

Disk Space Manager

Reference Manual

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Toronto, Ontario, Canada

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The logo for American Top Tools features the word "American" in a bold, black, sans-serif font. To its right, the words "Top" and "Tools" are stacked vertically. The letters "T" and "T" in "Top" and "Tools" are stylized with horizontal blue stripes. The word "American" is positioned to the left of the "T" in "Top".

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What's New

Release 5.0 of DSM is a major enhancement of the system. If you are currently using Release 2.4, these are the most noticeable modifications:

1. DSM can now run under security level 40. Twenty six of the twenty eight reports, eight of the nine reclaim space commands and all compress/decompress functions now work under this security level.

If and when IBM issues an API to cover the missing points (spool files and journals), a PTF will be issued to make DSM completely compatible with security level 40.

2. An option has been added to compress and decompress physical files and programs, and to analyze the savings, resulting from these compressions. Physical files represent generally a high percentage of the total disk space used.
3. The menus were reorganized as the compress decompress options grew from 5 to 10.
4. Users can now save the options selected to run the disk space analysis and the reclaim space analysis under an analysis code, and then reused those options later on. In this way, users can create multiple analysis codes to cover different types of analysis. This simplifies the task of repeating a given analysis.
5. An option has been added to analyze folders and documents
6. The system manual has been updated throughout.

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Chapter 1 - Introduction to DSM

1.1 General concepts

The Disk Space Manager (DSM) developed by Interdata Systems is a system utility that runs on AS/400 computers under OS/400 Version 3 Release 1 Modification 0 or later.

DSM is a useful tool for managing your system resources. It acts as an Inventory Management system for the DP department in which the stock items are the system objects.

With DSM you can:

- Analyze disk space usage by:
 - Libraries
 - Objects
 - Groups of objects
- Estimate the disk space savings before you use reclaim disk space techniques.
- Reclaim disk space using either space compression techniques or selective delete of unnecessary data.
- Perform operations on compressed source data.
- Analyze the historical evolution of the size of libraries and physical files and forecast your future disk space requirements.

Manages ALL or selected objects

The disk space and reclaim space analysis can be done globally for the whole machine or can be restricted to certain objects.

This analysis is important in helping to manage the inventory of objects as any AS/400 contains tens of thousands of objects. Many of these objects (e.g., IBM supplied system objects) do not need to be included in the analysis because they cannot be compressed or deleted. By excluding them from the processing run, DSM can print more compact and meaningful reports.

Identifies Duplicate and Damaged Objects

Two important groups of objects are duplicate objects and damaged objects. With DSM, you can print reports that include only these objects.

Duplicate objects are important to identify because in most cases they represent wasted disk space. Old objects that have been duplicated for an emergency test sometimes stay in the system permanently because no one dares to delete them for fear of deleting important data.

Damaged objects are a very rare occurrence. It is, however, recommended to run at least a monthly check to find out if any object has become damaged, before it is too late.

Operating considerations

Given the large amount of data the system needs to inspect for a disk space analysis or a reclaim disk space analysis, these jobs generally take a long time to run. Therefore, they must run in batch mode. Because the system environment changes continually in an active system, they should be run as overnight jobs when less changes are likely to occur.

1.2 Differences of interpretation between DSM and the operating system

To give you a better picture of the status of the system, DSM uses the following terminology that deviates from the operating system interpretation.

- Date when a library was last used

If you display/print this value using the system DSPOBJD command, you will obtain a blank value. DSM prints in this field the latest date that any object that belongs to the library was used. This concept is useful when you try to determine which libraries are obsolete.

- Size of a library

The DSPOBJD command indicates as the size of the library the size of the object in QSYS that describes the library. This object contains the description of each object but not the objects. Therefore this size is usually a very small percentage of the real size occupied by the library.

When DSM refers to the size of a library it is the sum of the library descriptor plus ALL objects in the library. For example, if you delete the library, the space that you free is identical to the library size indicated by DSM.

- PF attribute for files

Physical files are identified by the system as objects type *FILE with the attribute PF. This identification is insufficient for DSM because source and data physical files behave differently.

DSM identifies source physical files with the attribute PF-SRC and data physical files with the attribute PF-DTA. This is compatible with PDM (Programming Development Manager) on the AS/400.

1.3 DSM commands

All DSM options can be executed either by selecting a menu option or by typing a command. By using DSM commands, you can execute any DSM operation from inside a CL program by incorporating the DSM command in the program.

1.4 Customizing DSM

The display files, commands, and the DSM manual are supplied as members of the source file QTXTSRC. You can modify these members to change the headings and text. This is particularly useful for non-English speaking users.

The same applies to the messages issued by DSM. They can be found in the message file QDSMMSG.

Before customizing DSM read the instructions in member \$\$README in file QTXTSRC.

Chapter 2 - Starting the system

This chapter describes how to start the Disk Space Manager (DSM) and describes the various options on the DSM main menu. After adding the library for DSM (typically DSMLIB) to your library list, type:

STRDSM

The DSM main menu appears as follows:

```

DSM000M                               :Disk:Space:Manager:

Select one of the following:

      Option      Function      Command
      1.   Disk Space Analysis      DSKSPCANL
      2.   Reclaim Disk Space Analysis RCLSPCANL
      3.   Compress and Decompress    STRDSM 3
      4.   Other Reclaim Space Functions STRDSM 4
      5.   Auxiliary Functions        STRDSM 5

      90.  Sign off                  SIGNOFF

                                           Release level 5.0 M00
Selection or command      Copyright (c) 1989, 1999 Interdata Systems Inc.

===> _____
_____

```

The five main options on this menu are described below.

2.1 Disk Space Analysis

Select option 1 to print the disk space analysis reports. When you call this option from this menu, the system executes the command DSKSPCANL using all the defaults.

This command calls an online program that lets you enter a set of values to specify:

- The objects you want to include/exclude from the analysis
- The reports you want printed
- How to format these reports - page breaks, subtotals, etc.

Once you have entered these values, you may want to save them for another time. To do this you specify an analysis code. The analysis code is the name under which all these values are saved.

You can have as many analysis codes as you want. There is a small description associated to each analysis code to help you identify the purpose of the analysis code.

The DSKSPCANL command has the following parameters:

2.1.1 Analysis code

Specifies which analysis code must be pre-loaded when the program called by this command displays.

If you select *NONE no options will be pre-loaded. The DSM defaults will display.

2.1.2 Hold reports in the spool

Some of the reports produced may be quite large. You may choose to hold them in the spool to display them before printing or to print selected pages only. Use this option to specify whether the reports produced must be held in the spool.

2.1.3 Update DSM history

You can save the size of all libraries and physical files in your system. These values can be used later to print a report showing the historical trend of space usage by the system.

Each time you update the history a new member is added to the physical file HIST0 in the DSM library. The name of the member is the letter H followed by the date when the update was done in the format CYYMMDD where:

C is the century in standard IBM format.
0 for years between 1940 and 1999
1 for years between 2000 and 2039

YYMMDD is the date in the year/month/day format

For example if you update the history on January 27, 1992 the member added to the history file is named H0920127.

The data saved in the HIST0 file is processed by option 1 of the DSM - Auxiliary functions menu. If you want to write your own programs to process the historical data you can use the command DSPFFD to determine the record layout of the HIST0 file.

2.1.4 Save DSM work files

Specify whether the work files created in this run should be saved or discarded after the reports are printed.

During the run DSM uses several work files to generate the information to print. These files are created in the temporary library QTEMP and are therefore deleted at the end of the run.

Two of these files (DLIB0 and DOBJ0) contain the information about the libraries and objects processed. If you choose to save the work files, DSM copies these temporary files to the database files with the same name existing in the DSM library.

You can write your own programs to process the data in DLIB0 and DOBJ0. Please remember that when DSM saves the work files it replaces the existing data in

DLIB0 and DOBJ0 with the new data. Therefore the old data is lost. If you want to write some comparison reports you must first save DLIB0 and DOBJ0 to other database files.

To determine the record layout of these files use the DSPFFD command.

2.1.5 Display selection panel

The DSKSPCANL command can be run interactively or from a batch job. When the job is run from batch you cannot display the selection panels. Even when you run the command online you do not need to display the selection panels if you want to use an existing analysis code and you do not want to make any modifications.

The DSKSPCANL command displays the selection panels if you choose the option SELECT(*YES). See Chapter 3 for information on how to enter the values that define the run.

2.2 Reclaim Space Analysis

Select option 2 to print the reclaim space analysis reports. This is a What if analysis of the objects on your system. When you call this option from this menu the system executes the command RCLSPCANL using all the defaults.

This command calls an online program that lets you enter a set of values to specify:

- The objects you want to include/exclude from the analysis
- The reports you want printed
- How to format these reports - page breaks, subtotals

You can use an analysis code to save this set of specifications as well. The disk space analysis and reclaim space analysis codes are kept separately. Therefore you can have the same name for a disk space analysis code and a reclaim space analysis code.

The RCLSPCANL command has the following parameters:

2.2.1 Analysis code

Specifies which analysis code must be pre-loaded when the program called by this command displays.

If you select *NONE no options will be pre-loaded. The DSM defaults will display.

2.2.2 Hold reports in the spool

Specifies whether the reports produced must be held in the spool.

2.2.3 Display selection panel

The RCLSPCANL command can be run interactively or from a batch job. When the job is run from batch you cannot display the selection panels. Even when you run the command online you do not need to display the selection panels if you want to use an existing analysis code and you do not want to make any modifications.

The RCLSPCANL command displays the selection panels if you choose the option SELECT(*YES). See Chapter 3 for information on how to enter the values that define the run.

2.3 Compress and Decompress

Select option 3 to display menu DSM300M - Compress and Decompress. Using the options of this menu you will be able to reduce the size of physical files and programs.

2.4 Other Reclaim Space Functions

Select option 4 to display menu DSM400M - Other Reclaim Space Functions. Using the options of this menu you can delete any useless objects.

2.5 Auxiliary Functions

Select option 5 to display menu DSM500M - Auxiliary Functions. Using the options of this menu you can work with historical data and display/print DSM documentation.

Chapter 3 - Disk space analysis

This chapter describes how you can use DSM to analyze the usage of disk space by libraries, objects and group of objects.

When you select option 1 of the DSM main menu or enter the command DSKSPCANL with the option ANLCODE(*NONE) and SELECT(*YES) the following panel displays:

Disk Space Analysis	Select
Analysis code retrieved	<u>*NONE</u>
Description	_____

Type choices, press Enter.	
Define processing parameters . .	<u>1</u> 1 Libraries to process
	2 Object types and attributes
	3 Objects to process
	4 Report selection and options
Save parameters under	
analysis code	<u>*NONE</u> Name or *NONE
Description	_____
Hold reports in the spool . . .	<u>*YES</u> *YES or *NO
Note to print on reports . . .	_____
Update DSM history	<u>*NO</u> *YES or *NO
Save DSM work files	<u>*NO</u> *YES or *NO
Help F3=Cancel job F5=Refresh F8=Submit job F9=Retrieve analysis code F12=Save parameters and return	

If you pre-loaded an analysis code (by specifying it in the ANLCODE parameter of the DSKSPCANL command), that analysis code and its description are displayed in lines 2 and 3.

If you have not chosen any analysis code or if you want to change the code chosen press F9. A window displays up to five analysis codes on file. For example:

Update DSM history

The yes or no value for this field reflects the choices you made in the DSKSPCANL command. You can accept the value or change it.

Save DSM work files

The yes or no value for this field reflects the choices you made in the DSKSPCANL command. You can accept the value or change it.

Note to print on reports

The field Note to print on reports lets you enter a 30 character long field that prints on the top right corner of every page of every report. This option enables you to further identify the run with an appropriate comment.

3.2 Libraries to process

Disk Space Analysis		Libraries to process			
Libraries to include .	*ALL	_____	_____	_____	_____
		_____	_____	_____	_____
		_____	_____	_____	_____
		_____	_____	_____	_____
Minimum library size	<u>0</u>	in megabytes			
Libraries to exclude .	*NONE	_____	_____	_____	_____
		_____	_____	_____	_____
		_____	_____	_____	_____
		_____	_____	_____	_____
Special values	*ALL	All libraries			
	*NONE	No libraries			
	*SYSLIB	System libraries. All libraries with names starting with Q or Ñ			
	GENERIC*	All libraries with names starting with the GENERIC string (Example - ABC*)			
Help	F5=Refresh	F12=Return			

Including and excluding libraries

This panel lets you specify which libraries to include or exclude from the run. You can enter up to 25 libraries to include or to exclude or use the special values indicated at the bottom of the panel to specify groups of libraries.

There could be an overlapping of libraries in the include and exclude range because of the use of generic names. Example - you can specify that library ABCD must be included and that libraries AB* (meaning all starting by AB) must be excluded.

Processing rules:

If a library is specifically named in the include range (no generic values), the library is included. If it is specifically named in the exclude range, it is excluded. Therefore in the example, library ABCD would be included.

When a library name satisfies a generic range it will be included if and only if it satisfies an include range and does not satisfy an exclude range. The classic case is to specify *ALL in the include range and *SYSLIB in the exclude range (*SYSLIB is equivalent to Q* plus Ñ*). To exclude *SYSLIB means to exclude all libraries that start with a Q or a Ñ.

For example, library XYZ325 satisfies the include range and is outside the range specified in the exclude range. Therefore library XYZ325 is included in the report. However library QRPG satisfies the include range but also satisfies the exclude range. Therefore QRPG is excluded.

Examples:

A few practical examples are:

- Include all non system libraries. Specify *ALL in the include range and *SYSLIB in the exclude range.
- Include all libraries except QSYS. Specify *ALL in the include range and QSYS in the exclude range.
- Include all non system libraries and also include the system libraries QGPL and QSPL. Specify *ALL, QGPL, and QSPL in the include range and *SYSLIB in the exclude range.

Minimum size

You can also specify a minimum size for the libraries to include.

After all libraries have been selected based on the include/exclude parameters a second pass is made to check the library size. All libraries with a size smaller than the minimum size specified are excluded. You can avoid excluding any library by size if you specify a minimum size of zero.

An object will be included in the duplicate objects run if and only if another object with the same name exists in another library.

An object is classified as damaged when the system sets up the appropriate flag. Only damaged objects will be included in the run if you enter *YES in this field.

3.5 Report specifications

Disk Space Analysis			Report selection			
Maximum level of detail	*-- Report Code	*-- Report Selected	*----- MajorField	Sorting 2ndField	sequence 3rdField	-----* MinorField
Library name	1	*YES	Libr name			
Object type	2	*YES	Obj type			
	3	*YES	Libr name	Obj type		
	4	*YES	Obj type	Libr name		
Object atribt	5	*YES	Obj type	Obj atribt		
	6	*YES	Libr name	Obj type	Obj atribt	
	7	*YES	Obj type	Obj atribt	Libr name	
Object name	8	*NO	Libr name	Obj type	Obj name	
	9	*NO	Libr name	Obj type	Obj atribt	Obj name
	10	*NO	Libr name	Obj name	Obj type	Obj atribt
Select report code . . __			Unselect report code . . __			
Help	Roll up=More reports		F12=Return			

This panel lets you select the type of reports to print. There are eighteen reports you can select (ten from this panel and eight more from the panel below, that you can access using the Roll up key).

Disk Space Analysis				Report selection		
Maximum level of detail	*-- Code	Report -* Selected	*----- MajorField	Sorting 2ndField	sequence 3rdField	-----* MinorField
Object name	11	*NO	Obj type	Obj name		
	12	*NO	Obj type	Libr name	Obj name	
	13	*NO	Obj type	Obj atriibt	Obj name	
	14	*NO	Obj type	Obj atriibt	Libr name	Obj name
	15	*YES	Obj name	Obj type	Obj atriibt	Libr name
	16	*NO	Obj owner	Obj name		
	17	*NO	Obj owner	Libr name	Obj type	Obj name
	18	*NO	Obj owner	Obj type	Libr name	Obj name
Select report code . . __				Unselect report code . . __		
Help	Roll down=Page back		F12=Return			

Maximum level of detail

The major consideration when selecting a report is the maximum level of detail. The first seven reports are summary reports. The maximum level of detail is either the library name, the type or the attribute.

The last eleven reports are detailed reports. The maximum level of detail is the object. The reports list every object in the range selected.

For example, in report no. 1 the maximum level of detail is the library name. This means that the size of all objects in the library will be accumulated. Each library will print a single line in the report.

Sorting sequence

After the level of detail, select the sequence in which you want the report printed. The sequence of the report is controlled by the sorting fields. There are up to four sorting fields.

For example, reports no. 5 and 7 both summarize the objects by type/attribute. But in report no. 5 the system prints one line for each type/attribute while in no. 7 it prints one line for each type/attribute and library.

Report No. 7 is more detailed than no. 5 as it indicates how much space is used by each type of object/attribute in each library.

Use the two fields at the bottom to select a report for printing or to unselect a report already selected.

Printing options

When you select a report, DSM displays another panel where you enter a few options to control the printing of that report. Not all options are available for all reports. DSM only displays the options that are allowed for each report selected.

Disk Space Analysis	Report options
Report code selected	6
Maximum level of detail	Object attribute
Sorting sequence - Major field . . .	Library name
Second field. . .	Object type
Third field . . .	Obj attribute
Minor field . . .	

Printing options for the report	
Sequence libraries by	*SIZE *NAME or *SIZE
Change page when library name changes	*NO *YES or *NO
Print subtotals by object type . . .	*YES *YES or *NO
Number of copies to print	1 1 to 99
F5=Refresh	F12=Return

These options refer to

- How to sequence libraries and/or objects.

The conventional method is to sequence them by name. However this is not very useful if you are concerned about space savings. To save space the most important libraries or objects are the larger ones.

You can list these first if you enter *SIZE as the sorting sequence. DSM will list the libraries or objects in descending sequence by size. The larger libraries or objects will list first.

- When to change pages

To make the report more compact, you may not want to force a new page whenever a given control field changes (Example - a library name).

But in some instances you may want to print a report and send the pages that refer to a certain library to its owner for analysis. In this case, select *YES whenever the option Change page when library name changes is available.

- What kind of subtotals to print

Subtotals give you a better perspective of the space occupied by the objects. They also increase the size of the report.

You can have up to three levels of subtotals (depending on the report). Enter *YES if you want the subtotals printed. Otherwise enter *NO.

- How many copies to print

Enter the number of copies from 1 to 99

3.6 Submitting the job

After you define the options you selected you return to the Select panel. You must press one of the function keys listed to end the job:

F3 Cancels the job.

F8 Submits the job using the job description DSMJOB. Your selections will be saved in the analysis code specified (if you have specified one).

F12 Saves the parameters selected under the analysis code (if you have specified one). The disk space analysis job will not run.

If you want to save the parameters selected under an analysis code and this code already exists, DSM issues a warning message and asks you to confirm your selection or return and change the analysis code.

3.7 Special considerations

DSM only includes in the reports, external system objects. These are the objects you can list when you use the DSPLIB command.

The AS/400 also has a large number of internal system objects that are required for the system to function and temporary objects that are removed when users sign off (such as the QTEMP libraries) or in the next IPL.

These objects are not included in the reports. If you include all libraries and all objects in a report, the total size of all objects is smaller than the total amount of disk space used.

Chapter 4 - Reclaim disk space analysis

This chapter describes how you can use DSM to perform a What if analysis on the objects of your system.

To run the Reclaim disk space analysis, select option 2 from the main menu. The following panel displays:

Reclaim Space Analysis	Select
Analysis code retrieved	<u>*NONE</u>
Description	_____

Type choices, press Enter.	
Define processing parameters . .	<u>1</u> 1 Libraries to process
	2 Object types and attributes
	3 Objects to process
	4 Report selection and options
Save parameters under	
analysis code	<u>*NONE</u> Name or *NONE
Description	_____
Hold reports in the spool . . .	<u>*YES</u> *YES or *NO
Note to print on reports	_____
Help F3=Cancel job F5=Refresh F8=Submit job F9=Retrieve analysis code	
F12=Save parameters and return	

Selection criteria

The selection criteria for libraries types/attributes and objects are similar to the disk space analysis. Only the options Duplicate objects only and Damaged objects only are not available here.

Report type

The reports you can select are quite different. There are nine reports you can choose and they all go to the object level.

Reclaim Disk Space Analysis			Report selection		
<u>No.</u>	<u>Selected</u>	<u>Object types to include in the reclaim space analysis reports</u>	<u>Use range selection by Library Typ/atr Object</u>		
1	*NO	Physical files (source)	Yes	No	Yes
2	*NO	Physical files (data)	Yes	No	Yes
3	*NO	Programs	Yes	No	Yes
4	*YES	Save files	Yes	No	Yes
5	*YES	Spoiled output files	Yes	No	Yes
6	*YES	Journals and journal receivers	No	No	No
7	*YES	History log files	No	No	No
8	*YES	Problem log files and its journal	No	No	No
9	*YES	All (Duplicate objects analysis)	Yes	Yes	Yes
Select report code . . __			Unselect report code . . __		
Help			F12=Return		

Only the last report Duplicate objects analysis considers all selections by library, type/attribute and object that you make.

Reports 1 to 5 consider the selection by library and object but not by type/attribute. Reports 6 to 8 are only meaningful when applied to the whole system or are specific of some libraries. The selection criteria are ignored.

When you select a report a panel displays indicating the options applicable to the report. Example:

Reclaim Disk Space Analysis		Report options	
Report code selected	2		
Object types to include	Data physical files		

Select report scope			How many
Evaluate potential disk space to reclaim if			<u>days old</u>
Files are compressed	*YES	*YES or *NO	
Files are reorganized	*YES	*YES or *NO	
Expired members are removed	*YES	*YES or *NO	
Old inactive members are removed	*YES	*YES or *NO	180
Select print options			
Sequence data files in library by	*SIZE	*NAME or *SIZE	
Change page when library name changes	*YES	*YES or *NO	
Print subtotals by library name	*YES	*YES or *NO	
Number of copies to print	1	1 to 99	
F5=Refresh		F12=Return	

These specifications are similar to the report options for disk space analysis described in section 3.8.

Most reports evaluate the savings in space that can be done by actually executing the operation in a temporary library and reading the size of the object before and after. If the number of objects to process is quite high, this can be a long process.

4.1 Source physical files

This report lists all source files in the range specified, and the size before and after all members are compressed using the DSM command CPXSRCM.

Depending on the number of source files to be included in the run, this report may take a long time to process. DSM writes progression messages into the job log so you can monitor the progress of the operation. As a default it also sends a message to the user that requested the analysis each time the analysis of all source files of a library is completed.

If you do not want these messages to be issued, use the OS/400 CHGDTAARA command to change byte 31 of the DSM control area DSMCTL to '0'. Change it back to '1' if you want the messages to be sent again.

4.2 Data physical files

Two reports lists all data files in the range specified, their actual size and what size they would have if:

- The file is compressed
- The file is reorganized

- All expired members are removed
- Inactive members are removed.

The file compression report lists the size before and after all members are compressed using the DSM command CPXDATM.

DSM classifies a physical file member as inactive if it has not been modified in the last N days where N is a value that you specify when you select the report. DSM reads the date of the last use of each member and compares it with the date of the run. If older than N days, it is flagged as inactive. Otherwise it is considered active.

This option also writes progression messages to the job log and sends library completion messages to the user.

If you do not want these messages to be issued, use the OS/400 CHGD TAARA command to change byte 32 of the DSM control area DSMCTL to '0'. Change it back to '1' if you want the messages to be sent again.

4.3 Programs

Large savings can be realized if program observability is removed or the programs are compressed.

Removing observability

All system programs supplied by IBM have observability removed. All DSM programs also have observability removed.

When the observability is removed the program cannot be debugged and a dump of the program produces only a skeleton information. Otherwise the program executes normally.

Compressing programs

A compressed program is automatically decompressed by OS/400 when it is called. If the program is infrequently used OS/400 does a temporary decompression of the program. If OS/400 finds that the program is highly used it decompresses it permanently.

This option also writes progression messages to the job log and sends library completion messages to the user.

If you do not want these messages to be issued, use the OS/400 CHGD TAARA command to change byte 33 of the DSM control area DSMCTL to '0'. Change it back to '1' if you want the messages to be sent again.

4.4 Save files

Save files are convenient objects to use for backup of libraries and/or objects. The data can be saved on tape or diskette or optical disk later.

Save files tend to use large amounts of disk space. They become obsolete when the data is copied to media or when another save of the same library or object is done.

DSM lets you investigate what savings can be done if the following type of save files are deleted:

- Empty save files. They were created and never used.
- Save files more than N days old (you specify the value N). Save files are in principle temporary objects. If they are too old, the data is probably worthless.
- Superseded save files. A save file is considered superseded in the following cases:
 - Save files created with the SAVLIB command - When the library has been saved subsequently on another save file or on media.
 - Save files created with the SAVOBJ or SAVCHGOBJ command - When all objects saved have been saved subsequently to another save file or media.

4.5 Spooled output files

Spooled output files in some installations use a large amount of disk space because old reports remain on the spool when they are no longer needed.

The output queues in the AS/400 system do not contain the physical report data. They are only indexes that point to a physical file member in a file in QSPL that contains the real data.

When you delete the report from the spool, or when it finishes printing, this physical file member is cleared by the operating system but is not removed.

Some installations have hundreds or even thousands of these empty members doing nothing but using space.

This report prints an analysis of the savings that can be realized if old spool files are deleted (with the physical file member removed) and if all empty spool files are removed.

This report cannot be produced if you are running under security level 40.

4.6 Journals and journal receivers

Journals are very convenient to use and provide an easy method to recover your data. They are required if you use commitment control.

Like save files, journal receivers have a tendency to grow unnoticed. To conserve disk space, they must be changed when they reach a certain size, the detached receiver saved on media and then deleted.

This report lets you evaluate the savings that can be realized if the detached journal receivers are deleted and if large attached journal receivers are changed and then deleted. You can specify how large an attached receiver must be to be included in the report.

This report cannot be produced if you are running under security level 40.

4.7 History log files

History log files are automatically created and maintained by the system. In a dynamic environment as the AS/400, old history logs have little use. They

should be periodically saved on media and then deleted.

DSM lets you evaluate the disk savings if history log files older than N days (where this value N is specified by you) are deleted.

A history log file is considered to be N days old if the number of days elapsed between its most recent entry and the day of the run is N.

4.8 Problem log

When the AS/400 detects a malfunction of the system, it may write a description of the problem on a set of system files. It also updates a journal receiver with that information.

Problem logs are generally not very large. But some savings can be realized if old problems are deleted.

This report indicates the space savings that can be realized if problems older than N days are removed from the system. This value N must be entered by you.

The report also indicates the space savings if the journal receiver associated with the problem log is changed and the detached receiver deleted.

4.9 Duplicate objects

This is the analysis that could give you the most or the least savings depending on the installation.

If your installation often duplicates libraries or objects for testing purposes, you are a candidate for large savings. No matter how careful programmers are in getting rid of old test data, there is probably unnecessary test data left behind.

If you have a testing environment for each system, or use third party packages, chances are that you have a few duplicated objects.

When printing this report, you may request that source files be excluded from it. Usually source files are named according to IBM defaults (QDDSSRC, QCLSRC, etc.) in all libraries, and they are not really duplicated objects.

Chapter 5 - Compress and Decompress

This chapter describes how to use the Compress and Decompress functions of the DSM utility.

From the DSM main menu, select option 3 Compress and Decompress functions. The following panels displays:

DSM300M Disk Space Manager - Compress and decompress			
Select one of the following:			
	<u>Option</u>	<u>Function</u>	<u>Command</u>
Source files	1.	Compress members	CPXSRCM
	2.	Decompress members	DEXSRCM
	3.	Display compressed member attributes	DSPCPXMA
	4.	Edit compressed members	STRSEUX
	5.	Create objects from compressed members	CRTOBJX
Data files	6.	Compress members	CPXDATM
	7.	Decompress members	DEXDATM
	8.	Display compressed member attributes	DSPCPXPFMA
Programs	9.	Compress programs	CPXPGM
	10.	Decompress programs	DEXPGM
Selection or command			
===> _____			

Each option of this menu calls the command listed on the right hand side of the panel.

The result of all operations is written to the job log. Most commands may operate on many objects by using either generic names or the parameter value *ALL. To avoid cluttering the job log with messages, DSM displays only a completion message with the statistics of the operation.

For example. After compressing a set of source members, DSM will display the following message:

NNN members compressed and **PPP** not compressed. Check job log for details

If you want to know exactly which members have been compressed and which ones have not and why not, display the job log detailed messages.

5.1 Compress source physical file members

Compressing a source file member is be done using the DSM command CPXSRCM. DSM uses an AS/400 internal machine instruction to compress source file members. The operation is very fast. A compressed member is written as a member of a

sequential data physical file. The data file must be between 80 and 256 bytes long. Information of the source member is saved in the compressed data member. Command DSPCPXMA can be used to identify the attributes of the source member that was compressed.

The efficiency of the compressed operation varies with the type and the size of the member. OS/400 rounds up the size of each physical file member to a 2 Kb boundary. Therefore the results for small members are unpredictable. For members larger than 16 Kb the size of the compressed member is generally between 20% and 60% of the source member.

When you use this command you can compress one, many or all members of a source physical file. Many members can be compressed in one run if they all have the same generic name. All members in a source file can be compressed if the special value *ALL is used for the member name.

Defining the target file

The data physical file that is the target file in the compress operation must be created with the options MAXMBRS(*NOMAX) and SIZE(*NOMAX) as you probably want the file to contain several compressed members.

DSM supports the concept of a *NORMAL name for the target file. This is defined as being the same name as the source physical file followed by a single character as suffix. This concept is applicable only if the name of the source physical file is 9 characters long or less.

The default suffix used by DSM is the letter X. If you want to change this value, use the CHGDTAARA command to change byte 23 of the DSM control area DSMCTL to the new suffix you want.

When using the command you can specify if DSM should create the target file if the file does not exist. You can also specify if DSM should overwrite the compressed member if it already exists.

Adding this function to PDM

If you use PDM on the AS/400 when you display the members of the data file for the compressed members, the panel that displays is very similar to source files except that the member type is replaced by the member date.

To call this function from the PDM Work with members panel, add the following user-defined option:

```
Option code . . XS
Command . . . . cpxsrcm srcfile(&l/&n) srcmbr(&n)
```

5.2 Decompress source physical file members

This option calls the command DEXSRCM. This command decompresses the compressed member into a normal source physical file member.

This command supports the concept of *NORMAL source file as the CPXSRCM command does. For example, if the normal suffix is the letter X and the compressed source file name is QCLSRCX then it considers the normal source file to be QCLSRC.

If the compressed source file name does not end with the letter assigned as

the normal suffix, DSM cannot compute the name of the source file. In this case, you have to enter the name of the source file.

You can also tell DSM to create a source file if it does not exist by specifying CRTFILE(*YES) in the command.

If the source member already exists, DEXSRCM will not replace it unless you specify OVRWRT(*YES) in the command.

Adding this function to PDM

To call this function from the PDM Work with members panel, add the following user-defined option:

```
Option code . . DS
Command . . . . dexsrcm cpxfile(&l/&f) cpxmbr(&n)
```

5.3 Display compressed member attributes

This option calls the command DSPCPXMA that displays information about the source member that was compressed, when the compression was done, who did it, and provides some statistical information.

To call this function from the PDM Work with members panel, add the following user-defined option:

```
Option code . . XA
Command . . . . dspcpxma cpxfile(&l/&f) cpxmbr(&n)
```

5.4 Edit compressed source members

You can edit a member of a compressed source physical file using the DSM command STRSEUX. This command decompress the member before executing the system commands STRSEU. When you finish the edit of a compressed member, DSM compresses it before replacing the original copy.

DSM keeps track of the last compressed member edited by any user. Therefore, if you select the default parameters CPXFILE(*PRV) and CPXMBR(*PRV) you can edit again the last member you worked on.

To call this function from the PDM Work with members panel, add the following user-defined option:

```
Option code . . XE
Command . . . . strseux cpxfile(&l/&f) cpxmbr(&n) type(&t)
```

5.5 Create objects from compressed source members

This option calls the command CRTOBJX that calls the appropriate CRTxxxxxx system command to create the object. You do not have to decompress the member first. CRTOBJX does it automatically for you.

Because in future releases of the operating system IBM may add new create object commands for new object types, this function is driven by a table that can be maintained by you.

This simple table is implemented in source member CRTOBJX in file QTXTSRC of the Disk Space Manager library. The prologue of the table indicates how to add

more entries for future enhancements of the operating system.

The *PRV (previous) option for keywords CPXSRCF and CPXSRCM is also supported by this command.

Using the *PRV option is a very convenient way of creating a program from a compressed member. You can repeat the cycle edit, compile, edit, etc., until the program is correct, just by entering STRSEUX to edit and CRTOBJX to compile it. DSM will re-use the name of the program and the name of the file.

To call this function from the PDM Work with members panel, add the following user-defined option:

```
Option code . . XC
Command . . . . crtobjx obj(&l/&n)  cpxsrcf(&l/&f) cpxmbr(&n)
```

5.6 Compress data physical file members

Compressing a file is be done using the DSM command CPXDATM. The compression algorithm uses an AS/400 internal machine instruction to compress data file members. The operation is very fast and very efficient and normally saves a great amount of disk space. Compressed data files have to be decompressed before they can be used.

A compressed member is written as a member of a sequential data physical file with a record length of 512 bytes. Information of the original member is saved in the compressed data member. Command DSPCPXMA can be used to identify the attributes of the original member that was compressed.

The efficiency of the compressed operation varies widely with the content of the original member. The size of the compressed member can be as low as 10% of the original when you compress text files to as high as 120% (the compressed member being larger than the original member) if you try to compress an already compressed data member. The typical average value is 20%.

Defining the target file

The data physical file that is the target file in the compress operation must be created with the options MAXMBRS(*NOMAX) and SIZE(*NOMAX) as you probably want the file to contain several compressed members.

DSM supports the concept of a *NORMAL name for the target file as indicated above for source files.

When using the command you can specify if DSM should create the target file if the file does not exist. You can also specify if DSM should overwrite the compressed member if it already exists.

To call this function from the PDM Work with members panel, add the following user-defined option:

```
Option code . . XD
Command . . . . cpxdatm phyfile(&l/&n) phymbr(&n)
```

5.7 Decompress data physical file members

This option calls the command DEXDATM. This command decompresses the compressed member into a normal data physical file member.

This command supports the concept of *NORMAL original file as the CPXDATM command does. For example, if the normal suffix is the letter X and the compressed file name is ADCD1234X then it considers the normal original file to be ABCD1234.

If the compressed data file name does not end with the letter assigned as the normal suffix, DSM cannot compute the name of the original file. In this case, you have to enter the name of the original file.

You can also tell DSM to create a target file if it does not exist by specifying CRTFILE(*YES) in the command. The file created will be a sequential file. If the original file was an indexed file you have to create it first.

Most users do not delete the original file after compressing it to a target file. Instead they clear all physical file members. This brings the size of the file down to a few kilobytes. And the definition of the file can be used when decompressing the compressed data.

If the target decompressed member already exists, DEXSRCM will not replace it unless you specify OVRWRT(*YES) in the command.

To call this function from the PDM Work with members panel, add the following user-defined option:

```
Option code . . DD
Command . . . . dexdatm cpxfile(&l/&f) cpxmbr(&n)
```

5.8 Display compressed member attributes

See section 5.3

5.9 Compress programs

This option calls the command CPXPGM that compresses a program in place.

You can specify in this command that a program will only be compressed if unused for a certain number of days. If you select the option DAYS(*NONE) the program(s) will always be compressed.

An AS/400 program is composed of two parts:

- The instruction stream
- The observability tables.

The instruction stream is used every time a program is called. The observability tables are only needed when you debug or dump a program.

You have the choice to compress the complete program or the observability tables only. If you compress the complete program OS/400 automatically decompresses the program every time it is called. If it finds that the number of calls to the program exceed a given threshold it will decompress the program permanently.

If you only compress the observability tables the space savings are much lower, but OS/400 only decompresses the tables when a debug or dump is required (a very rare occurrence in a production program).

To call this function from the PDM Work with objects panel, add the following user-defined option:

```
Option code . . XP
Command . . . . cpxpgm pgm(&l/&n)
```

5.10 Decompress programs

This option calls the command DEXPGM that decompresses a program in place.

You have the option to decompress the complete program or just the instruction stream. If you choose the later option the program observability tables will remain compressed.

To call this function from the PDM Work with objects panel, add the following user-defined option:

```
Option code . . DP
Command . . . . dexpgm pgm(&l/&n)
```

Chapter 6 - Other reclaim disk space functions

This chapter describes a variety of methods you can use to reclaim disk space. These methods include:

- Deleting unnecessary files
- Removing program observability
- Deleting temporary programs
- Removing problem log files.

Select option 4 of the DSM main menu to use the Reclaim disk space functions menu. The following panel displays:

DSM400M	Disk Space Manager - Reclaim Disk Space		
Select one of the following:			
<u>Option</u>	<u>Type of objects</u>	<u>Reclaim space action</u>	<u>Command</u>
1.	Data files	Reorganize. Remove expired members	RGZDATPF
2.	Programs	Remove observability	RMVPGMOBS
3.	Programs	Delete temporary programs in QRPLOBJ	DLTTMPPGM
4.	Save files	Delete superseded and/or old files	DLTSAVF
5.	Spooled output	Delete old files. Remove empty files	DLTOLDSPLF
6.	Journal receivers	Delete detached receivers	DLTDXRCV
7.	History log files	Delete old history log files	DLTHSTLF
8.	Problem log	Remove old problems. Delete receivers	RMVOLDPRB
9.	Duplicate objects	Delete duplicate objects	DLTDUPOBJ
Selection or command			
===> _____			

All reclaim space options perform only recoverable or harmless operations. You can probably reclaim more space using OS/400 delete commands after analyzing the Reclaim disk space reports.

Each option of this menu calls a command where you specify the parameters for the function to perform. The commands called by the menu options are indicated on the right hand side of the menu.

6.1 Reorganize data physical files

This option calls the command RGZDATPF that reorganizes all members of a data physical file and/or delete expired members. One, several or all data physical files of a library can be reorganized in a single run.

6.2 Remove program observability

Removing program observability reduces the size of a program by up to 70%. Some programs need to be observable to function properly. PL/I programs fall in this category. DSM does not remove observability of a program if the program

must be observable to run.

You can use this option or the DSM command RMVPGMOBS to remove program observability for one, several or all programs in a library. You can further specify what attribute the programs must have to be processed.

6.3 Delete temporary programs

When you compile programs with the *REPLACE option, OS/400 uses the library QRPLOBJ to store the old copy of the program that is being replaced. This library can grow considerably.

To delete these programs you can use this menu option or enter the DSM command DLTTMPPGM. When deleting these programs, you can specify the attribute of the programs to delete and/or the owner of these objects.

6.4 Delete save files

You can use this option or the DSM command DLTSAVF, to delete save files that satisfy any of the three following conditions

- Are empty
- Have been superseded
- Are more than N days old (you specify the value N).

For an explanation about the concept of old or superseded save files, see section 4.4.

6.5 Delete spooled output files

You can use this option or the DSM command DLTOLDSPLF, to delete all spool output files that are listed in one or more output queues of a given library. The physical file member that contains the spool file is also removed.

This command also lets you reclaim disk space by removing all empty spool file members. For an explanation about empty spool file members see section 4.5.

6.6 Delete detached journal receivers

You can use this option or the DSM command DLTDTXRCV, to delete one or more detached journal receivers from one or all libraries in the system. You can restrict this operation only to journal receivers that have been saved. You can also exempt system receivers. These are journal receivers with names starting with the letter Q and existing in system libraries (library name starting also with a Q).

DSM will ask you for confirmation before deleting journal receivers if you select the parameter CONFIRM(*YES).

Because journal receivers are sequenced within a journal, some restrictions apply to the delete operation. For example:

- The system will not let you delete a journal receiver that has not been saved without requesting your confirmation
- You cannot delete a journal receiver in a chain if any of the prior receivers in the chain are still on disk.

This option is not available if you are running under security level 40.

6.7 Delete history log files

You can use this option or the DSM command DLTHSTLF, to delete history log files that are older than N days. You specify this value N. To find out how DSM computes the age of a history log file see section 4.7.

6.8 Remove old problems

You can use this option or the DSM command RMVOLDPRB, to remove from the system all entries in the problem log files that are older than N days. You specify this value N.

You can also use this option to delete the associated problem log journal receiver. DSM changes the receiver first and then deletes the detached receiver. No save of the receiver is done before deleting it.

6.9 Delete duplicate objects

You can use this option or the DSM command DLTDUPOBJ, to delete objects of a library that are duplicates of other objects. You may specify that one, several (generic name) or all objects of a library should be deleted.

You can restrict the operation to some object types only or enter *ALL to specify all object types handled by this command. Only the following object types are processed:

- *CMD
- *DTAARA
- *FILE
- *MENU
- *PGM
- *QRYDFN.

DSM cannot delete an object unless the original object is found. You can specify a list of up to 50 libraries that DSM can scan to find the original object.

You may further restrict the operation by specifying that the original object must have a creation date prior to the duplicate object.

You can also indicate to DSM that source physical files must be by-passed.

Chapter 7 - Folder and document analysis

This option lets you print two reports:

- A folder report
- A document report

Folders and documents are objects known to the system by a cryptic name that has no relationship with the name you use to access them. These are known as system name and the only time you need them is if you want to use the document library object commands to perform a special function and you do not want to enter their usual names.

Documents and folders are printed in the Disk Space Analysis under their system name with types *FLR and *DOC. But the use of these reports is limited because it is difficult to identify the object they are referring to.

The folder report prints a list of all folders sequenced either by decreasing size, by name or by date of last use. The name that prints on the report is the usual folder name you use. In addition it also prints the system name for the folder for cross referencing.

The date of last use of a folder is different from the date of last use indicated by the system. For DSM the date of last use of a folder is equal to the last date any document in the folder was added/changed or deleted.

The document report prints a list of all documents in a folder. The documents can be also printed in the same three sequences: decreasing document size, document name and date of last use.

Printing these reports by date of last use sequence can give you a practical method of cleaning your disk of old documents.

You can specify that only documents above a given size be reported. This certainly eliminates many small documents from the listing. When this happens the total size for the folder may not be equal to the sum of sizes of all documents reported, because some documents may have not been reported. Even if you include all documents the size is not exactly the same because of folder overhead. But it is very close.

There is an option to save the work files created by DSM. They are FLR0 for folder information and DOC0 for document information. They are saved in the DSM library if you specify *YES for the "Save work files" option.

You can use this information to write programs to perform additional processing on folders or documents. The most immediate use would be to write a program to remove all documents that were not used after a given date. This will help you to clean up the disk automatically.

Chapter 8 - Auxiliary functions

This chapter describes how to work with historical data and how to display and print the system documentation. To access these auxiliary functions, select option 5 from the DSM main menu. The following panel appears:

DSM500M Disk Space Manager - Auxiliary Functions			
Select one of the following:			
	<u>Option</u>	<u>Function</u>	<u>Command</u>
History	1.	Print history reports	PRTHSTRPT
	2.	Remove DSM history entries	RMVHSTENT
Documentation	3.	Display system manual	DSPDSMMAN
	4.	Print system manual	PRTDSMMAN
	90.	Sign off	SIGNOFF
Selection or command			
===> _____			

8.1 Print DSM history reports

This option calls the command PRTDSMHST that lets you print two reports showing the evolution of the size of a library, object type, or physical file on your system. You can use the trend coefficients to forecast when you will need more DASD in your system.

The summary report prints the disk usage for all *SYSTEM, *USER and *ALL libraries. An entry is written for each member of the history file. Remember that a new member is created each time you answer *YES to the Update history option in the Disk Space Analysis.

The detail report prints the disk usage in nine selected dates. If there are nine or less members in the history file in the range of dates that you selected, they will all print. If there are more than nine, DSM divides the total date range in eight equal parts and uses the members with dates closer to the calculated intermediate dates.

Two mathematical coefficients are printed for each line:

- The variation
- The trend.

Variation

The variation reflects the change in size between the earliest and latest date reported. It is expressed in percentage of the earliest value. For example, if a library had a size of 200 Kb the first time it was reported and 250 Kb the latest time the variation is

$$(250 - 200)/200 = .25 \text{ therefore } 25\%$$

This computation ignores all intermediate values.

Trend

The trend is a more complex function. DSM analyses all values reported and plots them in a two dimensional diagram (size versus time). Then it finds the straight line that best fits all these points using the least square deviation method.

The slope of this line reported in kilobytes/year gives an indication of the average growth or decrease of space occupied by the objects or libraries. All values reported are used in this computation.

8.2 Remove DSM history entries

This option calls the command RMVHSTENT that lets you remove one member of the history file. You may use the history summary report to find out the date of the members you want to remove.

8.3 Display system manual

This option calls the DSM command DSPDSMMAN that displays this manual. Use the roll keys to page through the manual.

8.4 Print system manual

This option calls the DSM command PRTDSMMAN that prints this manual. You can specify all parameters required to format the manual and the number of copies you want to print.

Chapter 9 - Installation

In all that follows, it is assumed that DSM will operate from a library named DSMLIB. However, the system is independent of the library name you choose. If you already have a library DSMLIB in your system, you can use any other name. Please make the necessary adjustments to the text below.

9.1 Installing DSM

To install the Disk Space Manager system, restore library DSMLIB from the distribution diskette or tape onto your system. If you restore DSMLIB under a user profile other than QPGMR or the security officer, the system will issue the diagnostic message CPF3848 indicating that four objects had authority or data format changes. Ignore the message.

To run the system from the restored library, you must have security officer authority. The security officer can allow other users to run the system if he/she runs executes the command DSMINIT. To run it, add library DSMLIB to the library list and enter:

```
DSMINIT
```

9.2 How to run DSM

After adding DSMLIB to your library list, type: STRDSM. A menu displays. Select the option you want from the menu.

As shipped, DSM is already pre-set to print a set of disk space analysis and reclaim space analysis reports that let you have a global picture of your system.

If you want to use the selections as shipped, select option 1 and press F8 to submit the job that prints the disk space analysis. Then select option 2 and press F8 to submit the job that prints the reclaim space analysis reports.

Because these are long running jobs, it is advisable to run them as overnight jobs.

9.3 How to activate DSM permanently

As shipped, DSM is active for 15 days. If after this test period you decide to purchase the product, here is what you should do:

- Get your CPU serial number and the DSM release level by entering from library DSMLIB the command SETDSMID. This command will display both values.
- Contact Interdata Systems or your dealer either by phone, FAX or in writing indicating those two values. Interdata will give you the key code to activate DSM permanently on your machine.
- Activate DSM permanently by using again the command SETDSMID. Enter the key code in the appropriate field. If the key code is correct, you will receive a message indicating that DSM is now permanently active.

9.4 Who can use and operate DSM

As shipped, the DSM system is public. All objects are owned by user profile QPGMR. However, for DSM to run properly, four programs need to have the authority of the internal user profile QSYS. When retrieving information about objects in the system, DSM must be able to read the object description.

Until this authority is set, only users with *SECOFR authority can run DSM. Running the command DSMINIT as indicated in 8.1 sets this authority and enables any user to run DSM.

In some options of menu DSM300M and DSM400M, DSM retrieves the objects and does a limited amount of update/delete. As indicated, these functions are restricted to recoverable and/or harmless operations. Nevertheless, the programs that do the update/delete are running ONLY under the authority of the user. Therefore update/delete operations cannot be performed if the user does not have enough authority.

9.5 How to un-install DSM

If you want to remove Disk Space Manager from your system type:

```
DLTLIB DSMLIB
```



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