

Information technology — Open Systems Interconnection — Remote Database Access —

Part 2: SQL Specialization

ICS 35.100.50

National foreword

This British Standard reproduces verbatim ISO/IEC 9579-2:1998 and implements it as the UK national standard. It supersedes BS ISO/IEC 9579-2:1993 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee IST/21, Open Systems Interconnection, Data Management and Open Distributed Processing, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue.

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Summary of pages

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INTERNATIONAL STANDARD

ISO/IEC 9579-2

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Information technology — Open Systems Interconnection — Remote Database Access —

Part 2: SQL Specialization

*Technologies de l'information — Interconnexion de systèmes ouverts
(OSI) — Accès aux bases de données à distance —*

Partie 2: Spécialisation SQL



Contents

1.	GENERAL.....	1
1.1	Scope	1
1.2	Normative references.....	1
1.3	Compatibility.....	2
1.3.1	SQL Standards Supported.....	2
1.3.2	Upward Compatibility.....	2
1.4	Definitions	2
1.4.1	Terms defined in ISO/IEC 9075 (Database Language SQL).....	2
1.4.2	Terms defined in this part of ISO/IEC 9579	4
1.4.2.1	SQL database resource	4
1.4.2.2	RDA SQL statement.....	4
1.5	Abbreviations.....	5
1.6	Conventions	5
2.	MODEL	6
2.1	The RDA SQL Specialization Service model	6
2.1.1	Mapping to the general model of the RDA Service.....	6
2.1.2	Mapping to the Concepts of Database Language SQL	6
3.	SERVICE.....	7
3.1	The RDA SQL Specialization Service	7
3.1.1	RDA Dialogue Management services.....	7
3.1.1.1	RDA Dialogue Initialization functional unit.....	7
3.1.1.1.1	R-Initialize Service	7
3.1.1.1.2	RDA Dialogue Termination functional unit	7
3.1.1.1.2.1	R-Terminate Service	7
3.1.1.2	RDA Transaction Management services.....	8
3.1.1.2.1	RDA Transaction Management functional unit	8
3.1.1.2.1.1	R-BeginTransaction Service	8
3.1.1.2.1.2	R-Commit Service	8
3.1.1.2.1.3	R-Rollback Service	8
3.1.1.3	RDA Control Services.....	8
3.1.1.3.1	Cancel functional unit	8
3.1.1.3.1.1	R-Cancel Service	8
3.1.1.3.2	Status functional unit.....	8
3.1.1.3.2.1	R-Status Service.....	8
3.1.1.4	Resource Handling services	8
3.1.1.4.1	Resource Handling functional unit.....	8
3.1.1.4.1.1	R-Open Service	8
3.1.1.4.1.2	R-Close Service	11
3.1.1.5	Database Language Services.....	11
3.1.1.5.1	Immediate Execution DBL functional unit	11
3.1.1.5.1.1	R-ExecuteDBL Service.....	11
3.1.1.5.2	Stored Execution DBL functional unit.....	14
3.1.1.5.2.1	R-DefinedBL Service.....	14

Descriptors: data processing, information interchange, network interconnection, open systems interconnection, factual data bases, access, protocols, SQL.

3.1.5.2.2 R-InvokeDBL Service.....	15
3.1.5.2.3 R-DropDBLService:	17
3.1.6 SQL statements, arguments and results:	17
3.1.6.1 sQLDBLStatement:	17
3.1.6.2 sQLDBLArgumentSpecification and sQLDBLResultSpecification.....	18
3.1.6.3 sQLDBLArgumentValues and sQLDBLResultValues.....	23
3.1.6.4 Referencing to parameters.....	24
3.2 Sequencing rules.....	24
3.2.1.1 RDA client sequencing rules.....	24
3.2.2 RDA Server Sequencing Rules	25
4. PROTOCOL	26
4.1 The RDA SQL Specialization client execution rules.....	26
4.1.1 RDA SQL Specialization dialogue-state model.....	26
4.1.1.1 SQL Transaction Entity.....	26
4.1.2 General client execution rules.....	26
4.1.2.1 Generation of the SQL transaction entity.....	26
4.1.2.2 Execution of an SQL-statement	26
4.1.3 <set transaction statement>	26
4.1.4 <connect statement>	27
4.1.5 <set connection statement>	27
4.1.6 <commit statement>	27
4.1.7 <rollback statement>	27
4.2 The RDA SQL Specialization server execution rules	27
4.2.1 RDA SQL Specialization dialogue-state model.....	28
4.2.1.1 RDA dialogue entity.....	28
4.2.1.2 Opened data resource entity	28
4.2.1.3 Defined DBL Entity	28
4.2.1.4 RDA operation entity	29
4.2.2 General server execution rules.....	29
4.2.3 RDA Dialogue Management services.....	29
4.2.3.1 RDA Dialogue Initialization functional unit.....	29
4.2.3.1.1 R-Initialize Service	29
4.2.3.2 RDA Dialogue Termination functional unit	29
4.2.3.2.1 R-Terminate Service	29
4.2.4 RDA Transaction Management services.....	29
4.2.4.1 RDA Transaction Management functional unit.....	29
4.2.4.1.1 R-Begin Transaction Service.....	29
4.2.4.1.2 R-Commit Service	29
4.2.4.1.3 R-Rollback Service	29
4.2.5 RDA Control services	30
4.2.5.1 Cancel functional unit	30
4.2.5.1.1 R-Cancel Service	30
4.2.5.2 Status functional unit.....	30
4.2.5.2.1 R-Status Service.....	30
4.2.6 Resource Handling services	30
4.2.6.1 Resource Handling functional unit.....	30
4.2.6.1.1 R-Open Service	30
4.2.6.1.2 R-Close Service	31
4.2.7 Database Language services	31
4.2.7.1 Immediate Execution DBL functional unit	31
4.2.7.1.1 R-ExecuteDBL service	31
4.2.7.2 Stored Execution DBL functional unit.....	36
4.2.7.2.1 R-define DBL Service	36
4.2.7.2.2 R-InvokeDBL Service.....	39
4.2.7.2.3 R-DropDBL Service	43

4.3 Structure and Encoding of RDA SQL APDUs.....	43
4.3.1 Abstract Syntax Name.....	43
4.3.2 ASN.1 Module for RDA SQL Specialization ASE	43
4.4 Conformance.....	56
4.4.1 Static conformance.....	56
4.4.2 Dynamic Conformance	57
5. THE RDA SQL SPECIALIZATION APPLICATION-CONTEXTS	58
5.1 The RDA SQL Basic application-context	58
5.1.1 RDA SQL Basic application-context object identifier	58
5.1.2 Additional constraints on the RDA SQL ASE datatypes.....	58
5.1.3 Additional sequencing rules.....	58
5.1.4 Additional conformance requirements.....	58
5.1.4.1 Static conformance	58
5.1.4.2 Dynamic conformance	58
5.2 The RDA SQL TP application-context	58
5.2.1 RDA SQL TP application-context object identifier.....	58
5.2.2 Additional constraints on the RDA SQL ASE datatypes.....	58
5.2.3 Additional sequencing rules.....	58
5.2.4 Additional conformance requirements.....	58
5.2.4.1 Static conformance	58
5.2.4.2 Dynamic conformance	58
Annex A (informative): Encoding of Multiple Rows	59

Figures

Figure 1. Usage of Embedded SQL Variables	24
---	----

Tables

Table 1. R-Initialise SQL Specific Service Parameters	7
Table 2. R-Cancel SQL Specific Service Parameters	8
Table 3. R-Status SQL Specific Service Parameters.....	8
Table 4. R-Open SQL Specific Service Parameters.....	9
Table 5. R-Close SQL Specific Service Parameters	11
Table 6. R-ExecuteDBL SQL Specific Service Parameters.....	12
Table 7. R-Define DBL SQL Specific Service Parameters.....	14
Table 8. R-InvokeDBL SQL Specific Service Parameters.....	15
Table 9. sQLDBLStatement	17
Table 10. sQLDBLArgumentSpecification and sQLDBLResultSpecification.....	19
Table 11. sQLDBLArgumentValues and sQLDBLResultValues.....	23
Table 12. R-ExecuteDBL use of SQL argument and result parameters.....	33
Table 13. R-DefineDBL use of SQL argument and result parameters.....	37
Table 14. R-InvokeDBL use of SQL argument and result parameters	40

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 9579-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 21, *Open systems interconnection, data management and open distributed processing*.

This second edition cancels and replaces the first edition (ISO/IEC 9579-2:1993), which has been technically revised. It also incorporates Technical Corrigendum 1:1995.

ISO/IEC 9579 consists of the following parts, under the general title *Information technology — Open Systems Interconnection — Remote Database Access*:

- *Part 1: Generic Model, Service and Protocol*
- *Part 2: SQL Specialization*

Annex A of this part of ISO/IEC 9579 is for information only.

Introduction

Remote Database Access (RDA) International Standards are members of a set of International Standards produced to facilitate the interworking of computer systems. The RDA International Standards are positioned in the Application Layer of the Reference Model of Open Systems Interconnection (OSI) and are related to other Open Systems International Standards in the set, as defined in ISO 7498, *OSI - Basic Reference Model*.

The goal of Remote Database Access is to allow, with a minimum of technical agreement outside the interconnection standards, the interconnection of applications and database systems:

- from different manufacturers;
- under different managements;
- of different levels of complexity;
- exploiting different technologies.

An application may itself be a database system and therefore an RDA Specialization standard can be used to support multi-database system interworking.

This part of ISO/IEC 9579 is to be used together with ISO/IEC 9579-1 to provide remote data access to a database management system conforming to ISO/IEC 9075 (Database Language SQL).

This part of ISO/IEC 9579 is provided for implementators of the protocol and service defined in ISO/IEC 9579-2:1993 who wish to upgrade their implementation to support those features of ISO/IEC 9075:1992 which are not supported by ISO/IEC 9579-2:1993. A third edition of this part of ISO/IEC 9579 is in preparation which will provide enhanced support more appropriate for new implementations wishing to support ISO/IEC 9075:1992 in conjunction with ISO/IEC 9075-3:1995 (SQL/CLI).

Information technology – Open Systems Interconnection – Remote Database Access –

Part 2:

SQL Specialization

1 GENERAL

1.1 Scope

This part of ISO/IEC 9579 specifies the functionality of a database server within a distributed open systems environment and specifies the communication service and protocol for accessing its capabilities. The communications capabilities are positioned in the Application Layer of the Reference Model for Open Systems Interconnection (OSI).

This part of ISO/IEC 9579 complements ISO/IEC 9579-1 (RDA Generic) in order that the two parts together:

- a) define the capabilities of an RDA SQL database server supporting dialogues with clients.
- b) define a model of dialogues between the RDA SQL database server and remote users.
- c) define a model of a dialogue between an RDA client and an RDA server.
- d) define an abstract service for the RDA SQL ASE, which models the communications facilities supporting interaction between the RDA client and RDA server.
- e) define the RDA SQL ASE protocol to support the RDA SQL Service.
- f) define the characteristics of application-contexts which include the RDA SQL ASE.
- g) define application contexts that support remote database access using SQL:
 - 1) RDA Basic application-context
 - 2) RDA TP application-context

This part of ISO/IEC 9579 does not specify individual implementations or products, nor does it constrain the implementation of entities and interfaces within a computer system.

This part of ISO/IEC 9579 does not define a programmatic interface. The RDA server includes a database capability as defined in ISO/IEC 9075 (Database Language SQL).

Notes:

- 1 The RDA client may contain an SQL application program but there is no requirement that the RDA client shall be an application program written to the ISO/IEC 9075 (Database Language SQL) application program interface.
- 2 ISO/IEC 9075:1989, the former International Standard for Database Language SQL, has been replaced by ISO/IEC 9075:1992. Both the current and former standards contain conformance rules, and the RDA SQL Specialization allows an RDA client to specify the desired level of conformance which it expects the RDA Server to support. Throughout this part of ISO/IEC 9579, "SQL" refers to the language statements permitted by the appropriate standard at the requested level of conformance.

1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 9579. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 9579 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 8824:1990, *Information technology – Open Systems Interconnection – Specification of Abstract Syntax Notation One (ASN.1)*.

ISO/IEC 8825:1990, *Information technology – Open Systems Interconnection – Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)*.

ISO/IEC 9075:1992, *Information technology – Database languages – SQL*.

ISO/IEC 9075-3:1995, *Information technology – Database languages – SQL – Part 3: Call-Level Interface (SQL/CLI)*.

ISO/IEC 9075-4:1996, *Information technology – Database languages – SQL – Part 4: Persistent Stored Modules*.

ISO/IEC 9579-1:1993, *Information technology – Open Systems Interconnection – Remote Database Access – Part 1: Generic Model, Service and Protocol*.

1.3 Compatibility

1.3.1 SQL Standards Supported

This part of ISO/IEC 9579 is fully compatible with the following editions and parts of the SQL International Standard:

- ISO/IEC 9075:1987 *SQL87*
- ISO/IEC 9075:1989 *SQL89*
- ISO/IEC 9075:1992 *SQL92*
- ISO/IEC 9075-3:1995 *SQL/CLI*
- ISO/IEC 9075-4:1996 *SQL/PSM*

1.3.2 Upward Compatibility

This edition of ISO/IEC 9579-2 is upward compatible with ISO/IEC 9579-2:1993. Where services or protocols are provided by both this edition and ISO/IEC 9579-2:1993, these services or protocols behave in the same manner and provide the same functionality.

SQL application programs which conform to SQL 87, SQL 89 or SQL 92 entry level should be able to correctly execute without change in the following configurations:

- ISO/IEC 9579-2:1993 client and ISO/IEC 9579-2:1993 server - This is the reference configuration against which the other cases are compared.
- ISO/IEC 9579-2:1993 client and ISO/IEC 9579-2:1997 server - The ISO/IEC 9579 -2:1997 server behaves as an ISO/IEC 9579-2:1993 server.
- ISO/IEC 9579-2: 1997 client and ISO/IEC 9579-2:1993 server - The ISO/IEC 9579 -2: 1997 client behaves as an ISO/IEC 9579-2:1993 client.
- ISO/IEC 9579-2: 1997 client and ISO/IEC 9579-2: 1997 server - This is the configuration provided for by this standard.

1.4 Definitions

For the purposes of this part of ISO/IEC 9579, the definitions given in ISO/IEC 9579-1 and the following definitions apply.

1.4.1 Terms defined in ISO/IEC 9075 (Database Language SQL)

This part of ISO/IEC 9579 makes use of the following terms defined in ISO/IEC 9075:1989 (Database Language SQL) or ISO/IEC 9075:1992 (Database Language SQL).

applicable privileges

catalog

cluster of catalogs

Embedded SQL

ISOLATION LEVEL SERIALIZABLE

READ WRITE

SQLCODE

SQLSTATE

SYSTEM_USER

In addition, this part of ISO/IEC 9579 references the following non-terminal production symbols from the SQL syntax, which represent a valid string of characters that can be derived from these production symbols according to the syntax rules in ISO/IEC 9075 (Database Language SQL) at the appropriate level of conformance.

<1987>
 <1989>
 <1992>
 <allocate descriptor statement>
 <alter domain statement>
 <alter table statement>
 <assert definition>
 <assignment statement>
 <call statement>
 <case statement>
 <catalog name>
 <character set definition>
 <close statement>
 <collation definition>
 <commit statement>
 <compound statement>
 <condition declaration>
 <connect statement>
 <cursor name>
 <deallocate descriptor statement>
 <declare cursor>
 <delete statement: positioned>
 <delete statement: searched>
 <direct implementation-defined statement>
 <domain definition>
 <drop assertion statement>
 <drop character set statement>
 <drop collation statement>
 <drop domain statement>
 <drop module statement>
 <drop routine statement>
 <drop schema statement>
 <drop table statement>
 <drop translation statement>
 <drop view statement>
 <embedded variable name>
 <fetch statement>
 <for statement>
 <get descriptor statement>
 <get diagnostics statement>
 <grant statement>
 <host identifier>
 <if statement>
 <indicator variable>

<insert statement>
<level of isolation>
<loop statement>
<module authorization identifier>
<module character set specification>
<module name>.
<open statement>
<repeat statement>
<resignal statement>
<revoke statement>
<rollback statement>
<routine invocation>
<schema definition>
<schema name>
<select statement: single row>
<set catalog statement>
<set connection statement>
<set constraints mode statement>
<set descriptor statement>
<set path statement>
<set schema statement>
<set transaction statement>
<signal statement>
<SQL conformance>
<SQL data statement>
<SQL edition>
<SQL variable declaration>
<SQL-invoked routine>
<SQL-server module definition>
<table definition>
<temporary table declaration>
<transaction access mode>
<translation definition>
<update statement: positioned>
<update statement: searched>
<variable specification>
<view definition>
<while statement>

1.4.2 Terms defined in this part of ISO/IEC 9579

1.4.2.1 SQL database resource

An SQL cluster of catalogs together with the data described by the schemas of the catalogs of that cluster.

1.4.2.2 RDA SQL statement

One of the non-terminals <schema definition>, <table definition>, <view definition>, <drop schema statement>, <alter table statement>, <drop table statement>, <drop view statement>, <domain definition>, <alter domain statement>, <drop domain statement>, <grant statement>, <SQL data statement>, <commit statement>, <rollback statement> and <declare cursor> as defined in ISO/IEC 9075 (Database Language SQL).

1.5 Abbreviations

For the purposes of this part of ISO/IEC 9579, the abbreviations given in ISO/IEC 9075 and ISO/IEC 9579-1 apply.

1.6 Conventions

This part of ISO/IEC 9579 adopts the conventions established in ISO/IEC 9579-1.

The RDA SQL Specialization is formally defined in an ASN.1 Module that is derived from the RDA Specialization module template defined in ISO/IEC 9579-1. The RDA SQL Specialization module provides definitions for those types listed in the template as being undefined by the Generic part of ISO/IEC 9579.

The structure of this part of ISO/IEC 9579 follows the requirements defined in ISO/IEC 9579-1 for defining specializations of the RDA Generic Service and Protocol.

In this part of ISO/IEC 9579, the RDA Generic parameters and data types named **specificXxxx...** and **SpecificXxxx...** are renamed to **sQLXxxx...** and to **SQLXxxx.....**, respectively.

In the service parameter tables in 3.1, parameters which are defined by this specialization have values entered in the Req, Ind, Rsp or Cnf columns. Other service parameters in these tables which are copied from the RDA Generic to improve readability do not have entries in these columns.

The RDA SQL Specialization defines a means of communicating SQL database language statements and their parameters from an RDA client to an RDA server, and of returning the results of those statements. Database Language SQL is supported at various levels of conformance, determined by an Object Identifier defined in ISO/IEC 9075

In this part of ISO/IEC 9579, the reference "**ISO/IEC 9075 (Database Language SQL)**" means any International Standard carrying the designation ISO/IEC 9075 and year of approval. The specific version (or versions) of that standard that is intended in each instance is determined, for the RDA client, by the SQL Conformance Level requested either when the RDA dialogue is initialized or when a data resource is opened, and, for the RDA server, by the SQL Conformance Level (or Levels) claimed in the Protocol Implementation Conformance Statement.

When the SQL Conformance Level specifies a year value of 1987 or 1989, the relevant International Standard is ISO/IEC 9075:1989; when the SQL Conformance Level specifies a year value of 1992, the relevant International Standard is ISO/IEC 9075:1992.

The term "**SQL**" is used throughout in a generic sense, intending to cover Database Language SQL at a particular conformance level as well as valid statements written within that conformance level.

2 MODEL

2.1 The RDA SQL Specialization Service model

2.1.1 Mapping to the general model of the RDA Service

This subclause relates the relevant concepts defined in Section 2 of ISO/IEC 9579-1 to this RDA SQL Specialization.

The term **data resource**, defined in ISO/IEC 9579-1, corresponds to an **SQL database resource** as defined in this part of ISO/IEC 9579.

The RDA client gains access to an SQL database resource at the RDA server by opening it. It is then available for use in requests for Database Language Services (3.1.5 "Database Language Services" on page 11). Nested SQL database resources are not supported.

Closing an SQL database resource causes it to be made inaccessible to the RDA client; that is, unavailable for subsequent use in requests for Database Language Services.

An implementor shall provide an RDA server at which one or multiple SQL database resources are available.

2.1.2 Mapping to the Concepts of Database Language SQL

This subclause relates the relevant Concepts defined in clause 4 of ISO/IEC 9075 (Database Language SQL) to the database model contained in the RDA server.

RDA SQL statements are executed by the database server exactly as if they were embedded in a host program local to the SQL database resource. Any exception condition or completion condition raised by the database server is returned to the RDA client.

Note: A <declare cursor> RDA SQL statement must have been executed or invoked at the RDA server prior to executing or invoking any <open statement> that uses the same cursor name. A <dynamic declare cursor> or <allocate cursor statement> must have been executed or invoked at the RDA server prior to executing or invoking any <dynamic open statement> that uses the same <dynamic cursor name>.

3 SERVICE

3.1 The RDA SQL Specialization Service

This clause contains the expansion of the RDA Generic Service parameters which are specialization defined. These specifications are in addition to those specified in ISO/IEC 9579-1.

Note: The subclauses in this clause are elaborations of the corresponding subclauses in ISO/IEC 9579-1 and are numbered accordingly.

3.1.1 RDA Dialogue Management services

3.1.1.1 RDA Dialogue Initialization functional unit

3.1.1.1.1 R-Initialize Service

Table 1 lists the R-Initialize SQL Specific Service Parameters.

Table 1. R-Initialize SQL Specific Service Parameters				
	Req	Ind	Rsp	Cnf
<u>Request Parameters</u>				
sQLInitializeArgument	U	C(=)		
sQLConformanceLevelDefault	U	C(=)		
userData	C	C(=)		
<u>Result Parameters</u>				
sQLInitializeResult			U	C(=)
userData			C	C(=)
<u>Error Parameters</u>				
sQLInitializeError			S	S(=)
characterSetNotSupported			S	S(=)

Request Parameters

sQLInitializeArgument:

This argument is used to negotiate the level of support desired by the RDA client.

sQLConformanceLevelDefault:

This parameter identifies the characteristics ("SQL level") of the Database Language SQL requested by the RDA client. The object identifiers specifying those characteristics are defined in ISO/IEC 9075:1992. This is the default SQL Conformance Level requested by the RDA client. If this parameter is omitted, there is no default established for the RDA client.

userData:

The meaning of this parameter is defined by the implementor of the RDA server.

Result Parameters

sQLInitialize Result:

This parameter contains information returned by the RDA server whose meaning is specific to this RDA SQL Specialization

userData:

The meaning of this parameter is defined by the implementor of the RDA server.

Error Parameters

sQLInitializeError:

This parameter is used by the RDA server to report errors.

characterSetNotSupported:

This parameter is returned by the RDA server when the RDA server does not support a character set associated with a character string value received from an RDA client.

3.1.1.2 RDA Dialogue Termination functional unit

3.1.1.2.1 R-Terminate Service

Note: None of the specific request, result or error parameters for this service are used in this Specialization.

3.1.2 RDA Transaction Management services

3.1.2.1 RDA Transaction Management functional unit

3.1.2.1.1 R-BeginTransaction Service

Note: There are no specific request, result or error parameters.

3.1.2.1.2 R-Commit Service

Note: There are no specific request, result or error parameters.

3.1.2.1.3 R-Rollback Service

Note: There are no specific request, result or error parameters.

3.1.3 RDA Control Services

3.1.3.1 Cancel functional unit

3.1.3.1.1 R-Cancel Service

Table 2 lists the R-Cancel SQL Specific Service Parameters.

Table 2. R-Cancel SQL Specific Service Parameters				
	Req	Ind	Rsp	Cnf
Error Parameters				
sQLCancelError			S	S(=)
characterSetNotSupported			S	S(=)

Error Parameters

sQLCancelError:

This parameter is used by the RDA server to report errors.

characterSetNotSupported:

This parameter is returned by the RDA server when the RDA server does not support a character set associated with a character string value received from an RDA client.

3.1.3.2 Status functional unit

3.1.3.2.1 R-Status Service

Table 3 lists the R-Status SQL Specific Service Parameters.

Table 3. R-Status SQL Specific Service Parameters				
	Req	Ind	Rsp	Cnf
Error Parameters				
sQLStatusError			S	S(=)
characterSetNotSupported			S	S(=)

Error Parameters

sQLStatusError:

This parameter is used by the RDA server to report errors.

characterSetNotSupported:

This parameter is returned by the RDA server when the RDA server does not support a character set associated with a character string value received from an RDA client.

3.1.4 Resource Handling services

3.1.4.1 Resource Handling functional unit

3.1.4.1.1 R-Open Service

Table 4 lists the R-Open SQL Specific Service Parameters.

Table 4. R-Open SQL Specific Service Parameters				
	Req	Ind	Rsp	Cnf
<u>Request Parameters</u>				
sQLAccessControlData	U	C(=)		
sQLUsageMode	U	C(=)		
sQLOpenArgument	U	C(=)		
charSet	U	C(=)		
sQLConformanceLevel	U	C(=)		
sQLDiagnosticsRequested	U	C(=)		
sQLDescriptorStatements	U	C(=)		
<u>Result Parameters</u>				
sQLOpenResult			U	C(=)
charSet			U	C(=)
charSetNotSupported			U	C(=)
sQLConformanceLevel			C	C(=)
<u>Error Parameters</u>				
sQLOpenError			S	S(=)
invalidSQLConformanceLevel			S	S(=)
rDATransactionOpen			S	S(=)
sQLAccessControlViolation			S	S(=)
sQLDatabaseResourceAlreadyOpen			S	S(=)
characterSetNotSupported			S	S(=)

Request Parameters

dataResourceName:

This parameter (defined in ISO/IEC 9579-1) specifies the <catalog name> of a catalog belonging to an SQL database resource as defined in this part of ISO/IEC 9579.

sQLAccessControlData:

Data supplied by the RDA client to authenticate the right to open the SQL database resource for the required usage.

sQLUsageMode:

This argument specifies the access mode to the SQL database resource. If "retrieval" mode is chosen then all the objects within that SQL database resource can be accessed for read-only purposes and any attempt to modify any object within that SQL database resource causes an error usageModeViolation. If "update" mode is chosen then update, insert and delete of the objects within that SQL database resource are permitted. The applicable privileges as defined in ISO/IEC 9075:1992 may further restrict the access to any of the objects within that SQL database resource irrespective of the sQLUsageMode. The default value for sQLUsageMode is "retrieval".

Note: The RDA service does not enforce consistency between the sQLUsageModeValue sent on R-Open and the access mode attributes on a <set transaction statement>.

sQLOpenArgument:

This parameter contains information sent by the RDA client whose meaning is specific to SQL.

charSet:

This parameter uniquely identifies the specification of a coded character set. The character repertoire for character data associated with (described by) this parameter is the character repertoire specified in the identified coded character set specification. The character set identified by that specification shall be used by the RDA client as the default in this RDA dialogue for all RDA SQL Statements and their associated character data arguments accessing the SQL database resource opened by this RDA service.

Note: This default can be overridden by explicit specification, in an sQLDBLArgumentSpecification or an sQLDBLStatement, of a character set for a particular argument value or RDA SQL statement.

If this parameter is omitted, there is no default established for the RDA client.

Note: This means that a charSet parameter must be specified for every character data argument and sQLDBLStatement sent by the RDA client.

sQLConformanceLevel:

This parameter identifies the characteristics ("SQL level") of the Database Language SQL requested by the RDA client. The object identifiers specifying those characteristics are defined in ISO/IEC 9075:1992. This is the sQLConformanceLevel which the RDA client requests for all RDA SQL statements for this SQL database resource. This parameter shall be provided if no default was established by the RDA client on R-Initialize.

sQLDiagnosticsRequested:

This parameter specifies the level of diagnostics information requested by the RDA client. If "always" is chosen, then the RDA client desires that diagnostics information always be included in the results of subsequent R-ExecuteDBL and R-InvokeDBL requests. If "onRequest" is chosen, then the RDA client desires that diagnostics information be included in the results of a subsequent R-ExecuteDBL and R-InvokeDBL request only when specifically requested on that individual R-ExecuteDBL or R-InvokeDBL request. If "never" is chosen, then the RDA client does not desire that diagnostics information be included in the results of subsequent R-ExecuteDBL and R-InvokeDBL requests. The default value for sQLDiagnosticsRequested is "never".

sQLDescriptorStatements:

This parameter specifies whether the client will flow the descriptor statements <allocate descriptor statement>, <deallocate descriptor statement>, <get descriptor statement> and <set descriptor statement>. If «always» is chosen, then the RDA client will flow these statements in subsequent R-ExecuteDBL requests. If «never» is chosen, then the RDA client will not flow these statements on subsequent R-Execute requests. The default value of «sQLDescriptorStatements» is always.

Note: If the client chooses an sQLDescriptorStatements value of «never» then it is the responsibility of the client to maintain local descriptor areas, for example by caching the relevant values received on R-ExecuteDBL results.

parentDataResourceHandle:

This parameter is not used in this Specialization.

Result Parameters**sQLOpenResult:**

This parameter contains information returned by the RDA server whose meaning is specific to SQL.

charSet:

This parameter uniquely identifies the specification of a coded character set. The character repertoire for character data associated with (described by) this parameter is the character repertoire specified in the identified coded character set specification. The character set identified by that specification shall be used by the RDA server as the default in this RDA dialogue for all character data results that are associated with DBL statements accessing the SQL database resource opened by this RDA service.

If the default character set declared by the RDA client in the charSet argument parameter is also supported for result parameters by the RDA server, then the RDA server declares the same default character set for itself by responding with the same character set identification.

Note: This default can be overridden by explicit specification, in an sQLDBLResultSpecification, of a character set for a particular result value.

If this parameter is omitted, there is no default established for the RDA server.

Note: This means that a charSet parameter must be specified for every character data result sent by the RDA server.

charSetNotSupported:

The character set declared by the RDA client is not supported by the RDA server.

Note: If the RDA server returns this parameter the RDA client should close the SQL database resource and propose another default character set.

sQLConformanceLevel:

If the RDA server cannot provide the SQL level requested by the RDA client then this parameter identifies the characteristics ("SQL level") of the Database Language SQL that the RDA server will provide. The object identifiers specifying those characteristics are defined in ISO/IEC 9075:1992. If the RDA server does not support the sQLConformanceLevel requested by the RDA client, the RDA server returns the sQLConformanceLevel which the RDA server does support in this result parameter.

Error Parameters**sQLOpenError:**

This parameter is used by the RDA server to report errors.

invalidSQLConformanceLevel:

The value of SQLConformanceLevel is not allowed. If the SQLConformanceLevel request parameter was supplied on the R-Open request, then the error refers to the value in that parameter. Otherwise it refers to the SQLConformanceLevelDefault request parameter value as supplied on the previous R-Initialize request.

rDATransactionOpen

The opening of an SQL database resource is not allowed within a transaction.

sQLAccessControlViolation:

The RDA client does not have the required authority to open the SQL database resource for the requested SQLUsageMode.

sQLDatabaseResourceAlreadyOpen

There is already an SQL database resource open.

characterSetNotSupported:

This parameter is returned by the RDA server when the RDA server does not support a character set associated with a character string value received from an RDA client.

3.1.4.1.2 R-Close Service

Table 5 lists the R-Close SQL Specific Service Parameters.

Table 5. R-Close SQL Specific Service Parameters				
	Req	Ind	Rsp	Cnf
<u>Error Parameters</u>				
sQLCloseError			S	S(=)
rDATransactionOpen			S	S(=)

Error Parameters**sQLCloseError:**

This parameter is used by the RDA server to report errors.

rDATransactionOpen

The closing of an SQL database resource is not allowed within a transaction.

3.1.5 Database Language Services

There are no constraints on intermixing invocation (through R-InvokeDBL operations) and execution (through R-Execute DBL operations) of RDA SQL statements.

3.1.5.1 Immediate Execution DBL functional unit**3.1.5.1.1 R-ExecuteDBL Service**

Table 6 lists the R-ExecuteDBL SQL Specific Service Parameters.

Table 6. R-ExecuteDBL SQL Specific Service Parameters				
	Req	Ind	Rsp	Cnf
<u>Request Parameters</u>				
sQLDBLStatement	M	M(=)		
sQLDBLArgumentSpecification	U	C(=)		
sQLDBLResultSpecification	U	C(=)		
dBLArguments				
singleArgument				
sQLDBLArgumentValues	U	C(=)		
multipleArgument				
listOfSQLDBLArgumentValues	U	C(=)		
returnSQLDiagnostics	U	C(=)		
<u>Result Parameters</u>				
sQLDBLResultSpecification			C	C(=)
listOfResultValues				
sQLDBLException			M	M(=)
sQLSTATE			C	C(=)
sQLCODE			C	C(=)
sQLErrorText			U	C(=)
sQLDiagnostics			U	C(=)
sQLDBLResultValues			C	C(=)
<u>Error Parameters</u>				
sQLExecuteDBLError			S	S(=)
hostIdentifierError			S	S(=)
rDATransactionNotOpen			S	S(=)
sQLDBLArgumentCountMismatch			S	S(=)
sQLDBLArgumentTypeMismatch			S	S(=)
sQLDBLNoCharSet			S	S(=)
sQLDBLStatementNotAllowed			S	S(=)
sQLUsageModeViolation			S	S(=)
characterSetNotSupported			S	S(=)
Note: The specific TerminationCode result parameter is not used in this Specialization.				

Request Parameters**sQLDBLStatement:**

This parameter contains the RDA SQL statement to be executed and is fully defined in "3.1.6.1 sQLDBLStatement:" on page 17.

sQLDBLArgumentSpecification:

This parameter consists of a list of SQL datatype descriptors and is fully defined in "3.1.6.2 sQLDBLArgumentSpecification and sQLDBLResultSpecification" on page 18.

sQLDBLResultSpecification:

This parameter consists of a list of SQL datatype descriptors and is fully defined in "3.1.6.2 sQLDBLArgumentSpecification and sQLDBLResultSpecification" on page 18.

sQLDBLArgumentValues:

This parameter consists of a list of the values of the argument parameters defined in the sQLDBLArgumentSpecification and is fully defined in "3.1.6.3 sQLDBLArgumentValues and sQLDBLResultValues" on page 23.

listOfSQLDBLArgumentValues:

This parameter consists of multiple lists of the values of the argument parameters defined in the sQLDBLArgumentSpecification and is fully defined in "3.1.6.3 sQLDBLArgumentValues and sQLDBLResultValues" on page 23.

returnSQLDiagnostics

This parameter specifies the level of diagnostics information requested by the RDA client when

'onRequest' was chosen by the RDA Client for the sQLDiagnosticsRequested parameter on R-Open. If "true" is chosen, then the RDA client desires that diagnostics information be included in the results of the request. If "false" is chosen, then the RDA client desires that diagnostics information not be included in the results of the request. The default value for returnSQLDiagnostics is "false".

Result Parameters

sQLDBLResultSpecification:

This parameter consists of a list of SQL datatype descriptors and is fully defined in "3.1.6.2 sQLDBLArgumentSpecification and sQLDBLResultSpecification" on page 18.

sQLDBLException:

This defines the completion code for the execution of the RDA SQL statement. It is the method used by the RDA server to return SQL exceptions (exception conditions or completion conditions).

sQLSTATE:

An SQLSTATE value as defined in ISO/IEC 9075:1992 or by the RDA server in conformance with that specification.

sQLCODE:

An SQLCODE value as defined in ISO/IEC 9075 (Database Language SQL).

sQLErrorText:

Supplemental information describing the error or warning corresponding to the sQLSTATE value or the sQLCODE value.

sQLDiagnostics

The semantics of the components of sQLDiagnostics are specified in clause 18 (Diagnostics Management) of ISO/IEC 9075:1992. An optional parameter may be omitted if its value is null.

sQLDBLResultValues:

This parameter consists of a list of the values of the result parameters defined in the sQLDBLResultSpecification and is fully defined in "3.1.6.3 sQLDBLArgumentValues and sQLDBLResultValues" on page 23.

Error Parameters

sQLExecuteDBLError:

This parameter is used by the RDA server to report errors.

hostIdentifierError:

The RDA server detected an error in an SQL variable name in an RDA SQL statement.

rDATransactionNotOpen:

No transaction is open and an attempt was made to execute an operation containing an RDA SQL statement.

sQLDBLArgumentCountMismatch:

The number of entries in sQLDBLArgumentValues parameter is not the same as in its associated sQLDBLArgumentSpecification parameter.

sQLDBLArgumentTypeMismatch:

The type of one or more entries in sQLDBLArgumentValues parameter is not the same as in its associated sQLDBLArgumentSpecification parameter.

sQLDBLNoCharSet

There is no default character set for the SQL database resource and either the sQLDBLArgumentSpecification contains a descriptor for character data without the explicit specification of its character set or the sQLDBLStatement contains character data without the explicit specification of its character set.

sQLDBLStatementNotAllowed:

The content of sQLDBLStatement is an SQL statement that is not permitted by the RDA SQL Specialization.

sQLUsageModeViolation:

The access mode of the SQL database resource associated with this request is in conflict with the RDA SQL statement specified.