Adabas Delta Save

Adabas Utility Functions for Delta Save

Version 8.5.4

September 2025

ADABAS & NATURAL

This document applies to Adabas Delta Save Version 8.5.4 and all subsequent releases.

Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

Document ID: ADE-UTIL-854-20250925

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Preface

The Adabas utilities manage the resources of an Adabas database. General Adabas utility operation and use are described in the basic Adabas documentation library. The information in this documentation applies only to the new and/or expanded utility functions required for an Adabas database running with the Adabas Delta Save Facility.

This document is organized as follows:

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ADAFRM Utility	Describes the functions of the ADAFRM utility specific to the Delta Save Facility.
ADAFRM JCL/JCS Requirements and Examples	Describes the JCL required to run the Delta Save functions of ADAFRM with BS2000/OSD, z/OS, z/VM, VSE/ESA and z/VSE systems.
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Restarting an Interrupted Save Operation	Explains how an ADASAV SAVE database or SAVE DELTA execution can be restarted after failure.
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ADAULD Utility	Describes the functions of the ADAULD utility specific to the Delta Save Facility.
ADAULD JCL/JCS Requirements and Examples	Describes the JCL required to run the Delta Save functions of ADAULD with BS2000/OSD, z/OS, z/VM, VSE/ESA and /z/VSEsystems.

1 About this Documentation

Document Conventions

Convention	Description
Bold	Identifies elements on a screen.
`Monospace font`	Identifies service names and locations in the format *`folder.subfolder.service`*, APIs, Java classes, methods, properties.
`Italic`	Identifies: Variables for which you must supply values specific to your own situation or environment. New terms the first time they occur in the text. References to other documentation sources.
`Monospace font`	Identifies: Text you must type in. Messages displayed by the system. Program code.
{ }	Indicates a set of choices from which you must choose one. Type only the information inside the curly braces. Do not type the { } symbols.
|	Separates two mutually exclusive choices in a syntax line. Type one of these choices. Do not type the | symbol.
[ ]	Indicates one or more options. Type only the information inside the square brackets. Do not type the [ ] symbols.
...	Indicates that you can type multiple options of the same type. Type only the information. Do not type the ellipsis (...).

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I Adabas Utility Functions for the Adabas Delta Save Facility

2 Adabas Utility Functions for the Adabas Delta Save Facility

The Adabas utilities manage the resources of an Adabas database. General Adabas utility operation and use are described in the basic Adabas documentation library. The information in this documentation applies only to the new and/or expanded utility functions required for an Adabas database running with the Delta Save Facility.

The following utility functions are described in this documentation for the Adabas Delta Save Facility:

Utility	Function	Action
ADAFRM (formatting)	DSIMFRM	Format the Delta Save Images (DSIM) data set.
	DSIMRESET	Reset an incorrect DSIM data set for reuse.
ADAPRI (printing)	DSIMPRI	Print DSIM data set blocks.
ADAREP (reporting)	ADAREP	Functions expanded for Delta Save operation where applicable.
ADARES (recovery)	COPY	Copy a sequential log data set.
	PLCOPY	Copy dual or multiple PLOG data sets to a single sequential data set.
ADASAV (save/restore)	MERGE	Combine delta save outputs with each other, and/or with the last full database save output.
	RESTORE DELTA	Restore files/database from separate full and delta save outputs.
	SAVE	Save the complete database to a full save data set.
	SAVE DELTA	Save the changed portions of the database to a delta save data set.
ADAULD (unloading)	UNLOAD with SAVETAPE	Unload from a full save tape, 1-8 delta save tapes, and optionally the DSIM data set.

The ADASAV RESTORE function is unchanged for conventional full save tapes, and can also be used to restore consolidated full save tapes that were created with ADASAV MERGE.

This chapter covers the following topics:

Utility Considerations for Delta Save Operation

In addition to the changes made to the ADASAV and ADARES utilities to allow delta save/merge/restore operations, changes have also been made to the ADAFRM, ADAPRI and ADAREP utilities.

The following points should be considered when running Adabas utilities with DSF:

- Changes made to database files by utilities (ADAINV, ADALOD, ADAORD and ADASAV RESTORE) are marked in the file control blocks (FCBs). The next Delta Save operation saves the changed parts (that is, the Data Storage, address converter and/or index) of the affected files;
- Delta Save operations are *not recommended* following ADAFRM utility runs that reset parts of the Associator or of Data Storage, since such changes are *not* logged. This means that those blocks are not *necessarily* saved by a later Delta Save operation. Therefore, any save following these operations should be a full database save.

Identifying New AC Extents Allocated During an Online Save

Every time the Adabas nucleus allocates a new address converter (AC) extent, it clears (fills with binary zeros) all blocks of that extent.

If a new AC extent is allocated during an online save, the Adabas nucleus writes a *special type of protection record* to the PLOG identifying the new extent and the blocks the nucleus has cleared. Like any online dump block, this protection record is written to the PLOG only, not to Work part 1.

The special protection record type is short and contains in its header only the file number and the first and last RABN of the newly allocated and cleared AC extent. The protection record has no data part.

ADARES PLCOPY (or COPY) recognizes the special protection record type when extracting online dump blocks from the PLOG and writing them to the DSIM data set. For each such protection record encountered, it creates special DSIM directory entries that contain the file number and one RABN of the new AC extent. ADARES creates one directory entry for each new AC block. There are no associated DSIM detail records containing the block images, since the blocks are known to be empty (binary zeros).

When the DSIM data set is processed for merging or unloading, the sort of the DSIM directory correctly positions the entries for new AC blocks within the sequence of all blocks and removes new AC entries made obsolete by subsequent block images written later in time.

New AC entries resulting from the merge process are substituted by empty AC blocks of the proper length. For an unload of the DSIM data set, the correct block size cannot be determined because no GCB is present, so any block deriving from a new AC entry is constructed with zero block length. The correct block length is determined in the next ADASAV MERGE or ADASAV RESTORE DELTA operation.

Note: The ADASAV RESTONL and RESTPLOG functions ignore the special AC extent record type on the protection log and continue comparing FCBs to determine any newly allocated and formatted address converter extents.

II ADAFRM Utility

The Delta Save Facility introduces two new functions to the database formatting utility ADAFRM:

- **DSIMFRM (Format the DSIM data set);**
- **DSIMRESET (Reset DSIM data set blocks).**
- **JCL/JCS Requirements and Examples**

DSIMFRM: Format DSIM Data Set

Before a Delta Save Images (DSIM) data set can be used in an online save/merge operation, it must be formatted using the DSIMFRM function.

```
ADAFRM  DSIMFRM   SIZE = size
                  [ DEVICE = device-type | ADARUN-device ]
                  [ FROMRABN = starting-rabn ]
                  [ NOUSERABEND ]
```

Essential Parameter

SIZE: Size of Area to be Formatted

SIZE specifies the size of the area to be formatted. Blocks (a decimal value followed by "B") or cylinders may be specified.

Optional Parameters

DEVICE: Device Type

DEVICE is the physical or logical device type to be assigned to the DSIM data set. If FROMRABN is also specified, DEVICE must specify the device type of the existing DSIM data set. If DEVICE is not specified, the device type specified by the ADARUN DEVICE parameter is used.

FROMRABN: Starting RABN

FROMRABN specifies the RABN at which formatting is to begin. This parameter may only be used for an existing data set.

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

Example

```
ADAFRM DSIMFRM SIZE=20,DEVICE=8381
```

A DSIM data set is to be formatted. It is 20 cylinders large. Its device type is to be 8381.

DSIMRESET: Reset the DSIM Data Set

The DSIMRESET function resets the specified blocks of the Delta Save Images (DSIM) data set to binary zeros. DSIMRESET can be used to reinitialize the DSIM data set for further use. If some exceptional condition left a DSIM data set ineligible for use by an online save operation, the data set can be made available again using the DSIMRESET function. This can be achieved by resetting only the first block (RABN 1).

Software AG recommends that you specify the DSIM data set for exclusive use by the ADAFRM utility to avoid accidentally destroying information in a DSIM data set currently in use by another utility.

```
ADAFRM  DSIMRESET  FROMRABN = starting-rabn
                   SIZE = size
                   [ DEVICE = device-type | ADARUN-device ]
                   [ NOUSERABEND ]
```

Essential Parameters

FROMRABN: Starting RABN

FROMRABN specifies the RABN at which the resetting is to begin. This parameter must be specified.

SIZE: Size of Area to be Reset

SIZE specifies the size of the area to be reset. Either cylinders (a numerical value alone) or blocks (a value followed by "B") can be specified. The SIZE parameter must be specified.

Optional Parameters

DEVICE: Device Type

DEVICE is the physical or logical device type of the DSIM data set. If DEVICE is not specified, the device type specified by the ADARUN DEVICE parameter is used.

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

Example

```
ADAFRM DSIMRESET SIZE=1B,FROMRABN=1
```

A DSIM data set is to be reset, making it again usable for online save/merge operation.

3 ADAFRM JCL/JCS Requirements and Examples

This section describes the job control information required to run the Delta Save functions of ADAFRM with BS2000/OSD, z/OS, z/VM, VSE/ESA and z/VSE systems, and shows examples of each of the job streams.

This chapter covers the following topics:

z/OS

Data Set	DD Name	Storage	More Information
Delta Save images (DSIM)	DDDSIMR1	disk	Required for DSIM... functions
ADAFRM parameters	DDKARTE		
ADARUN parameters	DDCARD		*Adabas Operations*
ADAFRM messages	DDDRUCK		*Adabas Messages and Codes*
ADARUN messages	DDPRINT		*Adabas Messages and Codes*

Format DSIM Data Set (ADAFRM DSIMFRM)

```
//FORMAT   EXEC  PGM=ADARUN
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIMR1,DISP=(NEW,CATLG),
//             VOL=SER=...,UNIT=...,SPACE=(CYL,20)
//DDCARD   DD  *
ADARUN    PROG=ADAFRM,...
//DDKARTE  DD  *
ADAFRM DSIMFRM SIZE=20,...
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

Reset DSIM Data Set (ADAFRM DSIMRESET)

```
//FORMAT   EXEC  PGM=ADARUN
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIMR1,DISP=OLD
//DDCARD   DD  *
ADARUN    PROG=ADAFRM, ...
//DDKARTE  DD  *
ADAFRM DSIMRESET FROMRABN=1,SIZE=1B
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

III ADAPRI Utility

4 ADAPRI Utility

This chapter covers the following topics:

ADAPRI DSIMPRI: Printing the DSIM Data Set

The ADAPRI DSIMPRI function prints one or more specified DSIM data set blocks.

```
ADAPRI   DSIMPRI    FROMRABN = block-number
                    TORABN = block-number
                    [ BATCH ]
                    [ DEVICE = device-type | ADARUN-device ]
                    [ NOUSERABEND ]
```

Essential Parameters

FROMRABN / TORABN: Range of Blocks to be Printed

The beginning and ending numbers of the DSIM data set RABNs to be printed. Both values must be specified; there are no defaults. Printing begins with the block number specified with the FROMRABN parameter and ends with the block number specified with the TORABN parameter. Each block in the range is printed in hexadecimal format.

Optional Parameters

BATCH: Output Format

Controls the line length of the printed output. If BATCH is not specified, the default line size is 80 characters. If BATCH is specified, the output line size is 120 characters.

DEVICE: Device Type

The device type on which the DSIM data set is contained. This parameter is required only if the device type is different from the standard device type assigned by the ADARUN DEVICE parameter.

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

Example

```
ADAPRI DSIMPRI FROMRABN=1,TORABN=1
```

Block 1 only of the DSIM data set is printed.

JCL/JCS Requirements and Examples

This section describes the job control information required to run the Delta Save functions of ADAPRI with BS2000/OSD, z/OS, z/VM, VSE/ESA and z/VSE systems, and shows examples of each of the job streams.

This section covers the following topics:

- BS2000/OSD
- z/OS

BS2000/OSD

Data Set	Link Name	Storage	More Information
Delta Save images (DSIM)	DDDSIMR1	disk	Required for the DSIMPRI function
ADAPRI parameters	SYSDTA/DDKARTE		
ADARUN parameters	SYSDTA/DDCARD		*Adabas Operations*
ADAPRI messages	SYSLST/DDDRUCK		*Adabas Messages and Codes*
ADARUN messages	SYSOUT/DDPRINT		*Adabas Messages and Codes*

Example

```
/.PRI               LOGON
/MOD-JOB-OPTIONS    LISTING=YES
/MOD-TEST           DUMP=YES
/ASS-SYSLST         DO.PRI.LST
/ASS-SYSOUT         DO.PRI.OUT
/ASS-SYSDTA         *SYSCMD
/SET-FILE-LINK      DDDSIMR1, ADABAS.DB010.DSIM
,SUP=DISK(SHARE-UPD=YES)
/SET-FILE-LINK      DDLIB   , ADABAS.MOD
/REMARK
/START-PROGRAM      FROM-FILE=*MOD(ADABAS.MOD,ADARUN)
ADARUN   PROG=ADAPRI, ...
ADAPRI DSIMPRI FROMRABN=...,TORABN=...
```

```
/ASS-SYSLST         *PRIM
/ASS-SYSOUT         *PRIM
/ASS-SYSDTA         *PRIM
/LOGOFF             SYS-OUTPUT=DEL
```

z/OS

Data Set	DD Name	Storage	More Information
Delta Save images (DSIM)	DDDSIMR1	disk	Required for the DSIMPRI function
ADAPRI parameters	DDKARTE		
ADARUN parameters	DDCARD		*Adabas Operations*
ADAPRI messages	DDDRUCK		*Adabas Messages and Codes*
ADARUN messages	DDPRINT		*Adabas Messages and Codes*

Example

```
//PRINT     EXEC  PGM=ADARUN
//DDDSIMR1  DD    DSN=ADABAS.DB010.DSIMR1,DISP=SHR
//DDCARD    DD    *
 ADARUN  PROG=ADAPRI, ...
//DDKARTE   DD    *
 ADAPRI  DSIMPRI FROMRABN=...,TORABN=...
//DDPRINT   DD    SYSOUT=*
//DDDRUCK   DD    SYSOUT=*
```

IV ADAREP Utility

5 ADAREP Utility

If a Delta Save logging (DLOG) area is defined in the database, the database report utility ADAREP additionally reports the Delta Save status. After the section about alternate RABNs, a Delta Save section is displayed with the following information:

- Delta Save status (disabled or enabled);
- percentage of the DLOG area used;
- number of full save operations since installation of the DLOG area;
- date and time of the last full save;
- number of Delta Save operations since the last full save;
- date and time of the last delta save;
- estimate of the number of database blocks that would be saved in a current Delta Save operation. The estimate may be higher or lower than the actual number of blocks.
- location, device type, block size, and number of unused blocks of the DLOG area.

If no DLOG area is defined, the Delta Save section is omitted.

This chapter covers the following topics:

Delta Save Report Format

The following is an example of the Delta Save section in an ADAREP database report:

```
************************
* DELTA SAVE FACILITY *                          yyyy-mm-dd  hh:mm:ss
************************



DELTA SAVE STATUS = ENABLED
DLOG AREA USAGE   = 2%


LAST FULL SAVE NUMBER        = 2
DATE/TIME OF LAST FULL SAVE  = 1997-01-19 04:03:36
LAST DELTA SAVE NUMBER       = 5
DATE/TIME OF LAST DELTA SAVE = 1997-01-24 22:39:45


ESTIMATED NUMBER OF CHANGED BLOCKS = CA. 1,700 BLOCKS


D S F   L O G G I N G   A R E A


LIST I DEV  BLOCK I  SPACE ALLOC.  I  FROM     TO   I  UNUSED SPACE  I
TYPE I TYPE LNGTH I BLOCKS     CYL I  RABN    RABN  I BLOCKS     CYL I
     I            I                I                I                I
-----I------------I----------------I----------------I----------------I
     I            I                I                I                I
DSF  I 3390  2004 I    100       0 I  1340    1439  I    74        0 I
     I            I                I                I                I
```

```
 ---------------------------------------------------------------------
```

Delta Save Checkpoints

The following additional checkpoints can be written by the Adabas nucleus or utilities and included in the ADAREP output when running with the Delta Save Facility:

Checkpoint		Originated	
Type	Name	By	Description
0B	SYNP	ADASAV	End of SAVE DELTA operation
0C	SYNP	ADASAV	End of RESTORE DELTA operation
0D	SYNP	ADASAV	End of MERGE operation
0E	SYNV	ADASAV	VOLSER entry for SAVE DELTA operation
0F	SYNV	ADASAV	VOLSER entry for MERGE operation (output volumes)
6A	SYNS	SYSAOS	DSF logging (DLOG) area installed
6B	SYNS	SYSAOS	DLOG area changed
6C	SYNS	SYSAOS	DLOG area removed

JCL/JCS Requirements and Examples

This section describes the job control information required to run the ADAREP utility with BS2000/OSD, z/OS, z/VM, VSE/ESA and z/VSE systems, and shows examples of each of the job streams.

This section covers the following topics:

- z/OS

z/OS

Data Set	DD Name	Storage	More Information
Associator	DDASSORn	disk	
Data Storage	DDDATARn	disk	
ADAREP parameters	DDKARTE		
ADARUN parameters	DDCARD		*Adabas Operations*
ADAREP messages	DDDRUCK		*Adabas Messages and Codes*
ADARUN messages	DDPRINT		*Adabas Messages and Codes*

Example

```
//REP       EXEC PGM=ADARUN
//STEPLIB   DD   DISP=SHR,DSN=ADABAS.Vvrs.LOADLIB
//*
//DDASSOR1  DD   DISP=SHR,DSN=EXAMPLE.ADA99.ASSOR1
//DDDATAR1  DD   DISP=SHR,DSN=EXAMPLE.ADA99.DATAR1
//SYSUDUMP  DD   SYSOUT=A
//DDDRUCK   DD   SYSOUT=A
//DDPRINT   DD   SYSOUT=A
//DDCARD    DD   *
ADARUN PROG=ADAREP,SVC=249,DEVICE=3390,DB=99
//DDKARTE   DD   *
ADAREP    CPLIST
```

V ADARES Utility

This chapter describes the additional functionality and new parameters of ADARES that are introduced by the Delta Save Facility.

The ADARES COPY and PLCOPY functions include additional operations and parameters for Delta Save operation. These additional Delta Save operations of ADARES are available only when the ADARUN parameter DSF=YES is specified in the DDCARD/CARD input.

This chapter covers the following topics:

COPY: Copy Sequential Protection Log

The COPY function copies one *sequential* protection log to another *sequential* protection log data set. It must be used to copy the sequential protection log of an Adabas nucleus session that has terminated abnormally; only then can the protection log be used for other purposes. Protection logs from several consecutive Adabas sessions may be copied in a single ADARES COPY execution.

The COPY function may be used to copy a sequential protection log from disk to tape before it can be used as input to the ADARES BACKOUT function. ADARES COPY may be used even if subsequent Adabas sessions have created other protection log data sets. ADARES COPY may be executed any number of times for any given input data set.

The COPY function also copies save tapes created by the ADASAV utility. Only one save data set can be copied in a single COPY execution.

When the Delta Save Facility is installed and ADARUN DSF=YES, the COPY function

- can also be used to rebuild a DSIM data set that could not be successfully built by PLCOPY executions because an error occurred. For example, the DSIM data set might have been too small to hold all online save information extracted from the protection log. Building a complete DSIM data set is a prerequisite for using the online save data set in subsequent merge operations.
- additionally extracts all protection log information relating to an online save operation and writes them to the DSIM data set. This data set can then be supplied to an ADASAV MERGE or RESTORE DELTA function.

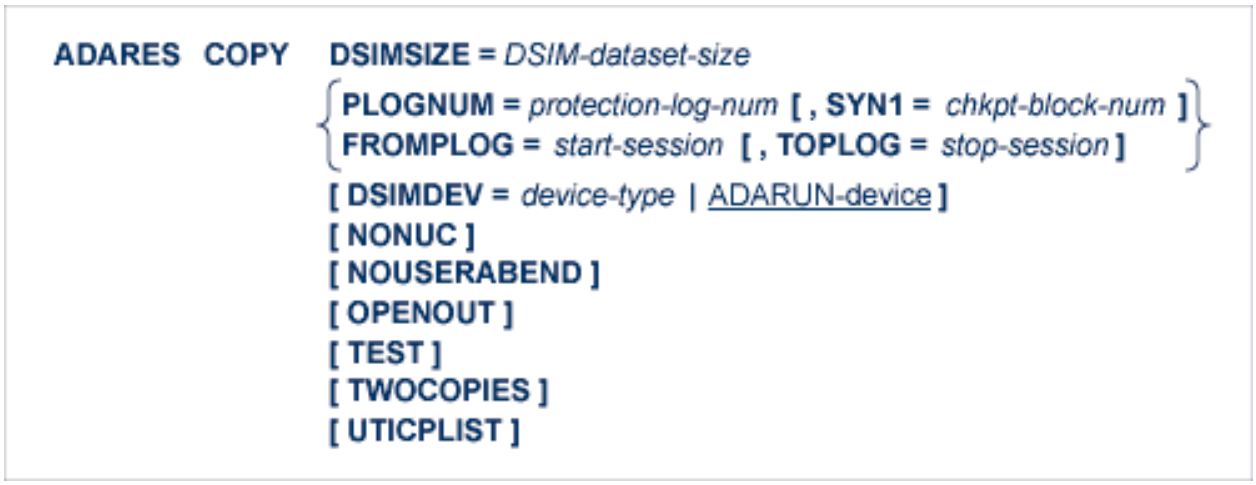
The protection log to be processed must cover a single, *complete* online save operation. The protection log must contain both SYN1 and SYN2 checkpoints. If it covers more than one online save, only the protection log information of the last one is extracted. Any other online save operation may be designated by specifying the block number of the save operation's start checkpoint in the SYN1 parameter. If more than one PLOG was processed during the online save operation, all these PLOGs need to be concatenated.

If the building of the DSIM data set is the only purpose of the COPY operation, the sequential output may be directed to a dummy data set so that no data is actually written. The online save information will nevertheless be extracted from the protection log and written to the DSIM data set.

For ADARES, the DSIM data set must be specified for shared-update use.

Procedures for rebuilding a DSIM data set are outlined in the section **Rebuilding the DSIM Data Set**.

Syntax



Essential Parameters

DSIMSIZE: DSIM Data Set Size

The size of the DSIM data set. The size can be specified in cylinders, or in blocks (by appending "B" to the number). This parameter is mandatory if ADARUN parameter DSF=YES is specified. Otherwise, do not specify DSIMSIZE.

PLOGNUM: Protection Log Number

The Adabas protection log number of the data set to be copied. This number may be obtained from the database status report produced by the ADAREP utility. The output of the COPY function will be assigned the same log number.

If ADARUN parameter DSF=YES is specified, the PLOGNUM parameter also identifies the protection log number of the SYN1 checkpoint where extraction of online save information is to start.

FROMPLOG: Beginning Session for Backout

FROMPLOG specifies the session number at which the ADARES COPY function is to start. ADARES searches the input (DDSIIN/SIIN) file for the correct starting session.

Optional Parameters

DSIMDEV: DSIM Data Set Device Type

The DSIMDEV parameter specifies the device type of the DSIM data set. This parameter is required only if the DSIM device type is different from that specified by the ADARUN DEVICE parameter (which is the default). It is allowed only if the ADARUN parameter DSF=YES is specified.

NONUC: Ignore Nucleus Response

The NONUC parameter in the ADARES COPY utility function is deactivated effective with Adabas 8.2. You can still specify the parameter, but it is ignored.

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

OPENOUT: Open DDSIAUS 1/2 or SIAUS 1/2 Output Data Sets

The OPENOUT parameter indicates that the DD/SIAUS1/2 output data sets are to be opened by ADARES, even if no data is actually to be copied. Without OPENOUT, the sequential output data sets are not opened if ADARES detects an end-of-file condition while attempting to read the first input record; this may cause problems in some operating system environments. With OPENOUT, the output data sets are opened before the first input record is read.

SYN1: Checkpoint Block Number

The block number of the SYN1 checkpoint on the protection log (PLOG) to be copied where extraction of online save information is to start. This is the start checkpoint of the online save operation. The SYN1 block number may be obtained from the database status report produced by the ADAREP utility.

If the SYN1 parameter is omitted, extraction of online save information starts at the first SYN1 checkpoint encountered. If the PLOG covers several online save operations, extracting the online save information is started anew at every SYN1 checkpoint that occurs. Therefore, if the SYN1 parameter is not specified, the online save information of the last online save operation recorded in the PLOG is extracted.

The SYN1 parameter is only allowed if ADARUN parameter DSF=YES is specified, and can be specified only with the PLOGNUM parameter.

TEST: Test Syntax

The TEST parameter tests the operation syntax without actually performing the operation. Note that the validity of values and variables *cannot* be tested; only the syntax of the specified parameters can be tested.

TOPLOG: Ending PLOG Session for Backout

TOPLOG specifies the last session to be processed by the specified ADARES function. If ADARES finds a session on the PLOG input (DDSIIN/SIIN) file that is greater than the specified TOPLOG session, that session is excluded from ADARES processing. If TOPLOG is not specified, the FROMPLOG session becomes the default.

TWOCOPIES: Create Two Output Copies

TWOCOPIES causes two copies of the output to be created.

UTICPLIST: Print All Utility Checkpoints

The UTICPLIST parameter causes ADARES to select and print all utility checkpoints found on the data protection log during the COPY function.

Example

```
ADARES COPY PLOGNUM=1310
ADARES      DSIMSIZE=10
ADARES      DSIMDEV=8381
```

A sequential protection log of the current active session is to be copied. The session number is 1310. Any protection log information relating to an online save operation is to be extracted and written to the DSIM data set. The DSIM data set size is 10 cylinders and the device type is 8381.

PLCOPY: Copy PLOG to Sequential Log

The PLCOPY function copies the *dual* or *multiple* protection log to a *sequential* protection log data set. The dual or multiple protection log data set that has the earlier timestamp is copied. Once the PLCOPY function is successfully completed, the copied data set is reset to an empty status. This function can therefore be used only once for any given portion of the protection log of an entire Adabas nucleus session. The PLCOPY function is only applicable if the Adabas nucleus is run with dual or multiple protection logging.

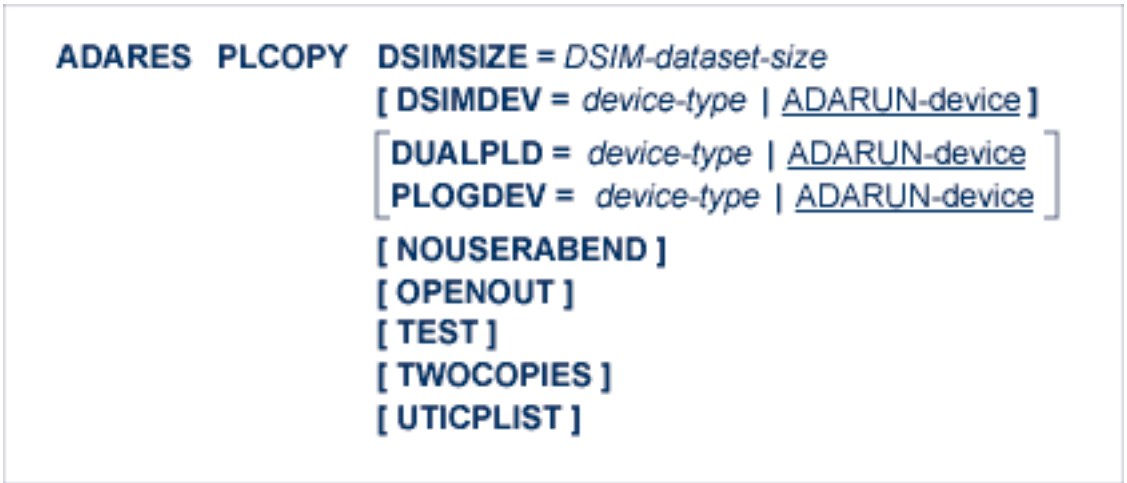
When the Delta Save Facility is installed and ADARUN DSF=YES, the PLCOPY function also extracts all protection log information relating to an online save operation and writes it to the Delta Save images (DSIM) data set. This process is called "building the DSIM data set". The data set can then be supplied to an ADASAV MERGE or RESTORE DELTA function.

Depending on the number of protection log switches during an online save operation, several PLCOPY executions may be necessary to extract all online save information. The DSIM data set remains incomplete between two such PLCOPY operations. It is marked ready for merge only after the SYN2 checkpoint indicating the end of an online save operation is found on the protection log.

If the "build" process is interrupted due to an error condition, subsequent merging and/or restore operations cannot take place; this renders the online save tape almost useless. In this case it is necessary to "rebuild" the DSIM data set using the COPY function.

Procedures for rebuilding a DSIM data set are outlined in the section **Rebuilding the DSIM Data Set**.

Syntax



Essential Parameter

DSIMSIZE: DSIM Data Set Size

The size of the DSIM data set. The size can be specified in cylinders, or in blocks (by appending "B" to the number). This parameter is mandatory if ADARUN parameter DSF=YES is specified. Otherwise, do not specify DSIMSIZE.

Optional Parameters

DSIMDEV: DSIM Data Set Device Type

The DSIMDEV parameter specifies the device type of the DSIM data set. This parameter is required only if the DSIM device type is different from that specified by the ADARUN DEVICE parameter (which is the default). It is allowed only if ADARUN parameter DSF=YES is specified.

DUALPLD | PLOGDEV: PLOG Device Type

DUALPLD specifies the device type used for dual protection log data sets; PLOGDEV specifies the device type used for multiple protection log data sets. This parameter is required if the device type used for the dual or multiple protection log data sets is different from that specified with the ADARUN DEVICE parameter.

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

OPENOUT: Open DDSIAUS 1/2 or SIAUS 1/2 Output Data Sets

The OPENOUT parameter indicates that the DD/SIAUS1/2 output data sets are to be opened by ADARES, even if no data is actually to be copied. Without OPENOUT, the sequential output

data sets are not opened if ADARES detects an end-of-file condition while attempting to read the first input record; this may cause problems in some operating system environments. With OPENOUT, the output data sets are opened before the first input record is read.

TEST: Test Syntax
The TEST parameter tests the operation syntax without actually performing the operation. Note that the validity of values *cannot* be tested; only the syntax of the specified parameters can be tested.

TWOCOPIES: Create Two Copies of Output
TWOCOPIES causes two copies of the output to be created. If TWOCOPIES is not specified, the default is one copy.

UTICPLIST: Print All Utility Checkpoints
The UTICPLIST parameter causes ADARES to select and print all utility checkpoints found on the data protection log during the PLCOPY function.

Example

```
ADARES PLCOPY
ADARES        DSIMSIZE=10
ADARES        DSIMDEV=8381
```

The dual or multiple protection log is to be copied. Any protection log information relating to an online save operation is to be extracted and written to the DSIM data set. The DSIM data set size is 10 cylinders and the device type is 8381.

Rebuilding the DSIM Data Set

Using the Delta Save Facility, you can perform full or delta save operations online and automatically combine the resulting save data set with all changes to the database that took place during the online save. The result is a quasi-offline save data set, which is equivalent to an offline save taken at the end of the online save operation.

Accumulating database changes during the online save operation depends on the ability of the ADARES PLCOPY function to extract images of changed database blocks from the protection log (PLOG) and write them to the DSIM data set. This process is called "building the DSIM data set". If this process is interrupted due to an error condition, subsequent merging and/or restore operations cannot take place; this renders the online save tape almost useless.

Possible error conditions on the DSIM data set include the following:

- The DSIM data set is full: that is, it is too small to hold all images of all database blocks changed during the online save operation;
- The status of the DSIM data set is incorrect; the sequence of operations being performed does not conform to the save/copy/merge cycle;

- An I/O error occurs on the DSIM data set;
- The DSIM data set is accidentally used (altered) by another utility.

If such an error condition occurs, the correct DSIM data set can be "rebuilt" using the ADARES COPY function. This is called "recover mode" and requires the following steps:

1 Determine and correct the cause of the error; for example, allocate and format a new, larger DSIM data set if the current one is too small.

2 Identify the copied, sequential PLOG data sets that contain all of the online save operation in question; the checkpoint list from the ADAREP database report may be used to determine the save operation's SYN1 checkpoint block number (the SYN1 checkpoint marks the beginning of an online full or delta save operation).

3 Using the chosen sequential PLOG data sets as input, execute the ADARES COPY function to rebuild the DSIM data set. If sequential PLOG output is not needed, specify a dummy output data set. If the supplied PLOG input covers multiple online saves, identify the correct one by specifying the SYN1-parameter with the checkpoint block number determined in step 2.

4 After the ADARES COPY function completes successfully, the DSIM data set can be merged with the online save data set and, optionally, other full or delta save data sets.

6 ADARES JCL/JCS Requirements and Examples

This section describes the job control information required to run the Delta Save functions of ADARES with BS2000/OSD, z/OS, z/VM, VSE/ESA and z/VSEsystems, and shows examples of each of the job streams.

Note: When running with the optional Recovery Aid (RLOG), all temporary data sets must also be cataloged in the job control.

This chapter covers the following topics:

z/OS

Data Set	DD Name	Storage	More Information
Associator	DDASSORn	disk	
Delta Save images (DSIM)	DDDSIMR1	disk	required when ADARUN DSF=YES
Sequential protection log (PLOG)	DDSIIN	tape/disk	input log for COPY
Dual/multiple PLOG	DDPLOGRn	disk	input log for PLCOPY
Copied log	DDSIAUS1	tape/disk	output of COPY and PLCOPY
Extra copied log	DDSIAUS2	tape/disk	required if a copy function is used with TWOCOPIES
Recovery log (RLOG)	DDRLOGR1	disk	required for RLOG option
ADARES parameters	DDKARTE		
ADARUN parameters	DDCARD		*Adabas Operations*
ADARES messages	DDDRUCK		*Adabas Messages and Codes*
ADARUN messages	DDPRINT		*Adabas Messages and Codes*

Rebuild DSIM Data Set from Sequential Protection Log (ADARES COPY)

```
//COPY     EXEC  PGM=ADARUN
//DDASSOR1 DD  DSN=ADABAS.DB010.ASSOR1,DISP=SHR
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIMR1,DISP=OLD
//DDSIIN   DD  DSN=ADABAS.DB010.PLOG0310,DISP=SHR
//DDSIAUS1 DD  DUMMY
//DDCARD   DD  *
ADARUN PROG=ADARES,DSF=YES,...
//DDKARTE  DD  *
ADARES COPY ...
ADARES      DSIMSIZE=...
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

Copy Dual/Multiple Protection Log/Build DSIM Data Set (ADARES PLCOPY)

```
//PLCOPY   EXEC  PGM=ADARUN
//DDASSOR1 DD  DSN=ADABAS.DB010.ASSOR1,DISP=SHR
//DDPLOGR1 DD  DSN=ADABAS.DB010.PLOGR1,DISP=SHR
//DDPLOGR2 DD  DSN=ADABAS.DB010.PLOGR2,DISP=SHR
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIMR1,DISP=SHR
//DDSIAUS1 DD  DSN=ADABAS.DB010.PLOG1310,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDCARD   DD  *
ADARUN PROG=ADARES,DSF=YES,...
//DDKARTE  DD  *
ADARES PLCOPY ...
ADARES        DSIMSIZE=...
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

VI ADASAV Utility

This chapter describes the ADASAV utility functions added specifically for use with the Delta Save Facility. The functions are:

- **MERGE** for
  - combining "offline" delta save output, either alone or with the last full save output;
  - combining "online" full or delta save output with data from the corresponding DSIM data set;
  - unloading the DSIM data set to a sequential delta save data set.
- **RESTORE DELTA** for restoring a full save and delta save output without a prior merging;
- **SAVE** and **SAVE DELTA** for performing either a full or "changes only" database save operation.

With the exception of `SAVE database', these functions are only available when the ADARUN parameter DSF=YES is specified. The `SAVE database' function includes special processing when DSF=YES is specified.

- **Restarting an Interrupted Save Operation**
- **JCL/JCS Requirements and Examples**

7 ADASAV MERGE

This chapter covers the following topics:

Consolidating Delta Saves or Updating Full Saves

The ADASAV MERGE function takes as input zero or one full save data set and zero to eight delta save data sets:

DD/DEL1...DD/DELn	up to eight consecutive delta save tapes covering a contiguous time span with no gaps. Do not omit a delta save tape.
DD/FULL	the optional full save input tape.

The input data sets may originate from SAVE database, SAVE DELTA, or MERGE functions. They must cover a continuous sequence of full and delta save operations. Overlapping delta save numbers in data sets used as input to the merge are allowed.

ADASAV MERGE combines the input data sets into a single data set: either a consolidated delta save tape or an updated full save tape:

DD/SAVE1	the new full or delta save output tape.

The output data set may subsequently be used as input for MERGE, RESTORE, or RESTORE DELTA functions.

If the DRIVES parameter is specified, ADASAV MERGE cuts the *full* save output into as many pieces as specified by DRIVES:

DD/SAVE1...DD/SAVEn	up to eight consecutive partial save tapes comprising together the new full save output tape.

The output data sets created can be used as input to a RESTORE function with the same value of DRIVES.

If only delta save input data sets are specified, the MERGE function creates a new delta save data set that contains every database block from each input save data set. If a block is present on more than one input save data set, its latest occurrence is taken. The result is a "consolidated" delta save data set that contains all changes since the last full save or since the last delta save not included in the MERGE function.

If a full save data set is specified as input, the MERGE function creates a new full save data set that contains the latest image of every used block of the database. This full save data set is equivalent to the database at the time of the last SAVE DELTA execution.

Merging Online Saves and DSIM Data Sets

The "online" variation of the MERGE function takes as input a full or delta save data set that originates from an online save operation *and* the accompanying DSIM data set that was specified for the online save operation:

DD/DSIMR1	interim data set from an online SAVE operation.

An online full or delta save data set with its corresponding DSIM data set can also be specified in a merge with "offline" save data sets. The output save data set from the "online" merge operation is always like an "offline" save data set and may be supplied together with another online save data set for a subsequent MERGE operation.

The DSIM data set is automatically built while ADARES PLCOPY copies the dual or multiple protection logs (PLOGs). Building the DSIM data set is completed when the PLCOPY function encounters the online save operation's SYN2 checkpoint on the PLOG.

If the MERGE function is performed directly after the online save operation, the DSIM data set will normally not be completely built when the MERGE function starts. The DSIM data set will not be ready for merge before the next PLCOPY operation has been performed. The DSIMWAIT parameter tells the MERGE function how long to wait for the DSIM data set to become ready for merge.

Upon completion of the MERGE function, the DSIM data set is reset for use in another online save/merge cycle.

Unloading DSIM Data Sets

The "unload" variation of the MERGE function transfers the contents of the DSIM data set

DD/DSIMR1	interim data set from the last online SAVE operation.

-to a sequential delta save data set

DD/SAVE1	delta save data set.

-that can be used in MERGE or RESTORE DELTA operations later on as needed.

The "unload" frees the DSIM data set for the next online SAVE operation.

Unlike the "merge" of the DSIM data set, the "unload" does not process the associated online full or delta save data set again immediately after it is created. Instead, more than one online save data

set can be processed later on in a single MERGE or RESTORE DELTA operation by sequencing for each the delta save data set created from its associated DSIM data set.

The DSIM data set is unloaded by running ADASAV MERGE with only the DSIM data set as input. The PATTERN parameter must be omitted or blank, and the DRIVES parameter must not be set to a value greater than one. The DSIMWAIT parameter functions normally.

Whereas the DSIM data set is direct access and contains changed blocks from the database in no particular order, the output data set is sequential and contains the blocks in ascending RABN sequence without duplicates, like any delta save data set.

An unloaded DSIM data set is identified by a flag in the save data set header. The header specifies

- the delta save ID (DSID) of the associated online save; and
- the positions of the online save's SYN1 and SYN2 checkpoints on the PLOG.

The fields mentioned in the header record are filled from the corresponding fields in the DSIM header block.

If the DSIM data set was (re)built by an ADARES COPY execution, the DSID is not known and will be zero. The associated online save is still correctly identified by the positions of its SYN1 and SYN2 checkpoints on the PLOG.

When a DSIM data set is unloaded, the MERGE function still generates a SYNP-0D checkpoint but with an indication that the created save data set is an unloaded DSIM data set.

Using Unloaded DSIM Data Sets as "Online" MERGE Input

When an unloaded DSIM data set is supplied as input for a MERGE operation, it must be specified

- as one of the DD/DELn input data sets. More than one unloaded DSIM data set may be supplied for a single MERGE.
- directly after its associated online delta save input; that is, with the next higher DD/DELn index number. For example, if an online delta save input is supplied as DD/DEL2, its associated unloaded DSIM data set must be given as DD/DEL3. If an unloaded DSIM data set is associated with an online full save, it must be specified as DD/DEL1.

These rules for specifying unloaded DSIM data sets ensure the correct output: each block is taken from the last input in sequence that contains a block image with the same RABN.

The MERGE function checks whether the online save fits the contents of the DSIM data set. If so, the online save is associated with the DSIM data set. If not, the next input delta save in logical sequence must be a matching unloaded DSIM data set.

Concatenated Data Sets in MERGE Input

The full save input to the ADASAV MERGE function must be supplied as a single entity. Full saves that are spread over several data sets (by means of the DRIVES parameter in ADASAV), must be concatenated as follows:

- For BS2000/OSD systems, by using the DDFULL01, DDFULL02, ... link names for the second, third, ... data sets;
- For z/OS, and z/VM systems, by using operating system concatenation capabilities;
- For VSE/ESA and z/VSE systems, by using the FULL01, FULL02, ... symbolic names for the second, third, ... data sets.

For a MERGE operation, a delta save data set may not be concatenated to another full or delta save data set. If the MERGE operation detects a concatenated data set at the end of any other data set in the logical sequence, it terminates with an error message.

Note: In cases where the MERGE function can be completed without reading all input save data sets to their end, wrongly concatenated input save data sets may still go undetected and be ignored.

See the JCL examples for the ADASAV MERGE function in section **JCL/JCS Requirements and Examples**. for more information on data set concatenation on BS2000 and VSE/ESA systems, see the *Adabas Utilities* documentation.

Syntax

```
ADASAV  MERGE   [ DRIVES = count | 1 ]
                [ DSIMDEV = device-type | ADARUN-device ]
                [ DSIMWAIT = seconds | 0 ]
                [ NOUSERABEND ]
                [ PATTERN = merge-pattern ]
                [ PERDRIVE = disks-per-tape ]
                [ TEST ]
                [ TWOCOPIES ]
```

Optional Parameters

DRIVES: Number of Output Data Sets

DRIVES can only be specified if the output save data set is a full save.

The DRIVES parameter specifies the number of output data sets to be created, all of which together build the full save output. The MERGE function cuts the output full save into as many pieces as specified by DRIVES.

Note: The full save input must always be specified using a single DD/link name (DD/FULL). Concatenation can be used, if necessary. See **Concatenated Data Sets in MERGE Input**.

The output data sets created can be used as input to a RESTORE function with the same value of DRIVES.

DSIMDEV: DSIM Device Type

The DSIMDEV parameter specifies the device type of the DSIM data set. This parameter is required only if the DSIM device type is different from that specified by the ADARUN DEVICE parameter (which is the default).

DSIMWAIT: DSIM Data Set Wait Time in Seconds

The DSIMWAIT parameter specifies how long the MERGE function should wait for the DSIM data set to become ready for merge.

It can be used if a merge step is to be executed directly after an online save operation but must wait for the ADARES PLCOPY function to copy the nucleus' dual or multiple protection log.

The maximum time to wait is specified in seconds. If the DSIM data set does not become ready for merge during this interval, and one of the input save data sets is an online save data set, the MERGE function fails.

If DSIMWAIT is not specified, the MERGE function will not wait for the DSIM data set to become ready for merge, but instead will begin operation immediately or fail if the DSIM data set is not ready for merge (the default).

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

PATTERN: Merge Input Pattern

PATTERN is an optional parameter that provides a cross-check between the intended merge input and the actual data sets specified by the job control. PATTERN specifies the count and type of input data sets to the merge operation as single letters "F" (full save tape) or "D" (delta save tape). Only one "F" can be specified in the pattern field, but up to eight "D"s can be entered-one for each existing delta save tape to be merged (additional delta save tapes can be merged in subsequent merge operations with the result of this merge operation).

The pattern starts with an "F" if a full save input is specified, and continues (or starts) with a "D" for every delta save input. For example, PATTERN=FDD specifies that the input comprises one full save data set and two delta save data sets. No special indicator is given for a save data set being online. The pattern string must exactly match the input save data sets specified in the job control.

PERDRIVE: Disk Drives Per Tape Drive

PERDRIVE specifies the number of disk drives to be assigned to a single output tape drive. For example, if the database is contained on seven disk drives and three tape drives are available for MERGE processing, PERDRIVE=3,2,2 would cause the first three disk drives to be written to tape drive 1, the next two disk drives to be written to tape drive 2, and the next two disk drives to be written to tape drive 3. The drive sequence corresponds to the DD/SAVEn or DD/DUALn job control specifications, as described in the section **JCL/JCS Requirements and Examples**.

The total number of drives specified by PERDRIVE must equal the sum of all Associator (DD/ASSORn) and Data Storage (DD/DATARn) disks; if both Associator and Data Storage are on a single disk, this counts as two separate disks. If the DRIVES parameter is used and the PERDRIVE parameter is omitted, ADASAV determines the most efficient utilization of the tape drives.

TEST: Test Syntax

The TEST parameter tests the operation syntax without actually performing the merge operation. Note that the validity of values *cannot* be tested; only the syntax of the specified parameters can be tested.

TWOCOPIES: Create Two Copies of Output

TWOCOPIES creates two physical copies of the ADASAV output.

Examples

Example 1:

```
ADASAV MERGE
DSIMDEV=8381,DSIMWAIT=300,PATTERN=DD
```

Two delta save tapes, one created during an online delta save, are to be merged into a single delta save tape. The merge operation will wait up to five minutes (300 seconds) for the DSIM data set to become available. The DSIM data set's device type is 8381.

Example 2:

```
ADASAV MERGE PATTERN=FD
ADASAV          DRIVES=4
ADASAV          TWOCOPIES
```

One full save and one delta save data set are to be merged. The full save output is to be distributed over four data sets, making them suitable for a restore using four drives. Two copies of each output data set are to be made.

Example 3:

```
ADASAV MERGE PATTERN=F
```

Only one (online) full save and its corresponding DSIM data set are to be merged. The output is equivalent to an offline full save taken at the end of the online save operation.

Example 4:

```
ADASAV MERGE PATTERN='FDDDDDDDD'
```

A full save and eight delta saves (the maximum number allowed) are to be merged.

8 ADASAV RESTORE DELTA: Restore Without Prior Merging

The RESTORE DELTA function restores a database or file(s) from a full save and zero, one, or more delta save data sets without first merging the save inputs. The input data sets may originate from SAVE database (with DSF=YES), SAVE DELTA, or MERGE functions, and must cover a continuous sequence of full and delta save operations.

For RESTORE DELTA database operations where more input save tapes are present than tape units are available, the excess save tapes may be concatenated to the delta save tape assigned to the last tape unit; however, the logical sequence of delta saves *must* be retained. If concatenation is not possible or not enough tape units are available, the number of input save data sets must be reduced to eight or fewer by doing consecutive merge operations.

An interrupted RESTORE operation must be executed again from the beginning. For RESTORE DELTA database, the restore operation can be restarted without the full save tape if the full save tape was completely restored and only some of the supplied delta save tapes remain to be restored. Message DSF048 in the restore operation's protocol indicates the input save data sets that have been completely restored. The other delta save data sets must be supplied for the restarted restore operation.

This chapter covers the following topics:

Online Save and DSIM Inputs

A full or delta save input data set may originate from an "online" save operation. In this case, the original or unloaded DSIM data set that was specified for the online save operation must also be specified as an input data set. It is possible to specify a single online save input and its corresponding DSIM data set without specifying any other input save data set.

The DSIM data set is automatically built while ADARES PLCOPY copies the dual or multiple PLOGs. Building the DSIM data set is completed when the PLCOPY function encounters the online save operation's SYN2 checkpoint on the PLOG.

If the RESTORE DELTA function is to be performed directly after the online save operation, the DSIM data set will normally not be completely built when the RESTORE DELTA function starts. The DSIM data set will not be ready for merge before the next PLCOPY operation has been performed. The DSIMWAIT parameter tells the RESTORE DELTA function how long to wait for the DSIM data set to become ready for merge.

When an "unloaded" DSIM data set is supplied as input for a RESTORE DELTA operation, it must be specified

- as one of the DD/DELn input data sets. More than one unloaded DSIM data set may be supplied for a single RESTORE.
- directly after its associated online delta save input; that is, with the next higher DD/DELn index number. For example, if an online delta save input is supplied as DD/DEL2, its associated un-

loaded DSIM data set must be given as DD/DEL3. If an unloaded DSIM data set is associated with an online full save, it must be specified as DD/DEL1.

These rules for specifying unloaded DSIM data sets ensure the correct output: each block is taken from the last input in sequence that contains a block image with the same RABN.

The RESTORE DELTA function checks whether the online save fits the contents of the DSIM data set. If so, the online save is associated with the DSIM data set. If not, the next input delta save in logical sequence must be a matching unloaded DSIM data set.

A RESTORE DELTA function may postpone processing the expected unloaded DSIM data set until a subsequent phase of the restore. For example, an online full save is first restored on multiple drives and then the associated DSIM data set is handled, which must be either the original or an unloaded DSIM data set; or, if the last delta save input in logical sequence contains an online save, the associated unloaded DSIM must be concatenated to that online save. If the expected unloaded DSIM data set is missing, the restore terminates with an error message, leaving the database intact for a proper RESTORE DELTA from the most recent restart point on, but with all files in restore-status.

During a RESTORE DELTA operation, ADASAV prints the DSF048 partial completion messages providing restart points in case of subsequent failure only when the full and delta saves already restored really form a consistent state of the database. A DSF048 message is suppressed if an online save is restored but the associated DSIM data set will be processed in a subsequent phase of the restore.

Upon completion of the RESTORE DELTA, the DSIM data set is *not* reset; it is still available for a MERGE operation.

Concatenated Data Sets in RESTORE DELTA Input

Consecutive delta save results can be combined (concatenated) as input to the ADASAV RESTORE DELTA function. The last delta save input (the one with the most recent time stamp) can be a concatenation of several consecutive delta save tapes, as follows:

- For BS2000/OSD systems, by using the DDDELn01, DDDELn02, ... link names, where the last delta save input has the serial number "n";
- For z/OS, and z/VM systems, by using the available operating systems capabilities;
- For VSE/ESA and z/VSE, by using the DELn01, DELn02, ... symbolic names, where the last delta save input has serial number "n".

See the JCL examples for the ADASAV RESTORE DELTA function in section **JCL/JCS Requirements and Examples**. For more information on data set concatenation on BS2000/OSD, z/VSE and VSE/ESA systems, see the *Adabas Utilities* documentation.

Output Database Requirements

For RESTORE DELTA database or RESTORE DELTA GCB, the output database must have the same physical layout (device types, extent sizes) as the original database. The Associator and Data Storage data sets must be present and must have been formatted at least once. The Adabas nucleus must not be active. If the dual or multiple protection log (PLOG) and/or dual or multiple command log (CLOG) data sets are specified in the job control, these data sets are reset to an empty status.

For RESTORE DELTA FILES or RESTORE DELTA FMOVE, an existing database must be present. The files to be restored may come from the same or a different database. The Adabas nucleus may be active. If the nucleus is active when checkpoint or security files are restored, the ADASAV utility requires exclusive database control; that is, no user may be active on the database.

Subsequent Operations

After a RESTORE database or RESTORE DELTA database operation, another RESTORE DELTA database function may be executed without the full save input data set, provided that

- a DSF logging (DLOG) area is defined in the database;
- no Adabas nucleus session has been started since the last restore operation;
- no utility that makes changes to the database (ADALOD, ADASAV RESTORE FILE) has been run since the last restore operation; and
- the delta save tape to be restored is the next in the logical sequence of delta save tapes already restored.

This way of executing the RESTORE DELTA function can be used to keep a shadow database up to date.

Syntax

The minimum syntax is ADASAV RESTORE DELTA. A database restore is assumed unless the FILES or FMOVE parameter is specified.

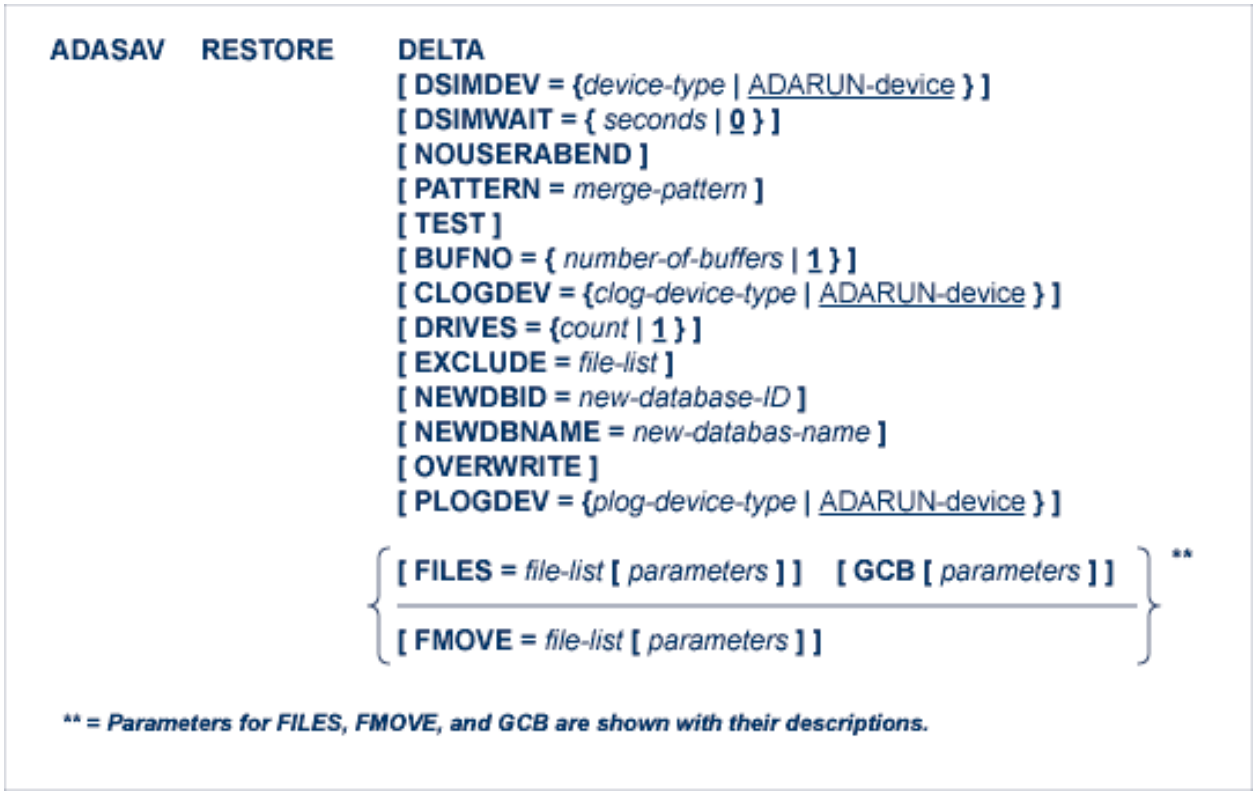
Any or all of the parameters DSIMDEV, DSIMWAIT, PATTERN, and TEST may be optionally specified independently. The parameters BUFNO, CLOGDEV, DRIVES, EXCLUDE, NEWDBID, NEWDBNAME, OVERWRITE, and PLOGDEV have special dependencies on other parameters as indicated in the individual parameter discussions.

The FILES, FMOVE, and GCB parameters are optional. However, if FILES or GCB is specified, FMOVE may not be specified and vice versa. FILES may be specified with or without GCB. The parameters available with FILES, FMOVE, and GCB are not depicted in the following syntax diagram; they are depicted instead with their detail descriptions instead.

ALLOCATION, NEWFILES, and PASSWORD are allowed with FILES or FMOVE only.

If FMOVE is specified, any or all of the parameters ACRABN, ALLOCATION, ASSOVOLUME, DATAVOLUME, DRIVES, DSRABN, DSSIZE, MAXISN, NEWFILES, NIRABN, NISIZE, PASSWORD, UIRABN, and UISIZE may be specified.

If GCB is specified, any or all of the parameters CLOGDEV, FILES, NEWDBID, NEWDBNAME, and PLOGDEV may be specified.



Optional Parameters

ACRABN: Starting AC RABN

ACRABN specifies the starting address converter RABN for each file specified by FMOVE. It can only be used in conjunction with the FMOVE parameter.

If FMOVE is specified and ACRABN omitted, the location of the address converter is chosen by ADASAV from the free areas in the Associator that have the same device type as used originally.

If several files are to be restored, the list of RABNs in the ACRABN parameter must correspond to the list of files in the FMOVE parameter. If no ACRABN value is to be given for a file, its entry in the RABN list must be specified as zero. See the **Example**.

ALLOCATION: Action to Follow File Extent Allocation Failure

ALLOCATION specifies the action to be taken if file extent allocations cannot be obtained according to the placement parameters ACRABN, DSRABN, NIRABN, or UIRABN.

ALLOCATION can only be specified if FILES or FMOVE is specified. If specified with FILES, ALLOCATION pertains to the implicit RABN specifications derived from the files on the save data set.

By default (that is, ALLOCATION=FORCE), the utility terminates with error if any file extent allocation cannot be met according to RABN placement parameters.

If ALLOCATION=NOFORCE is specified and any allocation with placement parameters fails, the utility retries the allocation without the placement parameter.

ASSOVOLUME: Associator Extent Volume

Note: The value for ASSOVOLUME must be enclosed in apostrophes.

ASSOVOLUME identifies the volume on which the file's Associator space (that is, the AC, NI, and UI extents) is to be allocated. If the requested number of blocks cannot be found on the specified volume, ADASAV retries the allocation while disregarding the ASSOVOLUME parameter.

If ACRABN, UIRABN, or NIRABN is specified, ADASAV ignores the ASSOVOLUME value when allocating the corresponding extent type. If ASSOVOLUME is not specified, the file's Associator space is allocated according to ADASAV's default allocation rules.

If several files are to be restored, the list of volumes in the ASSOVOLUME parameter must correspond to the list of files in the FMOVE parameter. If no ASSOVOLUME value is to be given for a file, its entry in the list of volumes must be left empty. See the **Example**.

BUFNO: Count of Buffers Per Drive

The BUFNO value, multiplied by the DRIVES parameter value, allocates fixed buffers for the RESTORE DELTA operation. A value of 2 or 3 usually provides optimum performance; a value up to 255 is possible. A value greater than 5, however, provides little advantage and allocates a lot of space. The default is 1 (one buffer per drive).

See also the DRIVES parameter .

CLOGDEV: Command Log Device Type

CLOGDEV is the device type to be assigned to the dual or multiple command log (CLOG). This parameter is required only if the device type to be used for the CLOG is different from that specified by the ADARUN DEVICE parameter. CLOGDEV is required only for the RESTORE DELTA database and RESTORE DELTA GCB functions if the dual or multiple CLOG is specified in the job control.

DATAVOLUME: Data Storage Extent Volume

Note: The value for DATAVOLUME must be enclosed in apostrophes.

DATAVOLUME specifies the volume on which the file's Data Storage space (DS extents) is to be allocated. If the number of blocks requested with DSSIZE cannot be found on the specified volume, ADASAV retries the allocation while disregarding the DATAVOLUME value.

If DSRABN is specified, DATAVOLUME is ignored for the related file. If DATAVOLUME is not specified, the Data Storage space is allocated according to ADASAV's default allocation rules.

If several files are to be restored, the list of volumes in the DATAVOLUME parameter must correspond to the list of files in the FMOVE parameter. If no DATAVOLUME value is to be given for a file, its entry in the list of volumes must be left empty. See the **Example**.

DRIVES: Tape Drives for Parallel Restore

ADASAV is able to restore files from multiple full SAVE data set volumes in parallel to RABNs that are different from their original RABNs in the database. DRIVES is the number (1-8 inclusive; default 1) of tape drives to be used for parallel restore processing.

The corresponding number of input data sets must be specified in the job control. These input data sets, combined, must represent a full save data set.

The default value (DRIVES=1) is required when GCB, FILES, or FMOVE is specified in conjunction with DELTA.

DSIMDEV: DSIM Device Type

The DSIMDEV parameter specifies the device type of the DSIM data set. This parameter is required only if the DSIM device type is different from that specified by the ADARUN DEVICE parameter (which is the default).

DSIMWAIT: DSIM Data Set Wait Time in Seconds

The DSIMWAIT parameter specifies how long the restore function should wait for the DSIM data set to become ready for merge. DSIMWAIT can be used if a restore step is to be executed directly after an online save operation but must wait for the ADARES PLCOPY function to copy the nucleus' dual or multiple protection log (PLOG).

The maximum time to wait is specified in seconds. If the DSIM data set does not become ready for restore operation within this time and one of the input save data sets is an online save data set, the RESTORE DELTA function fails.

If DSIMWAIT is not specified, the RESTORE DELTA function will not wait for the DSIM data set to become ready for restore operation, but instead will begin operation immediately or fail if the DSIM data set is not ready for restore operation (the default).

DSRABN: Starting Data Storage RABN/RABN List

DSRABN specifies the starting Data Storage RABN for each file specified by FMOVE. DSRABN can only be used in conjunction with the FMOVE parameter.

If FMOVE is specified and DSRABN omitted, the location of the file's Data Storage is chosen by ADASAV from the free areas in Data Storage that have the same device type as used originally.

If several files are to be restored, the list of RABNs in the DSRABN parameter must correspond to the list of files in the FMOVE parameter. If no DSRABN value is specified for a file, its entry in the RABN list must be specified as zero. See the **Example**.

DSSIZE: New Data Storage Size

DSSIZE is the new size to be allocated for Data Storage for each file specified by FMOVE. It can only be used in conjunction with the FMOVE parameter. If DSSIZE is omitted, the original Data Storage size is used.

The size can be specified in cylinders, or in blocks (by appending "B" to the number). It must be at least as large as the used area of the original Data Storage.

If several files are to be restored, the list of sizes in the DSSIZE parameter must correspond to the list of files in the FMOVE parameter. If no size is to be given for a file, its entry in the size list must be specified as zero. See the **Example**.

EXCLUDE: Exclude Specified Files from Restore

The EXCLUDE parameter is provided for use in recovery jobs built by the Adabas Recovery Aid (ADARAI). EXCLUDE lists the file numbers to be excluded from the restore operation; that is, the files that are not to be restored. Files specified in the EXCLUDE parameter will not exist in the restored database.

The parameter is optional: if not specified, no files are excluded. A file number may be listed only once.

For a database restore, all files specified in the EXCLUDE parameter must exist on the save data set.

For a RESTORE DELTA *without* a full save input, the EXCLUDE file list must be the same as that specified for the preceding RESTORE DELTA *with* a full save input; otherwise, the EXCLUDE parameter is rejected.

For a file restore

- without the NEWFILES parameter, all files specified in the EXCLUDE parameter must also be specified in the FILES or FMOVE parameter.
- with the NEWFILES parameter, all files specified in the EXCLUDE parameter must also be specified in the NEWFILES parameter. In this case, the file numbers specified in the EXCLUDE parameter refer to the new file numbers in the NEWFILES parameter, not the old file numbers in the FILES or FMOVE parameter.

FILES: Files to be Restored

Note: When FILES is specified, a RESTORE DELTA requires a full save input data set.

The file or list of files to be restored. For an Adabas expanded file, all component files of the expanded file including the anchor file must be specified. If a specified file is coupled to other files, the coupled files must also be specified.

The specified files are restored at the same place where they were originally located. The Adabas nucleus may be active during the restore operation unless the GCB parameter is also specified, or the Adabas checkpoint or security file is to be restored.

The FILES parameter cannot be specified if the FMOVE parameter is specified.

The syntax of the FILES parameter is shown next. The subparameters for the FILES parameter are described elsewhere in this section.

```
FILES = file-list
        [ ALLOCATION = { FORCE | NOFORCE } ]
        [ NEWFILES = file-list ]
        [ PASSWORD = password-list ]
```

FMOVE: Files to Be Restored to a New Location

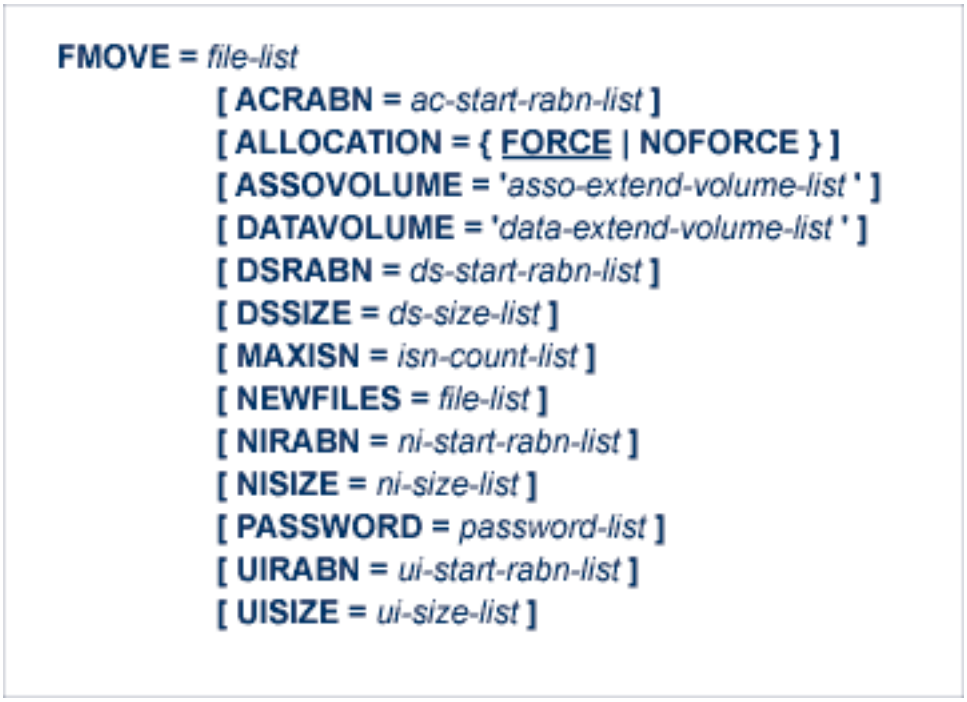
Note: When FMOVE is specified, a RESTORE DELTA requires a full save input data set.

The file or list of files to be restored. For an Adabas expanded file, all component files of the expanded file including the anchor file must be specified. If a specified file is coupled to other files, the coupled files must also be specified.

The specified files are restored as designated by the ACRABN, ASSOVOLUME, DATAVOLUME, DSRABN, DSSIZE, MAXISN, NIRABN, NISIZE, UIRABN, and UISIZE parameters. If any of these parameters is not specified, ADASAV chooses values for the locations of the corresponding parts of the file(s), and/or retains the existing sizes. The Adabas nucleus may be active during the restore operation unless the Adabas checkpoint or security file is to be restored.

FMOVE cannot be specified if the GCB or FILE parameter is specified.

The syntax of the FMOVE parameter is shown next. The subparameters for the FMOVE parameter are described elsewhere in this section.



GCB: Restore General Control Block

The GCB keyword parameter specifies that the GCB and the other administrative blocks are to be restored from the input save data set(s), as well as any files specified by the FILES parameter. That is, the entire database is restored except for the files not specified by FILES. The Adabas checkpoint and security files (if present) are always restored.

The Adabas nucleus must *not* be active when RESTORE DELTA GCB is being executed. The GCB parameter cannot be specified if the FMOVE parameter is specified.

⚠ **Important:** Any existing database in the target Associator and Data Storage data sets is completely overwritten, and any files in that database are lost.

The syntax of the GCB parameter is shown next. The subparameters for the GCB parameter are described elsewhere in this section.

MAXISN: New Maximum ISN

MAXISN is the new number of ISNs to be allocated for each file specified by FMOVE. It can only be used in conjunction with the FMOVE parameter.

The value must be at least as large as the original highest used ISN.

If MAXISN is omitted, the original ISN count is used.

If several files are to be restored, the list of ISN counts in the MAXISN parameter must correspond to the list of files in the FMOVE parameter. If no ISN count is to be given for a file, its entry in the ISN count list must be specified as zero. See the **Example**.

If the database consists of several Associator extents with different device types, error-171 may occur if MAXISN is specified. If this happens, remove the MAXISN parameter for the file indicated in the error message and rerun RESTORE DELTA FMOVE.

NEWDBID: New Database ID

NEWDBID may be used to assign a different database ID to the restored database. The ID can be in the range 1-65535. NEWDBID can only be specified for ADASAV RESTORE DELTA database and RESTORE DELTA GCB operations.

- If NEWDBID is specified, the ADARUN DBID parameter must specify the ID of the database on the save tape.
- If NEWDBID is not specified, the restored database keeps its old ID.

NEWDBNAME: New Database Name

NEWDBNAME assigns a new name to the restored database. NEWDBNAME can only be specified for ADASAV RESTORE DELTA database and RESTORE DELTA GCB operations. If NEWDBNAME is not specified, the restored database keeps its old name.

NEWFILES: New File Numbers

The NEWFILES parameter specifies the new file number to be assigned to each file specified by FILES or FMOVE.

The parameter is optional: if no new file number is assigned to a file, the file retains its original number.

NEWFILES may not be specified for expanded files, physically coupled files, or replicated files.

If a file with a number specified by NEWFILES already exists in the database, the corresponding file will not be restored unless the OVERWRITE parameter is also specified. If the file to be overwritten is password-protected, the corresponding PASSWORD parameter must also be specified.

If several files are to be restored, the list of file numbers in the NEWFILES parameter must correspond to the list of files in the FILES or FMOVE parameter. If no new file number is to be assigned to a file, its entry in the file number list of NEWFILES must be specified as zero. See the **Example**.

NIRABN: Starting Normal Index RABN/RABN List

NIRABN specifies the starting normal index RABN for each file specified by FMOVE. It can only be used in conjunction with the FMOVE parameter.

If FMOVE is specified and NIRABN omitted, the location of the normal index is chosen by ADASAV from the free areas in the Associator that have the same device type as used originally.

If several files are to be restored, the list of RABNs in the NIRABN parameter must correspond to the list of files in the FMOVE parameter. If no NIRABN value is to be given for a file, its entry in the RABN list must be specified as zero. See the **Example**.

NISIZE: New Size for Normal Index

NISIZE is the new size to be allocated for the normal index for each file specified by FMOVE. It can only be used in conjunction with the FMOVE parameter.

The size can be specified in cylinders, or in blocks (by appending "B" to the number). It must be at least as large as the used area of the original normal index.

If NISIZE is omitted, the original normal index size is used.

If several files are to be restored, the list of sizes in the NISIZE parameter must correspond to the list of files in the FMOVE parameter. If no size is to be given for a file, its entry in the size list must be specified as zero. See the **Example**.

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

OVERWRITE: Overwrite an Existing Database or File

The OVERWRITE parameter specifies that an existing database or file is to be overwritten by the RESTORE DELTA function.

If the FILES or FMOVE parameter is not specified, OVERWRITE specifies that an existing database is to be overwritten. If OVERWRITE is not specified and a GCB is found in Associator RABN 1, the RESTORE function is rejected.

If the FILES or FMOVE parameter is specified, OVERWRITE specifies that any existing file specified by this parameter is to be overwritten. If OVERWRITE is not specified and an FCB is found for any file to be restored, that file will not be restored.

See also the **PASSWORD** parameter.

PASSWORD: Adabas Security File Password

PASSWORD specifies one password or a list of passwords if one or more files in the FILES or FMOVE file list are password-protected. This also applies to files already in the database that are to be overwritten. If the NEWFILES parameter is specified, the PASSWORD parameter must specify the passwords related to the new file numbers.

When restoring more than one password-protected file, the correct passwords must be specified as positional values corresponding to the protected file numbers' positions in the FILES or FMOVE list. See the **Example** for more information about the PASSWORD parameter. When overwriting password-protected files, the Adabas nucleus must be active.

PATTERN: Merge Input Pattern

PATTERN is an optional parameter that provides a cross-check between the intended save input and the actual data sets specified by the job control. PATTERN specifies the count and type of input data sets to the save operation as single letters "F" (full save tape) or "D" (delta save tape). Only one "F" can be specified in the pattern field, but up to eight "D"s can be entered-one for each existing delta save tape to be included in the restore operation.

The pattern starts with an "F" if a full save input is specified, and continues (or starts) with a "D" for every delta save input. For example, PATTERN=FDD specifies that the input comprises one full save data set and two delta save data sets. No special indicator is given for a save data set being online. The pattern string must exactly match the input save data sets specified in the job control.

Concatenated delta save input does not take part in the matching of the PATTERN parameter.

PLOGDEV: Protection Log Device Type

The device type of the dual or multiple protection log (PLOG). This parameter is required only if the device type of the PLOG is different from that specified by the ADARUN DEVICE parameter. PLOGDEV is required only for the RESTORE DELTA database and RESTORE DELTA GCB functions if the dual or multiple protection log is specified in the job control.

TEST: Test Syntax

The TEST parameter tests the operation syntax without actually performing the restore operation. Only the syntax of the specified parameters can be tested; not the validity of values and variables.

UIRABN: Starting Upper Index RABN/RABN List

UIRABN specifies the starting upper index RABN for each file specified by FMOVE. It can only be used in conjunction with the FMOVE parameter.

If FMOVE is specified and UIRABN omitted, the location of the upper index is chosen by ADASAV from the free areas in the Associator that have the same device type as used originally.

If several files are to be restored, the list of RABNs in the UIRABN parameter must correspond to the list of files in the FMOVE parameter. If no UIRABN value is to be given for a file, its entry in the RABN list must be specified as zero. See the **Example**.

UISIZE: New Upper Index Size

UISIZE is the new size to be allocated for the upper index for each file specified by FMOVE. It can only be used in conjunction with the FMOVE parameter.

The size can be specified in cylinders, or in blocks (by appending "B" to the number). It must be at least as large as the used area of the original upper index.

If UISIZE is omitted, the original upper index size is used.

If several files are to be restored, the list of sizes in the UISIZE parameter must correspond to the list of files in the FMOVE parameter. If no size is to be given for a file, its entry in the size list must be specified as zero. See the **Example**.

Examples

Example 1:

```
ADASAV RESTORE DELTA,OVERWRITE
ADASAV       PATTERN=FDD
ADASAV       DSIMDEV=8381
ADASAV       DRIVES=4
ADASAV       PLOGDEV=3390,CLOGDEV=3390
```

An entire database is to be restored, possibly overwriting an already existing database. One full save and two delta save data sets are supplied as input. One of the input save data sets may have been created online; its accompanying DSIM data set is on a device type 8381.

The full save input is supplied as four data sets and is to be restored from four tape drives in parallel. The dual or multiple protection log and dual or multiple command log data sets are specified in the job control; they both have device type 3390. They are reset to an empty status as part of the restore operation.

Example 2:

```
ADASAV RESTORE DELTA,EXCLUDE=1000,255
```

Files 255 and 1000 are excluded from the restore of the database from full and delta save data sets.

Example 3:

```
ADASAV RESTORE DELTA,OVERWRITE
ADASAV      FMOVE=10,20,30
ADASAV      ACRABN=31415
ADASAV      MAXISN=1000000,0,20000
ADASAV      DATAVOLUME='ADADS1,,ADADS1'
ADASAV      DSSIZE=0,0,500B
ADASAV      NIRABN=0,10001
ADASAV      NISIZE=0,50
ADASAV      UIRABN=0,9901
ADASAV      UISIZE=0,100B
ADASAV      PASSWORD='PSW10,,PSW30'
```

Files 10, 20, and 30 are to be restored to new locations in the database, possibly overwriting already existing files. The number and type of input save data sets is not specified and is to be determined from the job control.

File 10's address converter is to be placed beginning at RABN 31,415, with a new highest allocated ISN of 1,000,000. The normal and upper index of file 20 are to be placed beginning at RABNs 10,001 and 9,901, with sizes of 50 cylinders and 100 blocks, respectively. The new highest allocated ISN of file 30 is to be 20,000. The Data Storage of file 10 is to be placed on volume ADADS1, if possible. The Data Storage of file 30 is to be placed on volume ADADS1 as well, if possible, with a size of 500 blocks. No placement instructions are provided for the Data Storage of file 20. File 10 has password "PSW10", file 30 has password "PSW30".

Example 4:

```
ADASAV RESTORE DELTA
ADASAV      FILES=11,12,13, 14,OVERWRITE
ADASAV      NEWFILES=16,0,17
```

Files 11, 12, 13, and 14 are to be restored. Files 11 and 13 are to be restored as files 16 and 17, respectively. The file numbers of files 12 and 14 will not be changed because the corresponding NEWFILES parameter values were specified as zero or omitted. Files 12, 14, 16, and 17 are to be overwritten, if already present in the database.

9 ADASAV SAVE: Save Database

The SAVE database function saves all blocks of the database that are in use to create a full save data set. If a Delta Save (DLOG) area is defined at the time of the save, the full save data set can be specified as input for subsequent MERGE or RESTORE DELTA functions. In any case, the data set can be specified as input for RESTORE or RESTONL functions.

The SAVE database function enables Delta Save logging at the end of the save if a DLOG area is defined in the database and the ADARUN parameter DSF=YES is specified. The next save operation may then be SAVE DELTA.

SAVE database may be executed with the Adabas nucleus active or inactive.

- If the Adabas nucleus is *inactive* , it cannot be started while the SAVE database function is executing, and no utility that makes changes to the database (e.g. ADALOD) can be run during this time. SAVE database cannot be executed offline if a nucleus session autorestart is pending, or if another offline utility (ADALOD or ADASAV) is currently running.
- If the Adabas nucleus is *active* , users have full access to the database. They can perform read, find, update, insert, and delete commands. However, utilities that make changes to the database (ADALOD, ADAINV, ADADBS DELETE, etc.) may not be running and cannot be started while the SAVE database function is performed. An online save operation is also not possible if the nucleus is running without protection logging.

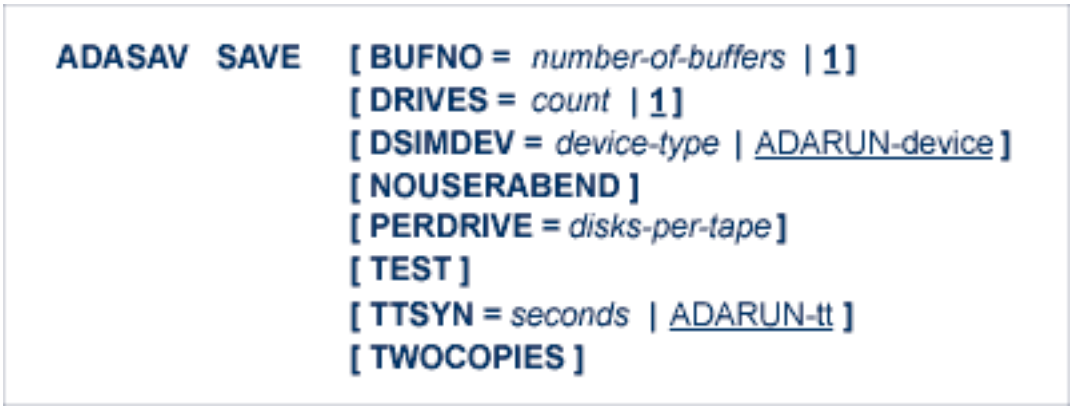
If the nucleus is active during the SAVE database function, an ET-synchronization is performed at the end of the save operation to bring all user transactions to ET status. During ET synchronization, transactions already begun are allowed to continue while the start of new transactions is delayed until the end of the ET synchronization. The maximum time required for this synchronization can be limited by the TTSYN parameter.

For an online SAVE database function using the Delta Save Facility, a DSIM data set must be supplied with DD name/link name DD/DSIMR1. This data set receives all database blocks changed by the nucleus during the execution of SAVE database. The DSIM data set must be supplied together with the created online save data set for a MERGE or RESTORE DELTA function. Until the DSIM data set has been specified for a subsequent MERGE operation, it cannot be reused for another online SAVE or SAVE DELTA operation (unless it is specifically reset by the ADAFRM DSIMRESET function).

If the execution of the SAVE database function is interrupted, it can be restarted using procedures outlined in the section **Restarting an Interrupted Save Operation**.

This chapter covers the following topics:

Syntax



Optional Parameters

BUFNO: Count of Buffers Per Drive

The BUFNO value, multiplied by the DRIVES parameter value, allocates fixed buffers for the SAVE operation. A value of 2 or 3 usually provides optimum performance; a value up to 255 is possible. A value greater than 5, however, provides little advantage and allocates a lot of space. The default is 1 (one buffer per drive).

See also the DRIVES parameter .

DRIVES: Tape Drives for Parallel Save Processing

DRIVES is the number of tape drives to be used for parallel SAVE operations. A maximum of eight drives may be specified. The default is 1.

DSIMDEV: DSIM Device Type

The DSIMDEV parameter specifies the device type of the DSIM data set. This parameter is required only if the DSIM device type is different from that specified by the ADARUN DEVICE parameter (which is the default).

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

PERDRIVE: Disk Drives Per Tape Drive

PERDRIVE specifies the number of disk drives to be assigned to a single output tape drive. For example, if the database is contained on seven disk drives and three tape drives are available

for SAVE processing, PERDRIVE=3,2,2 would cause the first three disk drives to be written to tape drive 1, the next two disk drives to be written to tape drive 2, and the next two disk drives to be written to tape drive 3. The drive sequence corresponds to the DDSAVEn/ DDDUALn or SAVEn/ DUALn job control specifications, as described in the section **JCL/JCS Requirements and Examples**.

The total number of drives specified by PERDRIVE must equal the sum of all Associator (ASSO) and Data Storage (DATA) disks; if both ASSO and DATA are on a single disk, this counts as two separate disks. If the DRIVES parameter is used and the PERDRIVE parameter is omitted, ADASAV determines the most efficient utilization of the tape drives.

TEST: Test Syntax

The TEST parameter tests the operation syntax without actually performing the operation. Only the syntax of the specified parameters can be tested; not the validity of values and variables.

TTSYN: SYN2 Checkpoint Control

TTSYN allows the user to decrease the nucleus' ADARUN TT (maximum transaction time) during the synchronized checkpoint processing of the current ADASAV operation. The value specified is the approximate time in seconds (TT + 1.05 seconds), and must be less than the current ADARUN TT value. If TTSYN is not specified or if TTSYN is greater than the nucleus' TT value, that TT value becomes the default.

If the Adabas nucleus is active while ADASAV SAVE is running, a synchronized SYN2 checkpoint is taken at the end of the SAVE operation. This ensures that there is a point in time where all users are at ET status. If a user is not at ET status, no new transactions can be started for other users; they must wait until the SYN2 checkpoint can be taken.

The ADARUN TT value controls the maximum elapsed time permitted for a logical transaction. This is the maximum wait time until the SYN2 checkpoint can be processed. The ADASAV SAVE TTSYN parameter allows the user to decrease the TT value only during the synchronized checkpoint processing. The original TT value becomes effective again when ADASAV ends the SAVE operation.

TWOCOPIES: Create Two Copies of Output

TWOCOPIES creates two physical copies of the ADASAV output.

Example

```
ADASAV    SAVE
ADASAV     DRIVES=4
ADASAV     TTSYN=10
```

The complete database is to be saved using four tape drives in parallel. If running online, the ET synchronization at the end of the save operation should last at most 10 seconds.

10 ADASAV SAVE DELTA: Save Changed Database Blocks

The SAVE DELTA function is only available if ADARUN parameter DSF=YES is specified. It can only be executed if Delta Save logging is enabled.

The SAVE DELTA function saves all blocks of the database that have been changed since the execution of the last SAVE database or SAVE DELTA function. It creates a delta save data set. This data set can be specified as input for a subsequent MERGE or RESTORE DELTA function.

SAVE DELTA may be executed with the Adabas nucleus active or inactive.

- If the Adabas nucleus is *inactive* , it cannot be started while the SAVE DELTA function is executing, and no utility that makes changes to the database (e.g. ADALOD) can be run during this time. SAVE DELTA cannot be executed offline if a nucleus session Autorestart is pending, or if another offline utility (ADALOD or ADASAV) is currently running.
- If the Adabas nucleus is *active* , users have full access to the database. They can perform read, find, update, insert, and delete commands. However, utilities that make changes to the database (ADALOD, ADAINV, ADADBS DELETE, etc.) may not be running and cannot be started while the SAVE DELTA function is performed. For an online delta save operation the nucleus must be running with dual or multiple protection logging.

If the Adabas nucleus is active during the SAVE DELTA function, an ET synchronization is performed at the end of the save operation to bring all user transactions to ET status. During ET synchronization, transactions already begun are allowed to continue while the start of new transactions is delayed until the end of the ET synchronization. The maximum time required for this synchronization can be limited by the TTSYN parameter.

For an online SAVE DELTA function, a DSIM data set must be supplied with DD name/link name DD/DSIMR1. This data set receives all database blocks changed by the nucleus during the execution of SAVE DELTA. The DSIM data set must be supplied together with the created online save data set for a MERGE or RESTORE DELTA function. Until the DSIM data set has been specified for a subsequent MERGE operation, it cannot be reused for another online SAVE or SAVE DELTA operation (unless it is specifically reset by the ADAFRM DSIMRESET function).

If the execution of the SAVE DELTA function is interrupted, it can be restarted using procedures outlined in the section **Restarting an Interrupted Save Operation**).

This chapter covers the following topics:

Syntax

```
ADASAV  SAVE  DELTA  [ BUFNO =  number-of-buffers  | 1 ]
                     [ DSIMDEV = device-type | ADARUN-device ]
                     [ NOUSERABEND ]
                     [ TEST ]
                     [ TTSYN = seconds  | ADARUN-tt ]
                     [ TWOCOPIES ]
```

Optional Parameters

BUFNO: Count of Buffers Per Drive

The BUFNO value allocates fixed buffers for a SAVE DELTA operation. A value of 2 or 3 usually provides optimum performance; a value up to 255 is possible. A value greater than 5, however, provides little advantage and allocates a lot of space. The default is 1 (one buffer per drive).

DSIMDEV: DSIM Device Type

The DSIMDEV parameter specifies the device type of the DSIM data set. This parameter is required only if the DSIM device type is different from that specified by the ADARUN DEVICE parameter (which is the default).

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

TEST: Test Syntax

The TEST parameter tests the operation syntax without actually performing the operation. Only the syntax of the specified parameters can be tested; not the validity of values and variables.

TTSYN: SYN2 Checkpoint Control

TTSYN allows the user to decrease the nucleus' ADARUN TT (maximum transaction time) during the synchronized checkpoint processing of the current ADASAV operation. The value specified is the approximate time in seconds (TT + 1.05 seconds), and must be less than the current ADARUN TT value. If TTSYN is not specified or if TTSYN is greater than the nucleus' TT value, that TT value becomes the default.

If the Adabas nucleus is active while ADASAV SAVE DELTA is running, a synchronized SYN2 checkpoint is taken at the end of the SAVE DELTA operation. This ensures that there is a point in time where all users are at ET status. If a user is not at ET status, no new transactions can be started for other users; they must wait until the SYN2 checkpoint can be taken.

The ADARUN TT value controls the maximum elapsed time permitted for a logical transaction. This is the maximum wait time until the SYN2 checkpoint can be processed. The ADASAV SAVE DELTA TTSYN parameter allows the user to decrease the TT value only during the synchronized checkpoint processing. The original TT value becomes effective again when ADASAV ends the SAVE DELTA operation.

TWOCOPIES: Create Two Copies of Output

TWOCOPIES creates two physical copies of the ADASAV output.

Example

```
ADASAV SAVE  DELTA
ADASAV      TTSYN=10
ADASAV      DSIMDEV=8381
```

A Delta Save operation is to be performed, using a DSIM device type 8381. If running online, the ET synchronization at the end of the SAVE DELTA operation should last at most 10 seconds.

11 Restarting an Interrupted Save Operation

This section describes how an ADASAV SAVE database or SAVE DELTA execution can be restarted after failure. The specific actions to be performed depend on the type of failure.

This chapter covers the following topics:

User ABEND 34 or 35

If the ADASAV utility terminates with an error message and user abend 34 or 35:

1 Determine and correct the cause of the error.

2 If the save operation was performed online, reset the DSIM data set (see below).

3 Resubmit the save job.

System ABEND or Other User ABEND

If the ADASAV utility terminates abnormally with a system ABEND or a user ABEND other than 34 or 35:

For Offline Save Operation

1 Determine and correct the cause of the error.

2 Remove the DIB entry of the ADASAV job, using ADADBS functions OPERCOM DDIB and RESETDIB.

3 Resubmit the save job.

For Online Save Operation

1 Determine and correct the cause of the error.

2 Reset the nucleus online dump status, using the ADADBS OPERCOM RDUMPST command or the corresponding Adabas Online System function.

3 Delete the user queue element (UQE) of ADASAV in the nucleus, using the ADADBS functions OPERCOM DUQ and OPERCOM STOPU or the corresponding Adabas Online System functions.

4 Remove the DIB entry of the ADASAV job, using the ADADBS OPERCOM DDIB and RESETDIB commands, or the corresponding Adabas Online System functions.

5 Reset the DSIM data set (see below).

6 Resubmit the save job.

Resetting the DSIM Data Set

After an interrupted online save operation, the DSIM data set must be reset to prepare it for another save/copy/merge cycle.

This can be done using the ADAFRM function DSIMRESET FROMRABN=1,SIZE=1B. See **DSIM-RESET: Reset the DSIM Data Set** .

Software AG recommends that you specify the DSIM data set for exclusive use by the ADAFRM utility to avoid accidentally destroying information in a DSIM data set currently in use by another utility. For the other utilities (ADASAV and ADARES), the DSIM data set must be specified for shared-update use.

12 ADASAV JCL/JCS Requirements and Examples

This section describes the job control information required to run the ADASAV functions for the Delta Save Facility with z/OS systems, and shows examples of each of the job streams.

Note: When running with the optional Recovery Aid (RLOG), all temporary data sets must also be cataloged in the job control.

This chapter covers the following topics:

z/OS

Data Set	DD Name	Storage	More Information
Full save input(s)	DDRESTn	tape/disk	for RESTORE DELTA
Full save input	DDFULL	tape/disk	for MERGE
Delta save input(s)	DDDELn	tape/disk	for MERGE/RESTORE DELTA
Delta Save images (DSIM)	DDDSIMR1	disk	required for online saves
Associator	DDASSORn	disk	
Data Storage	DDDATARn	disk	required for SAVE/RESTORE
Work	DDWORKR1	disk	required for SAVE/RESTORE if nucleus is inactive
Dual/multiple PLOG	DDPLOGRn	disk	optional for RESTORE DELTA
Dual/multiple CLOG	DDCLOGRn	disk	optional for RESTORE DELTA
Recovery log	DDRLOGR1	disk	required for recovery log
Full or delta save outputs	DDSAVEn	tape/disk	required for SAVE/SAVE DELTA /MERGE functions
Dual full or delta save outputs	DDDUALn	tape/disk	required for TWOCOPIES
ADARUN parameters	DDCARD		*Adabas Operations* documentation
ADASAV parameters	DDKARTE		
ADARUN messages	DDPRINT		*Adabas Messages and Codes*
ADASAV messages	DDDRUCK		*Adabas Messages and Codes*

Merge Delta Save Output (ADASAV MERGE)

```
//MERGE    EXEC  PGM=ADARUN
//DDASSOR1 DD  DSN=ADABAS.DB010.ASSOR1,DISP=SHR
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIM,DISP=SHR
//DDFULL   DD  DSN=ADABAS.DB010.SAVE039.PART1,DISP=SHR
//         DD  DSN=ADABAS.DB010.SAVE039.PART2,DISP=SHR
//         DD  DSN=ADABAS.DB010.SAVE039.PART3,DISP=SHR
//         DD  DSN=ADABAS.DB010.SAVE039.PART4,DISP=SHR
//DDDEL1   DD  DSN=ADABAS.DB010.MASTER.DELTA.OLD,DISP=SHR
//DDSAVE1  DD
DSN=ADABAS.DB010.SAVE040.PART1,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDSAVE2  DD  DSN=ADABAS.DB010.SAVE040.PART2,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDSAVE3  DD  DSN=ADABAS.DB010.SAVE040.PART3,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDSAVE4  DD  DSN=ADABAS.DB010.SAVE040.PART4,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDDUAL1  DD  DSN=ADABAS.DB010.COPY040.PART1,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDDUAL2  DD  DSN=ADABAS.DB010.COPY040.PART2,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDDUAL3  DD  DSN=ADABAS.DB010.COPY040.PART3,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDDUAL4  DD  DSN=ADABAS.DB010.COPY040.PART4,DISP=(NEW,CATLG),
//             UNIT=CASS,...
//DDCARD   DD  *
ADARUN  PROG=ADASAV,DSF=YES,...
//DDKARTE  DD  *
ADASAV MERGE PATTERN=FD
ADASAV       DRIVES=4
ADASAV       TWOCOPIES
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

Merge and Restore Database (ADASAV RESTORE DELTA)

```
//RESTORE  EXEC  PGM=ADARUN
//DDASSOR1 DD  DSN=ADABAS.DB010.ASSOR1,DISP=SHR
//DDDATAR1 DD  DSN=ADABAS.DB010.DATAR1,DISP=SHR
//DDWORKR1 DD  DSN=ADABAS.DB010.WORKR1,DISP=SHR
//DDPLOGR1 DD  DSN=ADABAS.DB010.PLOGR1,DISP=SHR
//DDPLOGR2 DD  DSN=ADABAS.DB010.PLOGR2,DISP=SHR
//DDCLOGR1 DD  DSN=ADABAS.DB010.CLOGR1,DISP=SHR
//DDCLOGR2 DD  DSN=ADABAS.DB010.CLOGR2,DISP=SHR
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIM,DISP=SHR
//DDREST1  DD  DSN=ADABAS.DB010.SAVE040.PART1,DISP=SHR
//DDREST2  DD  DSN=ADABAS.DB010.SAVE040.PART2,DISP=SHR
//DDREST3  DD  DSN=ADABAS.DB010.SAVE040.PART3,DISP=SHR
```

```
//DDREST4  DD  DSN=ADABAS.DB010.SAVE040.PART4,DISP=SHR
//DDDEL1   DD  DSN=ADABAS.DB010.MASTER.DELTA.OLD,DISP=SHR
//DDDEL2   DD  DSN=ADABAS.DB010.MASTER.DELTA1,DISP=SHR
//         DD  DSN=ADABAS.DB010.MASTER.DELTA2,DISP=SHR
//         DD  DSN=ADABAS.DB010.MASTER.DELTA3,DISP=SHR
//DDCARD   DD  *
ADARUN PROG=ADASAV,DSF=YES,...
//DDKARTE  DD  *
ADASAV RESTORE DELTA,OVERWRITE
ADASAV         PATTERN='FDD'
ADASAV         DRIVES=4
ADASAV         DSIMDEV=8381
ADASAV         PLOGDEV=3390,CLOGDEV=3390
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

Restore Files (ADASAV RESTORE DELTA,FMOVE...)

```
//RESTORE  EXEC  PGM=ADARUN
//DDASSOR1 DD  DSN=ADABAS.DB010.ASSOR1,DISP=SHR
//DDDATAR1 DD  DSN=ADABAS.DB010.DATAR1,DISP=SHR
//DDWORKR1 DD  DSN=ADABAS.DB010.WORKR1,DISP=SHR
//DDREST1  DD  DSN=ADABAS.DB010.SAVE040.PART1,DISP=SHR
//         DD  DSN=ADABAS.DB010.SAVE040.PART2,DISP=SHR
//         DD  DSN=ADABAS.DB010.SAVE040.PART3,DISP=SHR
//         DD  DSN=ADABAS.DB010.SAVE040.PART4,DISP=SHR
//DDDEL1   DD  DSN=ADABAS.DB010.MASTER.DELTA.OLD,DISP=SHR
//DDDEL2   DD  DSN=ADABAS.DB010.MASTER.DELTA1,DISP=SHR
//DDCARD   DD  *
ADARUN  . . .
//DDKARTE  DD  *
ADASAV RESTORE DELTA,OVERWRITE
ADASAV         FMOVE=10,20,30,...
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

Save Database (ADASAV SAVE)

```
//SAVE     EXEC  PGM=ADARUN
//DDASSOR1 DD  DSN=ADABAS.DB010.ASSOR1,DISP=SHR
//DDDATAR1 DD  DSN=ADABAS.DB010.DATAR1,DISP=SHR
//DDWORKR1 DD  DSN=ADABAS.DB010.WORKR1,DISP=SHR
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIM,DISP=SHR
//DDSAVE1  DD  DSN=ADABAS.DB010.SAVE039.PART1,DISP=(NEW,CATLG)
//             UNIT=CASS,...
//DDSAVE2  DD  DSN=ADABAS.DB010.SAVE039.PART2,DISP=(NEW,CATLG)
//             UNIT=CASS,...
//DDSAVE3  DD  DSN=ADABAS.DB010.SAVE039.PART3,DISP=(NEW,CATLG)
//             UNIT=CASS,...
//DDSAVE4  DD  DSN=ADABAS.DB010.SAVE039.PART4,DISP=(NEW,CATLG)
```

```
//             UNIT=CASS,...
//DDCARD   DD  *
ADARUN PROG=ADASAV,DSF=YES,...
//DDKARTE  DD  *
ADASAV SAVE
ADASAV         DRIVES=4
ADASAV         TTSYN=10
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

Save Database (ADASAV SAVE DELTA)

```
//SAVE     EXEC  PGM=ADARUN
//DDASSOR1 DD  DSN=ADABAS.DB010.ASSOR1,DISP=SHR
//DDDATAR1 DD  DSN=ADABAS.DB010.DATAR1,DISP=SHR
//DDWORKR1 DD  DSN=ADABAS.DB010.WORKR1,DISP=SHR
//DDDSIMR1 DD  DSN=ADABAS.DB010.DSIM,DISP=SHR
//DDSAVE1  DD  DSN=ADABAS.DB010.DELTA,DISP=OLD
//DDCARD   DD  *
ADARUN PROG=ADASAV,DSF=YES,...
//DDKARTE  DD  *
ADASAV SAVE   DELTA
ADASAV        TTSYN=10
ADASAV        DSIMDEV=8381
//DDPRINT  DD  SYSOUT=*
//DDDRUCK  DD  SYSOUT=*
```

VII ADAULD Utility

The ADAULD utility can unload an Adabas file from a full save tape together with 1 to 8 delta save tapes and optionally a DSIM data set. The save tapes may have been created online or offline using any version of the Delta Save Facility. Adabas files are unloaded from a combination of full or delta save tapes to reestablish the files from archive save tapes and load them into a database.

Note: It may not be possible to do this using the ADASAV RESTORE/RESTONL function if the archived database resided on device types that are no longer in use in the data cluster.

The records are unloaded in physical sequence; that is, in the order in which they are physically positioned within Data Storage.

The unloaded record output is in compressed format. The output records have the same format as the records produced by the Adabas ADACMP utility.

When using the MODE=SHORT option, descriptor entries (which are required to create the normal index and upper index for the file) are omitted during the unload process. This reduces the time required for unloading. Note, however, that output created using MODE=SHORT has a different FDT from the same file unloaded without MODE=SHORT, since all descriptor information is removed.

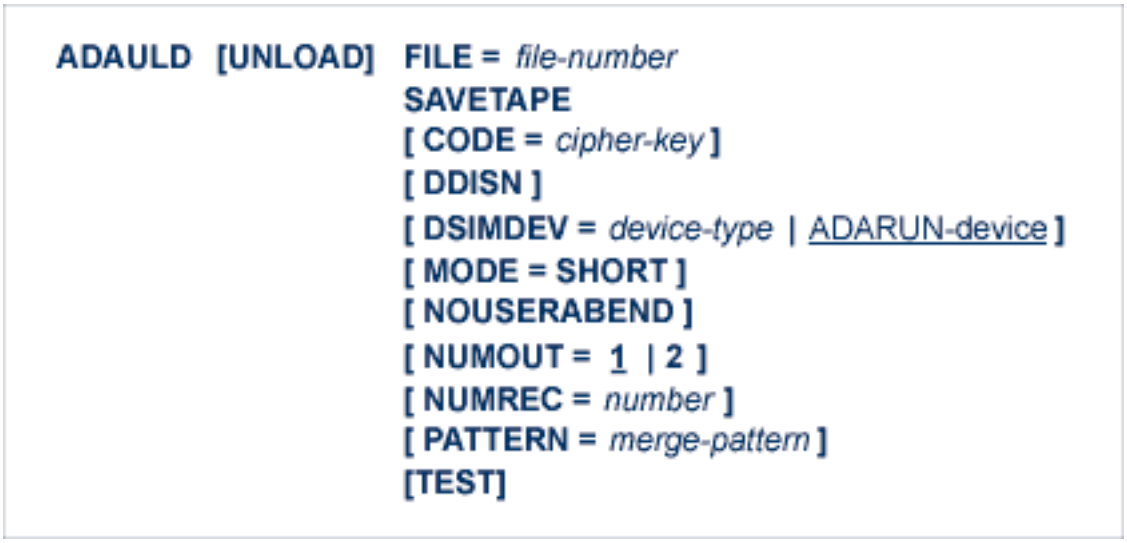
In general, the Adabas nucleus does not need to be active while unloading a file from a save tape.

Note: An interrupted ADAULD UNLOAD FILE run must be reexecuted from the beginning.

This chapter covers the following topics:

UNLOAD FILE: Unload Specified File from a Save Tape

Syntax



Essential Parameters

FILE

FILE specifies the number of the file to be unloaded. Neither the checkpoint file nor the security file can be unloaded.

SAVETAPE

SAVETAPE is used to unload a file from a full save tape together with 1 to 8 delta save tapes and optionally, a DSIM data set. This is useful when moving a file from a save tape with one blocksize to a database with another, or when using a file from a save tape in different test environments.

If the file to be unloaded from the save tape is ciphered, the CODE parameter must be specified as usual.

User exit 9 can be used to select records for a particular client of a multiclient file. For more information, see the section **ADAULD User Exit 9**.

For more information, see the section **Save Tape Input Processing**.

Optional Parameters

CODE: Cipher Code

If the file to be unloaded is ciphered, CODE *must* supply the appropriate cipher code.

DDISN: Create DD/ISN Output File of Unloaded ISNs

Specifying the DDISN parameter instructs ADAULD to write the list of unloaded ISNs to the sequential output file DD/ISN. DD/ISN is structured so that it can be used as input to ADALOD UPDATE for the purpose of deleting the unloaded records.

If the DDISN keyword is specified but the DD/ISN file is missing in the JCL, ADAULD terminates with error-081.

DSIMDEV: DSIM Device Type

The DSIMDEV parameter specifies the device type of the DSIM data set. This parameter is required only if the DSIM device type is different from that specified by the ADARUN DEVICE parameter (which is the default).

MODE=SHORT: Exclude Descriptor Information

This parameter indicates whether the descriptor information used to build the normal index and upper index are to be included in the output.

If MODE=SHORT is specified, no descriptor information will be unloaded, and all descriptor information is stripped from the field definition table (FDT) when it is written to the output data set.

If the output is to be used as direct input to the ADALOD utility, the file will have no descriptors.

NOUSERABEND: Termination without ABEND

When an error is encountered while the function is running, the utility prints an error message and terminates with user ABEND 34 (with a dump) or user ABEND 35 (without a dump).

If NOUSERABEND is specified, the utility will *not* ABEND after printing the error message. Instead, the message "utility TERMINATED DUE TO ERROR CONDITION" is displayed and the utility terminates with condition code 20.

NUMOUT: Number of Output Files

NUMOUT specifies the number of output files to be produced. If the number is greater than one, user exit 9 must be used to control DDOUT1 and 2 or OUT1 and 2 output file selection. For additional information, see the *Adabas DBA Tasks* documentation. Permitted values are 1 (default) and 2.

NUMREC: Number of Records to Be Unloaded

NUMREC limits the number of records to be unloaded. No limit will be in effect if the parameter is omitted.

PATTERN: Merge Input Pattern

The PATTERN parameter can be specified if the save tape from which the file is to be unloaded is supplied as a full save tape plus 1 to 8 delta save tapes. The parameter serves as a cross-check between the intended save input and the actual save data sets specified by the job control.

PATTERN specifies the count and type of input data sets to the merge operation as single letters "F" (full save tape) or "D" (delta save tape). Only one "F" can be specified in the pattern field, but up to eight "D"s can be entered-one for each existing delta save tape to be merged.

The pattern starts with an "F" if a full save input is specified, and continues (or starts) with a "D" for every delta save input. For example, PATTERN=FDD specifies that the input comprises one full save data set and two delta save data sets. No special indicator is given for a save data set being online.

The pattern string must exactly match the input save data sets specified in the job control.

TEST: Test Syntax

This parameter tests the operation syntax without actually performing the operation. Only the syntax of the specified parameters can be tested; not the validity of values and variables.

Examples

Example 1:

```
ADAULD FILE=6,SAVETAPE
```

File 6 is to be unloaded from a full save tape. The records are to be unloaded in the sequence in which they are physically positioned on the tape.

Example 2:

```
ADAULD FILE=6,SAVETAPE,MODE=SHORT
```

File 6 is to be unloaded in physical sequence from a full save tape. The entries used to create the normal index and upper index are not to be unloaded. All descriptor information is removed from the field definition table (FDT) in the output.

Example 3:

```
ADAULD FILE=6,SAVETAPE,PATTERN=FDD
```

File 6 is to be unloaded in physical sequence from a full save tape and two delta save tapes. The unloaded file will have the same contents as it had at the time of the second delta save operation.

Save Tape Input Processing

ADAULD is used to unload an Adabas file from a full save tape together with 1 to 8 delta save tapes and optionally, a DSIM data set:

- the full save is expected as a DD/FULL sequential input file;
- the delta saves are expected as DD/DEL1-DEL8 sequential input files; and
- the DSIM data set as DD/DSIMR1. The DSIM data set is required if any delta save tape specified is an online tape that is not accompanied by its unloaded DSIM data set. If the DSIM data set was not created with the current version, please use ADASAV to unload the DSIM data set with the version by which it was created.

Save tapes created using any version of the Delta Save Facility can be used.

The ADARUN DBID specified for the ADAULD run must match the DBID found on the save tapes. The ADARUN parameter DSF=YES must be specified for the ADAULD run.

If the file has hyperdescriptors defined, the corresponding hyperdescriptor exits must be specified in the ADARUN parameters for ADAULD. If the hyperdescriptor exit routines are no longer available, the file must be unloaded with MODE=SHORT specified. See the *Adabas DBA Tasks* documentation for more information about hyperdescriptor exits.

The ADAULD utility protocol on DD/DRUCK displays a short header indicating the kind of save tapes encountered, when each was created, the version of ADASAV used to create it, the database ID found on the save tape, and possibly the delta save ID of the save tapes when merged:

```
A D A U L D  v7.1   SM1   DBID = 00200   STARTED       YYYY-MM-DD  13:33:25


PARAMETERS:

-----------

ADAULD UNLOAD FILE=3; SAVETAPE

************************************************************

*                                                          *

*  UNLOAD FROM             ONLINE DATABASE SAVE            *

*  CREATED AT              1997-04-23                      *

*  BY ADASAV VERSION       v71                             *

*  DBID                    200                             *

*  DSID                    1 / 0 / 1997-04-23  13:32:19    *

*  PLOG SESSION NR         17                              *

*  SYN1/4 BLOCK NR         137                             *

*                                                          *

************************************************************
```

ADAULD first reads the file control block (FCB) and file definition table (FDT) from the save tape. Then:

- for full save tapes and merged full save tapes, ADAULD scans the tape to find the file's Data Storage RABNs, extracts the Data Storage records, and for each Data Storage record, generates the descriptor values according to the FDT.
- for full save tapes plus delta save tapes and optional DSIM data set, ADAULD calls the Delta Save merge facility to receive the latest version of each affected block. ADARUN DSF=YES must be specified so that the ADADSFS module containing the merge routines is loaded.

DSIM Data Set or the Protection Log

In order to unload a full save tape and one or more delta save tapes, one of which is online, you *must* supply the DSIM data set associated with the remaining online save. If the DSIM data set no longer exists, it is necessary to rebuild it from the protection log (PLOG) using ADARES COPY.

If an online full save tape *without* delta save tapes is unloaded, you have the option of providing either the associated DSIM data set or the protection log (PLOG) as of the time of the online save. If the full save is not the most recent online save, it is necessary to rebuild the DSIM data set from the PLOG using ADARES COPY. In this case, it is preferable to supply the PLOG directly to the unload. See the document *ADAULD* in the *Adabas Utilities* documentation for more information.

You can ensure that you have the DSIM data sets you need by unloading the original DSIM data set to a sequential file using the **ADASAV MERGE** function. The unloaded DSIM data set can be used wherever the original DSIM would be used. In addition, several unloaded DSIM data sets can be used in a merge, restore, or unload operation, whereas only one original DSIM can be supplied to any of these operations.

ADAULD Output Processing

ADAULD unloads the records in the specified sequence. The unloaded records are written to one of two sequential data sets: DD/OUT1 and DD/OUT2. Writing to these output data sets is controlled by user exit 9.

The records output are identical in format to the output produced by the ADACMP utility unless the MODE=SHORT option is used, in which case the descriptor entries required for the normal index and upper index are omitted and the descriptor information is removed from the Adabas FDT. The ISN of the record immediately precedes the compressed data record, and is provided as a four-byte binary number.

Specifying the DDISN parameter instructs ADAULD to write the list of unloaded ISNs to a sequential output file DD/ISN. Only one DD/ISN file is created, containing the superset of ISNs written to either or both DD/OUT1 and DD/OUT2. ISNs that are rejected by userexit 9 are not written to DD/ISN.

DD/ISN is structured so that it can be used as input to ADALOD UPDATE for the purpose of deleting the unloaded records.

The number of ISNs written to DD/ISN is displayed in the ADAULD statistics on the DD/DRUCK utility protocol:

```
A D A U L D   STATISTICS

------------------------


      NUMBER OF OUTPUT DATA SETS      = 1

      NUMBER OF REQUESTED RECORDS     = 16777215

      STARTISN                        = 0

      OPTIONS                         = DVT

      UNLOAD SEQUENCE                 = PHYS SEQ


      NUMBER OF RECORDS READ          =         1000

      NUMBER OF RECORDS WRITTEN       =         1000

      RECORDS WRITTEN TO DDOUT1       =         1000

      RECORDS WRITTEN TO DDOUT2       =            0

      RECORDS REJECTED BY USEREXIT-9  =            0

      NUMBER OF ISNS WRITTEN TO DDISN =         1000
```

The number of ISNs written to DD/ISN should always be the number of records read minus the number of records rejected by user exit 9.

ADAULD User Exit 9

User exit 9 is called (when present) for each record selected before writing the record to the output data set. The user exit is supplied with the record address, and returns an action code as follows:

1	write record to DD/OUT1
2	write record to DD/OUT2
3	write record to DD/OUT1 and DD/OUT2
I	ignore this record

The above data sets must have the same blocksize. See the *Adabas DBA Tasks* documentation for more information about user exits.

13 ADAULD JCL/JCS Requirements and Examples

This section describes the job control information required to run ADAULD with BS2000/OSD, z/OS, z/VM, VSE/ESA and z/VSE systems and shows examples of each of the job streams.

This chapter covers the following topics:

z/OS

Data Set	DD Name	Storage	More Information
Unloaded data	DDOUT1	tape/disk	Output by ADAULD (see note)
Unloaded data	DDOUT2	tape/disk	Output by ADAULD (see note)
Unloaded ISNs	DDISN	tape/disk	Required with DDISN
Full save tape	DDFULL	tape/disk	Required for full save tape
Delta save tape(s)	DDDEL1-DDDEL8	tape/disk	Required for delta save tape(s)
Delta Save images	DDDSIMR1	disk	Required for DSIM data set
Recovery log (RLOG)	DDRLOGR1	disk	Required for ADARAI
ADAULD messages	DDDRUCK	printer	*Adabas Messages and Codes*
ADARUN messages	DDPRINT	printer	*Adabas Messages and Codes*
ADARUN parameters	DDCARD	reader	*Adabas Operations*
ADAULD parameters	DDKARTE	reader	

Note: DDOUT1 and DDOUT2 must have the same block size; otherwise, an ADAULD error will occur. DDOUT2 is required only if NUMOUT=2 is specified.

z/OS Example

```
//ULD       EXEC PGM=ADARUN
//STEPLIB   DD   DISP=SHR,DSN=ADABAS.Vvrs.LOADLIB
//*
//DDOUT1    DD   DISP=(,KEEP),DSN=EXAMPLE.ADA99.OUT1,
//           UNIT=SYSDA,VOL=SER=DISK01,SPACE=(TRK,200,RLSE)
//DDFULL    DD   DISP=SHR,DSN=EXAMPLE.ADA99.FULLSAVE
//DDDEL1    DD   DISP=SHR,DSN=EXAMPLE.ADA99.DELTA1
//DDDEL2    DD   DISP=SHR,DSN=EXAMPLE.ADA99.DELTA2
//SYSUDUMP  DD   SYSOUT=A
//DDDRUCK   DD   SYSOUT=A
//DDPRINT   DD   SYSOUT=A
//DDCARD    DD   *
ADARUN PROG=ADAULD,SVC=249,DEVICE=3390,DB=99,DSF=YES
//DDKARTE   DD   *
ADAULD    FILE=1,SAVETAPE,PATTERN=FDD
```

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