

# **Adabas Native SQL**

## **Installation Manual for z/VM**

Version 2.4.1

October 2022

This document applies to Adabas Native SQL Version 2.4.1 and all subsequent releases.

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

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# Installation Manual for z/VM

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This document describes how to install Adabas Native SQL on z/VM.



**Important:** Before installing or upgrading, review the release notes, readmes, changes, system requirements, and installation or upgrade guide for the products you want to install. This documentation provides information you must know about the products before installing or upgrading, and also describes information you will need to provide during installation. Documentation is available on the Software AG [Empower](#) website.

This information is structured into the following sections:

*General Information*

This section provides general information about the installation procedure.

*Medium Layout*

This section describes the contents of the distribution medium.

*Installation*

This section describes how to perform the installation.

*Installation Checklist*

This section describes how to verify that the installation has been successful.

*Hints for Using Adabas Native SQL*

This section contains a list of useful hints about using Adabas Native SQL.

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# 1 About this Documentation

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## Document Conventions

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Convention	Description
<b>Bold</b>	Identifies elements on a screen.
Monospace font	Identifies service names and locations in the format <code>folder.subfolder.service</code> , APIs, Java classes, methods, properties.
<i>Italic</i>	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 (...).

## Online Information and Support

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### Product Documentation

You can find the product documentation on our documentation website at <https://documentation.softwareag.com>.

In addition, you can also access the cloud product documentation via <https://www.software-ag.cloud>. Navigate to the desired product and then, depending on your solution, go to “Developer Center”, “User Center” or “Documentation”.

### Product Training

You can find helpful product training material on our Learning Portal at <https://knowledge.softwareag.com>.

## Tech Community

You can collaborate with Software AG experts on our Tech Community website at <https://tech-community.softwareag.com>. From here you can, for example:

- Browse through our vast knowledge base.
- Ask questions and find answers in our discussion forums.
- Get the latest Software AG news and announcements.
- Explore our communities.
- Go to our public GitHub and Docker repositories at <https://github.com/softwareag> and <https://hub.docker.com/publishers/softwareag> and discover additional Software AG resources.

## Product Support

Support for Software AG products is provided to licensed customers via our Empower Portal at <https://empower.softwareag.com>. Many services on this portal require that you have an account. If you do not yet have one, you can request it at <https://empower.softwareag.com/register>. Once you have an account, you can, for example:

- Download products, updates and fixes.
- Search the Knowledge Center for technical information and tips.
- Subscribe to early warnings and critical alerts.
- Open and update support incidents.
- Add product feature requests.

## Data Protection

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Software AG products provide functionality with respect to processing of personal data according to the EU General Data Protection Regulation (GDPR). Where applicable, appropriate steps are documented in the respective administration documentation.

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# 2 GENERAL INFORMATION

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This chapter covers the following topics:

## Installation Procedures

---

The installation of SOFTWARE AG products is performed by installation procedures. Sample procedures are provided on the installation tape.



**Note:** These procedures are *only examples* and must be adapted to your environment as required.

# 3 INSTALLATION TAPE LAYOUT

The tape contains multiple datasets. The first dataset is in z/VM tape dump format and contains the following files.

Name	Type	Description
ADASQLA	TEXT	The executable Adabas Native SQL preprocessor (load module) for Adabas that runs with PREDICT Version 3.4 or later and generates Ada code.
ADASQLC	TEXT	The executable Adabas Native SQL preprocessor (load module) for Adabas that runs with PREDICT Version 3.4 or later and generates COBOL code.
ADASQLF	TEXT	The executable Adabas Native SQL preprocessor (load module) for Adabas that runs with PREDICT Version 3.4 or later and generates FORTRAN code.
ADASQLP	TEXT	The executable Adabas Native SQL preprocessor (load module) for Adabas that runs with PREDICT Version 3.4 or later and generates PL/I code.
FCID	TEXT	Module that dynamically generates command-IDs during execution of the application program. Used in FORTRAN programs.
FINDCID	TEXT	Module that dynamically generates command-IDs during execution of the application program. Used in COBOL and PL/I programs.
PRPABEND	TEXT	This module is used to abend an application program if an error occurred.
PRTFLOW	TEXT	Module that prints a flow-trace of all executed Adabas Native SQL statements during the execution of the application program if MODE FLOW is set (COBOL).
PRTRACE	TEXT	Module that traces the record buffers and format buffers during the execution of the application program if MODE TRACE is set (COBOL).
RESPINT	TEXT	The response code interpretation routine (COBOL).
SQFRDATE	TEXT/COBOL	Routine which converts format D number to numeric date.
SQFRTIME	TEXT/COBOL	Routine which converts format T number to numeric date and numeric time.
SQTODATE	TEXT/COBOL	Routine which converts numeric date to format D number.

Name	Type	Description
SQTOTIME	TEXT/COBOL	Routine which converts numeric date and numeric time to format T number.
DDCARD	ADASQL	The Adabas runtime parameters.
ADAGLOB	ADASQL	The Adabas Native SQL global runtime parameters.
AEX1...AEX3	SOURCE	Ada examples using various Adabas Native SQL statements.
CEX1...CEX3	SOURCE	COBOL examples using various Adabas Native SQL statements.
FEX1...FEX3	SOURCE	FORTRAN examples using various Adabas Native SQL statements.
PEX1...PEX3	SOURCE	PL/I examples using various Adabas Native SQL statements.
TYPESADA	SOURCE	Ada examples using various Adabas Native SQL statements.
PRTFLO	FORTRAN	The source code of the routine that prints a flow-trace of all executed Adabas Native SQL statements during the execution of the program if MODE FLOW is set (FORTRAN).
PRTFLOP	PL/I	The source code of the routine that prints a flow-trace of all executed Adabas Native SQL statements during the execution of the program if MODE FLOW is set (PL/I).
PRTFLOW	COBOL	The source code of the routine that prints a flow-trace of all executed Adabas Native SQL statements during the execution of the program if MODE FLOW is set (COBOL).
PRTRAC	FORTRAN	The source code of the routine that traces the record buffers and format buffers during the execution of the application program if MODE TRACE is set (FORTRAN).
PRTRACP	PL/I	The source code of the routine that traces the record buffers and format buffers during the execution of the application program if MODE TRACE is set (PL/I).
PRTRACE	COBOL	The source code of the routine that traces the record buffers and format buffers during the execution of the application program if MODE TRACE is set (COBOL).
RESPF	FORTRAN	The source code of the response code interpretation routine (FORTRAN).
RESPINT	COBOL	The source code of the response code interpretation routine (COBOL).
RESPPL1	PL/I	The source code of the response code interpretation routine (PL/I).
ADASQLC	EXEC	An EXEC to preprocess and compile a sample COBOL program.
ADASQLF	EXEC	An EXEC to preprocess and compile a sample FORTRAN program.
ADASQLP	EXEC	An EXEC to preprocess and compile a sample PL/I program.
ADAGO	EXEC	An EXEC to execute a sample program.

If necessary, the source module RESPINT (COBOL) or RESPPLI (PL/I) may be edited to accommodate installation-specific requirements. The original source module should be retained for future reference. PRTRACE and PRTFLOW may be recompiled for COBOL/II environments.

The second dataset is in NATURAL INPL format and contains Adabas Native SQL error texts.

The Adabas Native SQL preprocessor modules were not linked with the Adabas callpass routine *Adabas* to make them independent of an Adabas SM. The sample ADASQL $\times$  EXECs provided now issue a LOAD of Adabas along with the preprocessor module. If you have your own preprocessor EXEC it must be updated to issue a load of Adabas. The Adabas text file can be found in the ADAV $_{nnn}$  TXTLIB.



# 4      INSTALLATION

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Predict Version 3.4 or above is a prerequisite for the installation of Adabas Native SQL. Please check which version of Predict is installed.

The Adabas files and fields that will be used by Adabas Native SQL application programs must be defined in the data dictionary.

This chapter covers the following topics:

## Positioning the Medium

---

Adabas Native SQL consists of two datasets. To determine how to correctly position the tape in the next two sections *Loading Files from Magnetic Tape* and *Loading of Error Messages* please refer to the *Software AG Product Delivery Report*.

## Copying to a VM/CMS Disk

---

To position the tape for the TAPE LOAD command, calculate the number of tape marks as follows:

- If the sequence number of SQL23n.TAPE - as shown by the Software AG Product Delivery Report - is  $n$ , you must position over  $3n-2$  tape marks (that is, FSF 1 for the first dataset, FSF 4 for the second, etc.).
- Access the disk that is to contain the Adabas Native SQL installation files as minidisk.
- Ask the system operator to attach a medium drive to your virtual machine at the address X'181' and mount the Adabas Native SQL installation medium.

When the medium has been attached, enter the VM/CMS command:

```
TAPE REW  
↵
```

Position the medium by entering the VM/CMS command:

```
TAPE FSF  $n$   
↵
```

where  $n$  is calculated as above ( $3n-2$ ).

Load the Adabas Native SQL/VM/CMS installation material with the VM/CMS command:

```
TAPE LOAD * * <minidisk>
↵
```

You may wish to keep the medium drive attached to your virtual machine, because the medium is still needed in the installation procedure.

## Loading Error Messages

The other dataset of the `SQL $nnn$`  medium is an error messages dataset for the Adabas Native SQL preprocessor. The dataset name is `SQL $nnn$ .ERRN`. The following commands can be used to load the error messages:

```
TAPE REW
FILEDEF CMWKF02 SL $n$  VOLID SQL $nnn$ 
                (LRECL 4624 BLCKSIZE 4628 RECFM VB)
FILEDEF CMPRT01 DISK SQL $nnn$  INPL A
NAT3 $vs$  MAINPR=1,STACK=(LOGON SYSERR;ERRLODUS;FIN)
TAPE RUN
```

Where  $n$  represents the label defined in the Software AG Product Delivery Report and  $vs$  represents the Natural version and SM level.

## Modifying the Sample EXEC Procedures

Modify (XEDIT) the supplied EXECs `ADASQLC`, `ADASQLF`, `ADASQLP` and `ADAGO` as required for execution of the sample programs. The following specifications in the EXECs may be adapted to suit the system requirements.

- It may be necessary to provide the `LINK` and `ACC` statements necessary to acquire access to the Adabas virtual machine and to the Adabas text library.
- It may be necessary to provide the `LINK` and `ACC` statements necessary to acquire access to the COBOL system libraries for the COBOL compiler.
- The `FILEDEF` cards may be modified to point to different minidisks.
- The COBOL compile options (parameters) may be modified.
- In the `ADAGO.EXEC`, the `LOAD` statement may need to be modified depending on which global parameters are used. The module `FINDCID` is included only if the global parameter `OPTIONS DYNAMCID` is specified. The module `PRTFLOW` is included if the the global parameter `MODE FLOW` is specified. These modules will work in both COBOL and PL/I application programs.

In PL/I only environments, overhead can be further reduced by performing the following:

1. Compile routines RESPPL1, PRTRACP and PRTFLOP.
2. Code global parameter `ABORT RESPPLI PLI` in `ADAGLOB ADASQL`.
3. In the `LOAD` statement, replace `RESPINT, PRTRACE` and `PRTFLOW` with `RESPPL1, PRTRACP` and `PRTFLOP`.

The EXEC as supplied loads the standard Adabas interface module Adabas for the application program. If a different module is used, the EXEC must be modified accordingly.

## Modifying the Global Parameters

---

The global parameters for Adabas Native SQL must also be modified by editing (XEDIT) `ADAGLOB ADASQL fm`.

Note that the `DDFILE` parameter has been replaced by the `SYSFILE` parameter. Adjust the `FDIC` and `FNAT` parameters accordingly.

If the error message texts are stored in a file other than the data dictionary file, the parameter `FNAT` should be used to specify the number of this file. The error message texts are typically stored in the Natural system file (`FNAT`).

See chapter *Global Parameters* in the *Adabas Native SQL Reference Manual* for further information.

Typical global parameter definitions:

```
SYSFILE FDIC=(DBID,FNR) FNAT=(DBID,FNR).  
OPTIONS SOFT=ON NONDE=Y PREFIX=''.  
XREF ON.  
LANG COBOL.
```

## Modifying the DDCARD Parameters

---

The Adabas runtime parameters must also be modified by editing (XEDIT) `DDCARD ADASQL fm`. See the *Adabas CMS Installation Manual* for information regarding parameter usage.

## Testing Adabas Native SQL

Before testing the examples, check that the files EMPLOYEES and VEHICLES are loaded, and that they are documented in the Predict data dictionary. If the file definitions are not yet present in the data dictionary, they can be loaded from the file PRD $nnn$ .DEMO, which can be found on the Predict installation medium. The notation  $nnn$  represents the Version, Release and SM level of Predict at your site. If you wish to use Adabas Native SQL to preprocess FORTRAN programs, ensure that the necessary language synonyms are defined in the data dictionary. See for example Appendix B in the *Adabas Native SQL Reference Manual*.

It may be necessary to increase the storage capacity of the virtual machine that will execute the Adabas Native SQL preprocessor. To inquire on the amount of storage the virtual machine has, execute the following z/VM command:

```
Q STOR
```

If the response indicates that there is less than 2048k available, enter the following z/VM commands:

```
DEFINE STOR 2M
IPL CMS
```

The EXEC ADASQLC, ADASQLF or ADASQLP executes the following:

1. Prompt for the file name, file type and mode. File name will be the name of the example to be compiled, file type must always be source, and mode is the letter corresponding to the minidisk where the source of the example is contained (i.e. CEX1 SOURCE C).
2. Preprocess the program with Adabas Native SQL.
3. Compile the preprocessed program (COBOL, FORTRAN, PL/I).
4. The following modules may be called by the user program at runtime:

Ada	COBOL	FORTRAN	PL/I	Description
RESPF (F)	RESPINT (C)	RESPF (F)	RESPINT (C,P)	Error handling routine.
PRTRAC (F)	PRTRACE (C)	PRTRAC (F)	PRTRACE (C,P)	Runtime trace routine. Activated by the error handling routine if MODE TRACE is set.
PRTFLO (F)	PRTFLOW (C)	PRTFLO (F)	PRTFLOW (C,P)	Runtime Adabas Native SQL statement printing. Activated if MODE FLOW is set.
FCID (A)	FINDCID (A)	FCID (A)	FINDCID (A)	Generates dynamic Adabas command IDs. Activated if OPTION DYNAMCID is set.

Ada	COBOL	FORTRAN	PL/I	Description
PRPABEND (A)	PRPABEND (A)	--	PRPABEND (A)	Terminates program execution. Called by the error handling routine.
SQFRDATE (C)	SQFRDATE (C)	SQFRDATE (C)	SQFRDATE (C)	Routine which converts format D number to numeric date.
SQFRTIME (C)	SQFRTIME (C)	SQFRTIME (C)	SQFRTIME (C)	Routine which converts format T number to numeric date and numeric time.
SQTODATE (C)	SQTODATE (C)	SQTODATE (C)	SQTODATE (C)	Routine which converts numeric date to format D number.
SQTOTIME (C)	SQTOTIME (C)	SQTOTIME (C)	SQTOTIME (C)	Routine which converts numeric date and numeric time to format T number.



**Notes:**

- a. The FORTRAN error handling routine RESPF always returns condition code 8 when the job step terminates. The other error handling routines return the Adabas response code.
  - b. The characters in parentheses indicate the language in which the routines are written (Assembler, COBOL, FORTRAN or PL/I). Only the Assembler and COBOL modules are supplied in object form; if you wish to use FORTRAN or PL/I modules, you must compile the source modules.
  - c. The COBOL object modules of the routines RESPINT, PRTRACE and PRTFLOW supplied by Software AG can be linked with PL/I object modules to produce an executable load module. If you wish to use the PL/I versions of these routines, you must rename them: RESPPL1 - RESPINT, PRTRACP - PRTRACE, PRTFLOP - PRTFLOW, and then compile them, replacing the Software AG-supplied COBOL object modules by the PL/I object modules. The global parameter `ABORT PLI` should be coded. The procedure as supplied links the standard Adabas interface module ADAUSER to the application program. If a different module is used, the procedure must be modified accordingly.
5. Upon completion, notification is made as to the location of files created during preprocess and compilation. You should review these files for error and/or warning messages before continuing.
  6. Execute the ADAGO EXEC.

If the program is to be passed through other preprocessors in addition to Adabas Native SQL, the additional preprocessor(s) should be included in the EXEC following the Adabas Native SQL step and the preceding compilation.

## FILEDEF and DATADEF Names

Adabas Native SQL refers to datasets using the following names:

FILEDEF	Description
ADAIN	The source program to be preprocessed.
ADAOUT	The output of the preprocessor. Embedded Adabas Native SQL statements in the source program appear in this dataset as comments and are followed by the generated COBOL or PL/I code.
ADAGLOB	The global parameter definitions.
ADAMES	Adabas Native SQL writes messages at preprocessing time to this dataset.
SYSUT1	A temporary work file.
SYSDBOUT	Error messages are written to this dataset.
SYSOUT	Adabas Native SQL writes messages to this dataset if it abends.

At run time, the application program generated by Adabas Native SQL refers to datasets using the following names (in addition to any other user-defined datasets):

FILEDEF	Description
SYSOUT	If the FLOW facility is used, the flow-tracing output is written to this dataset.
TSTDMP	If the TRACE facility is used, the trace output is written to this dataset.

With Adabas Version 5, a DATADEF must be issued for the following files:

DATADEF	Description
DDPRINT	Adabas writes messages to this dataset at run time.
DDCARD	Adabas parameters that are used by the ADARUN module at run time.

---

# 5

## INSTALLATION CHECKLIST

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- Verify that Predict Version 3.4 or later is installed.
- Verify that the files and fields that are to be used by Adabas Native SQL applications are documented in the data dictionary. Adabas Native SQL recognizes only the PREDICT file types *Adabas file* and *Adabas userview*. Other file types are ignored by the Adabas Native SQL preprocessor.
- Follow the procedures outlined in the section *Installation* to download and INPL ADABAS Native SQL.
- Edit files DDCARD ADASQL and ADAGLOB ADASQL as required.
- Edit the EXECs ADASQLC, ADASQLF, ADASQLP and ADAGO as required.
- Ensure that the standard test files EMPLOYEES and VEHICLES are available and that they are correctly documented in the data dictionary. In particular, ensure that the file numbers and the database ID are correct. Ensure that the relationships for soft coupling are defined in the data dictionary. If you wish to use FORTRAN, ensure that appropriate language synonyms are defined in the data dictionary (see Appendix B in the *Adabas Native SQL Reference Manual*).
- Run the EXECs ADASQLC, ADASQLF, ADASQLP and ADAGO to execute the test programs. Verify the output.



# 6

## HINTS FOR USING ADABAS NATIVE SQL

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This chapter covers the following topics:

## Periodic Groups and Multiple Fields

---

If the maximum number of occurrences of periodic groups or multiple fields is known, specify this number in Predict. Otherwise Adabas Native SQL will allocate buffers using the default maximum values, resulting in wasted storage.

## Group Structure of Periodic Groups

---

Correct use of the `GROUP STRUCT` attribute in Predict can save significant amounts of space in the format buffers that are used when accessing records containing periodic groups. See *Defining More Attributes of Fields* in section *Field* of chapter *Predefined Object Types* in the *Predict Reference Manual*.

## Dynamic Command-IDs

---

If the database is accessed from many modules within one linked program, the global parameter `OPTIONS DYNAMCID.` should be specified. This ensures that a unique command-ID will be generated for each Adabas command if the same cursor-name is used in more than one module. Be aware that this can degrade run-time performance. See *Improving Adabas Native SQL Efficiency* and the section on using command-IDs in the *Adabas Command Reference Manual*.

## Locating Errors

---

The TRACE and FLOW facilities, which are switched on by means of global parameters, can be used to find runtime errors in the application program.

## Preprocessor Copy and Generate Facilities

---

The Adabas Native SQL preprocessor supports the COPY and GENERATE statements. These are compatible with the implementation of the COPY and GENERATE statements in the Predict preprocessor, so it should not normally be necessary to use both Adabas Native SQL and Predict preprocessors.

## Restriction for MU Fields Within PE

---

The data dictionary definition of a multiple-value field within a periodic group should not specify a counter field.

## Hyphens and Break Characters in PL/I Programs

---

Field names as defined in the data dictionary may include hyphens ("-") and/or break characters ("\_"). With Adabas Native SQL, each reference to a field name must match the definition in the data dictionary exactly. However, when generating PL/I output, Adabas Native SQL will change all hyphens found in data dictionary definitions to break characters, since hyphens are not valid in PL/I identifiers.

With previous versions of Adabas Native SQL, it was not necessary for references to field names to match the definitions in the data dictionary exactly: all break characters found in the source program were converted to hyphens before being compared with the data dictionary definitions; then, when generating PL/I output, Adabas Native SQL changed all hyphens to break characters.

The global parameter `UNDERSCORE NO.` can be used to ensure that Adabas Native SQL processes hyphens and break characters in a manner compatible with earlier versions.

## READ ISN Statement

---

After issuing the `READ ISN` statement with `OPTIONS SEQUENCE`, the program should check for end-of-file (`ADACODE = 3`). In some applications, it may be necessary to compare the ISN of the record that was read with the ISN that was specified in the `WHERE` clause of the statement.

## PL/I - Margin Settings

---

When using the PL/I compiler, the margins should be set to (2,72) (these are the default values).

## PL/I - Structure Variables in Superdescriptors

---

In PL/I, it is not possible to assign a structure variable to a superdescriptor in the WHERE clause. A string variable should be used in place of the structure variable.

## Last Statement Restriction in COBOL/II

---

The last statement in a COBOL/II program should not be an Adabas Native SQL statement. If necessary, the statement `EXIT.` can be coded at the end of the program.

## Adabas Native SQL Preprocessor Condition Codes

---

The Adabas Native SQL preprocessor can set the following condition codes:

Code	Meaning
0	No error was detected
4	One or more warning messages issued during processing.
8	One or more errors found during processing.
12	Adabas Native SQL abended.

Programs generated by the Adabas Native SQL preprocessor can cause various errors at runtime. Adabas errors are detected by the generated code. In COBOL and PL/I programs, the Adabas response code as described in the *Adabas Messages and Codes Manual* is returned to the calling procedure. In FORTRAN programs, response code 8 is returned to the calling procedure.

## SQL0217 Error Message When Running the Precompiler

---

This message is:

```
SQL0217 FDIC DBID OR FDIC FNR DOES NOT MATCH THE CONTROL RECORD
```

This message occurs if a DDM from another system is loaded into the Natural FDIC file and thereafter the DBID and FNR of the DDM are changed online to the current FDIC's DBID and FNR.

To rectify this, start the Natural containing the Predict:

```
LOGON SYSDIC
MENU
D      for defaults
A      for Adabas Native SQL
<Enter>
.      to exit
```

This will reset the Adabas Native SQL control record.

## Hints for Improving Adabas Native SQL Efficiency

---

### Reducing Database Accesses

Using the HISTOGRAM and READ statements as much as possible in preference to FIND can help to reduce the number of accesses made to the database.

### Command IDs

An explicit Adabas command ID is assigned whenever a cursor is declared in an Adabas Native SQL statement. Adabas Native SQL statements that are performed repeatedly should have a cursor, since the command ID derived from the cursor name is used by Adabas to indicate that the format buffer need not be translated repeatedly.

### Variable Indices

Periodic groups and multiple fields should only be referenced using variable indices when this is unavoidable, since variable indices cause additional format translations and also additional RC commands to be executed.

### Record Buffers

The number of record buffers generated by Adabas Native SQL can be reduced by coding UPDATE and INSERT statements with the WHERE CURRENT OF *cursor-name* clause but without the SET clause. This only applies if the UPDATE or INSERT statement and the statement referenced by the cursor-name contain the same field structure.

### **SELECT Clause**

Program efficiency is improved if only those fields that are needed are coded in the SELECT clause. You may be tempted to write "SELECT \*" instead of coding the name of each field, but this can result in excessively large record buffers and slower-running programs.

### **Global Format ID**

Application programs, in particular online application programs, should use the the global options parameter OPTIONS GFORMAT. This can improve efficiency by reducing the number of format buffer translations that are performed at runtime.