DB2 REXX SQL for VM/ESA®

Installation and Reference

Version 7 Release 1

SC09-2891-00

DB2 REXX SQL for VM/ESA®

Installation and Reference

Version 7 Release 1

SC09-2891-00

Note!

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 261.

First Edition (September 2000)

| This edition applies to Version 7 Release 1 Modification 0 of the IBM® DATABASE 2™ Server for VSE & VM
| Program, (product number 5697-F42) and to all subsequent releases and modifications until otherwise indicated in
| new editions.

| This edition replaces GC09-2660-00 and SC09-2676-00.

Contents

About This Manual

Part 1 of this manual describes how to install the DB2 REXX SQL for VM/ESA (DB2 RXSQL) program on a *Virtual Machine (VM)* system. The DB2 RXSQL software is a feature of the *DB2 Server for VM* relational *database manager*

Part 2 of this manual describes how the DB2 REXX SQL for VM/ESA (DB2 RXSQL) allows REXX programs to access the IBM DATABASE 2® Server for VM in a VM environment.

Who Should Use This Manual

Part 1 of this manual is for the person who installs DB2 RXSQL. It assumes you are familiar with *CMS commands* and *EXEC*s, and the Virtual Machine/Enterprise Systems Architecture (*VM/ESA*) system.

Part 2 of this manual assumes that readers are familiar with the concepts of relational databases, the facilities of the DB2 Server for VM relational database manager, and the elements of the REXX programming language.

How This Manual Is Organized

Part 1 — Installation

Part 1 of this manual focuses on the installation of DB2 RXSQL and contains the chapters described here.

Chapter 1. Before You Begin
defines the prerequisites needed to install DB2 RXSQL

Chapter 2. Installing DB2 RXSQL
describes how to install DB2 RXSQL and verify the installation

Chapter 3. Installing a REXX SQL NLS Language
contains the information concerning the material and procedures associated with the installation of DB2 REXX SQL NLS Languages

Chapter 4. Installing Preventive and Corrective Service
provides instructions for installing preventive and corrective service

Part 2 — Reference

Part 2 of this manual focuses on how the DB2 REXX SQL for VM/ESA (DB2 RXSQL) allows REXX programs to access the IBM DATABASE 2® Server for VM in a VM environment; it contains the chapters described here.

Chapter 5. Getting Started with DB2 RXSQL
Introduces the DB2 RXSQL interface, describes how the interface relates to REXX and DB2 Server for VM, and lists some sample programs to help you learn the interface.

Chapter 6. RXSQL-Supplied Programs
Provides information on the use of the general-purpose programs supplied with DB2 RXSQL.

Chapter 7. Concepts
Introduces concepts needed for SQL applications.

Chapter 8. Using Dynamic and Extended Dynamic SQL Statements in RXSQL
Explains how to write Dynamic and Extended Dynamic RXSQL applications.

Chapter 9. Coding DB2 RXSQL Requests
Outlines how to code RXSQL requests.

Chapter 10. RXSQL Request Descriptions
Contains detailed descriptions of each DB2 RXSQL request.

Part 3 — Appendixes

The Appendixes of this manual contain the following reference information associated with both the installation and usage of DB2 RXSQL.

Appendix A. Files Supplied by IBM
lists the files supplied by IBM

Appendix B. Installation and Service EXECs
provides instructions for running the installation and service EXECs

Appendix C. Online HELP Information
describes the HELP information available with DB2 RXSQL

Appendix D. Installation Messages
provides a summary of the installation messages

Appendix E. RXSQL Return Codes and Messages
Lists DB2 RXSQL return codes and error messages.

Appendix F. Sample Programs with Examples of RXSQL Requests
Illustrates typical DB2 RXSQL request functions within sample programs.

Appendix G. Performance and Diagnosis
Contains performance and diagnosis information.

Appendix H. Support for CMS Work Units
Describes how DB2 RXSQL uses CMS work units.

Appendix I. RXSQL Subcommand Environment
Explains how DB2 RXSQL requests can be executed in the DB2 RXSQL subcommand environment.

Appendix J. RXSQL Runtime Environment
Explains the DB2 RXSQL run-time environment.

Appendix K. Single User Mode Environment
Describes how to run DB2 RXSQL in single user mode.

Appendix L. Considerations and Restrictions Using the DRDA Protocol
Outlines the considerations for running RXSQL using the Distributed Relational Database Architecture™ (DRDA®) protocol.

Appendix M. DB2 RXSQL Incompatibilities by Release
Explains the incompatibilities by release.

Terminology

In the past, the term **database** was used in a general sense to refer to the *database management system* as well as stored objects and storage devices. However, using **database** in this context has proven to be misleading. Accordingly, the following terminology has been adopted and is used consistently in the text:

Term	Meaning
application server	Refers to the database management system including the accumulated data.
application requester	Refers to the facility that transforms a request from the application into a form suitable for communicating with an *application server*.
database	Refers only to the collection of data.
ISQL	Interactive Structured Query Language
IUCV	Inter-user communication vehicle
LUW	Logical unit of work
Request	Either a DB2 RXSQL statement or command
REXX	Restructured Extended Executor Language
RXSQL	DB2 REXX SQL for VM/ESA
SAA	Systems Application Architecture
user ID	Userid, user identification
VM/ESA	Virtual Machine/Enterprise Systems Architecture Version 2 Release 2 or later
XEDIT	System Product editor

If You Need More Information

Prerequisite IBM Publications

For information on the REXX programming language, refer to:

- *VM/ESA: REXX/VM Reference*, SC24-5770
- *VM/ESA: REXX/VM User's Guide*, SC24-5465.

The following manual is to be used in conjunction with the *DB2 REXX SQL for VM/ESA Installation and Reference* manual.

- *DB2 Server for VSE & VM SQL Reference*, SC09-2989.

See "Bibliography" on page 269 for related VM and DB2 Server for VM publications.

Related IBM Publications

Various IBM publications are mentioned throughout this document. Refer to them if you require additional information on related IBM products.

Only the short titles of the manuals are given in the text. For the long titles and their corresponding document numbers, see the Bibliography.

Highlighting Conventions

This manual observes the following text highlighting conventions.

Convention	Meaning
Italics	Italic type is used to denote the first occurrence of a term listed in the Glossary, titles of stand-alone documents, command variables, parameter values and their symbolic equivalents, and strings of*characters* referred to as such.
Boldface	Bold type is used for emphasis or for an important term that is being defined.
`Monospace Type`	Monospace type is used to indicate material that is entered at a display station, displayed on a screen, coded, or printed on a computer printing device.
ALL CAPS	Capital letters are used to indicate: • Acronyms and other all-cap abbreviations • Names of programs and other coded entities • Names of files, *tables*, libraries, logs, and so forth • Command, statement, and *parameter* names or *constants* • *Keyword* and option names • Data area and storage names.
"Quotation Marks"	Quotation marks (double) are used to enclose the headings of parts, chapters, and lesser sections of stand-alone documents when they are referenced.

How to Send Your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have any comments about this book or any other DB2 Server for VSE & VM documentation:

- Visit our home page at:

  `http://www-4.ibm.com/software/data/db2/vse-vm/`

- A form for readers' comments is provided at the back of this publication. If the form has been removed, address your comments to:

  IBM CANADA LTD.
  DB2 Server for VSE & VM
  2S/240/1150/TOR
  1150 Eglinton Ave. East
  North York, Ontario
  Canada M3C 1H7

- Send your comments by electronic mail to one of the following addresses:

Format	Address
Internet	torrcf@ca.ibm.com
Facsimile	(416) 448-6161 (Attention RCF Coordinator)

  Be sure to include the name of the book, the form number (including the suffix), and the page, section title, or topic you are commenting on.

  If you choose to respond through the Internet, please include either your entire Internet network address, or a postal address.

- Fill out the form at the back of this book and return it by mail, by fax, or by giving it to an IBM representative.

Syntax Notation Conventions

Throughout this manual, syntax is described using the structure defined below.

- Read the syntax diagrams from left to right and from top to bottom, following the path of the line.

  The ►►—— symbol indicates the beginning of a statement or command.

  The ——► symbol indicates that the statement syntax is continued on the next line.

  The ►—— symbol indicates that a statement is continued from the previous line.

  The ——►◄ symbol indicates the end of a statement.

  Diagrams of syntactical units that are not complete statements start with the ►—— symbol and end with the ——► symbol.
- Some SQL statements, Interactive SQL (ISQL) commands, or database services utility (DBS Utility) commands can stand alone. For example:

```
►►──SAVE──────────────────────────────────────────────────────────────►◄
```

  Others must be followed by one or more keywords or variables. For example:

```
►►──SET AUTOCOMMIT OFF────────────────────────────────────────────────►◄
```

- Keywords may have parameters associated with them which represent user-supplied names or values. These names or values can be specified as either constants or as user-defined variables called *host_variables* (*host_variables* can only be used in programs).

```
►►──DROP SYNONYM──synonym─────────────────────────────────────────────►◄
```

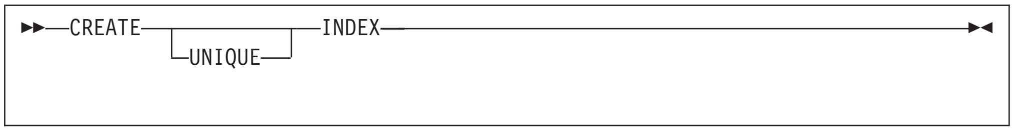
- Keywords appear in either uppercase (for example, SAVE) or mixed case (for example, CHARacter). All uppercase characters in keywords must be present; you can omit those in lowercase.
- Parameters appear in lowercase and in italics (for example, *synonym*).
- If such symbols as punctuation marks, parentheses, or arithmetic operators are shown, you must use them as indicated by the syntax diagram.
- All items (parameters and keywords) must be separated by one or more blanks.
- Required items appear on the same horizontal line (the main path). For example, the parameter *integer* is a required item in the following command:

```
►►──SHOW DBSPACE──integer─────────────────────────────────────────────►◄
```

  This command might appear as:

```
SHOW DBSPACE 1
```

- Optional items appear below the main path. For example:



This statement could appear as either:

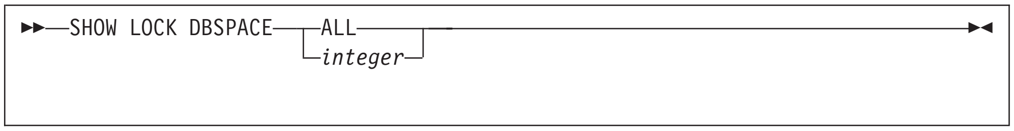
```
CREATE INDEX
```

or

```
CREATE UNIQUE INDEX
```

- If you can choose from two or more items, they appear vertically in a stack.

  If you must choose one of the items, one item appears on the main path. For example:



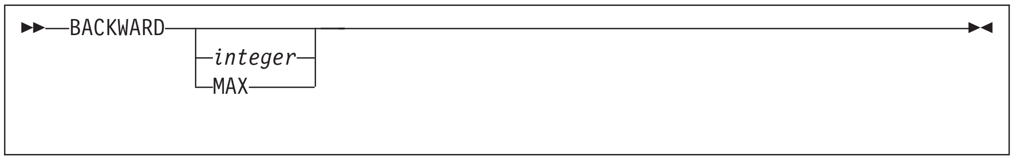
Here, the command could be either:

```
SHOW LOCK DBSPACE ALL
```

or

```
SHOW LOCK DBSPACE 1
```

If choosing one of the items is optional, the entire stack appears below the main path. For example:



Here, the command could be:

```
BACKWARD
```

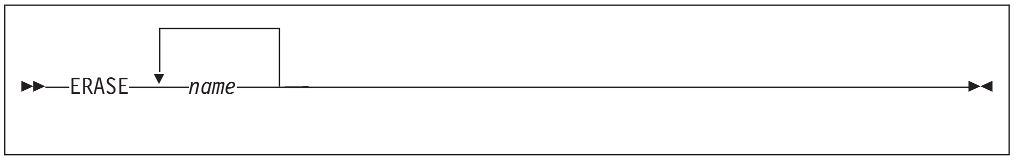
or

```
BACKWARD 2
```

or

```
BACKWARD MAX
```

- The repeat symbol indicates that an item can be repeated. For example:



This statement could appear as:

```
ERASE NAME1
```

or

```
ERASE NAME1 NAME2
```

A repeat symbol above a stack indicates that you can make more than one choice from the stacked items, or repeat a choice. For example:

```
               ┌─,──────────────────┐
               ▼                    │
►►──VALUES──(──────┬─constant──────────┬─┴──)──────────────────────────────►◄
                   ├─host_variable_list─┤
                   ├─NULL───────────────┤
                   └─special_register───┘
```

- If an item is above the main line, it represents a default, which means that it will be used if no other item is specified. In the following example, the ASC keyword appears above the line in a stack with DESC. If neither of these values is specified, the command would be processed with option ASC.

```
      ┌─ASC──┐
►►────┼──────┼─────────────────────────────────────────────────────────────►◄
      └─DESC─┘
```

- When an optional keyword is followed on the same path by an optional default parameter, the default parameter is assumed if the keyword is not entered. However, if this keyword is entered, one of its associated optional parameters must also be specified.

  In the following example, if you enter the optional keyword PCTFREE =, you also have to specify one of its associated optional parameters. If you do not enter PCTFREE =, the database manager will set it to the default value of 10.

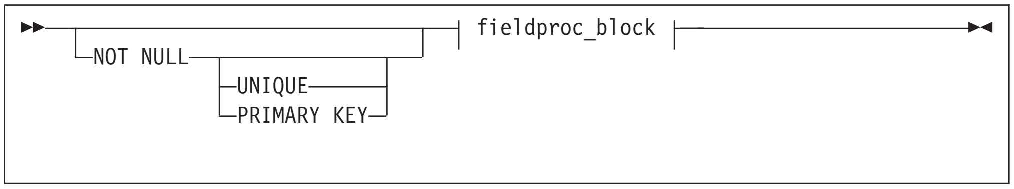
```
      ┌─PCTFREE = 10──────┐
►►────┼───────────────────┼────────────────────────────────────────────────►◄
      └─PCTFREE = integer─┘
```

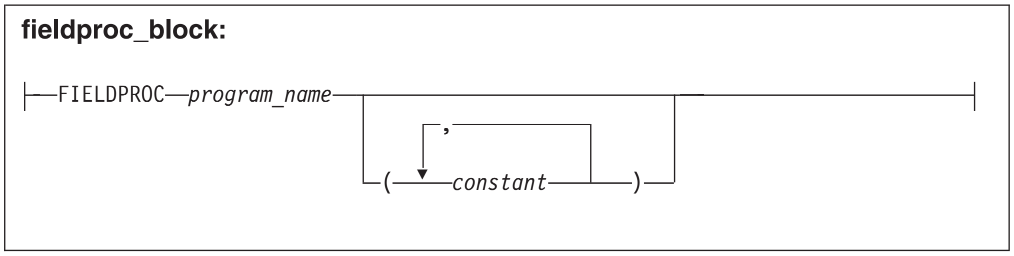
- Words that are only used for readability and have no effect on the execution of the statement are shown as a single uppercase default. For example:

```
                   ┌─PRIVILEGES─┐
►►──REVOKE ALL─────┴────────────┴──────────────────────────────────────────►◄
```

  Here, specifying either REVOKE ALL or REVOKE ALL PRIVILEGES means the same thing.

- Sometimes a single parameter represents a fragment of syntax that is expanded below. In the following example, **fieldproc_block** is such a fragment and it is expanded following the syntax diagram containing it.





EXEC Conventions

When running the EXECs included with DB2 RXSQL, you might receive a message such as the following:

```
Do you want to use these values?
Enter 0 (NO) or 1 (YES) OR 111 (QUIT)
```

To answer no, type one of the following:
`NO, No, no, N, n, 0.`

To answer yes, type one of the following:
`YES, Yes, yes, Y, y, 1.`

To stop the EXEC and exit processing, type one of the following:
`QUIT, Quit, quit, Q, q, 111.`

Summary of Changes

This is a summary of the technical changes to the DB2 Server for VSE & VM database management system for this edition of the book. All manuals are affected by some or all of the changes discussed here. For your convenience, the changes made in this edition are identified in the text by a vertical bar (|) in the left margin. This edition may also include minor corrections and editorial changes that are not identified.

This summary does not list incompatibilities between releases of the DB2 Server for VSE & VM product; see either the *DB2 Server for VSE & VM SQL Reference*, *DB2 Server for VM System Administration*, or the *DB2 Server for VSE System Administration* manuals for a discussion of incompatibilities.

Summary of Changes for DB2 Version 7 Release 1

Version 7 Release 1 of the DB2 Server for VSE & VM database management system is intended to run on the Virtual Machine/Enterprise Systems Architecture (VM/ESA®) Version 2 Release 3 or later environment and on the Virtual Storage Extended/Enterprise Systems Architecture (VSE/ESA™) Version 2 Release 3 Modification 1 or later environment.

Enhancements, New Functions, and New Capabilities

TCP/IP Support for DB2 Server for VSE

TCP/IP support allows:

- VSE online and batch application programs to access remote application servers which support IBM's implementation of the DRDA architecture over TCP/IP.
- Remote application requesters which support IBM's implementation of the DRDA architecture to access the DB2 for VSE application server over TCP/IP.

For more information, see the following DB2 Server for VSE & VM documentation:

- *DB2 Server for VSE & VM Database Administration*
- *DB2 Server for VSE System Administration*
- *DB2 Server for VSE Program Directory*.

DRDA RUOW Application Requester for VSE (Batch)

DRDA Remote Unit of Work Application Requester provides read and update capability in one location in a single unit of work.

This support provides VSE batch application programs with the ability to execute SQL statements to access and manipulate data managed by any remote application server that supports IBM's implementation of the DRDA architecture.

VSE batch application programs can access only one remote application server per unit of work, and must use TCP/IP communications.

For more information, see the following DB2 Server for VSE & VM documentation:

- *DB2 Server for VSE System Administration*
- *DB2 Server for VSE & VM Database Administration*
- *DB2 Server for VSE & VM Application Programming*

- *DB2 Server for VSE Program Directory*.

Stored Procedures Application Requester

A stored procedure is a user-written application program compiled and stored at the server. Stored procedures allow logic to be encapsulated in a procedure that is local to the database manager. The ability to use stored procedures provides distributed solutions that let more people access data faster. SQL statements and replies flowing across the network are reduced and performance is improved.

This support provides VM and VSE (online and batch) application programs with the ability to invoke stored procedures from any remote application servers that support IBM's implementation of the DRDA architecture. It also allows processing of result sets if supported by the remote DRDA application server.

For more information, see the following DB2 Server for VSE & VM documentation:
- *DB2 Server for VSE & VM Application Programming*
- *DB2 Server for VSE & VM SQL Reference*.

Simplified DB2 Server for VSE Installation/Migration

A REXX procedure Job Manager is supplied to assist in the DB2 Server for VSE Installation/Migration process. It controls the overall job flow based on the contents of the job list control tables and the parameter table (supplied as Z-type members). The job manager selects the job control member from the job list file (a Z-type member), extracts the member from the Installation Library, modifies the JCL, submits the job, evaluates the execution, posts the results, and then repeats the process as required. The users are required to modify the parameter table, according to their environment.

This support simplifies the process of installation and migration by reducing user intervention - the Job Manager submits the prepared jobs.

See the *DB2 Server for VSE Program Directory* for further details.

New Code Page and Euro Symbol Code Page Support

The following CCSIDs are now supported:
- 1137: Hindi
- 1142: E-Danish/Norweigan
- 1143: E-Finnish/Swedish
- 1145: E-Spanish.

Additional support has been added for conversions from Unicode (UTF-8) to host CCSIDs.

For a complete list of CCSIDs supported, refer to the *DB2 Server for VM System Administration* and *DB2 Server for VSE System Administration* manuals.

Control Center for VM Enhancements

The following is a list of enhancements that have been made to the Control Center for VM:
- QMF™ Tools: allow the user to list QMF objects, view and unload QMF queries and PROCS, schedule QMF PROCS to execute, and run explain on QMF queries.
- Table Create Tool: allows the user to create new tables.
- Search List improvements.
- Referential Integrity Report tool: A referential integrity map report can now be generated directly from the CMS command interface.

- PL/I prerequisite removal.
- New and improved tape hopper support.
- High density tape drive support: support for high density (non-CMS density) tape drives.

Control Center for VSE Enhancements

The following enhancements have been provided for Control Center for VSE:

- Additional Operator Command Support
- Installation of IBM-provided Stored Procedures.

QMF for VSE & VM Optional Feature

The following enhancements have been provided for QMF for VSE & VM:

- Application Requester support for VSE QMF users
- Command enhancements to default to object type
- Fast path to the QMF home screen
- Cross-platform install capability
- DB2 for AS/400 database access.

QMF for Windows® Optional Feature

The following enhancements have been provided for QMF for Windows :

- Java-based Query
- Aggregating, grouping and formatting directly within query results and automatic Form creation
- Personal portal user interface that launches centrally shared queries and reports, and sends results to spreadsheets, desktop databases, and browsers
- Procedures with REXX.

Reliability, Availability, and Serviceability Improvements

DBNAME Directory Restructuring

ARISDIRD has been restructured to improve readability and flexibility. Each DBNAME entry is now defined explicitly by its type (Local, Remote or Host VM (Guest Sharing)). CICS AXE Transaction TPNs (Transaction Program Names) are still included in the directory as a type of 'LOCALAXE'. The DBNAME Directory Builder program, ARICBDID has been rewritten as a REXX/VSE procedure with extensive error and dependency checking. Support for TCP/IP information is added and 'alias' DBNAMEs are supported. **ALL** DBNAMEs **must** be specified in the new DBNAME Directory, including the Product Default DBNAME "SQLDS". A migration REXX/VSE procedure, ARICCDID, is provided to assist in migrating to the new format. See the *DB2 Server for VSE System Administration* and *DB2 Server for VSE Program Directory* for additional information.

Migration Considerations

Migration is supported from SQL/DS™ Version 3 and DB2 Server for VSE & VM Versions 5 and 6. Migration from SQL/DS Version 2 Release 2 or earlier releases is not supported. Refer to the *DB2 Server for VM System Administration* or *DB2 Server for VSE System Administration* manual for migration considerations.

Library Enhancements

Some general library enhancements include:

- The following books have been removed from the library:
  - *DB2 Server for VM Application Programming*
  - *DB2 Server for VSE Application Programming*

- *DB2 Server for VM Database Administration*
  - *DB2 Server for VSE Database Administration*
  - *DB2 Server for VSE Installation*
  - *DB2 REXX SQL Interface Installation*
  - *DB2 REXX SQL Reference*
  - *DB2 Server for VM Diagnosis Guide and Reference*
  - *DB2 Server for VSE Diagnosis Guide and Reference*
  - *DB2 VM Data Spaces Support*

    Note: Information from this book can now be found in the *DB2 Server for VSE & VM Performance Tuning Handbook*
  - *DB2 Server for VM Master Index and Glossary*
  - *DB2 Server for VSE Master Index and Glossary*.
- The following books have been added to the library:
  - *DB2 Server for VSE & VM Database Administration*
  - *DB2 Server for VSE & VM Application Programming*
  - *DB2 REXX SQL for VM/ESA Installation and Reference*
  - *DB2 Server for VSE & VM Diagnosis Guide and Reference*
  - *DB2 Server for VSE & VM Master Index and Glossary*.

Refer to the new *DB2 Server for VSE & VM Overivew* for a better understanding of the benefits DB2 Server for VSE & VM can provide.

Part 1. Installation

Chapter 1. Before You Begin

This chapter outlines the prerequisites for installing RXSQL on either CMS *minidisks* or in CMS *Shared File System directories (SFS directories)*. It also gives a brief description of the installation process, explains the DB2 RXSQL machine-readable material, and details the VM storage requirements.

Prerequisites for Running DB2 RXSQL

The following are the hardware and software requirements for running DB2 RXSQL.

Hardware Requirements

RXSQL requires the following hardware:

- A magnetic tape unit and a terminal supported by VM for installation and maintenance
- 3 megabytes of direct access storage to store the installation and runtime code.

Software Requirements

DB2 RXSQL requires the following software:

- IBM DATABASE 2 Server for VM Version 7 Release 1, Licensed Program 5697-F42, or later.

  It is assumed that the DB2 Server for VM relational database manager Version 7 Release 1 is installed using the *defaults* mentioned in this manual. If this is not the situation, you must substitute the values that your site used to install the DB2 Server for VM system for the defaults in this manual.
- The following operating system, either by itself or as the base of any system *package:*
  - VM/ESA Version 2 Release 3 or later, Licensed Program 5654-030

  The DB2 RXSQL and DB2 products do not support mixed CP and CMS releases, as supported by VM/ESA.

  In this manual, the VM/ESA environment will refer to VM/ESA Version 2 Release 3 or later. The term VM will be used to refer to the VM/ESA environment, unless there is a specific reference to a particular release.

  The VM/ESA environment supports the installation of DB2 RXSQL on CMS minidisks and SFS directories.

RXSQL Installation Prerequisites

The DB2 Server for VM system must be installed and operational before DB2 RXSQL can be installed. The recommended installation procedures for the DB2 system create:

- An DB2 database machine (SQLMACH, or its equivalent). A database called SQLDBA is generated on this machine. The DB2 database machine is described in the *DB2 Server for VM System Administration* manual.

- An DB2 Server for VM user machine (SQLUSER, or its equivalent). The DB2 user machine is described in the *DB2 Server for VM System Administration* manual.
- A production minidisk and a service minidisk, or a production SFS directory and a service SFS directory.

  If the DB2 system is installed on minidisks:
  - SQLMACH 195 is defined as the DB2 production minidisk
  - SQLMACH 193 is defined as the DB2 service minidisk.

  If the DB2 system is installed in SFS directories:
  - VMSYS:SQLMACH.SQL.PRODUCTION is defined as the DB2 production SFS directory
  - VMSYS:SQLMACH.SQL.SERVICE is defined as the DB2 service SFS directory.
- An *authorization ID* called SQLDBA that has *DBA authority* must exist on the DB2 Server for VM application server into which you are installing DB2 RXSQL.

Overview of the Installation Process

The DB2 RXSQL files are installed on production and service minidisks or in production and service SFS directories. All users must be linked to the RXSQL production minidisk or SFS directory for all DB2 RXSQL operations but the RXSQL service minidisk or SFS directory is only required for service activities or installation. The RXSQL production and service disks must be owned by the same *user ID*.

DB2 RXSQL consists of two modules:
- DB2 RXSQL, which loads a CMS nucleus extension
- EXECSQL, which passes control to DB2 RXSQL.

DB2 RXSQL also includes a DB2 RXSQL LOADLIB, which is loaded as a CMS nucleus extension.

The term **disk** will refer to both minidisks and SFS directories for the remainder of this manual.

You can install DB2 RXSQL files on the same disks that the DB2 Server for VM files, or other product files, are on. However, production files should be stored separately from service files. For example, you should not install DB2 RXSQL production files on the disk where DB2 Server for VM service files reside.

To install DB2 RXSQL files on disks, you require three virtual machines and their associated user IDs. In this manual, our suggested installation uses the MAINT, SQLUSER, and SQLMACH user IDs, but you can use any equivalent machine identifier (user ID).

The MAINT user ID is used to attach tapes, link the disks in write mode on which DB2 RXSQL files will be *loaded*, link the DB2 Server for VM disks, and issue VMFPLC2 commands. If you do not use the MAINT user ID, you must obtain a user ID with which you can perform these functions.

The SQLMACH user ID is the DB2 Server for VM *database machine*. In this manual, the SQLMACH user ID owns the DB2 RXSQL disks. If your installation does not use SQLMACH, substitute the name of your DB2 Server for VM database machine where SQLMACH is used.

The name of the database that is generated during the installation of the DB2 system is SQLDBA. SQLDBA is also the name of the application server in which the database is generated. In this manual, SQLDBA is the name of the application server in which DB2 RXSQL is installed if you are installing DB2 RXSQL into a DB2 application server. If your installation does not use the SQLDBA application server, substitute the name of your DB2 application server where SQLDBA is used.

The SQLUSER user ID is the DB2 Server for VM user machine. It is used to link the production and service files in read mode and to load the RXSQL package into the application server. If your installation does not use SQLUSER, substitute the name of your DB2 Server for VM user machine where SQLUSER is used.

The remainder of this section describes the four phases necessary for installation. The first two phases are done once. The next two are repeated for each application server into which RXSQL will be installed. The fourth phase is optional.

Phase 1. Preinstallation Setup

Before installing DB2 RXSQL, you must set up the disks and ensure there is enough free space for one of the following situations:

1. **If you are installing DB2 RXSQL on minidisks other than the DB2 Server for VM production and service minidisks**, you must define the DB2 RXSQL production and service minidisks to the DB2 Server for VM database machine (SQLMACH). You must grant read *access* to the DB2 RXSQL production minidisks to the DB2 Server for VM user machine (SQLUSER), as well as any other DB2 RXSQL users.
2. **If you are installing DB2 RXSQL in SFS directories other than the DB2 Server for VM production and service SFS directories**, you must create the DB2 RXSQL production and service SFS directories and grant read access to the DB2 RXSQL directories to the DB2 Server for VM user machine (SQLUSER), as well as any other DB2 RXSQL users.
3. **If you are installing DB2 RXSQL on the same minidisks or SFS directories** that contain the DB2 Server for VM production and service files, you must ensure that there is enough free space on the DB2 Server for VM minidisks or SFS directories. Space requirements for the DB2 RXSQL production and service files are discussed in "Virtual Machine Requirements" on page 8.

Free space on the work disks of the user ID that will be used to do the installation in VM (MAINT) and the user ID that will install the DB2 RXSQL package into the application servers (SQLUSER) is also required.

Phase 2. Installing DB2 RXSQL in VM

In this phase, DB2 RXSQL is installed in a VM environment. The product load library and the product module are also created on the DB2 RXSQL production minidisk or in the DB2 RXSQL production SFS directory.

When DB2 RXSQL is installed in a VM/ESA environment, the installation EXEC issues a prompt asking whether you want to install DB2 RXSQL on minidisks or in SFS directories.

If you are installing on the DB2 minidisks and the DB2 Server for VM database machine is running, you must shut down the database during this phase because you need exclusive write access. If you are not installing on DB2 Server for VM minidisks, it is not necessary to bring down the database.

Phase 3. Installing the DB2 RXSQL Package and HELP Tables into DB2 Server for VM Application Servers

This activity is done for each DB2 Server for VM application server in which DB2 RXSQL will be made available. The DB2 Server for VM database machine must be started before you can install the DB2 RXSQL package into an application server.

An authorization ID called SQLDBA that has DBA authority must exist on the DB2 Server for VM application server into which you are installing RXSQL.

The following is installed in each application server:

- DB2 RXSQL package

  Space is required in each application server for one DB2 RXSQL package. The installation process loads this package into an available *public dbspace* that has been reserved for packages.
- DB2 RXSQL HELP tables

  Note: You do not install HELP tables (and do not, therefore, have to acquire a *dbspace*) if you are upgrading to DB2 RXSQL Version 7 Release 1 and have an earlier version of the HELP tables in the application server. Instead, you must run the ELOSHLP EXEC to update your help files. See "The ELOSHLP EXEC" on page 184 for more information.

  In each application server in which you install DB2 RXSQL HELP tables, you should add or make available a dbspace with the following characteristics:
  – DBSPACETYPE=1
    - This *variable* allows the dbspace to be acquired as public.
    - NPAGES=256.
- The public dbspace must be created before installing the DB2 RXSQL HELP tables.

A manual verification procedure is part of this phase. It verifies the installation of DB2 RXSQL by testing some of its functions.

Phase 4. Installing the DB2 RXSQL Package into Non-DB2 Server for VM Application Servers Using the DRDA Protocol

To do this step, your DB2 Server for VM installation must have the ability to use the *Distributed Relational Database Architecture*™ *(DRDA®)* protocol, and you must have DBA authority.

In this phase, you load the DB2 RXSQL package into each non-DB2 Server for VM application server in which DB2 RXSQL is to be installed. This phase must be repeated for each application server in which DB2 RXSQL is to be available. The *DBS Utility* package must be installed before installing DB2 RXSQL in a non-DB2 Server for VM application server.

The following is installed in each application server:

- DB2 RXSQL package

  Space is required in each application server for one DB2 RXSQL package.

  Note: The RXSQL HELP tables are not supported for non-DB2 Server for VM application servers.

DB2 RXSQL Machine-Readable Material

The DB2 RXSQL machine-readable material is provided on magnetic tape (reel or cartridge).

Basic Product Files

DB2 RXSQL can be ordered on its own distribution tape or on a tape that contains other products. In this manual, DB2 RXSQL tape files are referred to as tape file 1, tape file 2, and so on, and correspond to the sequence of DB2 RXSQL files on the distribution tape.

Tape file 1 Consists of the following CMS files, which are written to the work minidisk of the MAINT machine during the installation process:

I5697ELO 071012	Is the DB2 RXSQL System Identification File. It contains records describing the DB2 RXSQL release.
I5697ELO EXEC	Loads tape file 3 to the DB2 RXSQL production disk and tape file 4 to the DB2 RXSQL service disk, and performs the DB2 RXSQL system link-edit. After the I5697ELO EXEC loads the files, it positions the distribution tape at the end of the last DB2 RXSQL file on the tape.
ELOINLS EXEC	Loads desired NLS Language from the REXX SQL distribution tape to an NLS Product Minidisk or SFS Directory.
ELOUME TXTAMENG	Is a message repository with all system messages written in the default language, mixed case English.
ELOUME TXTUCENG	Is a message repository with all system messages written in Upper Case English.
ELOUME TXTFRANC	Is a message repository with all system messages written in French.
ELOUME TXTHANZI	Is a message repository with all system messages written in Simplified Chinese.
ELOUME TXTKANJI	Is a message repository with all system messages written in Japanese.
ELOLANG EXEC	Sets up the DB2 RXSQL message repository.
ELOLANMS EXEC	Displays messages during the installation process when the ELOLANG EXEC cannot set up the message repository.

Tape file 2	Contains one CMS file, I5697ELO MEMO, that is loaded to the MAINT machine's work minidisk. This is the *Memo to Users*, which contains a brief overview of the installation process.
Tape file 3	Contains executable product code files that are loaded by the I5697ELO EXEC to the DB2 RXSQL production disk during installation.
Tape file 4	Contains supplementary executable and nonexecutable files to support DB2 RXSQL. These CMS files are loaded by the I5697ELO EXEC to the DB2 RXSQL service disk during installation.
Tape file 5	Contains Upper Case English Help files loaded by ELOINLS to the NLS minidisk or SFS directory.
Tape file 6	Contains an exec and macro loaded to the REXX SQL service minidisk or SFS service directory. These files are used to enable and load the Upper Case English NLS language for REXX SQL.
Tape file 7	Contains the French Help files loaded by ELOINLS to the NLS minidisk or SFS directory.
Tape file 8	Contains an exec and macro loaded to the REXX SQL service minidisk or SFS service directory. These files are used to enable and load the French NLS language for REXX SQL.
Tape file 9	Contains Japanese or KANJI Help files loaded by ELOINLS to the NLS minidisk or SFS directory.
Tape file 10	Contains an exec and macro loaded to the REXX SQL service minidisk or SFS service directory. These files are used to enable and load the Japanese NLS language for REXX SQL.
Tape file 11	Contains Simplified Chinese or HANZI Help files loaded by ELOINLS to the NLS minidisk or SFS directory.
Tape file 12	Contains an exec and macro loaded to the REXX SQL service minidisk or SFS service directory. These files are used to enable and load the Simplified Chinese NLS language for REXX SQL.

Note: Do not change the CMS files supplied by IBM on the DB2 RXSQL production or service disks. They may be replaced by service updates.

More information on enabling an NLS Language for REXX can be found on "Chapter 3. Installing a REXX SQL NLS Language" on page 43.

Virtual Machine Requirements

Runtime DB2 RXSQL requires at least 500*K* (K is 1024 *bytes*) of storage.

The following disks are required for DB2 RXSQL:
- The DB2 RXSQL production disk
- The DB2 RXSQL service disk.

The DB2 RXSQL production disk must be available for all DB2 RXSQL operations during installation.

The DB2 RXSQL service disk is not required for normal DB2 RXSQL processing. The service disk must, however, be available for service activities or installation.

Both production and service disks must be owned by the same virtual machine.

MAINT Machine

This virtual machine exists in all VM environments. It is used to load information from the DB2 RXSQL distribution tape, including the EXECs supplied by IBM, to the work disk of the MAINT machine during installation.

Minidisk Requirements for Installation

The following information details the minidisk requirements for installing RXSQL on the MAINT machine:

- Use work minidisk 194 for installing DB2 RXSQL. Alternatively, minidisk 191 can be used.
- The MAINT machine needs read/write access to a minidisk with free space equal to at least 3 cylinders of an IBM 3380 storage device. Figure 1 shows the minimum free space required for this work minidisk.
- The space allocation in the FB-512 blocks applies to the following *DASD:*
  - 3370
  - 9332
  - 9335.

The minidisk block size is 4096 bytes, unless otherwise stated.

Minidisk	Virtual Address	Access Mode	3350 Cylinders	3375 Cylinders	3380 Cylinders	3390 Cylinders	9345 Cylinders	FB-512 Blocks
MAINT machine: Work minidisk for installation	194 or 191	A or C	4	5	3	3	4	3600

Figure 1. MAINT Machine Minidisk Free-Space Requirements for Installation

SQLMACH Machine

This virtual machine or its equivalent is in all VM environments that have the DB2 Server for VM relational database manager installed. SQLMACH is used to identify the DB2 Server for VM database machine that owns:

- The DB2 Server for VM production and service disks
- The database minidisks
- The RXSQL production and service files, whether they reside on DB2 Server for VM disks or on other disks.

DB2 RXSQL Minidisk or SFS Directory Requirements

The following information describes the free space requirements for installing DB2 RXSQL production and service files.

If you are installing RXSQL on the same minidisks or SFS directories as are used for the DB2 Server for VM files, there must be free space for the DB2 RXSQL files on the disks. Figure 2 on page 10 and Figure 3 on page 10 show the amount of free space that is required. You can then refer to “SQLUSER Machine” on page 10 to continue reading about DB2 RXSQL VM requirements.

If you are installing DB2 RXSQL on minidisks or SFS directories other than those used for the DB2 Server for VM files, you must modify the SQLMACH VM directory entries for minidisk installation, or use the MODIFY USER command for SFS installation. Figure 2 on page 10 and Figure 3 on page 10 show the amount of free space that needs to be defined.

Minidisks	Virtual Address	3350 Cylinders	3375 Cylinders	3380 Cylinders	3390 Cylinders	9345 Cylinders	FB-512 Blocks
SQLMACH machine: Production minidisk	198	3	4	2	2	2	2400
SQLMACH machine: Service minidisk	199	8	9	6	5	6	7500

Figure 2. Minimum Requirements for DB2 RXSQL SQLMACH Machine Minidisks

SFS Directories	Directory Name	4K Blocks
SQLMACH machine: Production SFS directory	VMSYS:SQLMACH.RXSQL.PRODUCTION	300
SQLMACH machine: Service SFS directory	VMSYS:SQLMACH.RXSQL.SERVICE	1000

Figure 3. Minimum Requirements for DB2 RXSQL SQLMACH Machine SFS Directories

SQLUSER Machine

This virtual machine or its equivalent exists in all VM environments that have the DB2 relational database manager installed. It is used to install the DB2 RXSQL package into application servers and to verify DB2 RXSQL installation.

If you are installing DB2 RXSQL on minidisks other than those used for the DB2 Server for VM files, the SQLUSER VM directory entries may be updated to automatically link the DB2 RXSQL minidisks to SQLUSER.

DB2 RXSQL Minidisk or SFS Directory Requirements

The free space requirements for installing RXSQL on the SQLUSER disk are shown in Figure 4 and Figure 5 on page 11.

The SQLUSER machine needs read/write access to a minidisk with free space equal to at least 1 cylinder of an IBM 3380 storage device, or read/write authority to an SFS directory with free space equal to at least 150 blocks.

Minidisk	Virtual Address	Access Mode	3350 Cylinders	3375 Cylinders	3380 Cylinders	3390 Cylinders	9345 Cylinders	FB-512 Blocks	Block Size
SQLUSER machine: Work minidisk for installation	191	A	1	1	1	1	1	930	1024

Figure 4. SQLUSER Machine Minidisk Free-Space Requirements for Installation

SFS Directory	Directory Name	Access Mode	4K Blocks
SQLUSER machine: Work SFS directory for installation	VMSYSU:SQLUSER	A	150

Figure 5. SQLUSER Machine SFS Directory Free-Space Requirements for Installation

Chapter 2. Installing DB2 RXSQL

This chapter describes how to install DB2 RXSQL on minidisks or in SFS directories, and provides instructions for verifying the DB2 RXSQL installation.

For a description of the installation messages, refer to "Appendix D. Installation Messages" on page 191.

For a description of the *CP* commands used during installation of DB2 RXSQL, refer to the *VM/ESA: CP Command and Utility Reference* manual for your VM operating system. For a description of the CMS commands used during installation of DB2 RXSQL, refer to the *VM/ESA: CMS Command Reference* manual for your VM operating system.

Installing DB2 RXSQL on Minidisks

This section provides instructions for installing DB2 RXSQL on minidisks.

The installation process consists of four phases: preinstallation setup, installing DB2 RXSQL in VM, installing the DB2 RXSQL package and HELP tables into DB2 Server for VM application servers, and installing the DB2 RXSQL package into non-DB2 Server for VM application servers. Each phase contains several steps. For a summary of the installation steps, refer to the "DB2 RXSQL Installation Checklist for Minidisks" on page 13.

If you are installing DB2 RXSQL in SFS directories, refer to "Installing RXSQL in SFS Directories" on page 23 to begin your installation.

DB2 RXSQL Installation Checklist for Minidisks

The following checklist summarizes the steps required to install DB2 RXSQL on minidisks.

Notes:
- *Perform the steps in order.*
- *Mandatory steps are preceded by squares* (▪).
- *Optional steps are preceded by circles* (○)
- *Page references are in parentheses.*

Phase 1: Preinstallation Setup

Skip this phase if installing DB2 RXSQL on DB2 Server for VM production and service minidisks.

○ Log on to the MAINT virtual machine (15).
○ Define required minidisks to SQLMACH (16).
○ Grant SQLUSER access to required minidisks (16).
○ Save the *directory* entry change (16).
○ Disconnect or log off the MAINT machine (16).

Phase 2: Installing DB2 RXSQL in VM

▪ Log on to the SQLMACH database machine (17).
▪ Shut down the database (17).
▪ Log off the SQLMACH machine (18).

▪ Reconnect or log on to the MAINT machine (18).
▪ Load the first two tape files to the MAINT work minidisk (18).
▪ Load and link-edit the DB2 RXSQL minidisks (18).
▪ Disconnect or log off the MAINT machine (20).
▪ Log on to the SQLMACH database machine (20).
▪ Start the DB2 system in *multiple user mode* (20).
▪ Disconnect from the SQLMACH database machine (20).
○ Install a new *date* or *time* exit (20).

Phase 3: Installing the DB2 RXSQL Package and HELP Tables into DB2 Server for VM Application Servers
▪ Log on to the SQLUSER machine (20).
▪ Access RXSQL and DB2 Server for VM disks (20).
▪ Install the DB2 RXSQL package and HELP tables into the DB2 Server for VM application server (22).
▪ Verify the DB2 RXSQL installation (33).
▪ Log off the SQLUSER machine (22).
○ Reconnect or log on to the MAINT machine (22).
○ Change the passwords in the VM directory (22).
○ Disconnect or log off the MAINT machine (22).

Phase 4: Installing the DB2 RXSQL Package into Non-DB2 Server for VM Application Servers
○ Log on to the SQLUSER machine (23).
○ Access DB2 RXSQL and DB2 disks (23).
○ Install DB2 RXSQL into the non-DB2 Server for VM application server (23).
○ Verify the DB2 RXSQL installation (33).
○ Log off the SQLUSER machine (23).

Phase 1: Preinstallation Setup

This phase of the installation sets up the environment needed to install RXSQL on minidisks. If you are installing DB2 RXSQL on DB2 Server for VM production and service minidisks, skip this phase and continue with “Phase 2: Installing DB2 RXSQL in VM” on page 17. Figure 6 on page 15 illustrates phase 1 of the installation process.

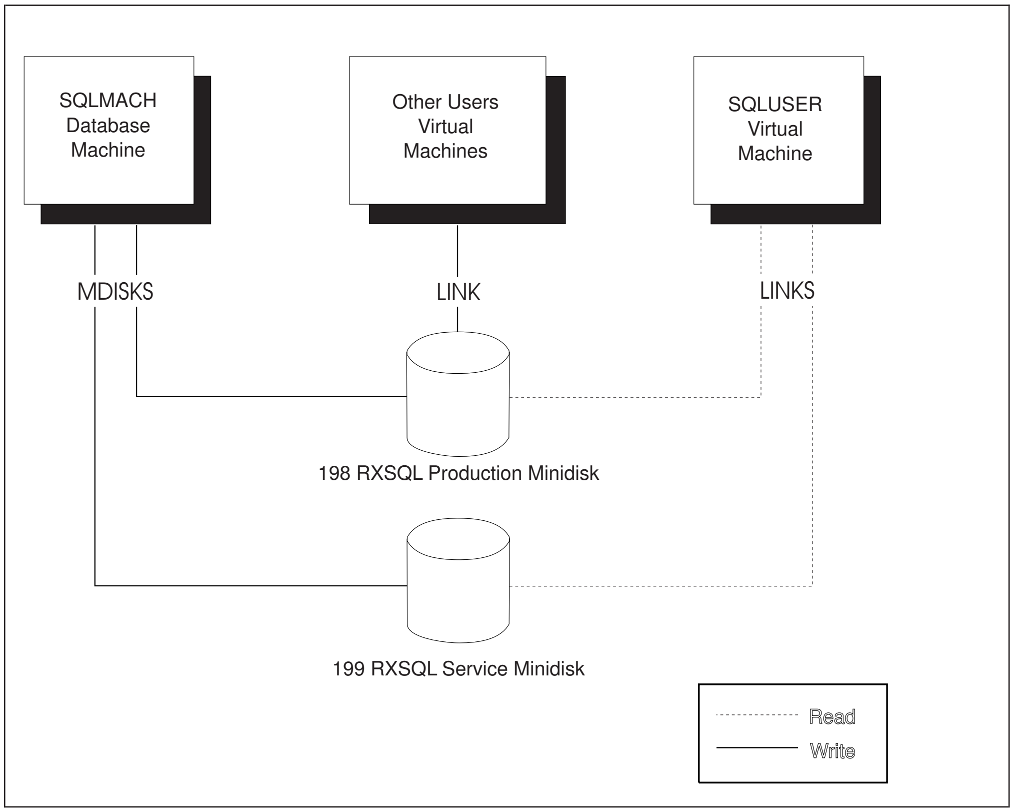

SQLMACH Database Machine
Other Users Virtual Machines
SQLUSER Virtual Machine
MDISKS
LINK
LINKS
198 RXSQL Production Minidisk
199 RXSQL Service Minidisk
Read
Write

Figure 6. DB2 RXSQL Virtual Machine Minidisks for Installation

Notes:

1. Virtual address 198 of the SQLMACH virtual machine is defined as the DB2 RXSQL production minidisk.
2. Virtual address 199 of the SQLMACH virtual machine is defined as the DB2 RXSQL service minidisk.
3. DB2 RXSQL minidisks are linked to the SQLUSER virtual machine (in read mode).
4. The SQLMACH 198 production minidisks can also be linked to other user virtual machines, but in read-only mode.

Use the MAINT machine to add control *statements* to the VM directory entries for SQLMACH, SQLUSER, and all other DB2 RXSQL users.

Step 1.1 Define Required Minidisks to SQLMACH

Log on to the MAINT machine and add two control statements defining the new minidisks for DB2 RXSQL to the VM directory entry for SQLMACH. Figure 7 on page 16 shows a sample directory entry for SQLMACH with the two control statements that define the new minidisks. Use the device types applicable to your VM environment.

```
  USER SQLMACH sqlmachpw 8M 8M G
  ACCOUNT nnnnnnnn
  OPTION MAXCONN 26
  IUCV *IDENT SQLMACH GLOBAL
  IUCV ALLOW
  IPL CMS
  CONSOLE 009 3215 T OPERATOR
  SPOOL 00C 2540 READER *
  SPOOL 00D 2540 PUNCH A
  SPOOL 00E 1403
  LINK MAINT 190 190 RR
  LINK MAINT 19D 19D RR
  MDISK 191 3380 cylr 010 volser W
  MDISK 193 3380 cylr 060 volser R readpw writepw
  MDISK 195 3380 cylr 024 volser RR readpw writepw multipw
1   MDISK 198 3380 cylr 002 volser RR readpw writepw
2   MDISK 199 3380 cylr 005 volser RR readpw writepw
  MDISK 200 3380 cylr 064 volser R readpw writepw
  MDISK 201 3380 cylr 022 volser R readpw writepw
  MDISK 202 3380 cylr 212 volser R readpw writepw
```

Figure 7. Example of VM Directory Control Statements for the SQLMACH Machine

The following statements are specific to the installation of DB2 RXSQL:

1 MDISK 198 3380 cylr 002 volser RR readpw writepw

This control statement defines the DB2 RXSQL production minidisk with virtual device address 198 and the link access mode of read specified. Read(readpw) and write(writepw) passwords must be specified.

2 MDISK 199 3380 cylr 005 volser RR readpw writepw

This control statement defines the DB2 RXSQL service minidisk with virtual device address 199 and the link access mode of read specified. Read(readpw) and write(writepw) passwords must be specified.

Step 1.2 Grant SQLUSER Access to Required Minidisks

DB2 RXSQL production and service minidisks must be available to SQLUSER to perform the installation steps described in "Phase 3: Installing the DB2 RXSQL Package and HELP Tables into DB2 Server for VM Application Servers" on page 20. You can set up the SQLUSER environment to make these disks available in one of the following ways:

- Update the SQLUSER VM directory to have the disks linked in at logon
- Modify SQLUSER's PROFILE EXEC to link to the minidisks
- Issue the CP LINK command from the CMS command line after you are logged on to SQLUSER.

Step 1.3 Save the Directory Entry Change

Type the following DIRM command to save the VM directory control statement change for SQLMACH:

```
DIRM REP SQLMACH
```

Disconnect or log off the MAINT machine.

Phase 2: Installing DB2 RXSQL in VM

Phase 1 prepared the environment for installing DB2 RXSQL files on minidisks. Phase 2 installs DB2 RXSQL in a VM environment.

The INSTFPP EXEC can be used instead of this phase. Refer to the appropriate VM installation guide for information on the INSTFPP EXEC. If you use the INSTFPP EXEC, ensure that you access the MAINT machine's work minidisk as *file mode* C, and that you access a read/write minidisk as file mode A.

Refer to Figure 8 on page 17 for an overview of the installation process.

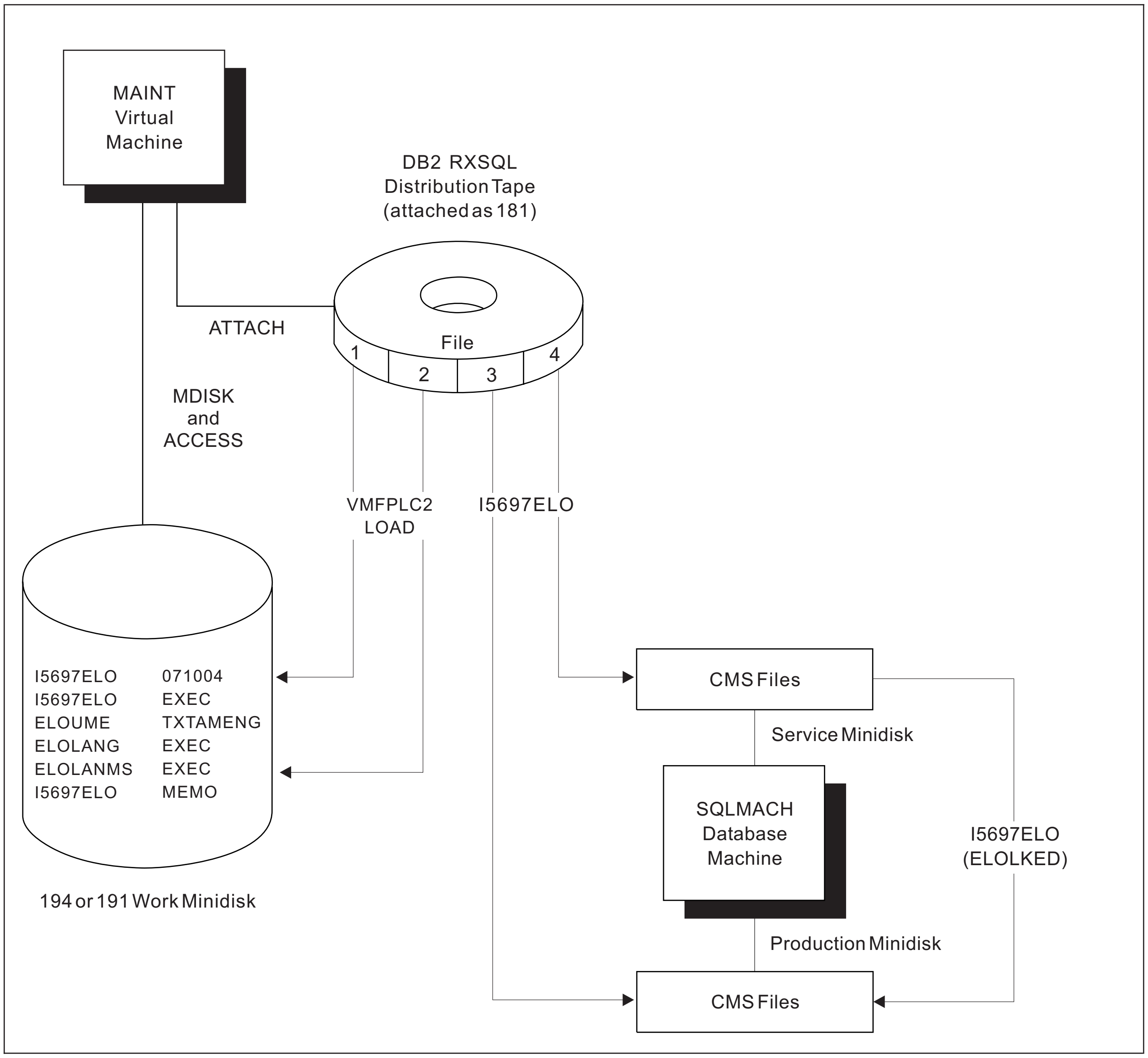


Figure 8. Summary of DB2 RXSQL Installation in VM

Step 2.1 Shut Down the DB2 Database

Log on to the SQLMACH database machine, and type the SQLEND command to shut down the DB2 database:

```
SQLEND NORMAL
```

This command finishes processing after all active *logical units of work* are completed. Log off the SQLMACH database machine:

```
LOGOFF
```

Step 2.2 Load the First Two Tape Files to the MAINT Machine's Work Minidisk

Log on to the MAINT machine to load the DB2 RXSQL files onto the production and service minidisks.

Access the MAINT machine's work minidisk as file mode A. Type the following statements to load the first two tape files to this minidisk:

- To identify the virtual device address (*cuu*) of the MAINT machine's work minidisk, type:
  ```
  ACCESS cuu A
  ```
  The *cuu* is usually specified as 194 or 191.
- To identify the real device number (*rdev*) of the tape device to be accessed as virtual tape address 181, type:
  ```
  ATTACH rdev TO MAINT AS 181
  ```
  The distribution tape must be mounted on the device defined as virtual address 181.
- To rewind the tape, type:
  ```
  VMFPLC2 REW
  ```
- To load tape files 1 and 2 from the distribution tape to the MAINT machine's A disk or work minidisk, type:
  ```
  VMFPLC2 LOAD * * A (EOF 2
  ```
  - Tape file 1 contains the I5697ELO EXEC, which will load the remaining DB2 RXSQL distribution tape.
  - Tape file 2 contains a *Memo to Users*, which contains an overview of the installation process. To print the *Memo to Users*, type the CMS PRINT command:
    ```
    PRINT I5697ELO MEMO A (CC
    ```

Step 2.3 Load the RXSQL Minidisks

The I5697ELO EXEC loads the DB2 RXSQL files onto the production and service minidisks. This step also links text files into a load library and creates a load module on the DB2 RXSQL production minidisk.

The I5697ELO EXEC

Before you run this EXEC, verify that:

1. The minidisk on which you plan to install the RXSQL production files is defined. The default is SQLMACH 198 if you are not installing on the DB2 Server for VM production minidisk.
2. The minidisk on which you plan to install the RXSQL service files is defined. The default is SQLMACH 199 if you are not installing on the DB2 Server for VM service minidisk.
3. No other users are linked to the production and service minidisks during installation.
4. You are not linked with write access to the minidisks on which you plan to install the DB2 RXSQL files.

5. There are enough free file modes to access the DB2 RXSQL and DB2 Server for VM minidisks. If you are installing DB2 RXSQL on the DB2 Server for VM minidisks, two free file modes are required. Otherwise, four free file modes are required for installing DB2 RXSQL.
6. There are enough free virtual device addresses to link the DB2 RXSQL and DB2 Server for VM minidisks. If you are installing DB2 RXSQL on the DB2 Server for VM minidisks, two free addresses are required. Otherwise, four free addresses are required for installing DB2 RXSQL. The free virtual device addresses must be between 001 and 499.
7. The write access passwords (writepw) assigned to the production and service minidisks on which you are installing RXSQL are available.
8. The read access passwords (readpw) assigned to the DB2 production and service minidisks are available if the DB2 system was installed on minidisks and you are not installing RXSQL on the DB2 Server for VM minidisks.
9. The user ID installing DB2 RXSQL must have the service and production minidisk linked with the virtual device address corresponding to the real device address. For example, SQLMACH 198 must be linked as 198.
10. The user ID installing RXSQL must have access to the files shown in Figure 9.

File Name	Location	DB2 Server for VM Components
DMSCSL	VM/ESA system minidisk.	Bootstrap for the callable services library.
ARIRVSTC	SQLMACH 195 minidisk or VMSYS:SQLMACH.SQL.PRODUCTION.	Bootstrap for the DB2 Server for VM system
ARIUXDT	SQLMACH 193 minidisk or VMSYS:SQLMACH.SQL.SERVICE SFS directory.	Date routine
ARIUXTM	SQLMACH 193 minidisk or VMSYS:SQLMACH.SQL.SERVICE SFS directory.	Time routine

Figure 9. VM and DB2 Server for VM Text Files

Running the I5697ELO EXEC

| To run the I5697ELO EXEC, type:

```
I5697ELO
```

| The I5697ELO EXEC usually takes approximately 5 minutes to run, depending on system capabilities and current load. Refer to “The I5697ELO EXEC” on page 175 for instructions on running this EXEC.

Check the final message returned by the installation EXEC. If it is a *return code* of 888, the installation is successfully completed. However, further instructions are needed to complete this installation. You must continue with “Step 2.4 Start the DB2 System in Multiple User Mode” on page 20.

If the DB2 RXSQL production and service minidisks were successfully loaded, but the DB2 RXSQL system link-edit was not completed successfully, run the ELOLKED EXEC to complete the system link-edit before performing the next step of the DB2 RXSQL installation procedure. Refer to “The ELOLKED EXEC” on page 182 for information on running the ELOLKED EXEC.

After the installation EXEC is finished, type the CP DETACH command to detach the tape device and rewind the tape:

```
DETACH 181
```

Disconnect or log off the MAINT machine as follows:

```
#CP DISCONNECT
```

Step 2.4 Start the DB2 System in Multiple User Mode

Log on to the SQLMACH database machine, and type the SQLSTART command to start the DB2 database:

```
SQLSTART DBNAME(SQLDBA)
```

If you usually specify additional parameters for SQLSTART, you should specify them in addition to the DBNAME parameter shown above.

Type the CP DISCONNECT command to disconnect from the SQLMACH machine:

```
 #CP DISCONNECT
```

Step 2.5 Installing a New Date or Time Exit

In this optional step, you can customize the date or time formats by creating a new exit. If exits already exist, they were linked in when the I5697ELO EXEC was run. To create a new date or time exit:

1. Create a date (ARIUXDT TEXT) or time (ARIUXTM TEXT) exit as described in the *DB2 Server for VM System Administration* manual.
2. Use VMSES to store the customized ARIUXDT and ARIUXTM TEXT files.
3. Run the ELOLKED EXEC as described in “The ELOLKED EXEC” on page 182

You must ensure that your date and time exits match the date and time exits of any application server to which you are connecting.

Phase 3: Installing the DB2 RXSQL Package and HELP Tables into DB2 Server for VM Application Servers

In this phase, you load the DB2 RXSQL package into each application server into which DB2 RXSQL is to be installed. You also create and install the DB2 RXSQL secondary-level HELP tables with the HELP text in each application server in which DB2 RXSQL is to be installed, and give the public select authority on these tables.

Repeat this phase for each application server in which DB2 RXSQL is to be available. You will be using the SQLUSER machine to install the DB2 RXSQL package into each application server.

An authorization ID called SQLDBA that has DBA authority must exist on the DB2 application server into which you are installing RXSQL.

Step 3.1 Link and Access the DB2 RXSQL and DB2 Disks

Log on to the SQLUSER machine. To install DB2 RXSQL in an application server, you must have read access to the DB2 RXSQL production and service disks and the DB2 production disk. The disks you must access depends on whether or not

DB2 RXSQL and the DB2 product were installed on the same disks, as shown in Figure 10.

Disks to Access	DB2 RXSQL Installed on DB2 Minidisks	DB2 RXSQL Installed on Separate Minidisks	
		DB2 Product is on Minidisk	**DB2 Product is in SFS Directories**
DB2 production minidisk	X	X	
DB2 service minidisk	X		
DB2 RXSQL production minidisk		X	X
DB2 RXSQL service minidisk		X	X

Figure 10. Accessing DB2 RXSQL and DB2 Disks When DB2 RXSQL Is on Minidisks

Note: You do not have to specify the CP LINK commands listed below if they are included in the SQLUSER VM directory entry or in the SQLUSER PROFILE EXEC.

DB2 RXSQL Was Installed on DB2 Minidisks: If DB2 RXSQL was installed on DB2 minidisks, specify the following commands to link and access the DB2 production and service minidisks:

- To link and access the DB2 production minidisk, SQLMACH 195, which also contains the DB2 RXSQL production files, type:

  ```
  LINK SQLMACH 195 195 RR
  ACCESS 195 Q
  ```

- To link and access the DB2 service minidisk, SQLMACH 193, which also contains the DB2 RXSQL service files, type:

  ```
  LINK SQLMACH 193 193 RR
  ACCESS 193 V
  ```

DB2 RXSQL Was Installed on Separate Minidisks

If DB2 RXSQL was not installed on DB2 minidisks, specify the following commands to link and access the DB2 RXSQL production and service minidisks and the DB2 production disk:

- To link and access the DB2 RXSQL production minidisk, SQLMACH 198, type:

  ```
  LINK SQLMACH 198 198 RR
  ACCESS 198 P
  ```

- To link and access the DB2 RXSQL service minidisk, SQLMACH 199, type:

  ```
  LINK SQLMACH 199 199 RR
  ACCESS 199 V
  ```

- You must also specify one of the following:
  - If DB2 Server for VM was installed on minidisks, type the following to link and access the DB2 production minidisk, SQLMACH 195:

    ```
    LINK SQLMACH 195 195 RR
    ACCESS 195 Q
    ```

  - If DB2 Server for VM was installed in SFS directories, type the following to access the DB2 production directory:

    ```
    ACCESS VMSYS:SQLMACH.SQL.PRODUCTION Q
    ```

Step 3.2 Install the DB2 RXSQL Package and HELP Tables into a DB2 Application Server

To complete this step, you must:

- Know the connect password for the SQLDBA authorization ID.

  Note: The dbspace RXSQHELP will be dropped and recreated with the new RXSQL help tables if you are upgrading. The installation exec will acquire the necessary dbspace for the help tables if you are installing this feature for the first time.

To install DB2 RXSQL into a DB2 application server, type the following commands:

- To establish the DB2 Server for VM application server into which the DB2 RXSQL package will be installed, type:

  ```
  SQLINIT DBNAME(SQLDBA)
  ```

  If you usually specify additional parameters for the SQLINIT EXEC, you should specify them in addition to the DBNAME parameter shown above.
- To load the DB2 RXSQL package into a DB2 application server, type:

  ```
  ELOAMOD
  ```

  Refer to "The ELOAMOD EXEC" on page 179 for instructions on running this EXEC.
- To install DB2 RXSQL HELP tables, type the following:

  ```
  ELOHLPLD
  ```
- To update DB2 RXSQL HELP tables, type the following:

  ```
  ELOSHLP LANG(S001)
  ```

  The ELOHLPLD EXEC installs DB2 RXSQL secondary-level HELP tables in an DB2 application server. Refer to "The ELOHLPLD EXEC" on page 181 for instructions on running this EXEC.

  The ELOSHLP EXEC replaces the AMENG HELP text for releases of DB2 RXSQL Version 3 with the AMENG HELP text for DB2 RXSQL Version 7 Release 1. Refer to "The ELOSHLP EXEC" on page 184 for instructions on running this EXEC.

Step 3.3 Verify the DB2 RXSQL Installation

To verify the DB2 RXSQL installation, refer to "Installation Verification" on page 33. Log off the SQLUSER machine. Installation of DB2 RXSQL is now completed.

Step 3.4 Change the Passwords in the VM Directory

Although this step is optional, you should perform it for security purposes.

Use the MAINT machine to change the passwords in the VM directory.

If you used the default passwords supplied by RXSQL, change them when you have finished your installation to prevent unauthorized access of the RXSQL files.

Phase 4: Installing the DB2 RXSQL Package into Non-DB2 Application Servers Using the DRDA Protocol

In this phase, you load the DB2 RXSQL package into each non-DB2 Server for VM application server in which DB2 RXSQL is to be installed. This phase must be repeated for each application server in which DB2 RXSQL is to be available.

To do this step, your DB2 Server for VM installation must have the ability to use the DRDA protocol, and you must have DBA authority.

Before you can load the DB2 RXSQL package into a non-DB2 Server for VM application server, you must ensure that the DBS Utility package has been installed on the application server, and that you can run DBS Utility jobs from the SQLUSER machine using the DRDA protocol.

Step 4.1 Link and Access the DB2 RXSQL and DB2 Disks

Log on to the SQLUSER machine and link and access the appropriate disks as described in "Step 3.1 Link and Access the DB2 RXSQL and DB2 Disks" on page 20.

Step 4.2 Install DB2 RXSQL into the Non-DB2 Server for VM Application Server

To install DB2 RXSQL in a non-DB2 Server for VM application server, type the following commands:

- To establish the non-DB2 application server into which the DB2 RXSQL package will be installed using the DRDA protocol, type:
  ```
  SQLINIT DBNAME(server_name) PROTOCOL(DRDA)
  ```
- To load the DB2 RXSQL package into the non-DB2 application server, type:
  ```
  ELOAMOD
  ```

  Refer to "The ELOAMOD EXEC" on page 179 for instructions on running the ELOAMOD EXEC.

  Note: HELP table installation is not supported in non-DB2 Server for VM application servers.

Step 4.3 Verify the DB2 RXSQL Installation

For information about verifying the DB2 RXSQL installation, refer to "Installation Verification" on page 33. Log off the SQLUSER machine.

Installing RXSQL in SFS Directories

This section provides instructions for installing DB2 RXSQL in SFS directories.

The installation process consists of four phases: preinstallation setup, installing RXSQL in VM, installing the RXSQL package and HELP tables into DB2 Server for VM application servers, and installing the DB2 RXSQL package into non-DB2 Server for VM application servers. Each phase contains several steps. For a summary of the installation steps, refer to the "RXSQL Installation Checklist for SFS Directories" on page 23.

If you are installing DB2 RXSQL on minidisks, turn to "Installing DB2 RXSQL on Minidisks" on page 13 to begin your installation.

RXSQL Installation Checklist for SFS Directories

The following checklist summarizes the steps required for installation of DB2 RXSQL in SFS directories.

Notes:
- *Perform the steps in order.*
- *Mandatory steps are preceded by squares* (▪).
- *Optional steps are preceded by circles* (○)
- *Page references are in parentheses.*

Phase 1: Preinstallation Setup

Skip this phase if installing DB2 RXSQL in DB2 Server for VM production and service SFS directories.

○ Log on to the MAINT virtual machine (25).
○ Increase the size of the SQLMACH SFS directory (25).
○ Enroll users in the VMSYS file pool (25).
○ Create the SFS directories (26).
○ Grant read access to the DB2 RXSQL production SFS directory (26).
○ Grant SQLUSER read access to the DB2 RXSQL service SFS directory (26).
○ Disconnect or log off the MAINT machine (26).

Phase 2: Installing DB2 RXSQL in VM

○ Reconnect or log on to the MAINT machine (27).
▪ Load the first two tape files to the MAINT work minidisk (27).
▪ Load and link-edit the DB2 RXSQL SFS directories (28).
▪ Grant SQLUSER read access to the DB2 RXSQL service files (29).
▪ Grant read access to the DB2 RXSQL production files (29).
▪ Disconnect or log off the MAINT machine (29).
○ Log on to the SQLMACH database machine (29).
○ Start the DB2 system in multiple user mode (30).
○ Disconnect from the SQLMACH database machine (30).
○ Install a new date or time exit (30).

Phase 3: Installing DB2 RXSQL into DB2 Server for VM Application Servers

▪ Log on to the SQLUSER machine (30).
▪ Access DB2 RXSQL and DB2 Server for VM disks (30).
▪ Install the DB2 RXSQL package and HELP tables into the DB2 Server for VM application server (31).
▪ Verify the DB2 RXSQL installation (33).
▪ Log off the SQLUSER machine (32).

Phase 4: Installing the DB2 RXSQL Package into Non-DB2 Server for VM Application Servers

○ Log on to the SQLUSER machine (32).
○ Access DB2 RXSQL and DB2 disks (32).
○ Install DB2 RXSQL in the non-DB2 Server for VM application server (33).
○ Verify the DB2 RXSQL installation (33).
○ Log off the SQLUSER machine (33).

Phase 1: Preinstallation Setup

This phase of the installation sets up the environment required for installing DB2 RXSQL in SFS directories. If you are installing DB2 RXSQL in DB2 Server for VM production and service SFS directories, skip this phase and continue with “Phase 2: Installing RXSQL in VM” on page 26. Figure 11 on page 25 illustrates phase 1 of the installation process.

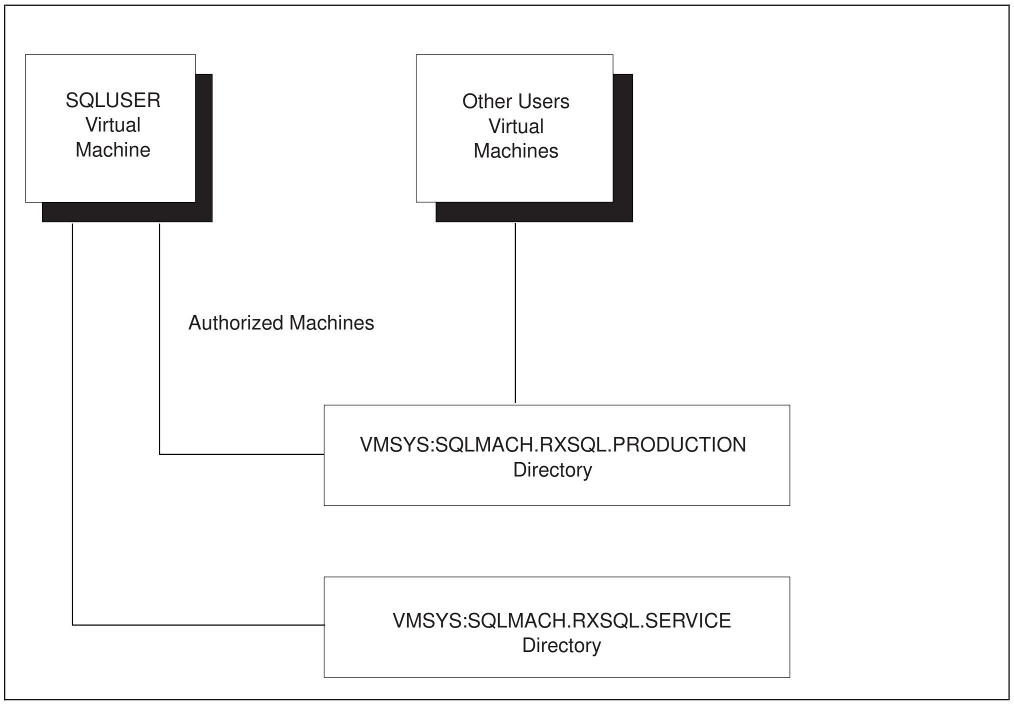


Figure 11. DB2 RXSQL Virtual Machine SFS Directories for Installation

Notes:

1. VMSYS is the default SFS file pool ID. Before continuing, determine the storage group in the VMSYS file pool to which DB2 RXSQL files will be assigned.
2. Directory VMSYS:SQLMACH.RXSQL.PRODUCTION is defined as the DB2 RXSQL production SFS directory.
3. Directory VMSYS:SQLMACH.RXSQL.SERVICE is defined as the DB2 RXSQL service SFS directory.
4. The SQLUSER virtual machine is authorized to use the directories in read-only mode.
5. Other user virtual machines are authorized to use the directories in read-only mode.

Use the MAINT machine to set up the SFS environment and give the appropriate authorization to SQLUSER and all other DB2 RXSQL users.

Step 1.1 Increase the Size of the SQLMACH SFS Directory

Log on to the MAINT machine and type the MODIFYUSER command to increase the size of the SQLMACH directory for DB2 RXSQL requirements:

```
MODIFY USER +1050 FOR SQLMACH VMSYS:
```

Step 1.2 Enroll Users in the VMSYS File Pool

Use the file pool administration machine to enroll users in the VMSYS file pool. The default file pool administration machine is the MAINT virtual machine. See the *VM/ESA: CMS File Pool Planning, Administration, and Operation* manual, for more information on the file pool administration machine.

Type the ENROLL command to grant connect *authority* to file pool VMSYS for all users:

```
ENROLL PUBLIC VMSYS:
```

To grant authority to file pool VMSYS for SQLUSER and other RXSQL users, type the following statements:

```
ENROLL USER SQLUSER VMSYS:
ENROLL USER userid  VMSYS:
                  .
                  .
```

SQLUSER and other RXSQL users must have *authorization* to access the file pool VMSYS.

Step 1.3 Create SFS Directories for RXSQL

Make sure you have created the VMSYS:SQLMACH SFS directory.

Type the CREATE command to create SFS directories for DB2 RXSQL production and service files:

```
CREATE DIR VMSYS:SQLMACH.RXSQL
CREATE DIR VMSYS:SQLMACH.RXSQL.PRODUCTION
CREATE DIR VMSYS:SQLMACH.RXSQL.SERVICE
```

Step 1.4 Grant Read Access to RXSQL Production SFS Directory

Type the GRANT command to grant read access to the DB2 RXSQL production SFS directory to all users:

```
GRANT AUTH VMSYS:SQLMACH.RXSQL.PRODUCTION TO PUBLIC (READ
```

To grant read access to the production directory to only SQLUSER and individual users, type the following statements:

```
GRANT AUTH VMSYS:SQLMACH.RXSQL.PRODUCTION TO SQLUSER (READ
GRANT AUTH VMSYS:SQLMACH.RXSQL.PRODUCTION TO userid  (READ
                  .
                  .
```

SQLUSER must have read authorization to the DB2 RXSQL production SFS directory, VMSYS:SQLMACH.RXSQL.PRODUCTION. Read-only authorization is granted because it is assumed the MAINT user ID has the authority to write to the production SFS directory. If the MAINT user ID does not have the authority, the file pool administrator must grant MAINT write authority.

Step 1.5 Grant Read Access to RXSQL Service SFS Directory

Type the GRANT command to grant read access to the DB2 RXSQL service SFS directory to SQLUSER:

```
GRANT AUTH VMSYS:SQLMACH.RXSQL.SERVICE TO SQLUSER (READ
```

Access to the DB2 RXSQL service SFS directory is required for installation and servicing only. It is assumed that the MAINT user ID will be performing all servicing.

If continuing with the next phase, you do not have to disconnect or log off the MAINT machine. Otherwise, disconnect or log off as follows:

```
#CP DISCONNECT
```

Phase 2: Installing RXSQL in VM

Phase 1 prepared the environment for installing DB2 RXSQL in SFS directories. Phase 2 installs DB2 RXSQL in a VM environment. It is not necessary to shut down the DB2 database during this phase.

The INSTFPP EXEC can be used instead of this phase. Refer to the appropriate VM installation guide for information on the INSTFPP EXEC. If you use the INSTFPP EXEC, ensure that you access the MAINT machine's work minidisk as file mode C, and that you access a read/write minidisk as file mode A.

Refer to Figure 12 on page 27 for an overview of the installation process.

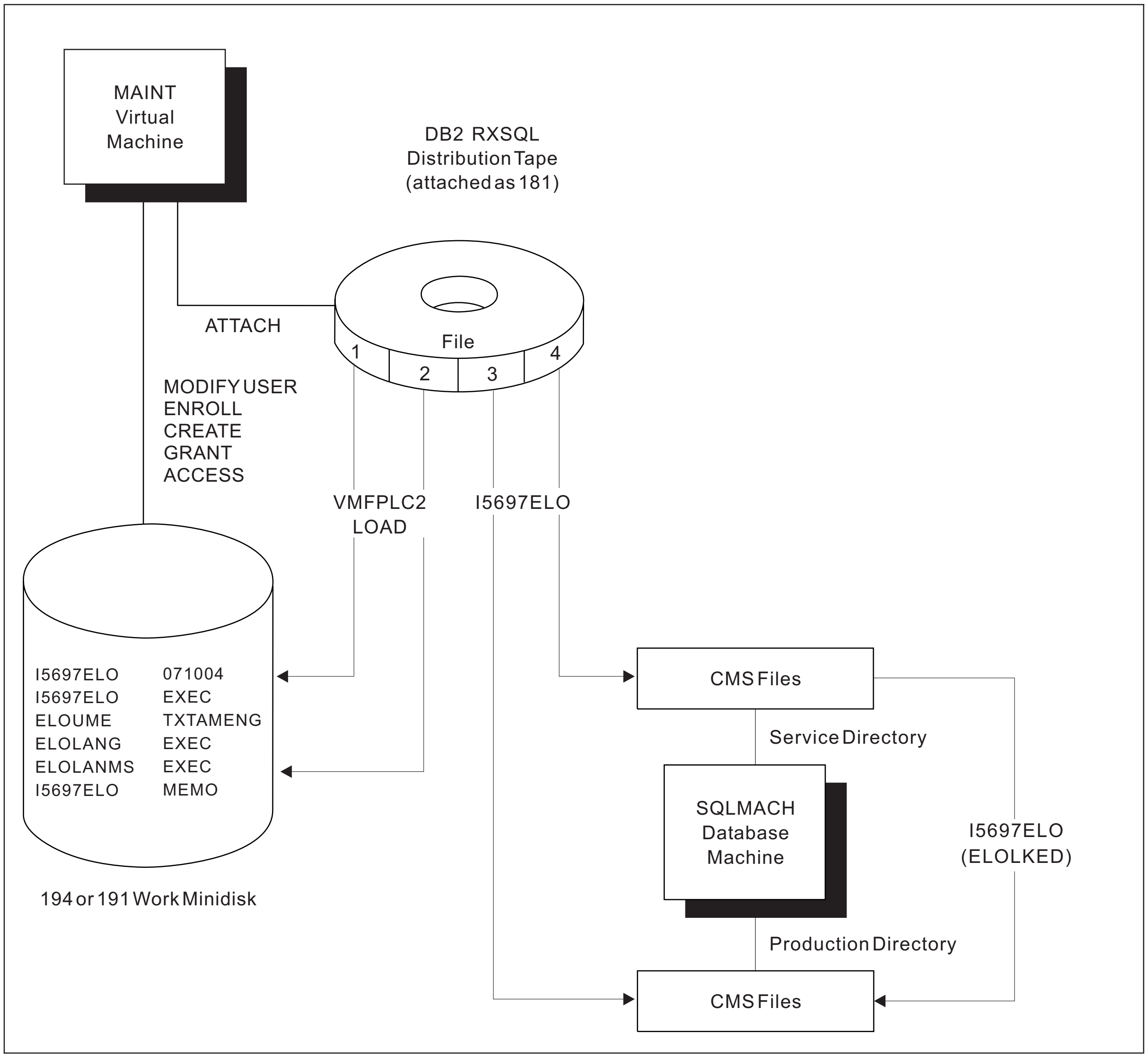


Figure 12. Summary of DB2 RXSQL Installation in VM

Step 2.1 Load the First Two Tape Files to the MAINT Work Minidisk

Use the MAINT machine to load the DB2 RXSQL production and service SFS directories. If continuing from the previous phase, you are already logged on to the MAINT machine.

Access the MAINT machine's work minidisk as file mode A. Type the following statements to load the first two tape files to this minidisk:

- To identify the virtual address (*cuu*) of the MAINT machine's work minidisk, type the following:

  ```
  ACCESS cuu A
  ```

  The *cuu* is usually specified as 194 or 191.
- To identify the virtual device address (*rdev*) of the tape device to be accessed as virtual tape address 181, type the following:

  ```
  ATTACH rdev TO MAINT AS 181
  ```

  The distribution tape must be mounted on the device defined as virtual address 181.
- To rewind the tape, type the following command:

  ```
  VMFPLC2 REW
  ```
- To load tape files 1 and 2 from the distribution tape to the MAINT machine's A disk or work minidisk, type the following:

  ```
  VMFPLC2 LOAD * * A (EOF 2
  ```
  - Tape file 1 contains the I5697ELO EXEC, which will load the remaining DB2 RXSQL distribution tape.
  - Tape file 2 contains a *Memo to Users*. To print the *Memo to Users*, type the CMS PRINT command:

    ```
    PRINT I5697ELO MEMO A (CC
    ```

Step 2.2 Load the RXSQL SFS Directories

The I5697ELO EXEC loads the DB2 RXSQL production and service SFS directories. This step also links text files into a load library and a load module on the DB2 RXSQL production SFS directory.

The I5697ELO EXEC

Before you run this EXEC, verify that:

1. The SFS directory in which you plan to install the RXSQL production files exists. The default is VMSYS:SQLMACH.RXSQL.PRODUCTION if you are not installing on the DB2 Server for VM production SFS directory.
2. The SFS directory on which you plan to install the RXSQL service files exists. The default is VMSYS:SQLMACH.RXSQL.SERVICE if you are not installing on the DB2 Server for VM service SFS directory.
3. There are enough free file modes to access the DB2 RXSQL and DB2 Server for VM SFS directories. If you are installing DB2 RXSQL on the DB2 Server for VM SFS directories, two free file modes are required. Otherwise, four free file modes are required for installing DB2 RXSQL.
4. There are two free virtual device addresses to link the DB2 Server for VM minidisks if DB2 was installed on minidisks. The free virtual device addresses must be between 001 and 499. If DB2 was installed in SFS directories, you do not require any free addresses.
5. The user ID running the DB2 RXSQL installation has access to the files shown in Figure 13 on page 29.

File Name	Location	DB2 Server for VM Components
DMSCSL	VM/ESA system minidisk.	Bootstrap for the callable services library.
ARIRVSTC	SQLMACH 195 minidisk or VMSYS:SQLMACH.SQL.PRODUCTION.	Bootstrap for the DB2 Server for VM system
ARIUXDT	SQLMACH 193 minidisk or VMSYS:SQLMACH.SQL.SERVICE SFS directory.	Date routine
ARIUXTM	SQLMACH 193 minidisk or VMSYS:SQLMACH.SQL.SERVICE SFS directory.	Time routine

Figure 13. VM and DB2 Server for VM Text Files

Running the I5697ELO EXEC

| To run the I5697ELO EXEC, type:

```
I5697ELO
```

| The I5697ELO EXEC usually takes approximately 5 minutes to run, depending on system capabilities and current load. Refer to “The I5697ELO EXEC” on page 175 for instructions on running this EXEC.

Check the final message returned by the installation EXEC. If it is a return code of 888, the installation is successfully completed. However, to complete this installation, you must continue with “Step 2.3 Grant Read Access to RXSQL Service Files” on page 29.

If the DB2 RXSQL production and service SFS directories were successfully loaded, but the DB2 RXSQL system link-edit was not completed successfully, run the ELOLKED EXEC to complete the system link-edit before performing the next step of the DB2 RXSQL installation procedure. Refer to “The ELOLKED EXEC” on page 182 for information on running the ELOLKED EXEC.

After the installation EXEC is finished, type the CP DETACH command to detach the tape device and rewind the tape:

```
DETACH 181
```

Step 2.3 Grant Read Access to RXSQL Service Files

Type the GRANT command to grant read access to the DB2 RXSQL service files to SQLUSER:

```
GRANT AUTH * * VMSYS:SQLMACH.RXSQL.SERVICE TO SQLUSER (READ
```

Step 2.4 Grant Read Access to RXSQL Production Files

Type the GRANT command to grant read access to the DB2 RXSQL production files to SQLUSER:

```
GRANT AUTH * * VMSYS:SQLMACH.RXSQL.PRODUCTION TO SQLUSER (READ
```

Type the GRANT command to grant read access to the DB2 RXSQL production files to all users:

```
GRANT AUTH * * VMSYS:SQLMACH.RXSQL.PRODUCTION TO PUBLIC (READ
```

Type the GRANT command to grant read access to the DB2 RXSQL production files to individual users:

```
GRANT AUTH * * VMSYS:SQLMACH.RXSQL.PRODUCTION TO userid  (READ
                        .
                        .
```

Log off or disconnect the MAINT machine as follows:

```
#CP DISCONNECT
```

Step 2.5 Start the DB2 Server for VM System in Multiple User Mode

If the database is shut down, log on to the SQLMACH database machine and type the SQLSTART command to start the DB2 Server for VM database:

```
SQLSTART DBNAME(SQLDBA)
```

If you usually specify additional parameters for SQLSTART, you should specify them in addition to the DBNAME parameter shown above.

Type the CP DISCONNECT command to disconnect from the SQLMACH machine:

```
#CP DISCONNECT
```

Step 2.6 Installing a New Date or Time Exit

In this optional step, you can customize the date or time formats by creating a new exit. If exits already exist, they were linked in when the I5697ELO EXEC was run. To create a new date or time exit:

1. Create a date (ARIUXDT TEXT) or time (ARIUXTM TEXT) exit as described in the *DB2 Server for VM System Administration* manual.
2. Use VMSES to store the customized ARIUXDT and ARIUXTM TEXT files.
3. Run the ELOLKED EXEC as described in “The ELOLKED EXEC” on page 182.

You must ensure that your date and time exits match the date and time exits of any application server to which you are connecting.

Phase 3: Installing the RXSQL Package and HELP Tables into DB2 Application Servers

In this phase, you load the DB2 RXSQL package into each application server in which DB2 RXSQL is to be installed. You also create and install the DB2 RXSQL secondary-level HELP tables with the HELP text in each application server in which DB2 RXSQL is to be installed, and give the public select authority on these tables.

Repeat this phase for each application server in which DB2 RXSQL is to be available. You will be using the SQLUSER machine to install DB2 RXSQL into each application server.

An authorization ID called SQLDBA that has DBA authority must exist on the DB2 application server into which you are installing RXSQL.

Step 3.1 Access the DB2 RXSQL and DB2 Disks

Log on to the SQLUSER machine. To install DB2 RXSQL into an application server, you must have read access to the DB2 RXSQL production and service disks and the DB2 production files. The disks that you must access depends on where DB2 RXSQL and the DB2 product are installed, as shown in Figure 14 on page 31:

Disks to Access	DB2 RXSQL Installed in DB2 SFS Directories	DB2 RXSQL Installed in Separate SFS Directories	
		DB2 Product is on Minidisk	DB2 Product is in SFS Directories
DB2 production SFS directory	✓		✓
DB2 service SFS directory	✓		
DB2 RXSQL production SFS directory		✓	✓
DB2 RXSQL service SFS directory		✓	✓
DB2 production minidisk		✓	

Figure 14. Accessing DB2 RXSQL and DB2 Disks When DB2 RXSQL Is in SFS Directories

DB2 RXSQL Was Installed in DB2 SFS Directories: If DB2 RXSQL was installed in DB2 SFS directories, specify the following commands to access the DB2 production and service SFS directories:

- To access the DB2 production SFS directory, which also contains the DB2 RXSQL production files, type:
  ```
  ACCESS VMSYS:SQLMACH.SQL.PRODUCTION Q
  ```
- To access the DB2 service SFS directory, which also contains the DB2 RXSQL service files, type:
  ```
  ACCESS VMSYS:SQLMACH.SQL.SERVICE V
  ```

DB2 RXSQL Was Installed in Separate SFS Directories: If DB2 RXSQL was installed in separate SFS directories, specify the following commands to access the DB2 RXSQL production and service SFS directories and the DB2 production files:

- To access the DB2 RXSQL production SFS directory, type:
  ```
  ACCESS VMSYS:SQLMACH.DB2 RXSQL.PRODUCTION P
  ```
- To access the DB2 RXSQL service SFS directory, type:
  ```
  ACCESS VMSYS:SQLMACH.DB2 RXSQL.SERVICE V
  ```
- You must also type one of the following commands:
  - If DB2 was installed in an SFS directory, type the following to access the DB2 Server for VM production directory:
    ```
    ACCESS VMSYS:SQLMACH.SQL.PRODUCTION Q
    ```
  - If DB2 was installed on minidisks, type the following to link and access the DB2 production minidisk SQLMACH 195:
    ```
    LINK SQLMACH 195 195 RR
    ACCESS 195 Q
    ```

    Note: You do not have to specify the CP LINK command if the DB2 production disk is already linked.

Step 3.2 Install the RXSQL Package and HELP Tables into a DB2 Application Server

To complete this step, you must:

- Know the connect password for the SQLDBA authorization ID.

Note: The dbspace RXSQHELP will be dropped and recreated with the new RXSQL help tables if you are upgrading. The installation exec will acquire the necessary dbspace for the help tables if you are installing this feature for the first time.

To install DB2 RXSQL into a DB2 application server, type the following commands:

- To establish the DB2 application server into which the DB2 RXSQL package will be installed, type:
  ```
  SQLINIT DBNAME(SQLDBA)
  ```
- To load the DB2 RXSQL package into a DB2 application server using the ELOAMOD EXEC, type:
  ```
  ELOAMOD
  ```

  Refer to "The ELOAMOD EXEC" on page 179 for instructions on running this EXEC.
- To install or update DB2 RXSQL HELP tables, type one of the following:
  ```
  ELOHLPLD
  ```
  or
  ```
  ELOSHLP LANG(S001)
  ```

  The ELOHLPLD EXEC installs DB2 RXSQL secondary-level HELP tables into a DB2 application server. Refer to "The ELOHLPLD EXEC" on page 181 for instructions on running this EXEC.

  The ELOSHLP EXEC replaces the AMENG HELP text for releases of DB2 RXSQL Version 3 with the AMENG HELP text for DB2 RXSQL Version 7 Release 1. Refer to "The ELOSHLP EXEC" on page 184 for instructions on running this EXEC.

Step 3.3 Verify the RXSQL Installation

For information about verifying the DB2 RXSQL installation, refer to "Installation Verification" on page 33. Log off the SQLUSER machine. Installation of DB2 RXSQL is now completed.

Phase 4: Installing the RXSQL Package into Non-DB2 Application Servers Using the DRDA Protocol

In this phase, you load the DB2 RXSQL package into each non-DB2 Server for VM application server in which DB2 RXSQL is to be installed. This phase must be repeated for each application server in which DB2 RXSQL is to be available.

For this phase, your DB2 installation must have the ability to use the DRDA protocol and you must have DBA authority.

Before you can load the DB2 RXSQL package into a non-DB2 Server for VM application server, ensure that the DBS Utility package has been installed on the application server, and that you can run DBS Utility jobs from the SQLUSER machine using the DRDA protocol.

Step 4.1 Access the DB2 RXSQL and DB2 Disks

Log on to the SQLUSER machine and access the appropriate DB2 RXSQL and DB2 disks as described in "Step 3.1 Access the DB2 RXSQL and DB2 Disks" on page 30.

Step 4.2 Install DB2 RXSQL into the Non-DB2 Server for VM Application Server

To install DB2 RXSQL in the non-DB2 Server for VM application server, type the following commands:

- To establish the non-DB2 application server into which the DB2 RXSQL package will be installed using the DRDA protocol, type:
  ```
  SQLINIT DBNAME(server_name) PROTOCOL(DRDA)
  ```
- To load the DB2 RXSQL package into the non-DB2 application server, type:
  ```
  ELOAMOD
  ```
  Refer to "The ELOAMOD EXEC" on page 179 for instructions on running this EXEC.

  Note: HELP table installation is not supported in non-DB2 Server for VM application servers.

Step 4.3 Verify the RXSQL Installation

For information about verifying the DB2 RXSQL installation, refer to "Installation Verification" on page 33. Log off the SQLUSER machine.

Installation Verification

This procedure verifies the installation of RXSQL by testing some of its functions. With it, you can check the sample programs and EXECs supplied by RXSQL.

The installation verification procedure is designed to test whether or not RXSQL was installed correctly into a DB2 application server. If you are verifying RXSQL installation into a non-DB2 Server for VM application server, you may have to modify the sample EXECs provided, or execute equivalent statements. You should verify that:

- The correct level of RXSQL is installed
- The RXSQL package was loaded correctly by checking the system *catalog*
- You can use DB2 RXSQL statements to create objects and manipulate data
- You can create a package, prepare statements into the package, and execute the statements in the package.

To perform this procedure, type the commands shown in lowercase as instructed. Compare the output from your command with the output shown in the figures immediately following the command. If the output is not similar, a problem may exist.

The installation verification procedure is as follows:

1. To load the DB2 RXSQL message repository, type:
   ```
   set language (add elo user
   ```
   ```
   Ready;
   ```
2. To check the DB2 RXSQL release level, type:
   ```
   rxsqlvl
   ```

```
ELO2102I *** DB2 RXSQL Version 7 Release 1 Modification 0 ***
Ready;
```

3. To create the RXEMP table and view and to load data into the table, type:

   ```
   empcre
   ```

   The EMPCRE program requires that your *userid* (SQLUSER) can create the table and load data into it. If you are verifying installation into an DB2 Server for VM application server, you must have a *private dbspace*.

```
Ready;
```

4. To verify that the table was created correctly, type:

   ```
   rxselect * from rxemp
   ```

   The following output is displayed in the temporary file S$Q$L S$T$M$T.

```
SELECT * FROM RXEMP
EMPNO  FIRSTNME MIDINIT LASTNAME WORKDEPT PHONENO   HIREDATE JOB      EDLEVEL SEX
------ -------- ------- -------- -------- ------- ---------- -------- ------- ---
002130 GARY     M       SAMS     B12      5643    1969-10-01 MANAGER       17 M
002300 JANET    L       HEDGLEY  B09      2345    1972-12-15 ANALYST       16 F
001010 RON      A       LOWRY    D14      2313    1978-01-15 ANALYST       20 M
000990 RANDY    M       SCHENKER A07      1430    1983-03-22 OPERATOR      15 M
002020 TERRY    A       RAINEY   D11      3243    1989-09-05 DESIGNER      20 M
001840 PAUL     P       CORDON   B09      7070    1985-07-21 FILEREP       18 M
002330 LES      H       FABER    A10      2119    1977-03-18 CLERK         14 M
009236 HEATHER  B       DOBSON   D08      3467    1979-04-03 WRITER        16 F
002574 JAY      Q       MERCIER  A11      2946    1991-05-06 WRITER        15 M
003567 DICK     E       SCHMIDT  C04      3847    1972-11-17 CLERK         14 M
002419 HARRY    P       ATWALA   A07      9127    1980-10-28 OPERATOR      16 M
003326 MARY     K       GOODBAR  B09      3943    1974-07-13 MANAGER       18 F
003589 STEVE    S       GOULD    D07      3565    1976-06-12 WRITER        17 M
ELO2121I ******** End-of-Data **********
```

In XEDIT, *scroll* to the right to view the remainder of the table.

```
 BIRTHDATE   SALARY  BONUS    COMM
---------- -------- ------ -------
1956-11-21 41700.00 900.00 4130.00
1963-06-01 37900.00 800.00 3178.00
1959-09-17 38240.00 600.00 3000.00
1960-12-17 30190.00 700.00 2660.00
1967-09-13 32560.00 500.00 2408.00
1965-03-05 28090.00 600.00 3090.00
1952-02-25 27800.00 400.00 1777.00
1964-05-31 37600.00 800.00 2900.00
1971-09-22 33400.00 600.00 2650.00
1960-12-03 25790.00 500.00 2540.00
1962-10-30 37940.00 800.00 3105.00
1959-02-25 40360.00 900.00 3980.00
1956-04-25 39250.00 350.00 3050.00
```

5. To verify that the view was created correctly, type:

   ```
   rxselect * from empview
   ```

The following output is displayed in the temporary file S$Q$L S$T$M$T.

```
SELECT * FROM EMPVIEW
EMPNO  FIRSTNME MIDINIT LASTNAME JOB      EDLEVEL   SALARY
------ -------- ------- -------- -------- ------- --------
002130 GARY     M       SAMS     MANAGER       17 41700.00
002300 JANET    L       HEDGLEY  ANALYST       16 37900.00
001010 RON      A       LOWRY    ANALYST       20 38240.00
000990 RANDY    M       SCHENKER OPERATOR      15 30190.00
002020 TERRY    A       RAINEY   DESIGNER      20 32560.00
001840 PAUL     P       CORDON   FILEREP       18 28090.00
002330 LES      H       FABER    CLERK         14 27800.00
009236 HEATHER  B       DOBSON   WRITER        16 37600.00
002574 JAY      Q       MERCIER  WRITER        15 33400.00
003567 DICK     E       SCHMIDT  CLERK         14 25790.00
002419 HARRY    P       ATWALA   OPERATOR      16 37940.00
003326 MARY     K       GOODBAR  MANAGER       18 40360.00
003589 STEVE    S       GOULD    WRITER        17 39250.00
ELO2121I ******** End-of-Data **********
```

6. To select *rows* from the table using dynamic statements, type:
   ```
   empsel
   ```

```
Employee: 002300      JANET L HEDGLEY
Job:ANALYST     Education:16     Salary:37900.00

Ready; T=0.25/0.44 10:00:47
```

7. To create a package for selecting data from the table:
   a. Type the following:
      ```
      empprp
      ```

```
Ready;
```

   b. To set the case to upper for RXSELECT EXEC, type the following:
      ```
      rxcase upper
      ```

```
Ready;
```

   c. If verifying RXSQL installation into an DB2 Server for VM application server, type the following to check that the package was created:
      ```
      rxselect * from system.sysprogauth where progname = 'empprog'
      ```

      Output similar to the following is displayed in the temporary file S$Q$L S$T$M$T.

```
SELECT * FROM SYSTEM.SYSPROGAUTH WHERE PROGNAME = 'EMPPROG'
GRANTOR  GRANTEE  CREATOR  PROGNAME TIMESTAMP    RUNAUTH
-------- -------- -------- -------- ------------ -------
SQLUSRV3 PUBLIC   SQLUSRV3 EMPPROG  B1AXKZO9IGO8 Y
SQLUSRV3 SQLUSRV3 SQLUSRV3 EMPPROG  B1AXKZN9HGLY G
ELO2121I ******** End-of-Data **********
```

If you are verifying RXSQL installation into a non-DB2 Server for VM application server, type an equivalent select statement to find the package listed in one of the *catalog tables*.

8. To use the package that was created to select data:
   a. Type the following to select an employee:
      ```
      empselx
      ```

```
Employee: 002300      JANET L HEDGLEY
Job:ANALYST     Education:16     Salary:37900.00

Ready; T=0.24/0.42 10:04:47
```

   b. Type the following to change the select statement to obtain a list of analysts earning less than $55,000:
      ```
      empselx analyst 55000
      ```

```
Employee: 002300      JANET L HEDGLEY
Job:ANALYST     Education:16     Salary:37900.00

Employee: 001010      RON A LOWRY
Job:ANALYST     Education:20     Salary:38240.00

Ready; T=0.27/0.46 10:05:02
```

9. To create another package that will update the table:
   a. Type the following:
      ```
      empprpm
      ```

```
Ready;
```

   b. If RXSQL was installed into a DB2 Server for VM application server, type the following to verify that the package was created correctly:
      ```
      rxselect * from system.sysprogauth where progname = 'empupd'
      ```

      Output similar to the following is displayed in the temporary file S$Q$L S$T$M$T.

```
SELECT * FROM SYSTEM.SYSPROGAUTH WHERE PROGNAME = 'EMPUPD'
GRANTOR  GRANTEE  CREATOR  PROGNAME TIMESTAMP    RUNAUTH
-------- -------- -------- -------- ------------ -------
SQLUSRV3 MANAGER  SQLUSRV3 EMPUPD   B1AXLXHR6LQO Y
SQLUSRV3 SQLUSRV3 SQLUSRV3 EMPUPD   B1AXLXGSJ78S G
ELO2121I ******** End-of-Data **********
```

If you are verifying RXSQL installation into a non-DB2 Server for VM application server, type an equivalent select statement to find the package listed in one of the catalog tables.

10. To use the package to insert and update data in the table:
   a. Type the following to modify the table:
      ```
      empupd
      ```

```
Enter command: Insert Set Update COMMit ROLLback or Quit
```

   b. Type the INSERT command:
      ```
      i
      ```

```
Enter Employee number, First name, Middle initial, Last name, Job,
Education level and Salary
 (Empty line to quit)
```

   c. Type the following information to update the table:
      ```
      888 joe e user manager 2 36737
      ```

```
Inserted.
Enter Employee number, First name, Middle initial, Last name, Job,
Education level and Salary
 (Empty line to quit)
```

   d. Press Enter:

```
Enter command: Insert Set Update COMMit ROLLback or Quit
```

   e. Type the SET command:
      ```
      s
      ```

```
Enter Emp#, Last name, SALARY. (Empty line to quit)
```

   f. Type the following to update the table:
      ```
      888 user 45000
      ```

```
1 row(s) updated.
Enter Emp#, Last name, SALARY. (Empty line to quit)
```

g. Press Enter:

```
Enter command: Insert Set Update COMMit ROLLback or Quit
```

h. Type the UPDATE command:

```
u
```

```
Enter percent salary change. (Empty line to quit)
  5 means add 5 percent to all current salaries,
 -4 means subtract 4 percent from all current salaries.
```

i. Type the following to add 3% to all current salaries:

```
3
```

```
14 row(s) updated.
Enter command: Insert Set Update COMMit ROLLback or Quit
```

j. Type the COMMIT command:

```
comm
```

```
Enter command: Insert Set Update COMMit ROLLback or Quit
```

k. Type the QUIT command:

```
q
```

```
Ready;
```

l. Type the following to see the updated table:

```
rxselect * from rxemp
```

The following output is displayed in the temporary file S$Q$L S$T$M$T.

```
SELECT * FROM RXEMP
EMPNO  FIRSTNME MIDINIT LASTNAME WORKDEPT PHONENO   HIREDATE JOB      EDLEVEL SEX
------ -------- ------- -------- -------- ------- ---------- -------- ------- ---
002130 GARY     M       SAMS     B12      5643    1969-10-01 MANAGER       17 M
002300 JANET    L       HEDGLEY  B09      2345    1972-12-15 ANALYST       16 F
001010 RON      A       LOWRY    D14      2313    1978-01-15 ANALYST       20 M
000990 RANDY    M       SCHENKER A07      1430    1983-03-22 OPERATOR      15 M
002020 TERRY    A       RAINEY   D11      3243    1989-09-05 DESIGNER      20 M
001840 PAUL     P       CORDON   B09      7070    1985-07-21 FILEREP       18 M
002330 LES      H       FABER    A10      2119    1977-03-18 CLERK         14 M
009236 HEATHER  B       DOBSON   D08      3467    1979-04-03 WRITER        16 F
002574 JAY      Q       MERCIER  A11      2946    1991-05-06 WRITER        15 M
003567 DICK     E       SCHMIDT  C04      3847    1972-11-17 CLERK         14 M
002419 HARRY    P       ATWALA   A07      9127    1980-10-28 OPERATOR      16 M
003326 MARY     K       GOODBAR  B09      3943    1974-07-13 MANAGER       18 F
003589 STEVE    S       GOULD    D07      3565    1976-06-12 WRITER        17 M
888    JOE      E       USER     ?        ?                ? MANAGER        2 ?
ELO2121I ******** End-of-Data **********
```

In XEDIT, scroll to the right to view the remainder of the table.

```
 BIRTHDATE   SALARY  BONUS    COMM
---------- -------- ------ -------
1956-11-21 42951.00 900.00 4130.00
1963-06-01 39037.00 800.00 3178.00
1959-09-17 39387.20 600.00 3000.00
1960-12-17 31095.70 700.00 2660.00
1967-09-13 33536.80 500.00 2408.00
1965-03-05 28932.70 600.00 3090.00
1952-02-25 28634.00 400.00 1777.00
1964-05-31 38728.00 800.00 2900.00
1971-09-22 34402.00 600.00 2650.00
1960-12-03 26563.70 500.00 2540.00
1962-10-30 39078.20 800.00 3105.00
1959-02-25 41570.80 900.00 3980.00
1956-04-25 40427.50 350.00 3050.00
         ? 46350.00      ?       ?
```

11. To issue an operator command, type:

    ```
    rxsqlop show system
    ```

    The following output is displayed in the temporary file S$Q$L O$P.

    Note: Because operator commands are not supported in the DRDA protocol, omit this step if you are verifying DB2 RXSQL installation into a non-DB2 Server for VM application server.

```
===========================================================
SQLOP SHOW SYSTEM
===========================================================
System state at DATE='03-11-92'  TIME='10:26:17'

POOL     TOTAL    NO. OF      NO. OF      NO. OF     %    NO. OF
NO.      PAGES  PAGES USED  FREE PAGES  RESV PAGES  USED  EXTENTS SOS
   1      1710        303        1407          20    17        2
FREE    252242
Log Status:
          .
          .
          .

Status of DB2 Server for VM agents:
          .
          .
          .

ARI0065I DB2 Server for VM operator command processing is complete.
```

12. To execute an SQL statement:
    a. Type the following:
       ```
       rxsqlex drop table rxemp
       ```

```
RXSQL EXEC DROP TABLE RXEMP
RXSQL COMMIT
Ready;
```

    b. Type the following to verify that the drop is executed correctly:
       ```
       rxselect * from rxemp
       ```

       The following is shown in XEDIT:

```
SELECT * FROM RXEMP
RXSQL PREP SELSTMT SELECT * FROM RXEMP
  Sqlcode: -204
 Sqlstate: 52004
  Sqlerrd.1: -100
  Sqlerrd.4: -7.23700514597311554e75
  Sqlerrp: ARIXOCA
  Sqlerrm: SQLUSRV3.RXEMP
```

13. To display HELP information on -204 *sqlcode*, type:
    ```
    rxsqlhlp -204
    ```

    Note: If you are verifying DB2 RXSQL installation into a non-DB2 Server for VM application server, HELP information is not available. The installation verification procedure is therefore completed.

    The following output is displayed in the temporary file S$Q$L H$E$L$P.

```
===========================================================
DB2 RXSQL HELP '-204'
===========================================================
TOPIC NAME:  ELO0204E / RETURN CODE 204 OR -204

ELO0204E <main_variable> is undefined and the value of
<indicator_variable> was non-negative.

Explanation:  The main variable was undefined, yet the
indicator variable indicated that the main variable would
be set with a value.

System Action:  The DB2 RXSQL request was not executed
successfully. Control is returned to the user's REXX
program.

User Response:  Check that the main variable or the
indicator variable was set correctly or that the main
variable was not inadvertently dropped.  Change your
program and rerun your program.

===========================================================
DB2 Server for VM HELP '-204'
===========================================================
TOPIC NAME: -204
-204       owner.object-name was not found in the system
catalog.

EXPLANATION: .
             .
             .
             .
             .
```

14. To display HELP for RXSQL return code (116), type:

    ```
    rxsqlhlp 116
    ```

    The following output is displayed in the temporary file S$Q$L H$E$L$P.

```
===========================================================
DB2 RXSQL HELP '+116'
===========================================================
TOPIC NAME:  ELO0116E / RETURN CODE 116 OR -116

ELO0116E <name> does not represent a SELECT statement.
<request> request cannot be executed.

Explanation:  The statement name or prepare name specified
in the <request> request does not refer to a prepared or
declared SELECT statement.

System Action:  The DB2 RXSQL request was not executed
successfully. Control is returned to the user's REXX
program.

User Response:  Check your spelling of the statement name
and rerun the program.

===========================================================
DB2 Server for VM HELP '+116'
===========================================================
ELO2112I DB2 Server for VM HELP text is not available for topic '+116'
for language S001.
```

The installation verification procedure is now completed.

Chapter 3. Installing a REXX SQL NLS Language

This chapter is intended for the system programmer responsible for installation and maintenance. It contains information concerning the material and procedures associated with the installation of DB2 REXX SQL NLS Languages. You should read all of this chapter before enabling a DB2 REXX SQL NLS Language.

This chapter will discuss:

- Installation Requirements and Considerations
- Installation Instructions
- Preventive Service Planning and Service Instructions.

Installation Requirements and Considerations

The following sections identify the system requirements for installing and activating DB2 REXX SQL NLS Languages. In most cases, you can install a DB2 REXX SQL NLS Language on a running system (target system). However, some cases may warrant the use of two systems. If two systems are required the following terminology is used:

1. The system used to install the language (driving system)
2. The system on which the language is installed (target system)

Installation Defaults

Before installing a DB2 REXX SQL NLS Language, you must have installed and verified DB2 Server for VM Version 7 Release 1 Modification 0. Therefore, you have created a DB2 Server for VM virtual machine, DB2 Server for VM Production and Service minidisks or SFS directories, and a user virtual machine.

It is also assumed that DB2 REXX SQL has been installed in the manner described in this manual (Chapter 2). Therefore, you have DB2 REXX SQL Production and Service minidisks or SFS directories. As part of the installation you will also have created the DB2 REXX SQL Help tables in your DB2 Server for VM application server. If DB2 Server for VM or DB2 REXX SQL was not installed using defaults, you may need to substitute machine names, virtual addresses, or SFS directory names in order to install a DB2 REXX SQL NLS Language.

The DB2 REXX SQL NLS Language installation described in this chapter is not applicable when using non-DB2 for VM application servers or when using the DRDA protocol.

Driving System Requirements

This section describes the environment required of the driving system to install a DB2 REXX SQL NLS Language.

Programming Requirements

Same requirements as the DB2 REXX SQL feature.

Additional DASD Requirements

The free space required on a work minidisk of the MAINT machine is described in the following table.

Table 1. Storage Requirements - DASD for Driving System

Minidisks	Block Size	Virtual Address	Access Mode	3375 Cyl	3380 Cyl	3390 Cyl	9345 Cyl	FB-512 Blocks
MAINT machine: Work minidisk for installation	4096	194 or 191	A or C	2	1	1	1	800

Target System Requirements

This section describes the environment required of the target system to install and use a DB2 REXX SQL NLS Language.

Programming Requirements

The same operating system environment as DB2 REXX SQL is required to run a DB2 REXX SQL NLS Language. Also before installing a DB2 REXX SQL NLS Language, you must have installed DB2 Server for VM Version 7 Release 1 Modification 0. You will also have installed DB2 REXX SQL prior to enabling a DB2 REXX SQL NLS Language.

Additional DASD Requirements

Before installing a DB2 REXX SQL NLS Language you must provide several minidisks for installation, service, and running. The following table lists the minidisks and the space requirements:

Table 2. DASD Storage Requirements for Target Minidisks

Minidisk Description	Default Address	Storage in Cylinders			Storage in Blocks	
		DASD	CYLS		Type	Blocks
SQLMACH machine: NLS UCENG Minidisk	298	9345 3390 3380 3375	1 1 1 2		FB512	960
SQLMACH machine: NLS UCENG SFS Directory	N/A	N/A	N/A		4K	120

Notes:

1. Select either minidisk or SFS directory values above, depending on where SQLMACH is located.
2. Minidisk 298 is a default address for the Upper Case English NLS Language. Each language has a specified default address. UCENG is used as an example throughout this chapter.
3. If you wish to install multiple languages, then you must create a new NLS minidisk or SFS directory *for each language to be installed*.

Installation Instructions

This section describes the installation method and the step-by-step procedures to install and to activate the functions of a DB2 REXX SQL NLS Language.

Installing a DB2 REXX SQL NLS Language

These instructions are intended to help you install a DB2 REXX SQL NLS Language on VM. It is assumed that you are familiar with the base DB2 REXX SQL installation process, VM commands and execs. Changes to the VM Directory MUST be performed by a user ID such as MAINT, which has VM Directory maintenance privileges. The terminology used in this documentation is synonymous with that used previously in this manual.

The following tasks must be completed before proceeding with the REXX SQL NLS installation process:

- Define an NLS Language minidisk or SFS directory for the DB2 for VM database
- Attach a tape drive with a virtual address of 181 to the VM installer user ID that can be used to read the DB2 REXX SQL distribution tape
- If you are installing on minidisks, obtain the names of the owner, virtual address, and the write password for the DB2 REXX SQL NLS Language minidisk and the DB2 REXX SQL Service minidisk.

  If you are installing on SFS directories obtain the directory name for the DB2 REXX SQL NLS Language SFS directory and the DB2 REXX SQL Service SFS directory.

DB2 REXX SQL NLS Language Installation Overview

The following activities are involved in installing a DB2 REXX SQL NLS Language:

- Defining the DB2 REXX SQL NLS Language minidisk or creating an SFS directory from a VM user ID with VM Directory privileges
- Formatting the NLS Language minidisk
- Running the IBM-supplied ELOINLS EXEC to load the DB2 REXX SQL NLS Language from the distribution tape to the NLS Language minidisk or SFS directory and associated macros and execs to the DB2 REXX SQL Service minidisk or SFS directory
- Verifying the DB2 REXX SQL NLS Language installation.

DB2 REXX SQL NLS Language Installation Steps

Step 1:

Log on to the MAINT user ID

To begin installing the DB2 REXX SQL NLS Language, log on to the MAINT user ID.

Step 2:

Define the new NLS minidisk or create an SFS directory

For minidisks:

Redefine the VM directory for SQLMACH, or its equivalent, to include a minidisk for the NLS Language.

Follow these steps:

1. Obtain a minidisk map and locate a free gap large enough for the new minidisk
2. Assign a new virtual device address to the new minidisk
3. Insert a new MDISK statement for the new minidisk
4. Replace the directory entry
5. Obtain a new minidisk map and check for overlaps
6. Place the VM directory online when satisfied.

Figure 15 on page 46 shows an example of the new MDISK statement based on 3380 DASD.

```
MDISK cuu 3380 cylr 001 volser RR readpw writepw
-------------------------------------------------------------------------
NOTES:
  1. 'cuu' is the virtual device address
  2. 'cylr' is the starting cylinder number
  3. The 'readpw' and 'writepw' cuu must be recorded for later
     use during installation.
```

Figure 15. Example of new MDISK statement

Refer to the *VM/ESA: Planning and Administration* manual, for a complete description of VM/ESA directory control statements.

The rest of the steps assume that the DB2 REXX SQL NLS Language minidisk has an owner of SQLMACH and virtual device address of 298. *The actual virtual device address will be different for each NLS language installed.*

For SFS Directories

Follow the procedure listed to define the DB2 REXX SQL NLS Language SFS directory.

1. Give the SQLMACH SFS directory 120 more blocks in the file pool VMSYS, or equivalent, by typing:
   ```
   MODIFY USER +120 FOR SQLMACH VMSYS:
   ```
2. Enroll users in VMSYS file pool by typing:
   ```
   ENROLL PUBLIC VMSYS:
   ```
   or, enroll specific users,
   ```
   ENROLL USER SQLUSER VMSYS:
   ```
   To enroll more users, substitute the user ID in for SQLUSER, and repeat the above command.
3. Create the SFS directory for a DB2 REXX SQL NLS Language

   Type,
   ```
   CREATE DIR VMSYS:SQLMACH.RXSQL.NLSPROD
   ```
   Note: If you are installing more than one REXX SQL NLS Feature, you may want to use a different directory name to reflect the language that you are installing. The installation exec and this document refer to the directory as REXX SQL.NLSPROD.
4. Grant read access to the DB2 REXX SQL NLS Language SFS directory

   Type:
   ```
   GRANT AUTH VMSYS:SQLMACH.RXSQL.NLSPROD TO PUBLIC (READ
   ```
   or, depending on the command you used to enroll users,
   ```
   GRANT AUTH VMSYS:SQLMACH.RXSQL.NLSPROD TO SQLUSER (READ
   ```
   Repeat the above command with the user ID substituted in for SQLUSER to grant authority to more users.

Refer to the *VM/ESA: CMS File Pool Planning, Administration, and Operation* manual, for a complete description of VM/ESA directory control statements.

For minidisks:

Step 3:

Format the new NLS minidisk

Access the new DB2 REXX SQL NLS Language minidisk and format it by entering the following commands:

```
LINK SQLMACH 298 ncuu WR writepw
FORMAT ncuu fmode (BLKSIZE 4096
```

The first statement links you to the new NLS minidisk in write mode. `ncuu` is any available virtual device address and `writepw` is the disk write password.

The second statement accesses and formats the new NLS minidisk. `fmode` is any available file mode. Any other disk accessed as `fmode` will be released.

For minidisks and SFS directories:

Step 4:

Mount the REXX SQL Distribution tape

Using your current operating procedures, attach a free tape drive to the installer user ID as virtual address 181 and mount the REXX SQL Distribution tape.

The REXX SQL distribution tape contains 12 files separated by tape marks.

Step 5:

Load the installation exec and print the Memo to Users

To load file 1 and file 2 of the REXX SQL distribution tape to your A-disk, enter the following commands:

```
VMFPLC2 REW
VMFPLC2 LOAD * * A (EOF 2
```

The first statement rewinds the distribution tape.

The second statement loads file 1 and file 2 of the distribution tape to the installer's work disk (assumed here to be the A-disk). **Any files on the work disk with the same names as those being loaded from the distribution tape will be overwritten**.

File 1 contains the ELOINLS EXEC that will load the desired DB2 REXX SQL NLS Language from the distribution tape to minidisks or SFS directories

File 2 contains the Memo to Users. To print this file, enter the command:

```
PRINT I5697ELO MEMO A (CC
```

Step 6:

Load Files to the new NLS minidisk or SFS directory and the DB2 REXX SQL Service minidisk or SFS directory

For minidisks:

If you are installing the DB2 REXX SQL NLS Language on minidisks, then you need to know the owners, virtual addresses, and write passwords of the DB2 REXX SQL NLS Language minidisk and the DB2 REXX SQL Service minidisk.

If you defined the DB2 REXX SQL NLS Language minidisk with the default options, the owner is SQLMACH, and the virtual address is 298 (for UCENG). The default password in the ELOINLS EXEC is WSQL; however, this is probably different from the password you assigned when you defined the disk.

If DB2 REXX SQL was installed with the default options, the DB2 REXX SQL Service minidisk owner is SQLMACH, the virtual address is 199, and the write password is WSQL.

For SFS Directories:

If you are installing a DB2 REXX SQL NLS Language on SFS directories, then you need to know the file pool ID, the directory owner, and the directory name for both the REXX SQL NLS directory and the DB2 RXSQL Service directory.

The ELOINLS EXEC default for the DB2 REXX SQL NLS Language directory is VMSYS:SQLMACH.RXSQL.NLSPROD, and the default for the DB2 REXX SQL Service directory is VMSYS:SQLMACH.RXSQL.SERVICE.

You may want to use the Language id for the DB2 REXX SQL NLS Language directory name, especially if you are planning on installing more than one language. As an example the Language ID for Upper Case English is ECENG.

For both minidisks and SFS directories:

You must change the current language by typing:

```
SET LANGUAGE langid
```

NOTE: **langid** can be UCENG for Upper Case English, FRANC for French, HANZI for Simplified Chinese, or KANJI for Japanese.

To invoke the ELOINLS EXEC, type:

```
ELOINLS
```

You can expect the ELOINLS EXEC to take approximately 5 minutes to complete. Processing time will vary depending on current system load and time spent responding to prompts.

The first prompt asks you if you want to install DB2 REXX SQL NLS Help files for Version 7 Release 1 Modification 0.

The default is No. Press enter to execute the default.

To continue, type the following and press ENTER:

```
        1
```

The next prompt asks you which DB2 REXX SQL NLS Help Language you wish to install.

There is no default available for this prompt.

To continue, type the following and press ENTER:

```
1         to install Upper Case English
2         to install French
3         to install Simplified Chinese
4         to install Japanese
QUIT      to exit at this point in the installation.
```

If you are on a VM/ESA installation the exec issues a prompt asking if DB2 REXX SQL is installed on minidisks or in SFS directories.

To continue, type one of the following, and press ENTER:

```
M        for minidisk
S        for SFS directory
111      to stop the installation process.
```

The exec then displays the defaults for the REXX SQL NLS minidisk, or SFS directory.

You are asked if you want the defaults. Type one of the following responses and press ENTER:

```
1        to accept the defaults and proceed
0        to specify different values
111      to stop the installation process.
```

If you typed 0 and pressed ENTER, you will be asked to specify, in order, a new:

1. Owner (minidisk) or file pool ID (SFS directory)
2. Virtual address (minidisk) or directory owner (SFS directory)
3. Write password (minidisk) or directory name (SFS directory)

The new values are listed for your verification. Type one of the following responses, and press ENTER.

```
1        to accept the new values and proceed
0        to specify different values
111      to stop the installation process.
```

The ELOINLS EXEC then displays the defaults for the DB2 REXX SQL Service minidisk or SFS directory.

You are asked if you want the defaults. Type one of the following responses, and press ENTER.

```
1        to accept the defaults and proceed
0        to specify different values
111      to stop the installation process.
```

If you typed 0 and pressed ENTER, you will be asked to specify , in order, a new:

1. Owner (minidisk) or file pool ID (SFS directory)
2. Virtual address (minidisk) or directory owner (SFS directory)
3. Write password (minidisk) or directory name (SFS directory)

The new values are listed for your verification. Type one of the following responses, and press ENTER.

```
1        to accept the new values and proceed
0        to specify different values
111      to stop the installation process.
```

A message with a return code of 888 displays when processing has finished. The REXX SQL NLS tape is positioned at the tape mark following the end of the last file on the tape (file 12).

For SFS directories

Step 7:

Grant read access to the REXX SQL NLS Language files

Type:

```
GRANT AUTH * * VMSYS:SQLMACH.RXSQL.NLSPROD TO PUBLIC (READ
```

or, depending on the command you used to enroll users,

```
GRANT AUTH * * VMSYS:SQLMACH.RXSQL.NLSPROD TO SQLUSER (READ
```

Repeat the above command with the user ID substituted in for SQLUSER to grant authority to more users.

For both minidisks and SFS directories:

Step 8:

Log off the MAINT user ID

Log off the MAINT user ID if installation will be continued from another machine.

Step 9:

Log on to the installer user ID

To continue with the DB2 REXX SQL NLS Language installation process, you should log on to the user ID that will be performing the installation into the database.

Step 10:

Install or refresh the DB2 REXX SQL NLS Language Help Text for each database

Note: If a previous release of the REXX SQL NLS Language is currently installed, then you refresh the Language Help text by applying service to it instead of installing it. There are different steps to follow depending on whether you are installing or refreshing. If you are installing, follow the instructions in **Step 10a**. If you are refreshing, follow the instructions in **Step 10b**.

To complete this step you must:
- Know the connect password for SQLDBA
- Know the language key of the Language. (S002 is the language key for Upper Case English, S003 for French, D001 for Japanese, and D003 for Simplified Chinese)
- Have previously installed the American English Help Text.

For minidisks:

Type the following statements, and press enter after each line.

```
LINK SQLMACH 195 195 RR
ACCESS 195 Q
LINK SQLMACH 199 199 RR
ACCESS 199 V
LINK SQLMACH 298 298 RR
ACCESS 298 N
```

This links and accesses you to the DB2 Server for VM Production minidisk, the DB2 REXX SQL Service minidisk and the DB2 REXX SQL NLS

Language minidisk. These statements may vary slightly if DB2 Server for VM, DB2 REXX SQL, or the DB2 REXX SQL NLS Language were not installed using the defaults.

For SFS directories

Type the following statements, and press enter after each line.

```
ACCESS VMSYS:SQLMACH.SQL.PRODUCTION  Q
ACCESS VMSYS:SQLMACH.RXSQL.SERVICE  V
ACCESS VMSYS:SQLMACH.RXSQL.NLSPROD  N
```

This gives you access to the DB2 for VM Production SFS directory, the DB2 REXX SQL Service SFS directory and the DB2 REXX SQL NLS Language SFS directory. These statements may vary slightly if DB2 for VM, DB2 REXX SQL, or the DB2 REXX SQL NLS Language were not installed using the defaults.

For both minidisks and SFS directories:

Enter the following statements *for each database* in which you intend to install or refresh the DB2 REXX SQL NLS Language Help text:

```
SQLINIT DBNAME(dbname)
```

This statement initializes the user to the DB2 for VM database in which the NLS Language Help Text will be installed or refreshed. Replace `dbname` with the name of your database.

After you run the SQLINIT EXEC, you must either install the DB2 REXX SQL NLS Language or apply service to the existing installed NLS Language Help text.

Step 10a:

Install the DB2 REXX SQL NLS Language

Invoke the ELOHNLS EXEC that performs this task for you by:
- Issuing a connect to the database as authorization ID SQLDBA
- Inserting a row containing information about the language being installed into the SQLDBA.ELOLANGUAGE table
- Loading the SQLDBA.ELOTEXT2 with text from file ELO2S002 MACRO, or ELO2S003 MACRO, or ELO2D001 MACRO, or ELO2D003 MACRO. Depending on which language you are enabling at the time.

To invoke the ELOHNLS EXEC type:

```
ELOHNLS <LANGkey (langkey)> <CONnect(SQLDBA/password)>
```

Text that is in the < > symbols is optional. You will be prompted for both the `langkey` and the connect `SQLDBA/password` if you invoke ELOHNLS without these options.

A message “*NLS Help text installed successfully in help tables*”. displays when the NLS Help Text is successfully loaded in the Help tables.

IF THE ELOHNLS EXEC FAILS:

An error message will identify the problem. If the error occurred during DBSU processing, check the console listing for more details. Correct the error, and rerun the ELOHNLS EXEC.

When this EXEC runs successfully the Language Help text is installed. Verify the Language Help text by following the instructions in **Step 11**.

Step 10b:

Apply service to the existing NLS Language Help Text

Invoke the ELOSHLP EXEC which applies service for you.

To invoke the ELOSHLP EXEC issue the following command:

```
EXEC ELOSHLP <LANGkey(langkey)> <CONnect(SQLDBA/password)>
```

A complete description of this exec is in Chapter 4 of this manual.

When this exec has successfully serviced the Language Help text, verify the Language Help text by following the instructions in **Step 11**.

See ″Changing the Default Help Text Language″ later in this chapter if you want to make the language you just installed or refreshed the default Help Text language.

Step 11:

Verify the installation

To complete the verification you must have a private dbspace available.

For minidisks

To verify that the installation of the DB2 REXX SQL NLS Language was successful, enter the following commands:

```
LINK SQLMACH 198 198 RR rsql
ACCESS 198 P
```

These statements link and access the DB2 REXX SQL Production minidisk SQLMACH 198 in read mode. `rsql` is the read password. The DB2 REXX SQL Production minidisk is accessed in file mode P. The DB2 REXX SQL NLS Language minidisk is still accessed with the file mode of N. The DB2 REXX SQL NLS Language minidisk must be accessed before the DB2 REXX SQL Production minidisk and before any other DB2 REXX SQL NLS minidisks.

For SFS directories:

To verify that the installation of the DB2 REXX SQL NLS Language was successful, enter the following commands:

```
ACCESS VMSYS:SQLMACH.RXSQL.PRODUCTION  P
```

This statement accesses the DB2 REXX SQL Production SFS directory in file mode P. The DB2 REXX SQL NLS Language SFS directory is still accessed with a file mode of N. The DB2 REXX SQL NLS Language SFS directory must be accessed before the DB2 REXX SQL Production SFS directory and before any other DB2 REXX SQL NLS SFS directory.

For both minidisks and SFS directories:

To continue with the verification, issue the following CMS command:

```
SET LANGUAGE langid (ADD ELO USER
```

The SET LANGUAGE command changes the current language of your CMS session and forces CMS to pick up the DB2 REXX SQL NLS

Language Message repository for REXX SQL. Remember, as an example, the **langid** for Upper Case English is **UCENG**.

To complete your verification type:

```
EMPCRE
```

This exec creates the RXEMP table and view, and loads data into the table. If you get an error when you run this exec, make sure that the RXEMP does not already exist in your database space, and make sure that you have the resource authority needed to create a table. If you are still encountering problems, refer to "Installation Verification" on page 33 for more information.

Now type:

```
RXSELECT * FROM RXEMP
```

Is the message text for number ELO2121I translated?

To continue the verification, exit from editing the file, and type:

```
HELP RXSQL RXSELECT
```

Is the Help Panel displayed in the Language you just enabled?

Now, exit from HELP, and type:

```
RXSQLANG RX(langid)
```

This will ensure that the HELP information displayed by DB2 REXX SQL will be in the Language you just enables. Refer to "RXSQLANG EXEC" on page 71 for more information about the REXX SQLANG EXEC.

To finish your verification type:

```
RXSQLHLP +116
```

Is the first section of the file displayed in the Language you just enabled?

Exit from the file you are editing.

If you answered **Yes** to all of the above questions, then you have successfully installed the DB2 REXX SQL NLS Language.

If you did not answer **Yes** to all of the above questions, verify that the NLS Language minidisk or SFS directory is accessed before the DB2 REXX SQL Production minidisk. If it is not, then reaccess it so that it is. Next, make sure that the CMS command "SET LANGUAGE **langid** (ADD ELO USER" was issued successfully. If you still encounter untranslated text that is supposed to appear in the DB2 REXX SQL NLS Language, then run the ELODNLS EXEC to delete the Language CMS HELP and any help text that may have been installed in the database, return to Step 6, and repeat the installation from that point.

For more information about running the ELODNLS EXEC refer to Appendix C in this manual.

Step 12:
Log Off the Installer User ID

You are finished installing the DB2 REXX SQL NLS Language.

Changing the Default Help Text Language

If you wish to make the language you just installed the default Help Text language for all users connecting to the database, then issue the following commands:

```
SQLINIT DBNAME(dbname)
```

Replace `dbname` with the name of your database.

```
ISQL
CONNECT SQLDBA IDENTIFIED BY password
SELECT * FROM SQLDBA.ELOOPTIONS
UPDATE SQLDBA.ELOOPTIONS SET VALUE = 'langkey' WHERE
RXSQLOPTION = 'DEFAULT LANGUAGE'
COMMIT WORK
EXIT
```

`password` is the password assigned to SQLDBA.

Activating DB2 REXX SQL NLS Language

The steps for activating the functions of the DB2 REXX SQL NLS Language are summarized below:

Once the installation of the DB2 REXX SQL NLS Language is complete, each user must do the following:

- Access the DB2 REXX SQL NLS Language minidisk or SFS directory
- Access the DB2 REXX SQL Production minidisk or SFS directory
- Issue the CMS command "SET LANGUAGE langid (ADD ELO USER" so that the CMS Message Repository for DB2 REXX SQL NLS Language will be accessed.
- Execute the RXSQLANG EXEC if appropriate

Notes:

1. The DB2 REXX SQL NLS Language minidisk or SFS directory must be accessed before the DB2 REXX SQL Production minidisk or SFS directory, and before any other DB2 REXX SQL NLS minidisk or SFS directory. This must be done to view the DB2 REXX SQL error messages and CMS Help text in the desired Language.
2. To switch between the current NLS Language and any other NLS language, you must change the order in which the NLS minidisks or SFS directories are accessed and issue the ″SET LANGUAGE″ command for the other NLS language. To return to the default language (American English), access the DB2 REXX SQL Production minidisk or SFS directory before any of the other NLS minidisks or SFS directories, and issue the ″SET LANGUAGE AMENG″ command.
3. You may want to execute the RXSQLANG EXEC to see Help information in the desired NLS Language. "RXSQLANG EXEC" on page 71 contains a complete description of this exec.

Preventive Service Planning and Service Instructions

There will be no preventive service for a DB2 REXX SQL NLS Language; however corrective service will be available.

If the file ELO2S002, ELO2S003, ELO2D001, and/or ELOSD003 MACRO is serviced, then you must invoke the Help Text service exec, ELOSHLP, for each database in which the DB2 REXX SQL NLS Language Help Text is installed.

To invoke the ELOSHLP EXEC issue the following command:

```
EXEC ELOSHLP <LANGkey(langkey)> <CONnect(SQLDBA/password)>
```

A complete description of this exec can be found in Chapter 4 of this manual.

Further details regarding Service can be found in Chapter 4 of this manual.

Chapter 4. Installing Preventive and Corrective Service

This chapter provides instructions for installing preventive service and corrective service for DB2 RXSQL. It also contains instructions for reloading packages and HELP text.

Preventive service, the most common form of service, is shipped on a VM-PUT tape. If you receive a VM-PUT tape that contains DB2 RXSQL preventive service, "Installing Preventive Service" on page 57.

Corrective service is provided only in special situations. If you receive an DB2 RXSQL corrective service tape, instructions for its use are available from your IBM Support Center. Refer to "Installing Corrective Service" on page 58 for specific instructions.

If DB2 RXSQL requires service, the MAINT machine, or its equivalent, must have read/write access to a minidisk with free space equivalent to at least 5 cylinders of an IBM 3380 storage device. Figure 16 on page 57 shows the minimum free space required for the work minidisk when the block size is 4096 bytes.

Minidisk	Virtual Address	Access Mode	3350 Cylinders	3375 Cylinders	3380 Cylinders	3390 Cylinders	9345 Cylinders	FB-512 Blocks
MAINT machine: Work minidisk for service	194 or 191	A or C	7	8	5	4	5	6000

Figure 16. Database Tables Used for DB2 RXSQL HELP Text

Installing Preventive Service

To apply DB2 RXSQL preventive service from a VM-PUT tape, use the VM VMSERV EXEC and the DB2 RXSQL preventive service EXEC. The name of the preventive service EXEC is listed in the Program Service section of the Program Directory. The DB2 RXSQL files on a VM-PUT tape are described in the VM-PUT document that comes with the tape.

To install preventive service, you must do the following:

1. Review the DB2 RXSQL service *Memo to Users* carefully before using the VMSERV EXEC and the DB2 RXSQL preventive service EXEC to apply service.
2. Load service for DB2 RXSQL from the VM-PUT tape. The service is loaded to the DB2 RXSQL service disk, and the DB2 RXSQL production disk.

   If you installed DB2 RXSQL on DB2 Server for VM disks, the defaults are:
   Production minidisk = SQLMACH 195
   Service minidisk = SQLMACH 193
   Production SFS directory = VMSYS:SQLMACH.SQL.PRODUCTION
   Service SFS directory = VMSYS:SQLMACH.SQL.SERVICE.

   If you installed DB2 RXSQL on separate disks, the defaults are:
   Production minidisk = SQLMACH 198

Service minidisk = SQLMACH 199
Production SFS directory = VMSYS:SQLMACH.RXSQL.PRODUCTION
Service SFS directory = VMSYS:SQLMACH.RXSQL.SERVICE.

3. If instructed by the preventive service EXEC, reload the DB2 RXSQL package into each application server in which DB2 RXSQL was installed. For information on reloading the DB2 RXSQL package, refer to "The ELOAMOD EXEC" on page 179.
4. If instructed by the preventive service EXEC, reinstall the HELP text in each application server in which DB2 RXSQL was installed. Follow the instructions in "Reloading HELP Text" on page 62.

The DB2 RXSQL preventive service EXEC performs the following functions:

- Loads all CMS files from DB2 RXSQL tape file 3 on the VM-PUT tape to a work disk.
- Updates the appropriate DB2 RXSQL production and service files.
- Determines if a link-edit is necessary. If it is, the preventive service EXEC calls the ELOLKED EXEC. For information on the prerequisites for running the ELOLKED EXEC, refer to "The ELOLKED EXEC" on page 182.

After installing preventive service, you should verify that DB2 RXSQL is correctly installed by following the procedure outlined in "Installation Verification" on page 33.

Installing Corrective Service

If you receive a corrective service tape, you also receive instructions for its use from your IBM Support Center. You must follow these instructions to copy the contents of the tape to the MAINT machine's A-disk, and then use the ELOSCOR EXEC to install the corrective service.

Step 1 Load the Service Files to the MAINT Work Minidisk

You will be using the MAINT machine to apply corrective service. Access the MAINT work minidisk as file mode A. Type the following statements to load the service files supplied by IBM to this minidisk:

- To identify the virtual device address (cuu) of the MAINT work minidisk, type:
  ```
  ACCESS cuu A
  ```
  The *cuu* is normally specified as 194 or 191.
- To identify the real device number of the tape device to be accessed as virtual tape address 181, type:
  ```
  ATTACH rdev TO MAINT AS 181
  ```
  The distribution tape must be mounted on the device defined as virtual address 181.
- To rewind the tape, type:
  ```
  VMFPLC2 REW
  ```
- To load tape file 1 from the corrective service tape to the MAINT work minidisk, type:
  ```
  VMFPLC2 LOAD * * A (EOF 1
  ```

Step 2 Rename the Corrective Service Files

Before proceeding and as instructed by your IBM Support Center, you must rename the *file types* of the corrective service files that you just loaded from the tape.

Step 3 Apply Corrective Service to DB2 RXSQL Using the ELOSCOR EXEC

You are now ready to use the ELOSCOR EXEC to install corrective service. This EXEC is supplied with DB2 RXSQL and resides on the service disk. It applies the service based on the contents of the corrective service tape. It does not use service files for other IBM products. These extra files remain on the MAINT work minidisk.

The ELOSCOR EXEC also determines whether or not a link-edit is necessary. If it is, the ELOSCOR EXEC calls the ELOLKED EXEC. For information on the prerequisites for running the ELOLKED EXEC, refer to "The ELOLKED EXEC" on page 182.

If the package has been serviced, the ELOSCOR EXEC issues a message indicating that the DB2 RXSQL package must be reloaded. You must reload this package into each application server on which DB2 RXSQL was installed. Follow the instructions in "Reloading the DB2 RXSQL Package" on page 62.

If the HELP text has been serviced, the ELOSCOR EXEC issues a message indicating that the HELP text must be reinstalled. You must reinstall this HELP text in each application server in which DB2 RXSQL was installed. Follow the instructions in "Reloading HELP Text" on page 62.

Step 3.1 Access the Appropriate Disks

To apply service to DB2 RXSQL, you must have write access to the DB2 RXSQL production and service disks and read access to the DB2 production and service disks. The procedure you must follow to access the appropriate disks depends on whether DB2 RXSQL is installed on minidisks or in SFS directories. The procedure to follow in each case is described in the following sections.

Accessing DB2 RXSQL and DB2 Disks When DB2 RXSQL Installed on Minidisks

If DB2 RXSQL is installed on minidisks, the disks that you must access before applying corrective service depends on whether or not DB2 RXSQL was installed on the same disks as DB2, as shown in Figure 17 on page 60.

Disks to Access	DB2 RXSQL Installed on DB2 Minidisks	DB2 RXSQL Installed on Separate Minidisks	
		DB2 Product is on Minidisk	**DB2 Product is in SFS Directories**
DB2 production minidisk	X	X	
DB2 service minidisk	X	X	
DB2 RXSQL production minidisk		X	X
DB2 RXSQL service minidisk		X	X
DB2 production SFS directory			X
DB2 service SFS directory			X

Figure 17. Accessing DB2 RXSQL and DB2 Disks To Apply Corrective Service

DB2 RXSQL Was Installed on DB2 Minidisks: If DB2 RXSQL was installed on DB2 minidisks, specify the following commands to link and access the DB2 production and service minidisks:

- To link and access the DB2 production minidisk, SQLMACH 195, which also contains the DB2 RXSQL production files, type:

  ```
  LINK SQLMACH 195 195 W writepw
  ACCESS 195 P
  ```

- To link and access the DB2 service minidisk, SQLMACH 193, which also contains the DB2 RXSQL service files, type:

  ```
  LINK SQLMACH 193 193 W writepw
  ACCESS 193 V
  ```

DB2 RXSQL Was Installed on Separate Minidisks: If DB2 RXSQL was not installed on DB2 minidisks, specify the following commands to link and access the DB2 RXSQL production and service minidisks and the DB2 production and service disks:

- To link and access the DB2 RXSQL production minidisk, SQLMACH 198, type:

  ```
  LINK SQLMACH 198 198 W writepw
  ACCESS 198 P
  ```

- To link and access the DB2 RXSQL service minidisk, SQLMACH 199, type:

  ```
  LINK SQLMACH 199 199 W writepw
  ACCESS 199 V
  ```

- You must also specify one of the following:
  - If DB2 was installed on minidisks, type the following to link and access the DB2 production and service minidisks, SQLMACH 195 and 193:

    ```
    LINK SQLMACH 195 195 RR
    LINK SQLMACH 193 193 RR
    ACCESS 195 Q
    ACCESS 193 W
    ```

  - If DB2 was installed in SFS directories, type the following to access the DB2 production and service directories:

    ```
    ACCESS VMSYS:SQLMACH.SQL.PRODUCTION Q
    ACCESS VMSYS:SQLMACH.SQL.SERVICE    W
    ```

Accessing DB2 RXSQL and DB2 Disks When DB2 RXSQL Installed in SFS Directories

If DB2 RXSQL is installed in SFS directories, the disks that you must access before applying corrective service depends on whether or not DB2 RXSQL and the DB2 product are installed on the same disks, as shown in Figure 18 on page 61:

Disks to Access	DB2 RXSQL Installed in DB2 SFS Directories	DB2 RXSQL Installed in Separate SFS Directories	
		DB2 Product is on Minidisk	**DB2 Product is in SFS Directories**
DB2 production SFS directory	X		X
DB2 service SFS directory	X		X
DB2 RXSQL production SFS directory		X	X
DB2 RXSQL service SFS directory		X	X
DB2 production minidisk		X	
DB2 service minidisk		X	

Figure 18. Accessing DB2 RXSQL and DB2 Disks To Apply Corrective Service

DB2 RXSQL Was Installed in DB2 SFS Directories: If DB2 RXSQL was installed on DB2 SFS directories, specify the following commands to access the DB2 production and service SFS directories:

- To access the DB2 production SFS directory, which also contains the DB2 RXSQL production files, type:
```
ACCESS VMSYS:SQLMACH.SQL.PRODUCTION P (FORCERW
```
- To access the DB2 service SFS directory, which also contains the DB2 RXSQL service files, type:
```
ACCESS VMSYS:SQLMACH.SQL.SERVICE V (FORCERW
```

DB2 RXSQL Was Installed in Separate SFS Directories: If DB2 RXSQL was installed on separate SFS directories, specify the following commands to access the DB2 RXSQL production and service SFS directories and the DB2 production and service disks:

- To access the DB2 RXSQL production SFS directory, type:
```
ACCESS VMSYS:SQLMACH.DB2 RXSQL.PRODUCTION P (FORCERW
```
- To access the DB2 RXSQL service SFS directory, type:
```
ACCESS VMSYS:SQLMACH.DB2 RXSQL.SERVICE V (FORCERW
```
- You must also type one of the following commands:
  - If DB2 was installed in SFS directories, type the following to access the DB2 Server for VM production and service directories:
```
ACCESS VMSYS:SQLMACH.SQL.PRODUCTION Q
ACCESS VMSYS:SQLMACH.SQL.SERVICE W
```
  - If DB2 was installed on minidisks, type the following to link and access the DB2 production and service minidisks, SQLMACH 195 and 193:

```
LINK SQLMACH 195 195 RR
LINK SQLMACH 193 193 RR
ACCESS 195 Q
ACCESS 193 W
```

Step 3.2 Call the ELOSCOR EXEC

To call the ELOSCOR EXEC to apply the DB2 RXSQL corrective service, type:

```
ELOSCOR
```

For information on running the ELOSCOR EXEC, refer to "The ELOSCOR EXEC" on page 184.

Step 3.3 Release Disks

Release any SFS directories to which you are linked and release and detach any minidisks to which you are linked.

For a description of the CP commands described in this section, refer to the *VM/ESA: CP Command and Utility Reference* manual for your VM operating system. For a description of the CMS commands described in this section, refer to the *VM/ESA: CMS Command Reference* manual for your VM operating system.

Reloading HELP Text

When you are installing preventive service or corrective service, the preventive service EXEC or the ELOSCOR EXEC may issue a request to reinstall the HELP text in each DB2 application server in which DB2 RXSQL was installed. As instructed, invoke the ELOSHLP EXEC for each DB2 application server into which DB2 RXSQL was installed. Refer to "The ELOSHLP EXEC" on page 184 for instructions on running this EXEC before using it.

The ELOSHLP EXEC is supplied with DB2 RXSQL and resides on the DB2 RXSQL service disk. The ELOSHLP EXEC services the DB2 RXSQL secondary-level HELP tables. It will service the AMENG HELP text as well as any national language support language that has been installed.

Reloading the DB2 RXSQL Package

When you are installing preventive service or corrective service, the preventive service EXEC or the ELOSCOR EXEC may issue a request to reload the DB2 RXSQL package into each application server in which DB2 RXSQL was installed.

Use the ELOAMOD EXEC supplied with DB2 RXSQL to load DB2 RXSQL packages into an DB2 application server. For more information about the use of the ELOAMOD EXEC, refer to "The ELOAMOD EXEC" on page 179.

Part 2. Reference

Chapter 5. Getting Started with DB2 RXSQL

This chapter introduces the DB2 RXSQL interface by describing the elements of DB2 RXSQL, and how to access it.

What is DB2 RXSQL?

The DB2 REXX SQL for VM/ESA (DB2 RXSQL) allows REXX programs to access the DB2 Server for VM relational database management system.

SQL, the language used to interface to the database manager, can be imbedded in procedural languages such as assembler, C, COBOL, FORTRAN, and PL/I. DB2 RXSQL extends this support to REXX programs and allows SQL statements to be used in DB2 RXSQL requests contained in REXX programs.

DB2 RXSQL contains an expanded interface that resembles the standard SQL language (except for user descriptors), as outlined in the *SAA Database Level 2 Reference* manual.

Unlike the other host languages mentioned, DB2 RXSQL requests are not preprocessed. Compiling your REXX programs has no effect on the DB2 RXSQL requests contained in them.

DB2 RXSQL supports the use of both Dynamic and Extended Dynamic SQL statements.

DB2 RXSQL performs some initial checking on these statements, transforms them into standard run-time SQL operations, and passes them to the database manager. Results of these SQL operations are returned to your program in REXX variables. This includes both data and resulting status information.

When you are coding DB2 RXSQL operations in a REXX program, you can use REXX variables to do the following:
- Pass input values to SQL statements
- Receive values fetched from the database
- Receive information about the outcome of the SQL statements after they are processed.

DB2 RXSQL consists of two modules:
1. RXSQL, which loads a CMS nucleus extension
2. EXECSQL, which passes control to RXSQL.

DB2 RXSQL also includes a DB2 RXSQL LOADLIB which gets loaded as a CMS nucleus extension.

What You Get with DB2 RXSQL

With DB2 RXSQL, you receive DB2 RXSQL-supplied programs, sample REXX programs, and online HELP information. You can use these along with the DB2 RXSQL requests that come with DB2 RXSQL to create your own applications.

DB2 RXSQL-Supplied Programs

RXCASE	Sets a global variable for the case setting of SQL statements to be used by the RXSELECT and RXSQLEX EXECs.
RXSELECT	Retrieves rows from the database and displays them in a temporary file, S$Q$L S$T$M$T, using XEDIT.
RXSQLANG	Sets global variables for determining languages that the HELP text and messages will be in when displayed using the RXSQLHLP EXEC.
RXSQLEX	Issues an SQL EXECUTE IMMEDIATE statement to execute a valid SQL statement.
RXSQLHLP	Provides HELP information pertaining to DB2 RXSQL return codes, DB2 RXSQL messages, and HELP topics provided by the database manager. The HELP topics provided by the database manager may also be displayed using the ISQL HELP command when using ISQL.
RXSQLOP	Executes a valid SHOW or COUNTER operator command and displays the output in the file S$Q$L O$P, using XEDIT.
RXSQLVL	Displays or stacks the current release level of DB2 RXSQL that is installed.

For further information, refer to “Chapter 6. RXSQL-Supplied Programs” on page 69.

Sample Programs

These programs are examples of how to use DB2 RXSQL statements in your own REXX programs.

EMPCRE	Creates a table and a view that are used by the rest of the sample programs. It also loads data into the table.
EMPSEL	Selects data from the table.
EMPPRP	Creates a package using Extended Dynamic SQL and generates the EMPDCL program.
EMPDCL	Declares a cursor and associates it with a statement in the package created by the EMPPRP program.
EMPSELX	Selects data from the table using Extended Dynamic SQL.
EMPPRPM	Creates a package for updating the table using Extended Dynamic SQL and generates the EMPDCLM program.
EMPDCLM	Declares cursors for statements in the package created by the EMPPRPM program.
EMPUPD	Updates the table interactively.

Refer to “Appendix F. Sample Programs with Examples of RXSQL Requests” on page 221 for more information.

DB2 RXSQL Requests

DB2 RXSQL supports a variety of commands and statements which are listed in “Chapter 10. RXSQL Request Descriptions” on page 121.

If you are unfamiliar with SQL you can read “Chapter 7. Concepts” on page 79 for an introduction to the way that DB2 RXSQL is used within REXX programs.

Online HELP

Use the CMS HELP command to obtain HELP information on these topics:

RXCASE
RXCMDS
RXSELECT
RXSQLANG
RXSQLEX
RXSQLHLP
RXSQLOP
RXSQLVL
RXUSAGE.

For further information, see “HELP RXSQL MENU” on page 77.

How to Access DB2 RXSQL

Before using DB2 RXSQL, ensure that it is installed and that you have access to the DB2 Server for VM database manager.

Link the Appropriate Disks

If DB2 RXSQL and the DB2 Server for VM program are installed on minidisks, access the DB2 Server for VM production minidisk and the DB2 RXSQL production minidisk by using the CP LINK and ACCESS commands.

If DB2 RXSQL and the DB2 Server for VM product are installed on minidisks using the defaults specified in “Chapter 2. Installing DB2 RXSQL” on page 13, then you can access the DB2 Server for VM and DB2 RXSQL production minidisks by typing the following commands:

```
CP LINK SQLMACH 195 195 RR
ACCESS 195 Q
CP LINK SQLMACH 198 198 RR
ACCESS 198 P
```

The name of the database machine (SQLMACH) and the minidisk numbers (195 and 198) may be different if DB2 RXSQL or the database manager are not installed using the defaults. Ask your database administrator about your installation's setup.

If the database manager and DB2 RXSQL are installed using SFS directories, type the following ACCESS commands:

```
ACCESS VMSYS:SQLMACH.SQL.PRODUCTION Q
ACCESS VMSYS:SQLMACH.RXSQL.PRODUCTION P
```

The names of the SFS directories, VMSYS:SQLMACH.SQL.PRODUCTION and VMSYS:SQLMACH.RXSQL.PRODUCTION may be different if DB2 RXSQL is not installed using the defaults.

Connect to the Application Server

If you are accessing the DB2 Server for VM application server for the first time, type the following command, substituting the name of your application server to establish a connection to it.

```
SQLINIT DBNAME(server_name)
```

The application server is now available for use by DB2 RXSQL or other applications that use the DB2 Server for VM relational database manager.

Access the CMS Message Repository

DB2 RXSQL uses the CMS message repository for storing its error messages. Consequently, you must issue the following CMS command before beginning an DB2 RXSQL session:

```
SET LANGUAGE (ADD ELO USER
```

Chapter 6. RXSQL-Supplied Programs

This chapter describes the use of the general-purpose programs supplied with DB2 RXSQL and the DB2 RXSQL online help that is invoked using the CMS HELP command. The programs and online help can be invoked from the command line, or from within your own programs.

There are two different kinds of online help provided with RXSQL. You can look up information about DB2 Server for VM and RXSQL error messages using the RXSQLHLP EXEC. The other way to find help information is by using the CMS HELP command. CMS HELP for RXSQL provides you with information on RXSQL-supplied programs, the syntax of the RXSQL requests and the RXSQL statement equivalents for each SQL statement.

Two of the RXSQL-supplied programs (RXSELECT and RXSQLEX) can be used to execute simple queries or perform simple data manipulations. These operations must be simple because you can not prepare an SQL statement for later execution, or use a cursor.

If you are writing an application that requires more complexity than these programs provide, see “Chapter 7. Concepts” on page 79. You can also refer to “Appendix F. Sample Programs with Examples of RXSQL Requests” on page 221 which illustrates how to use RXSQL requests in REXX programs. “Chapter 10. RXSQL Request Descriptions” on page 121, provides you with a detailed description of each RXSQL request.

RXCASE EXEC

```
►►──EXEC RXCASE──┬─String─┬──────────────────────────────────────────────────►◄
                 └─Upper──┘
```

The RXCASE program sets a global variable indicating the case setting to be used by the RXSELECT EXEC and the RXSQLEX EXEC. If RXCASE is `Upper`, the SQL statement is folded to upper case by the RXSELECT EXEC and the RXSQLEX EXEC. If RXCASE is `String`, the SQL statement remains as originally typed.

Note

1. If RXCASE `String` is not issued, your SQL statements will be folded to uppercase.

Examples

The following two examples show two different forms of output from RXSELECT when the two options for RXCASE are used.

Example 1

RXSELECT folds the SQL statement to uppercase.

```
RXCASE UPPER
RXSELECT EMPNO, LASTNAME, JOB, SALARY FROM RXEMP WHERE JOB = 'manager'
```

The following output is displayed in the temporary file S$Q$L S$T$M$T.

```
SELECT EMPNO, LASTNAME, JOB, SALARY FROM RXEMP WHERE JOB='MANAGER'
EMPNO  LASTNAME JOB        SALARY
------ -------- -------- --------
002130 SAMS     MANAGER  41700.00
003326 GOODBAR  MANAGER  40360.00
ELO2121I ******** End-of-Data **********
```

Example 2

RXSELECT leaves the SQL statement as typed. No data is selected from the table because the data is stored in uppercase and does not fit the search specification.

```
RXCASE STRING
RXSELECT EMPNO, LASTNAME, JOB, SALARY FROM RXEMP WHERE JOB = 'manager'
```

The following output is displayed in the temporary file S$Q$L S$T$M$T.

```
Select EMPNO, LASTNAME, JOB, SALARY FROM RXEMP WHERE JOB='manager'
EMPNO LASTNAME JOB SALARY
----- -------- --- ------
ELO2121I ******** End-of-Data **********
```

RXSELECT EXEC

```
►►──EXEC RXSELECT select_statement──────────────────────────────────────►◄
```

select_statement
Any valid SQL SELECT statement.

Note: The FOR UPDATE OF clause is not supported by the RXSELECT EXEC. If you want to use a Positioned Update or Positioned Delete statement you must write a DB2 RXSQL application.

See the *DB2 Server for VSE & VM SQL Reference* manual for more information about SELECT statements.

RXSELECT retrieves the first 100 rows from the database and displays them, using XEDIT, in a temporary file called S$Q$L S$T$M$T. If there are more than 100 rows in the result, type:

```
MORE
```

or,

```
MORE n
```

where *n* is the number of rows you want to display, from within XEDIT.

While you are in XEDIT, you can query the database again. Type:

```
RXSELECT new_select_statement
```

on the XEDIT command line, where *new_select_statement* is a new SQL SELECT statement. The new query overrides the previous query.

The RXSELECT EXEC folds the entire SELECT statement to uppercase unless you have issued the RXCASE EXEC with the `String` option.

When the RXSELECT EXEC returns data from a GRAPHIC, VARGRAPHIC, or LONG VARGRAPHIC column, and the DBCS option from the LASTING GLOBALV file for the DB2 Server for VM user is set to 'YES', RXSELECT concatenates the DBCS shift-out delimiter in front of the data and appends the DBCS shift-in character following the data.

Notes

1. The following commands are defined as XEDIT synonyms:
   SELECT for RXSELECT
   MORE for RXMORE
   SQLHELP for RXSQLHLP
2. A COMMIT or a ROLLBACK statement is issued from the RXSELECT EXEC before it terminates. This may affect your program if it calls the RXSELECT EXEC during a logical unit of work.

Example

Select the columns EMPNO, LASTNAME, WORKDEPT, JOB, and SALARY from the table RXEMP.

```
RXSELECT EMPNO, LASTNAME, WORKDEPT, JOB, SALARY FROM RXEMP
```

The following output is displayed in the temporary file S$Q$L S$T$M$T.

```
SELECT EMPNO, LASTNAME, WORKDEPT, JOB, SALARY FROM RXEMP
EMPNO  LASTNAME WORKDEPT JOB        SALARY
------ -------- -------- -------- --------
002130 SAMS     B12      MANAGER  41700.00
002300 HEDGLEY  B09      ANALYST  37900.00
001010 LOWRY    D14      ANALYST  38240.00
000990 SCHENKER A07      OPERATOR 30190.00
002020 RAINEY   D11      DESIGNER 32560.00
001840 CORDON   B09      FILEREP  28090.00
002330 FABER    A10      CLERK    27800.00
009236 DOBSON   D08      WRITER   37600.00
002574 MERCIER  A11      WRITER   33400.00
003567 SCHMIDT  C04      CLERK    25790.00
002419 ATWALA   A07      OPERATOR 37940.00
003326 GOODBAR  B12      MANAGER  40360.00
003589 GOULD    D07      WRITER   39250.00
ELO2121I ******** End-of-Data **********
```

RXSQLANG EXEC

```
►►──EXEC RXSQLANG──┬──────────────────────────────┬──┬──────────────────────────────┬──────────►◄
                   ├─RXlang(language_identifier)─┤  ├─SQlang(language_identifier)─┤
                   ├─RXlang(langid)──────────────┤  ├─SQlang(langid)──────────────┤
                   └─RXlang( )───────────────────┘  └─SQlang( )───────────────────┘
```

RXlang

(*language_identifier***)**
A 40-character string that has the same value as that found in the LANGUAGE column of the SQLDBA.ELOLANGUAGE table.

(*langid***)**
A one-to-five character short form for the language (for example, AMENG or KANJI) that has the same value as found in the LANGID column of the SQLDBA.ELOLANGUAGE table.

( )
If neither *language_identifier* nor *langid* is supplied, then RXSQLANG erases your default RXlang variable from the LASTING GLOBALV file.

SQlang

(*language_identifier***)**
A 40-character string that has the same value as that found in the LANGUAGE column of the SQLDBA.SYSLANGUAGE catalog table.

(*langid***)**
A one-to-five character short form for the language (for example, AMENG or KANJI) that has the same value as found in the LANGID column of the SQLDBA.SYSLANGUAGE catalog table.

( )
If neither *language_identifier* nor *langid* is supplied, then RXSQLANG erases your default SQlang variable from the LASTING GLOBALV file.

RXSQLANG provides a means to override the system defaults for the languages in which HELP information is displayed by DB2 RXSQL. During installation of both the database manager and DB2 RXSQL, a system default language is established. Using RXSQLANG you can specify your own default language for either or both DB2 RXSQL and DB2 Server for VM HELP information. The RXSQLHLP EXEC uses the default languages specified to display HELP information.

RXSQLANG verifies that the parameters you supply specify national languages that have been installed on your system. To determine which DB2 RXSQL national languages have been installed check the SQLDBA.ELOLANGUAGE table. This table is provided by DB2 RXSQL. To check which DB2 Server for VM languages have been installed check the SQLDBA.SYSLANGUAGE catalog table.

The national languages that you choose do not affect any other users or change the system defaults. The selection remains in effect until you issue RXSQLANG again with new parameters.

Note

1. RXSQLANG stores variables in the CMS global variables file (LASTING GLOBALV).

Examples

Example 1

Set the default language for RXSQL HELP information to American English using the *langid*.

```
RXSQLANG RX(AMENG)
```

Example 2

Set the default language for DB2 Server for VM HELP information to American English using the *language_identifier*.

```
RXSQLANG SQ(ENGLISH)
```

RXSQLEX EXEC

```
►►──EXEC RXSQLEX statement──────────────────────────────────────────────►◄
```

statement
A valid SQL statement that can be processed by an SQL EXECUTE IMMEDIATE statement. See the *DB2 Server for VSE & VM SQL Reference* manual for a list of valid statements.

DB2 RXSQL passes *statement* to the database manager where it is processed as an EXECUTE IMMEDIATE statement.

If no error occurs after the statement is processed, a COMMIT WORK statement is executed. If an error does occur a ROLLBACK statement is issued.

If the SQL statement is an INSERT, an UPDATE, or a DELETE, and it affects more than one row in the database, the following prompt appears:

```
Enter ROLLBACK or CANCEL to cancel the changes.
```

Cancel your changes by typing `ROLLBACK` or `CANCEL`, or accept your changes by pressing enter.

The SQL statement is folded to uppercase by DB2 RXSQL unless you select the `String` option for RXCASE.

Example

Grant select authority on the RXEMP table to all users.

```
RXSQLEX GRANT SELECT ON RXEMP TO PUBLIC
```

RXSQLHLP EXEC

```
►►──EXEC RXSQLHLP topic─────────────────────────────────────────────────►◄
```

topic
One of the following:
- A DB2 RXSQL return code
- A DB2 RXSQL message identifier of the format:

  `ELOnnnns`

  where *nnnn* is the message identifier number and *s* is the error severity
- An SQLCODE returned from the database manager
- `CONTENTS` lists all of the valid DB2 Server for VM topics that you can enter.

- Any DB2 Server for VM HELP topic that may be displayed using the ISQL HELP command. Refer to the *DB2 Server for VSE & VM Interactive SQL Guide and Reference* manual for more information.

RXSQLHLP can display both DB2 RXSQL and DB2 Server for VM HELP information if they are installed on your system.

The RXSQLHLP program uses the default language installed on your system, or the one you specified using the RXSQLANG EXEC. See “RXSQLANG EXEC” on page 71 for more information.

After the results are displayed in an XEDIT file, you can view additional topics by typing:

```
SQLHELP newtopic
```

on the XEDIT command line, where *newtopic* is any HELP topic as described above.

Notes

1. The following commands are defined as XEDIT synonyms:
   SELECT for RXSELECT,
   MORE for RXMORE
   SQLHELP for RXSQLHLP.
2. If the help tables for either DB2 Server for VM or DB2 RXSQL are not found, then RXSQLHLP returns an error condition.

Example

Display the HELP information for the topic '+100'.

```
RXSQLHLP +100
```

The following output is displayed in the temporary file S$Q$L H$E$L$P.

```
===========================================================
DB2 RXSQL HELP +100
===========================================================
ELO2112I DB2 RXSQL HELP text is not available
for topic '+100' for language S001.
===========================================================
DB2 for VM HELP '+100'
===========================================================
TOPIC NAME:  +100

+100       There are no (or no more) rows that satisfy the
          condition.

EXPLANATION:  For a query that uses a cursor, the cursor is
empty or all rows have been selected.  For a query that does
not use a cursor, no row was found that satisfied the WHERE
condition.  An INSERT via SELECT statement may return this
SQLCODE if the SELECT statement does not retrieve any rows.

SQLSTATE 02000.

SYSTEM ACTION:  Normal completion.

USER RESPONSE:  Take suitable action based on the SQLCODE
descriptive text.
```

RXSQLOP EXEC

```
►►──EXEC RXSQLOP operator_command──────────────────────────────────────────►◄
```

operator_command
One of the following:
- A DB2 Server for VM SHOW operator command
- A DB2 Server for VM COUNTER operator command

SHOW and COUNTER monitor the DB2 Server for VM system. See the *DB2 Server for VSE & VM Operation* manual for more information on operator commands.

Using XEDIT, RXSQLOP displays the results in the file S$Q$L O$P.

To process additional commands, type:

```
SQLOP newcommand
```

on the XEDIT command line, where *newcommand* is a DB2 Server for VM SHOW or COUNTER operator command.

This program will issue an error message if invoked from within a logical unit of work because the DB2 Server for VM database manager does not allow operator commands to be issued from within a logical unit of work.

Note

1. Operator commands cannot be issued when using the DRDA protocol.

Example

Issue a DB2 Server for VM operator command.

```
RXSQLOP COUNTER *
```

Output similar to the following is displayed in the temporary file S$Q$L O$P.

```
===========================================================
SQLOP COUNTER *
===========================================================
Counter values at  DATE='05-30-91'  TIME='11:18:01'
Calls to RDS                   RDSCALL :  1219
Calls to DBSS                  DBSSCALL:  6862
LUWs started                   BEGINLUW:  268
LUWs rolled back               ROLLBACK:  69
System checkpoints taken       CHKPOINT:  1
Maximum locks exceeded         LOCKLMT :  0
Lock escalations               ESCALATE:  0
Waits for lock                 WAITLOCK:  0
Deadlocks detected             DEADLCK :  0
Looks in page buffer           LPAGBUFF:  13576
DBSPACE page reads             PAGEREAD:  3117
DBSPACE page writes            PAGWRITE:  20
Looks in directory buffer      LDIRBUFF:  1092
Directory block reads          DIRREAD :  414
Directory block writes         DIRWRITE:  99
Log page reads                 LOGREAD :  3
Log page writes                LOGWRITE:  13
Total DASD reads               DASDREAD:  3534
Total DASD writes              DASDWRIT:  132
Total DASD I/O                 DASDIO  :  3666
ARI0065I Operator command processing is complete.
```

RXSQLVL EXEC

```
►►──EXEC RXSQLVL──┬────────┬──────────────────────────────────────────────────►◄
                  ├─RELMOD─┤
                  └─LIFO───┘
```

The RXSQLVL program may be executed to determine the release level of DB2 RXSQL that is installed.

RELMOD

LIFO

Places an entry on the program stack in the format `V R M` where V is the version, R is the release and M is the modification. Both parameters are equivalent.

If you do not specify a parameter, a message is displayed on the console indicating the version, release, and modification level of the installed DB2 RXSQL system.

Note

1. The RXSQLVL program should only be called with the RELMOD or LIFO parameters from another REXX program.

Example

Determine the release level of RXSQL that is installed.

```
RXSQLVL
```

The following output is displayed on the screen.

```
EL02102I *** DB2 RXSQL Version 7 Release 1 Modification 0 ***
```

HELP RXSQL MENU

This is not a program, but online HELP provided by DB2 RXSQL that can be displayed using the CMS HELP command. It is invoked from the command line like the DB2 RXSQL-supplied programs. The syntax is as follows:

```
►►──HELP RXSQL MENU──────────────────────────────────────────────────────────►◄
```

HELP RXSQL MENU displays a HELP panel with all the DB2 RXSQL HELP topics. You can find out

- how to use the DB2 RXSQL-supplied programs
- syntax of all the DB2 RXSQL operations
- the DB2 RXSQL statements that can be used for each SQL statement.

The topics you can choose from are as follows:

RXCASE
Information for invoking the RXCASE program

RXCMDS
Syntax for all the DB2 RXSQL operations

RXSELECT
Information on invoking the RXSELECT program

RXSQLANG
Information on invoking the RXSQLANG program

RXSQLEX
Information on invoking the RXSQLEX program

RXSQLHLP
Information on invoking the RXSQLHLP program

RXSQLOP
Information on invoking the RXSQLOP program

RXSQLVL
Information on invoking the RXSQLVL program

RXUSAGE
Information about which DB2 RXSQL statements can be used for each SQL statement.

Example

Display the RXSQL help menu.

```
HELP RXSQL MENU
```

The menu will look like this:

```
  DB2 RXSQL MENU   Menu Help Information       line  1 of  11
                   (c) Copyrighted IBM Corporation 2000.

 You can select a file for viewing by  placing  the  cursor  under  any
 character  of  the  file  wanted and pressing the PF1 key.  If you are
 using a terminal that does not have a CURSOR or PF KEYS, you MUST TYPE
 the  COMPLETE  HELP  COMMAND  with  operands  and  options.   For   a
 description of the operands and options, type HELP HELP.


 RXCASE    RXSELECT  RXSQLEX   RXSQLHLP  RXSQLOP   RXSQLVL   RXUSAGE
 RXCMDS    RXSQLANG
* * * End of File * * *

















 PF1= Help     2= Top      3= Quit     4= Return     5= Clocate   6= ?
 PF7= Backward 8= Forward  9= PFkeys  10=           11=          12= Cursor

====>
                                                             Macro-read 1 file
```

Chapter 7. Concepts

This chapter introduces some SQL and RXSQL concepts along with some DB2 RXSQL requests and the way that these requests work in your REXX programs. Also included in this chapter are illustrations on how to use Dynamic and Extended Dynamic SQL. A more detailed discussion on how to use Dynamic and Extended Dynamic statements in RXSQL is in the following chapter.

The concepts section is divided into two sections: SQL Concepts and RXSQL Concepts. The SQL concepts sections introduces some basic SQL concepts that are needed to use SQL in any programming language, while the RXSQL concepts section introduces some terms and concepts which are specific to RXSQL.

SQL Concepts

This section should be read along with the "Concepts" chapter in the *DB2 Server for VSE & VM SQL Reference* manual.

To understand this section you should be familiar with SQL queries and the SQL statements that can be issued interactively.

When you are using Dynamic SQL or Extended Dynamic SQL to access data, you will be using one of two types of RXSQL statement sequences, for cursor statements or for non-cursor statements.

Cursors

A *cursor* is a pointer to a row in an active set. An active set is composed of columns and rows of one or more base tables that the database manager selects (a result table) or generates (a put block) based on information in a SELECT statement or an INSERT statement respectively. In RXSQL, a cursor is defined by preparing a SELECT or INSERT statement, and optionally declaring it to give it a *cursor_name*. The cursor is then referenced in subsequent RXSQL statements (OPEN, FETCH or PUT, CLOSE) by the *cursor_name* if it was declared, or by its *prepare_name* if it was not declared.

Note: In other host languages supported by the database manager a cursor must be declared before it can be referenced on subsequent statements.

There are two types of cursors. If your program is retrieving data, the cursor is called a *query_cursor* because the active set or result table is defined by a SELECT statement. If your program is inserting data into a table, the cursor is called an *insert_cursor* because the active set or put block is defined by an INSERT statement.

When a cursor is opened, it is pointing to the top of the active set. Your program must open the cursor by issuing the OPEN statement, and then advance it row by row by issuing FETCH for a *query_cursor* or PUT for an *insert_cursor*. Generally, your program continues retrieving or inserting rows until the last row has been retrieved or all the data has been inserted. Then your program closes the cursor and commits the changes, if any.

You can also update or delete data with a cursor using a Positioned UPDATE or Positioned DELETE statement.

Positioned UPDATE or Positioned DELETE Statements

The Positioned UPDATE or Positioned DELETE statement is used to update or delete a row to which a cursor is currently pointing. This is different from the Searched UPDATE or Searched DELETE where each row that matches the search condition is updated or deleted.

Positioned UPDATE or Positioned DELETE statements use a cursor while Searched UPDATE or Searched DELETE statements do not require a cursor.

To code a Positioned UPDATE or Positioned DELETE statement, your program must first define a *query_cursor* where the SELECT statement has a FOR UPDATE OF *column_names* clause. The cursor is then used to retrieve each row of data using the FETCH statement. If the retrieved row is to be updated or deleted your program issues an UPDATE or DELETE statement with the WHERE CURRENT OF *cursor_name* clause.

Note: Coding the Positioned DELETE operation is different in other host languages supported by the database manager. See the *DB2 Server for VSE & VM SQL Reference* manual for more information on the Positioned DELETE operation.

Cursor and Non-Cursor SQL Statements

Some database operations require a cursor while others do not. The sequence needed for executing SQL statements with cursor operations is different from the sequence needed for non-cursor operations. The SQL statements that always require a cursor in RXSQL include OPEN, SELECT, Positioned UPDATE, Positioned DELETE, and CLOSE. The INSERT statement can be used as a non-cursor statement.

Note: This does not apply to other host languages that support the SELECT INTO statement, which does not require a cursor.

However, if many rows are to be inserted, it is more efficient to use an *insert_cursor* so the rows will be inserted in blocks rather than one row at a time.

The SQL statements which do not require a cursor in RXSQL include the following:

ACQUIRE DBSPACE	ALTER TABLE	ALTER DBSPACE
COMMIT	COMMENT ON	CONNECT
CREATE INDEX	CREATE SYNONYM	CREATE PACKAGE
CREATE TABLE	CREATE VIEW	Searched DELETE
DROP	EXPLAIN	GRANT
INSERT	LABEL ON	LOCK DBSPACE
LOCK TABLE	REVOKE	ROLLBACK
Searched UPDATE	UPDATE STATISTICS	

Blocking

Blocking is the process of retrieving or inserting rows of data in groups rather than one row at a time. If there are many rows to be retrieved or inserted, blocking usually improves performance. However, you should be aware that problem determination is affected by blocking. If you are inserting rows in blocks, an error condition is not detected for a PUT until the block is transmitted to the database manager. This occurs when a block is full or when CLOSE is invoked. To determine the row being inserted when the error was encountered, you must analyze the SQLCA variables as defined in the *DB2 Server for VSE & VM SQL Reference*.

Dynamic FETCH or PUT statements retrieve or insert data in blocks because blocking is the default for RXSQL. However, blocking is turned off when:

- You use the FOR UPDATE OF *cursor_name* clause in the SELECT statement
- You use the INSERT statement with any of the non-cursor sequences discussed in the following sections.
- The prepared INSERT or SELECT statement includes a LONG VARCHAR or LONG VARGRAPHIC column to be transmitted

If you wish to use FETCH or PUT without blocking, you must use DB2 RXSQL Extended Dynamic statements to create a package with the NOBLOCK option.

Illustrations of Using Dynamic SQL in RXSQL

Background

The default installation procedure for DB2 RXSQL includes installing a package for DB2 RXSQL to use. This package contains forty empty sections to be used by DB2 RXSQL when your program executes dynamic SQL statements. These sections are referenced by DB2 RXSQL with *statement_names* S1, S2, ..., S40 and their associated *cursor_names* C1, C2, ..., C40.

When your program prepares a dynamic statement, DB2 RXSQL uses an available section with its corresponding *statement_name* Sn in the RXSQL package. DB2 RXSQL maps the *statement_name* which your program defines to Sn. If your dynamic statement involves a cursor operation, DB2 RXSQL maps your cursor to the cursor Cn associated with statement Sn in the DB2 RXSQL package. The *statement_name* and *cursor_name* which you define in your program are known to RXSQL, but these are not passed to the database manager. When you invoke a DB2 RXSQL request referencing the dynamic statement previously defined, DB2 RXSQL passes the request to the database manager referring only to the statement Sn or its associated cursor Cn.

The following diagrams illustrate how to use Dynamic SQL. They do not contain the complete programming syntax, but are intended to illustrate the statements needed in your program, and how RXSQL processes them to manipulate data stored by the database manager. It is assumed that all of these examples belong to one program and are executed in the sequence that they are illustrated.

The examples that are inline with the text illustrate how to code RXSQL requests, but they are not complete. For example, they do not illustrate error handling. For a complete example of how to code RXSQL applications see “Appendix F. Sample Programs with Examples of RXSQL Requests” on page 221.

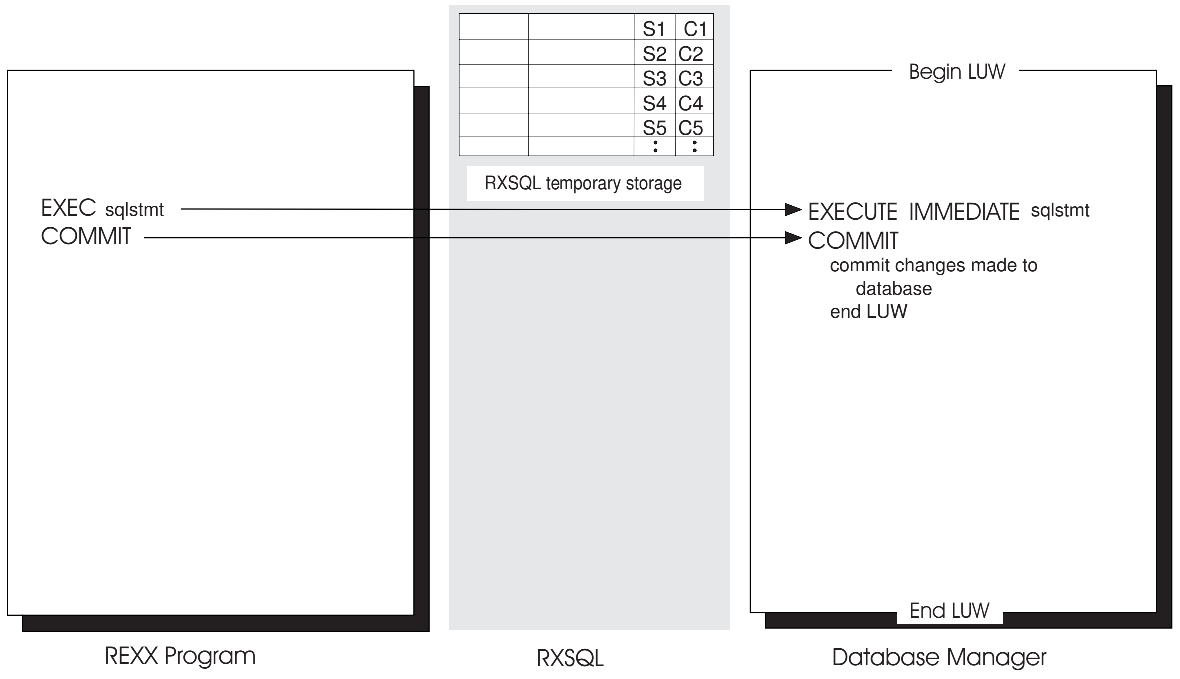


Figure 19. EXEC

RXSQL passes the SQL statement in the EXEC (or EXECUTE IMMEDIATE) statement directly to the database manager.

Rexx_host_variables are not allowed in SQL statements executed by the EXEC statement, but they can be used on the CALL or EXECUTE statement.

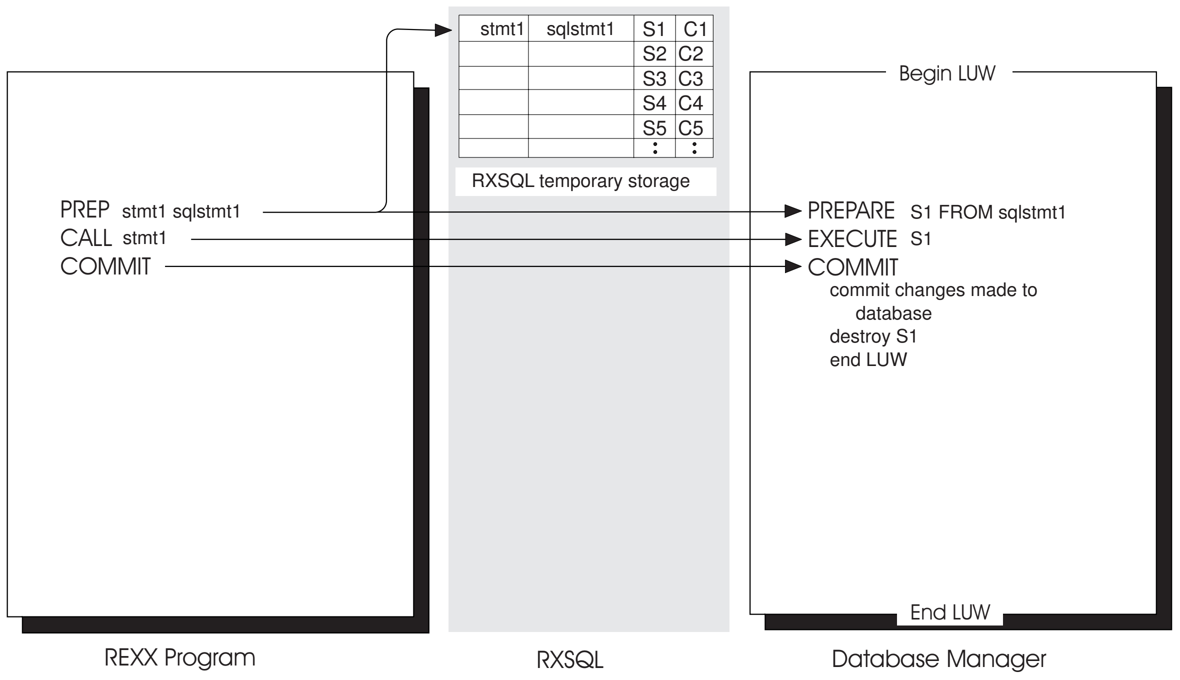


Figure 20. CALL

RXSQL stores the *statement_name* `stmt1` and the statement value `sqlstmt1` in a temporary storage area. Prepared statements can be opened or called until program control is returned to CMS, or until your program issues a PURGE command.

When DB2 RXSQL issues a PREPARE statement to the database manager, this statement remains active in the database manager for the duration of the LUW only. However, the prepared statement remains in DB2 RXSQL temporary storage.

If the SQL statement has *variable_names*, their values are passed to the database manager when the CALL statement is executed.

The following example illustrates a RXSQL CALL statement without any variables:

```
/*                                                       */
/*  For all of these examples assume that A_TABLE exists and    */
/*  has 5 character type columns                         */
/*                                                       */
"RXSQL PREP stmt1 INSERT INTO A_TABLE",
      "VALUES('HEATHER','L','DOBSON','T01','WRITER')"
'RXSQL CALL   stmt1'
'RXSQL COMMIT'
'RXSQL PURGE  stmt1'
```

The previous example will insert only one row into a table. If *variable_names* are coded in the INSERT statement, many rows can be inserted into the database using the same statement. The following example illustrates this:

```
/*                                                          */
/*  Assume that there is a file containing all the input called */
/*  DEPT FILE                                               */
Do forever
  'EXECIO 1 DISKR DEPT FILE * (LIFO '
  parse upper pull fname mid lname department job .
  If fname = '' then leave
  fname = "'"fname"'"  /* This ensures RXSQL will know that the */
  mid   = "'"mid"'"    /* data type is character              */
  lname = "'"lname"'"
  department = "'"department"'"
  job   = "'"job"'"
  'RXSQL PREP stmt1 INSERT INTO A_TABLE',
      'VALUES(:fname, :mid, :lname, :department, :job )'
  'RXSQL CALL   stmt1'
  'RXSQL COMMIT'
  'RXSQL PURGE  stmt1'
End
  'FINIS DEPT FILE *'
```

The previous example will work, but the performance will not be very good because a PREP statement is executed with each iteration of the loop. Performance would be much better if the PREP statement was executed only once, and host variables were used to substitute values into the table using the CALL statement. The following example illustrates this:

```
/*                                                          */
/*   Assume that there is a file containing all the input called */
/*   DEPT FILE                                              */
/*                                                          */
insert_data= 'INSERT INTO A_TABLE VALUES (',
  ':fname,:mid,:lname,:department,:job )'
'RXSQL PREP stmt1' insert_data
Do forever
  'EXECIO 1 DISKR DEPT FILE * (LIFO '
  parse upper pull fname mid lname department job .
```

```
     If fname = '' then leave
     fname = "'"fname"'"   /* this ensure RXSQL will know that the */
     mid = "'"mid"'"         /* data type is character             */
     lname = "'"lname"'"
     department = "'"department"'"
     job = "'"job"'"
     'RXSQL CALL stmt1'
   End
   'FINIS DEPT FILE *'
   'RXSQL COMMIT'
   'RXSQL PURGE stmt1'
```

With each iteration of the loop new values are retrieved from the input file `DEPARTMENT FILE` and passed to the database manager in the CALL statement. The PREP and COMMIT statements do not have to to be executed with each iteration of the loop making the program run much more efficiently.

Another point to note is that the PURGE statement is executed the same number of times the PREP statement is executed in all the examples to ensure that the RXSQL temporary storage area does not get filled.

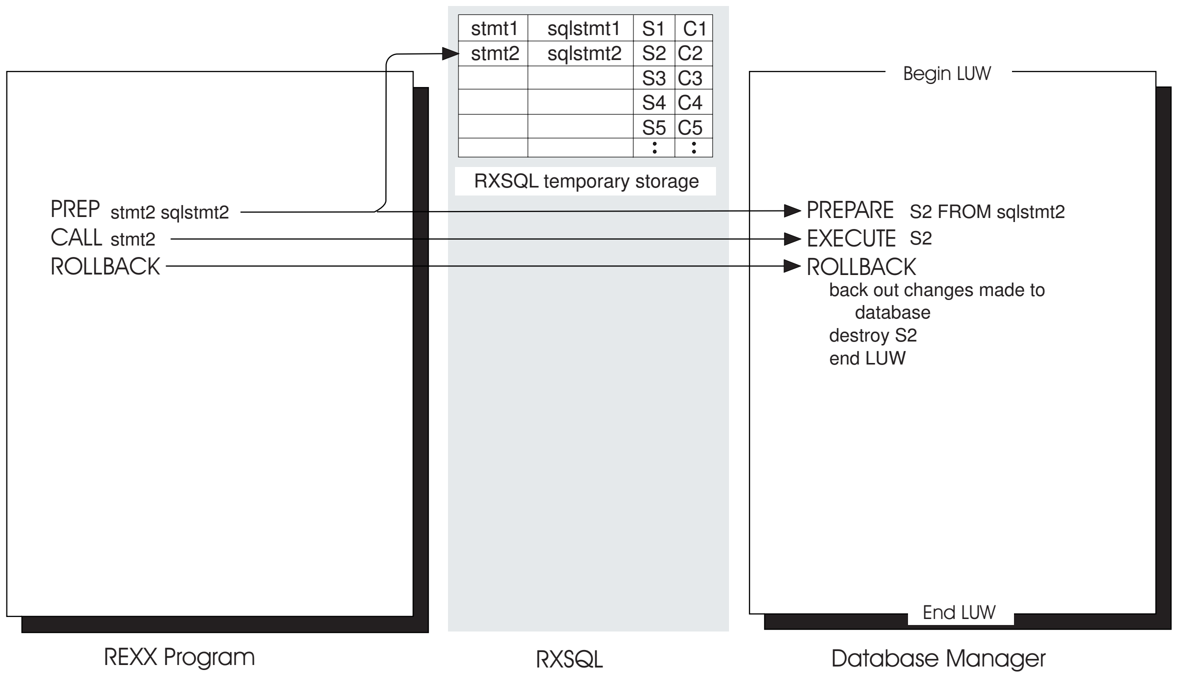


Figure 21. ROLLBACK

A ROLLBACK statement will back out all uncommitted changes. Note that this is opposite to a COMMIT statement which commits all changes. Also note that the prepared statement remains in RXSQL temporary storage even though the work done in the LUW has been rolled back.

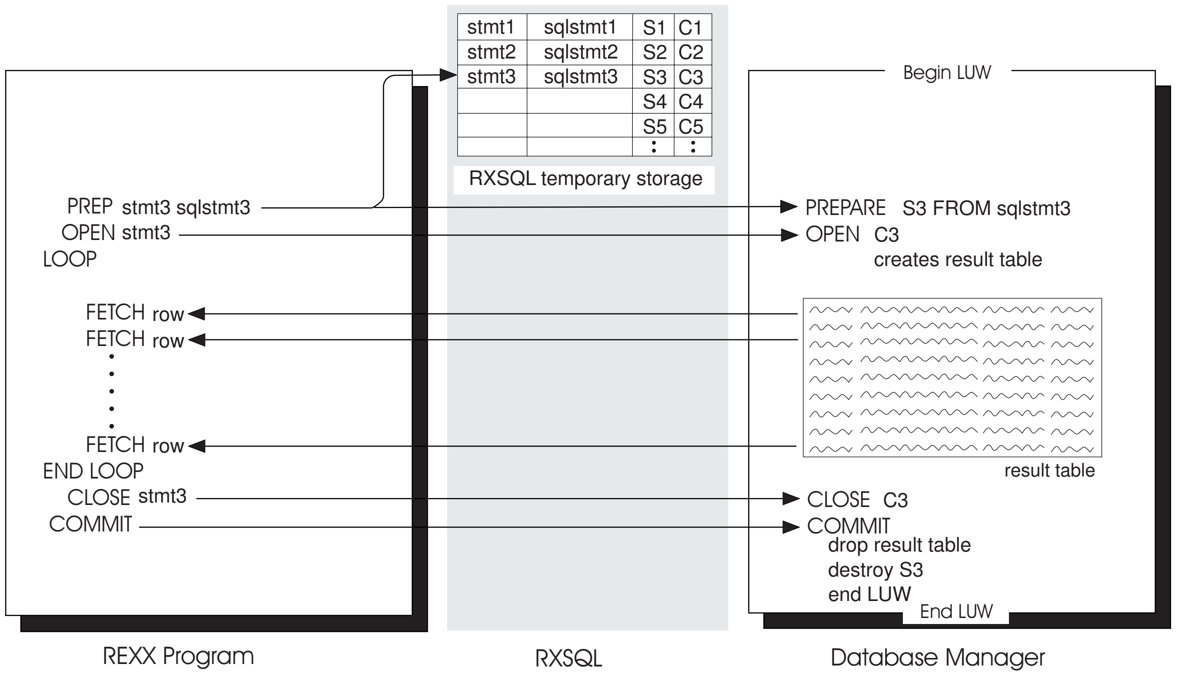


Figure 22. FETCH

In this example, `sqlstmt3` is a SELECT statement. RXSQL issues an OPEN statement to the database manager when an OPEN statement is issued in a program. RXSQL associates the cursor `C3` with the statement named `stmt3`.

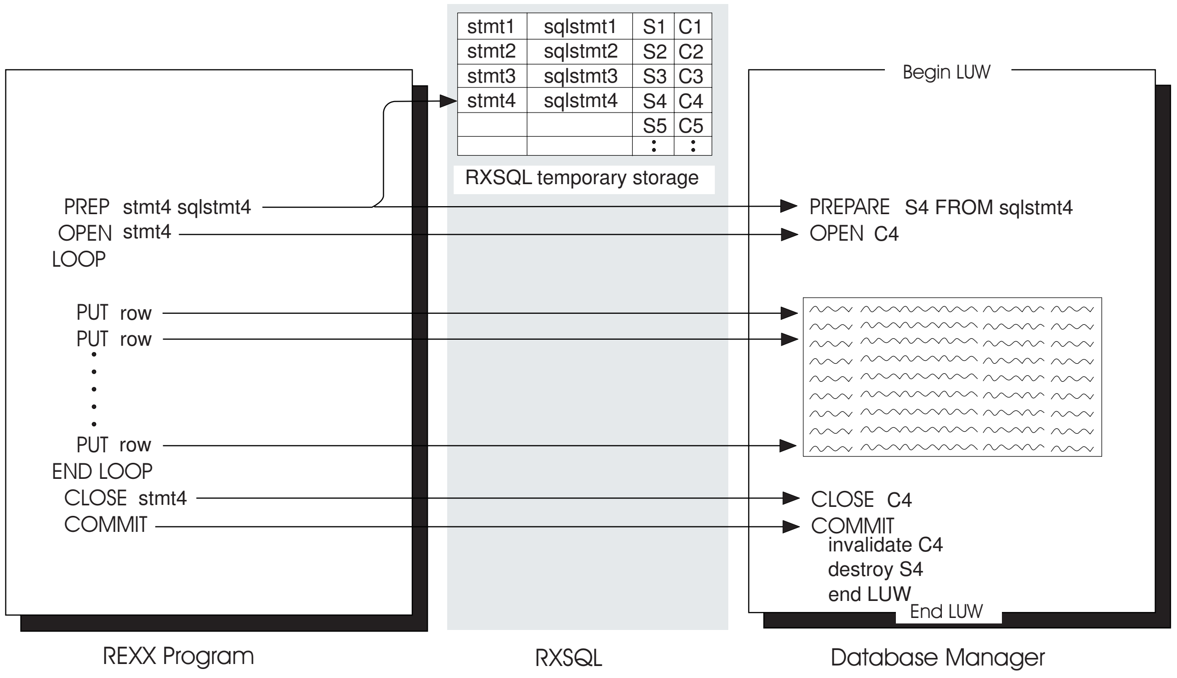


Figure 23. PUT

The prepared statement is an INSERT statement. When the program issues an OPEN statement, an insert-cursor is prepared for block input. Even though the program passes one row at a time to the database manager using the PUT statement, rows are inserted into the table in blocks. This is more efficient than inserting one row at a time into a table.

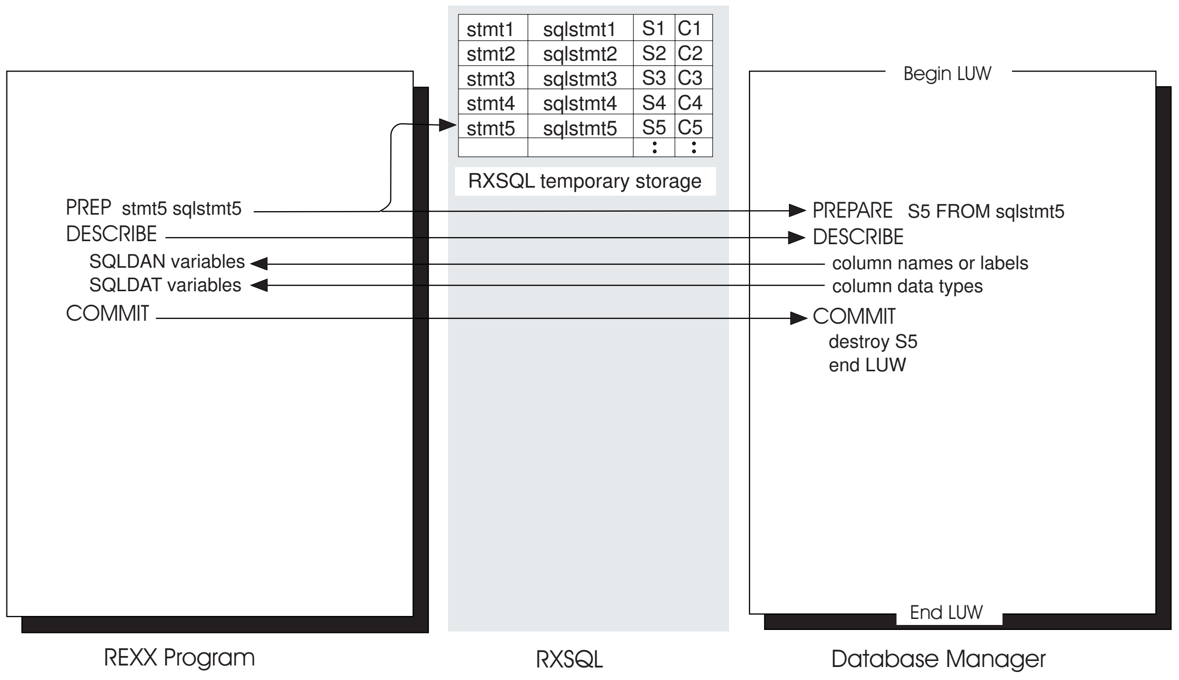


Figure 24. DESCRIBE

The prepared statement is a SELECT statement. When the program issues a DESCRIBE request, DB2 RXSQL returns information about the columns to be fetched into REXX stem variables. This information includes column names and data types.

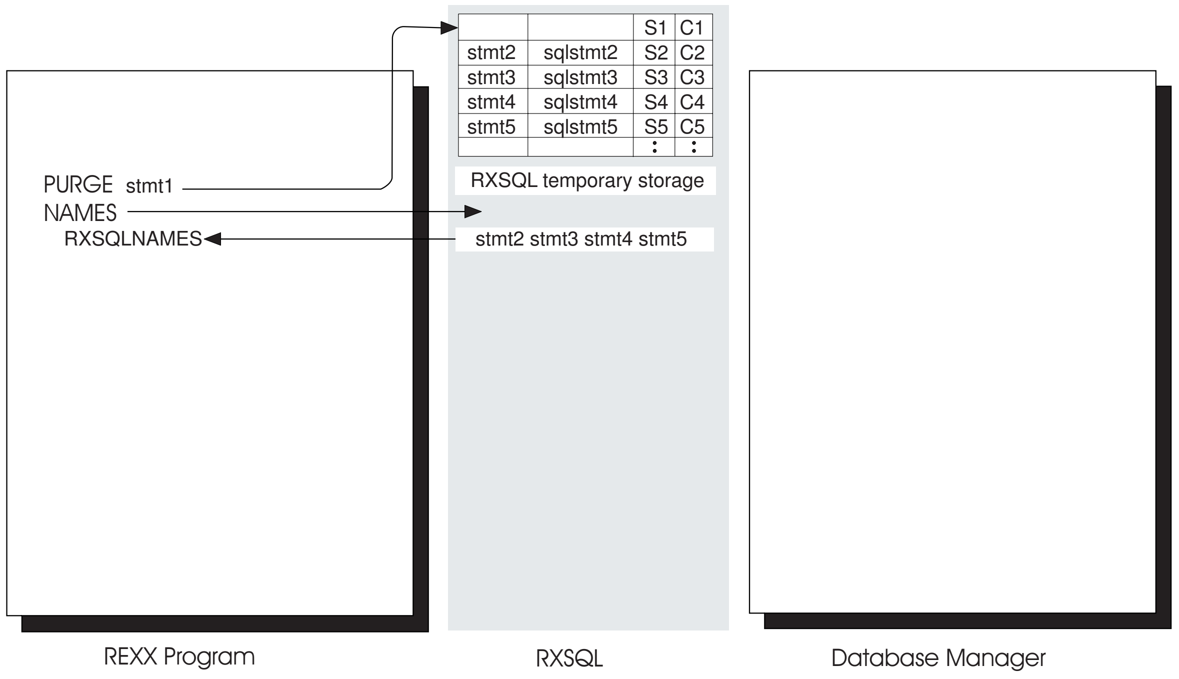


Figure 25. PURGE

Between the time that RXSQL is invoked and control is returned to CMS, RXSQL allows 40 statements to be prepared at one time. If your program tries to prepare more than 40 statements, DB2 RXSQL will return an error indicating that you have tried to prepare more than the allowed number of statements. For this reason, you may want to use the RXSQL PURGE command to maintain your prepared statements. PURGE does not pass a COMMIT statement to the database manager but, if there is an open associated cursor, DB2 RXSQL issues a CLOSE statement to the database manager to close it.

See "Appendix F. Sample Programs with Examples of RXSQL Requests" on page 221 for a detailed illustration of Dynamic SQL. See "Chapter 10. RXSQL Request Descriptions" on page 121 for a detailed description of RXSQL statements and commands.

Illustrations of Extended Dynamic SQL in RXSQL

The following diagrams illustrate how to use Extended Dynamic statements. It is assumed that the examples are executed in the sequence that they are illustrated and Figure 27 on page 88 to Figure 31 on page 90 are executed within one program.

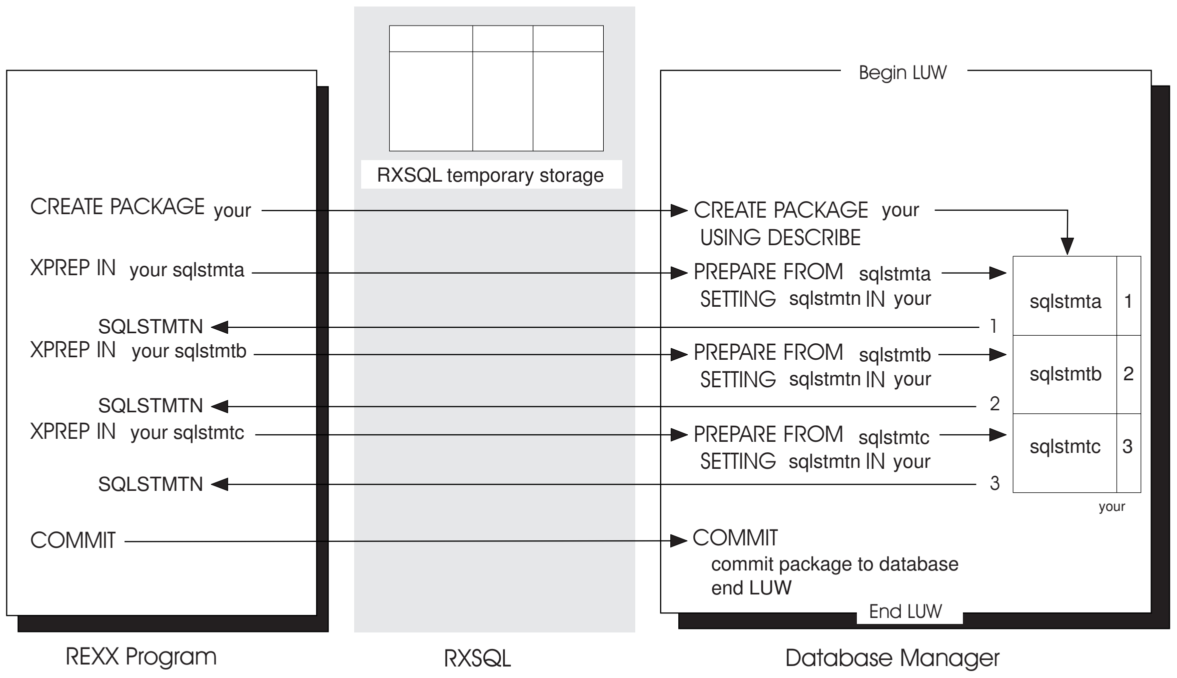


Figure 26. XPREP

Once the COMMIT is issued, the package `your` is stored by the database manger with three statements.

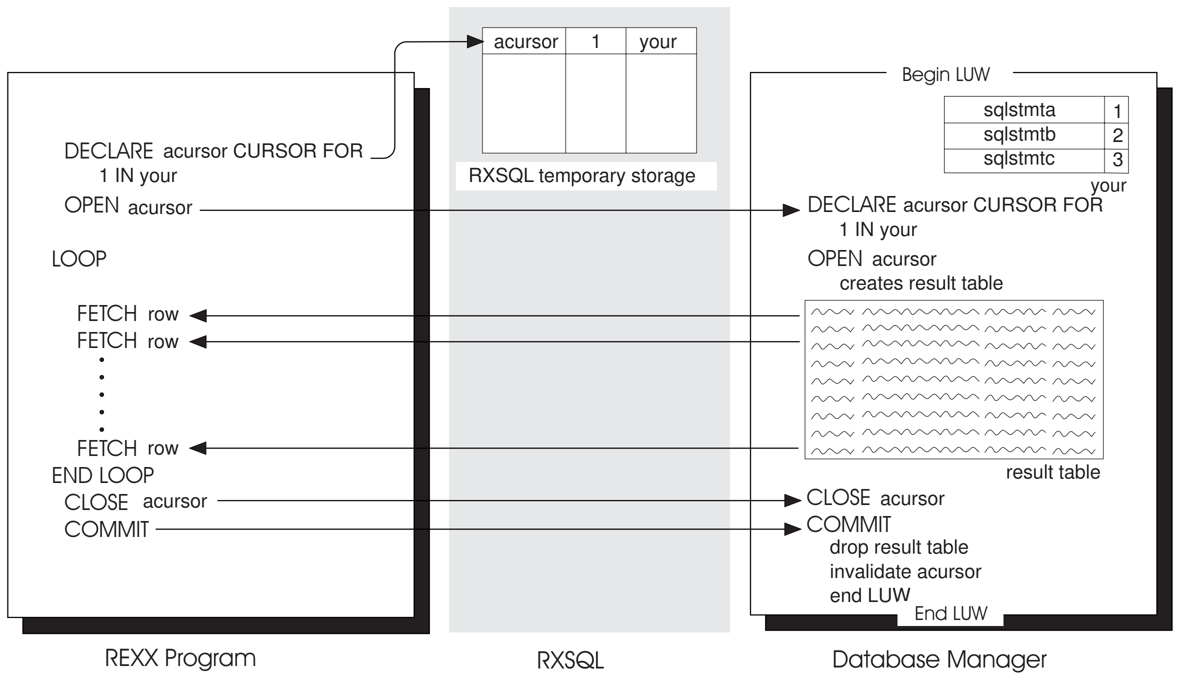


Figure 27. FETCH

The sequence of statements used in Extended Dynamic SQL is very similar to the sequence used in Dynamic SQL. However, note that Extended Dynamic statements have a different syntax to reference sections in a package.

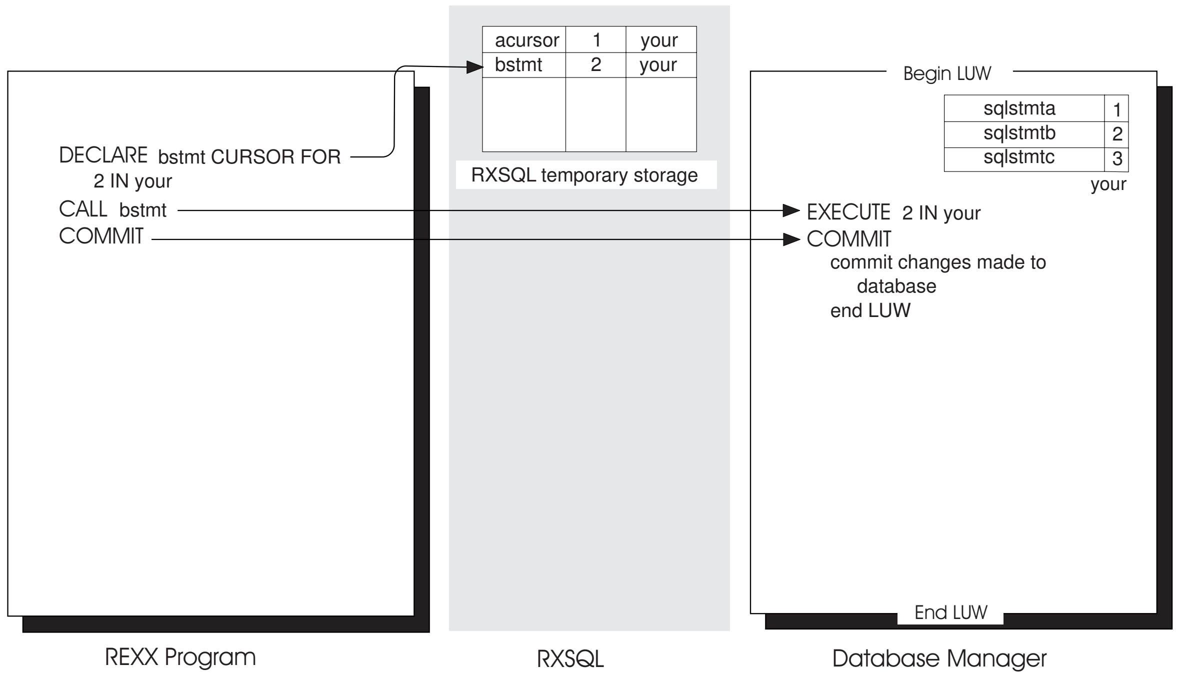


Figure 28. CALL

In this example, the Extended DECLARE defines a statement name `bstmt` for section 2 in `your` package. This statement name is subsequently referenced in the Extended CALL statement to execute the statement.

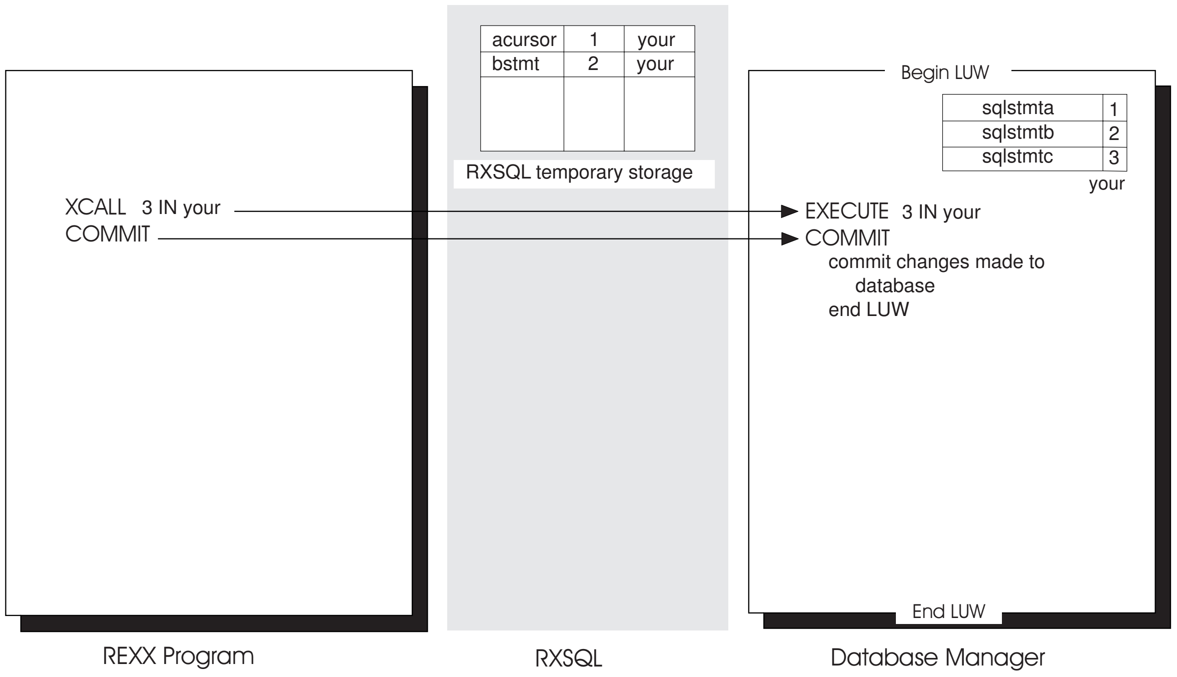


Figure 29. XCALL

Extended EXECUTE and XCALL invoke a statement in a package directly. However, you can not use *rexx_host_variables* in your SQL statement when using the XCALL statement. Use the Extended EXECUTE statement, or the Extended DECLARE and Extended CALL statements if you want to use *rexx_host_variables* in Extended Dynamic SQL.

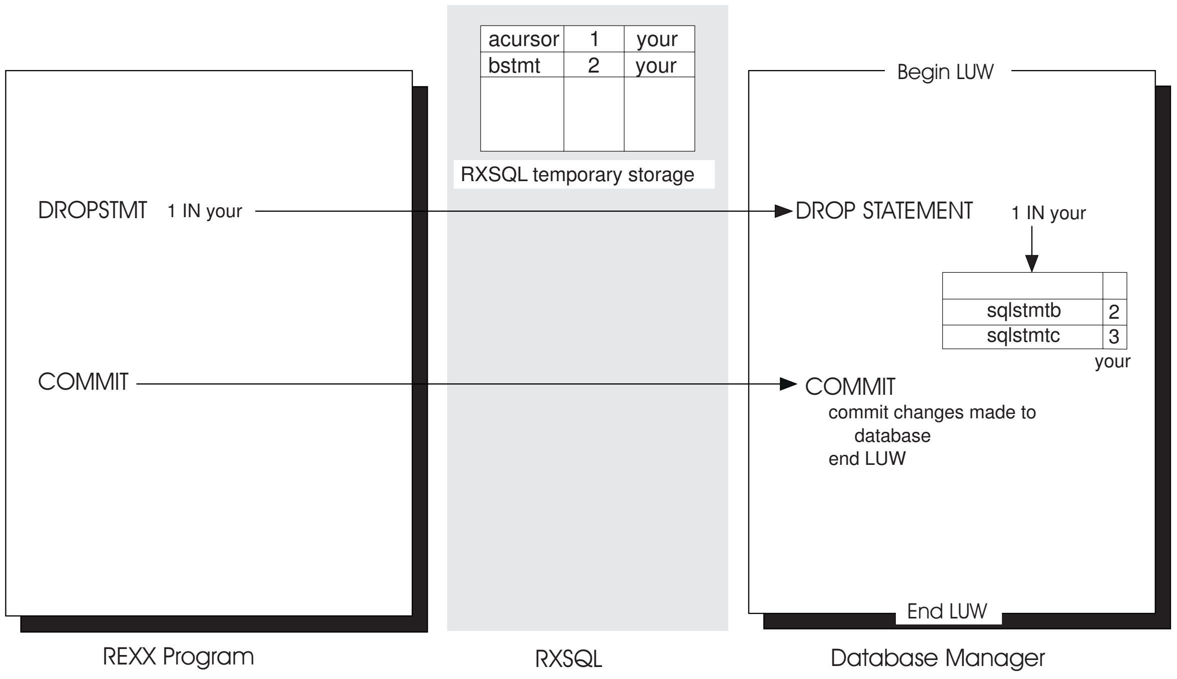


Figure 30. DROPSTMT

The DROPSTMT statement deletes statements from a package, but it does not remove a package from the database. The statement DROP PACKAGE removes a package from the database.

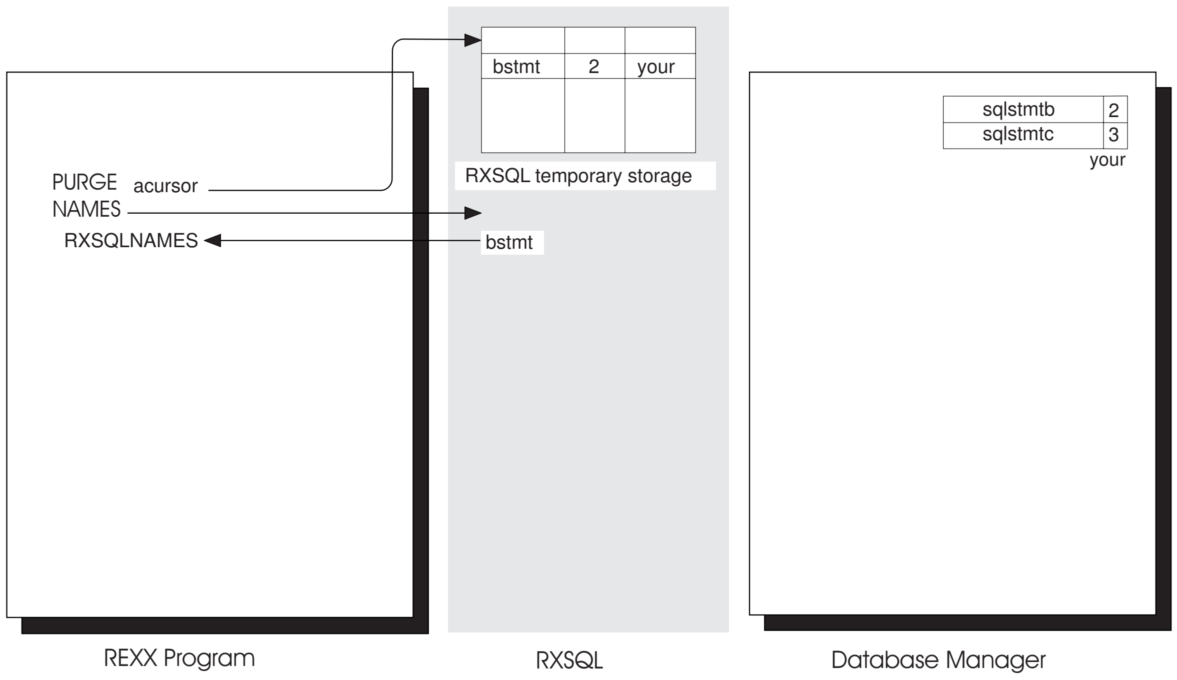


Figure 31. PURGE

RXSQL keeps track of the statements you have declared until control is returned to CMS, or until a PURGE command is issued. Unlike the limit of 40 prepared statements when using Dynamic SQL in RXSQL, the limit in Extended Dynamic SQL is much greater and is determined by the database manager.

Chapter 8. Using Dynamic and Extended Dynamic SQL Statements in RXSQL

Data stored by the database manager can be accessed by Static, Dynamic or Extended Dynamic SQL statements. RXSQL supports only Dynamic and Extended Dynamic SQL. *Dynamic* SQL statements are prepared and executed when your program is run and the operational form of the prepared statements does not persist beyond the logical unit of work. *Extended dynamic* statements support both static and dynamic access to data and are used for the direct creation and maintenance of packages.

Programs that use Dynamic SQL are easier to program and maintain than programs which use Extended Dynamic SQL; however there are situations where Extended Dynamic SQL has definite advantages over Dynamic SQL. The most prominent advantage that Extended Dynamic SQL has over Dynamic SQL is the ability to access data using Static SQL statements.

With Dynamic SQL, the database manager checks the statements being prepared for three things; existence, usage and authority. The database manager checks whether the objects referenced in the prepared statement exist and are being used correctly. The database manager also checks whether the authorization ID of the person executing the program has the authority and privileges required by the prepared statements. The database manager does this checking by looking up information in the catalog tables. This can cause many locks on these tables and slow the execution of the program.

With Static SQL, the database manager checks the statements being prepared for existence, usage and authority only once, when the statements are prepared and stored into a package. The privileges on the objects referenced in the prepared statements must be held by the authorization ID of the person who creates the package. These privileges may then be shared by granting the execute privilege on the package to others.

There are many situations where Static SQL is advantageous. They include the following:

- With Dynamic SQL, the user directs the program to prepare the SQL statement each time the program is invoked; with Static SQL the statement is prepared only once thus, in most cases, improving the performance of the application.
- Preparing a statement requires shared locks to be put on the catalog tables. Using Static SQL reduces the concurrency problems caused by locking because the PREPARE statement is issued only once, when the package is created.
- With Dynamic SQL, users must have the appropriate authority on a table before the statements can be executed. If the table contains sensitive data, the owner may need to manage this authority carefully. With Static SQL, the package owner can prepare statements which will restrict the user to only the necessary data. If the owner of the package has the appropriate authority, she can then grant execute so that a user is limited to issuing only the statements that are in the package.
- Users are not limited to the number of prepared statements in Extended Dynamic SQL. You can use dynamic or static Extended Dynamic SQL to prepare more than the current RXSQL limit of 40 Dynamic statements.

Within Dynamic, static Extended Dynamic and dynamic Extended Dynamic SQL, some of the statements are used to manipulate cursors while others are used to execute statements which do not require a cursor. The structure of the following sections on Dynamic, static Extended Dynamic and dynamic Extended Dynamic SQL matches this division of SQL statements into those which require cursors and those which do not require cursors.

Using Dynamic Statements in DB2 RXSQL

You can write queries, manipulate, control and define data using Dynamic SQL in RXSQL. The sequence of RXSQL statements you use depends on whether or not you require a cursor.

Using Dynamic Statements Which Require a Cursor

Cursors can be used to retrieve, insert, update or delete data. To retrieve data your program defines a *query_cursor* and retrieves rows using the FETCH statement. To insert data your program defines an *insert_cursor* and inserts rows using the PUT statement. You can also use a cursor to update or delete selected rows of an active set or result table by using the Positioned UPDATE or Positioned DELETE statement.

Using Dynamic Query or INSERT Statements

To execute *query_cursor* or *insert_cursor* statements in Dynamic SQL your program must issue the following RXSQL statements:

```
PREPARE sql_statement
DECLARE cursor for sql_statement    (optional)
OPEN cursor
    begin loop
    FETCH or PUT row for cursor
    end loop
CLOSE cursor
```

Note: The DECLARE *cursor* is optional, and may be executed before or after the PREPARE statement. If your program does not DECLARE a cursor for the INSERT or SELECT statement, then RXSQL will require *sql_statement* on the OPEN, FETCH, PUT and CLOSE statements. Other host languages supported by the database manager do not allow statement names to be used on OPEN or CLOSE statements.

Using Dynamic Positioned UPDATE or Positioned DELETE Statements

To execute Positioned UPDATE or Positioned DELETE statements in Dynamic SQL you have a choice of two sequences, illustrated as follows:

Sequence 1: Use the EXECUTE IMMEDIATE statement with the imbedded *select_statement* to update or delete the row retrieved by the *query_cursor*.

```
PREPARE select_statement
DECLARE query_cursor for select_statement
OPEN query_cursor
    begin loop
    FETCH row using query_cursor
    if the row satisfies the Positioned UPDATE or Positioned DELETE condition
        EXECUTE IMMEDIATE Positioned UPDATE or DELETE statement
    end loop
CLOSE query_cursor
```

The following example illustrates this sequence for a Positioned UPDATE.

```
/*** UPDATE the third column when the value in the second column = 300 ***/

/* The paired outside quotes are stripped off by REXX and the imbedded */
/* single quotes are passed to the database manager.                   */

"EXECSQL PREP stmt1 SELECT col2 FROM table1 WHERE col1='WRITER'",
     "FOR UPDATE OF col3"

'EXECSQL DECLARE query_cursor CURSOR FOR stmt1'

/* open the cursor and position it before first row */
'EXECSQL OPEN query_cursor'

 Do forever
  /* position cursor on a row and fetch data */
  'EXECSQL FETCH query_cursor col2_value'

   /* leave the loop when the cursor reaches the end of the result table */
   if SQLCODE=100 then leave

   if col2_value = 300 then
    "EXECSQL EXECUTE IMMEDIATE UPDATE table1 SET col3= 'S01' ",
      "WHERE CURRENT OF query_cursor"

 End  /* Do forever */

'EXECSQL CLOSE query_cursor'

'EXECSQL COMMIT'
```

Sequence 2: Prepare the *select_statement* and then issue the CALL or EXECUTE statement to update or delete the row retrieved by the cursor.

```
PREPARE select_statement
DECLARE query_cursor for select_statement
PREPARE Positioned UPDATE or Positioned DELETE sql_statement
OPEN query_cursor
    begin loop
    FETCH row using query_cursor
    if the row satisfies the Positioned UPDATE or Positioned DELETE condition
        EXECUTE or CALL prepared UPDATE or DELETE sql_statement
    end loop
CLOSE query_cursor
```

The UPDATE or DELETE *sql_statement* has a WHERE CURRENT OF *cursor_name* clause. If the DECLARE statement is not issued, the *select_statement* must be used on the OPEN, FETCH and CLOSE statements. The following example illustrates this sequence for a Positioned UPDATE.

```
/***** UPDATE the third column when the value in the second column = 300 ****/


"RXSQL PREP select_stmt SELECT col2 FROM table1 WHERE col1='WRITER'
     "FOR UPDATE of col3"

'RXSQL PREP stmt2 UPDATE table1 SET col3=:value',
                'WHERE CURRENT OF select_stmt'

/* open the cursor and position it before first row */
'RXSQL OPEN select_stmt'

 Do forever

  /* Position cursor on a row and fetch data */
```

```
    'RXSQL FETCH select_stmt INTO col2_value '

    /* leave the loop when the cursor reaches the end of the result table */
     if SQLCODE=100 then leave
     if col2_value = 300 then
     Do
       /* get the value that you want the column to be updated to  */
       say 'Type in the value you want and press enter'
       parse pull value .
       value="'"value"'"
      'RXSQL CALL stmt2 '
     End

   End

  'RXSQL CLOSE select_stmt'

  'X' COMMIT'
```

The DECLARE statement was not used in the preceding example to illustrate that RXSQL requires the *prepare_name* on the OPEN, FETCH and CLOSE statements, and in the WHERE CURRENT OF clause, when a cursor has not been declared.

Using Dynamic Statements Which Do Not Require a Cursor

To execute SQL statements which do not require a cursor, you have a choice of two different sequences. They are all illustrated as follows:

Sequence 1

Imbed the statement in an EXECUTE IMMEDIATE statement.
EXEC or **EXECUTE IMMEDIATE** *sql_statement*

Sequence 2

Prepare and then execute the statement.
PREPARE *sql_statement*
CALL or **EXECUTE** *sql_statement*

Sequence 1 supports previous versions of DB2 RXSQL.

Sequence 2 provides for preparing a non-cursor statement once and invoking it as often as required while the program is active. This sequence may execute more efficiently if the statement is to be invoked many times.

Using Extended Dynamic Statements in DB2 RXSQL

There are a few basic differences between using Dynamic SQL and Extended Dynamic SQL in RXSQL. The most obvious one is that you have to create a package when using Extended Dynamic SQL. This is **generally** done in a separate REXX program from the program that executes the prepared statements. This minimizes the number of times a statement is prepared.

For introductory illustrations see "Illustrations of Extended Dynamic SQL in RXSQL" on page 87.

Creating a Package

A package is created when the LUW that contains the CREATE PACKAGE statement, is ended by execution of the COMMIT statement. Packages are composed of sections which are added by the Extended PREPARE statement. There are two kinds of sections: those which are permanently filled with an SQL statement, and those which are empty. Those sections which are permanently filled with an SQL statement contain static SQL statements while those which are empty are ready for dynamic SQL statements to be temporarily prepared into them.

The type of section added to a package depends on the format of the Extended PREPARE statement used. Of the four formats of the Extended PREPARE statement, two are used to prepare Static SQL statements, while the other two are used for Dynamic SQL statements.

Static Sections in a Package

- The two formats used to prepare Static SQL are Basic and Single Row.
- The Basic Extended PREPARE statement is used to add a section to a package, and prepare an SQL statement into it.
- The Single Row Extended PREPARE statement is used to add a section to a package, and prepare a SELECT statement that returns only a single row.

Dynamic Sections in a Package

- The remaining two formats of the Extended PREPARE, Empty and Temporary, are used for Dynamic SQL.
- The Empty Extended PREPARE statement adds an empty section to a package.
- The Temporary Extended PREPARE statement fills the empty sections added to the package by the Empty Extended PREPARE.

The Empty Extended PREPARE must be issued in a LUW prior to the LUW that issues the Temporary Extended PREPARE. The package must exist, along with the empty section, before an SQL statement can be prepared into it. The empty section is filled for the duration of the LUW in which the Temporary Extended PREPARE statement is executed. When the LUW ends, the database manager resets the section to its original, empty condition.

There are restrictions on the use of the four formats of the Extended PREPARE statement depending on the type of package you create. You can create a non-modifiable package or a modifiable package.

Non-modifiable Package

A non-modifiable package supports all four formats of the Extended PREPARE statement and thus supports both static and dynamic SQL statements. The Basic, Single Row and Empty Extended PREPARE statements must be executed in the same LUW as the one in which the CREATE PACKAGE was issued. A non-modifiable package cannot be changed after the LUW in which it was created ends. Temporary Extended PREPARE statements must be executed in a later LUW. Static statements that are prepared into a non-modifiable package cannot be executed until package creation is complete, when the LUW ends.

Modifiable Package

In contrast, a modifiable package can be modified after the LUW in which it was created ends. Further, any committed modifications made to the package remain in force for subsequent LUWs. A modifiable package supports only the Basic Extended PREPARE and Single Row Extended PREPARE statement, and thus supports only Static SQL. A modifiable package can exist without any statements in it. Statements can be added to or dropped from a modifiable package at any time. They can also be executed in the same LUW as the one in which they were prepared without the necessity of first completing the creation of the package by committing the LUW.

Using Static Extended Dynamic Statements

When your program issues a Basic or Single Row Extended PREPARE statement, RXSQL returns a section number to your program in a REXX variable to indicate which section of the package your statement is in. Your program must record this number because it is used to refer to the statement when declaring or executing it.

Adding Static Sections to a Package

Static sections containing static statements are added to a package in the following sequence:

CREATE PACKAGE
Basic Extended **PREPARE** or Single Row Extended **PREPARE** *sql_statement*
– The section number is returned in a REXX variable
Write the section number to a file to keep a record of it
COMMIT

There can be many Extended PREPARE statements before the COMMIT WORK statement ends the LUW.

Adding Static Sections for Positioned UPDATE or Positioned DELETE Statements: There must be two statements prepared to execute a Positioned UPDATE or Positioned DELETE statement. The first one is a SELECT statement and the second one is an UPDATE or DELETE statement with a WHERE CURRENT OF *cursor_name* clause. Both the SELECT and the UPDATE or DELETE statements must be prepared into the same package. The following example illustrates this for a Positioned DELETE.

```
'RXSQL XPREP IN pkg1 SELECT col1, col2 FROM table1'
    'FOR UPDATE of col1,col2,col3'
/******* RXSQL returns section number 1 in SQLSTMTN; save it ****/

'RXSQL XPREP IN pkg1 DELETE FROM table1 WHERE CURRENT OF cursor1'
/******* RXSQL returns section number 2 in SQLSTMTN; save it ****/
```

The program that declares the cursor and executes the statements references the same *cursor_name* (cursor1) as the second XPREP statement. The cursor declared to retrieve rows must reference the section number (1) returned by the first XPREP statement. To delete a row satisfying the program requirements, the DELETE statement is invoked by referencing the section number (2) returned from the second XPREP statement. For example,

```
'RXSQL DECLARE cursor1 CURSOR FOR 1 IN pkg1'
/* cursor1 is the name of the query_cursor                    */

'RXSQL DECLARE delstmt FOR 2 IN pkg1'
/* delstmt will be referenced in an Extended CALL request      */
```

The SELECT statement must have a FOR UPDATE OF clause when

1. the package was created with the BLOCK option and
2. your program is preparing a Positioned UPDATE statement or, as in the example above, a Positioned DELETE statement.

The FOR UPDATE OF clause is necessary to turn off blocking.

Executing Static Extended Dynamic Statements in a Package

After a package is created, a second REXX program defines the cursor or executes the prepared statements by referring to the saved section number. The sequences of statements you can choose from for the second REXX program are similar to the sequences for cursor and non-cursor statements illustrated earlier.

Executing Static Extended Dynamic Query or INSERT Statements

To use *query_cursors* or *insert_cursors* in static Extended Dynamic SQL your program must issue the following RXSQL statements:

```
Extended DECLARE cursor_1 FOR section-1 IN pkg4
OPEN cursor_1
    FETCH or PUT row using cursor_1
    end loop
CLOSE cursor_1
```

Executing Static Extended Dynamic Positioned UPDATE or Positioned DELETE Statements

Two statements must be prepared to execute a Positioned UPDATE or Positioned DELETE statement. One is a prepared SELECT statement while the other is an UPDATE or DELETE statement with a WHERE CURRENT OF clause. The *cursor_name* in the WHERE CURRENT OF clause must have the same name as the *cursor_name* referenced in the DECLARE, OPEN, FETCH and CLOSE statements.

To execute a Positioned UPDATE or Positioned DELETE statement in static Extended Dynamic SQL, you have a choice of two sequences depending on whether a *statement_name* is declared for the Positioned UPDATE or Positioned DELETE statement.

If declared, the *statement_name* may be used in subsequent Extended CALL requests for the statement. Otherwise, the *section_number* and *package_name* must be used in subsequent Extended EXECUTE or XCALL requests for the statement.

The sequences are illustrated as follows:

Sequence 1:

```
Extended DECLARE cursor_1 FOR section-1 IN pkg1
Extended DECLARE stmt2 FOR section-2 IN pkg1
OPEN cursor_1
    begin loop
    FETCH row using cursor_1
    if the row satisfies the Positioned UPDATE or Positioned DELETE
        Extended CALL stmt2
    end loop
CLOSE cursor_1
```

Sequence 2:

```
Extended DECLARE cursor_1 FOR section-1 IN pkg1
OPEN cursor_1
    begin loop
    FETCH row using cursor_1
    if the row satisfies the Positioned UPDATE or Positioned DELETE
        Extended EXECUTE or XCALL section-2 IN pkg1
    end loop
CLOSE cursor_1
```

Executing Static Extended Dynamic Statements Not Requiring a Cursor

To execute static Extended Dynamic statements which do not require a cursor, you have a choice of two sequences.

Sequence 1: DECLARE and execute the statement.

Note: This sequence is unique to RXSQL.

Extended **DECLARE stmt_1 FOR** `section-1` **IN pkg3**
Extended **CALL** `stmt_1`

The Extended DECLARE statement gives a name to a prepared statement which is used on the Extended CALL.

Sequence 2: Execute the statement directly.

Extended **EXECUTE** or **XCALL FOR** `section-1` **IN** `pkg3`

Using Dynamic Extended Dynamic Statements

The Empty Extended PREPARE and Temporary Extended PREPARE support dynamic access to data. The Empty Extended PREPARE statement is used to add empty sections to your package. Then the Temporary Extended PREPARE statement is used to temporarily fill these empty sections. Empty sections are added to your package in the same LUW in which the package is created, while the Temporary Extended PREPARE statement is issued in a separate LUW.

When your program issues an Empty Extended PREPARE statement, RXSQL returns a section number to your program indicating which section of the package your statement is in. The section number must be saved to be used by a subsequent Temporary Extended PREPARE statement.

Adding Dynamic Sections to a Package

Dynamic sections are empty when they are added to a package so that statements can be dynamically prepared into them when the program is executing. The following sequence illustrates how empty sections are added to a package.

CREATE PACKAGE
Empty Extended **PREPARE**
– The section number is returned in a REXX variable
Write the section number to a file to keep a record of it
COMMIT

There can be many Static or Dynamic sections added to a package before the COMMIT statement ends the LUW. Two Dynamic sections must be available to execute a Dynamic Positioned UPDATE or a Positioned DELETE statement.

Executing Dynamic Extended Dynamic Statements in a Package

By preparing an Empty Extended PREPARE statement into your package, you have an empty section that is dynamically filled in a separate LUW by a Temporary Extended PREPARE statement.

Executing Dynamic Extended Dynamic Query or INSERT Statements

To use *query_cursors* or *insert_cursors* in dynamic Extended Dynamic SQL, your program must issue the following RXSQL statements:

```
Temporary Extended PREPARE FOR section-5 IN pkg1 sql_statement
Extended DECLARE cursor_5 FOR section-5 IN pkg1
OPEN cursor_5
    begin loop
    FETCH or PUT row using cursor_5
```

```
        end loop
    CLOSE cursor_5
```

Executing Dynamic Extended Dynamic Positioned UPDATE or Positioned DELETE Statements

To execute a Positioned UPDATE or Positioned DELETE statement in dynamic Extended Dynamic SQL you have a choice of two sequences depending on whether a *statement_name* is declared for the Positioned UPDATE or Positioned DELETE statement.

If declared, the *statement_name* may be used in subsequent Extended CALL requests for the statement. Otherwise, the *section_number* and *package_name* must be used in subsequent Extended EXECUTE or XCALL requests for the statement.

The sequences are illustrated as follows:

Sequence 1:

```
    Temporary Extended PREPARE sql_stmt_1 into section-11 IN pkg1
    – sql_stmt_1 is a SELECT statement with a FOR UPDATE OF clause.
    Temporary Extended PREPARE sql_stmt_2 into section-12 IN pkg1
    – sql_stmt_2 is an UPDATE statement with a WHERE CURRENT OF
      cursor_sel clause.
    Extended DECLARE cursor_sel FOR section-11 IN pkg1
    Extended DECLARE upd_stmt FOR section-12 IN pkg1
    OPEN cursor_sel
        begin loop
        FETCH row using cursor_sel
        if the row satisfies the conditions for Positioned UPDATE
            CALL upd_stmt
        end loop
    CLOSE cursor_sel
```

Sequence 2:

```
    Temporary Extended PREPARE sql_stmt_1 into section-11 IN pkg1
    – sql_stmt_1 is a SELECT statement with a FOR UPDATE OF clause.
    Temporary Extended PREPARE sql_stmt_2 into section-12 IN pkg1
    – sql_stmt_2 is an UPDATE statement with a WHERE CURRENT OF
      cursor_sel clause.
    Extended DECLARE cursor_sel FOR section-11 IN pkg1
    OPEN cursor_sel
        begin loop
        FETCH row using cursor_sel
        if the row satisfies the conditions for Positioned UPDATE
            Extended EXECUTE or XCALL section-12 IN pkg1
        end loop
    CLOSE cursor_sel
```

Executing Dynamic Extended Dynamic Statements Not Requiring a Cursor

When executing statements which do not require a cursor you have a choice of two sequences depending on whether a *statement_name* is declared for the statement.

If declared, the *statement_name* may be used in subsequent Extended CALL requests for the statement. Otherwise, the *section_number* and *package_name* must be used in subsequent Extended EXECUTE or XCALL requests for the statement.

The sequences are illustrated as follows:

Sequence 1: Prepare the statement, declare the statement to name it, then invoke it.

Note: This sequence is unique to RXSQL.
  Temporary Extended **PREPARE** *sql_statement* into `section-3` **IN** `pkg6`
  Extended **DECLARE** `stmtx` **FOR** `section-3` **IN** `pkg6`
  Extended **CALL** `stmtx`

Sequence 2: Prepare the statement and invoke it.
  Temporary Extended **PREPARE** *sql_statement* into `section-3` **IN** `pkg6`
  Extended **EXECUTE** or **XCALL** `section-3` **IN** `pkg6`

Chapter 9. Coding DB2 RXSQL Requests

Delimiting and Continuing DB2 RXSQL Requests

You code your DB2 RXSQL requests as part of your REXX program. When DB2 RXSQL receives the first RXSQL or EXECSQL request, it loads RXSQL as a nucleus extension.

Delimiting RXSQL Requests

You should surround your RXSQL requests with paired single or double quotes so the REXX interpreter, recognizing a literal string, does not treat any of the words as REXX variables and resolve them before passing the string on to RXSQL. The REXX interpreter strips off the paired quotes before passing the statement to RXSQL.

This means that your program can have two different types of quotes included as part of your RXSQL request. For example:

```
"RXSQL PREPARE stmt UPDATE table SET col2=100 WHERE col1='salary' "
```

would be passed to RXSQL as:

```
RXSQL PREPARE stmt UPDATE table SET col2=100 WHERE col1='salary'
```

Continuing RXSQL Requests

If your RXSQL request is too long for one line, you can end the line with a comma and start the remainder of the request on a new line. The REXX interpreter recognizes the comma as a continuation character and replaces it with a blank after concatenating the two strings. The comma must be outside a paired set of quotes as illustrated in the following diagram.

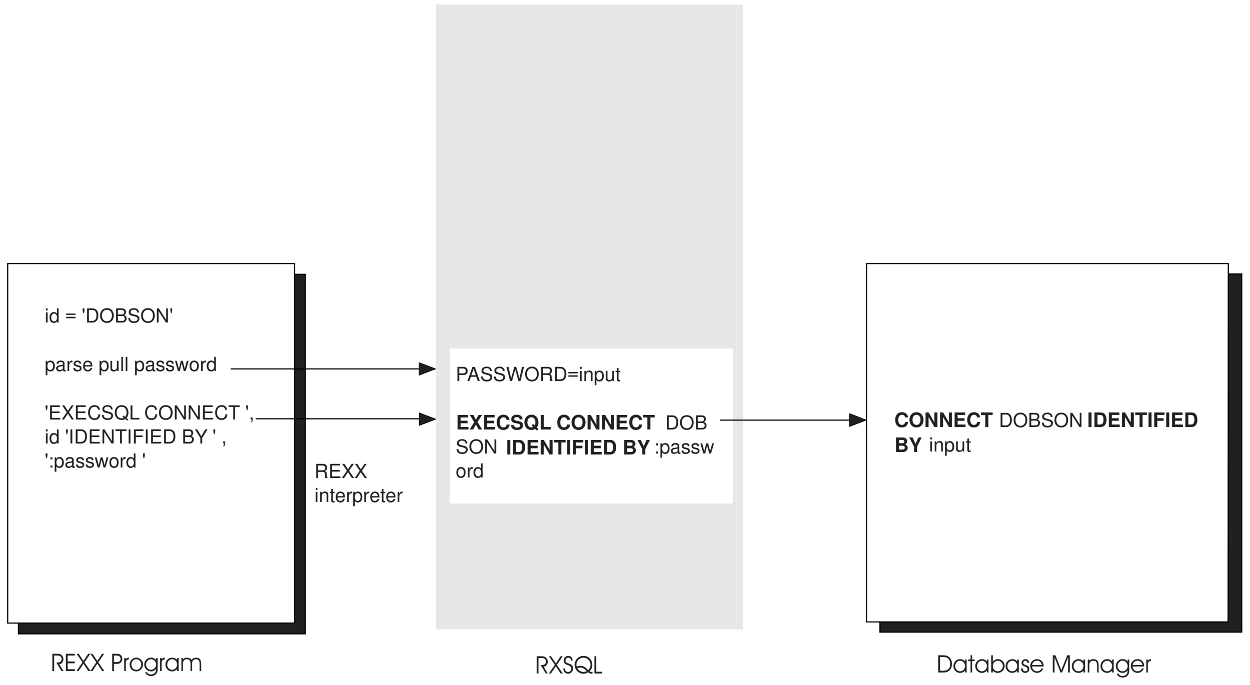

id = 'DOBSON'
parse pull password
'EXECSQL CONNECT ', id 'IDENTIFIED BY ' , ':password '
REXX interpreter
PASSWORD=input
EXECSQL CONNECT DOBSON IDENTIFIED BY :password
CONNECT DOBSON IDENTIFIED BY input
REXX Program
RXSQL
Database Manager

Figure 32. RXSQL Request Processing

This illustrates what happens to a RXSQL request as it gets passed from your program to RXSQL, and from RXSQL to the database manager. When you want the REXX interpreter to resolve a variable you leave it outside the quotes like `id`, and when you want RXSQL to resolve the variable you code it inside quotes and, in most cases, precede it with a colon like `:password`.

Elements of RXSQL Requests

Each RXSQL request is composed of many elements.

When the REXX interpreter is finished with the RXSQL request, it is passed to DB2 RXSQL. DB2 RXSQL then validates the elements and either executes the request or passes it to the database manager.

Keywords

DB2 RXSQL

1. translates your request to upper case to prepare for a keyword search,
2. checks that your keywords are correctly typed and are in the correct positions of your DB2 RXSQL request.

Note: For keyword scanning, DB2 RXSQL uses rules consistent with folding lowercase characters to uppercase using code page 037. See the *DB2 Server for VM System Administration* manual.

String of Characters

A string of characters is a sequence of bytes that RXSQL passes directly to the database manager. RXSQL will not change any part of the string of characters before passing it to the database manager.

Ordinary Identifiers

An *ordinary identifier* is an uppercase letter followed by zero or more characters, each of which is an uppercase letter, a digit, or the underscore character. RXSQL passes ordinary identifiers directly to the database manager for validation. A complete description can be found in the *DB2 Server for VSE & VM SQL Reference* manual.

Parameter Markers

A parameter marker is a question mark (?) that is used wherever a *variable_name* could be used in an SQL statement being processed by a PREPARE statement. RXSQL passes values for the parameter markers when the prepared statement is executed by a CALL, EXECUTE, OPEN or PUT statement.

Placeholders

Placeholders are periods (.) used in place of *rexx_host_variables* when retrieving data from the database manager. These are easy to code, but if performance is a concern you should restrict your select list to the columns of data that your REXX program needs. Placeholders may not have associated *indicator_variables* or *variable_qualifiers*.

REXX Variable Name

The term REXX variable name is used to distinguish between the name of a variable and its value. This distinction is important to RXSQL users because the REXX interpreter processes each RXSQL request before it is passed to RXSQL, and RXSQL often expects a REXX variable name, not a REXX variable value as input. To ensure that the REXX interpreter does not resolve a variable before it is passed to RXSQL, it must be enclosed in paired single or double quotes. The REXX interpreter then removes the quotes and passes the REXX variable name to RXSQL without resolving it. RXSQL retrieves the value of the REXX variable before passing the request to the database manager.

The valid status of a REXX variable name, as checked by the REXX SYMBOL function, can be LIT or VAR. It will be LIT if the REXX variable name has never been assigned a value, or if the REXX variable name has been dropped by the REXX DROP instruction. The variable status may be used to determine if a column has a value or is NULL. Note that there is a difference between a variable having a value consisting of an empty string and the variable representing a NULL value.

RXSQL and EXECSQL Invocation

There are two ways that the REXX interpreter will recognize a DB2 RXSQL request. One is when a command begins with the keyword **RXSQL**, and the other is when a command begins with the keyword **EXECSQL**. Error handling and the syntax rules vary with the way that a DB2 RXSQL request was invoked. This allows DB2 RXSQL to support two different rules of syntax; one to support programs developed for previous versions of RXSQL (RXSQL invocation) and the other to support enhanced error handling (EXECSQL invocation). The terms RXSQL invocation and EXECSQL invocation are used to distinguish the different processing rules. The different processing rules for the two invocations are discussed throughout this chapter.

You are strongly encouraged to use EXECSQL invocation when writing new applications to take advantage of the enhanced error handling.

When you are using RXSQL in an RXSQL or EXECSQL subcommand environment, the keyword EXECSQL or RXSQL always overrides the current RXSQL or EXECSQL subcommand environment. For more information see “Appendix I. RXSQL Subcommand Environment” on page 251.

RXSQL Request Syntax

You invoke the DB2 RXSQL interface by issuing DB2 RXSQL requests. Each request begins with either keyword `EXECSQL` or `RXSQL`, and is followed by a command or statement and then one or more clauses. The clauses may contain metavariables which represent variable values specified when the request is coded.

The following syntax diagram illustrates this:

```
                                    ┌─.──────────────────────────────┐
                 (1)                ▼                                │
►►──┬─EXECSQL─┬──────────┬─Command───┬───┬─────────┬──┬──────────────┬─┴────────────────►◄
    └─RXSQL───┘          └─Statement─┘   └─KEYWORD─┘  └─metavariable─┘
```

Notes:

1 RXSQL and EXECSQL must be in uppercase when you are using RXSQL in the address command environment.

Command

Statement
An action for the database manager, or a request that is specific to RXSQL. A DB2 RXSQL request may be either a statement or a command. These are illustrated in Table 6 on page 121.

KEYWORD
Part of the RXSQL request. The keywords and metavariables together are called clauses.

metavariables
The following list describes the possible metavariables that are used by DB2 RXSQL. Other metavariables used by the database manager, are passed directly to the database manager without being examined by DB2 RXSQL.

attributes_variable
A REXX variable name with an optional preceding colon whose value is a list of one of more data types, lengths and CCSIDs describing the parameter markers used in the SQL statement. For a description of the valid values allowed in the *attributes_variable*, refer to Figure 34 on page 150.

authorization_name
A string of 1 to 8 characters designating an SQL authorization ID. In DB2 RXSQL any character is allowed except the X'00'. See the *DB2 Server for VSE & VM SQL Reference* manual for details on authorization names.

Note: X'00' is allowed by other host languages supported by the database manager.

cursor_name

statement_name

A *cursor_name* is a string of characters that represents a cursor for an SQL SELECT or INSERT statement.

A *statement_name* is a string of characters that represents a prepared SQL statement.

Names can have a maximum length of 18 characters. They must begin with a letter (A–Z or a–z) or a symbol ($, #, or @). The remaining characters can be letters (A–Z or a–z), symbols ($, #, or @), numbers (0–9), or underscores (_). Leading and trailing blanks are removed. DB2 RXSQL does not allow DBCS characters. DB2 RXSQL folds lowercase characters into uppercase. This means that you cannot have two cursors with names `abc` and `ABC`, for example.

Notes:

1. The $, #, and @ characters are all from code page 037. If you are not using code page 037 then you can substitute equivalent values. See the *DB2 Server for VM System Administration* manual.
2. DB2 RXSQL folds lowercase characters to uppercase characters using different rules from those used by ISQL, DBSU and the DB2 Server for VM relational database manager.

The *cursor_name* or *statement_name* cannot be the same as any other *cursor_name* or *statement_name* defined in the program.

Note: This is more restrictive than for other host languages supported by the database manager which allow *statement_names* and *cursor_names* to have the same value.

function_number

trace_level

The function number and trace level that are specified when using the TRACE command. See "TRACE" on page 161 for a list of the valid values.

operator_command

A string of characters which form an DB2 Server for VM operator command that DB2 RXSQL passes directly to the database manager. The string does not have to be enclosed in quotations. See the *DB2 Server for VSE & VM Operation* manual for a complete list of operator commands.

option

An option used in the CREATE PACKAGE statement as listed in the *DB2 Server for VSE & VM SQL Reference* manual. DB2 RXSQL passes this value directly to the database manager.

package_name

The name of a package in which SQL statements are stored. Its structure is as follows:

package_name

```
►►──authorization_name──.──package_id──────────────────────────────►◄
```

package_id
A short ordinary identifier.

password
A string of 1 to 8 characters designating an SQL password. In DB2 RXSQL, any character is allowed except the X'00'.

Note: X'00' is allowed by other host languages supported by the database manager.

rexx_host_stem_name
A *rexx_host_stem_name* is composed of a *main_stem* and an optional *indicator_stem*. Its structure is as follows:

rexx_host_stem_name on EXECSQL invocation

```
►►─┬──────┬──────────────┬─────┬──────────────────────────────────────────┬─┬─►◄
   │└─:─┘ └─main_stem.─┘ │     └─┬───────────┬─┬───┬──┬────────────────┬─┘ │
   │                     │       └─INDICATOR─┘ └─:─┘  └─indicator_stem.─┘   │
   └─┬───┬─┬────────────┬─┬───┬─┬─────────────────┬───────────────────────┘
     └─:─┘ └─main_stem.─┘ └─:─┘ └─indicator_stem.─┘
```

rexx_host_stem_name on RXSQL invocation

```
►►───┬─┬───┬─┬────────────┬──────────────────────────┬───────────────►◄
     │ └─:─┘ └─main_stem.─┘                          │
     └─┬───┬─┬────────────┬─┬───┬─┬─────────────────┬┘
       └─:─┘ └─main_stem.─┘ └─:─┘ └─indicator_stem.─┘
```

main_stem
A REXX stem variable name that has an optional preceding colon and a trailing period.

indicator_stem
A REXX stem variable name that has a mandatory preceding colon and a trailing period.

DB2 RXSQL assigns to the *main_stem* variables the values of the row in the result table, and to the *indicator_stem* variables the indicator values passed from the database manager. DB2 RXSQL sets the first element of the *main_stem* and the *indicator_stem* variables (stem.0) to the number of columns returned from the database manager, and the remaining variables (stem.n) to the *n*th column value and *n*th indicator value.

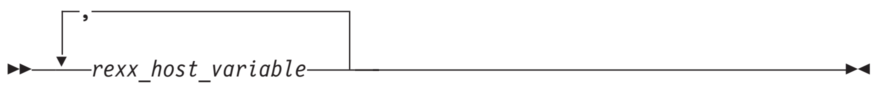
For example, suppose you have a REXX variable where:
- The stem is `abc.ln.`
- The variable `ln` in the program has the value D
- Four columns are in the result.

DB2 RXSQL sets the variables as follows:

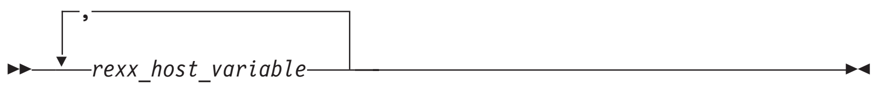
```
ABC.D.0 = 4 (number of columns returned)
ABC.D.1 = first column value
ABC.D.2 = second column value
ABC.D.3 = third column value
ABC.D.4 = fourth column value
```

rexx_host_variable_list
A *rexx_host_variable_list* is a list of *rexx_host_variables*, structured as follows:

rexx_host_variable_list on EXECSQL invocation



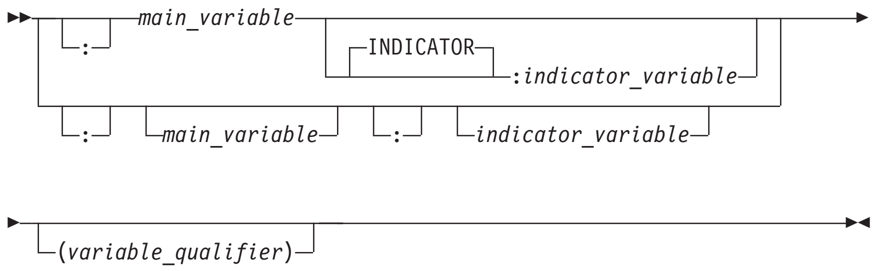
rexx_host_variable_list on RXSQL invocation



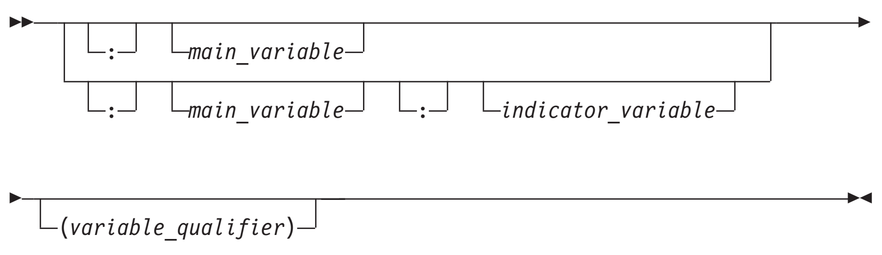
rexx_host_variable
Rexx_host_variables are used to pass and receive data between the program and the database. There are three parts to a *rexx_host_variable*: the *main_variable*, the *indicator_variable*, and the *variable_qualifier*.

A *rexx_host_variable* is structured as follows:

rexx_host_variable on EXECSQL invocation



rexx_host_variable on RXSQL invocation



main_variable
: A REXX variable name. The value of this variable is either used as input to the database manager or it is assigned with output from the database manager.

indicator_variable
: A REXX variable name. The value of this variable contains the input or output indicator value.

variable_qualifier
: A valid data type with an optional CCSID for input or output data. The data types are listed under "Data Type" on page 111.

  See the next section for a complete discussion of REXX Host Variables.

section_number
: The integer by which a section in a package is referenced when using Extended Dynamic SQL.

server_name
: A long ordinary identifier that designates an application server.

sql_statement
: A string of characters that forms an SQL statement. DB2 RXSQL passes this string to the database manager.

variable_name
: A REXX variable name with a mandatory preceding colon. DB2 RXSQL fetches the value of the *variable_name* and passes the value to the database manager when the statement containing this metavariable is executed. The value of the *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

REXX Host Variable

Your program uses *rexx_host_variables* for passing data between the database and your program. The *n*th *rexx_host_variable* corresponds to the *n*th column referenced.

There are differences in the way *rexx_host_variables* are coded that depend on the way the RXSQL request is invoked.

EXECSQL Invocation

On EXECSQL invocation,

- *rexx_host_variables* must be separated by commas in a *rexx_host_variable_list*.

- The indicator variable may be separated from its associated variable by blanks, the keyword INDICATOR, or it may directly follow the associated variable.
- Colons are optional for main variables, but their use is strongly recommended.

EXECSQL Invocation Examples:

```
'EXECSQL FETCH cursor INTO :name:indicator1, :department:indicator2'

'EXECSQL FETCH cursor INTO :name :indicator1, :department :indicator2'

'EXECSQL FETCH cursor INTO :name:indicator1,:department:indicator2(SMALLINT)'

'EXECSQL FETCH cursor INTO :name',
    'INDICATOR :indicator1(CHAR(25)),:department:indicator2(SMALLINT)'
```

RXSQL Invocation

On RXSQL invocation,

- *rexx_host_variables* may be separated by commas or blanks in a *rexx_host_variable_list*
- the indicator variable must follow the associated *main_variable* with no intervening blanks

RXSQL Invocation Examples:

```
'RXSQL FETCH cursor INTO :name:indicator1 :department:indicator2'

'RXSQL FETCH cursor INTO :name:indicator1(CHAR(25))',
                        ':department:indicator2(SMALLINT)'

'RXSQL FETCH cursor INTO :name:indicator1(CHAR(25)),',
                        ':department:indicator2(SMALLINT)'
```

Main_variable

A *main_variable* is a fully qualified REXX variable name with an optional preceding colon. RXSQL fetches the value of this variable on input or assigns a value to this variable on output.

Input: DB2 RXSQL must infer the data type of your input values, when inserting data and variable qualifiers have not been specified, because REXX variables do not have assigned data types. The rules that RXSQL follows to determine the data type of your input values are outlined under “Inferring the Data Type” on page 113. Variable qualifiers are discussed under “Variable_qualifier” on page 111.

Output: *Rexx_host_variables* in a list are set in order starting with the first column result. You should be careful in your naming of the *main_variables* and *indicator_variables* in the list of *rexx_host_variables*. If a *main_variable* is used within a compound variable name elsewhere in another *main_variable*, unexpected value assignments will result. The following example illustrates this.

```
n=5
'RXSQL FETCH row INTO :first.col.n,:col,:third.col.n '
```

The values returned from the database are respectively: fun, for, all.

REXX Variable Name	REXX Variable Name after resolved by the REXX interpreter	Variable Value
first.col.n	FIRST.COL.5	fun
col	COL	for
third.col.n	THIRD.FOR.5	all

Now, if the program tries to reference `first.col.n`, REXX translates all references to it as `FIRST.for.5`. This variable is undefined and will return a literal value equal to the variable name. The value `fun` that was assigned to the first column is not accessible unless the variable `COL` is dropped.

Indicator_variable

An *indicator_variable* is a REXX variable name that is preceded by a colon. Your program assigns a value to the indicator on input, and RXSQL assigns the value on output. The value of the *indicator_variable* must be zero or a positive or negative integer.

Input: When used on input, an *indicator_variable* is used to indicate whether the *main_variable* is null. *Indicator_variables* are used as described in the following table.

Table 3. Indicator Variable Values On Input

Invocation	Main_variable Status	Indicator_variable Value	Main_variable Value Passed to the Database Manager
EXECSQL	VAR	>= 0	not null
EXECSQL	VAR	< 0	null
EXECSQL	VAR	indicator_variable not used	not null
EXECSQL	LIT	>= 0	generates an RXSQL error condition
EXECSQL	LIT	< 0	null
EXECSQL	LIT	indicator_variable not used	generates an RXSQL error condition
RXSQL	VAR	>= 0	not null
RXSQL	VAR	< 0	null
RXSQL	VAR	indicator_variable not used	not null
RXSQL	LIT	>= 0	generates an RXSQL error condition
RXSQL	LIT	< 0	null
RXSQL	LIT	indicator_variable not used	null
Note: *Main_variable* status is available using REXX function SYMBOL('*main_variable*')			

Output: On output, RXSQL assigns to the *indicator_variable* the value that the database manager passes to DB2 RXSQL. Refer to the *DB2 Server for VSE & VM Application Programming* manual for information on possible *indicator_variable* values on output.

If the column value is NULL, then *indicator_variable* is assigned a value according to the following table.

Table 4. Indicator Variable Value On NULL Output

Invocation	Main variable	Indicator variable	Value of Indicator variable after FETCH	Value of Main variable value after FETCH
EXECSQL	present	present	< 0	unchanged

Table 4. Indicator Variable Value On NULL Output (continued)

Invocation	Main variable	Indicator variable	Value of Indicator variable after FETCH	Value of Main variable value after FETCH
EXECSQL	present	absent	generates an RXSQL error condition	unchanged
RXSQL	present	present	< 0	unchanged
RXSQL	present	absent	not applicable	undefined

As the table illustrates, you must provide an *indicator_variable* when using the EXECSQL invocation if

- there are NULL values in the columns of the table referenced in the SELECT statement or
- a derived result column can develop a numeric conversion error resulting in a NULL value.

Variable_qualifier

You can use *variable_qualifiers* on input and output to specify how you want the data stored in the *main_variables* to be sent to the database manager or how you want to retrieve data into the *main_variables*. When the *main_variable* has a data type supporting a Coded Character Set Identifier (CCSID), the CCSID can be specified following the data type. There must be at least one blank between the data type and the CCSID keyword.

If no data type is given for a *main_variable* then RXSQL will infer the data type according to the rules in "Inferring the Data Type" on page 113. If no CCSID is given for a *main_variable*, then the CCSID defined on the application server is used to perform the operation.

Data Type

The data type is specified first, and can be any of the following:

INTEGER
SMALLINT
REAL - for single precision float
FLOAT - for double precision float
DECIMAL(*m*,*n*) - where *m* = precision, *n* = scale
CHAR(*n*) - where *n* is an integer
VARCHAR(*n*)
LVARCHAR(*n*)
GRAPHIC(*n*)
VARGRAPHIC(*n*)
LVARGRAPHIC(*n*)

Note: ZDECIMAL(*m*,*n*) is also allowed when using the DRDA protocol.

Your program inserts DATETIME data by specifying a CHAR(*n*) data type, where *n* is the length of the DATETIME data string.

CCSID

The CCSID is specified after the data type as `CCSID` *n*. To specify FOR BIT DATA, set the CCSID to 65535.

Input: On input, the *variable_qualifier* specifies the data type to which you want DB2 RXSQL to convert the input data before passing it to the database manager. Input data is stored in the *main_variable*.

The following is an example of a statement that uses an input *variable_qualifier*:

```
OPEN cursor1 USING :v1:i1(VARCHAR(10) CCSID 500), :v3(INTEGER)
```

For numeric data, when the value of the *main_variable* is too large for, or cannot be converted to the data type specified in the *variable_qualifier*, DB2 RXSQL returns an error indicating that the data would be corrupted if it was passed to the database manager. However, if low order truncation for decimal data occurs because data after the decimal point was lost, then DB2 RXSQL passes the truncated data to the database manager and returns a warning condition.

For character and graphic data, either fixed or variable length, if the variable's data length is larger than specified by the variable qualifier, the data will be truncated on the right. For fixed length character or graphic data, if the variable's data length is shorter than specified by the variable qualifier, then the data is padded with blanks on the right.

Output: On output you can specify the data type and CCSID to which you want a column value being retrieved from the database to be converted. In this case, the database manager does the conversion before the data is passed to RXSQL. For example, you may want data from a column defined as `VARCHAR(20) CCSID 290` to be returned to your program as `CHAR(26) CCSID 500`. If the value returned to this program is less than 26 characters, the database manager will pad the end of the string with blanks and convert it to CCSID 500.

The following is an example showing how to code a *variable_qualifier* on output:

```
'EXECSQL FETCH cursor2 INTO:v1:i1(CHAR(26) CCSID 500),:v2(CCSID 500),:v3'
```

Passing Data from Your REXX Program to RXSQL

When your program passes input data from REXX to the database manager in a CALL, EXECUTE, OPEN or PUT statement, RXSQL must assign a data type and determine whether the input value is NULL. RXSQL assigns a data type to your input data according to the information you provide. If you use *variable_qualifiers*, then RXSQL will assign the data type you specified to the input data before passing it to the database manager. If you do not use *variable_qualifiers*, then RXSQL must infer the data type. Using *variable_qualifiers* is strongly recommended.

When you are using Extended Dynamic SQL you also have the option to provide attributes of input data when you are preparing the SQL statements. The attributes are used by the database manager to help build the access path which the optimizer uses when executing the prepared statements.

All of the ways to specify input data are discussed in the following section.

Using REXX Host Variables to Pass Input Data

Recognizing NULL Values

RXSQL recognizes NULL input values in two ways: a negative *indicator_variable*, or a *main_variable* with an unassigned value. The REXX DROP instruction makes a variable unassigned.

When your DB2 RXSQL request begins with the keyword `EXECSQL`, you must use *indicator_variables* to insert NULL values.

Using Variable Qualifiers to Assign a Data Type

You can use *variable_qualifiers* to specify the data type and CCSID of your input data. See “REXX Host Variable” on page 108. When you use *variable_qualifiers*, DB2 RXSQL will change your input data to the format requested before passing it to the database manager.

Specifying the CCSID: You can override the CCSID of any column for which CCSIDs are allowed by specifying the CCSID after the data type in the *variable_qualifier*.

You can determine the CCSID of a column using a DESCRIBE request for a prepared SELECT statement. The CCSID of each column is returned in a DB2 RXSQL variable.

Inferring the Data Type

After RXSQL retrieves the value of the *main_variable* from REXX, the following rules are used when assigning a data type if a *variable_qualifier* is not used:

Character Data: A string of characters enclosed in paired single quotation marks is a character string. RXSQL removes the leading and trailing quotation marks before passing the character string to the database. A string of characters enclosed in paired double quotation marks is passed with the quotation marks. DB2 RXSQL assumes an empty string is a character string, not a NULL value. A string which does not follow the rules for numeric or graphic data will be assigned a character data type.

To guarantee that RXSQL converts a string to a character data type, ensure that the first and last characters of the string value are single quotation marks. Simply assigning a value in single or double quotes does not work. For example,

```
stringvar='100'
```

will cause REXX to set the REXX variable `stringvar` to the string of characters 100 (without the single quotes) before passing it to RXSQL. RXSQL will assign a data type of integer to the string, and pass it to the database manager without the single quotes. On the other hand, if `stringvar=100`, then,

```
stringvar="'"stringvar"'"
```

will cause REXX to set the REXX variable `stringvar` to the string of characters ’100’ (with single quotes). RXSQL assumes that the string has a data type of character because it is enclosed with leading and trailing single quotes, and passes the string to the database manager without the single quotes.

Your input values will be assigned the current default CCSID. You must use *variable_qualifiers* if you want to specify the CCSID of your input data.

Graphic Data: Graphic data is recognized by RXSQL in two different ways, depending on how the request was invoked.

Invocation	**Graphic data attributes**
EXECSQL	A string that has a leading `G` followed by a single quote, a shift-out character ('0E'X), an even number of bytes, a shift-in character ('0F'X), and ends with a single quote is assigned a data type of VARGRAPHIC. RXSQL strips off the leading `G`, single quote and shift-out along with the trailing shift-in and single quote before passing the string to the database as VARGRAPHIC.
RXSQL	A string that has a leading shift-out character, a trailing shift-in

character, and contains an even number of bytes is assigned a graphic data type. RXSQL strips off the leading shift-out and the trailing shift-in characters before passing the string to the database as VARGRAPHIC. To ensure that MIXED data is passed to the database manager as VARCHAR, it must be enclosed in single quotes.

Table 5 expands the above descriptions. Shift-out and shift-in characters are represented by the symbols < and >, respectively.

Table 5. Input Data Inferred as Character or Graphic Data Types

Data	**Invoked by**	**Data modification**	**Data sent to the database manager**
<...even...>	EXECSQL		VARCHAR
	RXSQL	strip <>	VARGRAPHIC
G'<...even...>'	EXECSQL	strip G'< >'	VARGRAPHIC
	RXSQL		VARCHAR
'.......'	EXECSQL	strip ' '	VARCHAR
	RXSQL	strip ' '	VARCHAR
<...odd....>	EXECSQL		VARCHAR
	RXSQL		VARCHAR
G'<...odd>'	EXECSQL		VARCHAR
	RXSQL		VARCHAR
<...>...	EXECSQL		VARCHAR
	RXSQL		VARCHAR
G'<...>'...	EXECSQL		VARCHAR
	RXSQL		VARCHAR
...<...&gt	EXECSQL		VARCHAR
	RXSQL		VARCHAR
...G'<...>'	EXECSQL		VARCHAR
	RXSQL		VARCHAR
Note: The symbols ... represent any characters including < or >			

Numeric Data: Numeric data can be passed to the database manager as one of the three following data types:

FLOAT	A number in scientific or engineering notation. For example, a number followed immediately by an E or an e, an optional plus or minus sign, and a series of digits.
DECIMAL	A number with a decimal point is passed as a DECIMAL(*m*,*n*), where *m* indicates precision and *n* indicates scale. It can have a leading plus or minus sign.
INTEGER	A number with neither decimal point nor exponent. It can have a leading plus or minus sign.

If a number is not within the allowed numeric SQL limits supported by the database manager, then RXSQL will pass it to the database as a character string. See the *DB2 Server for VSE & VM SQL Reference* manual for information on SQL limits.

Datetime Data: When your program is inserting data into a DATE, TIME or TIMESTAMP column, then RXSQL passes your data directly as a character string.

Specifying Attributes of Input Data Using Extended PREPARE

When your program issues an Extended PREPARE statement, it can use *attributes_variables* to provide information about parameter markers in the prepared statement if the data types of the values that will replace the parameter markers are known. However, this does not prevent DB2 RXSQL from assigning a data type when the prepared statements are executed by the Extended CALL, Extended EXECUTE, OPEN and PUT statements as discussed in the previous sections.

Passing Data from RXSQL to Your REXX Program

DB2 RXSQL returns the results of requests in three ways:
- Setting REXX variables your program has defined
- Setting predefined RXSQL variables
- Setting the return code (rc).

Passing Output Data from the Database Manager to REXX Variables

When your program issues a FETCH, Extended CALL, or Extended EXECUTE statement to retrieve data from the database, DB2 RXSQL passes output to the program as requested, using either *rexx_host_variables* or a *rexx_host_stem_name*.

Using REXX Host Variables for Output Data

When your program uses *rexx_host_variables* to receive output data, DB2 RXSQL sets the *main_variable* and the *indicator_variable*, if supplied, for each column of data requested. The *main_variable* is set to the value of the output data according to the *variable_qualifier* setting, if provided, and the *indicator_variable* is set to the value that the database manager passes to RXSQL.

Handling Null Values

For EXECSQL invocation, if your program does not provide *indicator_variables*, DB2 RXSQL may return an error condition for FETCH, Extended CALL or Extended EXECUTE.

You can test for a NULL value returned by checking the *indicator_variable* as follows:

```
If column4ind < 0 then column4 = '?'
```

This example sets the `column4` variable to `?` if the result is NULL as indicated by its corresponding *indicator_variable* `column4ind`.

For more information, see "Indicator_variable" on page 110.

For RXSQL invocation, if your program does not provide *indicator_variables* for FETCH, Extended CALL or Extended EXECUTE, then RXSQL will drop the *main_variable* when the column value is NULL.

Do not test for '' (empty string) as if it were a NULL. '' is a valid non-NULL value. You can use the REXX function SYMBOL to test whether a variable is undefined as illustrated in the following example:

```
If SYMBOL('column5') <> 'VAR'
then column5 = '?'
```

This example sets the `column5` variable to `?` if the result is NULL. DB2 RXSQL has done the equivalent of the following REXX instruction:

```
drop column5
```

Using REXX Host Stem Names for Output Data

Your program can also use a *rexx_host_stem_name* to receive the output data and associated indicator values. The same considerations apply to *rexx_host_stem_variables* as for *rexx_host_variables* with respect to NULL values returned.

Handling Null Values

For EXECSQL invocation, if you do not provide an *indicator_stem* and a NULL value is returned, DB2 RXSQL returns an error condition.

For RXSQL invocation, if you do not provide an *indicator_stem* and a NULL value is returned for column n, the corresponding *rexx_host_stem.n* variable is dropped.

RXSQL Variables

RXSQL also returns data to your program in predefined REXX variables. Your program should not assign values to these variables, as RXSQL will reset what you assigned. The following table outlines the variables that RXSQL sets, and which RXSQL request they are assigned on.

Request	Variable	Explanation
All	RXSQLREQUEST	Your program's request as interpreted by DB2 RXSQL. It begins with either `RXSQL` or `EXECSQL`, and can be used to help you resolve errors. In a subcommand environment, DB2 RXSQL inserts either RXSQL or EXECSQL in front of the request if neither was specified. You may use it to display the request being processed at the time of the error.
Any	RXSQLMSG	An empty string if no DB2 RXSQL errors or warnings occurred, otherwise a text message. Message set for warnings only if EXECSQL invocation. `RXSQLMSG` is usually set with the message that corresponds to the DB2 RXSQL return code. If a specific message in the repository cannot be found, or the repository itself is unavailable, then `RXSQLMSG` is set with the CMS message generated at the time of the message repository error. In this case, the message will not correspond to the return code that identifies the RXSQL error or warning. If the DB2 RXSQL environment cannot be initialized, `RXSQLMSG` is not set.

Request	Variable	Explanation
DESCRIBE	SQLDAN.i SQLDAT.i SQLDAC.i SQLDAL.i	Column names, data types, CCSIDs, and labels where: SQLDAN.i = column names or label names SQLDAT.i = column data types SQLDAC.i = column CCSID values SQLDAL.i = column labels i = number of the column For each column i, you have SQLDAN.i, SQLDAT.i, SQLDAC.i, and optionally SQLDAL.i. Before the results are set, SQLDAN., SQLDAT., SQLDAC., and SQLDAL. stems are initialized to empty strings. DB2 RXSQL sets SQLDAN.0, SQLDAT.0, SQLDAC.0, and SQLDAL.0 to the number of columns in the *select_list*. The rest of the variables in these structures are set to column names, data types, CCSID values, and labels corresponding to the SELECT statement.
NAMES	RXSQLNAMES	A list of *cursor_names* and *statement_names* of all the SQL statements that RXSQL has prepared or declared.
OP	SQLOP.i	Each line of the result of the OP command is set into SQLOP.i and SQLOP.0 has the number of lines returned.
SQLDATE with no arguments	SQLDATE	The current date-formatting option character. SQLDATE is set with the first character of the argument specified on the last SQLDATE statement or RESET.
SQLISL with no arguments	SQLISL	The current isolation level. This setting is either *RR*(repeatable read), *CS*(cursor stability), or *UR* (uncommitted read).
SQLTIME with no arguments	SQLTIME	The current time-formatting option character. SQLTIME is set with the first character of the argument specified on the last SQLTIME statement or RESET.
STATE	RXSQLSTATE	Two words that describe the type and state of a particular statement.
STMT	RXSQLSTMT	The SQL statement given on a Dynamic PREPARE statement, or the section number and package name given on an Extended DECLARE statement.
XPREP, PREPARE	SQLSTMTN	The section number assigned by the database manager after an Extended PREPARE statement is executed. This number is used on a later DROPSTMT, Extended CALL, Extended EXECUTE, XCALL, Extended DECLARE, or another Extended PREPARE statement. The section number associates a statement name with a particular section of a package.

SQLCA Variables

The SQLCA variables are set after every RXSQL statement which results in a database manager call. DB2 RXSQL passes the value of these variables directly from the database manager. See the *DB2 Server for VSE & VM SQL Reference* and the *DB2 Server for VM Messages and Codes* manuals for a more detailed explanation of these variables.

SQLCODE
The DB2 Server for VM primary error code. In general, zero denotes successful completion. Codes greater than zero denote successful execution, but with an exception condition. Negative codes represent error conditions.

SQLSTATE
SQLSTATE contains error codes for errors common to the DB2 Server for VM relational database manager and other IBM* distributed relational database managers. SQLSTATE is a variable containing codes for warnings and errors returned as a result of processing SQL statements. The errors and warnings reported include all errors from each of the relational database products.

SQLSTATE does not replace SQLCODE. The SQLCA contains both an SQLSTATE value and an SQLCODE value.

SQLERRM
Error and warning message tokens. Adjacent tokens are separated by a byte containing X'FF'.

SQLERRMC
Set to the same value as SQLERRM. This was added to conform with SAA SQL.

SQLERRP
The product code and, if there is an error, the name of the module that returned the error.

SQLWARN.*n*
Each of the `SQLWARN.`*n* variables, where *n* ranges from zero to ten, is set to a single-character warning flag. The combination of eleven `SQLWARN.`*n* variables is equivalent to the `SQLWARN` variable. This was added to conform with SAA SQL.

SQLWARN
Eleven single-character

warning flags. SQLWARN is a single string of characters that can have embedded blanks.

Each flag has a distinct meaning based on its position. Check the first character; then, based on its value you may want to check the remaining fields. Descriptions of the characters are given in the *DB2 Server for VSE & VM SQL Reference* manual.

SQLERRD.*n*
There are six secondary error codes and indicators. *n* can have the value of 1 to 6. These are described in the *DB2 Server for VSE & VM SQL Reference* manual.

Error Handling

The way that RXSQL reports error conditions to your program depends on how the RXSQL request was invoked. The following sections summarize the meaning of the return codes for each type of invocation.

Return Code on EXECSQL Invocation

Each request invoked with `EXECSQL` sets a return code that can be tested in the REXX EXEC as variable `rc`. The following settings can occur:

rc = 0	Normal return (no errors).
rc = 10	An SQL warning occurred. At least one of the following conditions is applicable: 1. the first character of *SQLSTATE* equals 0 and the second character is greater than 0 2. the first character of SQLWARN is non-blank. For example, after a FETCH statement, a normal warning is `SQLCODE=100 SQLSTATE=02000`, which signifies that there are no more rows in the result table.
rc = -10	An SQL error occurred. If the first character of `SQLSTATE` is greater than 0, the database manager returned an error.
rc > 1000	A RXSQL warning occurred. Check the `RXSQLMSG` variable for an explanation.
rc < -100	A DB2 RXSQL error occurred. Check the `RXSQLMSG` variable for an explanation.
rc = -3, 28, 41	A CMS error occurred when the program was invoked.

Return Code on RXSQL Invocation

Each request invoked with `RXSQL` sets a return code that can be tested in the REXX EXEC as variable `rc`. The following settings can occur:

rc = 0	Normal return (no errors).
rc = 4	An SQL warning occurred. At least one of the following conditions is applicable: 1. the first character of *SQLSTATE* equals 0 and the second character is greater than 0 2. the first character of SQLWARN is non-blank. For example, after a FETCH statement, a normal warning is `SQLCODE=100 SQLSTATE=02000`, which signifies that there are no more rows in the result table.
rc = 8	An SQL error occurred. If the first character of `SQLSTATE` is greater than 0, the database manager returned an error.
rc > 100	A DB2 RXSQL error occurred. Check the `RXSQLMSG` variable for an explanation.
rc = -3, 28, 41	A CMS error occurred when the program was invoked.

The RXSQL invocation does not support the detection of DB2 RXSQL warnings.

See “Appendix E. RXSQL Return Codes and Messages” on page 203 for more information on CMS, DB2 Server for VM, and DB2 RXSQL return codes.

Chapter 10. RXSQL Request Descriptions

This chapter contains detailed information on using RXSQL requests. The following table lists where the syntax diagrams and detailed descriptions can be found.

RXSQL handles some requests by passing them directly to the database manager in an EXECUTE IMMEDIATE statement. The description, syntax diagram and usage rules of these requests are described in the *DB2 Server for VSE & VM SQL Reference* manual. These direct requests are translated to uppercase using code page 037. To avoid translation problems across different environments, you should code these commands in uppercase.

Note: The DB2 Server for VM language restrictions on EXECUTE IMMEDIATE prevent the use of host variables or parameter markers for DELETE, DROP, INSERT and UPDATE requests as immediate commands. If you wish to use host variables or parameter markers for these requests, you must code these as dynamic statements and prepare them to be invoked via CALL or EXECUTE.

Table 6. RXSQL Requests

Request Type	**RXSQL Request**	**Function**	**Refer To**
Dynamic Statement	ACQUIRE DBSPACE	Obtains and names a dbspace.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	ALTER DBSPACE	Alters the percentage of free space. Also alters the lock size of a PUBLIC dbspace.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	ALTER TABLE	Adds a column to a table or manages referential constraints.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	Dynamic CALL	Executes an SQL statement defined by a previous Dynamic PREPARE or PREP.	page 124
Extended Statement	Extended CALL	Executes an SQL statement defined and stored in a package by a previous Extended PREPARE or XPREP statement and declared by an Extended DECLARE statement.	page 124
Dynamic or Extended Statement	CLOSE	Closes an open cursor.	page 125
Dynamic Statement	COMMENT ON	Replaces or adds a comment to the description of a table, view, or column.	*DB2 Server for VSE & VM SQL Reference*
Dynamic or Extended Statement	COMMIT	Terminates a logical unit of work and commits the database changes made by that logical unit of work.	page 126
Dynamic Statement	CONNECT	Switches application servers, passes a new authorization ID to the database manager or queries the current authorization id and application server.	page 128
Dynamic Statement	CREATE INDEX	Defines an index on a table.	*DB2 Server for VSE & VM SQL Reference*

Table 6. RXSQL Requests (continued)

Request Type	RXSQL Request	Function	Refer To
Extended Statement	CREATE PACKAGE	Creates an empty package into which SQL statements can be prepared.	page 129
Dynamic Statement	CREATE SYNONYM	Defines an alternate name for a table or view.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	CREATE TABLE	Defines a table.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	CREATE VIEW	Defines a view of one or more tables or views.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	Dynamic DECLARE	Gives a *cursor_name* to a previously dynamically prepared INSERT or SELECT statement.	page 131
Extended Statement	Extended DECLARE	Gives a name to a statement in a package.	page 132
Dynamic Statement	DELETE	Deletes zero or more rows from a table.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	Dynamic DESCRIBE	Returns the names, data types, CCSIDs, and labels of the columns referenced in a prepared SELECT statement.	page 133
Extended Statement	Extended DESCRIBE	Returns the names, data types, CCSIDs, and labels of the columns referenced in a SELECT statement that has been prepared into a package.	page 136
Dynamic Statement	DROP	Deletes a table, index, view, synonym, dbspace, or package.	*DB2 Server for VSE & VM SQL Reference*
Extended Statement	DROP STATEMENT or DROPSTMT	Deletes a statement from a package.	page 137
Dynamic Statement	Dynamic EXECUTE	Executes an SQL statement that was defined by a previous Dynamic PREPARE statement.	page 138
Extended Statement	Extended EXECUTE	Executes an SQL statement in a package.	page 139
Dynamic Statement	EXECUTE IMMEDIATE or EXEC	Submits an SQL statement to be dynamically prepared and executed by the database manager.	page 140
Dynamic Statement	EXPLAIN	Obtains information about the expected structure and execution performance of a DELETE, INSERT, SELECT or UPDATE statement.	*DB2 Server for VSE & VM SQL Reference*
Dynamic or Extended Statement	FETCH	Assigns values of a row of a result table to variables provided by your program.	page 140
Dynamic Statement	GRANT	Grants system authorities as well as privileges on packages, tables, or views.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	INSERT	Inserts one or more rows into a table.	*DB2 Server for VSE & VM SQL Reference*

Table 6. RXSQL Requests (continued)

Request Type	RXSQL Request	Function	Refer To
Dynamic Statement	LABEL ON	Replaces or adds a label on the description of a table, view, or column.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	LOCK DBSPACE	Either prevents concurrent processes from changing a dbspace or prevents concurrent processes from using a dbspace.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	LOCK TABLE	Either prevents concurrent processes from changing a table or prevents concurrent processes from using a table.	*DB2 Server for VSE & VM SQL Reference*
RXSQL Command	NAMES	Returns all the *cursor_names* and *statement_names* known to RXSQL from previous Dynamic PREPARE, Dynamic DECLARE, and Extended DECLARE statements.	page 142
RXSQL Command	OP	Issues an operator command and returns the result in REXX variables.	page 143
Dynamic or Extended Statement	OPEN	Opens a cursor associated with a SELECT or an INSERT statement.	page 144
Dynamic Statement	Dynamic PREPARE or PREP	Prepares an SQL statement for a subsequent Dynamic CALL, Dynamic DECLARE, Dynamic EXECUTE, or OPEN statement.	page 146
Extended Statement	Extended PREPARE	Prepares an SQL statement into a package.	page 148
RXSQL Command	PURGE	Clears specified statements from RXSQL.	page 152
Dynamic or Extended Statement	PUT	Inserts a row of data into a table.	page 153
Dynamic Statement	REVOKE	Revokes system authorities as well as privileges on packages, tables or views.	*DB2 Server for VSE & VM SQL Reference*
Dynamic or Extended Statement	ROLLBACK	Terminates a logical unit of work and backs out the database changes made by that unit of work.	page 155
RXSQL Command	SQLDATE	Sets or returns the date format.	page 156
RXSQL Command	SQLISL	Sets or returns the isolation level.	page 157
RXSQL Command	SQLTIME	Sets or returns the time format.	page 158
RXSQL Command	STATE	Returns the type and state values of the SQL statement or cursor you specify.	page 159
RXSQL Command	STMT	Returns the statement associated with a given *statement_name* or *cursor_name*.	page 160
RXSQL Command	TRACE	Sets the trace level for selected functions in RXSQL.	page 161
Dynamic Statement	UPDATE	Updates the values of one or more columns in zero or more rows of a table.	*DB2 Server for VSE & VM SQL Reference*
Dynamic Statement	UPDATE STATISTICS	Updates statistics on tables and indexes in system catalogs.	*DB2 Server for VSE & VM SQL Reference*
Extended Statement	XCALL	Executes an SQL statement in a package that does not reference REXX host variables.	page 163

Table 6. RXSQL Requests (continued)

Request Type	RXSQL Request	Function	Refer To
Extended Statement	XPREP	Prepares an SQL statement in a package.	page 164

ACQUIRE DBSPACE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

ALTER DBSPACE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

ALTER TABLE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

Dynamic CALL

```
►►──CALL──statement_name──┬──────────────────────────────────────────┬──────────────────►◄
                          │ ┌─USING─┐                                │
                          └─┴───────┴──input_rexx_host_variable_list─┘
```

The CALL statement is provided for compatibility with previous versions of DB2 RXSQL. It is functionally interchangeable with the Dynamic EXECUTE statement, although its syntax is slightly different. For a full description of this command, refer to "Dynamic EXECUTE" on page 138.

Examples

Example 1

Execute the prepared statement UPDATE_JOB.

```
'RXSQL CALL UPDATE_JOB'
```

Example 2

Execute the statement RAISE_JOB using a REXX host variable with a variable qualifier.

```
raise_stmt = 'UPDATE EMPVIEW SET SALARY = SALARY * 1.08',
   'WHERE JOB = ?'

'EXECSQL PREPARE RAISE_JOB FROM' raise_stmt

'RXSQL CALL RAISE_JOB USING :job(CHAR(8))'
```

The REXX interpreter resolves *raise_stmt* before the request is passed to RXSQL.

Extended CALL

```
►►──CALL──statement_name──┬────────────────────────────────────────┬──────────►
                          │ ┌─USING─┐                              │
                          └─┴───────┴──input_rexx_host_variable_list┘

►──┬──────────────────────────────────────────┬──────────────────────────────►◄
   └─INTO──┬─output_rexx_host_variable_list─┬─┘
           └─rexx_host_stem_name────────────┘
```

The Extended CALL statement executes an SQL statement previously defined by an Extended PREPARE or XPREP statement and declared by an Extended DECLARE statement. The Extended DECLARE statement must be issued before the Extended CALL statement to associate a *statement_name* with the prepared statement.

statement_name
: The name given by an Extended DECLARE statement to the SQL statement to be issued.

input_rexx_host_variable_list
: One or more *rexx_host_variables* that supply the input values for the SQL statement.

output_rexx_host_variable_list
: One or more *rexx_host_variables* that receive the values of a row of the result table formed by a Single Row Extended PREPARE statement.

  Place holders may be used to discard unwanted values.

rexx_host_stem_name
: A REXX stem variable that receives all of the values of the row of the result table.

States

Required Initial State	Resulting State
EXTENDED-DYNAMIC UNDECLARED	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC DECLARED	EXTENDED-DYNAMIC DECLARED

Input

If there are parameter markers in the prepared SELECT statement, then the *input_rexx_host_variable_list* after the USING clause is used to resolve the parameter markers.

Example

Declare and execute the UPDATE_SALARY statement. It is assumed that the UPDATE statement issued by this program has been prepared into the package in a previously run program.

```
'EXECSQL DECLARE UPDATE_SALARY FOR :stmt_number IN RAISE_SALARY'

'EXECSQL CALL UPDATE_SALARY'
```

CLOSE

CLOSE

```
►►──CLOSE──┬─cursor_name──┬───────────────────────────────────────────────►◄
           └─prepare_name─┘
```

The CLOSE statement closes a cursor previously opened by an OPEN statement. CLOSE leaves the cursor ready to be opened.

cursor_name
: The name of the declared cursor to be closed.

  If a Dynamic DECLARE has identified a *cursor_name* for a dynamic prepared SELECT or INSERT statement, then CLOSE must use the *cursor_name* defined in the Dynamic DECLARE.

prepare_name
: The name given to a statement in a Dynamic PREPARE.

  If a Dynamic DECLARE statement has not been executed for a dynamic prepared SELECT or INSERT statement, then CLOSE must use the *prepare_name* defined in the Dynamic PREPARE.

States

Required Initial State	**Resulting State**
DYNAMIC OPEN	DYNAMIC PREPARED
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC DECLARED

Example

Close the cursor SELECT_EMPLOYEE.

```
'EXECSQL CLOSE SELECT_EMPLOYEE'
```

COMMENT ON

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

COMMIT

```
          ┌─WORK─┐
►►──COMMIT─┴──────┴──┬─────────┬──────────────────────────────────────────►◄
                     └─RELEASE─┘
```

The COMMIT statement commits all changes made to the database since the beginning of the LUW or since the last COMMIT or ROLLBACK statement. All locks in the database acquired during the LUW are released. COMMIT severs the database connection if you specify the RELEASE option.

States

Required Initial State	Resulting State
DYNAMIC DECLARED-ONLY	DYNAMIC DECLARED-ONLY
DYNAMIC UNPREPARED	DYNAMIC UNPREPARED
DYNAMIC PREPARED	DYNAMIC UNPREPARED
DYNAMIC OPEN	DYNAMIC UNPREPARED
EXTENDED-DYNAMIC UNDECLARED	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC DECLARED	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC UNDECLARED

Notes

1. DB2 RXSQL does not explicitly close any open cursors before issuing the COMMIT in the database manager.
2. All *statement_names* and *cursor_names* are retained by DB2 RXSQL after the COMMIT.
3. Do not execute any RXSQL statements between a COMMIT RELEASE statement and the invocation of an SQLINIT.

   DB2 RXSQL retrieves DATE and TIME specifications from the LASTING GLOBALV file the first time DB2 RXSQL is invoked or at the first invocation after a COMMIT RELEASE or ROLLBACK RELEASE. If your program issues a COMMIT RELEASE or ROLLBACK RELEASE and you wish to change DATE or TIME specifications using SQLINIT, you must do so before the next RXSQL statement is executed.

   For example, if your execution sequence is

   ```
   COMMIT RELEASE

   EXECSQL ...

   SQLINIT DATE(JIS)
   ```

   DB2 RXSQL will not retrieve the new date format, JIS, but will continue using the same specification you had before.

   The correct sequence in this case is as follows:

   ```
   COMMIT RELEASE

   SQLINIT DATE(JIS)

   EXECSQL ...
   ```

Example

Commit all changes made to the database.

```
'EXECSQL COMMIT'
```

CONNECT

```
►►──CONNECT──┬──────────────────────────────────────────────────────────────────────────┬──────────►
             │                                  ┌─BY─┐                                  │
             │                       ┌─IDENTIFIED─┴────┴─┐                              │
             └─┬─authorization_name─┬┴───────────────────┴───┬─password──────┬──────────┘
               └─variable_name──────┘                        └─variable_name─┘

►──┬───────────────────────┬──────────────────────────────────────────────────────────────────────►◄
   └─TO─┬─server_name───┬──┘
        └─variable_name─┘
```

The CONNECT statement lets you

- pass a new authorization ID with a password to the database manager to change the identity of the user,
- switch application servers or
- query the database manager for the current identity of the user and the server to which the user is connected.

For more information about this statement refer to the *DB2 Server for VSE & VM SQL Reference* manual.

authorization_name
: An SQL authorization ID.

password
: The password that SQL uses to validate the user ID.

server_name
: The name of the new application server to which you are connecting.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the CONNECT statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

Output

After you issue the CONNECT statement with no parameters, the SQLCA variables `SQLERRM`, `SQLERRMC` and `SQLERRP` are set. Both `SQLERRM` and `SQLERRMC` contain two message tokens separated by the hex character 'FF'x. The first token is the current SQL authorization ID, and the second one is the application server name. `SQLERRP` contains the product code. The REXX statement for extracting the values from `SQLERRM` looks like:

```
Parse Var sqlerrm sqlid 'FF'x server .
```

Notes

1. If you use the CONNECT statement to switch between application servers, the RXSQL package must be installed on each application server. Refer to "Phase 3: Installing the RXSQL Package and HELP Tables into DB2 Application Servers" on page 30 for instructions on installing the RXSQL package.
2. If you are switching between application servers while using RXSQL and the server connection is severed by a severe database error, you must issue another

CONNECT statement to re-connect you to the application server to which you were connected before the connection was severed.

Examples

The following examples produce the same result.

Example 1

Connect as SQLDBA.

```
'RXSQL CONNECT SQLDBA IDENTIFIED BY SQLDBAPW'
```

Example 2

Issue a CONNECT using the REXX variables *userid* and *password*.

```
 userid   = 'SQLDBA'
 password = 'SQLDBAPW'
'EXECSQL CONNECT :userid IDENTIFIED BY :password'
```

CREATE INDEX

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

CREATE PACKAGE

```
            ┌─PACKAGE─┐
►►──CREATE──┤         ├──┬─package_name──┬──┬──────────────────────────────────────────────────┬──────────►◄
            └─PROGRAM─┘  └─variable_name─┘  │                                                  │
                                            │         ┌─OPTIONs─┐               ┌─,──────────┐ │
                                            │  ┌─USING─┴─────────┴┐              ▼            │ │
                                            └──┴──────────────────┴───────────────┬─option────────┬┘
                                                                                  └─variable_name─┘
```

The CREATE PACKAGE statement creates an empty package. The package is stored in the database after you issue a COMMIT statement.

CREATE PROGRAM is equivalent to CREATE PACKAGE and is provided for compatibility with prior versions of RXSQL.

package_name
: The name of the package to be created for storing prepared SQL statements.

option
: Refer to the *DB2 Server for VSE & VM SQL Reference* manual for an explanation of all the options for the CREATE PACKAGE statement.

  Do not code either the DESCRIBE or the NODESCRIBE option on the RXSQL CREATE PACKAGE statement. RXSQL always adds the DESCRIBE option to the SQL CREATE PACKAGE statement to allow DB2 RXSQL to fetch data correctly. If you code either DESCRIBE or NODESCRIBE, the DESCRIBE which RXSQL adds will result in duplicate or conflicting options. In this case, the database manager will return an error condition.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the CREATE PACKAGE statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

Notes

1. A new package is created in the database after the COMMIT statement has executed successfully. Issuing a ROLLBACK statement will prevent this.
2. You can issue COMMIT for a package created with the MODIFY option even if the package contains no statements.
3. The Extended PREPARE and XPREP statement will prepare an SQL statement into a section and add it to a package.
4. The DROP STATEMENT statement will delete a section from a package created with the MODIFY option.
5. The way to use the CREATE PACKAGE statement along with other Extended Dynamic statements is described in "Using Extended Dynamic Statements in DB2 RXSQL" on page 94.

Examples

The packages in the three following examples are created using the ISOL(CS) and BLOCK options to minimize locking and to improve performance by inserting and retrieving rows in groups.

Example 1: Basic non-modifiable package

Create a non-modifiable package. Statements must be added using the Basic Extended PREPARE or XPREP within the same LUW in which the package is created.

```
'RXSQL CREATE PACKAGE CHANGE_STAFF USING BLOCK ISOL(CS)'
'RXSQL XPREP IN CHANGE_STAFF :update_view'
'RXSQL COMMIT'
```

A number is returned to the REXX program in the variable `SQLSTMTN` after the XPREP indicating which section the statement was prepared into. This number can be referenced on subsequent RXSQL requests.

Example 2: Non-modifiable package with empty section

Create a non-modifiable package, and add an empty section. Later, SQL statements can be temporarily prepared into this empty section to dynamically execute an SQL statement.

```
'EXECSQL CREATE PACKAGE NEW_EMPLOYEE USING BLOCK ISOL(CS) '
'EXECSQL PREPARE FROM NULL SETTING :section-number IN NEW_EMPLOYEE '
'EXECSQL COMMIT '
```

A number is returned to the REXX program in the variable `section_number` after the PREPARE statement indicating which section is the empty one. This number is then referenced in subsequent Temporary Extended PREPARE statements.

Example 3: Modifiable package

Create a modifiable package. Statements may be added to the package and deleted from the package even after the LUW in which the package was created ends.

```
'EXECSQL CREATE PACKAGE RAISE_SALARY USING OPTIONS BLOCK MODIFY ISOL(CS)'
'EXECSQL COMMIT '
```

CREATE SYNONYM

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

CREATE TABLE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

CREATE VIEW

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

Dynamic DECLARE

```
                             ┌─CURSOR─┐  ┌─FOR─┐
►►──DECLARE──cursor_name─────┴────────┴──┴─────┴──prepare_name──────────────────────►◄
```

The Dynamic DECLARE statement gives a *cursor_name* to an SQL INSERT or SELECT statement. Once you declare a cursor, you must use the *cursor_name* in subsequent OPEN, FETCH, PUT and CLOSE statements.

The use of the Dynamic DECLARE statement is optional. If you do not declare a cursor, then you must use the *prepare_name* on the OPEN, FETCH, PUT and CLOSE statements. The Dynamic DECLARE statement can be placed before or after the Dynamic PREPARE statement in your program.

cursor_name
The name which identifies the SQL cursor.

prepare_name
The name of the SQL INSERT or SELECT statement for which you are declaring a cursor.

States

Required Initial State	Resulting State
none	DYNAMIC DECLARED-ONLY
DYNAMIC UNPREPARED	DYNAMIC UNPREPARED
DYNAMIC PREPARED	DYNAMIC PREPARED
DYNAMIC OPEN	DYNAMIC OPEN

Note

1. The *cursor_name* on a dynamic DECLARE statement cannot be the same as another prepared or declared *prepare_name*, *statement_name*, or *cursor_name*. You must issue an explicit PURGE statement before reusing the name. For example, the third statement will generate an error:

```
'PREPARE JACK FROM :jack_string '

'PREPARE JILL FROM :jill_string '

'DECLARE JILL CURSOR FOR JACK '
```

Example

Prepare a SELECT statement, then DECLARE a cursor for the prepared statement.

```
select_ed = "SELECT * FROM EMPVIEW WHERE EDLEVEL >= 16"

'EXECSQL PREPARE SELECT_EDLEVEL FROM :select_ed'

'EXECSQL DECLARE EDLEVEL_16 CURSOR FOR SELECT_EDLEVEL'
```

Extended DECLARE

```
                                  ┌─CURSOR─┐   ┌─FOR─┐
►►──DECLARE──┬─cursor_name────┬──┴────────┴───┴─────┴──────────────────────────────►
             └─statement_name─┘

                        ┌─IN─┐
►──┬─section_number─┬───┴────┴───┬─package_name──┬────────────────────────────────►◄
   └─variable_name──┘            └─variable_name─┘
```

The Extended DECLARE statement has a dual role.

- It is primarily used to declare a cursor for an SQL statement that was prepared into a package. The *cursor_name* is referenced in subsequent OPEN, FETCH, PUT or CLOSE statements. In this case, the SQL statement was an INSERT or SELECT statement.
- It can also be used to give a *statement_name* to a prepared SQL statement for subsequent reference by an Extended CALL statement. This second use of Extended DECLARE is unique to RXSQL, and is not supported by other host languages supported by SQL.

cursor_name
The name which identifies the cursor.

statement_name
The name which identifies the SQL statement.

section_number
An integer value representing the statement number of the SQL statement that was assigned by the database manager when an Extended PREPARE or XPREP statement was executed.

package_name
The name of the package in which the SQL statement is stored.

variable_name
A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the Extended DECLARE statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

States

Required Initial State	Resulting State
none	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC UNDECLARED	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC DECLARED	EXTENDED-DYNAMIC DECLARED
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC OPEN

Notes

1. An Extended DECLARE statement cannot use the same name as that of another prepared or declared statement unless
   - the declaration matches the previous declaration exactly, or

- the state of the previously declared statement is EXTENDED-DYNAMIC UNDECLARED.

  You must end the LUW and issue an explicit PURGE statement before reusing the name.
2. When your program issues an Extended DECLARE statement for a cursor operation, DB2 RXSQL does not issue a DECLARE CURSOR statement to the database manager until your program issues an OPEN statement for the cursor.
3. The limit to the number of declared names that can exist at any one time is much larger than the limit of 40 dynamic prepared statements and is determined by the database manager.
4. RXSQL does not support the DECLARE CURSOR WITH HOLD statement.

Example

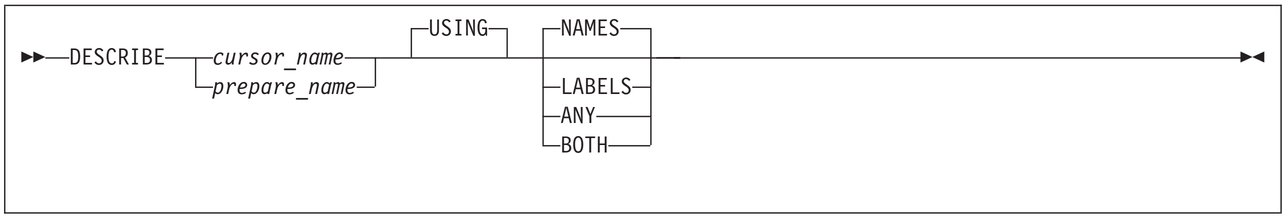
Declare the VIEW_EMPLOYEE cursor for the statement in the package RAISE_SALARY identified by the *variable_name stmt_number*.

```
'EXECSQL DECLARE VIEW_EMPLOYEE CURSOR FOR :stmt_number IN RAISE_SALARY'
```

DELETE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

Dynamic DESCRIBE



The Dynamic DESCRIBE statement returns the names, labels, CCSIDs, and data types of the columns of a dynamically prepared statement, or a prepared and declared SELECT statement. The returned values are put into the REXX stem variables `SQLDAN.`, `SQLDAT.`, `SQLDAC.`, and `SQLDAL.`.

cursor_name
: Name given by a Dynamic DECLARE to a prepared SELECT statement.

prepare_name
: Name given by a Dynamic PREPARE to a SELECT statement.

  The *prepare_name* may be used only if a *cursor_name* has not been declared for it.

States

Required Initial State	Resulting State
DYNAMIC UNPREPARED	DYNAMIC PREPARED
DYNAMIC PREPARED	DYNAMIC PREPARED
DYNAMIC OPEN	DYNAMIC OPEN

Output

All REXX variables with the prefix SQLDAN., SQLDAT., SQLDAC., and SQLDAL. are reset to empty strings before the result is set. RXSQL sets the SQLDAN.0, SQLDAT.0, SQLDAC.0, and SQLDAL.0 variables to the number of columns in the *select_list*. This is also the number of result columns that would be returned if the prepared or declared SELECT statement is executed.

For each result column i, the following group of variables is set:

- SQLDAN.i is set with the column NAMES or LABELS, depending on what is specified in the USING clause.
- SQLDAT.i is set with the SQL data type attributes for the corresponding column. There are two components to the data type attributes; the SQL data type, including the length or scale and precision where appropriate, and an indication of whether the column will accept NULL values.
- SQLDAC.i is set with the CCSID number of the column. If the datatype is not eligible for a CCSID value, its corresponding SQLDAC.i variable is an empty string.
- SQLDAL.i is set with the column label only if the BOTH option was specified.

For example, a DESCRIBE statement on a SELECT statement that has two columns in the *select_list* would cause the variables to be set similar to the following:

```
sqldan.0   = 2
sqldat.0   = 2
sqldac.0   = 2
sqldal.0   = 2
sqldan.1   = LASTNAME
sqldat.1   = V 15
sqldac.1   = 500
sqldan.2   = SALARY
sqldat.2   = D 9 2 N
sqldac.2   = ″
```

If BOTH option is specified:

```
sqldal.1   = Last_Name
sqldal.2   = Salary
```

In this example, you can see that column LASTNAME does not accept NULL values because there is no trailing N in SQLDAT.1 while the column SALARY does allow NULL values.

The abbreviations in the data type attributes are listed in Figure 33 on page 135.

SQL Data Type Abbreviations	SQL Data Type	Description
I	INTEGER	31 bit binary integer
S	SMALLINT	15-bit binary integer
R	FLOAT	Single precision, floating-point number
F	FLOAT	Double precision, floating-point number
D *m n*	DECIMAL	*m* is the precision; *n* is the scale
C *n*	CHAR	Fixed length character; *n* is the length
V *n*	VARCHAR	Variable length character; *n* is the maximum length
L *n*	LONG VARCHAR	Variable length character; *n* is the maximum length
G *n*	GRAPHIC	Fixed length graphic; *n* is the number of 2-byte characters
VG *n*	VARGRAPHIC	Variable length graphic; *n* is the maximum length
LG *n*	LONG VARGRAPHIC	Variable length graphic; *n* is the maximum length
DT *n*	DATE	*n* is the length
TM *n*	TIME	*n* is the length
TS *n*	TIMESTAMP	*n* is the length
ZD *m n*	ZONED DECIMAL	*m* is the precision; *n* is the scale. This data type is not valid on DB2 Server for VM application servers.
Notes: 1. For data limits, please refer to the *IBM SQL Reference, Version 2, Volume 1* manual. 2. An `N` following any of the above abbreviations means that the column allows NULL values.		

Figure 33. DB2 RXSQL Abbreviations for Data Type Attributes on DESCRIBE

Note

1. If the state of the statement is DYNAMIC UNPREPARED because you issued a COMMIT or ROLLBACK after you issued the original Dynamic PREPARE statement, DB2 RXSQL prepares the SQL statement again before the DESCRIBE statement is passed to the database manager.

Example

Return information about the prepared SELECT statement.

```
select_stmt = 'SELECT * FROM' table_name

'EXECSQL PREPARE SELECT_TABLE FROM :select_stmt'

'EXECSQL DESCRIBE SELECT_TABLE USING ANY '
```

Extended DESCRIBE

```
                                                             ┌─USING─┐   ┌─NAMES─┐
►►──DESCRIBE──┬─cursor_name──────────────────────────────────┬─┴───────┴───┼───────┼──────────────►◄
              ├─statement_name───────────────────────────────┤             ├─LABELS─┤
              │                        ┌─IN─┐                │             ├─ANY────┤
              └──┬─section_number─┬────┴────┴───┬─package_name─┬┘             └─BOTH───┘
                 └─variable_name──┘              └─variable_name─┘
```

The Extended DESCRIBE statement returns the names, labels, CCSIDs, and data types of the columns of a prepared SELECT statement in a package. The REXX stem variables `SQLDAN.`, `SQLDAT.`, `SQLDAC.`, and `SQLDAL.` are set with the descriptor information in the same manner described under the Dynamic DESCRIBE statement.

cursor_name
: Name given by an Extended DECLARE statement to the SELECT statement to be described.

statement_name
: Name given by an Extended DECLARE statement to the Single Row Extended PREPARE statement to be described.

section_number
: An integer value representing the statement number in the package where the SELECT statement to be described is stored. It was assigned by the database manager when an Extended PREPARE statement was executed.

package_name
: The name of the package in which the SELECT statement to be described is stored.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the Extended DESCRIBE statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

States

Required Initial State	**Resulting State**
none	none
EXTENDED-DYNAMIC UNDECLARED	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC DECLARED	EXTENDED-DYNAMIC DECLARED
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC OPEN

Output

Same as **Output** for the “Dynamic DESCRIBE” on page 133.

Example

Return information about the declared statement into DB2 RXSQL variables.

```
'EXECSQL DECLARE SELECT_EMPLOYEE CURSOR FOR 3 IN NEW_STAFF'

'EXECSQL DESCRIBE SELECT_EMPLOYEE'
```

DROP

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

DROP STATEMENT or DROPSTMT

```
                                          ┌─IN─┐
►►──┬─DROP STATEMENT─┬──┬─section_number─┬─┴────┴─┬─package_name──┬────────────────────────────►◄
    └─DROPSTMT───────┘  └─variable_name──┘        └─variable_name─┘
```

The DROP STATEMENT statement selectively deletes a section and its associated statement from a package. DROP STATEMENT applies only to packages created by a CREATE PACKAGE statement with the MODIFY option.

DROPSTMT is provided for compatibility with previous versions of RXSQL and is functionally equivalent to DROP STATEMENT.

section_number
: An integer value representing the section to be dropped. This number was assigned by the database manager when an Extended PREPARE statement was executed.

package_name
: The name of the package in which the prepared SQL statement to be dropped is stored.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the DROP STATEMENT or DROPSTMT statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

Examples

Example 1

Drop the statement identified by the value of the REXX variable *stmt_num_1* from the package UPDATE_SALARY.

```
'RXSQL DROPSTMT' stmt_num_1 'IN UPDATE_SALARY'
```

Example 2

Drop the statement identified by the section variable *stmt_number* from the package REVIEW_DEPT.

```
'EXECSQL DROP STATEMENT :stmt_number IN REVIEW_DEPT'
```

Dynamic EXECUTE

```
►►──EXECUTE──prepare_name──┬─────────────────────────────────────┬──────────────────►◄
                           └─USING──input_rexx_host_variable_list─┘
```

The Dynamic EXECUTE statement executes a prepared SQL statement.

input_rexx_host_variable_list
A list of one or more *rexx_host_variables* that supply the input values for the SQL statement.

prepare_name
The name given by a Dynamic PREPARE statement to the SQL statement to be issued. It must not represent a SELECT statement.

States

Required Initial State	Resulting State
DYNAMIC UNPREPARED	DYNAMIC PREPARED
DYNAMIC PREPARED	DYNAMIC PREPARED

Input

If you include an *input_rexx_host_variable_list* on the EXECUTE statement, RXSQL retrieves the values of the input variables. These values are used to replace the parameter markers in the SQL statement specified by the Dynamic PREPARE statement. If the SQL statement contained variable names rather than parameter markers when it was prepared, the *input_rexx_host_variable_list* will override the variable names specified in the prepared SQL statement.

Notes

1. If the initial state of the statement is DYNAMIC UNPREPARED because a COMMIT or ROLLBACK was issued after the statement was prepared, DB2 RXSQL prepares the SQL statement again before issuing the EXECUTE statement.
2. *Prepare_name* must not be a *cursor_name* defined by a Dynamic DECLARE.

Examples

Example 1

Execute the prepared statement.

```
'EXECSQL EXECUTE INSERT_EMPLOYEE'
```

Example 2

Execute the statement DELETE_EMPLOYEE using a REXX variable with a variable qualifier.

```
delete_stmt = 'DELETE FROM RXEMP WHERE EMPNO = ?'

'EXECSQL PREPARE DELETE_EMPLOYEE FROM :delete_stmt'

'EXECSQL EXECUTE DELETE_EMPLOYEE USING :emp_number(CHAR(6))'
```

Extended EXECUTE

```
                             ┌─IN─┐
►►──EXECUTE──┬─section_number─┬──┴────┴──┬─package_name─┬──────────────────────────────────────►
             └─variable_name──┘           └─variable_name┘

►──┬──────────────────────────────────────┬──┬──────────────────────────────────────────┬──────►◄
   └─USING──input_rexx_host_variable_list─┘  └─INTO──┬─output_rexx_host_variable_list─┬─┘
                                                     └─rexx_host_stem_name────────────┘
```

The Extended EXECUTE statement executes an SQL statement that was previously inserted into a package by an Extended PREPARE statement. It allows you to specify both input and output variables.

section_number
: An integer value representing the statement number of the SQL statement to be issued. It was assigned by the database manager when an Extended PREPARE statement was executed.

package_name
: The name of the package in which the prepared SQL statement to be issued is stored.

input_rexx_host_variable_list
: One or more *rexx_host_variables* that supply the input values for the SQL statement.

output_rexx_host_variable
: One or more *rexx_host_variables* that receive the result values of a Single Row Extended PREPARE statement.

  Place holders may be used to discard unwanted values.

rexx_host_stem_name
: A REXX stem variable name that receives all of the values of the result table row.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the Extended EXECUTE statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

States

Required Initial State	**Resulting State**
none	none
EXTENDED-DYNAMIC DECLARED	EXTENDED-DYNAMIC DECLARED
EXTENDED-DYNAMIC UNDECLARED	EXTENDED-DYNAMIC UNDECLARED

Input

If there are parameter markers in the prepared SELECT statement, then the USING *input_rexx_host_variable* clause is used to resolve the parameter markers.

Example

Issue statement 3 in the package NEW_EMPLOYEE.

```
'EXECSQL EXECUTE 3 IN NEW_EMPLOYEE',
            'USING :emp_data INDICATOR :emp_data_ind'
```

EXECUTE IMMEDIATE or EXEC

```
►►──┬─EXECUTE IMMEDIATE─┬──┬─sql_statement─┬──────────────────────────────────────────────►◄
    └─EXEC──────────────┘  └─variable_name─┘
```

The EXECUTE IMMEDIATE statement submits an SQL statement to be dynamically prepared and executed by the database manager.

sql_statement
: Any SQL statement that is allowed by the SQL statement EXECUTE IMMEDIATE. Refer to the *DB2 Server for VSE & VM SQL Reference* manual for a complete list of allowable SQL statements.

  Since RXSQL passes the SQL statement to the database manager with no argument substitution and no data transfer, the statement must not contain *variable_names* or parameter markers.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the EXECUTE IMMEDIATE statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

Example

Submit the SQL statement CREATE VIEW to the database manager to be executed.

```
create_view = 'CREATE VIEW EMP_VIEW',
   '(EMPNO, FIRSTNME, MIDINIT, LASTNAME,',
    'WORKDEPT, PHONENO, JOB, EDLEVEL)',
   'AS SELECT EMPNO, FIRSTNME, MIDINIT, LASTNAME, WORKDEPT,',
            'PHONENO, JOB, EDLEVEL',
      'FROM RXEMP'

'EXECSQL EXECUTE IMMEDIATE :create_view'
```

EXPLAIN

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

FETCH

```
                           ┌─INTO─┐
►►─FETCH──┬─cursor_name──┬─┴──────┴──┬─output_rexx_host_variable_list─┬───────────────────►◄
          └─prepare_name─┘           └─rexx_host_stem_name────────────┘
```

The FETCH statement obtains the next row from the result table of the SELECT statement that was processed by an OPEN statement.

cursor_name
: The name of the open cursor representing a SELECT statement.

  If a Dynamic DECLARE has been issued, your program must use the *cursor_name* on the Dynamic FETCH statement.

prepare_name
: The name given to an SQL SELECT statement by a Dynamic PREPARE.

  The *prepare_name* can be used only if a Dynamic PREPARE has given a *prepare_name* to the SELECT statement and a Dynamic DECLARE has not associated a cursor with the SELECT statement before the statement was opened.

output_rexx_host_variable_list
: One or more *rexx_host_variables* that receive the values of the columns of a result table row.

  If the number of columns in the active set or result table is

  1. greater than the number of *rexx_host_variables* you have provided,
     - all the variables will be set
     - the extra columns will be discarded by RXSQL
     - the EXECSQL invocation will return a warning indication
  2. less than the number of *rexx_host_variables* you have provided, the extra variables are not set.

  Note: In other languages supported by the database manager the number of output variables must match the number of columns in the result table.

  Placeholders may be used to discard unwanted columns from the active set.

rexx_host_stem_name
: A REXX stem variable name that receives all of the values of the result table row.

States

Required Initial State	Resulting State
DYNAMIC OPEN	DYNAMIC OPEN
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC OPEN

Output

The variables provided on the FETCH statement are set with the retrieved data.

Note

1. When the SQLCODE variable is equal to 100 (SQLSTATE 02000), the last FETCH executed tried to return a row beyond the last one in the active set and there are no more result rows.

Examples

The following examples illustrate a variety of ways in which data can be fetched using a cursor.

Example 1

Get data from selected columns of the result table into REXX variables. Indicator variables are used to see if the *job_title*, *phone_number*, and *sal* variables contain nulls. A variable qualifier is used on the *job_title* variable to ensure that it is returned using CCSID 037. Placeholders are used to avoid setting variables with unwanted data.

```
'EXECSQL FETCH SELECT_EMPLOYEE INTO :job_title :job_indicator(CCSID 037),',
  ':phone_number :phone_indicator,., :lname ,.,.,:sal :sal_indicator'
```

Example 2

Get data from selected columns of the result table into REXX variables.

```
'RXSQL FETCH EMPLOYEE_INFO :emp :fname :mid :lname :job'
```

Example 3

Get data from all columns of the result table into the `emp_stats.` stem variable.

```
'EXECSQL FETCH EMPLOYEE_INFO INTO :emp_stats.'
```

GRANT

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

INSERT

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

LABEL ON

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

LOCK DBSPACE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

LOCK TABLE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

NAMES

```
►►──NAMES──────────────────────────────────────────────────────────►◄
```

The NAMES command returns all the *statement_names*, *prepare_names* and *cursor_names* known to DB2 RXSQL from Dynamic PREPARE statements and Dynamic and Extended DECLARE statements. This statement sets the REXX variable `RXSQLNAMES` to a string of names separated by blanks. You may then use each *cursor_name* or *statement_name* in a STATE request to determine the state of each statement or, in a STMT command, to obtain the assigned SQL statement.

Output

The RXSQLNAMES variable is set. When there are no names known to RXSQL, RXSQLNAMES will be set to a string of length zero (a null string).

Note

1. For dynamic declared and prepared statements which have a statement and cursor name, RXSQLNAMES is set with the statement name followed by the cursor name in parentheses.

Example

Display the names of all prepared and declared statements that have not been purged.

```
'EXECSQL NAMES'
Say rxsqlnames
```

Output similar to the following is displayed.

```
STATEMENT_1 STATEMENT_2(CURSOR_2) STATEMENT_3(CURSOR_3)
```

OP

```
►►──OP operator_command────────────────────────────────────────────────────►◄
```

The OP command issues an operator command and returns the result in REXX variables. For example, the SHOW and COUNTER operator commands monitor the DB2 Server for VM system operation.

operator_command
: The DB2 Server for VM operator command to be issued.

  RXSQL passes the string of characters that follows the keyword OP, directly to the database manager. Refer to the *DB2 Server for VSE & VM Operation* manual for an explanation of the valid operator commands.

Output

SQLOP.0 is set with the number of lines returned. SQLOP.1 contains the first line, SQLOP.2 contains the second line, and so on.

Notes

1. All command keywords must be presented from REXX to DB2 RXSQL in uppercase.
2. The OP command cannot be issued during an active LUW.
3. The OP command cannot be issued when using the DRDA protocol.
4. The OP command cannot issue an operator command that must be issued from the operator console.

Example

Issue the operator command SHOW USERS and display the contents of the stem variable `sqlop.`.

```
'EXECSQL OP SHOW USERS'
Do i=1 to sqlop.0
   Say sqlop.i
End
```

Output similar to the following is displayed.

```
Status of connected users:
  2  users are connected to application server.
  1  Users are active.
     User ID: MERCIER   SQL ID: MERCIER
  0  Users are waiting.
  1  Users are inactive.
     User ID: HDOBSON  SQL ID: HDOBSON
  4  Agents are available.
  3  User connections are available.
ARI0065I Operator command processing is complete.
```

OPEN

```
►►──OPEN───┬─cursor_name──┬──┬──────────────────────────────────────────┬──────────────────►◄
           └─prepare_name─┘  │ ┌─USING─┐                                │
                             └─┴───────┴──input_rexx_host_variable_list─┘
```

The OPEN statement opens a cursor associated with either a declared or prepared SELECT statement (*query_cursor*) or a declared or prepared INSERT statement (*insert_cursor*).

For a *query_cursor*, when the OPEN statement is executed, the cursor is positioned before the first row of the result table defined by the SELECT statement. Each execution of a FETCH statement moves the cursor forward and retrieves the next row of the result table.

For an *insert_cursor*, when the OPEN statement is executed, block input is established on the tables. Each execution of a PUT statement moves the cursor forward and inserts a row into the input block.

cursor_name
: The name of the declared cursor to be opened.

  If a Dynamic DECLARE has identified a *cursor_name* for a dynamic prepared SELECT or INSERT statement, then OPEN must use the *cursor_name* defined in the Dynamic DECLARE.

prepare_name
: The name given to a statement in a Dynamic PREPARE.

  If a Dynamic DECLARE statement has not been executed for a dynamic prepared SELECT or INSERT statement, then OPEN must use the *prepare_name* defined in the Dynamic PREPARE.

input_rexx_host_variable_list
One or more *rexx_host_variables* that supply input values for the SQL SELECT statement.

If the prepared SQL statement is a SELECT statement, any parameter markers or *variable_names* in the SQL statement are resolved by RXSQL with values in the *input_rexx_host_variable_list* on the OPEN statement. If there is no *rexx_host_variable_list* supplied and *variable_names* are included in the dynamic prepared SQL statement, RXSQL retrieves the values of the variable names from REXX and these values are used when OPEN is executed.

If the prepared SQL statement is an INSERT statement, the USING clause is ignored. Any parameter markers or *variable_names* in the SQL statement will be resolved by RXSQL with values in the USING clause on the PUT statement.

States

Required Initial State	Resulting State
DYNAMIC UNPREPARED	DYNAMIC OPEN
DYNAMIC PREPARED	DYNAMIC OPEN
DYNAMIC OPEN	DYNAMIC OPEN
EXTENDED-DYNAMIC UNDECLARED	EXTENDED-DYNAMIC OPEN
EXTENDED-DYNAMIC DECLARED	EXTENDED-DYNAMIC OPEN
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC OPEN

Input

RXSQL fetches the values of *input_rexx_host_variables* or the values of *variable_names* in the prepared SQL statement and passes them to the database manager as input values for SELECT.

Notes

1. If the state of a *cursor_name* for a cursor operation is EXTENDED-DYNAMIC UNDECLARED, DB2 RXSQL issues a DECLARE CURSOR statement to the database manager when your program issues an OPEN for the statement.
2. When using Extended Dynamic SQL, if you DECLARE a cursor, OPEN the cursor, PURGE the cursor, then DECLARE and OPEN the same cursor, the database manager will return an error condition. When DB2 RXSQL executes PURGE, the *cursor_name* is not invalidated by the database manager. The cursor is still active in the database manager when the second DECLARE and OPEN are executed, resulting in the error.

   Once the cursor is purged from DB2 RXSQL, you must end the LUW before issuing the second DECLARE and OPEN by issuing a COMMIT or ROLLBACK statement.
3. If the state of the statement is DYNAMIC UNPREPARED because you issued a COMMIT or ROLLBACK statement after you issued the original Dynamic PREPARE statement, the SQL statement is prepared again by RXSQL before the OPEN statement is executed.
4. If the state of the statement is DYNAMIC OPEN or EXTENDED-DYNAMIC OPEN and your program issues another OPEN statement, then DB2 RXSQL will close the statement before it executes the OPEN statement.

Example

In this part of a REXX program, data is read from the file EMPLOYEE INPUT and inserted into the table RXEMP. The INSERT statement is prepared with parameter markers which are resolved on the PUT statement. Variable qualifiers are used so the program does not have to surround the input values with: "". The DECLARE statement is not used in this example.

```
insert_row = 'INSERT INTO RXEMP VALUES (?,?,?,?,?,?,?,?,?,?,?,?,?,?)'

'EXECSQL PREPARE INSERT_EMPLOYEE FROM :insert_row'

'EXECSQL OPEN INSERT_EMPLOYEE'

/* Begin loop */

   /* Read data from file */
   'EXECIO 1 DISKR EMPLOYEE INPUT * (LIFO'
   /* Get the data into REXX variables */
   Parse Upper Pull emp fname mid lname wdpt wdpt_ind,
                    ph ph_ind hire hire_ind job job_ind,
                    ed sex sex_ind birth birth_ind,
                    sal sal_ind bon bon_ind comm comm_ind .

   'EXECSQL PUT INSERT_EMPLOYEE USING',
      ':emp(CHAR(6)), :fname(VARCHAR(12)),',
      ':mid(CHAR(1)), :lname(VARCHAR(15)),',
      ':wdpt :wdpt_ind (CHAR(3)), :ph :ph_ind (CHAR(4)),',
      ':hire :hire_ind (CHAR(8)), :job :job_ind (CHAR(8)),',
      ':ed(SMALLINT), :sex :sex_ind (CHAR(1)),',
      ':birth :birth_ind (CHAR(8)), :sal :sal_ind (DECIMAL(9,2)),',
      ':bon :bon_ind (DECIMAL(9,2)), :comm :comm_ind (DECIMAL(9,2))'

/* End loop */

'EXECSQL CLOSE INSERT_EMPLOYEE'
```

Dynamic PREPARE or PREP

```
                              ┌─FROM─┐
►►──┬─PREPARE─┬──prepare_name──┴──────┴──┬─sql_statement─┬──────────────────►◄
    └─PREP────┘                          └─variable_name─┘
```

The Dynamic PREPARE statement prepares an SQL statement for a subsequent Dynamic CALL, Dynamic DECLARE, Dynamic DESCRIBE, Dynamic EXECUTE, OPEN, or PURGE request. PREP is provided as a synonym to support programs written for previous versions of RXSQL.

prepare_name
: The name you wish to give to the SQL statement. The *prepare_name* links the RXSQL Dynamic PREPARE statement with subsequent RXSQL requests.

  A Dynamic PREPARE statement cannot use the same *prepare_name*, *cursor_name*, or *statement_name* as that of another prepared or declared statement unless the state of the previously prepared statement is DYNAMIC UNPREPARED or DYNAMIC DECLARED-ONLY. If it is any other state, you must issue a PURGE command before reusing the name.

sql_statement
: The SQL statement to be prepared.

If the SQL statement is a SELECT, INSERT, UPDATE or DELETE statement, it can contain *variable_names* in the WHERE, VALUES or SET clause. RXSQL fetches the values of these variables before a Dynamic CALL, Dynamic EXECUTE, OPEN, or PUT statement is passed to the database manager to be executed. If you provide an *input_rexx_host_variable_list* on a Dynamic CALL, Dynamic EXECUTE, OPEN, or PUT statement, the *input_rexx_host_variables* override any variables named in the SQL statement on the Dynamic PREPARE statement.

You can also use parameter markers (?) to denote the locations of REXX host variables within the SQL statement. You must then provide an *input_rexx_host_variable_list* on the Dynamic CALL, Dynamic EXECUTE, OPEN (for FETCH), or PUT statement. These *rexx_host_variables* replace the parameter markers when the CALL, EXECUTE, OPEN, or PUT statement is executed. The rules for using parameter markers are documented in the *DB2 Server for VSE & VM SQL Reference* manual.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the Dynamic PREPARE statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

States

Required Initial State	**Resulting State**
none	DYNAMIC PREPARED
DYNAMIC UNPREPARED	DYNAMIC PREPARED
DYNAMIC DECLARED_ONLY	DYNAMIC PREPARED

Notes

1. If the SQL statement contains both parameter markers and *variable_names*, the *variable_names* in the SQL statement are replaced with parameter markers (?).
2. RXSQL has a limit of 40 active statements at any one time, i.e. whose state is DYNAMIC UNPREPARED, DYNAMIC PREPARED, or DYNAMIC OPEN. Use the PURGE command to discard prepared statements that are no longer needed.

Example

RXSQL retrieves the variable *phone_number* when the PREPARE statement is invoked and retrieves the value of the variable *emp* when the OPEN statement is invoked.

```
phone_number = "SELECT EMPNO, PHONENO FROM RXEMP WHERE EMPNO = :emp"

'EXECSQL PREPARE FIND_PHONENO FROM :phone_number'

'EXECSQL OPEN FIND_PHONENO'
```

OPEN was invoked here without a DECLARE to demonstrate that DECLARE is optional.

Extended PREPARE

Basic Extended PREPARE

```
                                        ┌─SETTING :SQLSTMTN──────┐    ┌─IN─┐
►►──PREPARE FROM statement_variable─────┼────────────────────────┼────┴────┴──┬─package_name──┬──────────►
                                        └─SETTING variable_name──┘             └─variable_name─┘

►──┬──────────────────────────────────┬─────────────────────────────────────────────────────────────────►◄
   └─USING────attributes_variable─────┘
```

Single Row Extended PREPARE

```
                          ┌─ROW─┐                                  ┌─SETTING :SQLSTMTN──────┐    ┌─IN─┐
►►──PREPARE SINGLE────────┴─────┴──FROM statement_variable─────────┼────────────────────────┼────┴────┴────────►
                                                                   └─SETTING variable_name──┘

►──┬─package_name──┬──┬──────────────────────────────────┬────────────────────────────────────────────────────►◄
   └─variable_name─┘  └─USING────attributes_variable─────┘
```

Empty Extended PREPARE

```
                          ┌─SETTING :SQLSTMTN──────┐    ┌─IN─┐
►►──PREPARE FROM NULL─────┼────────────────────────┼────┴────┴──┬─package_name──┬───────────────────────────►◄
                          └─SETTING variable_name──┘             └─variable_name─┘
```

Temporary Extended PREPARE

```
                                                                          ┌─IN─┐
►►──PREPARE FROM statement_variable FOR──┬─section_number─┬───────────────┴────┴──┬─package_name──┬─────────►◄
                                         └─variable_name──┘                       └─variable_name─┘
```

The **Basic** Extended PREPARE and the **Single Row** Extended PREPARE statements permit an SQL statement to be prepared and stored in a package for later execution. The **Empty** Extended PREPARE statement is used to provide support for Dynamic SQL statements. It is used in conjunction with the **Temporary** Extended PREPARE statement.

The Basic, Single Row and Empty Extended PREPARE statements return a number to a REXX variable that designates in which section the statement is stored. This number is then used in the Extended DECLARE statement, the XCALL statement, the Extended EXECUTE statement, the DROP STATEMENT statement or the Temporary Extended PREPARE statement.

You can use the Single Row Extended PREPARE statement on any SELECT statement that will return only one row. The Extended CALL or Extended EXECUTE statement with the INTO clause can be used to fetch the single row without using the OPEN, FETCH, CLOSE sequence of statements.

The Empty Extended PREPARE statement creates an indefinite section in the package. You can temporarily fill this section with an SQL statement in a subsequent logical unit of work by issuing a Temporary Extended PREPARE statement.

statement_variable
A REXX variable name with a mandatory preceding colon that holds the SQL statement to be prepared. RXSQL fetches the value of the *statement_variable* and passes the value to the database manager when the Extended PREPARE statement is executed.

If the statement is a SELECT, INSERT, UPDATE, or DELETE statement, parameter markers (?) can be used to denote the locations of variable_names within the SQL statement. You must provide an *input_rexx_host_variable_list* on the Extended CALL, Extended EXECUTE, OPEN, or PUT statement to give a value to all parameter markers. *Variable_names* are not allowed in the SQL statement.

SETTING :SQLSTMTN

SETTING *variable_name*
The REXX variable, either `SQLSTMTN` or one you specify with a mandatory preceding colon, is set with the section number into which the SQL statement is prepared. Your program must retain this number to refer to the statement on a later Extended DECLARE, Extended DESCRIBE, Extended EXECUTE, Extended XCALL, Extended DROP STATEMENT, or Temporary Extended PREPARE statement.

package_name
Indicates the name of the package in which the prepared SQL statement will be stored.

attributes_variable
A REXX variable with an optional preceding colon that contains a list which specifies the data type and length attributes for all parameter markers (?) in the SQL statement.

Do not use the DT (date), TM (time), or TS (timestamp) types that are returned by the DESCRIBE statement. Use the C n or V n types instead. An integer must be substituted for the m and the n in the following abbreviation list.

Extended PREPARE

SQL Data Type Abbreviations	SQL Data Type	Description
I	INTEGER	31 bit binary integer
S	SMALLINT	15 bit binary integer
R	FLOAT	Single precision, floating-point number
F	FLOAT	Double precision, floating-point number
D *m n*	DECIMAL	*m* is the precision; *n* is the scale.
C *n*	CHAR	Fixed length character; *n* is the length
V *n*	VARCHAR	Variable length character, *n* is the maximum length
L *n*	LONG VARCHAR	Variable length character, *n* is the maximum length
G *n*	GRAPHIC	Fixed length graphic; *n* is the number of 2-byte characters
VG *n*	VARGRAPHIC	Variable length graphic, *n* is the maximum length
LG *n*	LONG VARGRAPHIC	Variable length graphic, *n* is the maximum length
ZD *m n*	ZONED DECIMAL	*m* is the precision; *n* is the scale. This data type is not valid on DB2 Server for VM application servers.

Notes:
1. For data limits, please refer to *IBM SQL Reference, Version 2, Volume 1* , SC26-8416.
2. An `N` following any of the above abbreviations means that the input data value may be null.

Figure 34. Extended PREPARE Attributes Abbreviations

Specifying Attributes of Input Data that May Be Null

To specify that the input data corresponding to a parameter marker may be null, place an N after the SQL data type abbreviation. If you do not place an N after the SQL data type abbreviation, the default SQL data type will be such that null input data values are not allowed.

Note: If you specify an N, the application server may incur some extra processing overhead.

Keywords and numbers must be separated by blanks. For example:

```
attribute = 'C 3 N C 4 N CCSID 500 D 6 2'
```

Specifying the CCSID in Attributes Variables

The CCSID may be specified in the USING *attributes_variable* clause in the Extended PREPARE or XPREP statement. To specify the CCSID for the input data corresponding to a parameter marker, the keyword `CCSID` followed by the CCSID number `n` must be placed in the string following the appropriate SQL data type abbreviation.

Keywords and numbers must be separated by blanks. For example:

```
attribute = 'C 3 CCSID 500 S V 12 N CCSID 65535 V 20 D 6 2 C 1'
```

For more information on CCSID or coded character sets, refer to the *DB2 Server for VSE & VM SQL Reference* manual.

variable_name
A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* (except for `SETTING` *variable_name*) and passes the value to the database manager when the Extended PREPARE statement is executed.

The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

section_number
An integer value that specifies the statement number of the indefinite section of a package that was created by the Empty Extended PREPARE statement. The indefinite section of the package is used to prepare the statement for processing, but the package is not permanently modified. When the LUW ends, the statement is removed from the indefinite section.

Output

`SQLSTMTN` is set to the integer value of the statement number assigned by the database manager unless another REXX variable was specified in the SETTING *variable_name* clause. The Extended DECLARE, DROP STATEMENT, XCALL, Extended EXECUTE and temporary Extended PREPARE statements use the integer value to specify the corresponding prepared statement or indefinite section of the package.

Notes

1. When you are using a Positioned UPDATE or Positioned DELETE, the *cursor_name* in the WHERE CURRENT OF clause must belong to a SELECT statement in the same package.
2. When using *attributes_variables*, RXSQL builds an input SQLDA structure.
3. Although the *cursor_name* in a WHERE CURRENT OF clause may be delimited with double quotes (") when the SELECT statement is prepared using extended PREPARE, all other DB2 RXSQL references to the cursor (DECLARE, OPEN, FETCH, PUT, CLOSE) must not delimit the *cursor_name* with double quotes.

Note: A *cursor_name* that is a reserved word when used in an DB2 Server for VM statement must be delimited with double quotes.

Examples

Example 1: Basic PREPARE

Prepare a SELECT statement into the package DEPT_VIEW. RXSQL puts the section number into the REXX variable `dept_stmt_num`.

```
select_dept = "SELECT * FROM RXEMP WHERE WORKDEPT = ?"

'EXECSQL PREPARE FROM :select_dept',
    'SETTING :dept_stmt_num IN DEPT_VIEW'
```

Example 2: PREPARE Adding Empty Section

Prepare an empty section into the package identified by the package variable `emp_package`. DB2 RXSQL puts the section number in the REXX variable `emp_stmt_num`.

```
'EXECSQL PREPARE FROM NULL SETTING :emp_stmt_num IN :emp_package'
```

Example 3: PREPARE Filling Empty Section

Prepare a DELETE statement, filling in an empty section in the package CHANGE_STAFF.

```
remove_employee = "DELETE FROM RXEMP WHERE EMPNO = ?"

'EXECSQL PREPARE FROM :remove_employee',
        'FOR :stmt_num_1 IN CHANGE_STAFF'
```

Example 4: Single Row PREPARE

Prepare a SELECT statement that will return only one row.

```
count_ed = "SELECT COUNT(*) FROM EMPVIEW WHERE EDLEVEL = ?"

attributes = "S"

'EXECSQL PREPARE SINGLE ROW FROM :count_ed IN EMPLOYEE_STATS',
   'USING :attributes'
```

PURGE

```
             ┌─,──────────────────┐
             ▼                    │
►►──PURGE──┬──┬─statement_name─┬──┴─┬──────────────────────────────────────►◄
           │  ├─prepare_name───┤    │
           │  └─cursor_name────┘    │
           └── * ───────────────────┘
```

The PURGE command clears one or more statements from RXSQL temporary storage allowing them to be reused.

In Dynamic SQL, if an SQL statement has both a *prepare_name* and a corresponding *cursor_name*, the purging of either name will clear the SQL statement and both names from RXSQL temporary storage immediately.

statement_name
: The name given by an Extended DECLARE statement to a non-cursor SQL statement.

prepare_name
: The name given by a Dynamic PREPARE statement to an SQL statement.

cursor_name
: The name given to a dynamically prepared *prepare_name* by a Dynamic DECLARE statement or the name given to a statement in a package by an Extended DECLARE statement.

* An asterisk (*) requests clearing *all* active statement and cursor names stored by RXSQL.

States

Required Initial State	Resulting State
DYNAMIC DECLARED-ONLY	none
DYNAMIC UNPREPARED	none
DYNAMIC PREPARED	none
DYNAMIC OPEN	none
EXTENDED-DYNAMIC UNDECLARED	none
EXTENDED-DYNAMIC DECLARED	none
EXTENDED-DYNAMIC OPEN	none

Notes

1. If the name belongs to a cursor that is open, the cursor is closed before purging the name. If PURGE was invoked with EXECSQL, an RXSQL warning will be generated.
2. If you do not purge a statement or cursor name, RXSQL will store it from the time it is prepared or declared until control is returned to CMS. Invoking NUCXDROP RXSQL will also purge all statements and cursors but this is not recommended as a general technique.
3. There is a limit of 40 dynamic prepared statements at any one time.
4. If the *cursor_name* belongs to a statement that an Extended DECLARE and OPEN statement created, the database retains the *cursor_name* when the PURGE is executed. The database removes the *cursor_name* when the LUW ends. The *cursor_name* cannot be used again on an Extended DECLARE and OPEN statement sequence until the next logical unit of work is established.

Example

Clear the statements SELECT_EMPLOYEE and INSERT_EMPLOYEE from RXSQL temporary storage.

```
'EXECSQL PURGE SELECT_EMPLOYEE, INSERT_EMPLOYEE'
```

PUT

```
>>──PUT──┬─cursor_name──┬──┬─────────────────────────────────────────────┬──────────────><
         └─prepare_name─┘  │ ┌─USING─┐                                   │
                           └─┴───────┴──input_rexx_host_variable_list──┘
                             └─FROM──┘
```

The PUT statement performs an SQL INSERT. It is valid only for a block input statement processed by an OPEN statement.

cursor_name
: The declared name of the *insert_cursor*.

  If a Dynamic DECLARE has been issued, your program must use the *cursor_name* on the Dynamic PUT statement.

prepare_name
: The name specified in the PREPARE request for the INSERT statement.

  The *prepare_name* must be used if a Dynamic PREPARE has given a *prepare_name* to the INSERT statement and a Dynamic DECLARE has not associated a cursor with the INSERT statement before the statement was opened.

FROM/USING
: *FROM* is equivalent to *USING* and is provided for compatibility with prior versions of RXSQL.

input_rexx_host_variable_list
: One or more *rexx_host_variables* that supply the input values for the SQL statement.

States

Required Initial State	Resulting State
DYNAMIC OPEN	DYNAMIC OPEN
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC OPEN

Input

RXSQL fetches the values of *input_rexx_host_variables* or the values of *variable_names* in the prepared SQL statement and passes them to the database manager as input values.

Notes

1. If you specify an *input_rexx_host_variable_list*, then any variables named in the SQL statement are overridden.
2. If you are inserting values without using variable qualifiers, you must make sure that the length and type of each input field is the same on each PUT statement when blocking is in effect. Since DB2 RXSQL determines the data type of each variable from its value, it may not use the same data type for each PUT statement.

   For example, if the first PUT statement has a variable NUM with 4 as its value, DB2 RXSQL passes the value to the database manager with a datatype of INTEGER. On a subsequent PUT statement, if NUM has 4.1 as its value. DB2 RXSQL passes the value to the database manager with a datatype of DECIMAL(2,1). When blocking is on, the database manager returns an error indication to RXSQL indicating that the data type has changed. When this occurs, DB2 RXSQL CLOSEs the *insert_cursor*, OPENs the *insert_cursor* again, and retries the PUT command. If PUT was invoked using EXECSQL invocation, DB2 RXSQL returns a warning indication. While this implementation bypasses the error, it may affect performance.
3. If blocking performance is critical to an application, do one of the following to ensure correct data types and lengths:
   a. Use variable qualifiers in your *input_rexx_host_variable* list to indicate to DB2 RXSQL what type of data is being inserted into the table.
   b. Take the following measures:

      Strings
      Pad all strings with blanks on the right to make them of equal maximum length.

      Decimal numbers
      Pad all numbers with zeros both left and right of the decimal (being careful of the sign) to indicate the appropriate precision and scale to DB2 RXSQL.

      Numbers
      Do not mix decimal, integer, and scientific notation numbers for the same column.

Example

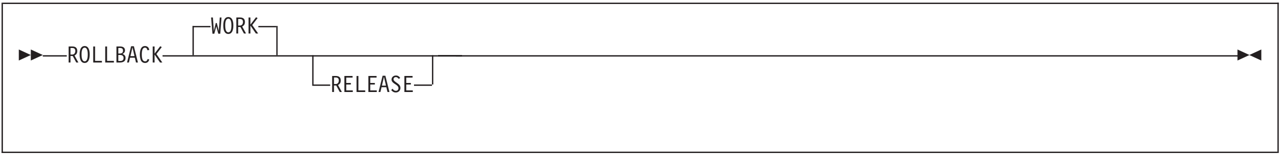
In this part of a REXX program, data is read from the file EMPLOYEE INPUT and inserted into the table RXEMP. The INSERT statement is prepared with parameter markers which are resolved on the PUT statement. Variable qualifiers are used to indicate what type of data is being inserted.

```
insert_row = 'INSERT INTO RXEMP VALUES (?,?,?,?,?,?,?,?,?,?,?,?,?,?)'

'EXECSQL PREPARE INSERT_EMPLOYEE FROM :insert_row'

'EXECSQL OPEN INSERT_EMPLOYEE'

/* Begin loop */

/* Read data from file */
'EXECIO 1 DISKR EMPLOYEE INPUT * (LIFO'
/* Get the data into REXX variables */
Parse Upper Pull emp fname mid lname wdpt ph hire job,
                 ed sex birth sal bon comm .

'EXECSQL PUT INSERT_EMPLOYEE USING',
   ':emp(CHAR(6)), :fname(VARCHAR(12)),',
   ':mid(CHAR(1)), :lname(VARCHAR(15)),',
   ':wdpt(CHAR(3)), :ph(CHAR(4)),',
   ':hire(CHAR(8)), :job(CHAR(8)),',
   ':ed(SMALLINT), :sex(CHAR(1)),',
   ':birth(CHAR(8)), :sal(DECIMAL(9,2)),',
   ':bon(DECIMAL(9,2)), :comm(DECIMAL(9,2))'

/* End loop */

'EXECSQL CLOSE INSERT_EMPLOYEE'
```

REVOKE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

ROLLBACK



The ROLLBACK statement backs out all changes made to the database since the LUW began or since the last COMMIT or ROLLBACK statement. All locks in the database are removed. If you specify RELEASE, the database connection is severed.

States

Required Initial State	Resulting State
DYNAMIC DECLARED-ONLY	DYNAMIC DECLARED-ONLY
DYNAMIC UNPREPARED	DYNAMIC UNPREPARED
DYNAMIC PREPARED	DYNAMIC UNPREPARED
DYNAMIC OPEN	DYNAMIC UNPREPARED
EXTENDED-DYNAMIC UNDECLARED	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC DECLARED	EXTENDED-DYNAMIC UNDECLARED
EXTENDED-DYNAMIC OPEN	EXTENDED-DYNAMIC UNDECLARED

Notes

1. DB2 RXSQL does not explicitly close any open cursors before issuing the ROLLBACK statement.
2. All *prepare_names* and *cursor_names* are retained by DB2 RXSQL after the ROLLBACK.
3. Do not execute any RXSQL statements between a ROLLBACK RELEASE statement and the invocation of an SQLINIT.

   DB2 RXSQL retrieves DATE and TIME specifications from the LASTING GLOBALV file the first time DB2 RXSQL is invoked or at the first invocation after a COMMIT RELEASE or ROLLBACK RELEASE. If your program issues a COMMIT RELEASE or ROLLBACK RELEASE and you wish to change DATE or TIME specifications using SQLINIT, you must do so before the next RXSQL statement is executed.

   For example, if your execution sequence is

   ```
   ROLLBACK RELEASE

   EXECSQL ...

   SQLINIT DATE(JIS)
   ```

   DB2 RXSQL will not retrieve the new date format, JIS, but will continue using the same specification you had before.

   The correct sequence in this case is as follows:

   ```
   ROLLBACK RELEASE

   SQLINIT DATE(JIS)

   EXECSQL ...
   ```

Example

Cancel the changes made to the database since the LUW began and release the database connection.

```
'EXECSQL ROLLBACK RELEASE'
```

SQLDATE

```
►►──SQLDATE──┬────────┬──────────────────────────────────────────────────►◄
             ├─Eur────┤
             ├─Iso────┤
             ├─Jis────┤
             ├─Local──┤
             ├─Reset──┤
             ├─Usa────┤
             └─*──────┘
```

The SQLDATE command sets the date format for the database manager or returns the current setting. If you specify a format, DB2 RXSQL sets a flag so that any date output columns will be converted into the specified format. If you do not specify a format, the current format is returned in the REXX variable SQLDATE.

The valid formats are:

Eur
European standard is *dd.mm.yyyy*

Iso
International Standards Organization standard is *yyyy-mm-dd*

Jis Japanese industrial standard is *yyyy-mm-dd*

Local
Installation defined format

Reset
Initial setting.

For dynamic statements, the format is taken from the LASTING GLOBALV file. If DB2 RXSQL fails to retrieve the format from this file, the date format is set to ISO.

For extended dynamic statements, the date format is set to be the same as the format in effect when the package was created.

Usa
USA standard is *mm/dd/yyyy*

* Default form taken from the LASTING GLOBALV file. If this information is not available, the date format is set to ISO.

Output

If no option is provided, the REXX variable `SQLDATE` is set to a single character indicating the current date format, with one exception. If the current format is Reset, `SQLDATE` is set to the word `RESET`.

Note

1. After an OPEN, the format in effect for the first FETCH statement that fetches date data is the format used until the cursor is closed.

Example

Set the date format to the Japanese industrial standard.

```
'EXECSQL SQLDATE J'
```

SQLISL

```
►►──SQLISL──┬────┬──────────────────────────────────────────────────►◄
            ├─Rr─┤
            ├─Cs─┤
            └─Ur─┘
```

The SQLISL command sets the isolation level for the database manager or returns the current setting. If you specify an option, the isolation level is set to that option; otherwise the current two-character isolation level value is returned in the REXX variable `SQLISL` in uppercase.

Once you specify an isolation level, any new cursor operations will be performed at that level.

Rr Repeatable read

Cs Cursor stability

Ur Uncommitted read

Output

The REXX variable `SQLISL` is set to the current isolation level if no input is provided.

Notes

1. Repeatable read is the default isolation level.
2. You can change the isolation level at any time so that subsequent SQL statements are processed at the new isolation level. However, if the level is changed while a cursor is open, all operations on that cursor (until the cursor is closed) are processed at the isolation level in effect when the cursor was opened. Note that the changed isolation level is used (without error) for SQL statements that do not reference the opened cursor.

Example

Set the isolation level to cursor stability.

```
'EXECSQL SQLISL C'
```

SQLTIME

```
►►──SQLTIME──────┬─────────┬──────────────────────────────────────────────────►◄
                 ├─Eur─────┤
                 ├─Iso─────┤
                 ├─Jis─────┤
                 ├─Local───┤
                 ├─Reset───┤
                 ├─Usa─────┤
                 └─*───────┘
```

The SQLTIME command sets or returns the time format. If you specify a format, an internal variable is set. RXSQL converts any time output columns into the desired format. If you do not specify a format, the current format is returned in the REXX variable `SQLTIME`.

The valid formats are:

Eur
European standard is *hh.mm*[*.ss*]

Iso
International Standards Organization standard is *hh.mm*[*.ss*]

Jis Japanese industrial standard is *hh:mm*[*:ss*]

Local
Installation defined form

Reset
Initial setting.

For dynamic statements, the format is taken from the LASTING GLOBALV file. If DB2 RXSQL fails to retrieve the format from this file, the time format is set to ISO.

For extended dynamic statements, the time format is set to be the same as the format in effect when the package was created.

Usa
USA standard is hh:mm AM or PM

* Default form taken from the LASTING GLOBALV file. If this information is not available, the time format is set to ISO.

Output

If no option is provided, the REXX variable `SQLTIME` is set to a single character indicating the current time format, with one exception. If the current format is Reset, `SQLTIME` is set to the word `RESET`.

Notes

1. After an OPEN, the format in effect for the first FETCH statement that fetches time data is the format used until the cursor is closed.

Example

Set the time format to the European standard.

```
'EXECSQL SQLTIME E'
'EXECSQL SQLTIME'
 Say 'SQLTIME is' SQLTIME

/* produces    SQLTIME is E   */
```

STATE

```
►►──STATE──┬─statement_name─┬──────────────────────────────────────────────────────►◄
           ├─cursor_name────┤
           └─prepare_name───┘
```

The STATE command returns the type and state values of the SQL statement you specify.

statement_name
The name given by an Extended DECLARE to a statement in a package for a non-cursor operation.

cursor_name
The name given by a Dynamic DECLARE to a previously prepared *statement_name* or the name given by an Extended DECLARE to a statement in a package for a cursor operation.

prepare_name
The name given by a Dynamic PREPARE to an SQL statement.

Output

DB2 RXSQL sets the REXX variable `RXSQLSTATE` with a character string consisting of the statement type and state separated by a blank. The possible type and state combinations are as follows.

Type	State	
DYNAMIC	DECLARED-ONLY	This dynamic statement has been declared, but not prepared
DYNAMIC	UNPREPARED	This dynamic statement has become unprepared after COMMIT or ROLLBACK
DYNAMIC	PREPARED	This dynamic statement has been prepared
DYNAMIC	OPEN	This dynamic cursor statement has been opened
EXTENDED-DYNAMIC	UNDECLARED	This Extended Dynamic statement has been declared with DB2 RXSQL Extended DECLARE, but either 1. the declare has not been passed to the database manager or 2. COMMIT or ROLLBACK was issued
EXTENDED-DYNAMIC	DECLARED	This Extended Dynamic statement has been declared and opened, but its state changed to DECLARED after a CLOSE
EXTENDED-DYNAMIC	OPEN	This Extended Dynamic cursor statement has been opened

When an error in processing occurs, `RXSQLSTATE` is set to an empty string.

Example

Display the type and the state of the statement VIEW_DEPT.

```
'EXECSQL STATE VIEW_DEPT'
Say rxsqlstate
```

Output similar to the following is displayed.

```
DYNAMIC PREPARED
```

STMT

```
►►──STMT──┬─statement_name─┬──────────────────────────────────────────►◄
          ├─cursor_name────┤
          └─prepare_name───┘
```

The STMT command returns the SQL statement associated with a given *statement_name*, *cursor_name*, or *prepare_name*.

statement_name
: The name given by an Extended DECLARE to a statement in a package for a non-cursor operation.

cursor_name
: The name given by a Dynamic DECLARE to a previously prepared *statement_name* or the name given by an Extended DECLARE to a statement in a package for a cursor operation.

prepare_name
: The name given by a Dynamic PREPARE to an SQL statement.

Output

The statement is put into the variable `RXSQLSTMT`.

If the statement is dynamic, the variable `RXSQLSTMT` is set with the statement string value with one exception; if the state is DYNAMIC DECLARED-ONLY, `RXSQLSTMT` is set with an empty string.

If the statement is extended dynamic, `RXSQLSTMT` is set with the section number and package name associated with the statement.

When an error in processing occurs `RXSQLSTMT` is set to a null string.

Note

1. If the given name is for a declared statement in a package, the returned string is in the format used on an Extended DECLARE statement, as follows:

   ```
   nn IN package_name
   ```

   where *nn* is the section number.

Example

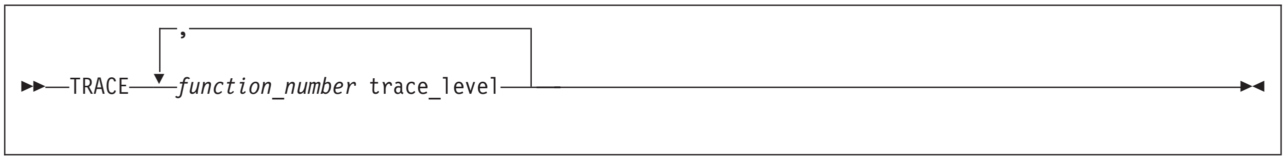
Display the dynamic statement associated with the cursor SELECT_EMPLOYEE.

```
'EXECSQL STMT SELECT_EMPLOYEE'
Say rxsqlstmt
```

Output similar to the following is displayed.

```
SELECT * FROM EMPVIEW WHERE SALARY < :salary AND JOB = :job
```

TRACE



The TRACE command sets the trace level (0 to 3) for one or all the functions in DB2 RXSQL. It is provided to aid IBM support personnel in problem determination.

function_number
: Specifies either the DB2 RXSQL function number, or a 0 for all functions. The following list outlines which functions you can specify.

  The function numbers correspond to the following functions:

0	All RXSQL components
1	All functions
7	Database interface component
8	Environment setup component
9	Parsing component
10	CLOSE
11	COMMIT
12	CONNECT
13	CREATE PACKAGE
14	DECLARE
15	DESCRIBE
16	DROP STATEMENT, DROPSTMT
17	EXECUTE, CALL, XCALL
18	EXECUTE IMMEDIATE, EXEC
19	FETCH
20	NAMES
21	OP
22	OPEN
23	PREPARE - Dynamic
24	PREPARE - Extended Dynamic, XPREP
25	PURGE
26	PUT
27	ROLLBACK
28	SQLDATE
29	SQLISL
30	SQLTIME
31	STATE
32	STMT
33	TRACE

trace_level

Specifies the trace level. The following list outlines the trace levels you can specify:

The trace levels correspond to the following events:

0	No tracing
1	Function entry and exit points
2	Data at function entry and exit points
3	All internal trace points

You can specify multiple pairs of function numbers and trace levels on one statement.

Output

The TRACE command displays the trace information to the terminal unless redirected by the CP SPOOL command.

Specifying a level will trace all points for levels with lower numbers. For example, if you specify trace level 2, all level 2 and level 1 trace points will be displayed.

Example

Set the trace level for all components at trace level 2.

```
'EXECSQL TRACE 0 2'
```

UPDATE

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

UPDATE STATISTICS

See the *DB2 Server for VSE & VM SQL Reference* manual for details.

XCALL

```
                                 ┌─IN─┐
►►──XCALL──┬─section_number─┬────┴────┴──┬─package_name─┬──────────────────────────────────────►◄
           └─variable_name──┘             └─variable_name─┘
```

The XCALL statement processes an SQL statement that was previously inserted into a package by an Extended PREPARE statement.

XCALL is provided for compatibility with previous versions of RXSQL and it does not support input or output *rexx_host_variables*. If you wish to use input or output *rexx_host_variables* with an extended dynamic statement, you may use the Extended EXECUTE statement, or the Extended DECLARE statement in combination with the Extended CALL statement.

section_number
: An integer value representing the section number of the SQL statement to be issued. It was assigned by the database manager when an Extended PREPARE statement was executed.

package_name
: The name of the package in which the prepared SQL statement to be issued is stored.

variable_name
: A REXX variable name with a mandatory preceding colon. RXSQL fetches the value of *variable_name* and passes the value to the database manager when the XCALL statement is executed. The value of *variable_name* must conform to the coding rules of the metavariable for which it is being substituted.

Notes

1. You cannot use the XCALL statement if your SQL statement is a SELECT statement.

Examples

Example 1

Issue the statement in the package SALARY_REVIEW identified by the REXX variable `stmt_number`.

```
'EXECSQL XCALL :stmt_number IN SALARY_REVIEW'
```

Example 2

Issue the statement identified by the value of the variable `section_no` in the package RAISE_SALARY.

```
 section_no = 1
'RXSQL XCALL' section_no 'IN RAISE_SALARY'
/* REXX resolves this to 'RXSQL XCALL 1 IN RAISE_SALARY' */
```

XPREP

Basic XPREP

```
>>──XPREP──┬─SETTING :SQLSTMTN──────┬──┬────┬──┬─package_name──┬──────────────────────────>
           └─SETTING variable_name──┘  └─IN─┘  └─variable_name─┘

>──┬──────────────────────────────┬──┬─sql_statement──────┬──────────────────────────────><
   └─USING──attributes_variable───┘  └─statement_variable─┘
```

Single Row XPREP

```
>>──XPREP SINGLE──┬─────┬──┬─SETTING :SQLSTMTN──────┬──┬────┬──┬─package_name──┬─────────>
                  └─ROW─┘  └─SETTING variable_name──┘  └─IN─┘  └─variable_name─┘

>──┬──────────────────────────────┬──┬─sql_statement──────┬──────────────────────────────><
   └─USING──attributes_variable───┘  └─statement_variable─┘
```

Empty XPREP

```
>>──XPREP──┬─SETTING :SQLSTMTN──────┬──┬────┬──┬─package_name──┬──┬──────┬───────────────><
           └─SETTING variable_name──┘  └─IN─┘  └─variable_name─┘  └─NULL─┘
```

Temporary XPREP

```
>>──XPREP FOR──┬─section_number─┬──┬────┬──┬─package_name──┬──┬─sql_statement──────┬─────><
               └─variable_name──┘  └─IN─┘  └─variable_name─┘  └─statement_variable─┘
```

XPREP is provided for compatibility with previous versions of DB2 RXSQL. It is functionally interchangeable with the Extended PREPARE statement, although its syntax is somewhat different.

The descriptions on how to use XPREP, and all metavariables except the following, can be found under "Extended PREPARE" on page 148.

sql_statement
: The actual SQL statement to be prepared into the package.

  If the statement is a SELECT, INSERT, UPDATE, or DELETE statement, parameter markers (?) can be used to denote the locations of variables within the SQL statement. You must provide a list of variable names on the Extended CALL, Extended EXECUTE, OPEN, or PUT statement to replace the parameter markers. Do not use *variable_names* in the SQL statement.

Note

1. For Temporary XPREP, the USING *attributes_variable* is not included in the syntax diagram, but is still permitted for compatibility with previous versions of RXSQL. It is ignored when the statement is passed to the database manager with RXSQL invocation, but DB2 RXSQL will return a warning with EXECSQL invocation.

Examples

Example 1: BASIC XPREP

Prepare the UPDATE statement identified by the statement variable `salary_stmt` into the package UPDATE_SALARY using the variable `attributes_list` to specify the data types and length attributes for each parameter marker.

```
salary_stmt = "UPDATE RXEMP SET SALARY = SALARY * ? WHERE EMPNO = ?",
          " AND JOB <> 'MANAGER'"

attributes_list = "D 9 2 C 6"

'EXECSQL XPREP UPDATE_SALARY USING :attributes_list :salary_stmt'
```

Example 2: Single Row XPREP

Prepare into the package SALARY_REVIEW a SELECT statement that returns only one row of data. RXSQL returns the statement number into the variable `salary_statement`.

```
average_salary = 'SELECT AVG(SALARY) FROM EMPVIEW WHERE JOB = ?'

'EXECSQL XPREP SINGLE ROW SETTING :salary_statement IN SALARY_REVIEW',
   ':average_salary'
```

Example 3: Empty XPREP

Prepare an empty section into the package.

```
'EXECSQL XPREP :package_name NULL'
```

Example 4: Temporary XPREP

Fill in the empty section identified by the section variable `stmt_number` in the package CHANGE_STAFF.

```
delete_employee = 'DELETE FROM RXEMP WHERE EMPNO = ?'

'EXECSQL XPREP FOR :stmt_number IN CHANGE_STAFF :delete_employee'
```

Part 3. Appendixes

Appendix A. Files Supplied by IBM

This appendix lists the load library and module, DB2 RXSQL HELP files, MACROs, EXECs, selected TEXT files, and corrective service files necessary for installing DB2 RXSQL.

Basic System Files

The basic system files that are built at installation time are:
EXECSQL MODULE
RXSQL MODULE
RXSQL LOADLIB.

Programs and HELP Files

The programs and HELP files that are provided for general use are:
RXSQL HELPMENU
RXCASE HELPRXSQ
RXSELECT HELPRXSQ
RXSQLANG HELPRXSQ
RXSQLEX HELPRXSQ
RXSQLHLP HELPRXSQ
RXSQLOP HELPRXSQ
RXSQLVL HELPRXSQ
RXCMDS HELPRXSQ
RXUSAGE HELPRXSQ
RXCASE EXEC
RXSQLANG EXEC
RXSQLEX EXEC
RXSELECT EXEC
RXSELECT XEDIT
RXMORE XEDIT
RXSQLHLP EXEC
RXSQLHLP XEDIT
RXSQLOP EXEC
RXSQLOP XEDIT
RXSQLVL EXEC.

Example EXECs

The example EXECs and the sample input file that are described in this manual are:
EMPCRE EXEC
EMPSEL EXEC
EMPPRP EXEC
EMPSELX EXEC
EMPPRPM EXEC
EMPUPD EXEC
EMPLOYEE INPUT.

Message Repository

The message repository for mixed-case American English is ELOUME TXTAMENG.

Installation Files

Files for installation are used to:

- Identify the product:
  I5697ELO 071012
  I5697ELO MEMO (*Memo to Users*)
- Contain the installation program:
  I5697ELO EXEC
- Build MODULE and LOADLIB:
  ELOLKED EXEC
- Load the DB2 RXSQL package:
  ELOAMOD EXEC
  ELORXSQL MACRO
- Load the DB2 RXSQL message repository:
  ELOLANG EXEC
  ELOLANMS EXEC
- Build MODULE and LOADLIB by ELOLKED:
  EDCSPC TXTLIB
  EDCXMEM TEXT
  ELOCDECH TEXT
  ELOCDOFM TEXT
  ELOCECVT TEXT
  ELOCFCVT TEXT
  ELOCGCVT TEXT
  ELOCGECV TEXT
  ELOCHEXD TEXT
  ELOCHXDS TEXT
  ELOCHXTB TEXT
  ELOCLECV TEXT
  ELOCLFCV TEXT
  ELOCLGCV TEXT
  ELOCMEMM TEXT
  ELOCPRTF TEXT
  ELOCSBRK TEXT
  ELOCSCMP TEXT
  ELOCSPRT TEXT
  ELOCSSPN TEXT
  ELOCSSTR TEXT
  ELOCTFDL TEXT
  ELOCTOUP TEXT
  ELODUMMY TEXT
  ELOECREA TEXT
  ELOECXA TEXT
  ELOECNXA TEXT
  ELOEPENV TEXT
  ELOFCLOS TEXT
  ELOFCONN TEXT
  ELOFCREA TEXT
  ELOFDECL TEXT

ELOFDESC TEXT
ELOFDROP TEXT
ELOFELUW TEXT
ELOFEXEC TEXT
ELOFFETC TEXT
ELOFIMME TEXT
ELOFOPER TEXT
ELOFOPEN TEXT
ELOFPREP TEXT
ELOFPURG TEXT
ELOFPUT TEXT
ELOFSQL TEXT
ELOFSTMT TEXT
ELOFTRAC TEXT
ELOFXPRE TEXT
ELOLK33 TEXT
ELOP TEXT
ELOPA TEXT
ELOPR TEXT
ELOPV TEXT
ELOPW TEXT
ELOSBUIL TEXT
ELOSCONV TEXT
ELOSDBR TEXT
ELOSDESC TEXT
ELOSDTCH TEXT
ELOSDTIN TEXT
ELOSEXTD TEXT
ELOSFETC TEXT
ELOSFORM TEXT
ELOSINFE TEXT
ELOSLEX TEXT
ELOSMEM TEXT
ELOSREXX TEXT
ELOSSCA TEXT
ELOSSERR TEXT
ELOSSSB TEXT
ELOSSTEM TEXT
ELOSUSER TEXT
ELOXDTCO TEXT
ELOXDTLO TEXT
ELOXECOM TEXT
ELOXGETE TEXT
ELOXGETM TEXT
ELOXGLBV TEXT
ELOXLWRT TEXT
ELOXMEM TEXT
ELOXREXX TEXT
ELORXSQL TEXT
ELOXUPPE TEXT
ELOXVAL TEXT
EXECSQL TEXT
RXSQL TEXT
SQLEXEC TEXT

- Tailor the DB2 RXSQL MODULE:
  RXSQL ASSEMBLE

- Install DB2 RXSQL HELP text tables:
  ELOHLPLD EXEC
  ELOHELPI EXEC
  ELOSDBU MACRO
  ELO1S001 MACRO
  ELO2S001 MACRO.

Corrective Service Maintenance Files

Files for corrective service are used to:

- Install corrective maintenance:
  ELOSCOR EXEC
- Service the RXSQL HELP text tables:
  ELOSHLP EXEC.

National Language Support Files

Files for installing and deleting NLS HELP text:
ELOINLS EXEC
ELODNLS EXEC.

Migration Considerations

The files supplied by IBM for DB2 RXSQL Version 7 Release 1 do not correspond directly to the files supplied for releases of Version 3.

The following DB2 RXSQL Version 3 Release 1 files, used to build MODULE and LOADLIB, are not required to run DB2 RXSQL Version 7 Release 1 and can be deleted:
ELOCF TEXT
ELOCM TEXT
ELOCP TEXT
ELODE TEXT
ELODT TEXT
ELOFE TEXT
ELOFP TEXT
ELOLK TEXT
ELOMN55 TEXT
ELOMN6 TEXT
ELOOP TEXT
ELOUT TEXT
ELOSH TEXT
ELOSM TEXT
ELOSQ TEXT
ELOST TEXT
ELOTM TEXT
ELOTR TEXT
ELOXP TEXT

The following DB2 RXSQL Version 3 Release 2 files, used to build MODULE and LOADLIB, are not required to run DB2 RXSQL Version 7 Release 1 and can be deleted:
ELOCF TEXT
ELOCM TEXT
ELOCP TEXT

ELODE TEXT
ELODT TEXT
ELOFE TEXT
ELOFP TEXT
ELOGL TEXT
ELOLK TEXT
ELOMN55 TEXT
ELOMN6 TEXT
ELOOP TEXT
ELOUT TEXT
ELOSH TEXT
ELOSM TEXT
ELOSQ TEXT
ELOST TEXT
ELOTM TEXT
ELOTR TEXT
ELOXP TEXT

The following DB2 RXSQL Version 3 Release 3 files, used to build MODULEs and LOADLIB, are not required to run DB2 RXSQL Version 7 Release 1 and can be deleted:

ELOPC TEXT
ELOPE TEXT
ELOPF TEXT
ELOPP TEXT
ELOPS TEXT
ELOPU TEXT

The following DB2 RXSQL Version 3 Release 4 files, used to build MODULEs and LOADLIB, are not required to run DB2 RXSQL Version 7 Release 1 and can be deleted:

I5688ELO 034004
I5688ELO MEMO
I5688ELO EXEC

Appendix B. Installation and Service EXECs

This appendix provides instructions for running the installation and service EXECs listed below.

The installation EXECs are:

I5697ELO	Calls ELOLANG EXEC to load the DB2 RXSQL message repository.
	Installs DB2 RXSQL on minidisks or in SFS directories.
	Calls ELOLKED EXEC to link-edit DB2 RXSQL.
ELOAMOD	Calls ELOLANG EXEC to load the DB2 RXSQL message repository.
	Loads the DB2 RXSQL package into a DB2 Server for VM or non-DB2 Server for VM application server.
ELOHLPLD	Calls ELOLANG EXEC to load the DB2 RXSQL message repository.
	Installs DB2 RXSQL secondary-level HELP tables in a DB2 Server for VM application server.
ELOLKED	Calls ELOLANG EXEC to load the DB2 RXSQL message repository.
	Link-edits DB2 RXSQL.

The service EXECs are:

ELOSCOR	Applies service depending on the contents of the corrective service tape.
ELOSHLP	Services the secondary level HELP tables.

The I5697ELO EXEC

The I5697ELO EXEC installs DB2 RXSQL on minidisks or in SFS directories. It does not format the minidisks on which it is installing DB2 RXSQL. You must ensure that the minidisks can be written to.

Prerequisites

Before running the I5697ELO EXEC, ensure that:

- The I5697ELO EXEC has been loaded to the MAINT machine's work minidisk.
- The MAINT machine's work minidisk is accessed as file mode A.
- The tape device containing the DB2 RXSQL distribution tape is attached to the MAINT machine as virtual address 181.
- The database machine is shut down and you are logged off the SQLMACH machine (this is a prerequisite only if you are installing DB2 RXSQL onto minidisks).
- The minidisk onto which you plan to install DB2 RXSQL is linked using the same virtual device address as the real device address (for example, SQLMACH 198 must be linked as 198) if the minidisk belongs to you.
- The minidisks into which you plan to install DB2 RXSQL must not be linked with write access before invoking this EXEC, nor can any other user IDs be linked to these minidisks with write access.

- You have the following number of free file modes to access the DB2 RXSQL and DB2 disks:
  - If you are installing DB2 RXSQL on the DB2 disks, you need two free file modes
  - If you are installing DB2 RXSQL on separate disks, you need four free file modes
- You have the appropriate number of free virtual device addresses between 001 and 499 to link the DB2 RXSQL and DB2 minidisks if DB2 RXSQL or DB2 are installed on minidisks.

  If DB2 RXSQL and DB2 are installed on separate minidisks, you need four free addresses. Otherwise, you need two free addresses.
- You have access to the following text files:

  DMSCSL
  ARIRVSTC
  ARIUXDT
  ARIUXTM.

  For information on these files, refer to Figure 9 on page 19.

Authorization

| Before running the I5697ELO EXEC, ensure that you have access to the following disks:

- If you are installing DB2 RXSQL on DB2 disks, you must have write access to the DB2 production and service disks.
- If you are installing DB2 RXSQL on separate disks, you must have write access to the DB2 RXSQL production and service disks and read access to the DB2 production and service disks.

Syntax

```
►►──I5697ELO──────────────────────────────────────────────────────►◄
```

Description

| When you run the I5697ELO EXEC, you must decide whether DB2 RXSQL is to be installed on separate disks or on DB2 Server for VM disks. If you are installing DB2 RXSQL on DB2 Server for VM disks, refer to "Installing DB2 RXSQL on DB2 Server for VM Minidisks or SFS Directories" on page 176. If not, refer to "Installing DB2 RXSQL on Separate Minidisks or SFS Directories" on page 177.

Installing DB2 RXSQL on DB2 Server for VM Minidisks or SFS Directories

If you are installing DB2 RXSQL on DB2 Server for VM disks, you are prompted to specify whether the DB2 Server for VM files reside on minidisks or in SFS directories.

The EXEC then displays the following defaults for the DB2 Server for VM production minidisk or SFS directory.

For minidisks the defaults are:

SQLMACH	User ID of the virtual machine that owns the DB2 Server for VM production minidisk
195	Virtual address of the DB2 Server for VM production minidisk
WSQL	Write access password for the DB2 Server for VM production minidisk.

For SFS directories the defaults are:

VMSYS	File pool ID
SQLMACH	SFS directory owner for DB2 Server for VM files
SQL.PRODUCTION	SFS directory name of the DB2 Server for VM production directory.

You must either accept these default values or supply different values.

The EXEC then displays the following defaults for the DB2 Server for VM service minidisk or SFS directory.

For minidisks the defaults are:

SQLMACH	User ID of the virtual machine that owns the DB2 Server for VM service minidisk
193	Virtual address of the DB2 Server for VM service minidisk
WSQL	Write access password for the DB2 Server for VM service minidisk.

For SFS directories the defaults are:

VMSYS	File pool ID
SQLMACH	SFS directory owner for DB2 Server for VM files
SQL.SERVICE	SFS directory name of the DB2 Server for VM service directory.

You must either accept the default values or supply different values.

The DB2 Server for VM production and service disks are then accessed with write access, and the DB2 RXSQL files loaded on the DB2 Server for VM disks.

| The I5697ELO EXEC calls ELOLKED EXEC to do the system link-edit.

A message with a return code of 888 displays when processing is completed. The DB2 RXSQL distribution tape is positioned at the tape mark following the end of the last DB2 RXSQL file on the tape (file 4).

Installing DB2 RXSQL on Separate Minidisks or SFS Directories

If you are installing DB2 RXSQL on separate disks, you are prompted to specify whether the installation is on minidisks or in SFS directories, and whether the DB2 Server for VM system is installed on minidisks or in SFS directories.

The EXEC then displays the following defaults for the DB2 RXSQL production minidisk or SFS directory.

For minidisks the defaults are:

SQLMACH	User ID of the virtual machine that owns the DB2 RXSQL production minidisk
198	Virtual address of the DB2 RXSQL production minidisk
WSQL	Write access password for the DB2 RXSQL production minidisk.

For SFS directories the defaults are:

VMSYS	File pool ID
SQLMACH	SFS directory owner for DB2 RXSQL files
RXSQL.PRODUCTION	SFS directory name of the DB2 RXSQL production directory.

You must either accept the default values or supply different values.

The EXEC then displays the following defaults for the DB2 RXSQL service minidisk or SFS directory.

For minidisks the defaults are:

SQLMACH	User ID of the virtual machine that owns the DB2 RXSQL service minidisk
199	Virtual address of the service minidisk
WSQL	Write access password for the DB2 RXSQL service minidisk.

For SFS directories the defaults are:

VMSYS	File pool ID
SQLMACH	SFS directory owner for DB2 RXSQL files
RXSQL.SERVICE	SFS directory name of the DB2 RXSQL service directory.

You must either accept the default values or supply different values.

The EXEC then displays the following defaults for the DB2 Server for VM production minidisk or SFS directory.

For minidisks the defaults are:

SQLMACH	User ID of the virtual machine that owns the DB2 Server for VM production minidisk
195	Virtual address of the DB2 Server for VM production minidisk
RSQL	Read access password for the DB2 Server for VM production minidisk.

For SFS directories the defaults are:

VMSYS	File pool ID

SQLMACH	SFS directory owner for DB2 Server for VM files
SQL.PRODUCTION	SFS directory name of the DB2 Server for VM production directory.

You must either accept the default values or supply different values.

The EXEC then displays the following defaults for the DB2 Server for VM service minidisk or SFS directory.

For minidisks the defaults are:

SQLMACH	User ID of the virtual machine that owns the DB2 Server for VM service minidisk
193	Virtual address of the service minidisk
RSQL	Read access password for the DB2 Server for VM service minidisk.

For SFS directories the defaults are:

VMSYS	File pool ID
SQLMACH	SFS directory owner for DB2 Server for VM files
SQL.SERVICE	SFS directory name of the DB2 Server for VM service directory.

You must either accept the default values or supply different values.

The DB2 RXSQL production and service minidisks or SFS directories are then accessed with write access, and the DB2 Server for VM production and service minidisks or SFS directories are accessed with read-only access. The DB2 RXSQL files are also loaded on the DB2 RXSQL production and service disks.

| The I5697ELO EXEC calls the ELOLKED EXEC to do the system link-edit.

A message with a return code of 888 displays when processing is completed. The DB2 RXSQL distribution tape is positioned at the tape mark following the end of the last DB2 RXSQL file on the tape (file 4).

| **If the I5697ELO EXEC is not successful:**

| An error message identifies the problem. Correct the error and rerun the I5697ELO
| EXEC.

Note: The error message output is spooled to the printer.

The ELOAMOD EXEC

The ELOAMOD EXEC loads the DB2 RXSQL package into a DB2 Server for VM or non-DB2 Server for VM application server. The DB2 RXSQL package has been preprocessed with the blocking option.

Prerequisites

To run the ELOAMOD EXEC, you must have:

- A user ID that has a read/write work disk accessed as file mode A

- Started the application server
- Established the application server into which you want to load the DB2 RXSQL package by typing:

  ```
  SQLINIT DBNAME(server_name)
  ```

  If you are loading DB2 RXSQL into the default DB2 Server for VM application server, the *server_name* is SQLDBA.

Authorization

To run the ELOAMOD EXEC, you must have:

- Read access to the DB2 Server for VM production disk
- Read access to the DB2 RXSQL production and service disks
- An authorization ID called SQLDBA that has DBA authority on the DB2 Server for VM application server into which you are installing DB2 RXSQL
- The connect password for the SQLDBA authorization ID if you are loading the DB2 RXSQL package into a DB2 Server for VM application server
- DBA authority if you are loading DB2 RXSQL into a non-DB2 Server for VM application server, or if you are using the DRDA protocol.

Syntax

```
►►──EXEC ELOAMOD──┬──────────────────────────┬──┬──────────────────┬──────────►◄
                  └─CONnect(SQLDBA/password)─┘  └─SQLDS(──┬─Yes─┬──)─┘
                                                          └─No──┘
```

CONnect
: Use the CONnect option if you do not want to be prompted to enter the password for the SQLDBA authorization ID.

  This option is valid only when you are loading the DB2 RXSQL package into a DB2 Server for VM application server and are not using the DRDA protocol.

SQLDS
: Use the SQLDS option if you do not want to be prompted about whether you are loading the DB2 RXSQL package into a DB2 Server for VM or non-DB2 Server for VM application server.

  This option is useful when you are including several ELOAMOD invocations in an EXEC.

  Note: SQLDS(YES) should be specified if loading the RXSQL package into a DB2 Server for VSE application server. The DRDA protocol must still be used even when loading RXSQL into a DB2 Server for VSE application server.

Description

If you are loading the DB2 RXSQL package into a non-DB2 application server, you must have DBA authority and the ability to use the DRDA protocol.

If you are loading the DB2 RXSQL package into a DB2 application server, and DRDA protocol is being used, you are prompted to specify whether or not you want to continue. If you want to continue the installation using the DRDA protocol, you must have DBA authority.

ELOAMOD does the following:

- Connects to the application server as SQLDBA when loading the DB2 RXSQL package into a DB2 Server for VM application server.
- Reloads the RXSQL package contained in the ELORXSQL macro file into the application server.
- Grants authority to the public to use DB2 RXSQL.

The following message is displayed when the package is successfully loaded into the application server.

```
PORTABLE PACKAGE RELOAD completed successfully.
```

If the ELOAMOD EXEC is not successful:

An error message identifies the problem. Correct the error and rerun the ELOAMOD EXEC.

Note: The error message output is spooled to the printer.

The ELOHLPLD EXEC

The ELOHLPLD EXEC installs DB2 RXSQL secondary-level HELP tables into the DB2 application server. Secondary-level HELP is not supported on non-DB2 application servers, or when using the DRDA protocol.

Prerequisites

Before running the ELOHLPLD EXEC, ensure that you have the following:

- A user ID that has a read/write work disk accessed as file mode A
- Established the application server into which you want to install the DB2 RXSQL table by typing:
  ```
  SQLINIT DBNAME(SQLDBA)
  ```
- A dbspace with the following characteristics is available or has been added to the list of available dbspaces:
  - DBSPACETYPE = 1 (so that it can be acquired as a public dbspace)
  - NPAGES = 256.

Authorization

To run the ELOHLPLD EXEC, you must have:

- Read access to the DB2 Server for VM production disk
- Read access to the DB2 RXSQL production and service disks
- The connect password for the SQLDBA authorization ID.

Syntax

```
▶▶──EXEC ELOHLPLD──┬──────────────────────────┬──────────────────▶◀
                   └─CONnect(SQLDBA/password)─┘
```

CONnect
: Use the CONnect option if you do not want to be prompted to enter the password for the SQLDBA authorization ID.

Description

ELOHLPLD does the following:

- Connects to the application server.
- Calls the ELOHELPI EXEC to create and load the HELP tables using the following files:
  - ELOSDBU MACRO, which contains the DBS Utility job input
  - ELO1S001 MACRO, which is the text for table ELOTEXT1
  - ELO2S001 MACRO, which is the text for table ELOTEXT2.

The ELOHELPI EXEC does the following:

- Acquires a public dbspace named RXSQHELP
- Creates table SQLDBA.ELOTEXT1 in the dbspace
- Creates table SQLDBA.ELOTEXT2 in the dbspace
- Creates index SQLDBA.ELOTEXT1INDEX on table ELOTEXT1
- Creates index SQLDBA.ELOTEXT2INDEX on table ELOTEXT2
- Loads the above tables with text from files ELO1S001 MACRO and ELO2S001 MACRO.

The following message is displayed when the HELP tables are successfully installed in the application server:

```
SECONDARY LEVEL TABLES installed successfully.
```

If the ELOHLPLD EXEC is not successful:

An error message identifies the problem. Correct the error and rerun the ELOHLPLD EXEC.

Note: The error message output is spooled to the printer.

The ELOLKED EXEC

The ELOLKED EXEC link-edits DB2 RXSQL and creates the following files on the DB2 RXSQL production disk:

- EXECSQL MODULE
- RXSQL MODULE
- RXSQL LOADLIB.

You can invoke this EXEC directly from CMS. It is also called from the I5688ELO EXEC, the ELOSCOR EXEC, and the preventive service EXECs.

Prerequisites

To run the ELOLKED EXEC, you must have:

- A work minidisk accessed as file mode A with free space equivalent to at least 2 cylinders of an IBM 3380 storage device
- Access to the following text files:
  DMSCSL
  ARIRVSTC
  ARIUXDT
  ARIUXTM.

  For information on these files, refer to Figure 9 on page 19.

Authorization

To run the ELOLKED EXEC, you must have:

- Write access to the DB2 RXSQL production disk to allow files to be written to this disk during the link-edit
- Read access to the DB2 RXSQL service disk
- Read access to the DB2 production and service disks.

Syntax

This syntax is valid if used from CMS.

```
►►──ELOLKED──┬────────────────────────────┬──────────────────────────►◄
             └─file_mode_1─┬─────────────┬┘
                           └─file_mode_2─┘
```

file_mode_1.
  Is the file mode for the DB2 RXSQL production disk. The default file mode is P.

file_mode_2
  Is the file mode for the DB2 RXSQL service disk. The default file mode

  is V.

Description

The ELOLKED EXEC link-edits DB2 RXSQL.

Performing an RXSQL System Link-Edit

If DB2 RXSQL was installed separately from the DB2 Server for VM files, you must link and access the DB2 RXSQL disks. If DB2 RXSQL was installed with the DB2 Server for VM files, it is unnecessary to link and access the DB2 RXSQL disks. You only have to link and access the DB2 Server for VM disks in write mode.

To perform a DB2 RXSQL system link-edit, do the following:

1. Access the DB2 RXSQL production disk in write mode.
2. Access the DB2 RXSQL service disk in read mode.
3. Access the DB2 production and service disks in read mode.
4. Type the following to call the ELOLKED EXEC to link-edit DB2 RXSQL:
   ```
   ELOLKED file_mode_1 file_mode_2
   ```

5. Release and detach the minidisks to which you are linked and release any SFS directories to which you are linked.

   The following message is displayed when the link-edit is successfully completed:

   ```
   DB2 RXSQL link-edit has been performed successfully.
   ```

Note: The RXSQL MODULE, EXECSQL MODULE, and RXSQL LOADLIB files are created by this EXEC.

If the ELOLKED EXEC is not successful:

An error message identifies the problem. Correct the error and rerun the ELOLKED EXEC.

Note: The error message output is spooled to the printer.

The ELOSCOR EXEC

This EXEC is supplied with DB2 RXSQL and resides on the service disk. It applies the service based on the contents of the corrective service tape. It does not use service files for other IBM products, but leaves them on the MAINT work minidisk.

Authorization

To run the ELOSCOR EXEC, you must have:
- Write access to the DB2 RXSQL production and service disks
- Read access to the DB2 production and service disks.

Syntax

```
►►──ELOSCOR──────────────────────────────────────────────────────────►◄
```

Description

The ELOSCOR EXEC determines whether a link-edit is necessary. If it is, the ELOSCOR EXEC calls the ELOLKED EXEC. The appropriate link-edits are done and the MODULE and LOADLIB files on the DB2 RXSQL production disk are replaced. For information on the prerequisites and authorization required to run the ELOLKED EXEC, refer to “The ELOLKED EXEC” on page 182.

If the package has been serviced, the ELOSCOR EXEC issues a message indicating that the DB2 RXSQL package must be reloaded. You must reload this package into each application server into which DB2 RXSQL was installed. For information on loading the DB2 RXSQL package, refer to “The ELOAMOD EXEC” on page 179.

The ELOSHLP EXEC

The ELOSHLP EXEC services the DB2 RXSQL secondary-level HELP tables. It services the AMENG HELP text as well as any national language support language that was installed. It is not supported for non-DB2 application servers, or when using the DRDA protocol.

Prerequisites

To run the ELOSHLP EXEC, you must have:

- Established the application server in which you want to service HELP tables by typing:
  ```
  SQLINIT DBNAME(SQLDBA)
  ```
- The language key of the language being serviced
- A read/write work disk accessed as file mode A. If more than one language is installed in your RXSQL HELP tables, you will need free space on your A disk. The amount of space required is 1 cylinder of 3380 DASD (or equivalent) for each language installed, excluding the language you are servicing. For example, if three languages are installed in your HELP tables, your A disk must have a minimum of 2 free cylinders of 3380 DASD (or equivalent) to run the ELOSHLP EXEC. The ELOSHLP EXEC can then save the text for the languages not being serviced on your A disk while the service is being performed. After the service is performed, the ELOSHLP EXEC restores the languages to the database and removes them from your A disk.

Authorization

To run the ELOSHLP EXEC, you must have:

- The connect password for the SQLDBA authorization ID
- Read access to the RXSQL disks
- Read access to the DB2 Server for VM production disk.

Syntax

```
►►──EXEC ELOSHLP──┬────────────────────┬──┬──────────────────────────────┬──────────►◄
                  └─LANGkey(langkey)───┘  └─CONnect(SQLDBA/password)─────┘
```

LANGkey
Use the LANGkey option if you do not want to be prompted to enter the language key for the language being serviced.

CONnect
Use the CONnect option if you do not want to be prompted to enter the password for the SQLDBA authorization ID.

Description

ELOSHLP does the following:

1. Connects to the application server
2. Uses the DBS Utility to:
   - Unload unchanged data from the HELP tables to temporary files on your A disk
   - Drop and recreate the HELP tables
   - Load the new data
   - Reload the saved data and erase the temporary files.

The following message is displayed when the HELP tables are serviced successfully:

```
SECONDARY LEVEL HELP TABLES serviced successfully.
```

If the ELOSHLP EXEC is not successful:

An error message identifies the problem. If the error occurred during DBS Utility processing, check the console listing for more details. Correct the error and rerun the ELOSHLP EXEC. The LASTING GLOBALV file contains the point at which the service EXEC had an error. Do not modify or delete this file. The temporary files ELO$TXT1 MACRO A and ELO$TXT2 MACRO A may have been created on your A disk. Do not modify or delete them. They will be used when you invoke the ELOSHLP EXEC again to complete the service.

Note: The error message output is spooled to the printer.

Appendix C. Online HELP Information

With DB2 RXSQL you can use any one of several national languages for messages and HELP information. (The HELP information is not supported for non-DB2 Server for VM application servers or when using the DRDA protocol.) During installation, one language is established as a system default. The default can be changed.

The HELP information is provided by the RXSQLHLP EXEC. This EXEC retrieves DB2 RXSQL HELP text for DB2 RXSQL-specific topics and DB2 Server for VM HELP information. The DB2 Server for VM HELP information is the same text that *ISQL* provides. The information is retrieved in the language that you define as your default during the installation of DB2 RXSQL. If you do not specify a default language, it is provided in the system default language. You can overwrite this default to specify your own language. Define your DB2 RXSQL and DB2 Server for VM default languages using the RXSQLANG EXEC. This EXEC verifies and stores the specified DB2 RXSQL and DB2 Server for VM language defaults in your LASTING GLOBALV file.

If you have installed a national language support feature (for example, Kanji or French), and have decided to delete it, use the ELODNLS EXEC. For a full description of the ELODNLS EXEC, see "The ELODNLS EXEC" on page 188.

The HELP text is stored internally in DB2 Server for VM tables, and can be retrieved and manipulated just like any data stored in the database. The RXSQLHLP EXEC issues SELECT statements on these tables. The tables used for DB2 RXSQL HELP text are created at DB2 RXSQL installation time. A list of the tables and a brief description of each is given in Figure 35 on page 188.

Table Name	Definition	Description
SQLDBA.ELOOPTIONS	This table has the same definition as the SYSTEM.SYSOPTIONS catalog table. The only difference is the name of the first *column:* instead of SQLOPTION, the ELOOPTIONS table has RXSQLOPTION. The other two columns have the same names and definitions.	Holds the system default language for DB2 RXSQL HELP information (SYSTEM.SYSOPTIONS holds the system default language for DB2 Server for VM HELP information).
SQLDBA.ELOLANGUAGE	This table has the same column names and definitions as the SQLDBA.SYSLANGUAGE catalog table.	This table contains a row for each language installed for RXSQL.
SQLDBA.ELOTEXT1	This table has the same column names and definitions as the SQLDBA.SYSTEXT1 table.	It also has the same usage as the SYSTEXT1 table.
SQLDBA.ELOTEXT2	This table has the same column names and definitions as the SQLDBA.SYSTEXT2 table.	It also has the same usage as the SYSTEXT2 table.

Figure 35. Database Tables Used for DB2 RXSQL HELP Text

Refer to the *DB2 Server for VSE & VM Database Administration* manual for more information on the contents of the DB2 Server for VM tables and the relationships between them.

RXSQL acquires enough space at installation time for four or five languages. You may have to check the number of active data pages for the RXSQL DBSPACE RXSQHELP. To do this, type the following command from CMS:

```
RXSELECT DBSPACENAME,NACTIVE FROM SYSTEM.SYSDBSPACES WHERE
DBSPACENAME = 'RXSQHELP'
```

If the NACTIVE value is close to 170 (256 less the index pages allowance), consider making the RXSQHELP DBSPACE larger by moving the HELP text to a larger dbspace. Refer to the *DB2 Server for VSE & VM Database Administration* manual for more information on expanding dbspaces.

The ELODNLS EXEC

The RXSQL ELODNLS EXEC deletes the CMS HELP files, the HELP text from a DB2 Server for VM application server, and the message repository for one or more languages. Delete American English HELP text only if absolutely necessary.

The HELP text is not supported for non-DB2 Server for VM application servers or when using the DRDA protocol.

Prerequisites

To run the ELODNLS EXEC, you must have:

- Established the application server from which the languages will be deleted by typing:

  ```
  SQLINIT DBNAME(SQLDBA)
  ```
- Freed file mode P.

Authorization

To run the ELODNLS EXEC, you must have:
- Read access to the DB2 Server for VM production and RXSQL service disks
- The connect password for the SQLDBA authorization ID.

Syntax

```
►►──ELODNLS──┬──────────────────────────┬──────────────────────────────────►◄
             └─CONNect(SQLDBA/password)─┘
```

CONNect
: Use the connect option if you do not want to be prompted to enter the password for the SQLDBA authorization ID.

Description

When you run the ELODNLS EXEC, it prompts you to:

1. Specify the HELP text languages to delete.

   After the EXEC displays a list of the currently installed languages, you are prompted for the language keys of the languages to be deleted. You must specify the languages to delete. You can separate the language keys with commas or blanks.

   Each time you make a selection and press ENTER, the language is flagged on the screen. When you complete your selections, press ENTER to process them.
2. Specify the new default language if the current default language is to be deleted, and two or more languages will remain on the system.

   When the current default language, as specified in the ELOOPTIONS table, is flagged for deletion, a list of the remaining languages and keys is displayed. Specify the key for the new default language and press ENTER.

   If only one language remains on the system, it becomes the new default language.
3. Confirm that you want to delete the DB2 RXSQL HELP text for the specified languages.

   Delete the flagged languages displayed on the screen from the database. To delete the languages, type `Yes`.

   To exit from the procedure without deleting any HELP text languages, type `No`.

   If you type `Yes`, the RXSQL HELP text for all languages marked for deletion is deleted from the database before you are prompted for deletion of the CMS HELP text and the message repository for each language.
4. Delete the CMS HELP text for the specified languages.

   If you want to delete the CMS HELP text for the current language, type `Yes`. You are prompted to type the disk information of the CMS HELP files of the current language. Be sure to give the correct information or you may delete the HELP text for another language.

If you do not want to delete the CMS HELP text for the current language, or you know that CMS HELP text does not exist for the current language, type `No` or `QUIT` to bypass the processing for this language. Processing continues for the next language flagged for deletion.

Prompts are issued for each language marked for deletion. The first prompts you to specify where the CMS HELP text is installed in your system.

The EXEC then displays the following defaults for the minidisk or SFS directory of the current language.

For minidisks the defaults are:

SQLMACH	User ID of the virtual machine that owns the minidisk of the current language
298	Virtual address of the minidisk
WSQL	Write access password for the minidisk.

For SFS directories the defaults are:

VMSYS	File pool ID
SQLMACH	SFS directory owner for CMS HELP files for the current language
RXSQL.NLSPROD	Name of the SFS directory in which the CMS HELP files for the current language were installed.

You must either accept these default values or supply different values. If you decide to bypass the deletion and go to the next language, type `QUIT`.

If the ELODNLS EXEC is not successful: An error message identifies the problem. Correct the error and rerun the EXEC.

Note: The error message output is spooled to the printer.

If the ELODNLS EXEC is successful: The summary message displays the status of all the languages marked for deletion. Check that:
- All languages are successfully deleted from the database
- The CMS HELP text for all languages is deleted or skipped as requested.

Notes:
1. At least one language remains in the SQLDBA.ELOLANGUAGE table. It is impossible to delete all languages.
2. For each language that you deactivate, the following is done:
   - The RXSQL HELP text is deleted by updating the SQLDBA.ELOTEXT2 and SQLDBA.ELOLANGUAGE tables.
   - If you delete the original default language, the SQLDBA.ELOOPTIONS table is updated with the new default language that you select.
   - If you choose to delete the CMS HELP text for a language, both the CMS HELP files and the message repository for that language are deleted.

Appendix D. Installation Messages

This appendix provides a summary of the messages that you can receive when installing DB2 RXSQL.

Messages

The RXSQL installation and database generation EXECs provide error messages. If more detailed information is required, you are directed to the appropriate documentation.

This section is divided into two parts:
- CMS- and CP-Related Messages
- RXSQL Installation Messages.

CMS- and CP-Related Messages

The following error messages may be displayed from any of the RXSQL installation EXECs:

CP FORCE command failed to force a logoff of *userid*. If command still fails after two attempts, check installation USERID class privileges.

Explanation: The CP FORCE command failed to force a logoff of the owner of the DB2 RXSQL product disk.

System Action: The program ends with the return code of 111 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Ensure the USERID installing the product has class privilege of A or use another USERID that does.

Error adding ELO message repository. RC = *rc* from the CMS SET LANGUAGE command.

Explanation: The CMS SET LANGUAGE command failed while trying to add the DB2 RXSQL message repository.

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the SET LANGUAGE command.

Error copying ELOUME TXTAMENG *fm* to the A disk as ELOUME TXT*lang-id*. RC = *rc* from the CMS COPYFILE command.

Explanation: Your current CMS language is not American English and there is no DB2 RXSQL message repository in your language on the product distribution tape. There is a DB2 RXSQL message repository for American English on the distribution tape; however, the CMS COPYFILE command failed while trying to copy that message repository to your current CMS language.

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the COPYFILE command.

Installation problem. ELOLANG EXEC & ELOLANMS EXEC not found.

Explanation: Neither the ELOLANG EXEC (to load the message repository) nor the ELOLANMS EXEC (to display messages for the ELOLANG EXEC) were found.

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: Contact the IBM Support Center.

Installation problem. ELOLANG EXEC not found.

Explanation: This message returns by the installation and service EXECs when the EXEC to load the message repository is missing (ELOLANG EXEC).

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: Contact the IBM Support Center.

Installation problem. ELOLANMS EXEC not found.

Explanation: The EXEC to display messages for the ELOLANG EXEC (ELOLANMS EXEC) was not found.

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: Contact the IBM Support Center.

Neither the *lang-id* nor the AMENG message repository could be found (ELOUME TXT*lang-id* and ELOUME TXTAMENG).

Explanation: The DB2 RXSQL message repository for American English, or for your current CMS language if other than American English, was not found on the DB2 RXSQL distribution tape.

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: Contact the IBM Support Center.

Return code = *rcode*. The DB2 RXSQL minidisks/directories have been successfully loaded. DB2 RXSQL link-edit has been completed successfully. Continue with the installation process described in the DB2 RXSQL manual. Briefly: Execute ELOAMOD EXEC to load the portable package and ELOHLPLD EXEC or ELOSHLP EXEC to load or migrate the HELP tables into each database where DB2 RXSQL is to be installed.

Explanation: The installation of DB2 RXSQL has been completed successfully. However, verification of the installation is not yet possible.

System Action: The program ends with the return
| code of 888 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Continue with the installation process as described in the DB2 RXSQL manual.

Tape not positioned at the end of the product and tape position is unknown.

Explanation: An error occurred while positioning the tape and the position of the tape is unknown.

System Action: The program ends with a return code
| of 18 or 20 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: After verifying that your hardware is working properly and your tape is mounted correctly, re-execute the installation EXEC. If you are using INSTFPP, **do not continue** installation of other products. **The tape position is unknown.** Correct the problem and reinstall. If the problem persists, contact the IBM Support Center.

The AMENG message repository could not be found.

Explanation: Your current CMS language is American English; however, there is no DB2 RXSQL message repository for American English on the product distribution tape.

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: Contact the IBM Support Center.

The *lang-id* repository, ELOUME TXT*lang-id* could not be found. The AMENG repository will be used.

Explanation: Your current CMS language is not American English and there is no DB2 RXSQL message repository in your language on the product distribution tape. There is, however, an American English message repository on the distribution tape and it will be used.

System Action: The program ends with the return code of 24, and the user returns to CMS.

User Response: If you want to operate DB2 RXSQL in a language other than American English, contact the IBM Support Center to acquire a message repository in your language.

User requests exit from *fn* installation EXEC.

Explanation: The user has requested an exit from the installation EXEC.

System Action: The program ends with the return code of 111, and the user returns to CMS.

User Response: Reexecute the installation EXEC.

RXSQL Installation Messages

The following error messages may be displayed during the installation of RXSQL:

ELO8502E The number of tape files as specified by the Product Identifier File is nonnumeric.

Explanation: The Product Identifier File (I5697ELO 071012) has nonnumeric characters in the fifth and sixth positions of the file type.

System Action: The program ends with the return code of 12 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Call the IBM Support Center to report the problem.

ELO8503E Product Identifier File not found.

Explanation: The CMS LISTFILE command failed to find the Product Identifier File (I5697ELO 071012) on the work disk.

System Action: The program ends with the return code of 12 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Make sure that the first two tape files of the DB2 RXSQL product tape are loaded to the work disk. Reexecute the installation EXEC. If the problem persists, contact the IBM Support Center.

ELO8504E Problem occurred while performing the LISTFILE command on the Product Identifier File. RC =*rc* from the CMS LISTFILE command.

Explanation: The LISTFILE command failed while trying to find the Product Identifier File (I5697ELO 071012).

System Action: The program ends with the return code of 12 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the LISTFILE command. Correct the problem and reexecute the installation EXEC.

ELO8506E There is no tape drive available at virtual address 181. Please attach a tape drive as virtual address 181, mount the DB2 RXSQL distribution tape, and reexecute the EXEC I5697ELO.

Explanation: The CMS QUERY command indicated that no virtual address exists for 181.

System Action: The program ends with the return code of 18 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Attach correct tape to virtual address 181 and reexecute the installation EXEC.

ELO8507E Tape scan failed to find the DB2 RXSQL Product Identifier File on the tape. Please mount the correct DB2 RXSQL distribution tape and re-execute the EXEC I5697ELO.

Explanation: No DB2 RXSQL Product Identifier File (I5697ELO 071012) was found on the tape mounted on virtual address 181.

System Action: The program ends with the return code of 18 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: After verifying that the tape mounted on virtual address 181 is the DB2 RXSQL distribution tape, reexecute I5697ELO. If the condition persists, contact the IBM Support Center.

ELO8516E Error accessing *userid cuu* as *fm*. RC = *rc* from the CMS ACCESS command.

Explanation: A minidisk could not be accessed.

System Action: The program ends with the return code of 16 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the ACCESS command. Correct the problem and reexecute the installation EXEC.

ELO8518E Error linking to *userid cuu1* as *cuu2* with *mode* mode. RC = *rc* from CP LINK command.

Explanation: A minidisk could not be linked. It is possible that the minidisk does not exist in the CP directory, the minidisk is linked by some other user, or an invalid link password was entered.

System Action: The program ends with the return code of 16 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Consult your CP command reference manual for details on the LINK command. If the minidisk does not exist in your CP directory, then refer to the Feature Program installation section for directory tailoring information. Otherwise, correct the problem and reexecute the installation EXEC.

ELO8523E Error loading *type* minidisk. RC = *rc* from the CMS VMFPLC2 command.

Explanation: The minidisk may be full or a tape error has occurred.

System Action: The program ends with the return code of 25 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the VMFPLC2 command. Correct the problem and reexecute the installation EXEC.

ELO8525E DB2 RXSQL minidisks or directories have been successfully loaded, but the DB2 RXSQL link-edit completed with error messages.

Explanation: The DB2 RXSQL disks have been successfully loaded, but the DB2 RXSQL link-edit program returned control to the main program with error messages.

System Action: The I5697ELO EXEC ends after displaying the error messages from the DB2 RXSQL link-edit program.

User Response: Check the error messages returned from the DB2 RXSQL link-edit, and follow the corrective steps that they outline.

ELO8527E The DB2 RXSQL minidisks or SFS directories have not been successfully loaded. DO NOT CONTINUE with the DB2 RXSQL installation process. Please correct the error identified by previous messages and review the installation procedure. Then re-execute the I5697ELO EXEC. Return Code = *rcode*

Explanation: The I5697ELO EXEC failed with the return code of 12, 16, 18, 20, 24, 25, 26, 36, 45, or 48.

System Action: The program ends with the return code of 12, 16, 18, 20, 24, 25, 26, 36, 45, or 48 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Correct the error identified by the previous error messages and reexecute the I5697ELO EXEC.

ELO8528E DB2 RXSQL link-edit was unsuccessful. Please correct the problem and do the following to complete the installation: Execute ELOLKED to do the DB2 RXSQL link-edit. Execute ELOAMOD to load the portable package. Execute ELOHLPLD to install secondary level HELP. Return Code = *rcode*

Explanation: The DB2 RXSQL disks have been successfully loaded, but the DB2 RXSQL link-edit failed.

System Action: The program ends with the return code of 24, 26, 29, 32, 36, or 48 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Correct the error identified by the previous error message. Reexecute the ELOLKED EXEC and continue the installation steps.

ELO8529E Look at the CMS file, ELOLK LKEDIT: - LINK-EDIT successful (if ELOLK LKEDIT contains only IEW0222 messages). - LINK-EDIT unsuccessful (if ELOLK LKEDIT contains error messages other than IEW0222). Return Code = *rcode* If DB2 RXSQL link-edit is successful then do the following to complete the installation: Execute ELOAMOD to load the portable package. Execute ELOHLPLD to install secondary level HELP. If DB2 RXSQL link-edit is unsuccessful then correct the errors identified in the CMS file ELOLK LKEDIT and do the following to complete the installation: Execute ELOLKED to do the DB2 RXSQL link-edit. Execute ELOAMOD to load the portable package. Execute ELOHLPLD to install secondary level HELP.

Explanation: The disks have been successfully loaded, but the DB2 RXSQL link-edit completed with warning messages.

System Action: The program ends with the return code of 33 from the I5697ELO or ELOLKED EXECs, and the user returns to CMS.

User Response: Check the CMS file ELOLK LKEDIT on your work disk. If the file contains only IEW0222 messages, the link-edit was successful. If the file contains other error messages, correct the errors, reexecute the ELOLKED EXEC, and continue the installation steps. If the problem persists, contact the IBM Support Center.

ELO8530E Error forwarding over tape file *num*. RC = *rc* from the CMS VMFPLC2 FSF command.

Explanation: An error occurred while forward spacing the tape. There is either a hardware problem or a tape error. The tape position is unknown.

System Action: The program ends with the return code of 20 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: After verifying that your hardware is working properly and your tape is mounted correctly, reexecute the installation EXEC. If the condition persists, call your IBM Customer Service Representative if it is a hardware problem, or contact the IBM Support Center if you suspect the problem is with the tape.

ELO8536E ELOHLPLD EXEC invoked with invalid parameters. To install secondary level HELP refer to the section in the DB2 RXSQL manual that describes the ELOHLPLD EXEC and execute the EXEC with correct parameters.

Explanation: The ELOHLPLD EXEC was not invoked with valid parameters.

System Action: The program ends with the return code of 27 from the ELOHLPLD EXEC, and the user returns to CMS.

User Response: Correct the problem and reexecute the ELOHLPLD EXEC with valid parameters. For information on the ELOHLPLD EXEC, refer to “The ELOHLPLD EXEC” on page 181.

ELO8537E Error connecting to the default database. Database is not available or the connect password for SQLDBA is incorrect. Return Code = *rcode*

Explanation: The error may have been caused by one of the following:
- The connect password for SQLDBA is incorrect
- SQLINIT has not been run.

System Action: The program ends with the return code of 31 from the ELOHLPLD EXEC, and the user returns to CMS.

User Response: Correct the error and reexecute the ELOHLPLD EXEC.

ELO8538E Either ELOHELPI EXEC is missing or a DBSU error occurred while installing HELP tables into the database. Return Code = *rcode*

Explanation: The ELOHELPI EXEC was not found or a DBS Utility error occurred while:
- Acquiring a public dbspace
- Creating HELP tables
- Creating indexes on the HELP tables
- Issuing GRANT SELECT TO PUBLIC on HELP tables.

System Action: The program ends with the return code of 31 from the ELOHLPLD EXEC, and the user returns to CMS.

User Response: Correct the problem and reexecute the ELOHLPLD EXEC. You may have to drop the PUBLIC.RXSQLHELP dbspace before reexecuting ELOHLPLD.

ELO8539E This VM execution environment is not supported by this release of DB2 RXSQL.

Explanation: Incorrect VM level. DB2 RXSQL 7.1.0 supports only VM/ESA Release 2.3 and later.

System Action: The program ends with the return code of 36, and the user returns to CMS.

User Response: Correct the problem and reexecute the installation EXEC. If the problem continues, contact the IBM Support Center.

ELO8540E DB2 Server for VM level *level* is not supported by this release of RXSQL.

Explanation: DB2 RXSQL does not support the indicated DB2 Server for VM level.

System Action: The program ends with the return code of 48, and the user returns to CMS.

User Response: Contact the IBM Support Center.

ELO8541E File RXSQL TEXT *fm* not found, or RXSQL SERVICE minidisk or directory is not accessed as *fm*.

Explanation: The CMS STATE command failed to find the RXSQL TEXT file on the minidisk or directory accessed as the file mode.

System Action: The program ends with the return code of 32 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the STATE command, or make sure that you are accessing the correct minidisk or directory. Correct the problem and reexecute the ELOLKED EXEC.

ELO8542E Error while generating RXSQL MODULE.

Explanation: The RXSQL MODULE could not be generated or the production disk is not accessed as read/write.

System Action: The program ends with the return code of 29 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Access the DB2 RXSQL production disk as read/write and reexecute the ELOLKED EXEC.

ELO8544E File ELOLK TEXT *fm* not found, or DB2 RXSQL SERVICE minidisk is not accessed as *fm*.

Explanation: The CMS STATE command failed to find the ELOLK TEXT file on the minidisk or directory accessed as the file mode.

System Action: The program ends with the return code of 32 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the STATE command, or verify that you are accessing the correct minidisk or directory. Correct the problem and reexecute the ELOLKED EXEC.

ELO8546E File *fn ft* * not found.

Explanation: The CMS STATE command failed to find one of the files required to perform the DB2 RXSQL link-edit.

System Action: The program ends with the return code of 32 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Access the DB2 RXSQL and DB2 Server for VM production and service disks with the required access modes and reexecute the ELOLKED EXEC.

ELO8547E The above file should be on the DB2 Server for VM *type* minidisk/directory or you should have your own DATE or TIME routine on one of the accessed minidisks.

Explanation: The CMS STATE command failed to find either the ARIUXDT TEXT file or the ARIUXTM TEXT file during the DB2 RXSQL link-edit.

System Action: The program ends with the return code of 32 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Make sure that the default date or time routines (on the DB2 Server for VM disk) or your customized date or time routines are available on one of the accessed disks. Reexecute the ELOLKED EXEC.

ELO8548E This file should be on the CMS System Disk.

Explanation: The CMS STATE command failed to find the DMSCSL TEXT file in the CMS system minidisk or directory.

System Action: The program ends with the return code of 32 from the ELOLKED EXEC, and the user returns to CMS.

User Response: File DMSCSL TEXT is required to perform the DB2 RXSQL link-edit in non-XA environments. Please make sure that the system minidisk or directory is accessed and reexecute the ELOLKED EXEC.

ELO8551E Error while generating RXSQL LOADLIB. Check ELOLK LKEDIT file (ignore IEW0222 messages).

Explanation: The link-edit completed with warning messages.

System Action: The program ends with the return code of 33 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Look at the ELOLK LKEDIT file. Ignore all IEW0222 messages, if they exist. Any other messages indicate unsuccessful link-edit. Correct the problem and reexecute the ELOLKED EXEC.

ELO8556E DB2 Server for VM level cannot be determined.

Explanation: The CMS LISTFILE command failed while trying to find the SQLLEVEL EXEC. This file is needed to determine the current DB2 Server for VM level. DB2 RXSQL Version 7 Release 1 only supports DB2 Server for VM Version 6 Release 1.

System Action: The program ends with the return code of 26, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the LISTFILE command. Contact the IBM Support Center if further problems persist.

ELO8557E DIAGNOSE X'00' command failed with RC = *rc*.

Explanation: The DIAGNOSE X'00' command failed when trying to determine the VM level.

System Action: The program ends with the return code of 36, and the user returns to CMS.

User Response: Consult your CP programming services manual for details on the DIAGNOSE command. Correct the problem and reexecute the installation EXEC.

ELO8559E ELOAMOD EXEC invoked with invalid parameters. To perform the PORTABLE PACKAGE RELOAD, refer to the section in the DB2 RXSQL manual that describes the ELOAMOD EXEC and execute the EXEC with correct parameters.

Explanation: The ELOAMOD EXEC was not invoked with valid parameters.

System Action: The program ends with the return code of 27 from the ELOAMOD EXEC, and the user returns to CMS.

User Response: Correct the problem and reexecute the ELOAMOD EXEC with valid parameters. For information on the ELOAMOD EXEC, refer to "The ELOAMOD EXEC" on page 179.

ELO8561E Error loading the PORTABLE PACKAGE into the database. Return Code = *rcode*

Explanation: The error may have been caused by one of the following:

- The password for SQLDBA is incorrect
- SQLINIT has not been run.

System Action: The program ends with the return code of 31 from the ELOAMOD EXEC, and the user returns to CMS.

User Response: Ensure that the above dependencies are met and reexecute the ELOAMOD EXEC.

ELO8566E PORTABLE PACKAGE RELOAD unsuccessful. Please correct the problem identified by the previous error messages and re-execute the ELOAMOD EXEC to complete the PORTABLE PACKAGE RELOAD. Return Code = *rcode*

Explanation: The PORTABLE PACKAGE RELOAD failed with the return code of 24, 26, 27, 31, or 48.

System Action: The program ends with the return code of 24, 26, 27, 31, or 48 from the ELOAMOD EXEC, and the user returns to CMS.

User Response: Check the return code and previous error messages for more information. Correct the errors and reexecute the ELOAMOD EXEC.

ELO8567E Installation of SECONDARY LEVEL HELP TABLES was unsuccessful. Please correct the problem identified by the previous error messages and re-execute the ELOHLPLD EXEC to complete the SECONDARY LEVEL HELP installation. Return Code = *rcode*

Explanation: The secondary-level HELP tables load failed with the return code of 24, 27, or 31.

System Action: The program ends with the return code of 24, 27, or 31 from the ELOHLPLD EXEC, and the user returns to CMS.

User Response: Check the return code and errors identified by previous error messages. Correct the problem and reexecute the ELOHLPLD EXEC.

ELO8573E The minidisk or directory accessed as filemode *fm* **is not a DB2 RXSQL** *type* **minidisk or directory or it is not accessed as read/write.**

Explanation: A disk accessed as the file mode is not the DB2 RXSQL production or service disk. There may be vital files missing from the disk.

System Action: The program ends with the return code of 29 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Make sure that the DB2 RXSQL production and service disks are accessed as read/write and reexecute the ELOLKED EXEC.

ELO8574E DB2 RXSQL link-edit was unsuccessful. Please correct the problem and do the following to complete the link-edit: Execute ELOLKED EXEC. Return Code = *rcode***.**

Explanation: The DB2 RXSQL link-edit was unsuccessful.

System Action: The program ends with the return code of 24, 26, 29, 32, 36, or 48 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Check the return code and the previous error messages for further details. Correct any errors and reexecute the ELOLKED EXEC.

ELO8575E The above file should be on the DB2 Server for VM *type* **minidisk/directory.**

Explanation: The STATE command failed to find the ARIRVSTC TEXT file to perform the DB2 RXSQL link-edit.

System Action: The program ends with the return code of 32 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Access DB2 Server for VM production and service disks in read access mode and reexecute the ELOLKED EXEC.

| **ELO8576E Error occurred while attempting to skip to the end of the 5697ELO tape files.**

Explanation: An error occurred while forwarding the tape to the end of the product.

System Action: The program ends with the return code of 20 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: After verifying that your hardware is working properly and your tape is mounted correctly, reexecute the installation EXEC. If the condition persists, call your IBM customer service representative if it is a hardware problem or contact the IBM Support Center if you suspect the problem is with the tape.

ELO8579E FILE EXECSQL TEXT *fm* not found, or DB2 RXSQL SERVICE minidisk or SFS directory is not accessed as *fm*.

Explanation: The CMS STATE command failed to find the EXECSQL TEXT file on the disk accessed as the file mode.

System Action: The program ends with the return code of 32 for the ELOLKED EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the STATE command or make sure that you are accessing the correct disk. Correct the problem and reexecute the ELOLKED EXEC.

ELO8580E Error while generating EXECSQL MODULE.

Explanation: The EXECSQL MODULE could not be generated or the production disk is not accessed with read/write mode.

System Action: The program ends with the return code of 29 from the ELOLKED EXEC, and the user returns to CMS.

User Response: Access the DB2 RXSQL production disk with read/write mode and reexecute the EXEC.

ELO8584E You are installing the DB2 RXSQL package on a non-DB2 Server for VM application server, but you are not using the DRDA protocol. To perform the installation of the DB2 RXSQL package on a non-DB2 Server for VM application server you must use the DRDA protocol.

Explanation: The ELOAMOD EXEC was not invoked with DRDA protocol when trying to install the DB2 RXSQL package onto a non-DB2 Server for VM application server.

System Action: The program ends with the return code of 38 from ELOAMOD EXEC, and the user returns to CMS.

User Response: Ensure that you are using the DRDA protocol and reexecute the ELOAMOD EXEC.

ELO8586E The SQLDS(No) parameter that you provided is not supported when you are running in the VM/XA environment.

Explanation: The DB2 RXSQL package cannot be installed in non-DB2 Server for VM applications servers when running in the VM/XA environment.

System Action: The program ends with the return code of 27 from ELOAMOD EXEC, and the user returns to CMS.

User Response: Change the parameter to SQLDS(Yes) and reexecute the ELOAMOD EXEC.

ELO8608E Error loading *type* directory. RC = *rc* from the CMS VMFPLC2 command.

Explanation: The directory may be full or the directory was not accessed in read/write mode.

System Action: The program ends with the return code of 25 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the VMFPLC2 command. Correct the problem and reexecute the installation EXEC.

ELO8610E Error accessing *directory* as *fm*. RC = *rc* from the CMS ACCESS command.

Explanation: An SFS directory could not be accessed.

System Action: The program ends with the return code of 16 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the ACCESS command. Correct the problem and reexecute the installation EXEC.

ELO8612E Write authority is required for: *directory*

Explanation: The SFS directory is not accessed in read/write mode.

System Action: The program ends with the return code of 45 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Acquire write authority for the SFS directory and reexecute the installation EXEC. If the problem persists, contact your IBM Support Center.

ELO8701E The DB2 RXSQL *type* minidisk or directory is not accessed as Read/Write with filemode *fm*.

Explanation: An error occurred when ELOSCOR EXEC tried to verify write access to the DB2 RXSQL *type* minidisk or SFS directory with filemode *fm*.

System Action: The program ends with the return code of 16 from the ELOSCOR EXEC, and the user returns to CMS.

User Response: Access the *type* minidisk or SFS directory as filemode *fm* with read/write access and reexecute the ELOSCOR EXEC.

ELO8702E No DB2 RXSQL corrective service files were found on the Work minidisk accessed as filemode *fm*. Check to make sure the proper tape was mounted and/or the proper files have been unloaded from the tape. Then re-execute this EXEC.

Explanation: ELOSCOR EXEC could not find any corrective service files on the work minidisk accessed as filemode *fm*.

System Action: The program ends and the user returns to CMS.

User Response: Ensure that the proper tape was mounted and/or the proper files have been unloaded from the tape to the work minidisk and reexecute this EXEC.

ELO8704E Error copying *fn ft fm* to the DB2 RXSQL *type* minidisk or directory. RC = *rc* from the CMS COPYFILE command.

Explanation: A CMS COPYFILE error occurred when the ELOSCOR EXEC was copying a file from the work minidisk to the DB2 RXSQL *type* minidisk or SFS directory.

System Action: The program ends with the return code of 28 from the ELOSCOR EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the return code *rc* from the CMS COPYFILE command. Correct the problem and reexecute ELOSCOR EXEC.

ELO8705E Error erasing the *fn ft fm* file. RC = *rc* from the CMS ERASE command.

Explanation: A CMS ERASE error occurred while the EXEC was erasing a file from the work minidisk.

System Action: The program ends with the return code of 28 from the EXEC, and the user returns to CMS.

User Response: Consult your CMS command reference manual for details on the return code *rc* from the CMS ERASE command. Correct the problem and reexecute the EXEC.

ELO8804E ELOSHLP EXEC was invoked with invalid parameters. To service secondary level help refer to the description of ELOSHLP EXEC in the manual. Re-execute the EXEC with the correct parameters. ELOSHLP *LANGkey (langkey) CONnect (SQLDBA/password)*

Explanation: The ELOSHLP EXEC was not invoked with valid parameters.

System Action: The program ends with the return code of 27 from the ELOSHLP EXEC, and the user returns to CMS.

User Response: Correct the problem and reexecute the ELOSHLP EXEC with valid parameters.

ELO8807E Invalid language key entered. The langkey format is either Sxxx or Dxxx, where xxx is a number. Check the console listing from the preventive service EXEC for the langkey that is to be used when applying service to the help tables. Rerun the ELOSHLP EXEC with the correct langkey.

Explanation: The ELOSHLP EXEC was not invoked with a valid language key parameter. The language key parameter langkey must:
- Start with either S or D
- Have three numbers following S or D.

System Action: The program ends with the return code of 27 from the ELOSHLP EXEC, and the user returns to CMS.

User Response: Check the console listing from the preventive service EXEC for the langkey that is to be used when applying service to the HELP tables, and reexecute the ELOSHLP EXEC with a valid langkey parameter.

ELO8808E A DBSU error occurred while servicing the help tables. The stage in service was *stage*. rc = *rc*. Look at the console listing to determine the error. Correct the problem indicated and rerun ELOSHLP EXEC.

Explanation: The DBS Utility error occurred during one of the following:
- Unloading unchanged data from HELP tables to temporary files
- Dropping and recreating HELP tables
- Dropping and recreating indexes on HELP tables
- Loading data into HELP tables
- Granting select authority on HELP tables to public.

System Action: The program ends with the return code of 31 from the ELOSHLP EXEC, and the user returns to CMS.

User Response: Look at the console listing to determine the DBS Utility error. Correct the problem indicated and rerun ELOSHLP EXEC.

ELO8811E Servicing of the SECONDARY LEVEL HELP TABLES was unsuccessful. Please correct the problem identified by the previous error messages and re-execute the EXEC ELOSHLP to complete the service of SECONDARY LEVEL HELP TABLES. rc = ***rc*****.**

Explanation: Servicing of the secondary-level HELP tables failed with the return code of 24, 26, 27, 31, 40 or 48.

System Action: The program ends with the return code of 24, 26, 27, 31, 40, or 48 from the ELOSHLP EXEC, and the user returns to CMS.

User Response: Check the return code and errors identified by previous error messages. Correct the problem and reexecute the ELOSHLP EXEC.

ELO8813E The ELOHNLS EXEC was invoked with invalid parameters. To load NLS help text for the languages installed, refer to the description of the ELOHNLS EXEC in the supplied documentation and re-execute the EXEC with the correct parameters. ELOHNLS *LANGkey (langkey) CONnect (SQLDBA/password)*

Explanation: The ELOHNLS EXEC was not invoked with valid parameters.

System Action: The program ends with the return code of 27 from the ELOHNLS EXEC, and the user returns to CMS.

User Response: Correct the problem and reexecute the ELOHNLS EXEC with valid parameters.

ELO8814E Invalid language key entered. The langkey format is either Sxxx or Dxxx, where xxx is a number. Check supplied documentation for the appropriate langkey and re-execute the ELOHNLS EXEC with the correct langkey.

Explanation: The ELOHNLS EXEC was not invoked with a valid language key parameter. The language key parameter langkey must:
- Start with either S or D
- Have three numbers following S or D.

System Action: The program ends with the return code of 27 from the ELOHNLS EXEC, and the user returns to CMS.

User Response: Check supplied documentation for the appropriate langkey and reexecute the ELOHNLS EXEC with a valid langkey parameter.

ELO8815E DBSU error occurred while loading the NLS help text into the help table. rc = ***rc*****. Look at the console listing to determine the error. Correct the problem indicated and rerun the ELOHNLS EXEC.**

Explanation: The DBS Utility error occurred during one of the following:
- Inserting a row into SQLDBA.ELOLANGUAGE table
- Dropping and re-creating indexes on HELP tables
- Loading data into HELP tables
- Granting select authority on HELP tables to public.

System Action: The program ends with the return code of 31 from the ELOHNLS EXEC, and the user returns to CMS.

User Response: Look at the console listing to determine the DBS Utility error. Correct the problem indicated and rerun ELOHNLS EXEC.

ELO8817E Loading of NLS help text into help tables was unsuccessful. Please correct the problem identified by the previous error messages and re-execute the EXEC ELOHNLS to complete the installation of NLS help text into help tables. Return Code = ***rc*****.**

Explanation: The NLS HELP tables load failed with the return code of 24, 26, 27, 31, or 48.

System Action: The program ends with the return code of 24, 26, 27, 31, or 48 from the ELOHNLS EXEC, and the user returns to CMS.

User Response: Check the return code and errors identified by previous error messages. Correct the problem and reexecute the ELOHNLS EXEC.

ELO8818E File ***fn ft*** **was not found. Check if you are using the correct langkey or that the DB2 RXSQL Service minidisk or directory is linked. Correct the problem and rerun** ***exec*****.**

Explanation: This error can be caused by running one of the following EXECs:
- ELOSHLP
- ELOHNLS.

If you used ELOSHLP EXEC, the required file used for servicing the HELP tables was not available. If you used ELOHNLS EXEC, the required file used for installation of NLS HELP tables was not available. Either you used an incorrect language key parameter or the DB2 RXSQL service disk was not accessed.

System Action: The program ends with the return code of 26 from the EXEC, and the user returns to CMS.

User Response: Check whether you are using the correct language key parameter or whether the DB2 RXSQL service disk is accessed. Correct the problem and run the EXEC again.

ELO8821E ELODNLS EXEC was invoked with invalid parameters. To delete language(s) refer to the section in the manual that describes the ELODNLS EXEC and execute the EXEC with the correct parameters.

Explanation: The ELODNLS EXEC was not invoked with valid parameters.

System Action: The program ends with the return code of 27 from the ELODNLS EXEC, and the user returns to CMS.

User Response: Correct the problem and reexecute the ELODNLS EXEC with valid parameters.

ELO8822E Error unloading table SQLDBA.ELOLANGUAGE

Explanation: A DBS Utility error occurred when ELODNLS EXEC tried to unload language key information from the SQLDBA.ELOLANGUAGE table.

System Action: The program ends with the return code of 31 from the ELODNLS EXEC, and the user returns to CMS.

User Response: Check the console listing to determine the DBS Utility error. Correct the problem indicated and rerun ELODNLS EXEC.

ELO8823E Error unloading table SQLDBA.ELOOPTIONS

Explanation: A DBS Utility error occurred when ELODNLS EXEC tried to unload default language information from the SQLDBA.ELOOPTIONS table.

System Action: The program ends with the return code of 31 from the ELODNLS EXEC, and the user returns to CMS.

User Response: Check the console listing to determine the DBS Utility error. Correct the problem indicated and rerun ELODNLS EXEC.

ELO8834E DBSU error while deleting rows from SQLDBA.ELOLANGUAGE or SQLDBA.ELOTEXT1 tables, or while updating table SQLDBA.ELOOPTIONS. Please review the console listing to find the DBSU error, correct the problem and re-execute this EXEC.

Explanation: A DBS Utility error occurred when ELODNLS EXEC tried to delete rows from SQLDBA.ELOLANGUAGE table or SQLDBA.ELOTEXT1 HELP table, or while updating the default language in SQLDBA.ELOOPTIONS table.

System Action: The program ends with the return code of 31 from the ELODNLS EXEC, and the user returns to CMS.

User Response: Check the console listing to determine the DBS Utility error. Correct the problem indicated and run ELODNLS EXEC again.

ELO8839E Failed to find DB2 RXSQL CMS HELP files on the NLS PRODUCTION minidisk or SFS directory accessed as filemode *fm*.

Explanation: An error occurred when ELODNLS EXEC tried to find DB2 RXSQL CMS HELP file with filename DB2 RXSQL and filetype HELPMENU. It was not found for one of the following reasons:

- The disk accessed as file mode *fm* was not the NLS production disk.
- The DB2 RXSQL CMS HELP file was never installed or has already been deleted.

System Action: The program ends with the return code of 16 from the ELODNLS EXEC, and the user returns to CMS.

User Response: Make sure that the file is on the NLS production disk and rerun ELODNLS EXEC.

ELO8844E Deactivation of the language or languages (from database and the corresponding CMS HELP from minidisks or SFS directories) was unsuccessful. Please correct the errors identified by the previous error messages and re-execute the ELODNLS EXEC. rc = *rc*.

Explanation: Language deactivation failed with the return code of 16, 24, 26, 27, 28, 31, 36, or 48.

System Action: The program ends with the return code of 16, 24, 26, 27, 28, 31, 36, or 48 from the ELODNLS EXEC, and the user returns to CMS.

User Response: Check the return code and errors identified by previous error messages. Correct the problem and reexecute the ELODNLS EXEC.

ELO8850E A DBSU error occurred while searching for the language *langkey* in the SQLDBA.ELOLANGUAGE table. rc = *rc*. Look at the console listing to determine the error. Correct the problem indicated and rerun ELOSHLP EXEC

Explanation: The error occurred when the DBS Utility tried to check if the language *langkey* was in the SQLDBA.ELOLANGUAGE table.

System Action: The program ends with the return code of 31 from the ELOSHLP EXEC, and the user returns to CMS.

User Response: Look at the console listing to determine the DBS Utility error. Correct the problem indicated and rerun ELOSHLP EXEC.

ELO8851E **An error occurred while searching for the language *langkey* in the SQLDBA.ELOLANGUAGE table. Either there were no entries in the output DBSU file, or there was more than 1. Look at the console listing to determine the error. Correct the problem indicated and rerun ELOSHLP EXEC.**

Explanation: The result file from the DBS Utility search for the language in the SQLDBA.ELOLANGUAGE table was empty or contained more than one entry.

System Action: The program ends with the return code of 31 from the ELOSHLP EXEC, and the user returns to CMS.

User Response: Ensure that the language is in the SQLDBA.ELOLANGUAGE table and there are no duplicate rows for the language in the table. Correct the problem and run the ELOSHLP EXEC again.

ELO8852E **The language *langkey* was not found in the SQLDBA.ELOLANGUAGE table. As a result, you cannot service this language. Correct the LANGkey parameter and rerun the ELOSHLP EXEC.**

Explanation: There is no entry for the language to be serviced in the SQLDBA.ELOLANGUAGE table. To service a language, it must be in the SQLDBA.ELOLANGUAGE table.

System Action: The program ends with the return code of 31 from the ELOSHLP EXEC, and the user returns to CMS.

User Response: Make sure that the language is in the SQLDBA.ELOLANGUAGE table and run the ELOSHLP EXEC again.

ELO8853E **The attempt to get *number* free *fm virtual address virtual address* for the access or link was unsuccessful. There must be at least *number* free for this EXEC. Correct the situation and rerun.**

Explanation: This EXEC will try to get enough free file modes, and if necessary, virtual device addresses to link and access disks. *number* indicates the number of free file modes or virtual device addresses required. The EXEC was unable to get the number required.

System Action: The program ends with the return | code of 16 from the I5697ELO installation EXEC, and the user returns to CMS.

User Response: Ensure that there are at least *number* free file modes or virtual device addresses (as indicated in the message) and rerun this EXEC.

Appendix E. RXSQL Return Codes and Messages

This appendix contains a list of DB2 RXSQL return codes and error messages. The return codes are returned in the REXX variable RC.

CMS-Related Return Codes

The following are the CMS return codes issued when DB2 RXSQL is not found or could not get through initialization.

-3

Explanation: DB2 RXSQL was not found by CMS or RXSQL was called through an unsupported interface (for example, call RXSQL ...).

System Action: The program ends and the user is returned to CMS.

User Response: Link to the correct DB2 RXSQL production library.

28 DMSSOP036E OPEN ERROR CODE ’04’ ON ’RXSQL ’.

Explanation: RXSQL LOADLIB was not found by RXSQL MODULE.

System Action: The program ends and the user is returned to CMS.

User Response: Ensure that the correct DB2 RXSQL production library is linked.

28 DMSSOP036E OPEN ERROR CODE ’04’ ON ’ARISQLLD’.

Explanation: ARISQLLD LOADLIB was not found by the DB2 Server for VM Resource Adapter.

System Action: The program ends and the user is returned to CMS.

User Response: Ensure that the DB2 Server for VM production library is linked.

41 DMSFRE159T INSUFFICIENT STORAGE AVAILABLE TO SATISFY DMSFREE REQUEST FROM *address*.

Explanation: There was not enough free storage to load the DB2 RXSQL code from the RXSQL LOADLIB. A minimum of approximately 500K bytes of free storage is needed.

System Action: The program ends and the user is returned to CMS.

User Response: Obtain more storage for your virtual machine and rerun the program.

DB2 Server for VM-Related Return Codes

The following are the return codes from a request where DB2 RXSQL had no error, but the DB2 Server for VM system gave an error or warning.

-10

Explanation: DB2 Server for VM has issued a serious error as a result of the last database request. See the SQLCA variables.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user’s REXX program.

User Response: Check the returned SQLCODE variable and other SQLCA variables in your program and refer to *DB2 Server for VM Messages and Codes* manual for an explanation.

4

Explanation: DB2 Server for VM has issued a warning as a result of the last database request. See the SQLCA variables.

System Action: The DB2 RXSQL request was completed with warnings. Control is returned to the user's REXX program.

User Response: Check the returned SQLCODE variable and other SQLCA variables in your program and refer to *DB2 Server for VM Messages and Codes* manual for an explanation.

8

Explanation: DB2 Server for VM has issued a serious error as a result of the last database request. See the SQLCA variables.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check the returned SQLCODE variable and other SQLCA variables in your program and refer to *DB2 Server for VM Messages and Codes* manual for an explanation.

10

Explanation: DB2 Server for VM has issued a warning as a result of the last database request. See the SQLCA variables.

System Action: The DB2 RXSQL request was completed with warnings. Control is returned to the user's REXX program.

User Response: Check the returned SQLCODE variable and other SQLCA variables in your program and refer to *DB2 Server for VM Messages and Codes* manual for an explanation.

Message Format and Associated Text

In the following sections, the conventions for showing messages are:

- All the letters, numbers, and punctuation marks (such as periods, commas, underscores, and dashes) following the message identifier in **bold** show the actual message text.
- Letters, words, and numbers in the text of the message that are in *italics* represent variables. RXSQL substitutes specific values for the variables when it displays the message.

  In the explanation following the message text, the variables are in *italics*.

All RXSQL messages begin with a message identifier of the form **ELOnnnnt**, where:

ELO Shows that the message is from RXSQL.

nnnn Identifies the particular message number.

t Is the action indicator:
  E Error
  I Warning or Information

Explanation contains information about the message, such as:

- Definitions for variable fields in the message text
- Possible reasons why the message occurred
- Additional descriptive information about the condition that caused the message to occur.

System Action describes the resulting action that was or will be taken by RXSQL.

User Response, **Operator Response**,

RXSQL Error Messages

The following messages are issued when there is an RXSQL error. The return code will be less than -100 on EXECSQL invocation, and greater than 100 on RXSQL invocation.

ELO0101E Insufficient storage available to start DB2 RXSQL.

Explanation: The attempt to start DB2 RXSQL failed because not enough storage could be obtained.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Obtain more storage for your virtual machine and rerun the program

ELO0103E Insufficient storage available for DB2 RXSQL to process the request.

Explanation: The amount of storage DB2 RXSQL needs to process the request is not available.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Obtain more storage for your virtual machine and rerun the program.

ELO0104E Error trying to fetch or set a REXX variable. Return code from EXECOMM = -1.

Explanation: An unexpected error was returned from EXECCOMM while DB2 RXSQL was trying to fetch or set a REXX variable.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: See the *VM/ESA REXX/VM Reference* manual for a description of the -1 return code from EXECCOMM and apply corrective measures.

ELO0105E The data type *data_type_number* of column *col_number* is not supported by DB2 RXSQL.

Explanation: DB2 RXSQL did not recognize the data type of the column in position *col_number*. The number found in the SQLTYPE field of the SQLDA was *data_type_number*. DB2 RXSQL did not recognize the SQLTYPE supplied by the database manager in the SQLDA as one of the supported SQLTYPEs.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Make sure you are running compatible release levels of the database manager and DB2 RXSQL. Ensure that DB2 RXSQL supports all data types in the tables being accessed.

ELO0106E DB2 RXSQL Error code = *code*: invalid internal code used.

Explanation: The DB2 RXSQL interface module to the database manager has received an invalid internal code.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Inform your DB2 RXSQL system programmer of the error.

System Programmer Response: Check that there are no inconsistencies with release levels of DB2 RXSQL. If there are none, contact IBM support with the problem.

ELO0107E DB2 RXSQL was not invoked from a REXX program.

Explanation: The return code from EXECCOMM was -3. There was no EXECCOMM environment available. DB2 RXSQL was not called from a REXX program.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Refer to the *VM/ESA REXX/VM Reference* manual for a description of the -3 return code from EXECCOMM. Ensure that your program is a REXX program.

ELO0108E Invalid variable name *name*.

Explanation: REXX rejected the request to set or fetch a variable because the name did not conform to REXX standards. Only the first 20 characters of your REXX variable name are shown. You may have had more main variables on the DB2 RXSQL request than DB2 RXSQL expected.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check the variable names on the request and ensure that they are valid REXX variables. Rerun the program.

ELO0109E Unexpected error trying to fetch or set a REXX variable. RC=*hexadecimal_code*.

Explanation: An unexpected error was returned from EXECCOMM as a result of trying to fetch or set REXX variables. *hexadecimal_code* is the SHVRET value for an EXECCOMM call.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Refer to the *VM/ESA REXX/VM Reference* manual for a description of the return codes from EXECCOMM (SHVRET).

ELO0110E An error has occurred while trying to read GLOBALV variable *name*.

Explanation: An error occurred when DB2 RXSQL tried to access the LASTING GLOBALV file. The LASTING GLOBALV file may be updated by the SQLINIT program and the CMS GLOBALV command. You did not invoke the SQLINIT program before using DB2 RXSQL, or you deleted a value from the LASTING GLOBALV file, or you placed an incorrect parameter in the LASTING GLOBALV file. The group name for values used by DB2 RXSQL is SQL/DS. DB2 RXSQL tried to access the global variable *name*.

If *name* was one of 'DATEFORMAT', 'TIMEFORMAT', 'LDATELEN' or 'LTIMELEN' then any date or time data fetched in subsequent requests will be returned in the ISO format. It is assumed that there are no local date and time exits.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Issue the SQLINIT program with the correct parameters. If the error persists, notify your system programmer.

System Programmer Response: Verify the parameters that were specified in the SQLGLOB program during initialization.

ELO0111E Unexpected error from EXECCOMM. Return code is negative.

Explanation: An unexpected error was returned from EXECCOMM. DB2 RXSQL was trying to fetch or set a REXX variable. The EXECCOMM return code was negative but not recognized by DB2 RXSQL. (The return code is not equal to -1, -2 or -3)

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Refer to the *VM/ESA REXX/VM Reference* manual for a description of the negative return codes from EXECCOMM and apply corrective measures.

ELO0115E Insufficient storage was available to set REXX variables.

Explanation: DB2 RXSQL was attempting to set a REXX variable value and EXECCOMM could not acquire enough storage to set the value. The return code from EXECCOMM was -2.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Obtain more storage for your virtual machine and rerun the program. For more information refer to the *VM/ESA REXX/VM Reference* manual for a description of the -2 return code from EXECCOMM.

ELO0116E *name* does not represent a SELECT statement. *request* request cannot be executed.

Explanation: The statement name or prepare name specified in the *request* request does not refer to a prepared or declared SELECT statement.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check your spelling of the statement name and rerun the program.

ELO0117E *name* is not open. FETCH request cannot be executed.

Explanation: The cursor name, prepare name or statement name, *name*, as an argument of the FETCH request has not been previously OPENed.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's program.

User Response: Issue an OPEN request using the cursor name or statement name, *name*, and then issue the FETCH.

ELO0118E *name* represents a SELECT statement. A PUT request cannot be executed.

Explanation: The statement name or prepare name specified in a PUT request represents a SELECT statement.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check your spelling of the statement name and rerun the program.

ELO0120E An attempt was made to prepare more than the allowed limit of *n* statements.

Explanation: No more than *n* SQL statements can be processed by the PREP request in a single program.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Issue a PURGE request for one or more of the existing statements, reuse a statement name in a PREPARE request, or use Extended Dynamic statements.

ELO0129E *metavariable* is an invalid function number.

Explanation: The function metavariable following the TRACE command has specified a function number that is either not numeric or is not one of the valid function numbers.

System Action: The DB2 RXSQL request was executed successfully. Control is returned to the user's REXX program.

User Response: Check the function metavariable following the TRACE command, change it and rerun the program.

ELO0130E *metavariable* is an undefined trace level.

Explanation: The trace metavariable following a TRACE command has specified a trace level that was not one of the valid levels.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check the trace metavariable following the TRACE command, change it and rerun the program.

ELO0134E Too many input rexx-host-variables were coded on the statement.

Explanation: The statement contained too many rexx-host-variables in the input-rexx-host-variable-list to pass on to the database. The maximum number of input rexx-host-variables allowed is 32767.

System Action: The request has not executed successfully. The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Reduce the number of input rexx-host-variables and rerun your program. Note that the database manager may have a smaller limit than DB2 RXSQL and a further error could be produced by the database manager if its maximum is exceeded.

ELO0135E Section *section* of package *package* owned by *creator* is not a SELECT. Request was *request*.

Explanation: The statement represented by the section number, creator name and package name on a *request* request is not a SELECT statement. The creator name may not be present if one was not given on the request.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Make sure that you are referencing the correct section in your package. Change the request and rerun your program.

ELO0138E *name* has a cursor-name *cursor-name*. *request* must use the cursor name.

Explanation: A cursor for the statement associated with *name* exists. As a result, the DB2 RXSQL request must be issued with the *cursor-name*.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Change the request to use the cursor name, and rerun the program.

ELO0139E *name* is not OPEN - unable to *operation*.

Explanation: A CLOSE or PUT request has been issued for an SQL statement that has not been previously processed by an OPEN request.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: An OPEN request must be issued before a CLOSE or PUT request can be performed. Change the program accordingly and rerun the program.

ELO0142E Name *name* has no associated dynamically prepared statement.

Explanation: An operation was issued without providing a dynamically prepared SQL statement for the name *name*.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: You must issue a Dynamic PREPARE statement to assign a statement to the statement name you used in your request.

ELO0143E The name *name* is too long.

Explanation: The cursor name, prepare name or statement name given is more than 18 characters long.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Shorten the statement name or cursor name shown to 18 characters or less. Rerun the program.

ELO0144E *name* is not valid.

Explanation: The name specified for an SQL statement on a Dynamic PREPARE, Dynamic DECLARE or Extended DECLARE request contains an invalid character.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Refer to the *DB2 REXX SQL for VM/ESA Installation and Reference* manual for a description of valid cursor names, prepare names or statement names. Change the statement name to the allowed format and rerun the program.

ELO0145E The name *name* does not exist.

Explanation: *name* has not been provided on any previous PREPARE or DECLARE statements. There is no SQL statement associated with *name*.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: A PREPARE or DECLARE request must be issued to define a statement name or cursor name and assign it to an SQL statement.

ELO0149E SQL statement of length *len* is too long.

Explanation: The maximum length for an SQL statement is 32767 characters. If your cursor or statement name in the WHERE CURRENT OF clause is 1 or 2 characters long, DB2 RXSQL will expand your statement by up to 2 characters when it substitutes its own values for cursor or statement name before the request is passed to the database manager.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Reduce the size of your SQL statement. Rerun the program.

ELO0150E Value passed in position *pos* of length *len* is too long.

Explanation: The maximum length for an SQL character string is 32767 characters.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Reduce the size of the character string. Rerun the program.

ELO0151E Operator command of length *length* is too long.

Explanation: The maximum length for an operator command accepted by RXSQL is 80 characters.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Reduce the size of your operator command. Rerun the program.

ELO0152E Error in operator command processing.

Explanation: The attempt to issue an operator command failed because the database returned unexpected information to DB2 RXSQL. The REXX SQLCA variables have been set.

System Action: The request has not executed successfully. The DB2 RXSQL request was not completed. Control is returned to the user's REXX program.

User Response: Check the SQLCA variables, correct the problem and rerun the program.

ELO0154E The name *name* in a Dynamic EXECUTE statement is associated with an Extended Dynamic statement.

Explanation: The name *name* found in a Dynamic EXECUTE statement has been declared as a statement name for an extended dynamic statement. A statement name cannot be used in a Dynamic EXECUTE statement when it is already being used in an Extended Dynamic statement.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Correct the statement and rerun the request.

ELO0156E Work unit information could not be obtained. DMSCSL return code *rc*.

Explanation: System information for the CMS work unit could not be obtained. No further processing can be done in this CMS work unit. If CMS work units were being used for the first time, no further processing can be done by the program.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Refer to the *VM/ESA: CMS Application Development Reference* manual for more information on the return code for the Callable Services Library Routines: DMSQWUID and DMSERP.

ELO0163E The *parameter* value *value* on the CONNECT request is too long.

Explanation: The value for the specified *parameter* is too long.

System Action: The request has not executed successfully. The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Correct the input and rerun the program. See the *DB2 REXX SQL for VM/ESA Installation and Reference* manual for the details on the CONNECT statement.

ELO0168E The authorization name *name* is too long.

Explanation: The authorization name (creator) must be a string of 1 to 8 characters.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Shorten the name and rerun the program.

ELO0169E Section number *number* is not in the valid integer range.

Explanation: The section number provided was either negative, zero or greater than 2,147,483,647. A valid section number ranges from 1 to 2,147,483,647.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your section number is in the valid range and rerun the program.

ELO0170E Name *name* matches the cursor name.

Explanation: A cursor name and prepare name on a Dynamic DECLARE statement were identical.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Change either the cursor name or prepare name so that they are different. Make sure that all other requests using the old name are also changed. Rerun the program.

ELO0171E Cursor name *cursor_name* is already in use.

Explanation: The cursor name *cursor_name* provided on a DECLARE statement is already defined for another statement. It matches either a cursor name or a prepare name.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: To reuse the name, issue an explicit PURGE request for the name. Otherwise, change the name and rerun the program.

ELO0172E The package id *id* is too long.

Explanation: The package identifier *id* must be a string of 1 to 8 characters.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Shorten the name and rerun the program.

ELO0173E Non-numeric section number *value*.

Explanation: The section number must be numeric.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that the value for the section number is numeric and rerun your program.

ELO0174E The name *name* is already in use.

Explanation: The name *name* provided is already in use. It matches either a previously declared cursor name or a statement name.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: To reuse the name, issue an explicit PURGE request for the name. Otherwise, change the name and rerun the program.

ELO0184E Output is not supported on a dynamic *request*.

Explanation: The INTO clause is not supported for the Extended Dynamic *request* that you issued. It is only supported for the Extended *request* for a SELECT statement you prepared into a package with the SINGLE ROW format.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Change your *request* by removing the INTO clause and rerun the program.

ELO0187E The syntax of the section number variable named *section-var* is invalid.

Explanation: The section number variable name must start with a colon.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Correct the input and rerun the program.

ELO0189E The syntax of the statement variable named *statement-var* is invalid.

Explanation: The statement variable name must start with a colon.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Correct the input and rerun the program.

ELO0192E Invalid *date-time* length value retrieved. Value was *value*.

Explanation: DB2 RXSQL retrieved the local date or time length value (LDATELEN or LTIMELEN) from your LASTING GLOBALV file. Either the length is an invalid length (too large or too small) or an illegal character was encountered during conversion.

Any date or time data fetched in subsequent requests will be returned in the ISO format. It is assumed that there are no local date and time exits.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Issue the SQLINIT program with correct parameters. If the error persists, notify your system programmer.

System Programmer Response: Verify the parameters that were specified in the SQLGLOB EXEC during initialization.

ELO0194E *date-time* format is invalid. Value retrieved was *value*.

Explanation: DB2 RXSQL fetched the DATEFORMAT or TIMEFORMAT from your LASTING GLOBALV file. An unrecognized value *value* was retrieved. Only the first 20 characters of the value are displayed.

Any date or time data fetched in subsequent requests will be returned in the ISO format. It is assumed that there are no local date and time exits.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Issue the SQLINIT program with correct parameters. If the error persists, notify your system programmer.

System Programmer Response: Verify the parameters that were specified in the SQLGLOB EXEC during initialization.

ELO0195E Unrecognized *date-time* data received from the database manager. Data was *data*.

Explanation: DB2 RXSQL has received date or time data (*data*) from the database manager in a format that cannot be recognized. The data is not in any of the database manager date or time formats and the local date or time exit does not recognize the data. Only the first 20 characters of the actual data is given in the message.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Inform your DB2 RXSQL system programmer of the error.

System Programmer Response: Check that there are no inconsistencies with the local date or time exit. For example, the exit should recognize the same date or time formats on both input and output. Also, make sure that the same version of the local exit has been linked with both DB2 Server for VM and DB2 RXSQL modules. Correct the problem, link-edit DB2 RXSQL, and rerun the program.

ELO0196E Supplied local *date-time* exit not replaced by user's local exit.

Explanation: DB2 RXSQL has tried to format a date or time value into the local format. However, the DB2 Server for VM local date or time exit was not replaced by a local exit when DB2 RXSQL was installed.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Inform your DB2 RXSQL system programmer of the error.

System Programmer Response: Make sure that the DB2 RXSQL link-edit was successful and that the correct local date or time exit is being linked with DB2 RXSQL. Re-link if necessary and rerun the program.

ELO0197E Invalid *date-time* value, function number = *number*, local exit RC = *rc*.

Explanation: DB2 RXSQL has called the local date or time exit to format a value retrieved from the database manager. The local exit indicated that the date or time value was invalid or that the date or time value was not in a valid format (check the return code *rc*).

The function number *number* indicated the direction in which the conversion was being performed by the local exit. If the number was '4' then the data was being converted from the LOCAL format to the ISO format. If the number was '8' then the data was being converted from the ISO format to the LOCAL format.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Inform your DB2 RXSQL system programmer of the error.

System Programmer Response: Find out why the local date or time exit did not recognize the data format that was passed to it. Correct the problems with the local exit, link-edit DB2 RXSQL again, and rerun the program.

ELO0198E Error returned from local *date-time* exit. Function = *func*, rc = *rc*.

Explanation: DB2 RXSQL has called the local date or time exit to perform the specified function, as indicated by *func*. The local exit returned the return code *rc* when trying to perform the operation.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Inform your DB2 RXSQL system programmer of the error.

System Programmer Response: Find out why an error occurred in the local date or time exit using the information returned in the message. Look at the function being performed and the return code from the routine. Correct the problems with the local exit, link-edit DB2 RXSQL again, and rerun the program.

ELO0202E Variable *var* is undefined or dropped.

Explanation: The variable *var* was undefined. This variable must contain a value.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that the variable's value has been set. Change your program and rerun it.

ELO0204E *main_variable* is undefined and the value of *indicator_variable* was non-negative.

Explanation: The main variable was undefined, yet the indicator variable indicated that the main variable would be set with a value.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check that the main variable or the indicator variable was set correctly or that the main variable was not inadvertently dropped. Change your program and rerun your program.

ELO0209E NULL data was retrieved for main variable *main-var* but no indicator variable was provided.

Explanation: DB2 RXSQL was invoked using EXECSQL invocation. NULL data was retrieved from the database, yet no indicator variable was provided to indicate this. Indicator variables are compulsory when retrieving NULL data using EXECSQL invocation.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that indicator variables are provided for all columns which can contain NULL values in your select list.

ELO0211E The indicator variable *ind_var* is undefined.

Explanation: The indicator variable did not have a value. DB2 RXSQL requires that an indicator variable, if provided, must have a value.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Assign a value to the indicator variable or remove the indicator variable from the statement. Rerun the program.

ELO0213E An indicator variable is required for main variable *main-var* to input NULL data.

Explanation: DB2 RXSQL was invoked using EXECSQL invocation. The main variable provided was undefined and no indicator variable was provided. This is not allowed using EXECSQL invocation.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: If you wish to input NULL data to the database manager, you must provide an indicator variable and assign a negative value to the variable.

ELO0214E GRAPHIC data *data* in variable *var* has an odd number of bytes.

Explanation: GRAPHIC data must have an even number of bytes.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check your GRAPHIC data to ensure that you have an even number of bytes. Rerun your program.

ELO0215E The value *number* in variable *variable* is out of the valid range for a floating point number.

Explanation: The number was too small or too large to be represented as a floating point number for the target operating system.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your data is within the range for your operating system and rerun the program.

ELO0216E An invalid floating point number *number* was in variable *variable*.

Explanation: DB2 RXSQL did not recognize the number as a valid floating point number.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your data is correct and rerun the program.

ELO0217E The value *number* you provided in *variable* is out of the range for SMALLINT.

Explanation: The value is out of the valid range for a small integer for the target operating system.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your column data type definition should be SMALLINT. If you really wish to insert this number, your column data type definition should be changed to INTEGER. Otherwise, ensure that your data is correct. Rerun your program.

ELO0218E The value *number* you provided in *variable* is out of the range for INTEGER.

Explanation: The value is out of the valid range for an integer for the target operating system.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your column data type definition should be INTEGER. If you really wish to insert this number, your column data type definition should be changed. Otherwise, ensure that your data is correct. Rerun your program.

ELO0219E The value *number* you provided for *variable* is an invalid integer.

Explanation: DB2 RXSQL did not recognize the value *number* as a valid integer number.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your data is correct and rerun the program.

ELO0220E The value *number* for variable *variable* is an invalid decimal number.

Explanation: DB2 RXSQL did not recognize the value as a valid decimal number.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your data is correct and rerun the program.

ELO0221E The value *value* for variable *variable* will result in high order truncation.

Explanation: Significant high order digits will be truncated from your number with the precision and scale given.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that your data is correct or ensure that the precision and scale are correct for the column. Rerun the program.

ELO0230E The value of variable *variable* has an invalid character *hex_value* at position *pos*.

Explanation: The variable value is invalid because it contains an invalid character.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Correct the request and rerun the program.

ELO0232E The value for the variable *variable* has a length of zero.

Explanation: The REXX variable *variable* was an empty string. For the request you are executing, the variable must have a length greater than zero.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Assign a valid value to the variable and rerun the program.

ELO0239E *name* must be used instead of *cursor-name* for the *request*.

Explanation: A cursor was declared for the statement associated with *name*, but the statement name or prepare name must be used for the request *request*.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Change the request to use the statement name, and rerun your program.

ELO0241E Initial state for *name* is invalid for the *request*.

Explanation: The statement must be in one of the initial states listed for the *request* in the *DB2 REXX SQL for VM/ESA Installation and Reference* manual.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Make sure that the state of the statement is allowed for the request and rerun the program.

ELO0242E The variable *var* is an invalid stem variable.

Explanation: A column and an indicator variable pair were provided, and only one of them is a valid stem variable.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Change the invalid variable name. Rerun your program.

ELO0243E Variable qualifiers are not allowed for stem variables.

Explanation: A variable qualifier was provided for a stem variable. DB2 RXSQL does not allow this.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Remove the variable qualifier or change the variable name or names so that they don't look like stem variables. Rerun your program.

ELO0250E The CREATE PACKAGE options of length *len* are too long.

Explanation: The maximum length for the options on a CREATE PACKAGE statement is 32767 characters. DB2 RXSQL appends the DESCRIBE option to the string that you specified, and this total length must not exceed the maximum.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Reduce the size of the options and rerun the program. Note that the database manager may have a smaller limit than DB2 RXSQL and a further error could be produced by the database manager if its maximum is exceeded.

ELO0330E The SQL statement has an invalid character, *hex-value*, at position *pos*.

Explanation: The character found at the indicated position in the SQL statement is not a valid character.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Replace the character found with a valid character and rerun the request.

ELO0340E The request has an invalid character, *hex-value*, at position *pos*.

Explanation: The character found at the indicated position in the request is not a valid character.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Replace the character found with a valid character and rerun the request.

ELO0344E The request begins properly but is incomplete.

Explanation: The DB2 RXSQL request was correct up to the point where no more input was found.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check that the request is complete and rerun the program.

ELO0345E Syntax error detected at word *word*, position *position* in the request.

Explanation: The word *word* is the first word that DB2 RXSQL does not recognize as being part of a valid request as shown in the DB2 RXSQL variable rxsqlrequest. This word may not be the cause of the error, it may be prior to this word.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check the value of rxsqlrequest, and correct the syntax of the request. Ensure that all keywords are spelled correctly. Rerun the program.

ELO0350E Invalid syntax at position *position* of the input string for *request*.

Explanation: The syntax for the request was incorrect. The error occurred at or near position *position* relative to the first non-blank character of the input string. Look for misspelled keywords.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check the syntax of your request. Change the statement and rerun your program.

ELO0444E The variable list begins properly but is incomplete.

Explanation: The variable list was correct up to the point where no more input was found.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check that the variable list is complete and rerun the program.

ELO0445E Syntax error detected at word *word*, position *position* in the variable list.

Explanation: A syntax error has occurred in the variable list at word *word*. This word is *position* characters from the beginning of the variable list.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check the syntax of the variable list and rerun the program.

ELO0450E The *field* provided, *value*, is not valid.

Explanation: On a variable qualifier, the value supplied was not correct for a *field*.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Change the value of the variable qualifier and rerun the request.

ELO0500E Unexpected C function error. File: *file-name* on Line: *line-num* detected the error.

Explanation: A call to a C function returned with an error.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Contact your system programmer with all the accompanying information.

System Programmer Response: Contact your IBM Service representative for corrective measures. Be prepared to have the necessary information for the error.

ELO0544E The value of the attributes variable begins properly but is incomplete.

Explanation: The value of the attributes variable was correct up to the point where no more input was found.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check that the value of the attributes variable is complete and rerun the program.

ELO0545E Syntax error detected at word *word*, position *position* in the attributes variable value.

Explanation: A syntax error has occurred in the value of the attributes variable at word *word*. This word is *position* characters from the beginning of the value of the attributes variable.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Check the syntax of the value of the attributes variable and rerun the program.

ELO0901E A severe error occurred. Extra info: *text* File: *file-name* Line: *line-num*

Explanation: DB2 RXSQL has discovered an internal inconsistency. *file-name* and *line-num* identify the DB2 RXSQL module that discovered the error. *text* may be provided to indicate more information about the error.

System Action: The DB2 RXSQL request was not executed successfully. Control is returned to the user's REXX program.

User Response: Contact your system programmer with all the accompanying information.

System Programmer Response: Contact your IBM Service representative for corrective measures. Be prepared to have the necessary information for the error.

ELO0960E Error trying to initialize the environment for DB2 RXSQL.

Explanation: The attempt to start DB2 RXSQL failed in subcommand processing.

System Action: The DB2 RXSQL request has not executed successfully. Control is returned to the user's REXX program.

User Response: This could be due to shortage of storage. Obtain more storage for your virtual machine and rerun the program. If the error persists, contact your system programmer with all the accompanying information.

System Programmer Response: Contact your IBM Service representative for corrective measures. Be prepared to have the necessary information for the error.

ELO0961E Error trying to initialize the environment for DB2 RXSQL.

Explanation: The attempt to start DB2 RXSQL failed in inter-language setup.

System Action: The DB2 RXSQL request has not executed successfully. Control is returned to the user's REXX program.

User Response: This could be due to shortage of storage. Obtain more storage for your virtual machine and rerun the program. If the error persists, contact your system programmer with all the accompanying information.

System Programmer Response: Contact your IBM Service representative for corrective measures. Be prepared to have the necessary information for the error.

ELO0962E Error trying to initialize the environment for DB2 RXSQL.

Explanation: The attempt to start DB2 RXSQL failed when trying to determine the operating environment.

System Action: The DB2 RXSQL request has not executed successfully. Control is returned to the user's REXX program.

User Response: Ensure that DB2 RXSQL is running on an operating system that is supported for DB2 RXSQL. If it is, contact your system programmer with all the accompanying information.

System Programmer Response: Contact your IBM Service representative for corrective measures. Be prepared to have the necessary information for the error.

ELO0963E Error trying to initialize the environment for DB2 RXSQL.

Explanation: The attempt to start DB2 RXSQL failed when trying setup the environment for DB2 RXSQL.

System Action: The DB2 RXSQL request has not executed successfully. Control is returned to the user's REXX program.

User Response: Contact your system programmer with all the accompanying information.

System Programmer Response: Contact your IBM Service representative for corrective measures. Be prepared to have the necessary information for the error.

RXSQL Warning Messages

The following messages are only issued on EXECSQL invocation, and indicate that RXSQL has issued a warning. The return code is always greater than 1000.

ELO1136I The statement for *name* was forced into a prepared or declared state during *request* processing.

Explanation: The statement corresponding to *name* was not in a prepared or declared state. One of the following SQL statements was executed to force a prepared or declared state: CLOSE, Dynamic PREPARE or Extended DECLARE.

System Action: A warning has been issued. The DB2 RXSQL request was completed. Control is returned to the user's REXX program.

User Response: You may continue processing. To avoid this warning, issue the appropriate request in order to put the statement associated with *name* in a Dynamic PREPARED or Extended Dynamic DECLARED state.

ELO1138I The input data on the OPEN request for *name* was ignored.

Explanation: An OPEN request for the cursor or statement named *name* has a variable list, however the statement corresponding to *name* is not a statement for which input is valid. As a result, the input has been ignored.

System Action: A warning has been issued. The DB2 RXSQL request was completed. Control is returned to the user's REXX program.

User Response: You may continue processing. To avoid this warning, remove the extra parameters on the OPEN request.

ELO1140I A Dynamic DECLARE has already been issued.

Explanation: A Dynamic DECLARE was issued when a Dynamic DECLARE had already been done for the cursor name and statement name. A Dynamic DECLARE is not necessary in this instance and should be removed from your program to improve the performance of your program.

System Action: A warning has been issued. The DB2 RXSQL request was completed. Control is returned to the user's REXX program.

User Response: You may continue processing. To avoid this warning, remove the redundant DECLARE request from your program.

ELO1142I *number* variables were given, but there are *select_number* select-list columns.

Explanation: The number of main variables in the REXX host variable list does not match the number of select-list expressions for the select statement.

System Action: A warning has been issued. The DB2 RXSQL request was completed. The number of REXX variables set with the data retrieved from the database is the minimum of *number* and *select_number*. Control is returned to the user's REXX program.

User Response: You may continue processing. To avoid this warning, the number of REXX variables to receive the fetched data must match the number of select-list columns.

ELO1170I An Extended Dynamic DECLARE has already been issued.

Explanation: An Extended Dynamic DECLARE was issued when an Extended Dynamic DECLARE had already been done for the cursor name, section number and package name supplied. An Extended Dynamic DECLARE is not necessary in this instance and should be removed from your program to improve the performance of your program.

System Action: A warning has been issued. The DB2 RXSQL request was completed. Control is returned to the user's REXX program.

User Response: You may continue processing. To avoid this warning, remove the redundant DECLARE request from your program.

ELO1175I The *attributes-variable* specified on the Temporary Extended PREPARE was ignored.

Explanation: A Temporary Extended PREPARE with an attributes variable was issued to fill an empty section. This attributes variable was ignored because it is ignored by the database manager.

System Action: A warning has been issued. The DB2 RXSQL request was completed. Control is returned to the user's REXX program.

User Response: You may continue processing. To avoid this warning, remove the USING clause from the Extended Dynamic PREPARE request.

ELO1221I The value for variable *variable* will result in low order truncation.

Explanation: Low order digits will be truncated from your number with the precision and scale given for the column.

System Action: A warning has been issued. The DB2 RXSQL request was completed. Control is returned to the user's REXX program.

User Response: You may continue processing.

ELO1299I PUT was reissued after database error. SQLSTATE=*sqlstate*, SQLERRD1=*sqlerrd1*, SQLERRD2=*sqlerrd2*.

Explanation: A PUT request was rejected by the database manager because the data type or length has changed for a main variable whose ordinal position was *sqlerrd2* in the REXX host variable list. DB2 RXSQL has intercepted this error from the database manager, has issued an SQL CLOSE and OPEN, and has reissued the PUT.

System Action: A warning has been issued. The DB2 RXSQL request was completed. Control is returned to the user's REXX program.

User Response: You may continue processing. To avoid this warning, ensure that all the data you are inserting into column number *sqlerrd2* looks like the same data type and has the same length. You may alternately provide variable qualifiers on your PUT statement that defines the target column's data type.

RXSQL-Supplied Program Messages

The following messages are issued only from the DB2 RXSQL-supplied programs.

ELO2100E XMITMSG RC= *rc*.

Explanation: An error occurred when a message from the DB2 RXSQL message repository was being retrieved. XMITMSG ended with a return code of *rc*.

System Action: No further processing is done. Control is returned to the user. The system waits for the user.

User Response: Refer to any other system messages that may have occurred. If the return code was 16 and a message was displayed saying the ELO repository was not found, then enter 'SET LANGUAGE (ADD ELO USER' to load the DB2 RXSQL message repository. For other errors refer to the *VM/ESA: System Messages and Codes* manual for the proper user response.

ELO2101E Invalid or conflicting *fn ft* parameter(s).

Explanation: The parameters used for the *fn ft* EXEC were not recognized or resulted in conflicting actions.

System Action: The operation was not executed successfully. Control is returned to CMS.

User Response: Refer to the section in the *VM/ESA REXX/VM Reference* manual describing the *fn ft* parameters allowed on the invocation.

ELO2102I * DB2 RXSQL Version *num1* Release *num2* Modification *num3* *****

Explanation: Identifies the DB2 RXSQL version and release modification level the user is invoking.

System Action: Normal completion. The user is returned to CMS.

ELO2111E *type* text is not installed or database is not available.

Explanation: The HELP text was not available at the time of invocation. Either the appropriate tables were not installed, not available, or the database was not available.

System Action: The operation was not executed successfully. Control is returned to CMS.

User Response: Refer to the SQLCA variables for more information. Ensure that the database is available and that the HELP table(s) indicated in the SQLCA variables have been created. If the HELP table(s) have been installed, the table(s) may have been temporarily unavailable. Try again later.

ELO2112I *type* text is not available for topic *topic* for language *langkey*.

| **Explanation:** The operation was not executed successfully. There was no DB2 RXSQL or DB2 Server for VM HELP text for the topic *topic*, in the language indicated by *langkey*.

| **System Action:** If this message is issued after `RXSQL HELP topic`, then processing continues with `SQL/DS HELP topic`. If this message is issued after `SQL/DS HELP topic`, then processing ends and control is returned to CMS.

User Response: If the topic was an ELO or ARI message ID, ensure that you entered all of the numbers in that message ID. If the topic was an unsigned number, a positive number is assumed. If you wanted

HELP for a negative number, place a minus (-) sign before the number.

ELO2121I ****** End-of-Data ************

Explanation: This is an informational message put at the end of the file being XEDITed. It indicates that all data from the query has been retrieved.

System Action: You are at the bottom of the file in XEDIT. The system waits for you to enter the next command.

ELO2122I Enter MORE to display more rows of data.

Explanation: Informational message indicating that there is more data to be retrieved and written to the file.

System Action: The system waits for you to enter the next command.

User Response: Enter MORE in the command line to get more rows of data into the file being XEDITed.

ELO2123I Enter RXSQLHLP *topic* to get more information.

Explanation: More information on the *topic* given may be retrieved by entering RXSQLHLP *topic* on the command line.

System Action: The system waits for you to enter the next command.

User Response: Enter 'RXSQLHLP topic' on the command line, if you wish to get more information on the topic.

ELO2124I Line truncated *num* characters by EXECIO.

Explanation: The row retrieved was too long to put in the file. *Num* indicates the number of characters that were truncated while writing to the file.

System Action: The truncated row was inserted in the file. The system continues writing rows into the file.

ELO2131I Current setting is *case*.

Explanation: The current case setting used by the RXSELECT EXEC is *case*. If *case* is UPPER, the SQL statement will be converted to upper case before being sent to the database manager. If the *case* is STRING, the statement will be sent to the database manager as it was entered.

System Action: The command was completed and the user is returned to CMS. The system waits for the next command.

ELO2141I No 'WHERE' clause was used on *cmd* statement.

Explanation: No 'WHERE' clause was specified on your *cmd* statement. More rows may have been affected than was intended.

System Action: The command was completed with warnings. The system waits for the next command.

User Response: You should verify that the change was intended unconditionally on the entire table. Refer to other messages issued and take action as indicated by those messages.

ELO2142I Row count = *num*.

Explanation: *Num* represents the number of rows processed by the command.

System Action: The command was completed with warnings. The system waits for the next command.

User Response: Check the row count against what you expected the number of affected rows to be. Refer to other messages displayed for more information and for an action to be taken. Also refer to SQLERRD.3 description in *DB2 Server for VSE & VM Application Programming* manual.

ELO2143I Row count = *num1* , Dependent row count = *num2*.

Explanation: *Num1* represents the number of rows processed by the command. *Num2* represents the number of dependent rows affected when the object table is a part of a referential structure.

System Action: The command was completed with warnings. The system waits for the next command.

User Response: Check the row counts against what you expected the number of affected rows to be. Refer to other messages displayed for more information and for an action to be taken. Also refer to SQLERRD.3 and SQLERRD.5 descriptions in *DB2 Server for VSE & VM Application Programming* manual.

ELO2144I Enter ROLLBACK or CANCEL to cancel the changes done.

Explanation: The system is waiting for a ROLLBACK or CANCEL response. If neither is entered, a COMMIT will be performed.

System Action: The system waits for a response from the user.

User Response: If you wish to rollback the changes made in this LUW, then enter ROLLBACK or CANCEL. Otherwise, press enter to commit all changes made so far.

ELO2151E Operator commands may not be issued while in a logical unit of work.

Explanation: You are in a logical unit of work. Operator commands are not allowed while you are in a LUW.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Refer to other messages issued and take action as indicated by those messages.

ELO2152I Do a COMMIT or ROLLBACK and try the command again.

Explanation: Enter COMMIT or ROLLBACK on the command line. If you wish to keep all changes made thus far, enter COMMIT; otherwise, enter ROLLBACK.

System Action: The system waits for the user to enter a command.

User Response: Issue a COMMIT or ROLLBACK to end the current LUW. Rerun the command.

ELO2153E Operator commands may not be issued while in single-user-mode.

Explanation: You are in single-user-mode. Operator commands are not allowed while you are in single-user-mode.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Do not issue operator commands while in single-user-mode. Restart the database in multiple user mode if you wish to enter operator commands.

ELO2154E Error processing DB2 Server for VM operator commands.

Explanation: An error was encountered while executing the DB2 Server for VM operator command.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Refer to other messages issued and take action as indicated by those messages.

ELO2155E Invalid SHOW command.

Explanation: The SHOW command you entered was invalid.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Refer to the *DB2 Server for VSE & VM Operation* manual for more information on the correct usage of the SHOW command. Change the command and rerun the program. Refer to any other messages issued and take action as suggested.

ELO2156E Invalid DB2 Server for VM operator command.

Explanation: The operator command entered was not a valid DB2 Server for VM operator command.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Refer to other messages issued and take action as indicated by those messages.

ELO2157E No DB2 Server for VM operator command entered.

Explanation: There was no DB2 Server for VM operator command entered.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Refer to other messages issued and take action as indicated by those messages.

ELO2158E DB2 Server for VM operator command value too long.

Explanation: A value entered with the operator command was too long.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Refer to other messages issued and take action as indicated by those messages.

ELO2159E Invalid operator command.

Explanation: The operator command entered was not a valid operator command.

System Action: The operator command was not executed. The system waits for the user to enter a command.

User Response: Refer to the *DB2 Server for VSE & VM Operation* manual for more information on operator commands. Change the command as necessary and rerun the program.

ELO2160E The CMS GLOBALV command failed. The return code from GLOBALV was *rc*.

Explanation: An error occurred when an attempt was made to update the LASTING GLOBALV file. GLOBALV ended with a return code of *rc*.

System Action: No further processing is done. Control is returned to the user. The system waits for the user.

User Response: Refer to the *VM/ESA: CMS Command Reference* manual for the proper user response.

ELO2161E The language *language* was not found in the *table* table.

Explanation: *language* was not found in the LANGUAGE or LANGID column of *table*. This national language is not installed.

System Action: No further processing is done. Control is returned to the user. The system waits for the user.

User Response: Query *table* to determine which languages are installed.

Appendix F. Sample Programs with Examples of RXSQL Requests

The example programs in this section describe how to write a set of REXX programs that create a table, insert data into it, and make queries on the table.

Examples Using RXSQL Requests

The first example program shows a REXX program that can be used to create the table named RXEMP. Figure 36 shows a sample input file that can be used to create the RXEMP table. The RXEMP table consists of columns with the headings EMPNO, FIRSTNME, MIDINIT, LASTNAME, WORKDEPT, PHONENO, HIREDATE, JOB, EDLEVEL, SEX, BIRTHDATE, SALARY, BONUS, and COMMISSION

```
002130 GARY    M  SAMS      B12  5643  1969-10-01  MANAGER   17  M  1956-11-21  41700  900  4130
002300 JANET   L  HEDGLEY   B09  2345  1972-12-15  ANALYST   16  F  1963-06-01  37900  800  3178
001010 RON     A  LOWRY     D14  2313  1978-01-15  ANALYST   20  M  1959-09-17  38240  600  3000
000990 RANDY   M  SCHENKER  A07  1430  1983-03-22  OPERATOR  15  M  1960-12-17  30190  700  2660
002020 TERRY   A  RAINEY    D11  3243  1989-09-05  DESIGNER  20  M  1967-09-13  32560  500  2408
001840 PAUL    P  CORDON    B09  7070  1985-07-21  FILEREP   18  M  1965-03-05  28090  600  3090
002330 LES     H  FABER     A10  2119  1977-03-18  CLERK     14  M  1952-02-25  27800  400  1777
009236 HEATHER B  DOBSON    D08  3467  1979-04-03  WRITER    16  F  1964-05-31  37600  800  2900
002574 JAY     Q  MERCIER   A11  2946  1991-05-06  WRITER    15  M  1971-09-22  33400  600  2650
003567 DICK    E  SCHMIDT   C04  3847  1972-11-17  CLERK     14  M  1960-12-03  25790  500  2540
002419 HARRY   P  ATWALA    A07  9127  1980-10-28  OPERATOR  16  M  1962-10-30  37940  800  3105
003326 MARY    K  GOODBAR   B09  3943  1974-07-13  MANAGER   18  F  1959-02-25  40360  900  3980
003589 STEVE   S  GOULD     D07  3565  1976-06-12  WRITER    17  M  1956-04-25  39250  350  3050
```

Figure 36. Example of Input File EMPLOYEE INPUT

Creating Tables and Inserting Data

Figure 37 is an example of how to use DB2 RXSQL to create a table and how to insert data rows in it.

```
/* EMPCRE */
/*   5697-F42 (C) Copyright IBM Corp. 1973, 2000.                    */
/*   All rights reserved.                                            */
/*   US Government Users Restricted Rights -                         */
/*   Use, duplication or disclosure restricted by                    */
/*   GSA ADP Schedule Contract with IBM Corp.                        */
/*                                                                   */
/*   Licensed Materials - Property of IBM                            */

/* An exec to create a table and a view of the table in SQL to control */
/* employee information.                                             */
/* Data from a file "EMPLOYEE INPUT" is loaded into the table         */
Address 'COMMAND' 1
```

Figure 37. Program to Create a Table and Insert Data (Part 1 of 3)

```
/* Define the data structure of the table to create                    */

creat_emp = 'CREATE TABLE RXEMP (', 2
                    'EMPNO        CHAR(6) NOT NULL,',
                    'FIRSTNME     VARCHAR(12) NOT NULL,',
                    'MIDINIT      CHAR(1) NOT NULL,',
                    'LASTNAME     VARCHAR(15) NOT NULL,',
                    'WORKDEPT     CHAR(3),',
                    'PHONENO      CHAR(4),',
                    'HIREDATE     DATE,',
                    'JOB          CHAR(8),',
                    'EDLEVEL      SMALLINT NOT NULL,',
                    'SEX          CHAR(1),',
                    'BIRTHDATE    DATE,',
                    'SALARY       DECIMAL(9,2),',
                    'BONUS        DECIMAL(9,2),',
                    'COMM         DECIMAL(9,2) )'  3

'RXSQL EXEC'  creat_emp 4            /* Create the table  */
If rc <> 0 then Signal 'ERROR'  5

view = 'CREATE VIEW EMPVIEW (EMPNO, FIRSTNME, MIDINIT, LASTNAME, JOB,',
       'EDLEVEL, SALARY)',
       'AS SELECT EMPNO, FIRSTNME, MIDINIT, LASTNAME, JOB, EDLEVEL,',
       'SALARY FROM RXEMP'

'RXSQL EXEC'  view                           /* Create the view  */
If rc <> 0 then Signal 'ERROR'

/* Define the insert statement to fill in rows of the table */

ins_emp = 'INSERT INTO RXEMP VALUES (',  6
              ':emp,:fname,:mid,:lname,:wdpt,:ph,:hire,:job,',
              ':ed,:sex,:birth,:sal,:bon,:comm )'

'RXSQL PREP IEMP'  ins_emp 7         /* Prepare the INSERT statement */
If rc <> 0 then Signal 'ERROR'
Do Forever                                   /* Input data to the table */
   'EXECIO 1 DISKR EMPLOYEE INPUT * (LIFO'  8  /* Read from file */
   If rc <> 0 then Leave  9
   /* Get the data into REXX variables */
   Parse Upper Pull emp fname mid lname wdpt ph hire job,
                    ed sex birth sal bon comm . 10
   If emp = '' then Iterate  11        /* Check for Blank record              */
   emp = "'"emp"'"  12                 /* Make sure it is a char string so    */
   fname = "'"fname"'"                 /* RXSQL does not change numeric chars */
   mid = "'"mid"'"                     /* to numeric type input type.         */
   lname = "'"lname"'"
   wdpt = "'"wdpt"'"
   ph = "'"ph"'"
   hire= "'"hire"'"
   job = "'"job"'"
   sex = "'"sex"'"
   birth = "'"birth"'"

   'RXSQL CALL IEMP'  13               /* Call the prepared INSERT statement */
   If rc <> 0 then Signal 'ERROR'
End
```

Figure 37. Program to Create a Table and Insert Data (Part 2 of 3)

```
'FINIS EMPLOYEE INPUT *'              /* Close input file         */
'RXSQL COMMIT'  14                    /* Commit the inserted data */
'RXSQL PURGE IEMP'  15                /* Purge prepared statement */
If rc = 0 then Exit


ERROR:                                 /* A severe error occurred  */
                                      /* Forget all inserted data so far */
errrc = rc
If errrc >= 100 then Do  16
   Say '  RXSQL Error:' errrc rxsqlmsg
   'RXSQL ROLLBACK'
End
Else If errrc = 4 | errrc = 8 then Do  17
   Say '  Sqlcode:' sqlcode  18
   Say ' Sqlstate:' sqlstate
   Do errd = 1 to 6
      If sqlerrd.errd <> 0 then Say '  Sqlerrd.'errd':' sqlerrd.errd
   End
   If sqlerrp <> '' then Say '  Sqlerrp:' sqlerrp
   If sqlerrm <> '' then Say '  Sqlerrm:' sqlerrm
   If sqlwarn <> '' then Say '  Sqlwarn:' "'"sqlwarn"'"
   If sqlcode < 0 & "INDEX"('WS',"SUBSTR"(sqlwarn,7,1)) = 0 then  19
      'RXSQL ROLLBACK'
End
Exit errrc  20
```

Figure 37. Program to Create a Table and Insert Data (Part 3 of 3)

Notes for EMPCRE Program

The following notes refer to the lines in the EMPCRE program identified by reverse video numbers in Figure 37 on page 221:

1 `Address COMMAND` causes REXX to pass command lines directly to a module without searching for a program of the same name. You should include `Address COMMAND` in your programs for performance reasons.

2 The comma at the end of the line causes REXX to concatenate the current line and the one that follows, replacing the comma with a blank. Using a comma for concatenation allows you to build long SQL statements.

3 This CREATE statement does not include an `IN dbspace_name` phrase. As a result, SQL chooses a PRIVATE DBSPACE for the table. To explicitly select a particular dbspace, use the `IN dbspace_name` phrase.

4 REXX expands the `creat_emp` variable and passes it to DB2 RXSQL as part of the command. DB2 RXSQL passes the statement to SQL for processing.

5 The REXX variable `rc` is set with the return code from DB2 RXSQL. If REXX, DB2 RXSQL, or the database manager indicates an error, this program (at label `ERROR`) displays all the error variables set by DB2 RXSQL, and then ends processing.

6 The names of the REXX variables are preceded by colons. They hold the values to be inserted into the fields of the RXEMP table.

7 This RXSQL PREP statement prepares the INSERT statement and gives it the name IEMP. DB2 RXSQL stores all the input variable names until the CALL request is made.

8 EXECIO is a CMS command to read a line from the EMPLOYEE INPUT file and put it on the program stack in last-in-first-out (LIFO) order.

9 The loop ends when the EXECIO command has an error (assumed to be end-of-file).

10 `Parse Upper Pull` gets the line read by EXECIO from the program stack. Each token in the line is assigned to the variables `emp`, `fname`, `mid`, `lname`, `wdpt`, `ph`, `hire`, `job`, `ed`, `sex`, `birth`, `sal`, `bon`, and `comm` respectively. The period after `comm` causes REXX to ignore any extra tokens on the line. Without the period, `comm` is set with all the characters remaining in the record, including trailing blanks.

11 If the record is all blank, the loop iterates and the program ignores the record.

12 The values `emp`, `fname`, `mid`, `lname`, `wdpt`, `ph`, `hire`, `job`, `sex`, and `birth` are put into quotation marks to ensure that DB2 RXSQL does not interpret the values as numeric. DB2 RXSQL removes the quotation marks before sending the values to the database manager on the CALL request.

13 The CALL request executes the IEMP statement prepared earlier. The input variables, held since the PREP statement (see line **7**), are converted from REXX variable values to SQL input data.

14 Processing reaches this point only if no errors occurred. The RXSQL COMMIT statement commits all data inserted in the database.

15 This RXSQL PURGE statement removes the prepared SQL statement named IEMP.

16 Processing reaches this point only if the program encounters a non-zero return code. This line checks for a DB2 RXSQL error (a number greater than 99). If the return code is greater than 99, the program displays the `rxsqlmsg` variable (a textual description of the error that occurred). The RXSQL ROLLBACK statement cancels any changes made to the database.

17 If the return code is not an RXSQL error, the program checks whether the return code is an SQL return code of 4 or 8. A return code of 4 indicates an SQL warning. A return code of 8 indicates an SQL error.

18 This line begins processing the SQL error indicator variables that display the following information:

sqlcode
: The primary SQL error code. You can issue the `EXEC RXSQLHLP sqlcode` command to determine the meaning of the displayed code.

sqlstate
: Error codes common to all distributed relational databases.

sqlerrd.1 - sqlerrd.6
: The secondary error codes and other information.

sqlerrp
: The SQL module that detected the error.

sqlerrm
: The values to be substituted into the error message text. See the *DB2 Server for VM Messages and Codes* manual for full error text.

sqlwarn
: Eleven characters of error indicators. For a more detailed explanation of `sqlwarn`, see page 118.

19 When the database manager cancels a transaction, it sets the seventh character of `sqlwarn` to W or S. This line checks whether the database manager has canceled the transaction or not by checking the value of the seventh character of `sqlwarn`. If the value is not W or S, the program issues an explicit DB2 RXSQL ROLLBACK command to cancel any changes to the database.

20 If the program encounters an error, it finishes processing and exits to VM.

Note: You can create a more sophisticated program to handle both recoverable situations and unrecoverable situations.

Retrieving Data from a Table

Figure 38 on page 226 shows a REXX program that you can use to retrieve data from the table created by the EMPCRE program.

```
/* EMPSEL */
/*   5697-F42 (C) COPYRIGHT IBM CORP. 1990, 2000.   */
/*   Licensed material - Program Property of IBM    */
/*   Refer to copyright instructions form G120-2083 */

/* An exec to display employees with a salary less then some amount */
/* Defaults: ANALYSTs with a salary less than $38,000               */
Address 'COMMAND'

Parse Upper Arg job salary .  1
If job = '' then job = 'ANALYST' 2
Else job = "'"job"'"  3                /* Make sure it is char type */
If salary = '' then salary = 38000  4

/* Define the select statement to pick part of the data from DB2 Server for VM */

sel_emp = 'SELECT * FROM EMPVIEW WHERE SALARY < :salary AND JOB = :job' 5

'RXSQL PREP SELEMP' sel_emp  6         /* Prepare the SELECT statement */
if rc<>0 then signal 'ERROR'
'RXSQL OPEN SELEMP'  7                 /* Open the SELECT statement */
if rc<>0 then signal 'ERROR'

If rc = 0 then Do                      /* If no errors occurred then */
   Do Forever                          /*   Get data from the table */

      /* Get the data into REXX variables from DB2 Server for VM */
      'RXSQL FETCH SELEMP emp fname mid lname job ed sal'  8
      If (rc = 4 & SQLCODE = 100)  then Leave  9  /* If there is no more */
      Else If rc <> 0 then Signal 'ERROR'     /* If there is an error */

      /* Check for Nulls */
      If "SYMBOL"('job') <> 'VAR' then job = '?'  10
      If "SYMBOL"('sal') <> 'VAR' then sal = '?'

      /* Type the data on the users terminal */
      Say 'Employee: 'emp '    ' fname mid lname
      Say 'Job:'job'    Education:'ed'     Salary:'sal
      Say ''  11                       /* Space down one line */
   End
   'RXSQL CLOSE SELEMP' 12             /* Close the SELECT statement */
   if rc<>0 then signal 'ERROR'
End
'RXSQL COMMIT'                         /* Commit the transaction */
'RXSQL PURGE SELEMP' 13               /* Purge PREPed statement */
If rc=0 then Exit
```

Figure 38. Program to Select Data from an SQL Table (Part 1 of 2)

```
ERROR:                                /* A fatal error occurred  */
                                      /* Forget all inserted data so far */
errrc = rc
If errrc >= 100 then Do
   Say '  RXSQL Error:' errrc rxsqlmsg
   'RXSQL ROLLBACK'
End
Else If errrc = 4 | errrc = 8 then Do
   Say '  Sqlcode:' sqlcode
   Say ' Sqlstate:' sqlstate
   Do errd = 1 to 6
      If sqlerrd.errd <> 0 then Say '  Sqlerrd.'errd':' sqlerrd.errd
   End
   If sqlerrp <> '' then Say '  Sqlerrp:' sqlerrp
   If sqlerrm <> '' then Say '  Sqlerrm:' sqlerrm
   If sqlwarn <> '' then Say '  Sqlwarn:' "'"sqlwarn"'"
   If sqlcode < 0 & "INDEX"('WS',"SUBSTR"(sqlwarn,7,1)) = 0 then
      'RXSQL ROLLBACK'
End
Exit errrc
```

Figure 38. Program to Select Data from an SQL Table (Part 2 of 2)

Notes for EMPSEL Program

The following notes refer to the lines in the EMPSEL program identified by reverse video numbers:

1 This program allows two arguments to be passed to it: `salary` and `job`.

2 If `job` is null, this line causes DB2 RXSQL to set `job` to a value of ANALYST.

3 This line ensures that any value specified for `job` is identified to DB2 RXSQL as a character type.

4 If `salary` is null, this line causes DB2 RXSQL to set `salary` to a value of 38000.

5 This SQL SELECT statement queries the RXEMP table for for employees with a certain job who have less than a certain salary. Colons in the variable names indicate to the database manager that the REXX variables `job` and `salary` are to supply these values.

6 This RXSQL PREP statement prepares the SELECT statement into the database. The statement is SELEMP for DB2 RXSQL. DB2 RXSQL stores the input variables `job` and `salary` for a subsequent OPEN request.

7 This RXSQL OPEN statement opens a cursor (for prepared statement SELEMP) on the query, using the values of the input variables `job` and `salary`.

8 This RXSQL FETCH statement reads one row from the result table each time through the loop. DB2 RXSQL uses the fields of the row as values for the variables listed on the FETCH request.

9 This line causes the loop to end if no more rows satisfy the query. This is not a true error situation. When there is a true error situation, the error routine takes control.

10 The columns of the table might contain null values. The `SYMBOL` function tests the REXX variable to see if it is defined or not. If the column value is null, DB2 RXSQL makes the variable that is to receive the column value undefined, and the SYMBOL function returns `LIT`. This means that the variable does not have a value. If the column has a value, DB2 RXSQL sets the variable that is to receive the column value, and the SYMBOL function returns `VAR`, meaning that the variable has a value.

11 These three lines format the results from one row of the query and display it for the user.

12 This RXSQL CLOSE statement closes the cursor (for prepared statement SELEMP) on the result table. A cursor for SELEMP can be opened again with another set of input `job` and `salary` values.

13 This RXSQL PURGE statement deletes the prepared statement named SELEMP. After the program processes this statement, SELEMP no longer exists. A cursor cannot be opened for it with another set of input values.

Examples Using Extended Dynamic RXSQL Requests

You can use an XPREP (or Extended PREPARE) request to accomplish the same results as the PREP request in the EMPSEL program. With an XPREP request, two programs replace the EMPSEL program. One program creates and prepares a package in the database. The other allows general users to access the data.

When the XPREP statement is processed, the database manager returns a section number identifying the position in the package that the prepared statement occupies. To use this prepared statement in any run-time program, you must use the same section number returned by the XPREP, in an extended DECLARE statement.

Since the XPREP needs to be done only once and the DECLARE every time you wish to use the prepared statement, two separate programs are typically used. One contains the XPREP statement and the other, a run-time program, contains the extended DECLARE statement. The following example programs describe a method of passing the section number from the first program to the run-time program.

Creating a Package

The following programs show one method of saving the section number. The EMPPRP program (shown in Figure 39 on page 229), contains the XPREP statement and generates the intermediate EMPDCL program (shown in Figure 40 on page 231). The EMPSELX program (shown in Figure 41 on page 232) is a run-time program that invokes the EMPDCL program to declare statement names for the appropriate SQL statement.

Note: The example generates a package with only one statement, but you can put more than one statement into a single package.

```
/* EMPPRP */
/*   5697-F42 (C) Copyright IBM Corp. 1973, 2000.                      */
/*   All rights reserved.                                              */
/*   US Government Users Restricted Rights -                           */
/*   Use, duplication or disclosure restricted by                      */
/*   GSA ADP Schedule Contract with IBM Corp.                          */
/*                                                                     */
/*   Licensed Materials - Property of IBM                              */

/* An exec to create and prepare the SQL statements available */
/* to the users                                               */
Address 'COMMAND'

/* Define the select statement to pick part of the data from DB2 Server for VM */
/* Note: Use parameter markers not variable names */
/*       Variable names given on OPEN */
sel_emp = 'SELECT * FROM EMPVIEW WHERE SALARY < ? AND JOB = ?' 1

/* Find out who I am */
'IDENTIFY (LIFO'  2
Parse Upper Pull myid . 3

/* Prepare to add DECLAREs to a generated exec called EMPDCL */
'ERASE EMPDCL EXEC'  4
/* Put in comment so exec will be a REXX exec */
'EXECIO 1 DISKW EMPDCL EXEC A (STRING /* EMPDCL */'  5
'EXECIO 1 DISKW EMPDCL EXEC A (STRING Trace "Err"' 6

Trace 'Err'
Signal ON ERROR  7                     /* Any error aborts */

/* Create package */
'RXSQL CREATE PACKAGE' myid'.EMPPROG USING BLOCK'  8

/* Prepare the SELECT statement */
'RXSQL XPREP' myid'.EMPPROG' sel_emp  9

/* Generate DECLARE with result of XPREP for EMPSELX to use */
decl ="'RXSQL DECLARE SELEMP CURSOR FOR" sqlstmtn "IN" myid".EMPPROG'"  10
'EXECIO 1 DISKW EMPDCL EXEC A (STRING' decl  11

'RXSQL COMMIT WORK'  12                /* Commit the transaction */

'RXSQL EXEC GRANT RUN ON EMPPROG TO PUBLIC'  13

'RXSQL COMMIT WORK'                           /* Commit the transaction */
Exit
```

Figure 39. Program to Define Extended Prepared Package (Part 1 of 2)

```
ERROR:
Signal OFF ERROR 14
errrc = rc
If errrc >= 100 then Do
   Say '  RXSQL Error:' errrc rxsqlmsg
   'RXSQL ROLLBACK'
End
Else If errrc = 4 | errrc = 8 then Do
   Say '  Sqlcode:' sqlcode
   Say ' Sqlstate:' sqlstate
   Do errd = 1 to 6
      If sqlerrd.errd <> 0 then Say '  Sqlerrd.'errd':' sqlerrd.errd
   End
   If sqlerrp <> '' then Say '  Sqlerrp:' sqlerrp
   If sqlerrm <> '' then Say '  Sqlerrm:' sqlerrm
   If sqlwarn <> '' then Say '  Sqlwarn:' "'"sqlwarn"'"
   If sqlcode < 0 & "INDEX"('WS',"SUBSTR"(sqlwarn,7,1)) = 0 then
      'RXSQL ROLLBACK'
End
Exit errrc
```

Figure 39. Program to Define Extended Prepared Package (Part 2 of 2)

Notes for EMPPRP Program

The following notes refer to the lines in the EMPPRP program identified by reverse video numbers:

1 This SELECT statement is the same as the SELECT statement used in the EMPSEL program, except that the variable names are replaced by parameter markers. The OPEN request in the EMPSELX program provides the variable names to replace the parameter markers.

2 IDENTIFY is a CMS command that returns the current VM user ID, along with other information. The LIFO option causes IDENTIFY to stack the result in last-in-first-out order.

3 This statement reads the stacked result of IDENTIFY and sets the `myid` variable with the current user ID. This value is used as the owner ID of the package. Some other value could be used if the user has appropriate database privileges.

4 This line erases any existing copies of the program to be generated.

5 This line of the EMPPRP program writes the first line of the generated EMPDCL program. The first line of the EMPDCL program must be a REXX comment to identify the program as a REXX program.

6 This line causes a trace of any errors that occur when the EMPDCL program runs.

7 If any command after this point sets a non-zero return code, REXX immediately branches to the label ERROR.

8 This RXSQL CREATE statement creates the package into which the SELECT statement is prepared. The BLOCK option allows the performance improvements achieved by blocking multiple rows from the database on the DB2 RXSQL FETCH statement. If you choose not to use the BLOCK option, you do not have to change any programs that use the package.

The default options REPLACE, NOMODIFY, and KEEP are not specified on this CREATE statement. These options replace the package if it already exists, keeping the authorizations that were granted on the previous package.

9 This RXSQL XPREP statement prepares the SELECT statement into the package. DB2 RXSQL sets the SQLSTMTN variable with the SQL statement number of the statement in the package.

10 This line sets the variable `decl` to a RXSQL DECLARE statement. The DECLARE statement declares the name SELEMP for the statement in the package identified by SQLSTMTN

11 This line writes the DECLARE statement to the generated program.

12 COMMIT causes the database manager to save the package in the database.

13 This line processes an SQL GRANT statement to allow the public to use the package called EMPPROG. Without this GRANT statement, only the creator of the package can use the package. You do not necessarily have to authorize the public to use the package; you can use a GRANT statement that authorizes only specific users.

14 This line turns off the automatic signal on ERROR. Turning off the signal prevents error loops.

The Generated EMPDCL program

Figure 40 shows the program generated by the EMPPRP Program. The DB2 RXSQL DECLARE statement declares the cursor `SELEMP` and associates it with section 1 in the package `xxx.EMPPROG`. The characters `xxx` are replaced with the name of the user running the EMPPRP program.

```
/* EMPDCL */
Trace "Err"
'RXSQL DECLARE SELEMP CURSOR FOR 1 IN xxx.EMPPROG'
```

Figure 40. Exec Generated by EMPPRP

Selecting Data

The EMPSELX Program in Figure 41 on page 232 is a slight modification of the EMPSEL program shown in Figure 38 on page 226. Instead of a PREP request, the EMPSELX program has a DECLARE request that defines a statement name for a prepared statement in a package.

```
/* EMPSELX version using extended dynamic SQL */
/*   5697-F42 (C) COPYRIGHT IBM CORP. 1990, 2000.   */
/*   Licensed material - Program Property of IBM    */
/*   Refer to copyright instructions form G120-2083 */

/* An exec to display employees with a salary less than some amount */
/* Defaults: ANALYSTs with a salary less than $38,000 */
Address 'COMMAND'

Parse Upper Arg job salary .
If job = '' then job = 'ANALYST'
Else job = "'"job"'"                          /* Make sure it is char type */
If salary = '' then salary = 38000

/* Declare name for SELECT statement prepared in EMPPRP */
'EXEC EMPDCL'  1                       /* Exec generated by EMPPRP */

/* Open the SELECT statement and give the input parms */
'RXSQL OPEN SELEMP salary job'  2
if rc<>0 then signal 'ERROR'

If rc = 0 then Do                              /* If no errors occurred then */
   Do Forever                                  /* Get data from the table */

      /* Get the data into REXX variables from DB2 Server for VM */
      'RXSQL FETCH SELEMP emp fname mid lname job ed sal'
      If (rc = 4 & SQLCODE = 100)  then Leave  /* If there is no more */
      Else If rc <> 0 then Signal 'ERROR'      /* If there is an error */

      /* Check for Nulls */
      If "SYMBOL"('job') <> 'VAR' then job = '?'
      If "SYMBOL"('sal') <> 'VAR' then sal = '?'

      /* Type the data on the users terminal */
      Say 'Employee: 'emp '    ' fname mid lname
      Say 'Job:'job'    Education:'ed'     Salary:'sal
      Say ''       /* Space down one line */

   End
   'RXSQL CLOSE SELEMP'                        /* Close the SELECT statement */
   if rc<>0 then signal 'ERROR'
End
```

Figure 41. Program to Select Data from an SQL Table after Extended Prepare (Part 1 of 2)

```
'RXSQL COMMIT'                              /* Commit the transaction */
'RXSQL PURGE SELEMP'                        /* Purge Declared name */
If rc=0 then Exit

ERROR:                                      /* A fatal error occurred  */
                                            /* Forget all inserted data so far */
errrc = rc
If errrc >= 100 then Do
   Say '  RXSQL Error:' errrc rxsqlmsg
   'RXSQL ROLLBACK'
End
Else If errrc = 4 | errrc = 8 then Do
   Say '  Sqlcode:' sqlcode
   Say ' Sqlstate:' sqlstate
   Do errd = 1 to 6
      If sqlerrd.errd <> 0 then Say '  Sqlerrd.'errd':' sqlerrd.errd
   End
   If sqlerrp <> '' then Say '  Sqlerrp:' sqlerrp
   If sqlerrm <> '' then Say '  Sqlerrm:' sqlerrm
   If sqlwarn <> '' then Say '  Sqlwarn:' "'"sqlwarn"'"
   If sqlcode < 0 & "INDEX"('WS',"SUBSTR"(sqlwarn,7,1)) = 0 then
      'RXSQL ROLLBACK'
End
Exit errrc
```

Figure 41. Program to Select Data from an SQL Table after Extended Prepare (Part 2 of 2)

Notes for EMPSELX Program

The following notes refer to the lines in the EMPSELX program identified by reverse video numbers:

1 This program statement invokes the generated EMPDCL program, that contains the DECLARE request.

An alternative to executing the program is to include it in the EMPSELX program after running EMPPRP. Including the EMPDCL program in the EMPSELX program requires that only one program be made available for general use instead of two.

2 This OPEN statement names the input variables. In the EMPSEL program, DB2 RXSQL stored the variable names given in the PREP statement until subsequent processing of the OPEN statement. This method worked because DB2 RXSQL recalled the variables in the same transaction. In the program in Figure 41, variables are not used in the same transaction. DB2 RXSQL cannot store variables between transactions.

More Examples Using Extended Dynamic RXSQL Requests

The following programs use extended dynamic SQL to interactively update entries in the table and to insert new records into the database.

Defining a Package

The EMPPRPM program shown in Figure 42 on page 234 defines the package for the statements that the EMPUPD program shown in Figure 44 on page 237 uses for updating, inserting, and scaling salaries. EMPPRPM program prepares the SQL statements into a different package than the one created by EMPPRP program because the statements are authorized for use by managers only. The EMPPRP program authorizes the general public to use its statements.

```
/* EMPPRPM */
/*   5697-F42 (C) Copyright IBM Corp. 1973, 2000.                   */
/*   All rights reserved.                                           */
/*   US Government Users Restricted Rights -                        */
/*   Use, duplication or disclosure restricted by                   */
/*   GSA ADP Schedule Contract with IBM Corp.                       */
/*                                                                  */
/*   Licensed Materials - Property of IBM                           */

/* An exec to create and prepare the SQL statements available to */
/* managers to update the tables */
Address 'COMMAND'

/* Define the insert statement to fill in rows of the table */
ins_emp = 'INSERT INTO EMPVIEW VALUES(?,?,?,?,?,?,?)' 1

/* Define the update to change a emp salary */
set_salary = 'UPDATE EMPVIEW SET SALARY = ?',  2
             'WHERE EMPNO = ? AND LASTNAME = ?'

/* Define the update to mark down/up all the salaries */
scale_salary = 'UPDATE EMPVIEW SET SALARY = SALARY * ?'

/* Find out who I am */
'IDENTIFY (LIFO'
Parse Upper Pull myid .

/* Prepare to add DECLAREs to a generated exec called EMPDCLM */
'ERASE EMPDCLM EXEC'
/* Put in comment so exec will be a REXX exec */
'EXECIO 1 DISKW EMPDCLM EXEC A (STRING /* EMPDCLM */'
'EXECIO 1 DISKW EMPDCLM EXEC A (STRING Trace "Err"'

Trace 'Err'
Signal ON ERROR                              /* Any error aborts */

/* Create package */
'RXSQL CREATE PACKAGE' myid'.EMPUPD'  3

/* Prepare the INSERT statement */
'RXSQL XPREP' myid'.EMPUPD' ins_emp
```

Figure 42. Program to Define Extended Prepare Package for Updating (Part 1 of 2)

```
/* Generate DECLARE with result of XPREP for EMPUPD to use */
decl = "'RXSQL DECLARE INSEMP CURSOR FOR" sqlstmtn "IN" myid".EMPUPD'"
'EXECIO 1 DISKW EMPDCLM EXEC A (STRING' decl

/* Prepare the first UPDATE statement */
'RXSQL XPREP' myid'.EMPUPD' set_salary
decl = "'RXSQL DECLARE SETEMP CURSOR FOR" sqlstmtn "IN" myid".EMPUPD'"
'EXECIO 1 DISKW EMPDCLM EXEC A (STRING' decl

Trace 'Off'
Signal OFF ERROR  4                   /* Don't signal on error */

/* Prepare the second UPDATE statement */
dcllist = 'F'  5                      /* Describe one input variable, Float type */
'RXSQL XPREP' myid'.EMPUPD USING dcllist' scale_salary  6
If rc > 4 then Signal 'ERROR'  7      /* Ignore expected warning */

Trace 'Err'
Signal ON ERROR  8                    /* Any error aborts */

decl ="'RXSQL DECLARE SCALEEMP CURSOR FOR" sqlstmtn "IN" myid".EMPUPD'"
'EXECIO 1 DISKW EMPDCLM EXEC A (STRING' decl

'RXSQL COMMIT WORK'                          /* Commit the transaction */

'RXSQL EXEC GRANT RUN ON EMPUPD TO MANAGER'  9

'RXSQL COMMIT WORK'                          /* Commit the transaction */
Exit

ERROR:
Signal OFF ERROR
errrc = rc
If errrc >= 100 then Do
   Say '  RXSQL Error:' errrc rxsqlmsg
   'RXSQL ROLLBACK'
End
Else If errrc = 4 | errrc = 8 then Do
   Say '  Sqlcode:' sqlcode
   Say ' Sqlstate:' sqlstate
   Do errd = 1 to 6
      If sqlerrd.errd <> 0 then Say '  Sqlerrd.'errd':' sqlerrd.errd
   End
   If sqlerrp <> '' then Say '  Sqlerrp:' sqlerrp
   If sqlerrm <> '' then Say '  Sqlerrm:' sqlerrm
   If sqlwarn <> '' then Say '  Sqlwarn:' "'"sqlwarn"'"
   If sqlcode < 0 & "INDEX"('WS',"SUBSTR"(sqlwarn,7,1)) = 0 then
      'RXSQL ROLLBACK'
End
Exit errrc
```

Figure 42. Program to Define Extended Prepare Package for Updating (Part 2 of 2)

Notes for EMPPRPM

The following notes refer to the lines in the EMPPRPM program identified by reverse video numbers:

1 A parameter marker represents each input value to be provided when the program calls the INSERT statement.

2 The expression used to scale SALARY is not a simple variable and requires a USING clause on a subsequent XPREP statement (see line **6**).

3 This CREATE PACKAGE statement does not specify the BLOCK option. Blocking is not appropriate here, because the EMPPRPM program is an interactive application.

4 This line turns off the REXX automatic branch-on-error action, because the XPREP request on the following line always generates an SQL warning, indicating that the SQL statement does not have a WHERE clause. This warning sets the fifth character of the SQLWARN variable to W.

5 This UPDATE statement has one input variable. The variable type is floating point. With numeric input, you should specify a data type that encompasses all possible input values so that you do not lose data when SQL translates the input value to the type you specify.

6 This RXSQL XPREP statement uses the name of the variable that contains the definition list `dcllist`. DB2 RXSQL obtains the value before preparing the statement.

7 If the program encounters an error more serious than the anticipated warning, this line signals the error exit routine.

8 This line turns on automatic error branching for the remainder of processing.

9 This DB2 RXSQL program statement processes the SQL statement to grant run authority to a specific SQL ID named MANAGER.

The Generated EMPDCLM program

Figure 43 shows the program generated by the EMPPRP program.

```
/* EMPDCLM */
Trace "Err"
'RXSQL DECLARE INSEMP CURSOR FOR 1 IN xxx.EMPUPD'
'RXSQL DECLARE SETEMP CURSOR FOR 2 IN xxx.EMPUPD'
'RXSQL DECLARE SCALEEMP CURSOR FOR 3 IN xxx.EMPUPD'
```

Figure 43. Program Generated by EMPPRPM

Interactive Updating

The EMPUPD program shown in Figure 44 on page 237 is an example of an interactive application that waits for commands from a user who wants to update the RXEMP table. The program can insert new rows into the table, set a new salary for an existing employee in the table, or make a percentage change to all the salaries in the table.

```
/* EMPUPD */
/*   5697-F42 (C) Copyright IBM Corp. 1973, 2000.       */
/*   All rights reserved.                               */
/*   US Government Users Restricted Rights -            */
/*   Use, duplication or disclosure restricted by       */
/*   GSA ADP Schedule Contract with IBM Corp.           */
/*                                                      */
/*   Licensed Materials - Property of IBM               */
/* An exec to interactively insert, set a salary, or    */
/* mark up/down all salaries                            */
trace 'Off' /* 1  */
Address 'COMMAND'

/* Declare INSEMP, SETEMP, SCALEEMP as cursor and   */
/* statement names by executing the exec generated  */
/* by EMPPRPM                                       */
'EXEC EMPDCLM' /* 2  */

Do Forever /*  3  */
   Say 'Enter command: Insert, Set, Update, COMMit, ROLLback, or Quit' /*  4  */
   Parse Upper Pull cmd .  /* 5  */
   Select /*  6  */
      When cmd = '' then Nop /*  7  */
      When ABBREV('QUIT',cmd,1) then Leave /*  8  */ /* terminate loop */
      When ABBREV('INSERT',cmd,1) then Do
         Do Forever /*  9  */
           Say 'Enter Employee number, First name, Middle initial,', /*  10  */
               'Last name, Job,'
           Say 'Education level and Salary'
           Say ' (Empty line to quit)'

           Parse Upper Pull employee_number first_name,
                            middle_initial last_name job ed_level salary .

           If employee_number = '' then Leave /*  11  */
           /* Got all input? */
           If salary <> '' then Do /*  12  */
          /* Use variable qualifiers to ensure */
          /* proper types                      */
             'EXECSQL CALL INSEMP USING',
                  ':employee_number (CHAR(6)),',
                  ':first_name   (VARCHAR(12)),',
                  ':middle_initial  (CHAR(1)),',
                  ':last_name    (VARCHAR(15)),',
                  ':job             (CHAR(8)),',
                  ':ed_level     (SMALLINT),',
                  ':salary       (DECIMAL(9,2))' /*  13  */
               If rc <> 0 then Call DSCERROR /*  14  */
               Else Say 'Inserted.'
            End  /* salary <> ''     */
         End     /* inner Do forever */
      End        /* When INSERT      */
```

Figure 44. Example Interactive Program to Update the EMPLOYEE Table (Part 1 of 3)

```
      When ABBREV('UPDATE',cmd,1) then Do
         Say 'Enter percent salary change. (Empty line to quit)'
         Say '  5 means add 5 percent to all current salaries,'
         Say ' -4 means subtract 4 percent from all current salaries.'
         Parse Pull factor .
         If factor <> '' then Do
            factor = 1 + factor/100 /* 15 */
            /* Scale all salaries */
            'EXECSQL CALL SCALEEMP USING :factor (DECIMAL(6,3))'
            If rc >= 0, /* 16 */
               Then Say sqlerrd.3 'row(s) updated.'
            If rc <> 0 then call DSCERROR
         End /* factor <> '' */
      End    /* When UPDATE  */
      When ABBREV('SET',cmd,1) then Do
         Do Forever
            Say 'Enter Emp#, Last name, SALARY. (Empty line to quit)'
            Parse Upper Pull,
                  employee_number last_name salary .
            /* Terminate inner loop */
            If employee_number = '' then Leave
            If last_name <> '' & salary <> '' then Do
               /* Reset salary*/
               'EXECSQL CALL SETEMP',
                   ':salary     (DECIMAL(9,2)),',
                   ':employee_number (CHAR(6)),',
                   ':last_name  (VARCHAR(15))'
               If rc >= 0,
                  then Say sqlerrd.3 'row(s) updated.'
               If rc <> 0 Then Call DSCERROR
            End
         End  /* Inner Do Forever */
      End     /* When SET         */
      When ABBREV('COMMIT',cmd,4) then Do /* 17 */
         'EXECSQL COMMIT'
         If rc <> 0 then Call DSCERROR
      End
      When ABBREV('ROLLBACK',cmd,4) then Do
         'EXECSQL ROLLBACK'
         If rc <> 0 then Call DSCERROR
      End
      Otherwise Say 'Unknown command' /* 18 */
   End  /* outer Select     */
End     /* outer Do Forever */

/* Commit the transaction */
'EXECSQL COMMIT RELEASE' /* 19 */
If rc <> 0 then Call DSCERROR
/* Purge Declared names */
'EXECSQL PURGE INSEMP, SETEMP, SCALEEMP'
Exit
```

Figure 44. Example Interactive Program to Update the EMPLOYEE Table (Part 2 of 3)

```
DSCERROR:
errrc = rc

/* Display the RXSQL request */
say 'RXSQL Request   :' rxsqlrequest

Select
  When errrc >=1000  then msgpart='RXSQL warning:'
  When errrc  =  10,
       then msgpart='Application Server warning:'
  When errrc  = -10,
       then msgpart='Application Server error:'
  When errrc <=-100  then msgpart='RXSQL error:'
  Otherwise msgpart='Unexpected return code from RXSQL:'
end

Say msgpart errrc rxsqlmsg
If errrc = 10 | errrc = -10 Then do
   Say '  Sqlcode:' sqlcode
   Say ' Sqlstate:' sqlstate
   Do errd = 1 to 6
      If sqlerrd.errd <> 0 then Say '  Sqlerrd.'errd':' sqlerrd.errd

   End
   If sqlerrp    <> '' then Say ' Sqlerrp :' sqlerrp

   If sqlerrmc   <> '' then Say ' Sqlerrmc:' sqlerrmc
   If sqlwarn.0  <> '' then Do
      warnflgs=sqlwarn.0||sqlwarn.1||sqlwarn.2||sqlwarn.3
      warnflgs= warnflgs||sqlwarn.4||sqlwarn.5||sqlwarn.6
      warnflgs= warnflgs||sqlwarn.7||sqlwarn.8||sqlwarn.9
      warnflgs= warnflgs||sqlwarn.10
      Say ' Sqlwarn : '"'"warnflgs"'"
   end
   If INDEX('WS',sqlwarn.6) <> 0, /* 20 */
      Then Exit errrc /* Terminate exec */

End
/* return back to interactive questions */
Return /* 21 */
```

Figure 44. Example Interactive Program to Update the EMPLOYEE Table (Part 3 of 3)

Notes for EMPUPD

The following notes refer to the lines in the EMPUPD program identified by reverse video numbers:

1 REXX tracing is set to `Off` from the default of `Normal`. Changing the default prevents REXX from displaying the EXECSQL statement whenever DB2 RXSQL returns a negative return code to signal an error condition.

2 The generated program declares all three statement names. Declaring all the names at once, even if they are not used, does not affect performance.

3 This Do Forever loop asks for input until a REXX Leave statement breaks the loop.

4 This line prompts for input. The capital letters indicate the minimum abbreviation.

5 This line reads the command typed from the terminal. The first token is assigned to the variable `cmd`. Any other tokens are discarded.

6 This REXX SELECT statement processes the first When clause that evaluates as true. If no When clause evaluates as true, the Select statement processes the Otherwise clause in line **18**.

7 This line tests for null input. If the input is null, the program prompts the user to type another command.

8 The ABBREV function tests if `cmd` matches the character string `QUIT`. The number 1 indicates the minimum number of characters needed for `cmd` to match the character string. If `cmd` is Q, QU, QUI, or QUIT, it matches. This line also contains the Leave statement which ends the Do Forever loop.

9 This line is another example of a Do Forever loop. This loop ends with the Leave statement in line **11**.

10 These lines prompt the user for all the input variables needed.

11 This line tests for null input.

12 If the `salary` variable has a value, then the program has all the input.

13 When writing programs that use DB2 RXSQL statements, you must make sure that the variables named match the columns of the table. DB2 RXSQL retrieves the values for the host variables from REXX as needed.

All variables in the list have *variable-qualifiers* to ensure that DB2 RXSQL passes appropriate data type values to the database manager.

14 If an error occurs, the DSCERROR subroutine displays the error variables. The DSCERROR subroutine does not cause the program to end abnormally. The program resumes processing at the point where DSCERROR was called (see line **21**).

15 The program converts the user's input percentage value to a scaling factor.

16 If the update was successful (indicated by a return code greater than or equal to zero) the program displays the number of rows that were updated. The program uses the number returned in SQLERRD.3. Note that DB2 RXSQL may still return a warning even though the update was successful.

17 Note that the minimum abbreviation required for COMMIT is 4, not 1.

18 If none of the When clauses are true, then this program does not recognize the `cmd` variable as valid input. The program informs the user that it does recognize the input by issuing the message **Unknown command**.

19 The program explicitly commits any as yet uncommitted changes to the database manager and drops the connection to free up resources.

20 If this condition is true, a serious database error occurred and the program ends abnormally.

21 Return causes the program to resume processing at the line of the program that called DSCERROR.

Appendix G. Performance and Diagnosis

The first section of this appendix covers some of the common errors and performance concerns that users have. The second section is a list of hints and tips provided to help you diagnose a problem.

This is not intended to be a comprehensive discussion on either performance or diagnosis, because RXSQL is merely an interface between REXX and the database manager. There are many factors that can contribute to the performance of your programs, or to errors in your programs. This discussion just highlights some of the more common pitfalls.

If you have a hint or a tip that you feel should be in this appendix please send it in to IBM on the **Readers' Comment Form** at the back of the manual. IBM is committed to providing you with quality documentation, and welcomes any suggestions you have. **IBM may use or distribute whatever information you supply in any way it believes appropriate without incurring any obligation to you.**

Performance

Performance Improvement After Testing

You can turn off the setting and resetting of a group of RXSQL variables to improve an application's performance, after you finish testing it. Before setting the LASTING GLOBALV variable (GLOBALV) described here, make sure that the application contains no programmed dependencies that will become incorrect with the changed settings of the RXSQL variables described in this section.

Use a GLOBALV variable to improve an application's performance. The GLOBALV variable, $$RXSQL32$$ in group SQL/DS, is retrieved at the first invocation of a RXSQL command in an EXEC. If the variable exists and the first character of its value is `Y` or `y`, several RXSQL variables will not be set or reset at each RXSQL or EXECSQL invocation. Changing the value of $$RXSQL32$$ after the first RXSQL request in an EXEC has no effect until control is returned to CMS.

The GLOBALV variable can be set with the following CMS command:

```
GLOBALV SELECT SQL/DS SETP $$RXSQL32$$ Y
```

When the above command is issued before the first RXSQL request in the EXEC, the affected RXSQL variables are:

- The `SQLERRMC`, `SQLWARN.`*n*, and `RXSQLREQUEST` variables are not set after any RXSQL request.
- The SQLCA variables `SQLCODE, SQLSTATE, SQLERRM, SQLERRP, SQLWARN,` and `SQLERRD.`*n* are not reset after each RXSQL request. If the request results in a database manager call, these variables are set with the corresponding values returned from the database manager.
- The `RXSQLMSG` variable is not reset after each RXSQL request. If a RXSQL interface error occurs, or if an EXECSQL interface error or warning occurs, this variable is set with a text message.

Setting $$RXSQL32$$ as a GLOBALV variable continues to affect the execution of RXSQL applications because the variable remains in the logon session after the application terminates, unless it is explicitly cleared. To stop the effect of this variable on an EXEC, clear the GLOBALV variable using an appropriate GLOBALV CMS command before the first RXSQL request in the EXEC.

Hints and Tips

There are a few basic rules to follow when coding your programs for optimum performance.

1. The performance of a program which uses RXSQL depends extensively on the design of the database and the efficiency of your SQL statements used to access and manipulate data in the database. This includes:
   - maintaining objects in the database so the optimizer is using current statistics
   - using static and dynamic SQL when appropriate to minimize locks put on catalog tables when preparing statements
   - ending LUWs by issuing COMMITs to free up any locks on objects as soon as possible.

   As an application designer you often have to weigh the pros and cons of many design strategies and many factors including system considerations, database considerations, and object design. Subjects that will help you make these decisions include: Locking, normalization, DASD balancing, indexes, and access authorities. Both the *DB2 Server for VSE & VM Application Programming* manual and the *DB2 Server for VSE & VM Database Administration* manual will provide you with more information on these and other topics.
2. Minimize the number of calls DB2 RXSQL must make to the database manager by minimizing the number of DB2 RXSQL requests executed in your programs.
3. Minimize the number of calls DB2 RXSQL must make to CMS by minimizing the number of *variable-names* within your RXSQL statements. Each *variable-name* that needs resolution by DB2 RXSQL requires a call to a CMS interface. Where possible, let REXX resolve the values of *variable-names* before DB2 RXSQL is passed the request.
4. Use *variable-qualifiers* so that RXSQL does not have to infer the data types.
5. Ensure that data types are consistent from one insert to the next. If DB2 RXSQL infers a different data type from the execution of one PUT statement to the next, then DB2 RXSQL traps the error returned from the database manager, closes the cursor and re-opens it. This will affect the performance of your application. For example, if you insert the value 12 on one PUT statement, DB2 RXSQL will infer that the data type is integer. If the value on the next PUT statement is 12.07, then DB2 RXSQL will infer that the data type is decimal.
6. Shorten the CMS command search path by using either `Address COMMAND` or the DB2 RXSQL subcommand environment. See "Appendix I. RXSQL Subcommand Environment" on page 251.

Diagnosis

Hints and Tips

In the following discussion, all SQLCODES and return codes mentioned are for DB2 Server for VM.

Common Error conditions:

- **SQLCODE error -301 (SQLSTATE 22507) on a** CALL, EXECUTE, OPEN, or PUT statement

  This DB2 Server for VM error condition means that the data type of a *rexx-host-variable* and the target data column are not compatible. It usually occurs when the database expects a character value, but DB2 RXSQL infers that the data type of the *rexx-host-variable* is numeric.

  To ensure that DB2 RXSQL passes a character value to the database, use *variable-qualifiers*, or enclose the value of the *rexx-host-variable* in single quotation marks ('). DB2 RXSQL removes the leading and trailing quotation marks and passes the value to the database as a character string.

  For example, typing:

  ```
     charvar = "'"charvar"'"
  ```

  before a CALL, EXECUTE, OPEN or PUT statement ensures that `charvar` will be interpreted as a character string.

  If you are using *variable-qualifiers*, do not surround your input values with quotes.
- **Unpredictable results on FETCH, CALL, EXECUTE, PUT, OPEN**

  When specifying an *output-rexx-host-variable-list* on FETCH or an *input-rexx-host-variable-list* on CALL, EXECUTE, OPEN or PUT, ensure that the *rexx-host-variable-list* is enclosed within quotation marks so that REXX does not resolve the variables before the statement is passed to DB2 RXSQL.
- **Unexpected ROLLBACK when an EXEC completes**

  Don’t rely on an implicit COMMIT to occur when an EXEC finishes processing. There are VM timing dependencies when the IUCV communications connection to the database is terminated. Either a COMMIT or a ROLLBACK can occur. Make sure you use the COMMIT statement explicitly to save the changes you made to the database before the EXEC finishes processing.
- **RXSQL errors ELO0163E, ELO0168E, ELO0172E**

  These DB2 RXSQL error messages tell you that a host variable value is too long. If the variable value does not appear to be too long, check that it does not have any leading or trailing blanks as part of its value. DB2 RXSQL does not strip leading or trailing blanks from the value in host variables when retrieved from REXX. For example:

  ```
  package_id = '   USERAAA.MYPACK'
  ```

  In this example, the *authorization-name* appears to DB2 RXSQL as if it is 10 characters long, but *authorization-name* is limited to 8 characters in length.
- **SQL statements folding to uppercase**

  Enclose each DB2 RXSQL statement in single quotes to prevent CMS from folding it to uppercase.
- **Truncation of long SQL statements on PREP, EXEC, or XPREP statements**

  If you use DB2 RXSQL in the XEDIT environment, as for example from XEDIT macros, XEDIT truncates all DB2 RXSQL commands that it finds (even if implicitly passed to CMS when IMPCMSCP is ON).

  When you use `Address COMMAND` or the DB2 RXSQL subcommand environment, the DB2 RXSQL statement bypasses XEDIT handling of the command.

  ```
     Address COMMAND 'RXSQL ... '
  ```
- **RXSQLOP EXEC or DB2 RXSQL OP statement fails to return the results of an operator command**.

This is usually the result of

1. OP being called in an EXEC that has not ended the current logical unit of work or
2. DB2 RXSQL not receiving the operator command in uppercase.

Miscellaneous Tips

- **Consider the following programming techniques:**
  - When using EXECSQL invocation, specify `trace 'Off'`. Overriding the default of `normal` prevents REXX from displaying the EXECSQL statement whenever DB2 RXSQL returns a negative return code to signal an error condition.
  - PURGE all names previously used in PREP or DECLARE statements.
  - Put all DECLAREs at the beginning of your program.
  - If you use DB2 RXSQL in a program that invokes other application packages that use IUCV, make sure all application packages access IUCV through the CMSIUCV interface, instead of the CP IUCV interface. The DB2 Server for VM resource manager loses track of its path to the database if the CP IUCV interface is used.
  - When you are writing a non-terminating program, such as in a service machine, ensure that you include the RELEASE option on the COMMIT or ROLLBACK statement when the database is not needed between service requests. This allows the database to shut down, if necessary, without being locked up by the service machine program.
- **Stopping SQL processing of a database statement**

  Type:

  ```
  SQLHX
  ```

  A return code of -914 (user cancel) is issued from the database manager, and a ROLLBACK is issued for your current logical unit of work. You receive a return code of 8 from DB2 RXSQL, and an SQLCODE of -914 is returned to your EXEC.
- **Avoiding program checks**.
  - When a program that has been using DB2 RXSQL issues an EXEC SQLRMEND or an EXEC SQLINIT, the database manager becomes independent of DB2 RXSQL. This may result in a program check on the next DB2 RXSQL statement. Before calling either SQLRMEND or SQLINIT, issue one of:

    COMMIT WORK RELEASE
    ROLLBACK WORK RELEASE

    The next DB2 RXSQL statement reconnects to the database manager and continues processing.
- **Recovering from a severed database connection**

  After a severe error has terminated your connection to the application server, any request other than a CONNECT request results in an SQLCODE of -900 and an SQLSTATE of 51018 in the SQLCA. You must issue a CONNECT request to reconnect to the application server when the error has been fixed.

  On DB2 Server for VM releases prior to Version 3 Release 4, after a severe error had occurred on a previous request, the DB2 Server for VM system would accept only the CONNECT request, and would abend on any other request. To avoid abends from the DB2 Server for VM system, any RXSQL release prior to Version 3 Release 4 did the following after it detected a severe error:
  - It submitted only CONNECT requests.

- For non-CONNECT requests, it did not submit the request and instead returned the SQLCA of the original severe error.

  Starting with RXSQL Version 3 Release 4, RXSQL submits SQL requests to the application server without checking for severe errors. If a severe error had occurred previously, the RXSQL user will get an SQLCODE of -900 and an SQLSTATE of 51018, issued by SQL/DS system Version 3 Release 4 or later.

  Note: If RXSQL Version 3 Release 4 or later submits requests to an DB2 Server for VM system on a release prior to Version 3 Release 4, users might encounter abends after a severe error has occurred.

- **Supporting different versions of DB2 RXSQL**

  If you are switching between application servers that have different versions of the RXSQL package, you must:

  1. COMMIT or ROLLBACK RELEASE
  2. NUCXDROP RXSQL
  3. access the appropriate DB2 RXSQL production minidisk or SFS directory

  before you issue the CONNECT statement.

Appendix H. Support for CMS Work Units

The database manager and DB2 RXSQL will use CMS work units unless you specify WORKUNIT(NO) when you invoke the SQLINIT EXEC. CMS work unit support is available in VM/ESA.

CMS work unit support allows a virtual machine to have multiple independent paths into one or more DB2 Server for VM databases. You can have multiple active DB2 Server for VM logical units of work (LUW), each accessing the same or separate databases. The application can switch between work units while CMS, the DB2 Server for VM Resource Adapter, and DB2 RXSQL maintain all the necessary information.

For example, an application can copy data from one database to another without using a temporary file. Previously, you could not switch databases until your LUW ended. With CMS work unit support, you can copy data from one database to another using the following steps:

1. Establish a work unit, WU1.
2. Connect to database SQL1 and open a cursor on a SELECT statement.
3. Establish a work unit, WU2.
4. Connect to database SQL2 and open a cursor on an INSERT statement.
5. Make WU1 the current work unit.
6. Fetch into an array as many rows as feasible.
7. Make WU2 the current work unit.
8. Put all rows from array into SQL2.
9. Repeat steps 5-8 until all rows are read and put in the database.
10. Commit work on each database.

DB2 Server for VM will prevent an application from switching databases within the same LUW unless all work is committed or rolled back.

CMS work units also allow an EXEC to shield itself from other applications that may be accessing a database at the same time in the user’s virtual machine.

For example, suppose a currently running EXEC with an active LUW in a database calls a second application EXEC that accesses the same or another database. In this situation, the called EXEC creates a new CMS work unit. Within the second CMS work unit, the called EXEC can access and modify the database, commit the changes, and return to the calling application without disturbing the LUW of the calling application. With two CMS work units, there are no DB2 RXSQL name or status conflicts between the applications.

To control the CMS work units, the application must use the VM/ESA CMS callable services library (CSL) interface for creating and managing work units. The REXX function, CSL, invokes the CMS callable services library. Figure 45 on page 248 shows how to Get, Push, and Pop CMS work units in REXX.

```
/* Acquire a new work unit ID */

Call CSL('DMSGETWU retcode reason workunit')
If retcode <> 0 then Say "Get WU rc="retcode "reason="reason

/* Note: the work unit is not active yet */
   ⋮
'RXSQL ...'

/* RXSQL creates environment for default work unit */
   ⋮
/* Make work unit the active work unit */

Call CSL('DMSPUSWU retcode reason workunit')
If retcode <> 0 then Say "Push WU rc="retcode "reason="reason
   ⋮
'RXSQL ...'

/* RXSQL creates new environment for new work unit */
   ⋮
Call CSL('DMSPOPWU retcode reason')
If retcode <> 0 then Say "Pop WU rc="retcode "reason="reason
   ⋮
'RXSQL ...'

/* RXSQL uses default work unit environment */
   ⋮
Exit
```

Figure 45. Example Using the REXX Function CSL

DB2 RXSQL uses the DMS CSL routines to determine the current work unit identifier. If the DMSQWUID routine fails, DB2 RXSQL uses the DMSERP routine to determine the current work unit identifier. DB2 RXSQL determines which DB2 RXSQL control blocks are used to handle the request based on the current work unit identifier.

When DB2 RXSQL finds a new work unit identifier, it creates a complete set of DB2 RXSQL control blocks for that work unit. Work units do not have to share data. Even settings such as isolation level (SQLISL), date and time format settings (SQLDATE and SQLTIME), and tracing levels (TRACE) are not shared, and you must set them independently for each work unit.

When DB2 RXSQL detects end-of-command processing, it frees storage and removes all of the environments created by DB2 RXSQL.

Setting CMS Work Unit Support Off

If CMS work unit support is not required in your program, and you suspect it is causing your CPU time to be high, you may turn this feature off. CMS work unit support is turned off by specifying WORKUNIT(NO) when invoking the SQLINIT EXEC. If you specify this, both the database manager and DB2 RXSQL will not use CMS work unit support until you execute another SQLINIT with the WORKUNIT(YES) parameter.

The SQLINIT EXEC and DB2 RXSQL use the LASTING GLOBALV file to check whether CMS work unit support is on or off. If this file is corrupted, DB2 RXSQL will issue an error message indicating that the SQLINIT EXEC must be invoked again.

Switching Work Unit Support

Do not switch work unit support by using the SQLINIT EXEC from within your program. Unexpected results will occur if you do. The value for the WORKUNIT parameter is retrieved from the LASTING GLOBALV file when your program is started. It may not be changed until control is returned to CMS at the completion of your program.

Changing Database Parameters When Using CMS Work Units

Do not use the SQLINIT EXEC to change parameters like Date or Time formats after the first RXSQL or EXECSQL statement has executed. DB2 RXSQL retrieves these parameters from the LASTING GLOBALV file at the first invocation of RXSQL or EXECSQL when the application starts, or at first invocation of RXSQL or EXECSQL after a COMMIT RELEASE or ROLLBACK RELEASE request.

For predictable results with these parameters, use the DB2 RXSQL requests SQLDATE and SQLTIME after starting a new work unit before the first request to fetch or insert data. For a cursor operation, the parameters must be changed before opening the cursor.

For SQLDATE, SQLISL, and SQLTIME, the changed environment is applicable only within the CMS Work Unit in which these commands were issued.

Appendix I. RXSQL Subcommand Environment

DB2 RXSQL commands may be executed in either the EXECSQL or RXSQL subcommand environment. The default environment may be altered (between various subcommand environments or the host environment) using the **ADDRESS** command. If `ADDRESS EXECSQL` or `ADDRESS RXSQL` has been invoked, you may code requests without the prefix ’EXECSQL’ or ’RXSQL’ respectively.

The command is passed directly to DB2 RXSQL without the search for EXECs or CP commands. Judicious use of either subcommand environment will improve the performance of a DB2 RXSQL application.

Do the following to invoke the DB2 RXSQL subcommand environment:

1. ’ADDRESS COMMAND’ may be issued first to eliminate the CMS search for EXECs and CP commands.
2. DB2 RXSQL must first be invoked with a regular DB2 RXSQL command to load DB2 RXSQL as a nucleus extension and set up the subcommand environment. This command may request a harmless process such as setting tracing off for all modules or getting the names of all cursors used. Alternatively, the first command may do something relevant to your EXEC processing.
3. The ’ADDRESS EXECSQL’ or ’ADDRESS RXSQL’ command may be issued after the first DB2 RXSQL command. All non-REXX commands following this ADDRESS command are assumed to be EXECSQL or RXSQL subcommands and will be passed on to DB2 RXSQL.
4. It is assumed that the invocation of your DB2 RXSQL request is the same as the subcommand environment you are in unless you override it. For example, if your program issues ’ADDRESS EXECSQL’,
   - any command that begins with the keyword `EXECSQL`, or does not have a keyword RXSQL, is processed using EXECSQL invocation rules.
   - any command that begins with the keyword `RXSQL` is processed using RXSQL invocation rules.

   If you wish to execute CMS or other non-RXSQL commands, another ADDRESS command must be issued. For more information on the use of ADDRESS, see the *VM/ESA REXX/VM Reference* manual.

Appendix J. RXSQL Runtime Environment

The RXSQL MODULE is a transient module that initiates NUCXLOAD to load the DB2 RXSQL nucleus extension from the RXSQL LOADLIB module. After it loads the nucleus extension, the transient module is not invoked again, because the CMS command search order looks for the nucleus extension first.

The nucleus extension is loaded in an area obtained by CMSSTOR so any CMS abnormal end of task (abend) such as HX causes an implicit NUCXDROP of the extension. The next invocation of DB2 RXSQL locates the transient module again and reloads the nucleus extension.

The RXSQL MODULE loads the nucleus extension with the SERVICE and ENDCMD options so that DB2 RXSQL is notified when CMS ends abnormally or returns control to the user after the typed command finishes processing successfully. When CMS notifies DB2 RXSQL of these actions, DB2 RXSQL stops communications with the database, purges all prepared SQL statements, and de-allocates or releases dynamic storage.

There is also an EXECSQL MODULE whose sole purpose is to pass control to the RXSQL MODULE or nucleus extension.

DB2 RXSQL communicates with the DB2 Server for VM database manager through the DB2 Server for VM Resource Adapter interface code. The Resource Adapter does end-of-command processing to end existing communications links with the database. When this happens, the Resource Adapter implicitly commits or rolls back changes to the database depending on how the user's command ends. If a CMS abnormal end-of-task (abend) occurs, changes are rolled back. Otherwise, an implicit COMMIT is done. Changes are committed even if the command has an error return code.

Note: End-of-command processing occurs only after a command is entered from the virtual console. It does not occur when a command is issued from an EXEC, a user program, or CMS SUBSET mode.

Tailoring the RXSQL Transient Module

RXSQL ASSEMBLE is the source file for the DB2 RXSQL transient module. The source file is distributed to allow local tailoring of the module. The RXSQL ASSEMBLE source file issues the following commands:

```
FILEDEF RXSQL DISK RXSQL LOADLIB * (NOCHANGE
NUCXLOAD RXSQL RXSQL RXSQL (ENDCMD SERVICE
CMSCALL RXSQL
```

The command `CMSCALL RXSQL` calls the loaded code.

If you plan to use the EXECSQL interface, you must not change the CALLTYPE option on the CMSCALL statement. DB2 RXSQL will not execute correctly if you do so.

To generate a new RXSQL MODULE type the following commands:

```
GLOBAL MACLIB DMSSP CMSLIB
HASM RXSQL
LOAD RXSQL (RLDSAVE
OR
GENMOD RXSQL (SYSTEM AMODE=31 RMODE=ANY    for VM/ESA
```

Appendix K. Single User Mode Environment

To run DB2 RXSQL in single-user mode, you require SQLEXEC as an interface between DB2 Server for VM and the EXEC. When you start DB2 Server for VM in single user mode, DB2 Server for VM can only invoke modules. SQLEXEC provides the module interface and puts the user parameter list into standard format for invoking an EXEC. An untokenized parameter list is passed; therefore, the EXEC must be written in REXX. Tokenized parameter lists are used in EXEC1 and EXEC2 EXECs.

SQLEXEC must be in USERLIB LOADLIB for the DB2 Server for VM database start-up EXECs to find it. To create USERLIB or to add SQLEXEC to an existing USERLIB, type:

```
LKED SQLEXEC (LIBE USERLIB
```

To run an EXEC that uses DB2 RXSQL in single user mode, type:

```
SQLSTART DBNAME(dbname) [DCSSID(dcssid)]
PARM(SYSMODE=S,[PARMID=parmid,]
PROGNAME=SQLEXEC/[EXEC] execname execparms)
```

For more information on the SQLSTART EXEC, see the *DB2 Server for VSE & VM Operation* manual.

Appendix L. Considerations and Restrictions Using the DRDA Protocol

This appendix outlines what you must do to use RXSQL to access a non-DB2 Server for VM application server, and also outlines the restrictions that are specific to using RXSQL in the DRDA protocol. You should also read the appendix in the *DB2 Server for VSE & VM SQL Reference* manual that discusses the DB2 Server for VM restrictions when using the DRDA protocol.

Publications that contain additional information on Distributed Relational Database and Distributed Data Library can be found in "Bibliography" on page 269.

Using RXSQL in a Distributed Environment

With RXSQL, you can exploit the ability of the DB2 Server for VM application requester to communicate with other application servers that implement the DRDA architecture. The non-DB2 Server for VM application server will receive and process your RXSQL requests and return data to your program.

Prerequisites to Accessing Distributed Data

Software Requirements

DRDA support is available only in the following environments:

- VM/ESA Version 2 Release 1 or later, Licensed Program Number 5684-112

Setup Steps

There are a few setup steps which you must follow before you can use RXSQL to access distributed data.

1. ***Install RXSQL in Your Distributed Environment***

   Before you can use RXSQL to access a non-DB2 Server for VM application server, you should make sure that RXSQL has been installed in your distributed environment. Refer to "Chapter 1. Before You Begin" on page 3 for more details.
2. ***Setup COMDIRs***

   A communication directory must be set up specifying the name and address of the application server. The communication directory describes the information pathway between the application requester and the target application server. See the *DB2 Server for VM System Administration* manual for more details.
3. ***Issue SQLINIT With Appropriate Protocols***

   When invoking SQLINIT, the protocol parameters should be either DRDA or AUTO. When DRDA is specified, the Isolation Level must be CS. Any RXSQL SQLISL commands are ignored and the Isolation Level is fixed as CS. See the *DB2 Server for VSE & VM Database Administration* manual for more details.

Accessing Distributed Data

To access data in a non-DB2 Server for VM application server you must be connected to that server. You connect to the non-DB2 Server for VM application server when you issue the SQLINIT EXEC, or you can switch application servers while using RXSQL by issuing the CONNECT statement. For the syntax and recommended usage of this statement and other SQL statements used to access data in non-DB2 Server for VM application servers, see the *IBM SQL Reference,* *Version 2, Volume 1* manual. When you are using Extended Dynamic SQL to access a non-DB2 Server for VM application server which does not support Extended Dynamics, such as DB2, then each prepared statement is mapped to either a Static or a Dynamic statement.

Restrictions When Using RXSQL in the DRDA Protocol

DB2 RXSQL has some restrictions in addition to those listed in the appendix *"Restrictions with Distributed Relational Database Architecture (DRDA) Protocol"* of the *DB2 Server for VSE & VM SQL Reference* manual.

- Operator commands are not supported when connected to a non-DB2 Server for VM application server. An error condition is returned if you attempt to use them.
- When using Extended Dynamics while accessing a non-DB2 Server for VM application server which maps these statements to Dynamic or Static statements, RXSQL issues an Extended DESCRIBE statements whenever your program issues an OPEN statement. If the prepared insert or select statement is a Static Extended Dynamic statement (for example, it was prepared using a Basic Extended PREPARE or a Single Row Extended PREPARE), then DB2 RXSQL will return an error condition.

  In summary, only Dynamic SQL (regular or Extended Dynamic) is supported when accessing a non-DB2 Server for VM application server that does not support Extended Dynamic SQL.
- When using the Basic Extended PREPARE statement, if the SQL statement being prepared includes parameter markers, you must include the USING *attributes_variable* clause.
- When using an AS/400* application server and inserting a NULL value for a column, you must use both an *indicator_variable* and a *variable_qualifier* for that column. Further, the *variable_qualifier* must have the correct data type attribute for the column, even when it is a NULL value, to prevent an error condition being returned.

Enhancements When Using RXSQL in DRDA Protocol

You may specify a data type of zoned decimal in a *variable_qualifier* on data input or output when connected to an application server that supports this data type. Zoned decimal is not valid when connected to an DB2 Server for VM application server.

Appendix M. DB2 RXSQL Incompatibilities by Release

Version 3 Release 3 Modification 0

Authorization ID

RXSQL does not allow the hexadecimal value X'00' in the *authorization-name* or *password* in the CONNECT or CREATE PACKAGE statement.

STATE Command

When the STATE command is issued, the variable `RXSQLSTATE` is now set with two words indicating the type and state of the statement. In previous releases this variable was set with integers indicating the type and state of the statement.

NAMES Command

The NAMES command has been enhanced to support a new feature, *cursor-names* declared for dynamic prepared statements. When the NAMES command is issued, if a statement has a *prepare-name* and a *cursor-name* associated with it, `RXSQLNAMES` will include both names. However, the *cursor-name* will be enclosed in brackets and immediately follow the *prepare-name*. Previously, the NAMES command returned all names prepared or declared as a string of names.

Fetching DATETIME Values

The DATETIME defaults are retrieved from the LASTING GLOBALV file instead of the SYSTEM.SYSOPTIONS table in response to SQL/DS Version 3 Release 3 Modification 0 changes.

New and Changed Error Messages

Many of the error messages have been changed to support the extensions to RXSQL. Different RXSQL error codes and messages may be returned to your programs when run in this release of RXSQL.

Version 3 Release 2

DB2 RXSQL was modified to correctly retrieve DATE and TIME defaults in Version 3 Release 2; however no DB2 RXSQL statements may be executed between a COMMIT RELEASE (or ROLLBACK RELEASE) statement and the invocation of the SQLINIT EXEC.

For additional information on this restriction, see:
- “ COMMIT” beginning on page 126
- “ ROLLBACK” beginning on page 155
- “ Appendix H. Support for CMS Work Units” beginning on page 247

Version 3 Release 1

Some of the REXX Variables that RXSQL sets are renamed as outlined in following table.

Variable Name in Version 3 Release 1	Variable Name in Program Offering
RXSQLSTATE	SQLSTATE
RXSQLNAMES	SQLNAMES
RXSQLSTMT	SQLSTMT

Notices

Programming Interface Information

This manual documents intended Programming Interfaces that allow the customer to write programs to obtain services of DB2 RXSQL.

Trademarks

Glossary

This glossary includes terms and definitions from:

- The *American National Standard Dictionary for Information Systems* ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies may be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.
- The *Information Technology Vocabulary* developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.

access. The manner in which files or data sets are referred to by a computer.

access module. See *package*.

application server. The database manager component that receives and processes database requests issued by the application requester.

authority. See *CONNECT authority, RESOURCE authority,* and *DBA authority*.

authorization. The right granted to a user to communicate with or make use of a computer system.

authorization ID. (1) A character string that designates a set of privileges. The authorization ID of a statement is used by the database manager for authorization checking and as an implicit qualifier for the names of tables, views, and indexes. (2) A user or a group of users. Contrast with *user ID*.

byte. A unit of storage consisting of eight adjacent binary digits operated on as a unit and constituting the smallest addressable unit in the system.

catalog. A set of tables that contain descriptions of objects such as tables and views, and other entities such as conversion tables and authorization IDs maintained by the database manager.

catalog table. A table maintained dynamically by the DB2 Server for VSE & VM database manager containing information about objects such as tables and views, and other entities such as conversion tables and authorization IDs defined to the database manager.

character. (1) A letter, digit, or other symbol in a data character set that is part of the data. (2) A data type in SQL.

CMS. See *conversational monitor system.*

column. The vertical component of a table. A column has a name and a particular data type (for example, character, decimal, or integer).

command. A request for system action. ISQL and DBS Utility commands can be used with the DB2 Server for VSE & VM database manager. Contrast with *statement*. DB2 RXSQL commands do not have SQL equivalents.

commit. (1) The operation that terminates a *unit of work* by releasing locks so that the database changes made by that unit of work can be perceived by other processes. (2) The process that allows data changes to be made permanent. When a commit occurs, other applications can reference the just-committed data.

CONNECT authority. The authority to use database functions, such as SQL statements, on a database.

constant. Data that has an unchanging, predefined value to be used in processing. Constants are classified as string constants or numeric constants. Synonymous with *literal*. Contrast with *variable*.

control program (CP). A component of a VM system that manages the resources of a single computer so multiple computing systems appear to exist. Each virtual machine is the functional equivalent of an IBM System/370™ or System/390® system.

conversational monitor system (CMS). A virtual machine operating system that provides general interactive time sharing, problem solving, and program development capabilities, and operates only under control of the VM *control program*.

CP. See *control program*.

DASD. See *direct access storage device*.

database machine. A virtual machine that has access to SQL/DS™ code and a database. The database machine controls access to the database.

database management system (DBMS). A software system that controls the logical and physical resources and facilities of a database.

database manager. A program product that processes SQL statements.

Database Services utility (DBS utility) Services utility (DBS utility). An application program supplied with the DB2 Server for VM and DB2 Server for VSE database managers to provide several utility functions,including the loading and unloading of data and packages,and the execution of SQL statements previously saved in a command file.

date. A three-part value that designates a day, month, and year.

DB2 for VM. Short form of DB2 Server for VM.

DBA authority. The authority to perform all SQL operations on all SQL tables. DBA authority includes both CONNECT authority and RESOURCE authority.

DBMS. See *database management system.*

DBS Utility (Database Services Utility). See *Database Services Utility*.

dbspace. A logical allocation of space in a *storage pool* contained in a database. Contains one or more tables and their associated indexes.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.

direct access storage device (DASD). A device in which access to data is independent of the location of the data.

directory. A list of identifiers that map corresponding items of data. For example, an SQL/DS directory maps dbspaces to addresses on a physical device.

distributed relational database architecture (DRDA). Pertaining to an IBM connection protocol for the access and use of distributed relational data wherever it resides in an interconnected network of relational database products.

DRDA (distributed relational database architecture). See *distributed relational database architecture*.

EXEC. A CMS file with a file type of EXEC. It contains a series of commands or instructions that are executed when you enter the filename of the EXEC file.

file mode. A 2-character CMS file identifier field comprised of a file mode letter (A through Z) followed by the file mode number (0 through 6). The file mode letter indicates the minidisk or SFS directory on which the file resides. The file mode number indicates the access mode of the file.

file type. A 1- to 8-character alphanumeric field, comprised of A through Z, 0 through 9, and special characters $ # @ + - (hyphen) : (colon) _ (underscore), that is used as a descriptor or as a qualifier of the file name field in the CMS file identifier.

Interactive Structured Query Language (ISQL). A facility of the SQL/DS system that provides online data query and report writing support.

ISQL. See *Interactive Structured Query Language*.

K. Kilobyte

Kanji. A graphic character set consisting of symbols used in Japanese ideographic alphabets.

keyword. In programming languages, a predefined word that has a special meaning or function. For example, in the DB2 Server for VM and DB2 Server for VSE database managers, SELECT is the keyword used to retrieve data from a table.

kilobyte. 1 024 bytes

literal. A string whose value is given by the content of the string itself. For example, the numeric literal 7 has the value 7. Synonym for *constant*.

load. To transfer data from one medium to another; for example, to transfer data from a sequential file to a database, or to transfer a program from storage to computer memory.

logical unit of work (LUW). A recoverable sequence of operations within an application process. At any time, an application process is a singleunit of work, but the life of an application process can involve many units of work as a result of commit or rollback operations.

LUW. See *logical unit of work (LUW).*

minidisk. Logical division of a physical direct access storage device.

multiple user mode. A mode of operating the database manager in which one or more users or application programs can access the database at the same time. Contrast with *single user mode.*

NLS. National language support.

owner. The authorization ID associated with an SQL object.

package. A control structure produced during program preparation that is used to execute SQL statements. module.

parameter. A variable that is given a constant value for a specified operation.

private dbspace. A logical space in a DB2 Server for VM database owned by one user.

public dbspace. A logical space in a DB2 Server for VM database that is accessible to many users.

rc. See *return code*.

RESOURCE authority. The authority to create tables in a public dbspace and to acquire a private dbspace.

return code. A string, typically a number passed in an implementation-dependent way, that conveys some information about the command that has been executed. Return codes usually indicate the success or failure of the command but can also be used to represent other information.

REXX. A procedural language that allows programs and algorithms to be written in a clear and structured way.

row. A horizontal component of a table. A row consists of a sequence of values, one for each column of the table.

RXSQL. DB2 REXX SQL for VM/ESA.

scroll. To move a display image vertically or horizontally to view data that is not otherwise visible in a display or window.

SFS directory (shared file system directory). See *shared file system directory.*

shared file system directory (SFS directory). A part of CMS that allows users to organize their files into groups known as directories, and to selectively share those files and directories with other users.

single user mode. A mode of operation in which the database manager and one application run in the same virtual machine. No other application programs or userscan access the database at the same time. Contrast with *multiple user mode*.

SQLCA. See *SQL communication area (SQLCA).*

SQLCODE. A code set by the database manager after an SQL statement is executed to indicate the success or failure of the SQL statement. The value returned in the SQLCODE is specific to the DB2 Server for VSE & VM system. Contrast with *SQLSTATE*. See also *SQL communication area*.

SQL communication area (SQLCA). A set of variables that provides an application program with information about the execution of its SQL statements.

SQL/DS. See *Structured Query Language/Data System*.

SQLSTATE. A code set by the database manager after an SQL statement is executed to indicate the success or failure of the SQL statement. Contrast with *SQLCODE*.

statement. An instruction in a program or procedure. A language construct that represents a step in a sequence of actions. Contrast with *command*. RXSQL statements have SQL equivalents.

storage pool. A specific set of available storage areas. These areas are used by the database administrator to control storage of the database. A storage pool contains one or more dbspaces.

Structured Query Language/Data System (SQL/DS). A standardized language for defining and manipulating data in a relational database. This was the previous product name for DB2 Server for VSE & VM.

table. A named data object consisting of a specified number of columns and any number of unordered rows.

time. A three-part value that designates a time of day in hours, minutes, and seconds.

unit of work. See *logical unit of work (LUW).*

user ID. A string of characters that uniquely identifies a user to a system. Contrast with *authorization ID*.

variable. A quantity that can assume any of a given set of values. Contrast with *constant*.

Virtual Machine (VM). A functional simulation of a computer and its associated devices. VM manages the computer's resources in such a way that all workstation users have their own virtual machine. All users can work at their virtual machines as though each is the only person using the real computer.

VM. See *Virtual Machine*.

VM/ESA environment. Virtual Machine/Enterprise Systems Architecture. The 370 feature addresses a maximum of 16 megabytes of virtual storage per virtual machine. The ESA Feature addresses a maximum of 2 gigabytes of virtual storage per virtual machine.

Bibliography

This bibliography lists publications that are referenced in this manual or that may be helpful.

DB2 Server for VM Publications

- *DB2 Server for VSE & VM Application Programming*, SC09-2889
- *DB2 Server for VSE & VM Database Administration*, SC09-2888
- *DB2 Server for VSE & VM Database Services Utility*, SC09-2983
- *DB2 Server for VSE & VM Diagnosis Guide and Reference*, LC09-2907
- *DB2 Server for VSE & VM Overivew*, GC09-2995
- *DB2 Server for VSE & VM Interactive SQL Guide and Reference*, SC09-2990
- *DB2 Server for VSE & VM Master Index and Glossary*, SC09-2890
- *DB2 Server for VM Messages and Codes*, GC09-2984
- *DB2 Server for VSE & VM Operation*, SC09-2986
- *DB2 Server for VSE & VM Quick Reference*, SC09-2988
- *DB2 Server for VM System Administration*, SC09-2980
- *DB2 Server for VSE & VM Performance Tuning Handbook*, GC09-2987
- *DB2 Server for VSE & VM SQL Reference*, SC09-2989

Related Publications

- *DB2 Server for VSE & VM Data Restore*, SC09-2991
- *DRDA: Every Manager's Guide*, GC26-3195
- *IBM SQL Reference, Version 2, Volume 1*, SC26-8416
- *IBM SQL Reference*, SC26-8415

VM/ESA Publications

- *VM/ESA: General Information*, GC24-5745
- *VM/ESA: VMSES/E Introduction and Reference*, GC24-5837
- *VM/ESA: Installation Guide*, GC24-5836
- *VM/ESA: Service Guide*, GC24-5838
- *VM/ESA: Planning and Administration*, SC24-5750
- *VM/ESA: CMS File Pool Planning, Administration, and Operation*, SC24-5751
- *VM/ESA: REXX/EXEC Migration Tool for VM/ESA*, GC24-5752
- *VM/ESA: Conversion Guide and Notebook*, GC24-5839
- *VM/ESA: Running Guest Operating Systems*, SC24-5755
- *VM/ESA: Connectivity Planning, Administration, and Operation*, SC24-5756
- *VM/ESA: Group Control System*, SC24-5757
- *VM/ESA: System Operation*, SC24-5758
- *VM/ESA: Virtual Machine Operation*, SC24-5759
- *VM/ESA: CP Programming Services*, SC24-5760
- *VM/ESA: CMS Application Development Guide*, SC24-5761
- *VM/ESA: CMS Application Development Reference*, SC24-5762
- *VM/ESA: CMS Application Development Guide for Assembler*, SC24-5763
- *VM/ESA: CMS Application Development Reference for Assembler*, SC24-5764
- *VM/ESA: CMS Application Multitasking*, SC24-5766
- *VM/ESA: CP Command and Utility Reference*, SC24-5773
- *VM/ESA: CMS Primer*, SC24-5458
- *VM/ESA: CMS User's Guide*, SC24-5775
- *VM/ESA: CMS Command Reference*, SC24-5776
- *VM/ESA: CMS Pipelines User's Guide*, SC24-5777
- *VM/ESA: CMS Pipelines Reference*, SC24-5778
- *VM/ESA: XEDIT User's Guide*, SC24-5779
- *VM/ESA: XEDIT Command and Macro Reference*, SC24-5780
- *VM/ESA: Quick Reference*, SX24-5290
- *VM/ESA: Performance*, SC24-5782
- *VM/ESA: Dump Viewing Facility*, GC24-5853
- *VM/ESA: System Messages and Codes*, GC24-5841
- *VM/ESA: Diagnosis Guide*, GC24-5854
- *VM/ESA: CP Diagnosis Reference*, SC24-5855
- *VM/ESA: CP Diagnosis Reference Summary*, SX24-5292
- *VM/ESA: CMS Diagnosis Reference*, SC24-5857

- CP and CMS control block information is not provided in book form. This information is available on the IBM VM/ESA operating system home page (http://www.ibm.com/s390/vm).
- *IBM VM/ESA: CP Exit Customization*, SC24-5672
- *VM/ESA REXX/VM User's Guide*, SC24-5465
- *VM/ESA REXX/VM Reference*, SC24-5770

C for VM/ESA Publications

- *IBM C for VM/ESA Diagnosis Guide*, SC09-2149
- *IBM C for VM/ESA Language Reference*, SC09-2153
- *IBM C for VM/ESA Compiler and Run-Time Migration Guide*, SC09-2147
- *IBM C for VM/ESA Programming Guide*, SC09-2151
- *IBM C for VM/ESA User's Guide*, SC09-2152

Other Distributed Data Publications

- *IBM Distributed Data Management (DDM) Architecture, Architecture Reference, Level 4*, SC21-9526
- *IBM Distributed Data Management (DDM) Architecture, Implementation Programmer's Guide*, SC21-9529
- *VM/Directory Maintenance Licensed Program Specification*, GC20-1836
- *IBM Distributed Relational Database Architecture Reference*, SC26-4651
- *IBM Systems Network Architecture, Format and Protocol Reference*, SC30-3112
- *SNA LU 6.2 Reference: Peer Protocols*, SC31-6808
- *Reference Manual: Architecture Logic for LU Type 6.2*, SC30-3269
- *IBM Systems Network Architecture, Logical Unit 6.2 Reference: Peer Protocols*, SC31-6808
- *Distributed Data Management (DDM) General Information*, GC21-9527

CCSID Publications

- *Character Data Representation Architecture, Executive Overview*, GC09-2207
- *Character Data Representation Architecture Reference and Registry*, SC09-2190

DB2 Server RXSQL Publications

- *DB2 REXX SQL for VM/ESA Installation and Reference*, SC09-2891

C/370 Publications

- *IBM C/370 Installation and Customization Guide*, GC09-1387
- *IBM C/370 Programming Guide*, SC09-1384

Communication Server for OS/2 Publications

- *Up and Running!*, GC31-8189
- *Network Administration and Subsystem Management Guide*, SC31-8181
- *Command Reference*, SC31-8183
- *Message Reference*, SC31-8185
- *Problem Determination Guide*, SC31-8186

Distributed Database Connection Services (DDCS) Publications

- *DDCS User's Guide for Common Servers*, S20H-4793
- *DDCS for OS/2 Installation and Configuration Guide*, S20H-4795

VTAM Publications

- *VTAM Messages and Codes*, SC31-6493
- *VTAM Network Implementation Guide*, SC31-6494
- *VTAM Operation*, SC31-6495
- *VTAM Programming*, SC31-6496
- *VTAM Programming for LU 6.2*, SC31-6497
- *VTAM Resource Definition Reference*, SC31-6498
- *VTAM Resource Definition Samples*, SC31-6499

CSP/AD and CSP/AE Publications

- *Developing Applications*, SH20-6435
- *CSP/AD and CSP/AE Installation Planning Guide*, GH20-6764
- *Administering CSP/AD and CSP/AE on VM*, SH20-6766
- *Administering CSP/AD and CSP/AE on VSE*, SH20-6767
- *CSP/AD and CSP/AE Planning*, SH20-6770
- *Cross System Product General Information*, GH23-0500

Query Management Facility (QMF) Publications

- *Introducing QMF*, GC27-0714
- *Installing and Managing QMF for VSE*, GC27-0721
- *QMF Reference*, SC27-0715
- *Installing and Managing QMF for VM*, GC27-0720
- *Developing QMF Applications*, SC27-0718
- *QMF Messages and Codes*, GC27-0717

- *Using QMF*, SC27-0716

Query Management Facility (QMF) for Windows Publications

- *Getting Started with QMF for Windows*, SC27-0723
- *Installing and Managing QMF for Windows*, GC27-0722

DL/I DOS/VS Publications

- *DL/I DOS/VS Application Programming*, SH24-5009

COBOL Publications

- *VS COBOL II Migration Guide for VSE*, GC26-3150
- *VS COBOL II Migration Guide for MVS and CMS*, GC26-3151
- *VS COBOL II General Information*, GC26-4042
- *VS COBOL II Language Reference*, GC26-4047
- *VS COBOL II Application Programming Guide*, SC26-4045
- *VS COBOL II Application Programming Debugging*, SC26-4049
- *VS COBOL II Installation and Customization for CMS*, SC26-4213
- *VS COBOL II Installation and Customization for VSE*, SC26-4696
- *VS COBOL II Application Programming Guide for VSE*, SC26-4697

Data Facility Storage Management Subsystem/VM (DFSMS/VM) Publications

- *DFSMS/VM RMS User's Guide and Reference*, SC35-0141

Systems Network Architecture (SNA) Publications

- *SNA Transaction Programmer's Reference Manual for LU Type 6.2*, GC30-3084
- *SNA Format and Protocol Reference: Architecture Logic for LU Type 6.2*, SC30-3269
- *SNA LU 6.2 Reference: Peer Protocols*, SC31-6808
- *SNA Synch Point Services Architecture Reference*, SC31-8134

Miscellaneous Publications

- *IBM 3990 Storage Control Planning, Installation, and Storage Administration Guide*, GA32-0100
- *Dictionary of Computing*, ZC20-1699
- *APL2 Programming: Using Structured Query Language*, SH21-1056
- *ESA/390 Principles of Operation*, SA22-7201

Related Feature Publications

- *DB2 for VM Control Center Operations Guide*, GC09-2993
- *DB2 Replication Guide and Reference*, SC26-9920

Index

Readers' Comments — We'd Like to Hear from You

DB2 REXX SQL for VM/ESA®
Installation and Reference
Version 7 Release 1

Publication No. SC09-2891-00

Overall, how satisfied are you with the information in this book?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Overall satisfaction	☐	☐	☐	☐	☐

How satisfied are you that the information in this book is:

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Accurate	☐	☐	☐	☐	☐
Complete	☐	☐	☐	☐	☐
Easy to find	☐	☐	☐	☐	☐
Easy to understand	☐	☐	☐	☐	☐
Well organized	☐	☐	☐	☐	☐
Applicable to your tasks	☐	☐	☐	☐	☐

Please tell us how we can improve this book:

Thank you for your responses. May we contact you? ☐ Yes ☐ No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

Name	Address
Company or Organization	
Phone No.	

Readers' Comments — We'd Like to Hear from You

SC09-2891-00

Cut or Fold
Along Line

Fold and Tape **Please do not staple** Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

IBM CANADA LTD.
DB2 Server for VSE & VM
2S/240/1150/TOR
1150 Eglinton Avenue East
North York, Ontario, Canada M3C 1H7

Fold and Tape **Please do not staple** Fold and Tape

SC09-2891-00

Cut or Fold
Along Line

File Number: S370/4300-50
Program Number: 5697-F42

Printed in the United States of America
on recycled paper containing 10%
recovered post-consumer fiber.

SC09-2891-00

Spine information:

IBM DB2 REXX SQL for VM/ESA® RXSQL Install and Reference Version 7 Release 1