another machine for testing, upgrading, or disaster recovery? If so, you'll need more than one piece of hardware. You'll actually need identical hardware for each of those machines.
- Do you ever upgrade tape drives to take advantage of higher speeds or compression? With a hardware encryption solution, you're stuck with that speed and that level of compression. You can never upgrade to a faster or higher-density tape without buying the entire solution again, for all your machines (for example, production, development, and disaster recovery).
- Will the hardware always be compatible with IBM Power Systems hardware? Robot Save will. Power Systems is moving to IOP-less cards in the new hardware. Not all tape drives can be used with the new hardware.
- Hardware solutions can be expensive and less flexible. You can expect to pay between $15,000 and $50,000 per unit.

Q: At a disaster recovery site, do I need to install Robot Save before I can restore anything else?

A: No. You can choose how to handle the restore.

- If you encrypt only selected objects, those are the only items that require you to use Robot Save commands to decrypt the saved objects. You can still restore all other objects before handling the restore of encrypted objects.
- Restoring Robot Save first allows you to restore everything through the product. You don't even have to remember the passwords (keys) used to encrypt the data. Robot Save keeps track of all your passwords for you. Hardware solutions usually require the encryption keys to be stored in an additional card on your system before you can restore objects.

Q: I can't afford to add any time for encryption to my backup window.

A: Robot Save can help.

- First, save the objects that you want to encrypt to a save file. After that save completes, allow your users back on the system. Then, use Robot Save to encrypt the save file as it's saved to tape. Generally, a save to disk is faster than tape. This means you could actually reduce your backup times. (Note: Saving to a save file can increase your DASD usage.)

Encryption Options

Robot Save provides you with three options for encryption:

- Encrypt everything in a library—This adds the most time to a backup and uses the most additional disk space.
- Encrypt selected objects in a library—This adds less time onto a backup and uses less disk space than encrypting every object.
- Encrypt a selected list of objects using an object list—This allows you to customize your backup by selecting objects from multiple libraries, decreasing the backup time needed.

Other factors that also can affect backup times:

- Size of your processor
- Memory allocated to your save job
- Run priority
- System activity
- Level of encryption—Robot Save provides four levels of encryption (you select the level required to protect your data).
  - Low—8-bit encryption
  - Medium—based on DES 56-bit encryption
  - High128—based on AES 128-bit encryption
  - High256—based on AES 256-bit encryption

Performing Manual Backups

If you schedule all your backup set saves as Robot Schedule jobs, you may never need to run a backup set manually. You don't need to run backups manually if all your backups are automatic and unattended. But, if you need to run a backup set at a time other than its scheduled time, you can select the backup set and enter the option code to execute it manually. This section describes how you can perform a backup manually.

1. When the Operations by Backup Class panel displays, press **F4** in the Opt column next to the Daily backup class. The Backup Class Operations window displays. Select option **1**, Select Backup Set.
2. The Backup Set Selection panel displays. Press **F4** in the Opt column next to the backup set you are going to save. From the Backup Set Selection window, select option **3**, Perform Save Operation.

   Note: Robot GUIDE built the DAILY1 backup set to perform a SAVLIB *ALLUSR. When you run the backup set, all user libraries on your system will be added to the backup set. You might not want to run the save during the day and should schedule it to run at night.

3. A window displays identifying the set and rotation to be run. If you want to submit the save to batch, enter a **Y** in the Submit this save field. To run the save interactively, leave the default, **N**. You also can enter job description and job queue names. Leave these fields blank to use the defaults. Press Enter to perform the save, or press **F3** to cancel the save request.
4. When the save completes, the fields on the Backup Set Selection panel are updated for the backup set just saved. The next set to be run now appears at the top of the list. Press **F3** to return to the Operations Menu.

Using an RSU Job to Run a Full System Backup

This procedure describes how to create a Restricted State Utility (RSU) job in Robot Schedule to perform a complete backup of your system. The steps you need to follow are outlined below. Detailed information for each step appears in the remainder of this document. If you need additional information, see the appropriate user guide for Robot Save or Robot Schedule.

Note: You can run restricted state TCP/IP using the RSU. For more information, see "Set Up Restricted State TCP/IP" under the Robot Self-Service Support tab on our website.

In Robot Save

1. From the Backup Class Entry panel, create a backup class named WEEKLY.

   After you complete the panel entries, press **F10** to start the Robot Save Navigator. This takes you to the Backup Set Definition Maintenance panel.

2. On the Backup Set Definition Maintenance panel, press **F6** to create a new backup set.
3. Enter the information for the new backup set on the Backup Set Information panel. Specify the backup set name, WEEKLY and set the Backup Set Type to 9.

   Notes:

   - You do not need to add libraries to this backup set because Robot Save issues the following commands as specified by Backup Set Type 9: SAVSYS, SAVLIB *NONSYS, SAVLIB RBSPGMLIB to SAVF, Save the SAVF to tape (saves the RBSPGMLIB SAVF to tape), SAVDLO, SAV (to save IFS), SAVLIB RBSDTALIB to SAVF, Save the SAVF to tape (saves the RBSDTALIB SAVF to tape).
   - All commands are IBM commands.
   - You can omit libraries from a backup set type 9. Enter a save code of NO next to the library name on the Items to be Saved Within a Backup Set panel.

- You also can specify whether to create an object archive entry for the objects saved within each library. See the Robot Save User Guide for complete information on creating an object archive.

In Robot Schedule...

You now are ready to create a Robot Schedule job to run the Robot Save backup set. Start Robot Schedule by entering the command RBO on a command line. Select option **1**, Robot Schedule.

1. On the Robot Main Menu, select option **1** to display the Job Schedule List panel.
2. Press **F6** to create a new job record.
3. On the Initial Job Setup panel, enter the information for the job. Enter a **C** (command) in the Job Type field. Specify a name for the job, for example, WEEKLYBK. Enter the date and time you want the job to run, for example, 0100 (1 a.m.) on Saturday morning. Press Enter to save your changes and then press **F10** to continue to the Robot Command Entry panel.
4. Use the Robot Command Entry panel to enter the RSU commands to be scheduled in Robot Schedule. The following panel shows the RSU command stack. To begin entering the command parameters, make sure that the Robot Save libraries, RBSPGMLIB and RBSDTALIB are in your library list. Enter each RSU command and then press **F4** to display the command prompt panel. Each of the command panels are described on the following pages. For complete information about the Restricted State Utility, see the Robot Save User Guide.
5. Enter the RSU Start Command, **RBSRSUSTR**. The RBSRSUSTR command places the IBM i in a restricted state by ending the system using the ENDSBS *IMMED command.

   Note: If the IBM i cannot go into a restricted state within a specified time (the default is 60 minutes), Robot Save automatically IPLs the system. You cannot start any subsystem during this time without performing an IPL.
6. Enter the **RBSRSUCMD** command. On the RBSRSUCMD panel, enter the RBSSave command and press **F4** to display the RBSSave command prompt panel. Enter the name of the backup class and backup set.

   Note:

   You can issue the RBSRSUCMD command multiple times during the same restricted state job. You can enter any IBM i command allowed in a restricted state on a RBSRSUCMD command. The RBSRSUCMD commands run in the order they were entered.

   For example, you can use the RBSRSUCMD command to execute command such as RCLSTG (Reclaim Storage). We recommend that you perform a RCLSTG quarterly, or at least twice per year.

You also can automate the RGZPFM (Reorganize Physical File Member) command using RSU.

See the IBM OS/400 Backup and Recovery Guide for more information on using the RCLSTG or RGZPFM commands.

All RBSRSUCMD commands must run after the RBSRSUSTR command and after the RBSRSUEND command.

7. Enter the RBSRSUEND command to end the RSU command stack. The RBSRSUEND command has three predefined parameters that let you specify how to restart the system: *IPL to IPL the system; *STARTSBS to start the controlling subsystem; or *CMD, which allows you to specify a command to use to start the system.

   Note: If your operating system level is V6R1 (IBM i 6.1), you need to be aware that the default behavior of the Power Down System (PWRDWNSYS) command has changed. The default value (*ENVVAR) for the CONFIRM parameter on the PWRDWNSYS command now displays a confirmation window. This will cause the RSU to halt and wait for a confirmation before performing the IPL. Enter the following command on a command line before you start the RSU. The command permanently bypasses the confirmation window on the PWRDWNSYS command:

   ADDENVVAR ENVVAR(QIBM_PWRDWNSYS_CONFIRM) VALUE(*NO) LEVEL(*SYS)

   In the Prerequisite user job name field, specify the name of the user job prerequisite. This is an imaginary user job that is a prerequisite for a Robot Schedule reactive job that will run immediately after Robot Schedule restarts.
8. Return to the Job Schedule List and enter option **5** next to the WEEKLYBK job to display the Control Options panel. Specify the Job description as RBSJOBD in library RBSPGMLIB. Enter a job queue for the job, for example, enter QCTL so that the job runs at the time it is scheduled and doesn't wait for another job to complete. The Message reply value should be Operator Required.
9. When you are ready to run the restricted state job, enter the Robot Save Restricted State Utility command, RBSRSURDY, to prepare the console to enter a restricted state. You must enter the RBSRSURDY command at the console from a user profile with the proper authority to perform the backup.

Omitting IFS Directories and Objects from a Backup

Introduction

The Integrated File System (IFS) on your IBM i server can be quite large and backing up the entire IFS can take a lot of time—and may not even be necessary. Robot Save allows you to omit entire directories, or selected objects, that do not need to be backed up regularly, helping reduce your backup time.

To specify directories to omit, create an object list containing the directories using Robot Corral and then set up a Robot Save backup set to omit the selected object list.

You can omit IFS directories from the following Robot Save backup types:

- 9 = Full system backup
- 1 = User-defined: IFS–Save all IFS
- 1 = User-defined: IFS plus Domino databases

Omitting IFS Directories

Create an object list of IFS objects to omit

1. In Robot Corral, display the Work with Object Lists panel. Press **F6** to create an object list.
2. On the Object List panel, enter the name, description, and retention type for the object list. Select **D** (directory) as the Selection Type. Press Enter to display the Directory Selection criteria.

   Note: You do not need to complete the Select Using File Dates section and the Include subdirectories field. If you enter values in these fields, Robot Save does not use them (this is an IBM limitation).

   You can use the File name filter field to filter objects in the specified directory.

   - If you do not specify a file name filter (recommended whenever possible), the default, *ALL, is used and the resulting object list automatically omits all subdirectories below the selected directory. For example, if you select to omit the /notes directory, all objects in /notes, including all objects in subdirectories, such as /notes/server1/*, are omitted from the backup.
   - If you do specify a file name filter, only objects in the chosen directory that match the file name pattern are omitted from the backup. Subdirectories under the specified directory are not omitted (this is an IBM limitation on the SAV command). For example, if you select to omit files that match the pattern /notes/*.n?f, only objects with .NSF and .NTF extensions in the /notes/directory are omitted. Objects in a subdirectory, such as /notes/server1/*.n?f, are not omitted. To omit these subdirectories, you must create additional object lists and specify the subdirectories you want to omit. You can create as many object lists as you need. Robot Save allows you to specify up to 290 omit-type object lists for each backup set.
3. Press **F4** in the Directory path field to display the Directory Finder panel. Enter a **1** next to the IFS directory that you want to omit.

   You do not need to build the object list in Robot Corral.

Define a Robot Save backup set to omit the object list

1. Create a backup set. The backup set can be type **9** (Save Entire System) or type **1** (User-Defined) to save the IFS. For a type 9 backup set, skip to Step 3; if you are using a type 1 backup set, continue with Step 2.
2. On the Items to be Saved Within a Backup Set panel, press **F6** to select the type of item to be saved. Select either Save All IFS or IFS plus Domino databases on the Item Type Selection panel. The Items to be Saved Within a Backup Set panel redisplays.
3. On the Items to be Saved Within a Backup Set panel, press **F6**. When the Item Type Selection panel displays, select IFS Object Lists to Omit.
4. The IFS Object List Selection panel displays allowing you to select the object lists to be omitted from the backup. Enter a **1** next to the object list containing the directory you want to omit. You can specify up to 290 object lists to omit for each backup set.
5. The Items to be Saved Within a Backup Set panel now shows the object lists you selected with a save code of NO. You cannot change the save code for omitted object lists.

When the backup runs, Robot Save automatically builds the RBSSAVIFS command with the omit parameters based on the selected object lists.

Considerations When Omitting IFS Directories

- If you omit part of the IFS, you should be aware that you will not be able to restore the entire IFS using Robot Save. When Robot Save backs up the IFS, it treats the entire IFS as a single entity to back up and restore. You should back up the entire IFS as part of another backup set. Or, save the omitted directories as part of an object-list type backup set. You then can restore the directories using the Robot Save object archive
- Robot Save can omit a maximum of 290 directory-type object lists from a single backup set, with a total of approximately 21,000 unformatted characters in the omit parameter, based on the directories selected.
- If your directory names or file name filters contain single or double quotation marks, they become case-sensitive and you may need to create multiple object lists to get the desired results.
- To test that you are omitting the correct files, you should run a save and review the results.

Moving Volumes to Locations and Containers

Use the RBSMOVVOL command to move volumes to locations and containers. For example, you can move all the volumes of a backup set from one location or container to another. The RBSMOVVOL command can be run interactively or in batch.

Note: We do not recommend using the RBSMOVVOL command if you have automated move sets established.

Complete the command parameters with the information for your system. If you need additional information about the command parameters, press the Help key to display the command help.

You can enter either a location or container, but not both. Entering a location or container without a backup class allows you to specify a “From” field. This is particularly helpful if you are moving all the volumes from one location or container to another.

The following example moves all the volumes from one location to another. Enter the location name, then use F10 to display the From Location field.

Press **F1** from, the Robot Save Move Volumes panel for field descriptions.

Note: To change both the location and container, you must run the RBSMOVVOL twice.

Duplicating Volumes

With Robot Save, you can duplicate volumes for an entire backup class/set/rotation. The duplicate volumes can then be tracked either as *ADHOC or attached to another specific class/set/rotation combination. When duplicate volumes are attached to a class/set/rotation, they're handled as if they were created by a backup process, with a couple of exceptions:

- Restores are only allowed at the library level; individual objects must be restored manually.
- Only library-based objects can be restored via Robot Save; IFS based objects must be restored manually.

Use the RBSDUPROT command to duplicate all volumes from a specific class/set/rotation combination. However, before you can use the command, you must meet both of the following requirements:

- Have Robot Save 11.08 or higher installed on your system.
- Have two drives of the same type that use the same media, or a virtual and physical drive.

You can also use the RBSDUPASN command (for Robot Save 12.17 and higher) to assign the duplicate volumes created by RBSDUPROT to a specific backup class/set/rotation. And, because the RBSDUPASN command was integrated into the RBSDUPROT command, you can duplicate the volumes and assign them, all in one step. The primary benefit to using the RBSDUPASN command parameters is the ability to manage duplicate volumes using the tools available within Robot Save. This includes the use of move sets and other volume tracking/volume movement functionality. **Note:** If the assigned class/set/rotation has a move set attached to it, and the second location requires a tape to be ejected, Robot Save will allocate the tape drive.

If you choose not to use the RBSDUPASN command parameters when you run the RBSDUPROT command, then the duplicate volumes are tracked as *ADHOC volumes. If you want to release the duplicated volumes to the scratch pool when their data expires, be sure to specify **Y** (Yes) in the Release expired *ADHOC tapes to scratch field on the Media Defaults panel.

To help you manage duplicated volumes, option **11**, Tape Cross Reference Inquiry, on the Save Media Management Menu displays volume information for both the duplicate and the original volumes. Press **F8** to print a report of your duplicate volumes. The Volume Inquiry panel also displays duplicate volume information.

When you submit or schedule the RBSDUPROT or RBSDUPASN commands, both the RBSDTALIB and RBSPGMLIB libraries must be in your interactive library list. The commands are located in RBSPGMLIB, but use files from RBSDTALIB. If you are scheduling the RBSDUPROT or RBSDUPASN command using Robot Schedule, display the Control Options panel and enter RBSPGMLIB/RBSJOBD in the Job Description fields, and *JOBD in the Library List Name field.

Starting and Stopping the Robot Save Monitor Jobs

Robot Save has three data center management communication monitor jobs that run in the RBTSLEEPER subsystem. The jobs are: RBSDEP, RBSDCM, and RBSERP. These jobs control the event data among the systems in a data center. If the jobs are not running, no data is sent between systems. All communications go through the data center management system (DCMS). Note: The jobs also manage data in a stand-alone system and should be running even if your system in not in a data center.

If a system in the data center stops communicating with the DCMS, any Robot Save processing done on that system continues to be tracked. When communication resumes, the data is sent to the DCMS and then distributed to the other systems in the data center. If only some of the monitor jobs on a system are running, the system may be able to send data but not receive it, or receive data but not send it. To check if all the jobs are running, use the command WRKACTJOB SBS(RBTSLEEPER) to display the RBTSLEEPER subsystem.

The status of the jobs is shown at the top of the Operations Menu. Use Options 8 and 9 on the Operations Menu to start and stop these monitor jobs.

Attaching Additional Volumes

If a save requires additional volumes and there are no tapes left in the rotation, you can mount a tape and Robot Save attaches it to the rotation. The tape must be expired and cannot be attached to any other rotation (see Reserved Volumes for complete information on using volumes). If the tape you mount is new, and you are using serial or logical naming, Robot Save initializes it automatically and then continues with the save.

Archiving Individual Volumes

The RBSADDTAP command helps you manage your tape inventory. The RBSADDTAP command does the following:

- Populates the inventory of volumes in Robot Save with historical volumes, one volume at a time
- Reads the data on the volume and inserts it into the Robot Save object archive records

After the command has completed, the volume and archive information is available to Robot Save. The volumes then can be recycled into the scratch pool as they expire.

Steps To Use the RBSADDTAP Command

1. Install Robot Save on your system. Follow the online installation instructions.
2. Set up Robot Save backup classes, sets, and rotations.
3. Load the historical volume on the drive.
4. Add the libraries RBSPGMLIB and RBSDTALIB to your library list.
5. Enter the following command:

   RBSADDTAP
6. **Press F4** to display the command prompt.

Complete the command parameters with the information for your system. If you need additional information about the command parameters, press **F1** to display the command help.

Running the Backup Set Save

When you select to run a save manually or schedule it using Robot Schedule, Robot Save does a normal save to tape with these additional enhancements:

- If you are saving libraries, it assigns undefined libraries automatically, according to the criteria specified on the System Defaults panel, to the backup sets flagged on the Extended Backup Set Information panel.
- It intercepts all device messages and tells you what to do next so you cannot choose the wrong option.
- It uses the mounted tapes (if they are not assigned to another backup set).
- It tells you what volume to mount next.
- It allows you to initialize additional tapes if you run out (except when you use an AML)
- If you have Robot Alert, our pager and email message software, Robot Save can send a message if a tape mount is needed or if the tape device jams.
- If you have specified the save-while-active option, Robot Save waits (if necessary) for a library for the period of time you have set.

If you execute the Robot Save command, RBSSave, in batch, the messages are sent to the usual tape device message queue, QSYSOPR.

If the backup set belongs to a data set class, the data set program you entered into the set is executed instead of a save. The program runs interactively from the operator's workstation. Robot Save does not intercept any tape device messages; they are sent to the usual tape device message queue.

For a detailed explanation of the save process, see the Robot Save Save Process topic.

Running Concurrent Backups

Robot Save supports the use of concurrent backups. In a concurrent backup, you can run more than one backup operation to more than one save device at the same time (concurrently). If you have multiple tape devices, using concurrent backups can save time spent on backup operations.

Robot Save allows you to run concurrent backups as long as there is no contention for the same save device or the same libraries, and the saves are not from the same backup class. Although you can run as many backup sets at the same time as you want, **we recommend you run no more than two**. Because backups are so disk-intensive, running three or more at the same time can actually be slower than running three saves one right after another.

We suggest that if you split libraries between backup sets that are to run at the same time, keep it simple. Have one set do a few of the largest libraries and the other do all the rest. Only the "all the rest of the libraries" backup set should use the option to add new, undefined libraries to the backup set.

If you are saving your Domino databases using Domino online backup, you cannot save databases on the same server using concurrent backups. However, you can save databases on different servers concurrently.

If two or more backup sets are running at the same time, the volume used for the last backup set to finish is the one used to save the Robot Save data library (RBSDTALIB). If you are backing up the Robot Save program library (RBSPGMLIB), make sure it is the last library on the last backup set to finish so that there are no contention problems for the library. RBSPGMLIB will be saved right before RBSDTALIB.

Creating Media Definitions for Parallel Operations

The Robot Save Create Media Definition (RBSCRTMDFN) command allows you to create media definitions for parallel operations, in which a backup or restore operation uses multiple save devices simultaneously. Robot Save uses an IBM API to create media definitions specifying the tape drives, volumes, and sequences needed to run the operation. After you create the media definition, you can specify it on save and restore library or object commands.

Note: You cannot use the RBSCRTMDFN command with a Robot Save backup class and backup set; however, you can use it with a Robot Save data set session. If you wish to track the tapes used in this type of save operation, Robot Save's ad hoc tape monitoring creates a record of the tapes used.

Audit Report and Object Archive Creation

Robot Save gives you double assurance that the save was done. First, it monitors for completion messages from the save commands to assure that each command is successful. Second, it creates the Audit Report.

The Audit Report is a summary of the save, including a listing of all objects that were not saved. The most common reason why an object is not saved is because a user had a lock on the object during the save. You should review the Audit Report after every save.

Robot Save also creates object archive entries after the save process completes. An archive job is submitted to create the object archive unless:

- You selected the system-wide option of no object archive creation.
- You specified no object archive entries on a backup set or for a library

Working With Status Messages

Status messages tell you when a backup set was executed and whether or not it was successful. Robot Save creates status message records whenever a backup set save or restore executes. The Status and Completion Inquiry panel lists all the backup sets that have been executed. The panel includes the following information:

- The name and rotation of the backup set.
- The time and date the backup set ran.
- Whether the save or restore completed successfully or terminated abnormally.
- Whether there are warning messages for the backup set.
- The run time for the job.

From the Status and Completion Inquiry panel, you can do the following for each backup set operation:

- Display a list of the warning messages issued for the backup set.
- Display detailed information on each warning message. The message details include:
  - The complete message text.
  - The start and end times of the save or restore.
  - The number of objects saved and objects not saved.
  - The user who ran the save or restore.
- Display a list of the items (libraries, objects, object lists, documents, IFS files) that were not saved.
- Display the activity log for the operation.
- Select a backup set and change its definition information.
- Delete the messages for the job.
- End the job if it is active.
- Display any history log (QHST) entries from the job.
- Create a save file containing the job's logs to help Robot Technical Support with problem resolution.
- Display the job log for the operation.
- Resume an incomplete save.
- Work with the job if it is active.

In addition to displaying status messages, the Operations Menu also provides options to print or delete messages for a given time range or type. If you have Robot Network installed, you can display all systems from one central host system. See the Status Center discussion in the *Robot Network User Guide* for complete information.

To display the status messages, select option **2** from the Operations Menu.

Related Topics

- Overriding Status Messages
- Deleting Status Messages

Overriding Status Messages

To specify the status messages that will display a Warning flag on the Status and Completion Inquiry panel, do the following:

1. Call the program RBS960 using the following command:

   CALL RBS960
2. The Message Override Selection panel displays. The panel lists any message IDs that have been defined to issue a warning message. (**Note:** If no messages have been defined, the panel will be blank.)

   Press **F6** to add a message to the panel. (To change an existing message, enter a 1 next to the message you want to change. To delete a message from the list, enter a **4** next to the message.)
3. The Override Message Finder panel displays. Enter a **1** next to the message you want to add to the list. Only messages that appear on the Override Message Finder panel can be changed.
4. The Override Message Severity Maintenance panel displays. Enter a **W** in the Robot Save message severity field to have the message display a warning flag on the Status and Completion Inquiry panel. You also can specify the severity of the status that is sent to the Robot Network Status Center.
5. Continue to follow these steps to add as many messages as you wish to the Message Override Selection panel.

Related Topics

- Working With Status Messages
- Deleting Status Messages

Deleting Status Messages

To delete messages, select option **4**, Delete Status Messages, on the Operations Menu. The Status Message Deletion panel allows you to specify the number of days of status history you want to retain. You also can select to delete only certain categories of messages. To delete all messages, leave the panel blank and press Enter.

Note: We recommend that you keep the last two weeks of status messages.

If you have Robot Schedule installed, you can schedule the deletion of messages. To schedule a Robot Schedule job, enter a **2** in the Opt column.

Related Topics

- Working With Status Messages
- Overriding Status Messages

Working With Completed Saves

After each save operation that you run using Robot Save, do the following:

- If you are moving your tapes manually to the next location and using manual move sets:
  - Select option **1**, Operations by Backup Class, from the Operations Menu.
  - Select the backup set just executed.
  - From the options window, select to display the volumes by prior rotation.
  - Press **F7** to move all volumes to the next location, probably off-site.

    If you are using a move set with auto move processing, backup set rotations are moved automatically at the end of the save.
- Review the status messages after each save:
  - Select option **2**, Display Status Messages, from the Operations Menu. The status information available from the Status and Completion Inquiry panel provides details about any libraries added to the set, tape volumes that were renamed, job logs, history logs, output generated, and objects not completely saved.
  - Review the status messages; you often can anticipate potential problems by monitoring the Status and Completion Inquiry panel every day.
- Review the audit report (RBS405P):

  Verify that all libraries were saved successfully. The report tells you which volumes were used and the order in which they were used, libraries saved, and objects not saved successfully. If you don’t review the audit report each day, you may not realize that your backups are not complete until it is time to perform a restore operation.
- Store your restoration reports (RBS410P) off-site with the tapes used for the backup.

  The restoration report tells you how to restore your entire system from the tape backup—store them with your backups. Review the restoration report carefully, especially when you first start using Robot Save, to make sure all your libraries are being backed up.

Working With Canceled Saves

If you canceled a backup operation, check the volumes attached to the backup set rotation. If there are volumes attached and you want to run the same backup set rotation again, do the following:

1. Mark the rotation as the next rotation to use.
2. Mount the volumes on the save device in the same order as they appear on the Media Volume Maintenance panel.
3. Start the save operation again.

A window displays indicating that the mounted volume contains unexpired data. Robot Save marks the volume as having an error condition and loads the next volume. See the Error Resolution topic for more information on resolving the volume error.

Resuming Incomplete Saves

You can resume save jobs that didn't complete if, for example, a damaged tape or a problem with a drive resulted in an incomplete save. You can resume a save using the RBSSave command, and from the Status and Completion Inquiry and Warning Messages Inquiry panels. Incomplete saves display with a status of Abnormal End. Check the Warning Messages panel to determine whether you can resume the save.

Resuming an incomplete save should be done soon after you find that a problem has occurred, for example, the morning after the save stopped. If you attempt to resume an incomplete save several days after it stopped, data integrity cannot be guaranteed. If there has been a delay of several days, it is best to start the save from the beginning.

Use the following to determine if a save can be resumed:

- You cannot resume a save whose Activity Log records have been purged.
- You cannot resume a save that is in Running or Message Waiting status.
- You cannot resume a save if another save from the same backup class and set has been run.
- You cannot resume the following types of saves: SAVSYS, data sets, object lists, or SLSD backup types.
- You normally cannot resume a save if the number of days before media expires (specified on the Backup Set Information panel) has passed since the incomplete save last ran. However, if the volumes are still attached to the rotation, the save can be resumed.

When you resume an incomplete save, the following occur:

- Resumed saves use the same save number as the original save job.
- Warning messages are issued indicating that the save was resumed.
- A resumed save starts at the beginning of the item immediately following the last successfully saved item. If the last volume used in a save is damaged, Robot Save resumes the save at the beginning of the volume so that all libraries saved on that volume can be restored if necessary.
- Resumed saves begin on an unused tape; they do not append to the tape used by the incomplete save job.
- If you use save while active, checkpoints are not synchronized with the original incomplete save. Therefore, libraries synchronized after the save is resumed are not synchronized with the libraries that were saved before the backup stopped. It is possible that you will not be able to resume an incomplete save that has save while active processing specified.
- The object archive created for the original incomplete save is not deleted. The resumed save creates an additional object archive.
- A resumed save does not run any before-backup programs defined for the backup set.
- The last backup set saved and the next rotation to be used are updated when the resumed save completes successfully.
- The last save date and the next usage date values use the dates of the original save.
- The volume expiration date is based on the date of the original save. This ensures consistence with the other volumes used for the rotation.
- The Robot Save data library (RBSDTALIB) is saved at the end of the resumed save.

Resuming Your Incomplete Save

To resume your save, do one of the following:

- Display the Status and Completion Inquiry panel.
- Enter an **R** (or select option R from the Status Message Options window) next to the backup set you want to resume.

Or,

Enter the command, **RBSSave**, and specify ***RESUME** in the Rotation Code field.

Or,

On the **RBSSave** command, and press **F9** to display additional parameters. Enter the name of the library where you want the save to resume in the Library to resume on field. This allows you to override the default library at which Robot Save would resume the save.

Saving the System Software

You should have a backup set that saves just the system software. The topic Other Backup Set Types describes how to set up the SAVSYS backup set. This backup set saves only the QSYS library, which contains the IBM i operating system, security information, licensed internal code, private authorities, and device configurations. Because this type of save requires that the system be in a restricted state, use the Restricted State Utility and schedule a Robot Schedule job to run the save command unattended. These saves can use the menu options discussed in this section, but they must be run from the system console.

Working With Errors

Working With Errors

Whenever several systems are involved in transferring data among themselves, errors can occur, the result of conflicting operations performed by one or more systems. Robot Save does not try to anticipate or prevent these errors. Instead, it allows the processing (for example, a backup, volume movement, AML operations) to proceed to completion on each system even if the volume handling connected to the process (or event) may cause an error condition. Robot Save does, however, keep track of the errors that occur so that you can repair them at a later time. In addition, tape errors can occur on any system, whether or not it is in a data center.

All systems in a data center always send their data to, and receive data about other systems from, the data center management system. Because operations are processed locally on each system in a data center, the database information from each system must be distributed to the data center management system and then to all other systems in the data center. When two different systems perform an operation on the same object, the result can be an inconsistency in the database information. This causes an error condition.

An error can result when one of the following occurs:

- More than one system modifies the same database record
- A volume is found to contain unexpired data during an initialize operation
- Robot Save attempts to write to a volume containing unexpired data during a save
- A volume is write-protected during an output operation
- A volume generates a data management error (for example, bad tape or dirty drive)

Related Topics

- Types of Errors
- Identifying Errors

Types of Errors

Robot Save considers errors to be operational or event.

Operational Errors

Operational errors represent a physical problem with a tape, such as being write-protected or having unexpired data on the tape. Operational errors can occur on any system, whether or not they’re in a data center.

Event Errors

Event errors represent a difference in the database between a system and the rest of the data center. These types of errors result when more than one system attempts to modify a database whose contents are shared across the data center. An event error also can occur if the communication between systems is down. Event errors can occur only in a multisystem data center environment. The following examples illustrate some of the situations that can result in an event error.

- System A is in a restricted state and uses a volume 1. At the same (apparent) time, an operator uses volume 1 on another system in the data center. When the restricted-state system comes back up, an event error occurs because the same volume ID was used on two different systems.
- On System A, the operator changes the number of volumes al- lowed in the container BIGBOX from 20 tapes to 30. At the same time on System B, another user changes the number of tapes allowed in BIGBOX to 40. This creates an error event for BIGBOX and you need to select which system has the value you want to use.
- System A uses volume BB0006 from the scratch pool during a backup. At the same time, System B attaches volume BB0006 to a rotation. This creates an event error for the volume.

  An event error can result any time you create, change, or delete the same item (from the following) on more than one system at the same time: Volumes, Media, Containers, Locations, Move Sets, or AMLs

- System A creates location TOPSHELF as on-site. System B creates location TOPSHELF as off-site. The other systems in the data center would show TOPSHELF as either on-site or off-site, depending on which data reached the DCMS first.

> **Note:** Even if System B created the location as on-site, the error would still be created. The error doesn't necessarily signify that the data is different, only that something happened to the same object on two different systems, each without knowing about each other's actions.

Robot Save treats operational and event errors differently. Operational errors are considered to be of "lesser" importance than are event errors, and are treated more as notifications of the error condition. For example, a tape that generates an operational error because it is write-protected still can be involved in volume movement or container changes.

Once an event error occurs, all other events for that object are considered part of the same error until the error condition no longer exists.

Identifying Errors

Event errors are identified when a system sends information to the data center management system. The information becomes an event error on all systems in the data center when the information received by the data center management system conflicts with information it has received from another system concerning the same object. Once an error condition for an object has been identified, all future information for that object is also considered to be in error on all systems in the data center until the error is repaired.

For example, an event error might occur when a system is not communicating with the data center (such as during a restricted state backup). If you change a location on the non-communicating system and change the same location in the data center, an event error occurs because the same entity (in this case, location) was altered more than once at the same apparent time. When the restricted state system comes back up, it will see these two changes (one from the data center, one from itself) and flag the location as being in error because it cannot determine which is more correct. You must then determine which system has the "correct" information and distribute it to all systems in the data center.

Operational errors are identified when an operation involving the physical tape volume encounters an error condition, such as attempting to write to a write-protected volume.

Resolving Errors

The Operations Menu provides a way for you to resolve errors that occur when Robot Save works with a volume, media type, location, container, move sets, AML definitions, and so on. Errors can occur when several systems transfer data among themselves in a data center, or when Robot Save encounters a physical problem with a tape. Robot Save considers errors to be one of two types: operational or event.

Operational errors represent a physical problem with a tape, such as being write-protected or having unexpired data on the tape. Operational errors can occur on any system. Robot Save records operational errors on the Warning messages panel for the backup set. Event errors

represent a difference in the database between a system and the rest of the data center. These types of errors result when more than one system attempts to modify a database whose contents are shared across the data center. Event errors can occur only in a multisystem data center environment.

Robot Save does not try to resolve either type of error when it occurs. Instead, it keeps track of the error and records the information on the Error Resolution panel. You must then identify the cause of the error and repair it. For an event error, that involves identifying the correct information within the data center and distributing it to all systems in the data center. For an operational error, you must resolve the physical problem with the tape volume. See Error Resolution, later in this section, for a complete discussion.

Select option **5** from the Operations Menu to display the Error Resolution panel.

Resolving Event Errors

To resolve an event error condition, enter a **1** next to the error to display the Error Resolution panel. The panel displays details about the object in error. To repair the error, you must determine which system in the data center has the data you consider to be correct and then send it to all systems in the data center.

Event Errors		
Type of Error	**Cause**	**Error Resolution**

Volume AML Definition AML Device Group AML Eject Queue AML Port Definition AML System Connection Backup Class Backup Set Backup Set Rotation Container Device Group Minimum Inventory Level Move Set Move Set Sequence Save Media Storage Location System Setup Object Public Security Volume Text Object User Security	More than one system attempted to modify the specified data.	Display the data from the other systems in the data center. Determine which system has the data you consider to be correct. Then, press F8 to distribute that data to all systems in the data center. If a system shows no data for an object, it means that the object was deleted from that system. If you determine that the system showing the deleted object has the correct data, press F8 to delete the object on all systems. If a system displaying data is correct, pressing F8 re-creates the object on any system where it has been deleted.

Resolving Operational Errors

To resolve an operational error, enter a **1** next to the error to display the Volume Error Resolution panel. The panel displays the current volume information for the volume in error.

The Volume Error Resolution panel allows you to select from a list of options to repair the error. Enter the option number of the repair you want to perform.

Note: You cannot resolve an operational error and reuse a volume while a backup is running. Use a different volume to complete the backup. If the volume in error is a scratch volume, you can correct the error and replace the volume in the scratch pool. If the save requires another volume, it can reuse the corrected volume.

Operational Errors		
Error	**Cause**	**Repair Action Options**
Unexpired Data	A volume contains unexpired data or was used in an ad-hoc operation and was used during a backup or initialization operation. The error also can occur if a failed rotation is run before the tapes have expired.	Option 1. Ignore unexpired data. The data on the volume will be overwritten (deleted) the next time the volume is used (unless the volume has another error). The volume will be reserved for the system that resolved the error. You cannot remove the reservation until the volume has been used for a backup. We recommend that you do not use this option. Option 2. Assign the volume to a Backup Set Rotation. You can do this if the volume currently is not assigned to a rotation. The volume will be tracked and moved with the rotation. You may get this error again if you attempt to use the volume before the data expires. 3. Remove this error condition. The data is still unexpired. This ignores the error. You may get this error again if you attempt to use the volume before the data expires.

Write-Protected	The tape is write protected.	1. Remove the error. Don't forget to unprotect the tape, if necessary. If you don't remove the write-protection from the tape, you will receive the error again when you attempt to use it. If you want the tape to remain protected, do not remove the error or the write protection from the tape.
Data Management Error	Something is wrong with the volume.	1. Destroy the volume and delete it completely from Robot Save. Removes the volume information from all systems in the data center. You can reinitialize the volume if you wish. 2. Remove the error. Next use of volume may cause this error again. The volume remains in the volume inventory. Using it in the future can cause this error again. Select this option if you suspect a dirty tape drive; clean the drive, remove the error, and try using the volume again.

Saving Data to Virtual Tape

The Virtual Tape Save feature provides more flexibility for your save strategies. The virtual tape save is built on IBM's Image Catalog technology. It uses virtual storage to create a virtual tape images that reside on your hard disk. Once the virtual tape image is populated, you can use the DUPTAP command to save your data to physical media, such as tape.

To use a virtual tape save, you must define a virtual tape device that you then can specify in your backup command just as you would any other device.

Creating a Virtual Tape Device

1. Enter the following command to create the virtual tape device (you only need to do this once):

   CRTDEVTAP DEVD(TAPVRT01) RSRCNAME(*VRT) TEXT(*'Virtual Tape Device'***)**
2. Enter the following command to vary on the device:

   VRYCFG CFGOBJ(TAPVRT01) CFGTYPE(*DEV) STATUS(*ON)
3. Enter the following command to create the image catalog for the save:

   CRTIMGCLG IMGCLG(*catalog_name***) DIR('/IMAGECATALOG') TYPE(*TAP) TEXT ('Save Image Catalog')**

   where *catalog_name* is the name of the image catalog you are creating.

   Note: You can use this image catalog multiple times.
4. Enter the following command to create virtual tape volumes for your backup:

   ADDIMGCLGE IMGCLG(*catalog_name***) FROMFILE(*NEW) TOFILE(VOL001) VOLNAM(VOL001) DENSITY(*VRT32K) NEWOWNID(***user1***)**

   where catalog_name is the name of the image catalog and user1 is the owner of the virtual tape cartridges.

   Repeat this command as many times as necessary, changing the TOFILE and VOLNAM parameter, to create enough virtual volumes as you need.
5. Enter the following command to load the image catalog to the virtual tape device:

   LODIMGCLG IMGCLG(*catalog_name***) DEV(TAPVRT01) OPTION(*LOAD)**

After you complete these steps, you can specify the virtual device you created in Step 1 as the device in all your Robot Save backups.

Special Notes

1. You can write-protect image catalog entries using the CHGIMGLE command.
2. There can be a maximum of 35 virtual tape devices defined to your system.
3. You can secure a virtual image by giving it a digital signature.
4. You can use a virtual tape device for all save commands that can be executed to physical media except for the following:
   - SAVSTG
   - Dump to media from SST and DST
5. The minimum size for a tape image file volume is 48 MB; the maximum size is 1,000,000 MB.
6. Files can span virtual volumes, just like physical volumes. If you specify *MOUNTED on your command, the volume that is mounted will be used. If no volumes are mounted, the next loaded volume will be mounted automatically.

7. If you specify *MOUNTED for a save, a new volume will be created automatically when the save reaches the end of the defined image catalog volumes.

Restricted State Utility

Restricted State Utility Overview

The Robot Save Restricted State Utility (RSU) allows you to schedule commands to be run unattended while your system is in a restricted state. The utility takes care of warning users that the system will be entering restricted state, ends the system, runs the specified commands, and restarts the system.

Some commands can be run only while the system is in a restricted state (for example, the Robot Save SAVSYS and NONSYS functions, or when you save the entire system). In the past, you've always needed an operator available at the console when you ran these commands. Now, the restricted state utility lets you schedule them on Robot Schedule and run them unattended.

Putting the Console in a Ready State

The RBSRSURDY command puts the console in a ready state enabling the restricted state utility to begin its work. The command must be entered at the console.

Notes:

- The system value QINACTITV should be set to *NONE when you use RSU. The system value determines the time-out period for an inactive job and could end your RSU session if it is set to a value other than *NONE.
- The message queue being monitored cannot be in break mode. The message queue should not be used by other jobs and should be clear of old messages. You should not use the QSYSOPR message queue.
- You can run restricted state TCP/IP using the RSU. For more information, see "Set Up Restricted State TCP/IP" under the Robot Self-Service Support tab on our website.

Ending the Restricted State Prior to Completion

If you need to end RSU prior to completion, enter a valid user ID and password at the console. If the console doesn't respond, use System Request 2 to enter a valid user ID and password. When you enter the user ID and password, a message is sent to QSYSOPR, and the RSU job starts the controlling subsystem, creates a job log, and then signs off the system.

If a Problem Occurs

If a problem occurs during any step in the process, the utility sends a pager message (if you have Robot Alert) or calls the Error program you specified. Problems that could cause an error include a tape drive running out of backup tapes or the system not being able to enter the restricted state.

If you specify both a pager message and an Error program, the pager message is sent before the program is called. The restricted state utility then uses the parameters specified on the RBSRSUEND command to restart the system, signs off, and prints a job log.

Related Topics

- Preparing the Console for Restricted State
- Creating an RSU Command Stack
- Creating an RSU Job in Robot Schedule for Full System Backups

Preparing the Console for Restricted State

Use the RBSRSURDY command to prepare the console to enter the restricted state, execute the commands entered on the RBSRSUCMD command, and then to restart the system.

When the console detects a complete command stack, it begins entering into the restricted state. A status window on the Robot Save RSU Utility At Work panel displays messages indicating the sequence of events taking place and the command that is being run.

Creating an RSU Command Stack

Set up a Robot Schedule job scheduled to run at a later time and enter the RSU command stack. The console waits until the Robot Schedule job starts and issues the command stack, then begins the restricted state utility work. Use the following commands to create an RSU command stack. Press **F1** from any command screen for detailed help.

RBSRSUSTR

The RBSRSUSTR command directs the console to put the system into a restricted state. This command defines how the system will be ended: it ends jobs, warns users that the system will be ending, manages errors that may occur, and uses Robot Alert to page the appropriate person should a problem arise.

RBSRSUCMD

Use the RBSRSUCMD (Robot Save Restricted State Utility Command) command to specify the command you want to run while the system is in the restricted state. If you want to run more than one command while in the restricted state, enter a separate RBSRSUCMD

command for each. The commands are run in the order they were entered. Note: The commands you enter on the RBSRSUCMD command can be any command that requires a restricted state, for example, RGZPFM or RCLSTG.

RBSRSUEND

The RBSRSUEND command signals the utility that it has received a complete set of commands. The parameters on this command specify how to restart the system (end the restricted state) when RSU completes its work.

Note to V6R1 (IBM i 6.1) Users: The default behavior of the Power Down System (PWRDWNSYS) command has changed. The default value (*ENVVAR) for the CONFIRM parameter on the PWRDWNSYS command now displays a confirmation window. This will cause the Robot Save Restricted State Utility (RSU) to halt and wait for a confirmation before performing the IPL.

Enter the following command on a command line to permanently bypass the confirmation window on the PWRDWNSYS command:

ADDENVVAR

ENVVAR(QIBM_PWRDWNSYS_CONFIRM)

VALUE(*NO) LEVEL(*SYS)

Note: The RBSRSUSTR, RBSRSUCMD, and RBSRSUEND commands must be entered together to create an RSU command stack.

Creating an RSU Job in Robot Schedule for Full System Backups

Before You Begin

This procedure describes how to create a Restricted State Utility (RSU) job in Robot Schedule to perform a complete backup of your system. The steps you need to follow are outlined below. If you need additional information, see the appropriate user guide for Robot Schedule.

Note: You can run restricted state TCP/IP using the RSU. For more information, see "Set Up Restricted State TCP/IP" under the Robot Self-Service Support tab on our website.

In Robot Save

1. Create a backup class named WEEKLY.
2. After you complete the panel entries, press **F10** to start the Robot Save Navigator. This takes you to the Backup Set Definition Maintenance panel.

3. On the Backup Set Definition Maintenance panel, press **F6** to create a new backup set.
4. Enter the information for the new backup set on the Backup Set Information panel. Specify the backup set name, WEEKLY and set the Backup Set Type to 9.

   Notes:

   - You do not need to add libraries to this backup set because Robot Save issues the following commands as specified by Backup Set Type 9: SAVSYS, SAVLIB *NONSYS, SAVLIB RBSPGMLIB to SAVF, Save the SAVF to tape (saves the RBSPGMLIB SAVF to tape), SAVDLO, SAV (to save IFS), SAVLIB RBSDTALIB to SAVF, Save the SAVF to tape (saves the RBSDTALIB SAVF to tape).
   - All commands are IBM commands.
   - You can omit libraries from a backup set type 9. Enter a save code of NO next to the library name on the Items to be Saved Within a Backup Set panel.
   - You also can specify whether to create an object archive entry for the objects saved within each library. See the Robot Save User Guide for complete information on creating an object archive.

In Robot Schedule

You now are ready to create a Robot Schedule job to run the Robot Save backup set. Start Robot Schedule by entering the command RBO on a command line. Select option **1**, Robot Schedule.

1. On the Robot Main Menu, select option **1** to display the Job Schedule List panel.
2. Press **F6** to create a new job record.
3. On the Initial Job Setup panel, enter the information for the job. Enter a **C** (command) in the Job Type field. Specify a name for the job, for example, WEEKLYBK. Enter the date and time you want the job to run, for example, 0100 (1 a.m.) on Saturday morning. Press Enter to save your changes and then press **F10** to continue to the Robot Command Entry panel.
4. Use the Robot Command Entry panel to enter the RSU commands to be scheduled in Robot Schedule. The following panel shows the RSU command stack. To begin entering the command parameters, make sure that the Robot Save libraries, RBSPGMLIB and RBSDTALIB are in your library list. Enter each RSU command and then press **F4** to display the command prompt panel. Each of the command panels are described on the following pages. For complete information about the Restricted State Utility, see the Robot Save User Guide.
5. Enter the RSU Start Command, **RBSRSUSTR**. The RBSRSUSTR command places the IBM i in a restricted state by ending the system using the ENDSBS *IMMED command.

Note: If the IBM i cannot go into a restricted state within a specified time (the default is 60 minutes), Robot Save automatically IPLs the system. You cannot start any subsystem during this time without performing an IPL.

6. Enter the **RBSRSUCMD** command. On the RBSRSUCMD panel, enter the RBSSave command and press **F4** to display the RBSSave command prompt panel. Enter the name of the backup class and backup set.

   Note:

   You can issue the RBSRSUCMD command multiple times during the same restricted state job. You can enter any IBM i command allowed in a restricted state on a RBSRSUCMD command. The RBSRSUCMD commands run in the order they were entered.

   For example, you can use the RBSRSUCMD command to execute command such as RCLSTG (Reclaim Storage). We recommend that you perform a RCLSTG quarterly, or at least twice per year.

   You also can automate the RGZPFM (Reorganize Physical File Member) command using RSU.

   See the IBM OS/400 Backup and Recovery Guide for more information on using the RCLSTG or RGZPFM commands.

   All RBSRSUCMD commands must run after the RBSRSUSTR command and after the RBSRSUEND command.

7. Enter the RBSRSUEND command to end the RSU command stack. The RBSRSUEND command has three predefined parameters that let you specify how to restart the system: *IPL to IPL the system; *STARTSBS to start the controlling subsystem; or *CMD, which allows you to specify a command to use to start the system.

   Note: If your operating system level is V6R1 (IBM i 6.1), you need to be aware that the default behavior of the Power Down System (PWRDWNSYS) command has changed. The default value (*ENVVAR) for the CONFIRM parameter on the PWRDWNSYS command now displays a confirmation window. This will cause the RSU to halt and wait for a confirmation before performing the IPL. Enter the following command on a command line before you start the RSU. The command permanently bypasses the confirmation window on the PWRDWNSYS command:

   ADDENVVAR ENVVAR(QIBM_PWRDWNSYS_CONFIRM) VALUE(*NO) LEVEL(*SYS)

In the Prerequisite user job name field, specify the name of the user job prerequisite. This is an imaginary user job that is a prerequisite for a Robot Schedule reactive job that will run immediately after Robot Schedule restarts.

8. Return to the Job Schedule List and enter option **5** next to the WEEKLYBK job to display the Control Options panel. Specify the Job description as RBSJOBD in library RBSPGMLIB. Enter a job queue for the job, for example, enter QCTL so that the job runs at the time it is scheduled and doesn't wait for another job to complete. The Message reply value should be Operator Required.
9. When you are ready to run the restricted state job, enter the Robot Save Restricted State Utility command, RBSRSURDY, to prepare the console to enter a restricted state. You must enter the RBSRSURDY command at the console from a user profile with the proper authority to perform the backup.

At the system console

Enter the Robot Save Restricted State Utility command, **RBSRSURDY**, to prepare the console to enter a restricted state.

Managing AMLs

Managing Your IBM Tape Libraries

The RBSAMLLRN command works with your IBM Automated Media Libraries (AMLs) to help you manage your tape inventory. After you install Robot Save on your system and configure it to work with your IBM AML, you use the RBSAMLLRN command to do the following:

- Initialize new volumes to the tape barcode label
- Populate the inventory of volumes to be used by Robot Save with the volumes in the AML
- Optionally, read the data on the volumes and insert it into the Robot Save object archive records

After these functions have completed, volume and archive information is available to Robot Save and can be used for restoration. The volumes then can be released into the scratch pool as they expire.

The command also is used regularly to import tapes from outside the AML and place them in the Robot Save category as they return from archive.

Steps To Use the RBSAMLLRN Command

1. Install Robot Save on your IBM i. Follow the online installation instructions.
2. Configure Robot Save to use your IBM AML.
3. Set up Robot Save classes, sets, and rotations.
4. Place the volumes into the category you will use with the command. This is usually the *INSERT category.
5. Add the libraries RBSPGMLIB and RBSDTALIB to your library list.
6. Enter the following command:

   RBSAMLLRN
7. Press **F4** to display the command prompt.

Complete the command parameters with the information for your system. If you are importing tapes that already are known to Robot Save into the AML, enter your AML name, use the default command parameters, and leave the Backup Class and Backup Set parameters blank. If you need additional information about the command parameters, press **F1** to display the command help.

If you want to initialize new or blank volumes to the barcode, you must specify *INSERT as the category.

When the RBSAMLLRN command completes, the display shows the changes made to the volumes in the AML. If the RBSAMLLRN command was submitted to batch, it also produces a report (RBS414P) showing the same information.

All IBM AMLs except the IBM 3494: After you run the RBSAMLLRN command on one system in a data center, you must run the RBSAMLSYNC command on all other systems in the data center that share the AML. The RBSAMLSYNC command moves the volumes to the proper category in the AML unit as defined on each system.

Notes:

- If you stop the RBSAMLLRN process before it completes and have specified *QUEUE on the Build Object History parameter, you can use the RBSADDALL command to continue and complete the process. Enter the following command; you do not need to specify any command parameters.

  RBSADDALL

  You do not need to run the RBSADDALL command if you are not creating object history.

- If your IBM i systems are set up in a data center, you should run the RBSAMLLRN command on each system that shares the AML as soon as it is included in the data center.

Automated Media Library Support

IBM Automated Media Libraries

You can use the following IBM AMLs with Robot Save:

- IBM 3494 Librarian
- IBM 3570 Librarian
- IBM TS3100/TS3200 Librarian
- IBM 3575 Librarian
- IBM TS3310 Librarian
- IBM TS3400 Librarian
- IBM 3581 Librarian
- IBM 3583 Librarian
- IBM 3584/TS3500 Librarian
- IBM 3590 Librarian
- IBM 9427 Librarian

Note: If you will be sharing the AML and its volumes with multiple systems, your AML will be part of a Robot Save data center.

- If you are defining an AML to Robot Save for the first time, the AML name and parameters must be exactly the same on all systems in the data center.
- If you are setting up an AML on a system that is already part of a data center, the AML definition already exists.

The Automated Media Library Entry panel shows one of the default IBM AML definitions shipped with Robot Save. Separate definitions are shipped for each of the AMLs listed above. Copy the appropriate definition for your AML and modify it for your site, as described below.

Field	Description

Name	Enter a generic name for the AML that is meaningful to you. If the AML is being shared by multiple systems in a data center, you must use the same name for the AML on each system. **Note:** The AML name you enter here does not have to match the OS/400 device description name.
Description	Enter a brief description of this AML or leave the description retrieved from the shipped definition.
Storage Location	Enter a storage location to use for the volumes located in the AML. We recommend you use the name of the AML as the storage location. Note: Make sure the storage location name you enter is unique. To see currently defined storage locations, select **option 5** from the Robot Save System Setup Menu to display the Storage Location Entry panel.
This AML has a barcode reader?	Enter **Y** if the AML has a barcode reader; enter **N** if there is no barcode reader.
Vary devices off after use?	Accept the default value of Y; all IBM AMLs should be varied off after use.
Delay tape ejections	Specify if you want to queue volumes for ejection from the AML. Volumes are ejected from the AML when Robot Save moves them to a location other than the AML location. You can enter one of the following values: **0** No queueing occurs. No volumes are added to the ejection queue until you turn on queueing. **1** Queues volumes that are attached to automatic move sets and are moved to the ejection queue only during auto move processing following a backup or through the RBSAUTOMOV command. The volumes are ejected from the queue at a later time using the RBSEJQVOL command. **2** Queues all volumes that have been moved by Robot Save to a location outside of the AML. **Note:** Delay tape ejections does not queue volumes moved outside of Robot Save.

Using StorageTek AMLs

Volume Management:

Follow these guidelines when using Robot Save with an AML:

- Use the manual volume naming method to name your save media.
- On the System Setup Media Defaults panel, specify **Y** in the Use Scratch Media Pool field.
- All volumes that will be used by the AML must be in the Robot Save scratch pool.
- Use the RBSAMLLRN command to insert volumes into the AML. The command inventories all the volumes in the AML, adds the volumes to the scratch pool (if they do not exist in Robot Save), and defines the AML location for the volumes.

  Note: For more information, see "RBSAMLLRN Command for StorageTek Librarians" under the Robot Self-Service Support tab on our website.
- Robot Save uses the logical ID (internal label) of the volume to update its database. The StorageTek AML locates volumes using the barcode label (external label). If a volume's internal and external labels do not match, Robot Save might not be able to retrieve the volume for backup or restore functions. You should make sure that all volumes have the correct labels. If you need assistance initializing volumes, call Robot Technical Support.

Error Resolution:

- If a volume that is write protected or contains unexpired data is mounted during a backup, Robot Save automatically removes the volume from the AML drive and loads another volume. The volume is flagged with an error condition and cannot be selected again until the errors have been corrected. To resolve a volume error, select option **5**, Data Center Error Resolution, from the Operations Menu.

Data Center Recommendations:

- If you have multiple systems sharing an AML, we recommend that you select one system to be the Data Center Management System (DCMS). The DCMS should be the fastest system in the data center and the system with the least amount of planned or actual downtime.
- Once volumes are placed in the AML, they are available to all systems using the AML. If you do not want to share volumes among all systems, you can assign volumes to a specific system. Volumes assigned to a specific system remains assigned until you change it manually by selecting the volume ID.
- You should be aware that if you are sharing volumes, the volumes assigned to the system are used first; then the volumes that have been used the least; then other volumes, in alphabetical order.

- If a system other than the DCMS is excluded from the data center, all the shared volumes in the shared scratch pool will be unavailable to that system. If all systems are excluded from the data center, the shared scratch volumes will be available only to the DCMS. Volumes assigned to systems will always remain on those systems.

Support for StorageTek AMLs

StorageTek Automated Media Libraries

You can use the following StorageTek AMLs with Robot Save:

- StorageTek L180
- StorageTek MVS File Server
- StorageTek Server Attached
- StorageTek WolfCreek

These instructions are designed to be used in conjunction with the Robot Save User Guide. The User Guide contains a complete discussion of Robot Save AML setup considerations and panels.

Note: If you will be sharing the AML and its volumes with multiple IBM i systems, your AML will be part of a Robot Save data center.

- If you are defining an AML to Robot Save for the first time, the AML name and parameters must be exactly the same on all systems in the data center.
- If you are setting up an AML on a system that is already part of a data center, the AML definition already exists. See the Robot Save User Guide for a discussion on how to select AML drives and connect the system to the AML.

The Automated Media Library Entry panel shows one of the default StorageTek AML definitions shipped with Robot Save. Separate definitions are shipped for each of the AMLs listed above. Copy the appropriate definition for your AML and modify it for your site, as described below.

Field	Description
Name	Enter a generic name for the AML that is meaningful to you. If the AML is being shared by multiple systems in a data center, you must use the same name for the AML on each system. **Note:** The AML name you enter here does not have to match the StorageTek *RML device description name.

Description	Enter a brief description of this AML or leave the description retrieved from the shipped definition.
Storage Location	Enter a storage location to use for the volumes located in the AML. We recommend you use the name of the AML as the storage location.
This AML has a barcode reader?	Enter **Y** if the AML has a barcode reader; enter **N** if there is no barcode reader.
Vary devices off after use?	Accept the default value of Y; all StorageTek AMLs should be varied off after use.
Delay tape ejections	Specify if you want to queue volumes for ejection from the AML. Volumes are ejected from the AML when Robot Save moves them to a location other than the AML location. You can enter one of the following values: **0** No queueing occurs. No volumes are added to the ejection queue until you turn on queueing. **1** Queues volumes that are attached to automatic move sets and are moved to the ejection queue only during auto move processing following a backup or through the RBSAUTOMOV command. The volumes are ejected from the queue at a later time using the RBSEJQVOL command. **2** Queues all volumes that have been moved by Robot Save to a location outside of the AML. **Note:** Delay tape ejections does not queue volumes moved outside of Robot Save.

Managing Your StorageTek Libraries

The RBSAMLLRN command works with your StorageTek AMLs to help you manage your tape inventory. After you install Robot Save on your system and configure it to work with your StorageTek AML, you use the RBSAMLLRN command to do the following:

- Populate the inventory of volumes to be used by Robot Save
- Optionally, read the data on the volumes and insert it into the Robot Save object archive records

After these functions have completed, volume and archive information is available to Robot Save and can be used for restoration. The volumes then can be released into the scratch pool as they expire.

Steps To Use the RBSAMLLRN Command

1. Install Robot Save on your IBM i. Follow the online installation instructions.
2. Configure Robot Save to use the StorageTek AML.
3. Set up Robot Save classes, sets, and rotations.
4. Insert the volumes to be used into the proper slots in the StorageTek unit.
5. Add the libraries RBSPGMLIB and RBSDTALIB to your library list.
6. Enter the following command:

   RBSAMLLRN
7. Press **F4** to display the command prompt.

Complete the command parameters with the information for your system. If you are importing tapes that already are known to Robot Save into the AML, enter your AML name, specify *KNOWN for the Add Tapes to Robot Save parameter, and leave the Backup Class and Backup Set parameters blank. If you need additional information about the command parameters, press the **Help** key to display the command help.

When the RBSAMLLRN command completes, the display shows the changes made to the volumes in the AML. If the RBSAMLLRN command was submitted to batch, it also produces a report (RBS414P) showing the same information.

Notes:

- If you stop the RBSAMLLRN process before it completes and have specified *QUEUE on the Build Object History parameter, you can use the RBSADDALL command to continue and complete the process. Enter the following command; you do not need to specify any command parameters.

  RBSADDALL

  You do not need to use the RBSADDALL command if you're not creating object history.
- If your IBM i systems are set up in a data center, you should run the RBSAMLLRN command on each system that shares the AML as soon as it is included in the data center.

Automated Media Librarian Operations

The Automated Media Librarian Operations option allows you to perform some common AML tasks. To display the Automated Media Library Operations panel, select option **7** from the Operations Menu. Press **F1** from the Automated Media Library Operations panel for more help.

Processing AML Volumes Queued for Ejections

Using the RBSEJQVOL command with automatic media librarians (AMLs) gives you the ability to eject volumes from multiple backups at one time. To set up your AML for automatic ejection, do the following:

1. From the Robot Save Main Menu, select option **7**, System Setup
2. On the System Setup menu, select option **3**, AML Maintenance
3. On the Automated Media Library Maintenance panel, enter a 1 next to your predefined AML to select it.
4. On the Automated Media Library Entry panel, enter one of the following options in the Delay tape ejections field:

   0 - Does not allow queuing or turns off queueing

   1 - Queues only volumes that are attached to automatic move sets and are to be ejected from the AML unit at a later time

   2 - Queues all volumes that are to be ejected from the AML using Robot Save functions

Once the volumes are queued, you can eject them using the RBSEJQVOL command. The command also generates a report (RBS442P) that lists the volumes to be ejected.

You also can remove volumes from the ejection queue manually, if necessary. From the Automated Media Library Maintenance panel, select option **6**, AML Queued Ejections. Or, select option **7**, Automated Media Librarian Operations, from the Operations Menu. Then, on the Automated Media Library Operations panel, enter option **2**, Queued Ejections, next to the AML name to eject the queued volumes.

Notes:

- If you are using a StorageTek AML, the command job will wait until the volumes are removed before completing. If the ejected volumes fill the port, the command waits until the volumes are removed from the port and then fills it with the remaining volumes before completing.
- If you are using an IBM AML, the command completes even if there still are volumes to be removed. The AML logic knows to eject the next set of volumes even though the job itself has completed.

AML Import Forecast Messages

The following table shows the messages that can appear in the Import Forecast report when AMLs are part of your data center setup. One or more of these messages can appear in the

report. Any of the conditions described in the messages prevents the inclusion of the candidate system into the data center.

AML Inclusion Messages	
Message	**Description**
AML Location &1 is used by port &2/&3	The location on the AML on the candidate system is used by an AML port in the data center. This prevents inclusion of the candidate system. The AML and port in the data center are shown as AML/PORT.
AML Location &1 is used by AML &2	The location on the AML on the candidate system is used by another AML in the data center. This prevents inclusion of the candidate system.
Port &3 Location &1 is used by AML &4	The location assigned to the port on the candidate system is used by another AML in the Data Center. This prevents inclusion of the candidate system.
Port &3 Location &1 is used by port &4/&5	The location assigned to the port on the candidate system is used by a port in another AML in the data center. This prevents inclusion of the candidate system.
Port &1 definition conflict	The port is defined to the same AML in the data center and on the candidate system, but is defined differently on each system. This prevents inclusion of the candidate system.
Port &1 has no matching port	The AML exists in the data center and on the candidate system; the port is defined on the candidate system, but it is not defined on the DCMS. This prevents inclusion of the candidate system.
AML Definition is not the same on both systems	The AML is defined to the Data Center and the candidate system, but the definition is different on each system. This does not include the operational flag fields.

Defining AML Ports

An AML port is an opening in the AML you can use to insert or remove volumes without opening the main AML door. They are sometimes called convenience ports or convenience access ports. You can define AML ports and assign storage locations to allow movement of volumes in and out of the AML. Each AML handles input and output of volumes differently. See the Robot Support Self-Service topic for your AML on our website for specific instructions on defining ports.

Note: IBM AMLs do not require a port definition. Only StorageTek AMLs define ports.

To define I/O ports for an AML, enter a **3** next to the AML name. The Automated Media Library Port Maintenance panel displays. Press **F1** for help on this panel.

AML Maintenance

Automated Media Libraries (AMLs; also called Automatic Tape Librarians or ATLs) include any save device that can load, use, and unload specific save media automatically. By using an AML, you can automate your saves completely and eliminate the need for an operator to mount tape volumes during the save process. Robot Save supports Automated Media Libraries from several manufacturers. For each of these devices, Robot Save provides a driver program that is used to load, assign, eject, and unload media automatically during the save session.

An AML can be connected to multiple systems or partitions, both IBM i and other platforms, such as an RS/6000 or a mainframe. Robot Save may manage some of the volumes in the AML, while the other systems manage the rest.

You must define an AML to Robot Save before it can be used for backup operations. Robot Save must know which systems an AML is connected to and the tapes Robot Save is supposed to manage. An AML must have the same name, as specified during Robot Save setup, on every system connected to it. However, the device descriptions you use to configure an AML on each system do not need to be the same.

Note: If you set up your AML to have multiple logical units, each logical unit, with its defined tape drives, is defined as a separate AML. You must have a separate AML definition for each logical unit.

General Recommendations

The following general recommendations apply to all of the AMLs supported by Robot Save:

- Use the manual volume naming method to name your save media. AMLs use barcoded tapes and you must be able to match the internal volume name to the barcode. Manual naming allows you to control the volume names. If you use the serial or logical naming methods, the volume name is generated automatically by Robot Save. This could result in a mismatch between the barcode (external label) and the internal label.
- Establish a scratch pool of tapes before starting your saves. Use the RBSAMLLRN command to add the tapes to Robot Save. The RBSAMLLRN command inserts volumes into the AML and places them in the scratch pool with the correct location (location and category for IBM AMLs). If you are using an IBM AML, the RBSAMLLRN command also initializes new volumes (if necessary).

Note: IBM non-3494 AMLs in a data center also must run the RBSAMLSYNC command to synchronize the category information on all systems.

- On the Media Defaults panel, specify **Y** in the Use Scratch Media Pool field.
- Keep tapes containing AML vendor libraries so they are available for restore operations, if needed. You will need to restore these libraries before you can use the AML for the remainder of the system restoration.

  Note: You only need to do this if your AML requires additional software provided by the AML manufacturer. IBM AML software is part of the operating system.

AML Device Groups

AMLs use the device groups a little differently than the way they are used by the rest of Robot Save. The save devices in the AML are placed into a device group automatically when you select them for the AML. Only devices that are not already in another device group are available for selection. The device group is given the same name as the name of the AML. You do not need to create the device group using the Device Group Maintenance option from the System Setup Menu. Any changes to the save devices in the group must be made using the AML Maintenance option.

Storage Locations

An AML as a whole is associated with a single unique storage location. The location represents the volumes that currently are stored in the AML. Robot Save uses this location when it selects scratch volumes during a save operation or ejects volumes from the unit. Since the storage location must be unique, we recommend you use the AML name for the storage location. This storage location is used by every system in the data center and always refers to the same AML. You cannot use the Storage Location Maintenance option to create or change the storage location information for an AML. All changes must be made through the AML Maintenance option on the System Setup Menu.

In addition to a storage location for the entire AML unit, you can define storage locations for the I/O ports in the AML. The I/O ports are used to move volumes in and out of the AML. You can create storage locations when you define the port. The location names used for the ports also must have a unique name and are used by all systems in the data center. You cannot use the Storage Location Maintenance option to create or change storage locations associated with AML ports.

When a volume moves from the storage location assigned to an AML to another location, it is ejected from the AML. Volumes can be ejected immediately or queued to be ejected at a later time.

If Robot Save requests a volume during a backup, but the volume cannot be found in the AML, the volume is moved to a location with the special name UNKNOWN. The location is

marked as being in error and the volumes in that location will not be used because the location is incorrect. See Error Resolution in the Operations section of this User Guide for complete information on resolving errors. You can view the list of volumes in two ways:

- Display the Volume Inquiry panel and select the By Location search option.
- Run the Volumes by Location Report and select the location UNKNOWN.

Supported Automated Media Libraries

Robot Save supports Automated Media Libraries from a number of manufacturers. Definitions for the supported AMLs are shipped with Robot Save and appear on the Automated Media Library Type Selection panel. Specific information on using each AML with Robot Save is available here.

If you have an Automated Media Library that does not appear on the Automated Media Library Type Selection panel, contact Robot Technical Support to see if support is planned for the future.

Introducing Volumes into the Tape Library

The RBSADDVOL command works with Robot Save to introduce volumes into the tape inventory. The command allows you to do the following:

- Populate the inventory of volumes in Robot Save with scratch volumes, or add tapes to established backup sets.
- Set up a list of historical volumes to be read into Robot Save object archive records later using the RBSADDALL command. Make sure the Add to Archive Queue parameter on the RBSADDVOL command has been set to *YES.

Steps To Use the RBSADDVOL Command

1. Install Robot Save on your iSeries or AS/400 system.
2. Set up Robot Save backup classes, sets, and rotations.
3. Add the libraries RBSDTALIB and RBSPGMLIB to your library list.
4. Enter the following command:

   RBSADDVOL
5. Press **F4** to display the command prompt.
6. Complete the command parameters with the information for your system. If you need additional information about the command parameters, press the Help key to display the command help.

Using the Archive Feature

If you select to use the archive feature, use the following information:

- Make sure you enter the volumes in the sequence they were used, for historical backup records.
- Make sure the Add to Archive Queue parameter on the RBSADDVOL command is set to *YES.
- The list of volumes will be read into a file called RBSAT in RBSPGMLIB. You can add as many historical backups as you wish.
- The actual processing of the volumes will take place when you execute the RBSADDALL command. We recommend that you submit the command to batch as it can run for an extended length of time (each tape will be displayed as it processes).
- If you are using an AML (automated tape librarian), the tapes will be loaded automatically. Otherwise, load the magazine with the tapes in the correct order. You will be prompted when more volumes are needed.

  The RBSADDALL process can be canceled and restarted, if necessary.
- After the command has completed, the volume and archive information is available to Robot Save. The volumes then can be recycled into the scratch pool as they expire.

Initializing Reserved Volumes in an AML

The Initialize Volumes in an AML (RBSINZAML) command allows you to initialize volumes in an AML. You can use the command to initialize scratch pool volumes that are reserved to a system. For example, volumes that have been moved to the scratch pool from the Error Resolution panel or have been removed from a rotation and contain unexpired data remain assigned to the system on which the correction was made. Because you cannot remove the reservation, this prevents the volumes from being used by other systems in the data center. Using the RBSINZAML command allows the volumes to be used by any other system connected to the AML.

You can use the RBSINZAML command with both IBM and StorageTek AMLs.

Using the RBSINZAML Command

1. To queue volumes for initialization, display the Scratch Tape Pool Maintenance panel on the reserved system. Enter option **11**, Mark Volume for Initialization, next to each volume you want to initialize. This removes the volume from the assigned system and changes its status to *INZTAP, ready to be initialized. The volumes to be initialized must be in an AML location.

Notes:

- You also can initialize unreserved volumes in the scratch pool. Although these volumes are not reserved, you must select them for initialization from the DCMS.
- Volumes marked for initialization (*INZTAP) cannot be used in a backup until they've been initialized.

2. After you have selected the volumes to be initialized, enter the RBSINZAML command to begin the initialization process. You can issue the RBSINZAML command from any system attached to the AML.

Synchronizing Volume Information for AMLs in a Data Center

Use the Synchronize AML Inventory (RBSAMLSYNC) command to synchronize the volume information in Robot Save for an AML that is connected to multiple systems in a data center. Run the RBSAMLSYNC command on each system in the data center connected to the AML after you run the RBSAMLLRN command on one of the systems.

Ejecting Volumes From a Specified Rotation

Use the Eject Volumes by Rotation (RBSAMLEJT) command to eject the volumes from a specified rotation from an AML.

Press **F1** from the Eject Volumes by Rotation panel for more help.

Ejecting Volumes from Multiple Backups at One Time

Using the RBSEJQVOL command with automatic media librarians (AMLs) gives you the ability to eject volumes from multiple backups at one time. To set up your AML for automatic ejection, do the following:

1. From the Robot Save Main Menu, select option **7**, System Setup
2. On the System Setup menu, select option **3**, AML Maintenance
3. On the Automated Media Library Maintenance panel, enter a 1 next to your predefined AML to select it.
4. On the Automated Media Library Entry panel, enter one of the following options in the Delay tape ejections field:

   0 - Does not allow queuing or turns off queueing

1 - Queues only volumes that are attached to automatic move sets and are to be ejected from the AML unit at a later time

2 - Queues all volumes that are to be ejected from the AML using Robot Save functions

Once the volumes are queued, you can eject them using the RBSEJQVOL command. The command also generates a report (RBS442P) that lists the volumes to be ejected.

You also can remove volumes from the ejection queue manually, if necessary. From the Automated Media Library Maintenance panel, select option **6**, AML Queued Ejections. Or, select option **7**, Automated Media Librarian Operations, from the Operations Menu. Then, on the Automated Media Library Operations panel, enter option **2**, Queued Ejections, next to the AML name to eject the queued volumes.

Notes:

- If you are using a StorageTek AML, the command job will wait until the volumes are removed before completing. If the ejected volumes fill the port, the command waits until the volumes are removed from the port and then fills it with the remaining volumes before completing.
- If you are using an IBM AML, the command completes even if there still are volumes to be removed. The AML logic knows to eject the next set of volumes even though the job itself has completed.

Save Media Management

Save Media Management

This section describes Robot Save's save media management system. It describes how you can use Robot Save to manage the storage, movement, and condition of your save media. It explains how to manage save media for a data center, whether it consists of a single system or multiple systems.

Robot Save's Save Media Management Menu provides many options to manage your media volumes. From this menu, you can:

- Move tape volumes to a new container or location, or both
- Display lists of volumes by backup set rotation, container and location, or volume name
- Manage the scratch tape pool, if you are using one
- Perform tape management functions on the individual volumes

- Display volume information for media volumes used in ad-hoc saves performed outside of Robot Save

We suggest that you read the recommendation topics before you start this section. It contains useful information on managing your save media and can save you time.

Save Media Management Menu

The Save Media Management Menu provides options to manage your media volumes and obtain information for those volumes. From this menu, you can select options to move tapes from one container to another, move containers from one location to another, or display lists of volumes by backup set rotation, container, location, or volume name. You also can perform tape management functions on individual volumes. If you use a scratch tape pool, you can manage it through this menu. You also can print various media reports and labels for your tapes.

To display the Save Media Management Menu, select option **2** on the Robot Save Main Menu.

Manage Save Media

The first four options on the Save Media Management Menu allow you to manage your media volumes from a number of different routes. These Manage Save Media options give you a wide range of methods to help you track your volume usage and location.

The first option on the Save Media Management Menu, By Backup Set Rotations, allows you to view and manage your media volumes by backup set rotation. When you select this option, the Backup Class Selection panel displays. It lists all the backup classes that are defined on all systems in a data center. When you select a backup class, you see the backup set rotations for that class.

Selecting option 2 on the Save Media Management Menu allows you to manage your save media by volume name. The Volume Inquiry panel lists all volumes defined to Robot Save in volume order, without regard to their location or use. You can use the volume options (described earlier in this section) to work with the media volumes.

When you select option 3 on the Save Media Management menu, Robot Save displays the Container Selection panel. This panel lists all the containers you have defined to Robot Save that currently contain volumes. Select a container to view the volumes assigned to the container and additional container information.

Select option 4, By Ad hoc Tape File Label, to see a list of the volumes used in ad hoc tape operations. Robot Save records the volume information for these operations. The Ad-hoc Volume Label Inquiry panel shows the volumes used in ad hoc operations.

Manage Scratch Pool

Options 5, 6, and 7, along with the media volume reports, allow you to manage the scratch tape pool. If you have selected automatic release of expired tapes to the scratch pool for a backup class, selecting option 7 releases the on-site expired tapes to the scratch tape pool. This also removes all library and object archive entries for these volumes. Instead of selecting this option every day, you can schedule the commands RBSRLSEXTP or RBSAUTOMOV (if you use automatic move sets) on Robot Schedule to release tapes to scratch. Note: In a data center, only the system on which you select option 7 or run a command releases its expired tapes to the scratch pool. Each system in the data center must release its own tapes to the scratch pool separately.

Select option 6, Scratch Pool Minimum Inventory Levels, to specify minimum inventory levels for certain types of save media. You can set an inventory level for save media that are shared by the whole data center, or just for a specific system. Setting a minimum helps you maintain control over the number of scratch volumes available for use. If you set a minimum value, use the RBSCHKINV command to check the inventory levels and send a message to the specified device if the level drops below your specified minimum. You can run the command interactively or schedule it to run regularly in Robot Schedule. If you do not use the command to check inventory levels, the only notification you receive is a message that prints in the Good Morning report.

Other Media Information

The Media Volume Reports option allows you to print reports that define where your tapes are located, forecast how many tapes you'll need, which tapes you should use, when they expire, and when they should be moved. You can print a report detailing all the movement of tape volumes that use automated move sets. The Good Morning report gives you a summary view of volume statistics each day. You also can print volume labels if you've marked volumes for label printing.

For more information on media volume reports, see the Reports section.

The Move History Inquiry panel shows the movement of every volume that is part of a backup set that uses auto move processing. You can use this panel to check the movement history of volumes as they are moved automatically from one location to the next. To display the Move History Inquiry panel, select option 9 from the Save Media Management Menu.

Use the Purge Move History panel to purge media volume move history records. Because each move of each media volume creates a record, you should purge the history regularly. To display the Purge Move History panel, select option 10 on the Save Media Management Menu.

Scratch Pool Recommendations

Every tape library should have a rack or container to store all expired tapes that are no longer needed for rotations. Every tape in the rack should have its label marked as unused or scratch.

To help you manage your scratch tape pool, use the following recommendations:

- Specify scratch pool minimum inventory levels for each type of save media used at your site. Setting a minimum helps you maintain control over the number of scratch volumes available for use.

  Run the RBSCHKINV command to check the inventory levels and send a pager message if the level drops below the specified minimum. You can run the command interactively, or schedule it to run regularly on Robot Schedule.

  Run the Good Morning report each day to check your save media inventory and see which volumes require additional attention.
- Run the Scratch Pool Listing weekly and make sure all volumes are in your scratch tape pool rack.
- If your scratch tape pool allows automatic release of expired tapes, expect a lot of tape management activity. To help you with the activity, review the following reports weekly:
  - Scratch Pool Listing, which tells you the number of scratch tapes you have on hand.
  - Media Required Summary Forecast, which lists the save media operations you'll perform for a date range that you specify.
  - Media Expiration Forecast, which lists the volumes that will be expired for the date range that you specify.

  If any of these reports show that your scratch pool is getting low, you know in time to purchase additional tapes.

You can release expired on-site volumes from the rotations to the scratch tape pool automatically in two ways:

- Run the RBSRLSEXTP command on Robot Schedule every morning to release the tapes that expired that day or earlier.
- Designate a location on your move sets as an auto release location. Whenever an expired volume is logged into that site, it will be released.

Tape Storage Recommendations

For On-site Storage

Follow these recommendations for on-site storage:

- Don’t store tapes in the same room as the computer. Store tapes on the opposite end of the building—away from the computer. An entire building is rarely destroyed; an entire room is destroyed more often.
- Store this week’s rotation of tapes, with the most recent saves, in a fireproof container (safe) until they can be moved to off-site storage. The most recent saves should never be kept on-site more than seven days.
- Print the Media Required Summary Forecast each Monday using the upcoming Friday’s date. The report lists the location of each rotation you will need so you can make sure all the tapes you are going to use in the coming week are on-site.
- Once a quarter, print the Volumes by Container report for the on-site locations. Have your operators find everything on the list. Update the tape management system if you find any errors.

For Off-site Storage

Follow these recommendations for off-site storage:

- Store at least one rotation of tapes off-site for every backup set you use to back up your system. That site should be at least five miles away from your computer room. We recommend you use a commercial storage service rather than someone’s basement or another office.
- Use a commercial delivery service to pick up and deliver backup tapes on a scheduled basis. Your people are too busy to move tapes off-site regularly. Scheduled delivery service pick up adds outside discipline to your tape management system. Everyone knows the service will be on your doorstep every Monday, and those tapes must be ready to be picked up.
- Do not give tapes to non-company personnel unless they sign a receipt. Keep a log of the tapes they take.
- Develop and use move sets for all backup classes and for individual data sets. The move sets will move tapes automatically to the next location. Not only does this reduce tape movement errors, it allows Robot Save to give you additional information to better manage your department.
- Use delivery tickets to list the volumes you should give the tape storage service and the volumes they should return to you. Robot Save generates those delivery tickets for you. Print the Volumes to be Moved report for the locations of the volume exchange, using today’s date as the date range.
- Run the Volumes Leaving or Arriving Today report to see a list of volumes that need to be sent to an off-site location or check that the volumes due back have arrived.

- Before you move tape rotations off-site, put them in permanent, sealable tape boxes or cases. Put a serial number on each tape box and enter it as an allowable container in system setup. It is much easier for you and your tape storage service to control containers rather than volumes. Never allow non-company personnel to handle individual tape volumes. Use Robot Save's container movement system to log and track the tape cases to and from your tape storage service.
- Never mix rotations from the same backup set in the tape cases sent off-site. If you don't follow this rule, one of the rotations will be back on-site before it should.
- Run the Volumes to be Moved report at least once a week to spot any tape movement errors.
- Audit your tape storage service once a quarter with a surprise visit. Print out a list of containers and volumes they should have. Have them find everything on the list and note how long it takes. If you are not satisfied by what you see, consider finding another storage service.

Creating Media Definitions

The Robot Save Create Media Definition (RBSCRTMDFN) command allows you to create media definitions for parallel operations. You can perform save and restore operations while using more than one tape device simultaneously. Robot Save uses an IBM API to create media definitions specifying the tape drives, volumes, and sequences needed to run the operation.

Once the media definition has been created, you can specify it on save and restore library or object commands. You must have *USE authority to the media definition and *EXECUTE authority to the media definition library. You also must have normal save or restore authority for each device that is specified on the media definition.

Using the RBSCRTMDFN Command

Enter the RBSCRTMDFN command on a command line and press **F4** to display the command prompt panel. Complete the command parameters with the information to define the media definition you are adding. If you need additional information about the command parameters, press **F1** to display the command help.

To see the information for a media definition, enter the RBSDSPMDFN command.

Robot Save can track the volumes and labels you save using ad-hoc tape management. See Ad Hoc Volume Operations for complete information on using ad-hoc tape management.

Also see the IBM Backup and Recovery Guide for more information.

Note: You can restore from one tape device even if the save was performed using multiple tape drives.

However, if you are restoring from one tape drive after having used multiple tape drives for the save, you must create a new definition for the drive you plan to use. When you create the new definition, you must specify the drive to be used and the volumes used in the original backup in the order they were used.

Volume Options

You can display the Volume Options window from any list panel in Robot Save that contains volume information. The options available on the Volume Options window allow you to perform media volume management functions. Because you can access these options from a number of panels, this section describes each of the volume options first, then discusses how to use the options on the Save Media Management Menu.

To display the Volume Options window, press **F4** in the Opt column on any list panel that displays volume information to see the following list of volume options:

- Show Volumes for a Rotation: Shows all volumes that are in the same backup set rotation as the selected volume.
- Container and Location: Shows all volumes that are in the same container and location as the selected volume.
- Display Volume Information: Shows all information available for the volume on one panel.
- Move Volume Options: Allows you to move the volume to a new container or location. If it is a scratch tape, you can attach the volume to a backup set rotation. If the volume is attached to a rotation and has expired, you can move it to the scratch tape pool.
- Volume Contents: Shows the objects stored on the volume, based on the object history. Because creating object history is optional, not all the objects on a volume may be shown.
- Display Move History: Shows where the volume currently is located and where it has been, and the dates and locations of the moves.
- Reserve for one system: Allows you to reserve the selected volume for use on a specific system.
- Remove Reservation: Removes the reservation of a volume.
- Remove Media Volume: Removes the volume from a rotation or from Robot Save's tape management system.
- Mark Volume for Label Print: Marks the volume record so that a label will print for the volume the next time labels are printed.

- Volume Description Entry: Allows you to view or modify the volume description.
- Volume Extended Text Entry: Allows you to enter additional information about the volume.

Press **F1** after selecting any of these options for additional help.

Tape Labels

Printing Tape Labels

Because it's a hassle to load tape label forms into a printer to print just one or two tape labels, Robot Save offers you a better idea. When a volume requires a label to be printed, Robot Save marks the volume for label printing. Then, you can select an option on the Media Volume Report Selection panel to print all the marked labels at the same time. Or, schedule the command RBSPRTMRKL on Robot Schedule to print the labels once a day.

Robot Save marks tape volumes for printing in the following situations:

- A tape volume is initialized.
- A volume in the scratch tape pool is assigned to a backup set rotation.
- A volume in a backup set rotation is released to the scratch tape pool.
- If you've specified during system setup to mark all volumes in a backup set rotation used in a save. (This label shows the save date and tape expiration date.)
- Your data set program executes the command RBSMRKPRT—all volumes in that data set's backup set rotation will be marked. (This label shows save date and tape expiration date.)
- Whenever you pick a volume to be marked for printing on any volume display panel.

To allow you to customize your printed tape labels, Robot Save supplies source members RBS425 and RBS425P in RBSPGMLIB/RBSSRC. You can modify these source members and re-create the corresponding objects into RBSPGMLIB.

By default, labels print for all tapes. If you do not want to print labels for specific tapes, then you must modify RBS425. The example below shows how you might modify RBS425 to bypass printing tape labels for *ADHOC and *SCRATCH tapes. (Modifications are shown in italics.)

```
 *====================================================================
 * Program Mainline
 *====================================================================
 *
 * Check for System Lock
C                   Exsr      CHKLOCK

C                   Exsr      SET

C                   Exsr      GETSYS
C     1             Chain     RBSDF                              49

 * Initial read
C                   Eval      TVPMRK = '0'
C     KYTV01        SetGT     RBSTV15
C                   Read      RBSTV15                                50

 * Clear all the print flags.
C                   DoW       not *IN50
C                   If        TVBCLS <> '*ADHOC'   and
C                             TVBCLS <> '*SCRATCH'
C                   Exsr      MVDB
C                   Exsr      WRTH1
C                   Endif

 * Reset the Print Mark field
C                   Call      'RBS4251'
C                   Parm      TVTPVL         P1TPVL

C                   Read      RBSTV15                                50
C                   Enddo

C                   Exsr      RETURN
```

We recommend that you move any modified source members out of RBSPGMLIB/RBSSRC so they are not overwritten by a future Robot Save update.

Changing the Layout of Tape Labels

The tape labels, by default, contain the following information when printed:

- Company name, from the System Defaults panel
- System name
- Backup class, set, and rotation; and sequence
- Expiration date
- Last date used
- Volume name

You can change the layout of the tape label if you want. The source for the program and print file are found in the source file RBSSRC in library RBSPGMLIB. The program name is RBS425 and the print file name is RBS425P.

Note: If you apply a fix or update to a new version of Robot Save, RBS425 will be overlaid. To avoid losing any changes you make to the RBS425 program, we recommend that you copy it to a different library.

Defining a Move Set and its Sequences

A move set is a sequence of locations that tape volumes follow from backup to storage and back to backup again. Robot Save offers automatic move sets that completely automate the movement of tapes throughout the locations in a move set. By using this feature, you let Robot Save handle all volume movement, decreasing the possibility for error. Auto move processing also creates a history file that provides a detailed audit trail of the movement of tape volumes.

Note: If you are defining a move set for an AML, refer to the topic for your AML.

1. On the System Setup Menu select option **7**, Move Set Maintenance. A move set is a group of move sequences that documents the cycle of media movement.
2. If you haven't yet defined any move sets, the Move Set Maintenance panel is blank when it displays. This example illustrates how to define a move set that uses auto move processing. Press **F6** to define a new move set to Robot Save.
3. When the blank Move Set Entry panel displays, enter the name of the move set, a brief description, and the move set type. In this example, the move set is called DAILYAUTO and is defined as Auto Move Type 2, Maximum Days at Location. Press Enter.
4. After you press Enter, the panel name changes to Move Set Sequences. Because this move set uses auto move processing, the first location, In Use, already is defined. To define the remaining locations, press **F6**.
5. The Move Sequence Entry panel displays with the move set name and type already filled in. Enter the move sequence number; this indicates the order in which the sequence is to be performed in the movement cycle. Then, enter a brief description of the sequence, the location name (press **F4** to select from a list of defined locations), and the number of days the rotation will remain at the location. Leave the Auto Move from this Location field set to Y.

   After you have entered this information, press Enter.
6. To define the next move sequence, press **F6**. When the Add/Copy/Delete window displays, select **Add Record**. Enter the information for the next move sequence and press Enter.

   Repeat this step until you have defined all the move sequence locations for the move set. If you are using a scratch pool, only one of the sequences in the move set should have the field Release to Scratch set to Y.

   Press **F3** when you are finished to return to the Move Set Sequences panel.

The move sequences you defined now display on the Move Set Sequences panel.

7. Press **F3** to return to the Move Set Maintenance panel.
8. The DAILYAUTO move set now appears on the Move Set Maintenance panel. You can define additional move sets and their sequences to Robot Save by following the procedures just described. Press **F3** when you are finished.

Assigning a Move Set to a Backup Class and Sets

After you have defined your move sets and sequences, you can assign a move set to your backup classes and sets.

1. On the Robot Save Main Menu, select option **5**, Automated Backup Setup Menu.
2. On the Automated Backup Setup Menu, select option **1**, Maintain Backup Classes and Sets.
3. On the Backup Class Maintenance panel, enter a **1** next to the Backup Class to which you want to assign a move set. The Backup Class Entry panel displays.
4. The Backup Class Entry panel displays information about the backup class you selected and allows you to enter or update the backup information. Enter the name of the move set you want to assign to the backup class. In this example, enter DAILYAUTO, or press **F4** to select from a list of move sets defined to Robot Save. Press Enter; then, press **F10** to proceed to the Backup Set Definition Maintenance panel.
5. The Backup Set Definition Maintenance panel lists all the backup sets for the DAILY backup class. Select the first backup set by entering a **1** in the Opt column.
6. The Backup Set Information panel displays information about the backup set you selected and allows you to enter or update the information. Enter the name of the move set you want to assign to the backup set, in this case, DAILYAUTO, or press **F4** to select from a list of move sets. Press **F3** to return to the Backup Set Definition Maintenance panel.

   Note: If you assign a move set to a backup class before creating any backup sets, the move set name defaults automatically to all the backup sets in the class.

Using Move Sets With an AML

Robot Save allows you to create three types of move sets, each using a different method to control the movement of volumes:

- Manual: Volume movement occurs only if you select the option to move a rotation or individual volumes. Robot Save does not automatically move the volumes.

- Maximum Days at Location: Robot Save automatically moves backup set rotations from one location to the next based on the number of calendar days allowed at each location. Volumes move automatically to the IN USE location when they are used in a backup. When the backup completes, the volumes in the rotation move to the next location in the move set. The volumes remain at each location for the specified number of days, then move to the next location the next time a save is run. You specify the number of days (including weekends) that the rotation remains at each location. A rotation becomes eligible to be moved after it has been at the location the specified number of days.
- Maximum Rotations at Location: Robot Save automatically moves backup set rotations from one location to the next based on the number of rotations of a backup set allowed at each location. Volumes move automatically to the IN USE location when they are used in a backup. When the backup completes, the volumes move to the next location in the move set. The volumes remain at the location until the total number of rotations of the backup set at the location has been exceeded, then move to the next location.

Note: If you use a scratch pool location, volumes should not move to the scratch pool location until they expire. The sum of the maximum number of days in each location (except the scratch pool location) should be equal to or greater than the actual number of days before the media expires.

When a backup completes normally, the RBSAUTOMOV command runs automatically if an automatic move set is attached. This moves all volumes that are to be moved for that day. If you do not run daily backups or run backups that do not have automatic move sets, you can schedule the RBSAUTOMOV command to move volumes to the next location automatically. We recommend that you schedule the RBSAUTOMOV command to run daily in case your backups fail.

If any days are missed and the command is not run, the next backup with a move set performs a “catchup” move and moves the volumes to where they should be. You also can run the RBSAUTOMOV command to perform the catch up move. If a volume is moved to the scratch location after it has expired, the volume is removed from the rotation and released to the scratch pool automatically.

Examples

The following examples show how you can define and use move sets with an AML.

Example 1: Delay Tape Ejection = 0

The backup set performs daily backups with eight rotations, one day until the next rotation, and seven days before the media expires. The AML definition has Delay tape ejections set

to 0. Volumes used in a backup remain in the AML and are ejected manually after each backup. The move set is defined as Type 2, Maximum Days at Location.

Note: The first two locations in the move set keep the volume in the AML. If you use alternate sets, the move set should be defined only to the primary backup set, not the secondary sets. Volumes used with alternate sets always are assigned to the rotations of the primary backup set.

After the backup completes, use the Eject Volumes by Rotation (RBSAMLEJT) command to eject the volumes from the AML. Enter the command as follows:

RBSAMLEJT AML(*AML_name***) CLASS(***Backup_class_name***) SET(***backup_set_name***) ROTATION(*PRIOR) LOC(*NEXT)**

Note: Specifying the location as *NEXT allows auto movement of volumes to continue; entering a specific location name stops auto movement.

Example 2: Delay Tape Ejection = 2

The Weekly backup set is defined with three rotations, seven days until the next rotation, and 14 days before the media expires. The AML definition has Delay tape ejections set to 2. Volumes used in each backup are placed in a queue to be ejected after all backup jobs have completed. The volumes are ejected using the Process Queued Ejections (RBSEJQVOL) command. You also can eject the volumes from the AML by selecting option 6, AML Queued Ejections, on the Automated Media Library Maintenance panel. The move set is defined as Type 2, Maximum Days at Location.

Notes:

- If the next location in the move set sequence after the IN USE location is the AML location, Robot Save cannot queue the volumes and the volumes are not ejected when the RBSEJQVOL command runs. The volumes remain in the AML inventory and in the AML location until the move set moves them to the next location in the sequence.
- If you are using alternate sets, the second location in the move set must be the AML location so that the volumes remain available for the next backup set.

After the volumes have expired, return them to the AML. The move set should release them to the scratch pool. If the expired volume does not show its location as being in the AML, the volume was not physically in the AML when it was released to the scratch pool. To place the previously used volumes back into the AML, use the Learn AML volume inventory (RBSAMLLRN) command:

RBSAMLLRN AML(*AML_name***) ADDNEW(*KNOWN) MEDIA(***save_media_name***) CATPOOL (*INSERT)**

You can find additional information on creating and using move sets in the following topics:

- Support for StorageTek AMLs
- Automated Media Library Support

Moving Volumes Manually

Occasionally, you might need to move volumes manually from one location to another. Do the following to move a rotation of volumes to a new location.

From the Robot Save Main Menu:

1. Select option **2**, Save Media Management.
2. On the Save Media Management Menu, select option **1**, By Backup Set Rotations.
3. On the Backup Class Selection panel, enter a **1** next to the backup class name.
4. On the Rotation Maintenance panel, locate the backup set that used the rotation to be moved and select it with by entering a **1** in the Opt column.
5. When the Media Volume Maintenance panel displays, press **F7** to move the volumes. The Move Options window displays so you can select where you want to move the volumes.

Note: You should move volumes manually only on rotations that use manual move sets or with no move sets.

Using Move Sets Without an AML

Robot Save allows you to create three types of move sets, each using a different method to control the movement of volumes:

- Manual: Volume movement occurs only if you select the option to move a rotation or individual volumes. Robot Save does not automatically move the volumes.
- Maximum Days at Location: Robot Save automatically moves backup set rotations from one location to the next based on the number of calendar days allowed at each location. Volumes move automatically to the IN USE location when they are used in a backup. When the backup completes, the volumes in the rotation move to the next location in the move set. The volumes remain at each location for the specified number of days, then move to the next location the next time a save is run. You specify the number of days (including weekends) that the rotation remains at each location. A rotation becomes eligible to be moved after it has been at the location the specified number of days.

- Maximum Rotations at Location: Robot Save automatically moves backup set rotations from one location to the next based on the number of rotations of a backup set allowed at each location. Volumes move automatically to the IN USE location when they are used in a backup. When the backup completes, the volumes move to the next location in the move set. The volumes remain at the location until the total number of rotations of the backup set at the location has been exceeded, then move to the next location.

Note: If you use a scratch pool location, volumes should not move to the scratch pool location until they expire. The sum of the maximum number of days in each location (except the scratch pool location) should be equal to or greater than the actual number of days before the media expires.

When a backup completes normally, the RBSAUTOMOV command runs automatically if an automatic move set is attached. This moves all volumes that are to be moved for that day. If you do not run daily backups or run backups that do not have automatic move sets, you can schedule the RBSAUTOMOV command to move volumes to the next location automatically. We recommend that you schedule the RBSAUTOMOV command to run daily in case your backups fail.

If any days are missed and the command is not run, the next backup with a move set performs a “catchup” move and moves the volumes to where they should be. You also can run the RBSAUTOMOV command to perform the catch up move. If a volume is moved to the scratch location after it has expired, the volume is removed from the rotation and released to the scratch pool automatically.

The following examples show setting up and using three different move sets that use Maximum Days at Location with Auto Move Set processing enabled (do this on the Media Defaults panel).

Notes:

- You need to define storage locations for the volume movement before creating a move set.
- The sum of the maximum number of days in each location (except the scratch pool location) should be equal to or greater than the actual number of days before the media expires.

Defining Move Sets

Use the following steps to define a move set:

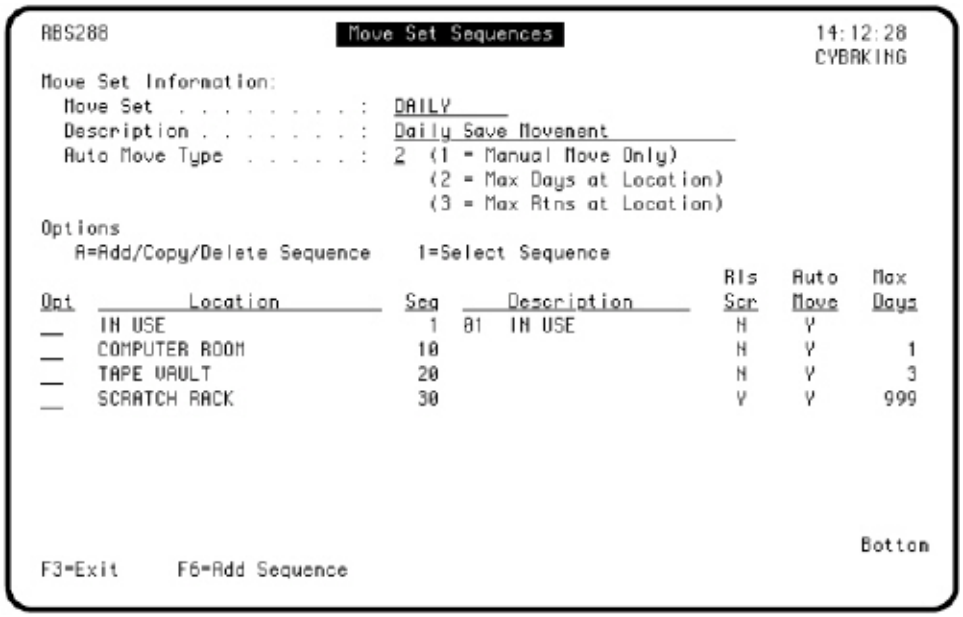
1. Create the locations for the move sets. From the Robot Save Main Menu, select option **7**, System Setup Menu. Then, on the System Setup Menu, select option **5**, Storage Location Entry. When the Storage Location Entry panel displays, enter the name of each location you want to create on a blank line. When you press Enter, the names are sorted in alphabetical order.

   Notes:

   - The Scratch location must be on-site to allow your volumes to be released to the scratch pool.
   - Do not define an AML location using the Storage Location Entry panel. An AML location is defined when the AML is defined to Robot Save and does not display on this panel.
2. Define the move sets you want to use for your backups. Each move set describes the sequence of locations used by the backup set volumes. From the System Setup Menu, select option **7**, Move Set Maintenance. Press **F6** to define each new move set.

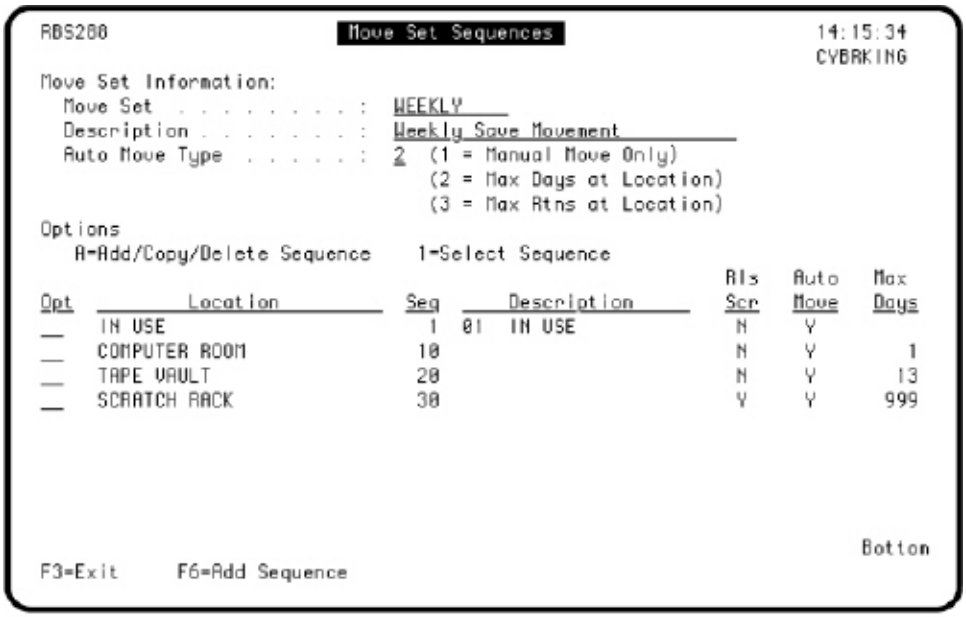
Example One: Daily

The Daily backup set has five rotations, one day until the next rotation, and four days before the media expires. The following panel shows how you might define the Daily move set:



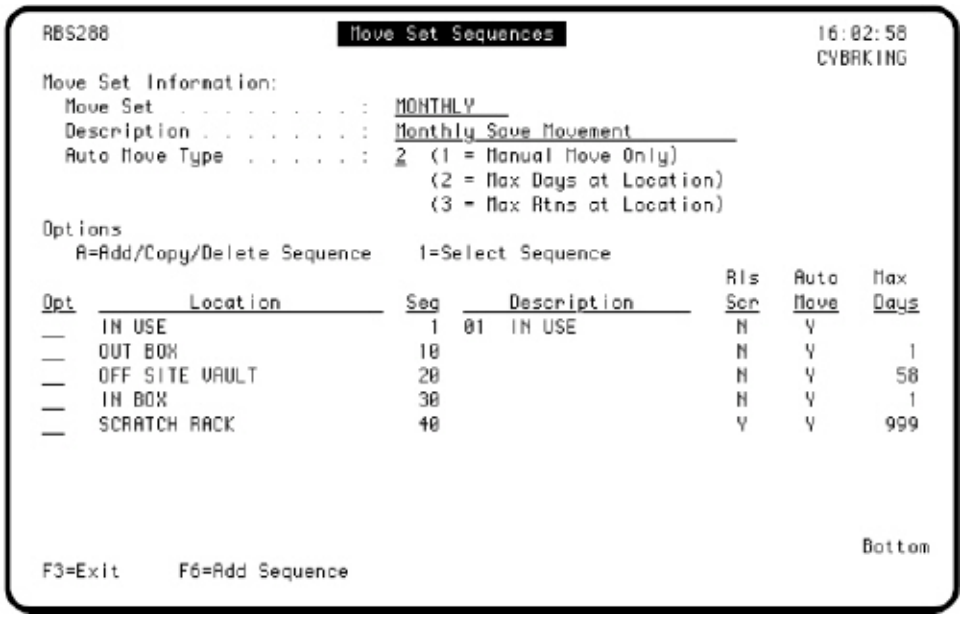
Example Two: Weekly

The Weekly backup set has three rotations, seven days until the next rotation, and 14 days before the media expires. The following panel shows how you might define the Weekly move set:



Example Three: Monthly

The Monthly backup set has three rotations, 30 days until the next rotation, and 60 days before the media expires. The following panel shows how you might define the Monthly move set:



Note: You also can move the volumes back on-site after they have expired. You can find additional information on creating and using move sets in the following topics:

- Using Move Sets With An AML
- Support for StorageTek AMLs
- Automated Media Library Support

Maintaining a Scratch Pool

A scratch tape pool is a listing of all tape volumes that have expired and do not contain any vital data. During a save, you can mount a tape from the scratch pool and Robot Save will attach the volume to the backup set rotation automatically. To work with the scratch pool, start from the Save Media Management Menu.

1. On the Robot Save Main Menu select option **2**, Save Media Management Menu.

   Options 5, 6, and 7 on the Save Media Management panel allow you to manage the scratch tape pool. Select option **5** to display the Scratch Tape Pool Maintenance panel.

   Option 6 allows you to set minimum levels of scratch tapes that should be available in the scratch pool.
2. If you specified automatic release of expired tapes to the scratch tape pool for a backup class, select option **7** to release the on-site expired tapes to the scratch pool. This also removes all object archive entries for the volumes. You also can schedule the command Scratch Expired Media (RBSRLSEXTP) to run daily on Robot Schedule.
3. On the Scratch Tape Pool Maintenance panel, press **F4** next to a media volume to display the Scratch Tape Maintenance window.
4. Robot Save initializes new volumes automatically when they are mounted; however, you also can press **F6** on the Scratch Media List panel to initialize a media volume.

Notes

If you use an AML:

- You can mark volumes in the AML for initialization using option 11. Then, run the **RBSINZAML** command to initialize the volumes into the scratch pool.
- To initialize new volumes into the scratch pool, use the **RBSAMLLRN** command.

Defining Locations

Locations help you track the movement of tape volumes. A location is any place a tape rotation stays during the movement cycle. You can define as many locations as you need to provide the degree of control you want to achieve. To start defining locations, select option **7**, System Setup Menu, from the Robot Save Main Menu.

1. On the System Setup Menu select option **5**, Storage Location Entry.
2. When the Storage Location Entry panel displays, enter all storage locations that you plan to use. Define a unique location for any place a tape stays during the movement cycle.
3. Indicate if the location is on-site (this flag determines whether a tape can be released to the scratch pool if it is expired).
4. Press Enter when you have finished entering your locations. To delete a location, blank out the location name.
5. Press **F3** to return to the System Setup Menu.

Defining Containers

Containers are boxes, racks, or shelves that are used to store your tapes. You can define containers to help you manage the movement of your tape volumes.

1. On the System Setup Menu select option **6**, Container Maintenance.
2. The Container Maintenance panel lists the containers defined to Robot Save. If no containers have been defined, the panel is blank. Press **F6** to define a container to Robot Save.
3. Use the Container Entry panel to enter the information about the container you are defining. Press Enter when you are finished.
4. Press **F6** to define additional containers to Robot Save. The Add/Copy/Delete window allows you to copy the current information, add a new container, or delete the current container. In this case, select **Add Record** to define another container. Define as many containers as you need, then press **F3** to return to the Container Maintenance panel when you are finished.
5. The containers you defined to Robot Save appear on the Container Maintenance panel.
6. Press **F3** to return to the System Setup Menu.

Using Virtual Tape to Save Data

IBM i includes Virtual Tape Save, which provides more flexibility for your save strategies. The virtual tape save is built on IBM's Image Catalog technology. It uses virtual storage to create a virtual tape images that reside on your hard disk. Once the virtual tape image is populated, you can use the DUPTAP command to save your data to physical media, such as tape.

To use a virtual tape save, you must define a virtual tape device that you then can specify in your backup command just as you would any other device.

Creating a Virtual Tape Device

1. Enter the following command to create the virtual tape device (you only need to do this once):

   CRTDEVTAP DEVD(TAPVRT01) RSRCNAME(*VRT) TEXT('Virtual Tape Device')
2. Enter the following command to vary on the device:

   VRYCFG CFGOBJ(TAPVRT01) CFGTYPE(*DEV) STATUS(*ON)
3. Enter the following command to create the image catalog for the save:

   CRTIMGCLG IMGCLG(*catalog_name***) DIR('/IMAGECATALOG') TYPE(*TAP) TEXT ('Save Image Catalog')**

   where *catalog_name* is the name of the image catalog you are creating.

   Note: You can use this image catalog multiple times.
4. Enter the following command to create virtual tape volumes for your backup:

   ADDIMGCLGE IMGCLG(*catalog_name***) FROMFILE(*NEW) TOFILE(VOL001) VOLNAM(VOL001) DENSITY(*VRT32K) NEWOWNID(***user1***)**

   where *catalog_name* is the name of the image catalog and user1 is the owner of the virtual tape cartridges.

   Repeat this command as many times as necessary, changing the TOFILE and VOLNAM parameter, to create enough virtual volumes as you need.
5. Enter the following command to load the image catalog to the virtual tape device:

   LODIMGCLG IMGCLG(*catalog_name***) DEV(TAPVRT01) OPTION(*LOAD)**

After you complete these steps, you can specify the virtual device you created in Step 1 as the device in all your Robot Save backups.

Special Notes

- You can write-protect image catalog entries using the CHGIMGLE command.
- There can be a maximum of 35 virtual tape devices defined to your system.
- You can secure a virtual image by giving it a digital signature.
- You can use a virtual tape device for all save commands that can be executed to physical media except for the following:
  - SAVSTG
  - Dump to media from SST and DST
- The minimum size for a tape image file volume is 48 MB; the maximum size is 1,000,000 MB.

- Files can span virtual volumes, just like physical volumes. If you specify *MOUNTED on your command, the volume that is mounted will be used. If no volumes are mounted, the next loaded volume will be mounted automatically.
- If you specify *MOUNTED for a save, a new volume will be created automatically when the save reaches the end of the defined image catalog volumes.

Tape Management Methodology

Robot Save is flexible enough to handle almost any tape management methodology. No matter which method you use, Robot Save minimizes the following common operator errors:

- Not knowing what tapes to use for restoration.
- Writing over unexpired tapes.
- Not having an inventory of active tapes.
- Mounting tapes in the wrong order for saves.
- Not knowing where a tape volume is stored.

To use Robot Save's tape management system, you must decide the tape management methodology you want to use. Some possible methodologies are:

- Manage tapes by backup set rotations with no scratch tape pool
- Manage tapes by backup set rotations with a scratch pool
- Manage tapes by volume name with an automatic release to a scratch pool

You can also combine tape management methods on your system. Robot Save allows you to use a different tape management methodology for each backup class.

For example, you might use automatic release and manage by volume name just for data set-type backup classes. Tapes used for backup could be managed and stored by backup set rotations.

If You Use a Scratch Pool

A scratch tape pool is a listing of all tape volumes that have expired and do not contain any vital data. Anyone who needs a tape can select a volume from the scratch tape pool from the scratch tape list. Volume labels can be serial numbers or preassigned unique volume names. The tape will have the same volume name for its lifetime.

If you want to use a scratch tape pool, Robot Save gives you unsurpassed tools to manage the scratch tape pool.

When a new tape arrives, Robot Save initializes it. The tape is given a volume name and Robot Save then registers the tape volume in the scratch tape pool list.

When you run a save, tapes can be loaded in any order from the scratch pool as long as they are expired. Robot Save attaches these volumes to the rotation automatically. Thus, a rotation will have a new set of tapes for every save session.

A field on the Backup Class Entry panel allows you to specify the release of its sets' tape rotations to the scratch pool automatically. If this field is set to Yes, tapes are released in the following situations:

- If the tape expires before it moves into a move set location that has automatic release selected, it is released when it moves into the location. If the tape expires after moving into a move set location that has automatic release specified, you must run the RBSRLSEXTP command to release it.
- The command RBSRLSEXTP is executed by a Robot Schedule job or the automatic release menu option is selected by the operator.

If the automatic release field is set to No, tapes are not released to the scratch pool. In this case, you must move the tapes to the scratch pool manually, or you can use the same tapes again the next time the rotation is run.

In addition, you can release expired volumes used in ad hoc operations to the scratch pool. A field on the Media Defaults panel allows you to specify if ad hoc volumes should be released to the scratch pool. If the field is set to Yes, the tapes are released to the scratch pool when a release expired tapes operation is run.

Robot Save's reports and displays help you manage a scratch tape pool any way you want.

Managing Tapes By Backup Set - No Scratch Pool

Method 1 uses logical volume naming and manages tapes by their function. Using this method means that you permanently assign tapes to a backup set rotation until they wear out. You move and store the rotation of tapes as a group.

Our studies show that it's very important to establish habits to do recurring tasks error-free. By permanently assigning volumes to a certain save session, you can use the tape seals to reinforce the habit of using certain volumes to do certain saves.

Tape usage errors drop dramatically if the operator knows that the volumes for Monday's backup have tape seals marked MON, the volumes for Tuesday's backup have tape seals marked TUE, and so on.

When a tape is assigned to a rotation, it is initialized and given a logical volume name automatically by Robot Save. The volume name tells you which backup set rotation the tape belongs to. The logical volume name also tells you where in the rotation this tape belongs.

For example, the third tape in Monday's Backup Set, Rotation 1, will have the volume name MNA003. The first tape in Tuesday's Backup Set, Rotation 4 will have the volume name TUD001. When you use logical naming, Robot Save automatically converts the rotation number to a letter code for volume naming (1=A, 2=B, and so on).

This method is easy for an operator to learn and use. It is also the method least likely to cause operator error. It is frequently used in smaller IBM i shops.

Managing Tapes By Backup Set - With a Scratch Pool

Method 2 uses serial or manual volume naming. When an additional tape is needed for backup, you pull it from the scratch tape pool and assign it to a backup set rotation. The tape remains assigned until it expires.

The tapes are managed and stored by backup set rotation, as in method 1, using tape labels to visually identify which rotation the tape belongs to.

Unused tapes are stored physically in the scratch tape pool rack in volume order. If an unexpired tape is placed on the rack in error, Robot Save won't allow you to use it.

If you want to use a scratch tape pool, this is the safest method and is least likely to cause operator error.

Manage Tapes by Volume Name

When you use method 3, all tapes are stored and moved by volume name. Tapes are not permanently assigned to backup set rotations. Thus, the volumes needed to restore a save session may be stored on several different racks. In addition, expired backup set rotation tapes are released automatically to the scratch tape pool when they expire.

When tapes are needed for backup, they can be mounted from the scratch pool without previously assigning volumes to rotations.

This is the method most commonly used by larger IBM i shops.

Defining Tapes and Containers

You can define as few or as many locations and containers as you want. The more you define, the stricter control you have. Robot Save's auto move processing lets you maintain

strict control with a minimum of effort. Once you have determined the sequence of moves, you can let Robot Save take over the tape movement process.

Location issues

At a minimum, you should enter a location wherever a tape container stays for eight hours or more. Each location must be unique. For manual moves, you should have at least two locations: on-site and off-site. If you are using automatic move set processing, you should have at least four locations. Here are two lists of locations for storing tapes on- and off-site:

More Control	Minimum Control
Computer Room	On-site
Shipping Dock	Tape Storage Service
Delivery Service	
Tape Storage Service	
Tape Library	

Define the locations you need to provide the degree of control you and your staff want to achieve. You should enter the tape storage service contacts and the procedures for retrieving tapes in Robot Save's Disaster Plan.

Move Sets

The move set documents the tape location movement sequence from backup to storage and to backup again. Each list of locations is given a move set name. You can create as many move sets as you want. In fact, each backup set can have its own move set. Move sets can be one of three types:

- Manual Move Only
- Maximum Days at Location
- Maximum Rotations at Location

Robot Save's move set feature gives you three benefits:

- If you are using manual move sets, the operator sees the next location where the volumes should be moved when it's time to move a rotation to a new location. This helps eliminate operator error—especially by new operators.
- You can enter the number of days the volumes will be at each location or the number of rotations of a single backup set that can be in a location. Reports are available to list the tape volumes that should be exchanged with the tape storage service each

day.

- Robot Save has an option to release expired tapes automatically to the scratch tape pool. You can designate automatic release on a move set's location. When an expired tape is logged into that location, the volume will be released automatically from the backup set rotation to the scratch tape pool.

The following shows two examples of move sets for storing tapes off-site:

More Control	Minimum Control
Computer Room	On-site
Shipping Dock Out	Tape Storage Service
Delivery Service Out	
Tape Storage Service	
Delivery Service In	
Shipping Dock In	
Tape Library	

Container Issues

You can have two types of tape containers: tape racks for on-site storage and tape boxes or seals for off-site storage.

You can create a container for every tape rack, or for every shelf in your tape racks, or even every foot of shelf in your tape racks. It's up to you.

For off-site storage, we recommend permanent, sealable tape boxes or seals. Each tape box must have a serial number. Create a container record for each tape box.

Managing and Storing Tapes

These ideas are aimed at a medium-sized IBM i sites. You can adopt as many of these recommendations as you please.

Managing Tapes Using Logical Volume Naming

If you use Robot Save's logical volume naming option, the volume uses the following six-character name when it is initialized:

- You enter the first two alpha characters of the volume name to designate the backup set.
- Robot Save supplies the third alpha character of the volume name to designate the rotation. Robot Save automatically converts the rotation number to a letter code for volume naming (1=A, 2=B, and so on).

  Note: Backup sets using logical volume naming are limited to 26 rotations.
- Robot Save supplies the fourth through sixth characters of the volume name to designate the sequence of volumes in the rotation.

For example, the third tape in Monday's Backup Set, Rotation 1, will have the volume name MNA003. The first tape in Tuesday's Backup Set, Rotation 4 will have the volume name TUD001.

Thus, you can tell by the volume name what the tape is used for and where it should be stored.

Managing Tape Movement and Storage by Backup Set Rotation

Even if you want to store tapes by volume name, we recommend that you use Robot Save's auto move processing. All tapes are moved automatically by backup set rotation. This minimizes tape management errors.

Robot SAVE Encryption

Restoring Encrypted Data

You should be aware of the following when restoring encrypted data:

- Restoring encrypted data is completely transparent to the user if you use the Robot Save menu system. For objects saved using the menus, Robot Save keeps track of all encryption keys used to save data and restores both encrypted and nonencrypted objects automatically. (Robot Save does not keep a record of encryption keys used during an ad hoc save.)
- To restore an entire sequence number on a tape with one command, you must use the RBSRSTxxx commands to restore all the data saved using the RBSSAVxxx commands. This restores both encrypted and nonencrypted data. You can use either the IBM restore commands or RBSRSTxxx commands to restore the nonencrypted data on a tape that contains both encrypted and nonencrypted data. However, the IBM commands will not restore any encrypted data and will stop the restore when the command finds an encrypted object.

- You can use IBM tape commands on tape volumes that contain encrypted and nonencrypted data. For example, the IBM Display Tape (DSPTAP) command displays what is on a volume that contains encrypted data. However, the command does not show which objects are encrypted.
- The Robot Save Create Restoration Subset (RBSCRTRST) command creates a save file that contains the programs and restore encrypted data commands required to restore encrypted data on a system that does not have Robot Save installed. You can use the save file to restore RBSPGMLIB at a hot site if it was saved with encryption. You also can send the save file to a vendor or another site to allow them to restore encrypted objects.
- The restoration commands require an encryption key to decrypt the data. If you don't enter an encryption key (leave the parameter value as *DEFAULT), the current encryption key value is used. If the current encryption key is different than the one in use at the time the data was saved, you must know the encryption key that was used to save the data.
- If restoring to a different machine than you saved from, the RBSKEYLIB needs to be restored using the RBSRSTLIB command. You will need to enter the Encryption Key number that was used to save the library.

Saving Objects With Encryption

The Robot Save encryption process offers a great deal of flexibility. We recommend that you keep the following in mind as you set up an encryption strategy and select the objects that you want to encrypt.

Encryption Key Management

You must enter an encryption key before encrypted saves can run. You can change the encryption key as often or as rarely as you wish.

Note: Be aware that you must have key management procedures in place if you change your encryption key regularly. You cannot restore encrypted data without the proper key and you cannot recover a lost or forgotten encryption key.

Encryption keys do not display on the Save Encryption Key Entry panel. The panel displays blanks for the current and new encryption key values.

Robot Save stores encryption keys in an encrypted format in library RBSKEYLIB. Encryption keys are never shown to any user. If encryption is enabled on your system, RBSKEYLIB is saved encrypted automatically at the end of every save. If encryption is not enabled, RBSKEYLIB is not saved.

Encryption keys are retained in RBSKEYLIB as long as save history exists for objects that were saved with encryption. When the save history no longer exists, the key is purged from RBSKEYLIB

You can encrypt objects saved as part of an ad hoc save by using the RBSSAVxxx commands in a program or from the command line. You should be aware, however, that Robot Save does not store the encryption keys used for ad hoc saves in RBSKEYLIB. You must know the key that was used to save the data to be able to restore it.

If you are restoring objects manually from a command line at a hot site, you must know the encryption key or keys that were used to encrypt the data. If you use Robot Save guided restoration, Robot Save has a record of the encryption keys that were used and you do not need to enter them.

Encrypting Data

For backup set types 5, 6, 7, 8, 9, and A, the saves execute as always with the exception that libraries flagged for encryption are omitted from the save. After the normal save process completes, but before RBSDTALIB is saved, the libraries flagged for encryption are saved to tape. Then, the libraries RBSKEYLIB and RBSDTALIB are saved. Thus, in the case of a full system save, the libraries flagged for encryption are not saved with the other libraries, but would be on the tape after those libraries and the IFS.

When encrypting libraries saved by a type 1 (user-defined) backup set, the libraries to be encrypted are grouped and saved before any other libraries in the backup set. If you want the libraries saved in a specific order, specify a unique sequence number for each library in the backup set.

Encrypting objects using Robot Save could impact your save time. The type and amount of data saved and the encryption level you choose are all factors. We recommend that you test your proposed encryption strategy to see the performance levels you will experience on your system. Then, review your backups and set up an encryption strategy that works for you. One of the advantages of Robot Save is that you don’t need to encrypt entire libraries, but can select which data needs to be encrypted and what doesn’t. Encrypting only the objects that require encryption will help you minimize the time it takes to complete your backup.

If you have defined items to be saved with encryption and then set the encryption level to None, turning off encryption, your saves will still complete. However, be aware that the items defined to be saved using encryption will not be encrypted. Robot Save will issue a warning message that displays on the Warning Messages panel.

You can encrypt any library on your system, within encryption guidelines, including RBSPGMLIB. However, if you choose to encrypt RBSPGMLIB, and need to restore it, you must be able to access the Robot Save restore encrypted data commands (RBSRSTxxx) from one of the following: the save file created by the RBSCRTRST command, the Robot Products

Installation CD, the Robot website, or another system. **Note:** We recommend that you do not encrypt RBSPGMLIB.

You cannot encrypt any library that cannot be saved individually with the SAVLIB command, for example, the IBM system libraries.

You can specify whether new libraries should be saved with encryption on the System Defaults panel.

You can specify default objects in a library to be saved encrypted any time the library is saved using Robot Save backup classes and sets. **Note:** The objects are not saved encrypted if they are saved in an object list, as part of a data set operation, using the Robot Save RBSSAVxxx commands in an ad hoc operation, or using the IBM save commands from a command line.

Objects saved with encryption are identified on the Object Archive Information panel.

The volume information panels and reports do not indicate that a volume contains encrypted data.

To encrypt IFS files, you must use an object list. Set up an object list that contains only the IFS directories you want to encrypt. To save other, nonencrypted, IFS directories, create a second object list containing those directories. **Note:** You cannot encrypt the entire IFS by specifying Save All IFS or IFS plus Domino databases on the Items to be Saved Within a Backup Set panel.

You also can use the RBSSAV command to encrypt specific IFS directories or individual IFS objects. Specify the path name of the directories you want to save encrypted; use the OMIT parameter to specify any objects that you do not want to save.

Note: Using the RBSSAV command is considered an ad hoc save. If you choose to use the RBSSAV command, you must remember the encryption key used to save the objects. You will need to enter the key to restore the objects.

About Robot Save Encryption

Robot Save encryption is a powerful tool that can help you maintain the security of your tapes in the event they are lost or stolen. In today's world, it's not unusual to hear of companies or individuals being compromised because their business or personal data has been discovered missing. Whether the tapes containing this vital information are just misplaced or are stolen for illegal purposes, knowing that your important data cannot be accessed by unauthorized individuals can bring peace of mind to everyone involved.

In addition, privacy laws and legislation, such as Sarbanes-Oxley and HIPAA, have forced companies to become more aware of this issue. These regulations require that data be kept secure and that companies can provide an audit trail of their backups. Robot Save maintains

complete records of all saved data and encryption provides even more security for your tape volumes. Maintaining the security of your backups is crucial. Robot Save helps you feel confident that your data remains safe.

Robot Save encrypts selected data as it is saved to tape. No encrypted data is stored on your system; only on the tape. You choose what needs to be encrypted and what doesn't. This allows you to encrypt only selected objects, instead of entire libraries, making the best use of your time.

Related Topics

- Saving Objects with Encryption
- Restoring Encrypted Data
- Using the Robot Save Encryption Commands

Using the Robot Save Encryption Commands

Saving encrypted data using Robot Save normally is transparent to the user. After you specify the items you want to encrypt on the backup set, all encryption takes place as part of the normal backup process as it is saved to tape. You also can use the following commands from a command line or program or as part of an ad hoc save to save encrypted data. The commands allow you to specify the encryption information for the objects being saved.

Note: To restore encrypted objects saved with these commands, you must use the Robot Save RBSRSTxxx commands and enter the correct encryption key that was used to save them. See Restoring Encrypted Objects for more information on the RBSRSTxxx commands.

RBSSAVLIB

The Save Library Encrypted (RBSSAVLIB) command works like the IBM SAVLIB command and allows you to save an encrypted copy of one or more libraries and the objects in the library.

RBSSAVOBJ

The Save Object Encrypted (RBSSAVOBJ) command works like the IBM SAVOBJ command and allows you to save an encrypted copy of a single object or a group of objects.

RBSSAVCHG

The Save Changed Objects Encrypted (RBSSAVCHG) command works like the IBM SAVCHGOBJ command and allows you to save an encrypted copy of each changed object or group of objects.

RBSSAV

The Save Encrypted Object (RBSSAV) command works like the IBM SAV command and allows you to encrypt specific IFS directories or individual IFS objects. Specify the path name of the directories you want to save; use the OMIT parameter to specify any objects you do not want save.

RBSSAVSAVF

The Save Save File Encrypted (RBSSAVSAVF) command works like the IBM SAVSAVFDTA command. It encrypts objects that are of the type specified in the command as it saves the contents of a save file to tape. The data in the save file is not encrypted until the save file is saved to tape.

Data Centers

Defining a Data Center

Before starting to set up your data center, make sure you have met the following prerequisites:

- Robot Save is at the current release/modification level, if possible, on all systems that will become part of the data center.
- Robot Network Host R10M00 and Node R10M00, or higher, are installed and configured on the systems that will be in the data center. We always recommend that you have the most current modification level installed, if possible. Note: Robot Network does not have to be active, but it must be configured properly to run a Robot Save data center.
- Read the Data Center Management section in the Robot Save User Guide
- Test a backup using the configured tape devices before you combine your systems into a data center. The backups should complete normally.
- Be familiar with Robot Save Error Resolution before joining systems into a data center.

Setting up TCP/IP for your Robot Save Data Center

Note: Authentication entries will be created for DCMs and DCPs.

1. To allow data center manager jobs to run in RBTSLEEPER, enter the following commands:

- **CHGSYSVAL SYSVAL(QRETSVRSEC) VALUE('1')**
- **ADDSVRAUTE USRPRF(RBTUSER) SERVER(QDDMDRDASERVER) USRID (qsecofr) PASSWORD(***xxxxxxx***)**
- **ADDSVRAUTE USRPRF(RBTUSER) SERVER(QDDMSERVER) USRID(qsecofr) PASSWORD(***xxxxxxx***)**

2. For additional data center management functions (Includes, Excludes, RBSPOLLDC, etc.) enter the following commands for each user that may execute data center commands:
   - **ADDSVRAUTE USRPRF(***user***) SERVER(QDDMDRDASERVER) USRID(qsecofr) PASSWORD(***xxxxxxx***)**
   - **ADDSVRAUTE USRPRF(***user***) SERVER(QDDMSERVER) USRID(qsecofr) PASSWORD(***xxxxxxxx***)**
3. The following is only needed for running the command RBSPOLLDC:
   - **ADDRDBDIRE RDB(***RD-Name RDB-Alias***) RMTLOCNAME('***valid-ip-addr***' *IP)**

Prior to Including Systems

- Designate one system in the data center as the Data Center Management System (DCMS). The DCMS controls and routes all communications among the other systems in the data center. Use the following suggestions to help select a system as the DCMS:
  - The system with the least amount of activity in the data center.
  - The fastest system in the data center.
  - The system that is likely to be in a non-restricted condition most of the time.

  Note: If you are creating a data center on a system that is logically partitioned, the DCMS does not have to be the primary partition. The DCMS does not have to be the Robot Network Host.

- Purge automatic move history that is no longer needed on the DCMS and on any system to be included in the data center. Retaining history will result in the inclusion taking longer to complete. To purge history, do the following:
  - Display the Save Media Management Menu. Select option **9**, Move History Inquiry, and determine how many days of history you want to retain.
  - Return to the Save Media Management Menu and select option **10**, Purge Move History. Enter the number of days of history to retain and press Enter to remove the remaining history records.

  Note: We recommend that you do not mirror Robot Save. Mirroring Robot Save in a data center will cause your data to become corrupted.

Steps to Include Systems into a Data Center

There cannot be any activity in Robot Save on the selected system or the DCMS when you include a system into the data center; for example, no backup or restore procedures can be running; users cannot be in the menu system; and so on. We recommend that managing the data center systems be handled by one person at a time.

1. From the Robot Save Main Menu on the DCMS, select option **7**, System Setup Menu.
2. On the System Setup Menu, select option **15**, Data Center Management. When the Data Center Management panel displays, press **F8** to start the Robot Save monitor jobs.

   Note: The monitor jobs must be running in the RBTSLEEPER subsystem on all systems that will be included in the data center at the time of the inclusion. The status of the Robot Save monitor jobs shown on the Data Center Management panel is for the current system only.
3. **Select option 1** for the system you want to include in the data center to run the Import Forecast report. The report lists the actions that will be taken during the inclusion of the system you selected. This allows you to make any changes needed on the selected system before actually including it in the data center. These changes might include renaming a media type, resolving duplicate names, and so on.

   You can select this option only on the DCMS. The selected system cannot be in any other multiple system data center. Data from the selected system is imported automatically and global data center data is copied to the target system. The data must be consistent across each system in the data center, so some objects (such as, move sets, locations, containers, AML names, or save media types) could be renamed during the inclusion process, if you haven't already resolved the conflicts as reported by the Import Forecast report.

   Caution: Stop here until you have resolved any conflicts between the DCMS and the system being included. Attempting to resolve these differences after inclusion can be very time consuming. See Using the Import Forecast Report in the Robot Save User Guide to help resolve any reported conflicts.

   If the systems being included in the data center share a tape library, the AML name and AML location name defined to Robot Save must be the same on all systems. However, the iSeries configured device descriptions can be different. See AML Considerations in the Data Center Management section of the Robot Save User Guide for complete information.
4. After you have resolved all conflicts, enter a **2**, Include, next to the system you want to include. The Data Center System Inclusion window displays asking you to confirm that you want to include the system at this time. Enter a **1** next to the option you want to select.

Note: The inclusion of a system can take an extended length of time depending on how much information must be shared between the systems. Check the monitor jobs in the RBTSLEEPER subsystem for CPU usage if you are unsure if the inclusion process is running.

5. After the inclusion completes, the systems in the data center share their information. You can select the following menu options to display data for all the systems in the data center.

   Note: You can display Volume Contents only on the system that used the volume.

   From the Operations Menu:

   - Data Center Error Resolution
   - Automated Media Librarian Operations

   From the Save Media Management Menu:

   - By Backup Set Rotation
   - By Volume Name
   - By Containers and Locations
   - By Ad hoc Tape File Label
   - Scratch Pool Maintenance

     Notes:

     - Volumes can be reserved/unreserved for any system in the data center from any system in the data center
     - Moving expired tapes to scratch must be done on each specific system
   - Scratch Pool Minimum Inventory Levels
   - Media Volume Reports
   - Move History Inquiry
   - Purge Move History

   From the Report Menu

   - Media Volume Reports
   - Media Storage Reports

   From the System Setup Menu

- AML Maintenance (for systems that share the same AML)
- Save Media Maintenance
- Storage Location Entry
- Container Maintenance
- Move Set Maintenance\
- Media Defaults (Release ad hoc tapes to scratch; all systems must be at Robot Save version 10 or higher)
- Security

Transferring the DCMS to a Different System

Transferring the Data Center Management System (DCMS) from one system to another is a very simple process. It might be necessary to transfer the DCMS if the current DCMS will be down temporarily or you have decided that a different system is a better DCMS candidate. Transferring the DCMS transfers control of the communications among systems in the Data Center from one system to another.

To transfer the DCMS, display the Data Center Management panel on the current DCMS. Select **option 3**, Transfer DCMS, for the system that will be the new DCMS. The Transfer DCMS window displays to verify that all systems are communicating. Confirm that you want to continue the transfer.

If the DCMS or any other included system is in a restricted state, the data on that system will be updated when the monitor jobs on the system are restarted.

Note: If the DCMS is down or stops communicating with the other systems in the data center before you can transfer the DCMS, go to each system and exclude it from the data center. Then, include all systems again from the new DCMS.

Excluding a System from the Data Center

Excluding a system from a data center causes all volume data (volumes, descriptions, and security information) from the other systems in the data center to be deleted from the system being removed. Shared scratch volumes, since they are shared in the data center, also are removed from the system being excluded. The excluded system will end up with only those volumes that are assigned to rotations on that system or are scratch tapes reserved for that system.

Note: You cannot exclude the DCMS from the data center.

To exclude a system, display the Data Management Center panel and select **option 4**, Exclude. When the Data Center System Exclusion window displays verify that you want to continue with the exclusion.

Note: If you have a system that will be unavailable for more than three days, we recommend that you exclude the system from the data center and include it again when it becomes available.

Changing a Data Center Participant (DCP) System Name

A data center participant (DCP) system is any system in the data center other than the DCMS. To change the system name for a DCP, do the following:

IMPORTANT: Do step 1 before changing your system name.

1. Exclude the DCP from the data center. Follow the instructions in the previous section to exclude the system. Allow approximately 15 minutes for the exclude to be processed on each DCP in the data center.
2. Change your system name following IBM's recommendations.
3. Run the **RSLCHGSYSN** command to change the previous DCP system name to the current system name in Robot Save's files. Do this on all systems that have Robot Save installed and are included, or eligible to be included, in the data center.

   Note: The Data Center Management menu lists all included and eligible systems.
4. Use the **RSLCHGSYSN** command to change the previous system name to the current name in the product files for any of the following Robot products installed on the systems in the data center: Robot Console, Robot Monitor, Robot Schedule, Robot UPS, and Robot Reports.
5. Include the DCP back into the data center.

Changing the Data Center Management System (DCMS) Name

To change the DCMS system name, do the following:

IMPORTANT: Do step 1 before changing your system name.

1. Transfer the DCMS to another system in the data center. (All systems in the data center must have the Robot Save monitor jobs active when you perform this step.)
2. Exclude the original DCMS from the data center. Follow the instructions in the section, Excluding a System from the Data Center. Do this from the new DCMS. Allow approximately 15 minutes for the exclude to be processed on each system in the data center.

3. Change the system name following IBM's recommendations.
4. Run the **RSLCHGSYSN** command to change the previous DCMS system name to the current system name in Robot Save's files. Do this on all systems that have Robot Save installed and are included, or eligible to be included, in the data center.

   Note: The Data Center Management menu lists all included and eligible systems.
5. Use the **RSLCHGSYSN** command to change the previous system name to the current name in the product files for any of the following Robot products installed on the systems in the data center: Robot Console, Robot Monitor, Robot Schedule, Robot UPS, and Robot Reports.
6. Include the original DCMS back into the data center.
7. Transfer the DCMS responsibilities back to the original DCMS (which now has been renamed).

Data Center Management

A Data Center is a physical center of operations for one or more iSeries systems. Typically, the systems are located in one location and share the same pool of media volumes. This physical proximity makes it easy for an operator to accidentally insert a tape into one system that was used previously on another system, making the backup and recovery system less reliable. Robot Save's Data Center Management system can help prevent these types of errors by making each system aware of the others' activity and data content.

Operators typically view the systems they manage as a group, not as multiple individual systems. Volume management is considered a data center activity, not limited to any individual system. Robot Save consolidates the volume-related information in its database to allow volume management and reporting from any system in the data center.

Robot Save does this by designating one system in the data center as the Data Center Management System (DCMS). It controls and routes all communications between the other systems in the data center. Although it is not the central storage location for all data, it acts as the router of data to all systems. The DCMS must be able to communicate with all the other systems in the data center since there is no guarantee that the other systems can communicate with each other. The DCMS becomes a central "routing point" to guarantee communications between systems. You must have Robot Network, the network management software from Help/ Systems, installed and properly configured to set up this type of data center.

Select option **15** from the System Setup Menu to display the Data Center Management panel. Press **F1** for help with this panel.

- See Defining a Data Center for more information on setting up data centers.

Single and Multiple System Data Centers

When you first install Robot Save, the data center is configured with only one system in it. This system is also the DCMS for that data center. If you have more than one system, each with Robot Save installed, you could have multiple data centers, each containing only one system. Robot Network is not required for this single-system form of data center.

To connect multiple systems into a single data center, you consolidate each of the single-system data centers using the Data Center Management option on the System Setup Menu. Robot Network is required to support a multiple-system data center.

The data center topology (which system is defined as the DCMS and which systems are part of the data center) is not dependent on the Robot Network topology (whether a system is a node, host, or alternate host). However, authorities in Robot Network must be defined so that all systems in the data center can see each other.

System Restoration in a Data Center

If you need to perform a system restoration on one or more systems in a data center, you must restore Robot Network on all systems in the data center. If the system name or IP address has changed, you must reconfigure Robot Network with the correct information before you can use the data center in Robot Save.

Recommendations for Setting Up a Data Center

Use the following recommendations to help you set up a data center in Robot Save.

- A Robot Save data center includes iSeries systems located in a single location and sharing a centralized pool of tapes. A data center also can consist of a system that has multiple logical partitions (LPARs). It is not an enterprise solution that should be used to manage tapes from a number of different platforms or systems located in remote sites.
- The data center management system (DCMS) should be the system with the least amount of activity in the data center. Another option might be to assign the fastest system in the data center as the DCMS.
- The system you select as the DCMS should be the one with the least amount of planned or actual downtime (for example, due to backups or other maintenance actions).
- Run the Import Forecast report for a system before attempting to include the system in the data center. The report lists the actions that will be taken during the inclusion of the selected system. This allows you to make any changes needed on the system before actually including it in the data center. These changes might include renaming a media type, resolving duplicate names, changing formats of volumes, and so on.

We strongly recommend that you run the Import Forecast report and resolve any conflicts between systems before actually including a system in the data center. Attempting to resolve these differences after inclusion can be very time consuming. See the discussion on the Import Forecast report, later in this section, for more information on how it can help you in defining your data center.

- When you run the Import Forecast report or include a system into the data center, there cannot be any activity in Robot Save on the selected system or the DCMS (for example, no backup or restore procedures can be running; users cannot be in the menu system; and so on).
- The data center operations—Include, Exclude, and Transfer DCMS— should be the only activity on all data center systems at the time they are executed. Users should not be in the menu system and no Robot Save jobs should be running except the three monitor jobs in the RBTSLEEPER subsystem. You should not attempt to exclude a system from the data center at the same time that another user is transferring the DCMS. We recommend that these operations be handled by one person at a time.
- Robot Save 10 and higher allow you release the tapes used in ad hoc operations to the scratch pool. You specify if you want to release ad hoc tapes on the Media Defaults panel. This value must be the same on all systems in the data center.

Note: We recommend that you do not mirror Robot Save. Mirroring Robot Save in a data center will cause your data to become corrupted.

Object Archive

Object Archive System

The Object Archive system, along with your save media, gives you the ability to restore prior versions of libraries, files, source members, documents, programs, object lists, IFS files, and Domino databases. When you need to restore an item, Robot Save helps you find the version you need and then restores it for you automatically. This section describes Robot Save's Object Archive system. You'll see how you can restore a library, file, document, IFS file, or Domino database by selecting it from the object archive records.

Robot Save provides two restoration systems. One system uses the Guided System Restoration Procedures to restore the entire system. The other system, the Object Archive system, is for restoration on a smaller scale, such as when a file is ruined or deleted accidentally. The two restoration systems are independent of each other.

An Object Archive is optional; you can choose to create an archive for the rotations in a backup set on the Backup Set Information panel. This allows you to specify whether or not to

create an object archive, or whether to create an object archive only for items that have been flagged. For example, you probably won't want to create an archive for purchased or test programs because you are not developing new versions of these programs. However, if you are backing up object lists created through Robot Corral, you should have an object archive because, without archive records, you cannot restore objects saved using an object list. And, for large system saves, such as a NONSYS, you can choose to flag only individual libraries (using the Modify Library Save Information panel) for an archive, while not archiving others.

Robot Save creates the object archive after the backup session has completed. At the end of the save session, it submits a job to create the archive records. You can stop the archive job if you don't want it to run at that time. You then can resubmit the job at a later time to complete the archive.

The Object Archive system has two components:

- Save media volumes containing the objects saved by a backup set.
- Indexes over the saved objects. You search these indexes for a saved object using the Object Archive display panels.

Once you find the object you want to restore, Robot Save:

- Tells you which media volumes to mount.
- Searches for the object on the media volumes and restores it automatically.

Why You Need an Object Archive

If every employee were perfect, never made mistakes, and could predict the future, you would not need an object archive. Since this isn't the case, your Object Archive allows you to recover when:

- A new batch update program ruins a file.
- You discover an operator cleared the wrong file a week ago.
- An object is logically damaged after a power failure.
- A programmer radically changed a source member, but now wants to return to an earlier version.
- A source member is corrupted. You need to know when it was changed and what the code was before the change.
- A file in a directory from a Domino server was deleted accidentally.

Robot Save's Object Archive system is object destruction insurance. It helps you find the object and version you need and then restores it for you.

Object Archive Display Options

The Object Archive Menu provides several options for searching the object archive, an option for working with the volumes on which the archived objects are saved, an option to print object archive reports, and an option to see the status of individual archive jobs submitted by a backup session.

To find what you want restored, first select one of the following options from the Object Archive Menu:

- Library

  Select this option to locate a specific library to restore. You can choose to restore the entire library or select objects from the library for restoration. To display the Library Archive Inquiry panel, select option **1** on the Object Archive Menu.
- Library/Object

  Select this option to find any object except documents and folders. You can search for a specific library or object in a library, or restrict the display to a specific object type. You also can display all members of a database file and search for a specific member. To display the Object Archive Inquiry panel, select option **2** on the Object Archive Menu.
- Folder/Document

  Select this option to display all documents and folders created by PCs. You can search for a specific folder or nested folder. To display the Document Archive Inquiry panel, select option **3** on the Object Archive Menu.
- Source File

  Select this option to find a source file or member. Although you can find a source file or member from the Library/Object display, you can see a change history of your source on the source member display. Select option **4** on the Object Archive Menu to display the Source File Archive Inquiry panel.
- Save Media Volume

  Select this option to work with the volumes on which the objects are saved. If a volume is lost or damaged, use this display to see what objects you could not restore. Select option **5** on the Object Archive Menu to display the Volume Inquiry panel.

  Note: You also can display this panel by selecting option **2**, By Volume Name, from the Save Media Management Menu.
- Object List

  Select this option to display the object lists saved by Robot Save. From this list, you can select to display the objects in a specific object list or select an object list to restore. Select option **6** on the Object Archive Menu to display the Object List History panel.

- Integrated File System

  Select this option to display a list of the directories and objects in the Integrated File System (IFS). You can search for individual files or see all the files is a specified directory. To display the IFS Directories panel, select option **8** on the Object Archive Menu.
- Security Data (SAVSECDTA)

  Select this option to see a list of the backups of the security data on your system saved by the SAVSECDTA command. To display the SAVSECDTA Archive Inquiry panel, select option **9** on the Object Archive menu.
- Configuration Data (SAVCFG)

  Select this option to see a list of the backups of your system configuration data saved by the SAVCFG command. To display the SAVCFG Archive Inquiry panel, select option **10** on the Object Archive menu.
- Domino Online Backup

  Select this option to display a list of the Domino databases that have been saved. You can search for the databases you want to restore or recover. To display the Domino Online Backup Archive Inquiry panel, select option **11**on the Object Archive menu. See Restoring and Recovering Domino Databases for more information.

For most of these displays, you can choose to display:

- All saved versions of an object and when they were saved
- Last saved version only
- All change dates and times for all saved versions of an object
- Last changed version only

The All Change Dates option shows you a history of changes to an object. For example, you might schedule a Robot Schedule job to print the Source Archive Report every day after the source file library is saved. Set the change limit at the previous day. The report then prints a list of source members that were changed for the current day only. You can print a change history for any object, library, or object type.

Mounting Volumes for Restoration

When Robot Save creates the Object Archive entries, it takes its information from the object description written by the system. Unfortunately, the object description only lists the libraries saved on the volume; it does not list the objects saved on the volume.

Therefore, when you select an object to restore, Robot Save reads the Object Archive entries to find the volumes on which the library containing the object is saved. If the library

containing the object required more than one volume, Robot Save may require that you mount more than one volume.

After you mount a volume, Robot Save searches it until it finds the object you want restored. Robot Save then restores the object, if you have the proper authority.

Keeping Your Object Archive

Robot Save keeps the archive entries for the saved objects as long as the volume on which those objects are saved remains attached to the backup set rotation. It removes the entries when it writes over the volume as part of the normal rotation usage.

In addition, Robot Save removes the archive entries for objects on a volume if any of the following events occurs:

- The expired volume is moved to the scratch tape pool manually.
- The volume is renamed or replaced.
- The expired volume is released to the scratch tape pool automatically because that option was selected on the backup class record.

The archive program creates the object archive entries after the save has completed. Unlike the RBSDTALIB library, the Object Archive library, RBSPGMLIB, is not backed up automatically. Place the RBSPGMLIB library in a backup set and save it as part of your backup session. RBSPGMLIB is saved at the end of the last volume used, right before RBSDTALIB. Save RBSPGMLIB daily if you are going to restore from the object archive; otherwise, saving it weekly is sufficient.

Keeping Source File Backup On-Site

Often, the media volume you need from the regular source file backup is stored off-site. To keep your source file backup on-site, use a backup only, no restore class to create an archive for just your source members.

You can create a backup set that saves just the daily changes to your source libraries. Schedule a Robot Schedule job to run the backup set every workday at noon. Keep the resulting tape volumes on-site all the time. Use them to restore members when someone ruins a source member.

However, to restore source files if a disk drive fails, you still should rely on source member saves done by backup sets in the backup and restore classes. These volumes should be stored off-site.

Saving Object Lists

An object list allows you to save objects that are located in more than one library, or a list of documents or IFS files. For example, you might want to save all your payroll files at month end. However, since the files are located in more than one library, it's not as simple as saving a single library. By creating an object list using Robot Corral, the object selection manager, you can save just the files you need. The following example shows the procedure for creating and saving an object list. For complete information on using Robot Corral, see the Robot Corral User Guide.

1. To create an object list, you use Robot Corral. Enter the following command on a command line:

   RBTROLLIB/RWRKOBJL
2. When the Work With Object Lists panel displays, press **F6** to add a new object list.
3. On the Object List panel, enter the name and a brief description of the new object list. Specify an Instruction Retention Type of P (permanent) so the list can only be deleted manually. Enter **R** in the Selection Type field. Press Enter to display the regular selection parameters.

   Enter ***ALL** in the Object Name field. Enter ***FILE** as the object type and **PF** as the object attribute. Specify the libraries where the objects are located. You can prompt for a list of valid values for these fields.

   Press **F9** to submit the object list for building.
4. When you return to the Work With Object Lists panel, press **F5** to refresh the display. The newly created object list shows a description of *** IN USE ***. You will receive a message when the build is complete. Press **F5** again to display the object list description. You then can enter a **2** in the Opt column to display the objects in the object list.
5. Start Robot Save and select option **5** from the Robot Save Main Menu. When the Automated Backup Setup Menu displays, select option **1** to display the Backup Class Maintenance panel. Press **F6** to create a new backup class.

   Complete the Backup Class Entry panel with a name and description of the backup class. Enter the rotation information for the class. Select Object Lists as the Usage Type. Press Enter to save your entries. Then, press **F10** to display the Backup Set Definition Maintenance panel.
6. When the Backup Set Definition Maintenance panel displays, press **F6** to define a new backup set.

   Complete the Backup Set Information panel with a name of the backup set. When you have completed the panel, press **F12** to return to the Backup Set Definition Maintenance panel.

   Continue adding backup sets until you have defined all the backup sets for your object list backup class.

7. On the Backup Set Definition Maintenance panel, press **F4** next to a backup set to display the Backup Set Options window. Select option **4** to specify the object list the backup set will save.
8. On the Object List Saved Within a Backup Set panel, enter the name of the object list you want to save. You can press **F4** to select from a list of object lists on your system. Fill in the save code for the backup set; press **F4** to see a list of valid save codes.

   If you want to encrypt the object list as it is saved to tape, enter a Y in the Save encrypted field.

   Complete the panel based on how you want the object list handled during and after the save; this example specifies to rebuild the list prior to the save and to copy the saved objects to tape.
9. You are now ready to save your object list. Return to the Robot Save Main Menu and select option **1**. When the Operations Menu displays, select option 1 to display the Operations by Backup Class panel. Enter a **1** next to the backup class. On the Backup Set Selection panel, enter a **3** next to the backup set containing your object list. Or, you can schedule the save using Robot Schedule.

Restoring Object Lists

You can restore object lists through the Robot Save Object Archive using four different strategies.

From the Object Archive History:

- Select the object list from the object archive and restore it as it was last saved, regardless of the objects currently included in the list.
- Select a version of the object list as of a specific date, regardless of the current contents of the list.

From the Object List:

- Select the object list to restore, locate the most recent version in the object archive history, and restore that version.
- Build an object list by selecting specific objects from the object archive and restore the newly-built list. This creates an object list from the history records only and should be done by an operator.

  Note: If you create an object list in this way using the Robot Save object archive:

- The new object list must be backed up before you can restore the objects added to the list.
- You should not revise the list at a later date using Robot Corral.

Each of the object archive panels contains a function key that allows you to start and stop adding objects to an object list. Once you start object list collection (by pressing the function key), you can select objects from any of the object archive panels and include them in a new or selected list (created in Robot Corral). The only restrictions are:

- You can add documents only to a Directory-type object list.
- You cannot add individual members to an object list unless the list is created with List Members separately set to Yes.
- Object lists created by adding objects from the Robot Save object archive should not be revised using Robot Corral.

See the Robot Corral User Guide for complete information on creating object lists.

Restoring IFS Groups

You can restore object lists through the Robot Save Object Archive.

1. From the Object Archive Menu panel, select option **7**, IFS Groups.
2. The IFS Group Selection panel displays a list of the current IFS groups and their descriptions. Use this panel to select an IFS group and restore all or part of it.
    - Option **1** displays the IFS Restore Selection panel. From this panel you can specify which directories should be included when you restore the IFS Group, display the directories in the group, and display the files in a directory. Press **F1** for help on selective restores.
    - Option **3** displays the IFS Group Restore Selection panel. From this panel you can restore the IFS Group; display archive information about the group; selectively restore objects from the group; and display and work with the subdirectories that have been saved. Press **F1** for help on IFS group restores.

Restoring and Recovering Domino Databases

There are two ways to get a Domino database back on your system following a Domino online backup. Regardless of whether you use transaction logging, you can always restore a database as it was at the time of the backup. If you use archived transactional logging, you can recover the database to a specified point in time as determined by the logged transactions. A database recovery restores the database and then applies the logged transactions. You can perform both a restore and a recovery from the Object Archive panels.

You also can restore all Domino databases for a selected server using Robot Save's Guided System Restoration Procedures panel. See System Restoration, later in this user guide, for more information.

Select option **11** from the Object Archive Menu to display the Domino Backup Archive Inquiry panel.

System Restoration

System Restoration

If you need to restore your entire system, Robot Save's Guided System Restoration procedures guide you through everything you need to do. Robot Save creates restoration instructions as part of every library save so you can print detailed reports that describe the restoration process. The Guided System Restoration Procedures panel lets you select to restore the entire system by pressing just one function key.

Library Save Information

The library save information list is the keystone of Robot Save's Guided System Restoration Procedures. Because this list of libraries is so important, Robot Save automatically puts the Robot Save data library **RBSDTALIB**, where the list is found, on the last tape after every regular save is completed.

Because Robot Save saves and restores libraries in the order specified on the library save information list, it is important that the libraries are in the proper order for a successful restoration. The Guided System Restoration Procedures panel uses this data to build its restoration procedures.

You can tell Robot Save not to create Object Archive entries for a library on its library save information record. For example, since you rarely need to go back to prior versions of purchased or test programs, you don't need to archive entries for these libraries.

You also can tell Robot Save to skip the next save of a library. You can do this either on the Modify Library Save Information panel or use the command **RBSSKIPLIB**. You might decide to skip a library when it's needed for work too important to cancel, but you still want to complete the daily backup. Robot Save skips the library on the next backup, but saves it in succeeding saves.

To display the Modify Library Save Information panel, select option **5**, Automated Backup Setup Menu from the Robot Save Main Menu; then, enter option **2** on the Automated Backup Setup Menu.

Library Restoration and Object Archive Differences

Robot Save offers two different methods of restoration. Use the Guided System Restoration procedures to restore the entire system. Use the Object Archive panels to restore individual libraries, objects from libraries; object lists; source members; documents; IFS files; IFS Groups; or Domino databases. When you restore an object through the object archive panels, you can select to restore from any date available on the selection panel.

Robot Save automatically backs up the library save information files (contained in the RBSDTALIB library). If you use the Object Archive (contained in the RBSPGMLIB library), you need to determine when it is to be backed up.

Library Save Information Order

Robot Save saves and restores libraries in the order they appear on the library save information list. You can change the order of the libraries in the list by changing the sequence number.

The order of restoration may be important to you if:

- Physical files are stored in one library and its logical files are stored in another. Or, you may have join files over two physical files in different libraries. The physical files must be restored to the system before you can restore the logical files. Make sure your library restoration order deals with this possible situation.
- You want to start using important applications before the system restoration process is complete. Put those important application libraries at the top of your library save information list. Put seldom-used application libraries at the bottom of the list.
- Your journals for all files are stored in one library. It may be necessary to restore the journal library first, along with all the journal receiver changes. You should evaluate your situation and determine if journaling will affect the order of library restoration.

System Restoration Methods

You can restore your system in two ways: By entering the restore commands listed on the System Restoration report on a command line or by selecting restoration procedures from the Guided System Restoration Procedures panel. The System Restoration Checklist topic provides step-by-step instructions for restoring your system.

Using the Restoration Reports

Robot Save automatically prints out the following restoration reports after every backup:

Restore your system if you have lost all disk drives The instructions list the commands needed to restore the last entire library saves from tapes. Then, the report lists commands to restore the library changes since the entire library save was done.

Restore your system if you have lost a disk drive but your save file ASP is intact

The instructions list the commands needed to restore from available library save files and then from tapes for the rest of the items.

Restore your system from your previous set of media volumes The instructions list the commands needed to restore from the last pre- ceding saves. You can use these restoration instructions in combination with the above instructions if you have had a partial tape loss.

Restore your system and replicate your current system configuration The instructions list the commands needed to restore your system with only the items that were on the system at the time the report was run. For example, if you run a backup, delete items, then run the report, the report shows the system configuration when the report was run, not at the time of the backup.

To restore your system, locate the volumes indicated on the appropriate restoration report. Then, type in the commands on a command entry panel. You can print the restoration reports for the most recent save at any time by selecting option 3, System Reports, from the Automated Backup Setup Menu. You also should have copies of the Audit Report (RBS405) and, if you use object lists, the Saved Object List Contents Report (RBS407).

Using the Guided System Restoration Procedures Panel

The Guided System Restoration Procedures panel lists the procedures necessary to restore your system. If save files are on an undamaged ASP, Robot Save also lists them. To display the Guided System Restoration Procedures panel, enter option **4** on the Automated Backup Setup Menu.

You can select to restore one library, several items, or all the items listed on the panel. When you select the items to be restored, Robot Save specifies the media volumes you need for the restoration. During the restoration, Robot Save tells you the proper volume to mount. If you have selected to restore more than one library, Robot Save determines the most efficient order in which to restore the items based on the user- defined sequence and the media volumes where they were saved. This helps make the restoration process more efficient by minimizing tape mounts and tape rewinds. Finally, Robot Save tells you whether or not the restore was successful.

Robot Save guides you through the restoration procedures until the entire system is restored. If necessary, you also can restore a library from a save other than the last save of the entire library or its changed objects.

Note: If you plan to restore your system using RSTLIB *NONSYS, you should restore the Robot Save libraries (RBSDTALIB, RBSPGMLIB, and RBSKEYLIB) first.

System Restoration Checklist

Use this checklist to restore your IBM i if you lose your entire system due to a disk drive failure.

Notes

- Before going to a hot site, consider the following: Encryption of the Robot Save program library, RBSPGMLIB, is not recommended. If you did encrypt RBSPGMLIB, call Robot Technical Support to assist you with adding the necessary steps to the Disaster Recovery plan or Restoration Checklist to accommodate decryption and restoration of RBSPGMLIB at the hot site.
- If your operating system level is V5R2 or V5R3 and you use Robot Save encryption, you must have the IBM licensed program 5722AC3, Cryptographic Access Provider 128-bit for the IBM i, installed on the system to which you are restoring. The program is available on the IBM installation CD; if you are not sure the program is on the system, make sure this CD is available at the hot site.

  To restore the program, enter the following command:

  RSTLICPGM LICPGM(5722AC3) DEV(*optical_device_name***)**

You must restore the program before you restore RBSKEYLIB (see Step 10).

1. Before starting your restoration, obtain temporary security codes for all Robot products. Security codes are available by calling your Robot Regional Sales Manager.
2. Locate the following reports:
   - The most recent Robot Save printed Restoration Procedures report. The report lists the volumes you will need to use to restore your system. Locate these volumes and have them available for the restore process.
   - The Audit Report (RBS405).
   - The Saved Object List Contents Report (RBS407). **Note:** The Restoration Procedures report does not include object list restoration information; if you use objects lists as part of your backup strategy, you should have a copy of this report.
3. Follow the instructions for your system and environment in the IBM Backup and Recovery Guide to restore the Licensed Internal Code and the IBM i operating system.
4. Sign on to the console as QSECOFR.
5. Put the system into a restricted state.

6. Mount the volumes indicated on the Restoration report to restore the user profile data. Enter the restore user profile data command as shown on the restoration report.
7. Mount the volumes indicated on the Restoration report to restore your configuration data. Enter the restore configuration data command as shown on the restoration report.

   Note: If you are restoring to a disaster recovery test system, check with your disaster recovery personnel for the recommended value for the System Resource Management parameter before entering the RSTCFG command.

   Refer to your printed Restoration Procedures report for Steps 8 through 11.
8. Restore the Robot Save data library RBSDTALIB. Mount the volumes indicated and enter the restore command as shown on the restoration report. Specify *REWIND as the End of tape option.
9. Restore the Robot Save program library RBSPGMLIB. You may need to restore the library and then restore the changes to the library. Mount the volumes indicated and enter the restore commands as shown on the restoration report. Specify *REWIND as the End of tape option.
10. If you have encrypted data, restore RBSKEYLIB. It contains the encryption keys necessary to restore your encrypted data. Specify *REWIND as the End of tape option.

    Note: You must enter the encryption key that was used to save RBSKEYLIB.
11. Restore the library RBTSYSLIB. Mount the volumes indicated and enter the restore command as shown on the restoration report. Specify *REWIND as the End of tape option.
12. Add RBTSYSLIB to the system portion of your library list using the following command:

    CHGSYSLIBL RBTSYSLIB
13. Add RBSPGMLIB and RBSDTALIB to your library list. If you have save files that need to be restored, execute the command RBSRSTSAVF. This restores the data necessary to access the save files on your ASP. The data is stored in library RBSDTALIB.

    Note: If you are not sure whether you have any save files to restore, we recommend that you execute the RBSRSTSAVF command anyway.
14. If you are restoring your system on a system whose name differs from your regular system name, run the RSLCHGSYSN (Change System Name in Files) command to change the system name for the restoration process.

    RSLCHGSYSN BEFORE(*previous_system_name***) AFTER(***current_system_name***)**

    PRODUCT(ROBOTSAV)

    Do one of the following:

If you are using IBM commands only to complete the restoration (that is, you are not using Robot Save Guide System Restoration), do Steps 15, 16, 17, and 18. (**Note:** If you are restoring encrypted data, use Robot Save Guided System Restoration or the Robot Save restoration commands to complete the restoration. Although you can restore nonencrypted objects using the IBM restore commands, using Robot Save allows you to restore both encrypted and nonencrypted objects saved on the same tape.)

OR

If you are using Robot Save Guided System Restoration to complete the restoration, go to Using Robot Save Guided System Restoration to Restore. Read the note regarding AMLs and do Steps 19, 20, and 21.

Using IBM Commands to Restore

15. If you are restoring from a *NONSYS save, enter the following command using the tapes specified on the restoration report:

    RSTLIB SAVLIB(*NONSYS) DEV(*device_name***)**

    Note: The RSTLIB command will not restore any encrypted libraries. You must restore encrypted libraries separately using the Robot Save restore commands (located in RBSPGMLIB) after the *NONSYS restore completes.

16. Remove the Robot Save exit programs. Enter the WRKREGINF command and press Enter. On the Work with Registration Points panel, locate the following exit points, QIBM_QTA_STOR_EX400, format EX400200, and QIBM_QTA_TAPE_TMS, format TMS00200, and select them using option 8, Work with exit programs. When the Work with Exit Programs panel displays, use option 4 to remove the programs.

17. Enter the following command to restore your documents and folders:

    RSTDLO DLO(*ALL) SAVFLR(*ANY) RENAME(*SAME) RSTFLR(*SAME) DEV (*device_name***)**

    Or, select QDOC from the Robot Save Guided System Restoration Procedures panel.

18. If you save the Integrated File System (IFS), enter the following command to restore IFS files, using the parameter values shown in the Restoration report.

    RST OBJ(('/*') ('/QSYS.LIB' *OMIT) ('/QDLS' *OMIT)) SUBTREE(*ALL) ALWOBJDIF (*ALL) DEV('/QSYS.LIB/*tapedrive***.DEVD') VOL(***volume_ids***) SEQNBR(***sequence_ numbers***) LABEL(***label***) ENDOPT(*REWIND)**

    Or, select RBSSAVIFS from the Robot Save Guided System Restoration Procedures panel.

    Continue with Step 22.

    Using Robot Save Guided System Restoration to Restore

    Notes:

- If you are using a device that is not in Robot Save, you must define the device to Robot Save before continuing.
- If you have been using an AML at your original site, but do not plan to use an AML when restoring your system, we recommend you remove the device from the AML. This allows Robot Save to use the device as a standalone unit. Do the following to remove the device before continuing with the restore operation.
- Enter the command **RBSPGMLIB/RBS** to display the Robot Save Main Menu.
- Select option **7**, System Setup Menu.
- Select option **3**, AML Maintenance.
- On the Automated Media Library Maintenance panel, enter a **2**, AML Devices, next to the AML name.
- On the Automated Media Library Device Maintenance panel, enter a **3**, Remove from AML group, next to the device

Continue with Step 19.

19. Enter the command **RBSPGMLIB/RBS** to display the Robot Save Main Menu. Select option **5** to display the Automated Backup Setup Menu.
20. On the Automated Backup Setup Menu, select option **4** to display the Guided System Restoration Procedures panel.
21. Press **F22** to restore the items that were on the system when the last backup was performed. Robot Save tells you which volumes to mount and then restores libraries, document library objects, and the IFS automatically until all items and their changes are restored. When each item is restored, it is marked “RESTORED.”

    Continue with Step 22.
22. When all items and their changes are restored, enter the following commands on the system console to restore object authority for the objects:

    ENDSBS *ALL *IMMED

    RSTAUT USRPRF(*ALL)
23. If some objects were created after you last saved your user profile security data, the ownership of the objects is transferred to the system default owner. You can fix this problem by executing the command for each library that has this problem.

    RBSCHGOWN LIBRARY(*library_name***)**

    When you execute this command, Robot Save finds the object archive entry for each object in the library and changes the ownership to the object owner as of the last object save. This should take care of any lost owner problems.
24. If you use journaling, you will need to apply your journal receivers from the last time Robot Save saved the file. Execute the **DSPJRN** command on the file to find out when the file was last saved. Place the next sequence number in the FROMENT parameter of the **APYJRNCHG** command. Use ***LAST** for the ending sequence number.

25. Similarly, apply the journal receivers to all the appropriate files in your libraries.
26. If you need to restore an object list backup as part of your system restoration, you must have a backup of RBSPGMLIB that was saved after the archive job for the object list completed. You then can use the Robot Save Object Archive menus to restore the object list.
27. If you are restoring your system on a system whose name differs from your regular system name, run the **RSLCHGSYSN** (Change System Name in Files) command. This changes the system name for any other Robot products that are installed, as specified on the product parameter. Use the following command:

    RSLCHGSYSN BEFORE(*previous_system_name***) AFTER(***current_system_name***)**

    PRODUCT(*product_name***)**

    Press **F4** to select the product name.
28. When you have finished and everything looks normal, do a **PWRDWNSYS *IMMEDRESTART(*YES)**.

After you have finished restoring your system, enter license key information for your IBM applications and security codes for your Robot products. Review your setup to find any additional information you may need to re-enter. We also recommend that you review your hardware configuration on the new system.

Restoring Encrypted Objects

You can restore encrypted objects using the Robot Save restoration procedures or object archive menus. You do not need to enter the encryption key if the current default key is the same as the key that was used to save the data to tape. The restoration can be on the same system where the save took place or on a different system.

If you are not using the Robot Save menus to restore your data, Robot Save provides a series of restoration commands specifically for encrypted data. If you use the Robot Save restore encrypted data commands, you must know the encryption key. The following commands restore both encrypted and non-encrypted data on a tape:

RBSRSTLIB

The Restore Encrypted Library (RBSRSTLIB) command works like the IBM RSTLIB command and restores libraries that contain encrypted and non-encrypted objects.

RBSRSTOBJ

The Restored Encrypted Object (RBSRSTOBJ) command works like the IBM RSTOBJ command and restores encrypted and non-encrypted objects in a library.

RBSRST

The Restore Encrypted IFS Object (RBSRST) command works like the IBM RST command and restores IFS files that have been encrypted.

Notes:

- You cannot use the IBM restore commands to restore objects that have been encrypted by Robot Save. However, you can use the IBM restore commands to restore non-encrypted objects from a library that was saved with some encrypted objects.
- You can use the Display Tape (DSPTAP) command to view the contents of a volume that contains encrypted data. The command does not show which objects on the tape are encrypted.

Restoring Encrypted Data on Systems Without Robot Save

If you need to restore encrypted data on a system that does not have Robot Save installed or is at an earlier version of Robot Save, you can create a save file containing a subset of Robot Save programs and commands that allows you to restore encrypted objects without a current Robot Save license.

The Robot Save Create Restoration Subset (RBSCRTRST) command creates a save file that contains the programs and restore encrypted data commands required to restore encrypted data on a system that does not have Robot Save installed. You can send the save file to a vendor or another site to allow them to restore encrypted objects. You also should have the save file available when performing a complete system restoration in case you need to restore an encrypted library manually.

Notes:

- The restoration commands require that you enter the encryption key used to save the data. You must know the encryption key that was used at the time of the save before you can restore the encrypted data. If you have changed the encryption key, you may need more than one encryption key to restore all your data.
- The target system must have OS/400 V5R3 or higher installed.

Using IBM Media and Storage Extensions

Robot Save works with IBM Media and Storage Extensions (MSE) to allow you to free disk space on your IBM i system. You can use object list backups in conjunction with MSE to free the storage associated with the objects in the list.

Note: You should not use this function with your daily backups.

To take advantage of MSE, define your backup set with the Object Transfer option for the object list set to FREE. Save your object list using Robot Save. At the end of the save, only the object description remains on the IBM i; all data has been moved to tape.

You can free the following types of objects on your system: files (*FILE), ILE modules (*MODULE), programs, ILE service programs, Structured Query Language (SQL) packages, *DOC, *FLR, *LIB, *MENU, *QRYDFN, and IFS. However, only objects of the type *FILE with an attribute of PF can trigger the MSE restore process. For that reason, we recommend that you only free files. If you want to free any other type of object, be certain you understand what is in your libraries and the objects and processes necessary to restore the object list.

Then, using Robot Save, associate the object list with one or more freed files. When a user or application attempts to use a freed file, MSE requests Robot Save to restore the entire object list associated with it.

Free objects only during a save. This ensures that the objects are available for restoration. The tapes on which you have saved your freed objects should never be allowed to expire. If you reuse a backup set rotation that contains freed data, the data will be lost and cannot be restored.

Note: If your object list contains member names (that is, it was created in Robot Corral with the field List Members separately set to Yes) or is a folder list, the object list cannot be freed. This is an IBM limitation. See the Robot Corral User Guide for complete information on working with members in object lists or folder lists.

Object List Related to Freed Object Panel

The Object List Related to Freed Object Panel shows any object lists that have been associated with a freed object in Robot Save. You can use the panel to relate a freed object to an object list, change the object list related to an object, or delete the relationship between an object and object list. You can have the same object list related with any number of freed objects. Using any of the freed objects triggers the restoration of the related object list. Select option **6** from the Automated Backup Setup Menu to display the Object List Related to Freed Object panel.

Example

The following example describes a typical situation where you might use MSE to free file space.

Note: This is meant as an example only and may or may not be applicable in your organization.

Problem

Your company has a monthly process. You don't know the order in which it does its processing. However, you do know that all the files and objects needed by the process are found in the same library, MONTHLIB. The library is used only once a month so, to conserve disk space, you want to free the library and restore it only when it is needed.

Solution

- Using Robot Corral, build an object list of all the *FILE objects in the library that have an object attribute of PF.
- On the Object List Saved Within a Backup Set panel, specify you want to save this object list with Rebuild Option 1 (REBUILD) and Object Transfer Option 3 (FREE). Robot Save will build the object list before saving it and free the storage of the objects as they are saved.
- Save the backup set. This frees all the month-end database physical files.
- Relate each *FILE object saved to the object list name. You can do this one object at a time using the Object List Related to Freed Object Entry panel. Or, use the RBSRELATE command to relate all *FILE objects in the object list to the object list

  Note: If any relationships already exist for objects in the object list you specify on the RBSRELATE command, no new relationships will be created and a message will be issued.

When you next run your monthly process, any use of any of the freed files will trigger the restoration of the entire object list.

This function is transparent to the user and no programming is required to use it. If you use an automated media library, all tape handling is done automatically.

What to Do at a Hot Site

Do you know what to do with your Robot software if disaster strikes? Fortra Provides 24/7 support for the Robot product line.

If disaster strikes, how do I recover my Robot software? When I'm at our hot site testing the disaster recovery plans for our business applications, how do I activate the Robot products? Our Technical Support Consultants frequently field questions similar to these. First, let's look at the general considerations that apply to all the Robot products, and then at the special considerations that apply to a few of the products.

General Considerations

You are licensed to use the Robot products based on the model of your system and its unique serial number (permanent security code) or by a temporary date (temporary security code). You must call us for a temporary security code prior to using your Robot software on your disaster recovery systems.

If you are at your hot site because of a disaster, call 952-933-0609 at any time. A Technical Consultant will give you a temporary security code. This line is available 24 hours a day, 7 days a week. You should be aware, however, that outside our regular office hours, it might take us up to an hour to get back to you.

Regular office hours are:

- 7:00 A.M. to 6:00 P.M. CT, Monday through Thursday
- 7:00 A.M. to 5:00 P.M. CT on Fridays

Backup also is something you should consider for all the products. For a description of how to back up each of the Robot products, see, Backing Up the Robot Products, under the on our website. Each of the Robot products should be backed up. All products require your input to run properly on your system, so having the backup information available at your hot site will save you time.

Most people at a hot site restore from a full system backup, including network attributes. The hot site system is given the name of the host at the regular site. If you are at a hot site and restore the product user libraries for Robot Autotune, Robot Console, Robot Reports, Robot Save, Robot Schedule, or Robot UPS to a host system with a different name, you will have to run the command RSLCHGSYSN against these products. This command changes the internal fields that contain the old system name to the new system name.

Product-Specific Considerations

Robot Save

Before disaster strikes, make sure you review Robot Save's Audit Report every day. It takes only a few seconds to review this report for backup and recovery errors—critical information to know at your hot site.

When you go to your hot site, take the necessary documentation. We recommend that you bring the Robot Save User Guide and the IBM Backup and Recovery Guide. The IBM Backup and Recovery Guide tells you how to restore your IBM Licensed Internal Code (microcode) and operating system.

After you have loaded the IBM Licensed Internal Code and the operating system, use the Robot Save Guided Restoration Report and the Robot Save User Guide to recover your user data. Robot Save creates this report automatically after every backup and it details step-by-step instructions. Print and store this report with the backup media every day.

In addition, you should be aware that Robot Save places a copy of its database at the end of each complete set of backup tapes. You will find information about how Robot Save is set up and how to restore your system in the RBSDTALIB library.

Robot Autotune

We recommend that that you keep a “clean” copy of this product available and do a clean install at the hot site. In general, the size of the system and its memory setup will be different from the system in your regular data center. As a result, it is easier to do a clean install.

Robot Network

If you have two or more systems and use Robot Network in your data center, and you will use multiple machines at the hot site, bring along Robot Network. Depending on your circumstances, you may want to delete and reinstall the product to reflect the differences in the hot site and your regular site.

Reports

Reports

Robot Save provides a main menu option for printing reports. Select option **4** on the Robot Save Main Menu to display the Report Menu. From there, you can select the types of reports you want to print. You also can schedule Robot Schedule jobs to print the reports automatically at selected times.

System Reports

The System Report Selection panel lets you select reports detailing the information described in the Setup section of this manual. The System Reports are important to have as a record of how you set up Robot Save in case a system failure causes you to lose the system setup information.

The System Setup Information Report lists the system and media default information you defined during the initial installation of Robot Save. The Backup Class Information Report prints all backup class information, and includes backup sets, their basic and extended set

information, libraries, subsystems, and any text attached to the classes and sets. You can print four different versions of the Restore Procedure Report: for a system with damaged disk drive; for a system with damaged disk drive, but ASP not damaged; for restoration from a previous set of media volumes; or to replicate your current system configuration. The Libraries on System Report prints a list of all the libraries on the system, along with their size in bytes. The Library and IFS Objects Selected for Encryption Report lists all the objects on the system that have selected for encryption. The PC Client Administration Report prints PC client information such as the client ID, the directory list status, the most recent save date and time, and each backup class and set that save the PC. The PC Client Directory Setup Report prints a list of the directories on each PC defined to Robot Save.

Disaster Plan

Creating a Disaster Plan is described in the Disaster Planning section of this manual. After you create the plan, you should print copies of the entire plan to be kept both on-site and off-site. Print selected records of the plan to post where they can be read by those who may need to take emergency action. When you update the plan, you can print the entire plan or just the updated records.

Media Volume Reports

The Media Volume Report Selection panel allows you to select the reports described in the Save Media Management section of this manual. The media volume reports give you information about the media you've defined to Robot Save—where your tapes are located, tapes moving off-site or returning on-site, forecast how many tapes you'll need for the next run, what tapes you should use, when tapes will expire, and when they should be moved. You also can print a report detailing all the movement of tape volumes that use automated move sets. The Good Morning report gives you a summary view of system statistics each day.

Object Archive Reports

Use the Object Archive Report Selection panel to select the same report options described in the Object Archive section of this manual. You can print the Object Archive entries for all libraries and objects, all source files, all documents and folders, all PC clients, the Integrated File System (IFS), or Domino servers. Or, you can limit the report to a specific library, object, file, member, document, folder, PC, filename, or server. Or, use a generic name to limit the report to a group of entries whose names begin with the same letters.

Media Storage Reports

The Media Storage Report Selection panel allows you to print lists of all the containers, locations, and move sets defined to Robot Save. These are explained in the System Setup section of this manual.

Write Your Own Save Media Reports

You also can use Query or other report writers to write additional media volume reports. All volume data is contained in the file RBSTV in the library RBSDTALIB.

Printing Reports

To submit a job immediately to print a report, enter a **1** in the Opt column next to the report on the System Report Selection screen. You can choose from the following reports:

- Select the System Setup Information Report to print all the system, media, database, and save file defaults you have defined to Robot Save. These defaults are defined from the System Setup Menu.
- Select the Backup Class Information Report to print all Robot Save backup class information, including backup sets, their basic and extended set information, libraries to be saved, encryption status, objects to encrypt, subsystems to be terminated, and any text defined to the classes and sets. See the Setting Up Backups section for complete information about backup classes and backup sets.
- Select any of the four Restore Procedure Reports. The reports are very similar; however, each provides different information.
    - System with Damaged Disk Drive—Provides instructions to restore your system from backup tapes if your disk drives have been damaged.
    - System with Damaged Disk Drive, ASP not damaged—Provides instructions to restore your system from save files if a disk drive is damaged but your auxiliary storage pool (ASP) is not damaged.
    - From Previous Set of Media Volumes—Provides instructions to restore your system from an earlier set of backup tapes.
    - Replicate Current System Configuration—Provides instructions to restore the entire system with only the libraries that are on the system at the time the report is run.
- Select the Libraries on System Report to print a list of all the libraries on the system, along with their size in bytes.
- Select the Library and IFS Objects Selected for Encryption Report to print a list of all objects selected for encryption. The report includes each object; the library or object list it is in; the object type; the backup class; and, for library objects, whether the object was selected for encryption at the default or backup set level.

- Select the PC Client Administration Report to print PC client information. The report includes information such as the client ID, the directory list status, the most recent save date and time, and each backup class and set that save the PC.
- Select the PC Client Directory Setup Report to print a list of the directories on each PC defined to Robot Save.

Scheduling Report Printing

If you have Robot Schedule installed, you can schedule the printing of a report. To schedule a Robot Schedule job to print a report, enter a **2** in the Opt column next to the report. Robot Save displays the Robot Schedule Initial Job Setup panel. It has already filled in the job description information and the commands to run the report; all you need to do is enter when you want the job to run. Press **F1** on this panel for more help.

Volume Management

Reserved Volumes

You can reserve volumes for a specific system in a data center. Reserving a volume restricts the volume so it can be used only on the named system and not on any other system in the data center. When a reserved volume expires and is released back to the scratch pool, it remains reserved for the specified system. The volume cannot be reserved by another system until the reservation is removed. You must remove the reservation by selecting option **8**, Remove Reservation, from the Volume Options window.

Volumes from the scratch pool are used first for a backup. Robot Save uses scratch volumes reserved for a system and then uses unreserved scratch volumes.

Volumes can be reserved in two ways:

- Mark the volume as reserved
  - Use option **7**, Reserve for one system, on the Volume Options window. Use option **8**, Remove Reservation to release the volume so it can be used by any other system. You can mark volumes used in ad hoc operations as reserved for a system.
- Automatic reservation
  - If a volume contains unexpired data (from any backup class/set/rotation) and you select either option **9**, Remove Media Volume, from the Volume Options window, or move the entire rotation to the scratch pool, the volume is removed

from the rotation but is marked as reserved to the system where the removal was done.

- A volume that contains unexpired data and has been flagged as being in error is marked as reserved if you select option **1**, Ignore unexpired data, from the Error Resolution panel. This allows the volume to be used on the reserved system even though it contains unexpired data. We recommend that you do not use this option.

You cannot remove the reservation for volumes that have been reserved automatically by selecting option **8**, Remove Reservation. The volume must be used by another backup set or in an ad hoc tape operation; after it has been used, you can remove the reservation.

Volumes in Error

Volumes that have been flagged as being in error appear on the Media Volume Information panel and in the Good Morning report. The Status and Completion Inquiry panel also indicates that a warning message has occurred for the backup set. The Warning Message panel displays a message that the volume was in error.

Volumes that have error conditions are treated differently by Robot Save and ad hoc operations:

- If an ad hoc operation attempts to use a volume that previously has been flagged as being in error with unexpired data, the ad hoc operation proceeds to use the volume. However, the ad hoc operation will fail because the volume contains unexpired data.
- If a Robot Save backup attempts to use a tape that is write-protected or contains unexpired data, Robot Save skips the volume and continues the save using another volume (you must be using a stacker unit or AML). The volume containing the unexpired data is placed in error. Use Robot Save error resolution to resolve the error.

Ad Hoc Volume Operations

Volumes used in ad hoc operations are placed in the Adhoc Tape backup class and set by Robot Save. This allows Robot Save to track the volumes. A volume used in an ad hoc operation can be reserved for a system after it has been used. It also can be reserved for a system other than the one where it was used.

Robot Save tracks the expiration date of volumes used in ad hoc operations. If a volume contains data from more than one ad hoc operation, Robot Save tracks the greatest expiration date. This prevents active data from being overwritten.

Ad hoc volumes in an AML are assigned a location by Robot Save. Volumes that are not in an AML are not assigned a location, although you can assign a location to the volume.

Robot Save can release expired volumes that were used in an ad hoc operation to the scratch pool if you have specified the option on the Media Defaults panel. You also can select option **9**, Remove Media Volume, from the Volume Options window to release both expired and unexpired volumes to the scratch pool. If the volume contains unexpired data, the volume is reserved for the system on which the removal was done. If the volume has expired, it is not reserved.

If you do not use a scratch pool, an expired volume is completely removed from Robot Save. To remove the volume, you must select option 9 from the Volume Options window; a volume cannot be released automatically without a scratch pool.

When you perform an ad hoc operation:

- Volumes in the scratch pool can be used for any ad hoc operation
- Volumes assigned to a Robot Save backup class, set, or rotation cannot be used.

Adding Volumes to a Scratch Pool

You can add volumes to the scratch pool in several ways:

- Remove a volume from a backup class/set/rotation using option 9, Remove Media Volume from the Volume Options window.
- Initialize a volume using Robot Save
- Initialize a volume using the IBM Initialize Tape (INZTAP) command
- Use the Robot Save Add Volumes to Robot Save (RBSADDVOL) command
- Release a volume to scratch from a move set that has a location flagged as Release Scratch=Yes
- Use the RBSAMLLRN command to add volumes in an AML to the scratch pool

Assigned Volumes

- Volumes are assigned to a backup set that has the same media type as the volume
- Scratch tape pool volumes are unassigned
- Volumes that are completely unknown to Robot Save (have not been initialized) are considered Unknown

Initializing Tapes

Use the following guidelines when initializing tapes:

- Duplicate volumes are not allowed. You cannot initialize a volume with the same volume ID as an existing volume, regardless of the media type of the volumes.
- If you use a scratch pool, initializing a tape places it into the scratch pool.
- The Allow blind initialization field on the Media Defaults panel allows you to specify if you will allow tapes to be initialized using the INZTAP CHECK(*NO) VOL (*MOUNTED) command. If you specify Y (Yes) in the field, tapes can be initialized and data can be overwritten. Robot Save is shipped with this field set to N (No). Tapes are checked and will not be initialized if unexpired data is found.

Volume Use Hierarchy

Robot Save uses the following hierarchy when selecting the volumes to be used for a backup:

1. Media type.
2. Volumes reserved for a system.
3. AMLs Only: Location defined by the AML. IBM AMLs require that volumes be in the Robot Save category.
4. Number of times the tape has been used; newer tapes are used first.
5. Alphabetical order by volume ID.

You can append to the end of a tape used in a previous save.

- Ad hoc operations—the next operation just uses the same tape.
- Robot Save backup—use alternate sets to append to the tape.

Logical Naming Method

If there are volumes assigned to the rotation, those volumes must be used before any others can be assigned automatically.

- Assigned volumes must be used in the order they were attached (they cannot be used out of order).
- If an unassigned volume is mounted, you will receive an error and the save will not be allowed to continue until the assigned volume is loaded.
- If you are using a stacker, the unassigned volume will be unloaded and the next volume in the stacker unit will be loaded. This will continue until all volumes in the stacker have been checked.

If no volumes are assigned or all assigned volumes have been used:

- The mounted tape's volume label does not exist in Robot Save:
  - The volume is initialized with the next available logical name in the set/rotation.
  - The volume is added to the set/rotation
- The mounted tape exists in a scratch tape pool:
  - You will receive a warning message telling you that scratch tapes cannot be used with logical volume naming.
- The mounted tape exists in another set/rotation:
  - A warning appears stating the volume is attached to another set rotation.

If the mounted volume has active files:

- You cannot use the volume.
- The volume will be marked in Error.

Note: For Logical, Serial, and Manual Naming:

If you want to prevent Robot Save from automatically initializing tapes that currently are not defined to Robot Save, use the RBSNOAUTO command to disable automatic initialization. You might want to do this if the same media type is being used by more than one computer system (for example, an IBM i and a mainframe) and the possibility of confusing tape volumes exists.

Serial Naming Method

If there are volumes assigned to the rotation, those volumes must be used before any others can be assigned automatically.

- Assigned volumes can be used in any order.
- If an unassigned volume is mounted, you will receive an error and the save will not be allowed to continue until the assigned volume is loaded.
- If you are using a stacker, the unassigned volume will be unloaded and the next volume in the stacker unit will be loaded. This will continue until all volumes in the stacker have been checked.

If after all assigned volumes have been used or, if you do not assign volumes:

- The mounted tape exists in the scratch tape pool:
  - The volume is removed from the scratch tape pool.
  - The volume is changed to the set/rotation.
- The mounted tape exists in another serial set/rotation:
  - You cannot use the tape.
- The mounted tape exists in a logical or manual set/rotation:
  - You cannot use the tape.
- The mounted tape's volume label does not exist in Robot Save or it is unreadable:
  - The volume is initialized with the next available serial number assigned by the system.
  - The volume is added to the set/rotation.

If the mounted volume has active files:

- You cannot use the tape.
- The volume will be marked in Error.

Manual Naming Method

If the volumes are assigned to the rotation, those volumes must be used before any others can be attached automatically.

- Assigned volumes can be used in any order.
- If an unassigned volume is mounted, you will receive an error and the save will not be allowed to continue until the assigned volume is loaded.
- If you are using a stacker, the unassigned volume will be unloaded and the next volume in the stacker unit will be loaded. This will continue until all volumes in the stacker have been checked.
- If you are using an AML, the assigned volumes will be moved to the UNKNOWN location if they are not in the AML and scratch volumes will be used so the backup will not stop.

If, after all assigned volumes have been used or, if you do not assign volumes:

- The mounted tape exists in the scratch tape pool:
  - The volume is removed from the scratch tape pool.
  - The volume is assigned to the set/rotation.
- The mounted tape exists in another set/rotation:

        - You cannot use the tape.
    - The mounted tape's volume label does not exist in Robot Save:
        - The volume is assigned to the set/rotation.
    - The mounted tape has a bpi inconsistency with the tape device or has an unreadable label:
        - A window displays asking you to enter a name (this occurs only on a single cartridge drive; it does not display if you are using a stacker unit or AML). If the save is running in batch, a message is sent to the designated message queue.
        - The volume is initialized with the specified name.
        - The volume is assigned to the set/rotation.

If the mounted volume has active files:

- You cannot use the volume.
- The volume will be marked in Error.

If the volume is not known to Robot Save, has not been initialized, and RBSNOAUTO is set to No:

- The backup set does not have any volumes attached.
- You are using a non-AML drive.
    - The volume will not be used.

Data Sets

Data Sets

Robot Save handles ninety-nine percent of the items you want to save. However, if you have a special situation where you need to save something that can't be defined using Robot Save panels, Robot Save supports the use of data sets. For example, you might use a data set tape operation if you regularly create duplicate volumes using the CPYTOTAP command.

Robot Save handles data set tape operations just like other save operations. You can code data set commands in a program and Robot Save automatically records volume usage, initializes tapes with the appropriate volume names, and enforces all rules for volume usage. In addition, Robot Save gives you the option of entering object archive entries for the objects that were saved.

You can use data sets in the following ways:

From inside Robot Save:

Use a user-written program to supply Robot Save with the unique save commands that Robot Save cannot generate to save the data. The backup set must be in a Data Set-type backup class. Enter the program name on the Extended Backup Set Information panel as the Data Set program. The backup set executes like any other Robot Save backup. When the backup runs, Robot Save acts as if a normal backup is running, except that it uses your program to execute the actual save commands instead of generating them.

Note: Commands supported during the processing of a Data Set-type backup are limited to commands that begin with "SAV" such as, SAVLIB, SAVOBJ, SAVDLO, SAV, and so on. A non-inclusive list of unsupported commands includes: RBSDUPROT, DUPTAP and INZTAP.

From outside Robot Save:

If you have a product that performs its own backups and therefore cannot be saved by a regular Robot Save backup set, you can use a data set to record its volume usage. Use the RBSRECORD command before running your product's backups. All volume activity will be tracked as the product performs its backups. When the backup completes, use the RBSRECEND command to end the volume monitoring. If your product's backup is scheduled using a job scheduler, place the RBSRECORD command in the scheduled job before the product runs and the RBSRECEND command after the product finishes its backup. If you run the product's backups interactively, run the RBSRECORD command from a command line before starting the backup, and the RBSRECEND command after the backup completes.

Note: Before you set up a data set backup class and backup sets, we recommend that you contact Robot Technical Support. Robot Save offers several options for backing up and tracking your data, and we can help you determine which method is the best to use.

Robot Save Manages Your Data Set Programs

You can enter the data set program name in your backup set definition. Then, when the RBSSave command for that backup set is run, it executes your data set program. This gives you the following advantages:

- You can schedule the data set program on Robot Schedule from the Backup Set Definition Maintenance panel.
- You can run the data set program from the Backup Operations Menu.

Note: When you use data sets in this way, do not use the RBSRECORD and RBSRECEND commands in your program.

You also can create data set-type backup sets just to manage tapes manually and not to execute data set programs. Robot Save allows you to update the tape volume usage by changing the usage date of the backup set's rotation.

Related Topics

- Data Set Commands
- Robot Save as Alternative to Data Set Programs
- Adding Existing Volumes to Data Sets
- Examples of Data Set Sources

Data Set Commands

Data Set Commands With No Volume Restrictions

Robot Save provides the following commands to record the volumes used in a data set save performed outside of Robot Save:

- **RBSRECORD** Track volumes saved outside of Robot Save.
- **RBSRECEND** End the volume tracking.

The procedure below allows you to record volumes used when a tape operation command is run from a command entry panel. If you want to restrict a user to predefined volumes for a tape operation, you must code a CL program with the commands RBSMTMSG, RBSSVSMSG, RBSSRTVBSD, and RBSUPDBSD.

1. On a command entry line enter the RBSRECORD command. In this example, the command is entered as follows:

   RBSRECORD CLASS(PROGRAMMER) SET(DAVEJ)

   This command allows you to use any unexpired tape in a tape operation and have it recorded in the tape management system of Robot Save. It also creates save status messages and an object archive entry.
2. Enter the SAVLIB command on a command entry line. In the example, the command is entered as:

   SAVLIB (DAVEJLIB) (TAP07)

   This command executes the save of the library to the tape mounted on the save device entered.
3. After the save is complete, enter the RBSRECEND command on a command entry line.

   RBSRECEND

You must enter this command or the tape usage recording process will not take place.

Data Set Commands to Restrict Volumes

Use the following commands to interface your tape operation programs with Robot Save's tape management system to restrict volumes:

- **RBSRTVBSD** Retrieves information stored on your Backup Set definition. Use the information in the execution of your save or restore commands.
- **RBSRTVBSL** Retrieves a list of all the libraries, along with their save codes, associated with a backup set. Use this information to save multiple libraries on a single save command.
- **RBSRTVSES** Retrieves information about the current backup session, including output file information that is required to generate object archive data.
- **RBSMTMSG** Sends a message telling the operator what volumes to get.
- **RBSUPDBSD** Updates the volumes used information in the Backup Set rotation. This updates all the information needed by the Robot Save tape management system.
- **RBSSVSMSG** Updates Robot Save Save Status Messages.
- **RBSMRKPRT** Marks volume labels used in tape operation for printing.

Robot Save as Alternative to Data Set Programs

Having Robot Save perform the save rather than using your data set program provides the following advantages:

- You don't have to code the save commands in your program.
- Robot Save makes entries in the Object Archive for the objects saved.
- Robot Save intercepts the operating system messages and tells the operator what to do.
- Robot Save can use Robot Alert to send a pager or email message on a tape wait.

Robot Save saves libraries, objects, the IFS, IFS Groups, documents, folders, Domino servers and transaction logs. You also can do the following to save information:

1. Create a dummy library—for example, DATASETLIB.
2. Create a backup set with DATASETLIB as its only library to save. The set must belong to a Save Only, No Restore-type class.

3. Create a before-save user program that creates a duplicate customer master file (also duplicate the data) into the DATASETLIB. You want to save the customer master to tape. Enter the program name into the backup set definition.
4. Create an after-save user program that clears the dummy library DATASETLIB. Enter the program name into the backup set definition.

When the backup set is executed, the before-save program creates a duplicate of the customer file into DATASETLIB. Robot Save saves the file in the library and updates the tape management files for you. After the save is complete, your after-program clears the DATASETLIB and everything returns to normal. An object archive entry is available for the file.

Adding Existing Volumes to Data Sets

All volumes used by the tape management system should be initialized by Robot Save to eliminate possible errors. The exception to this rule is when you are managing tapes created before you had Robot Save. To record these volumes into a backup set rotation so that they can be man- aged, Robot Save gives you two commands:

- Use the RBSRDVOLTP command if the volume is available on-site. Robot Save reads and records the volume name into the rotation for you.
- Use the RBSADDVOL command if the volume is not available on- site. Add the volume name into the rotation with this command.

After you have recorded all pre-existing volumes in the tape management system, you should restrict authority to these commands. For further explanation of these commands, see Robot Save Commands.

Examples of Data Set Sources

The source file RBSSRC in library RBSPGMLIB is shipped with Robot Save and contains examples of how to use data set commands. Use it as a reference source when coding your own data set programs. You can find the following source members illustrating data sets in RBSSRC:

EXAMPLE1—EXAMPLE9

Sample source members (not compiled programs) that illustrate using the RBSRECORD command and generating history for a save performed outside of Robot Save. These are not data set program examples.

RBS98EXMPL

A data set program example source member (not a compiled program) that is a framework of the data set command for a simple SAVOBJ command.

RBS99EXMPL

A data set program example source member (not a compiled program) that is similar to RBS98EXMPL (above), but restores a file, uses it, and saves it again.