RDBExpert

Version 2026.09

User Guide

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Chapter 1

Introduction

RDBExpert is a GUI shell developed in Java that provides an interface to Firebird and Red Database. RDBExpert is an operating system independent programme that requires only JDK at least 21.

RDBExpert provides easy interaction with the database, allowing you to perform various actions: write and profile queries, create and edit tables, export and compare database metadata, collect statistics, and much more.

You can contact us via the feedback form in the application (Help → Feedback) or by sending an e-mail to rdb.support@red-soft.ru. In your letter you can give us your feedback about the work of the programme, inform us about a bug or suggest a new functionality. We will be glad to help you!

Chapter 2

Install and update

2.1 Installation on Linux

1. Download the RDBExpert distribution from the official Red Database Management System website. The download is available only to authorized users.
2. Set executable permissions for the downloaded file:

```
sudo chmod +x rdbexpert-2026.08-installer.run
```

1. Run the RDBExpert installation:

```
[sudo] ./rdbexpert-2026.08-installer.run [-- <options>]

<options>::=
  --no-prompt
| --path=</path/to/installation/directory>
```

If sudo is not specified, RDBExpert can only be run by the user under whose account the installation was performed. If the installation is performed as a superuser, RBDExpert will be available to all users if you answer "Yes" to "Allow other users to run the application?".

The --no-prompt option sets the installation to silent mode.

The --path option specifies the path where RDBExpert will be installed. The default is /opt/rdbexpert.

Example of using the options:

```
./rdbexpert-2026.08-installer.run -- --no-prompt --path=/opt/rdbexpert
```

1. Run RDBExpert.

2.1.1 Installation on RedOS 8

1. Add the application repository to /etc/yum.repos.d, to do this, install the rdbexpert-release package:

```
sudo dnf install -y rdbexpert-release
```

2. Install RDBexpert:

```
sudo dnf install -y rdbexpert
```

More information on managing repositories in RedOS 8.

2.2 Installation on Windows

1. Download the RDBExpert distribution from the official Red Database Management System website. The download is available only to authorized users.

2. Run rdbexpert-<version>-installer-windows.exe. Installation is performed using the standard software installation wizard. After installation, a shortcut to the application will appear on your desktop.
3. Run RDBExpert.

2.3 Installing the portable RDBExpert

1. Download the RDBExpert distribution from the official Red Database Management System website. The download is available only to authorized users.
2. Extract the archive containing the portable version of RDBExpert: rdbexpert-<version>-portable-linux.tar.gz on Linux or rdbexpert-<version>-portable-windows.zip on Windows.
3. Run RDBExpert.

Translated with DeepL.com (free version)

2.4 Installation Java

The Java supplied with RDBExpert is used by default. When upgrading from older versions of RDBExpert (2025.05 and below), Java will be downloaded automatically.

To use third-party Java, you need to specify it in RDBExpert/config/launcher.conf. You must use an absolute path to the executable file, for example:

- Example for Windows:

```
app.java.path=C:\ProgramFiles\openjdk-21\bin\java.exe
```

- Example for Linux:

```
app.java.path=/usr/lib/jvm/openjdk-21/bin/java
```

You can run the application from the console as java -jar rdbexpert.jar command from the directory where rdbexpert.jar is located, You can also launch the Launcher by running the command ./RDBExpert64. When starting the Launcher, you can specify JVM arguments, for example:

```
./RDBExpert64 -Djna.debug_load=true
```

Also JVM arguments can be specified in RDBExpert/config/launcher.conf:

```
# ---------------------
# - JVM CONFIGURATION -
# ---------------------
-Djna.debug_load=true # as example
```

2.5 Update

1. When a new version of the application is released, a dialog box will appear to notify you that a new version has been released, and the status bar will display the message Update available.
2. Click the Download button in the dialog box or the status bar and start the update.
3. When the update is complete, restart RDBExpert.

You can also check for updates via menu item Help → Check for updates.

2.5.1 Skip version

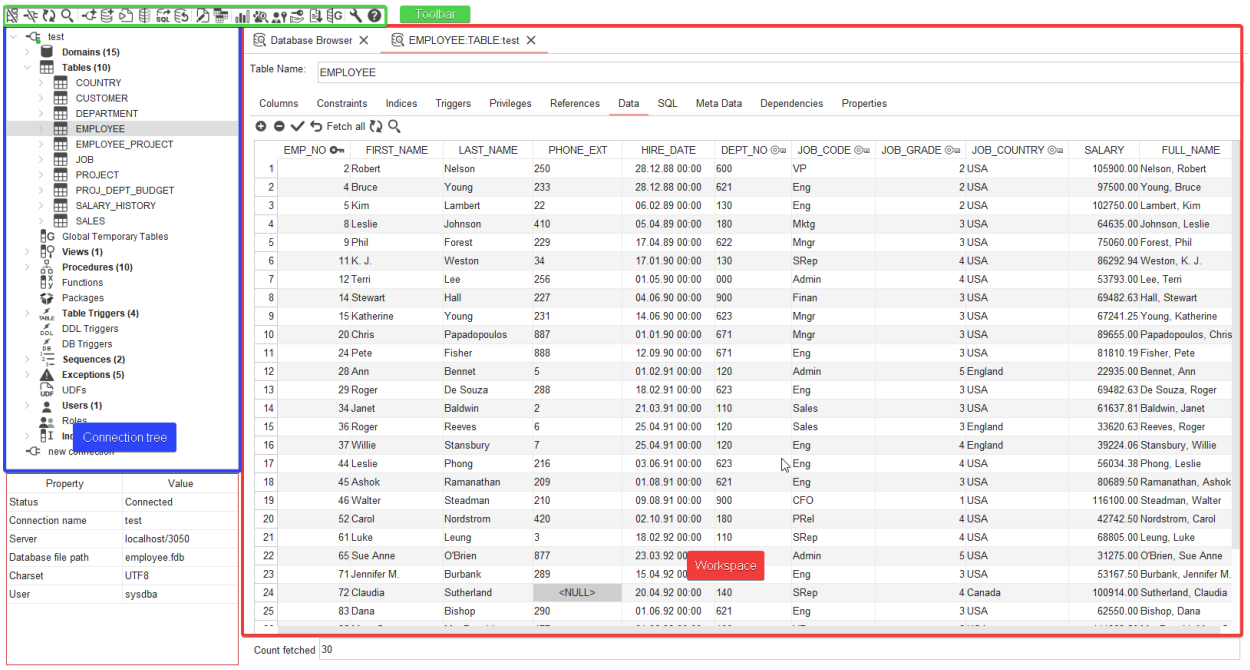
The Skip Version button keeps application at the current version and disables notifications of available update. In this case, there will be no update notifications until the next version is released. You can install the skipped version via menu item Help → Check for updates.

You can postpone the update by clicking the Remind Later button. Then the dialog box informing you about the available update will open again at the next application start.

Chapter 3

GUI Overview

The application interface is divided into three parts: toolbar, connection tree and workspace.



Img 3.1 — Application interface

The status bar at the bottom of the application displays information about the number of connections, available updates, JDK version and memory status.

The toolbar contains buttons that allow you to perform various actions, such as connecting to database and disconnecting from it, creating a new database or connection. There are also buttons for quick access to tools. The set of buttons on the toolbar can be edited in the View menu or in the application settings. See appendix for a detailed description of buttons Toolbar.

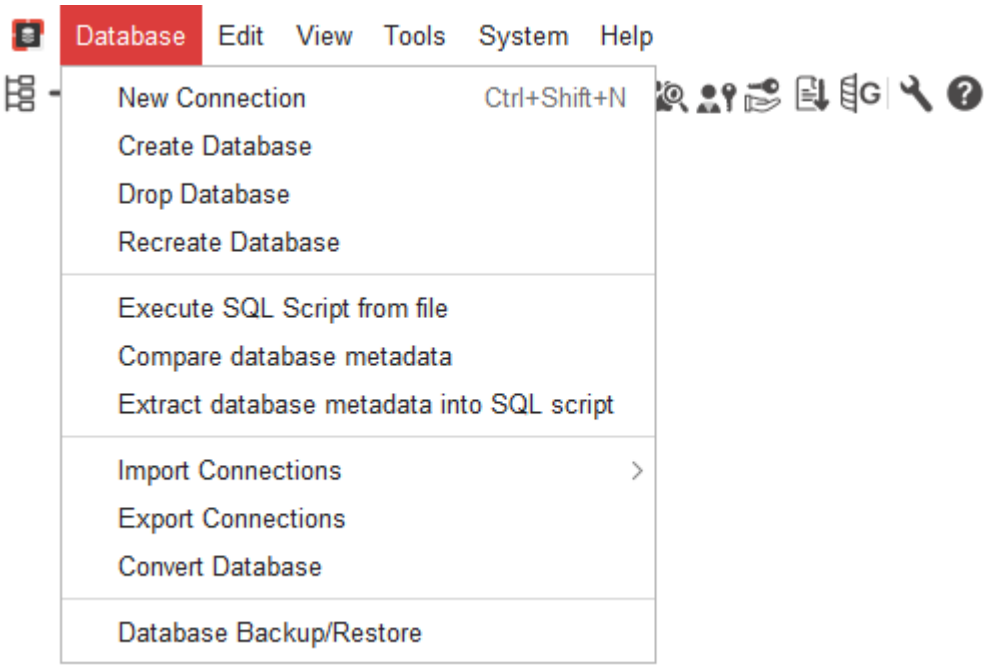
After connecting to the database, the panel displays the tree structure, the nodes of which represent database objects. The number of objects of each type is indicated in brackets. A right-click on a node will bring up a pop-up menu with available actions for this object. Double-clicking on object will open a tab with detailed information about it.

Workspace is used to work with database tools and edit objects.

Chapter 4

Database

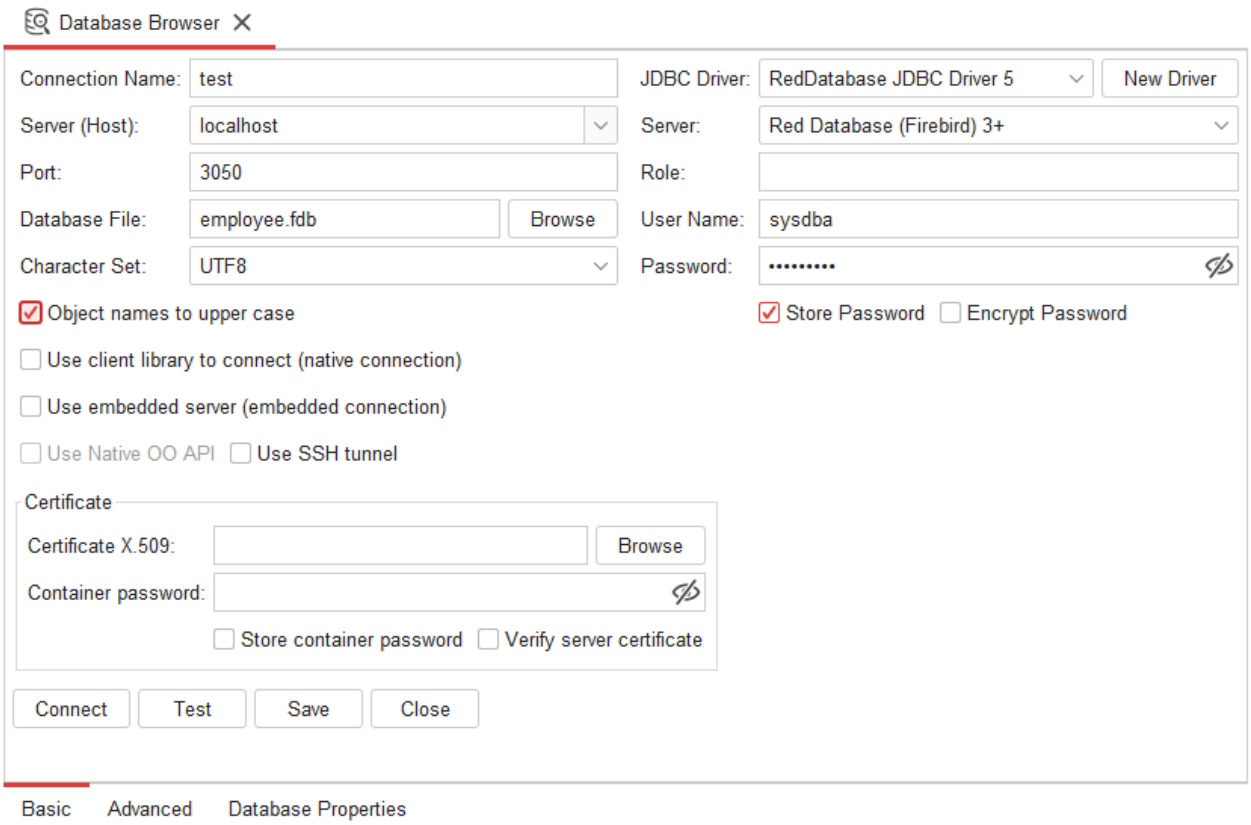
Tools for creating a database, connecting to it, and extracting and comparing metadata are under the Database tab.



Img 4.1 — Database tab

4.1 Creating a connection

RDBExpert allows multiple database connections to be used simultaneously. The Database Browser displays information about the connection.



Img 4.2 — Database Browser

To create a connection, select the corresponding item in the Database menu or click the New Connection button in toolbar. Fill in the fields in the opened window and click the Connect button. Test button establishes a connection with the specified parameters, but does not save it in the Connection Tree. Save button applies changes to the connection parameters, but does not establish a connection. Close button closes the connection editing window without saving changes to the parameters.

A network connection encryption error may occur when trying to connect. To support encryption you need Java version at least 21 or Java Cryptography Extension (JCE) add-on installed. Otherwise, change the value of the WireCrypt = Disabled parameter in firebird.conf.

4.1.1 Native connection

Native connection is performed via ISC API and uses the fbclient library, which is supplied with RDBExpert.

When connecting with the client library, the “Use new OO API” option becomes available, which allows you to use batches when generating test data.

4.1.2 Embedded server

Embedded server mode allows you to work with a database when the DBMS server is unavailable or not installed on the local computer. To connect, you only need a database file that the user who launched RBDExpert has read and write access to. However, embedded server mode imposes certain restrictions, which are listed below.

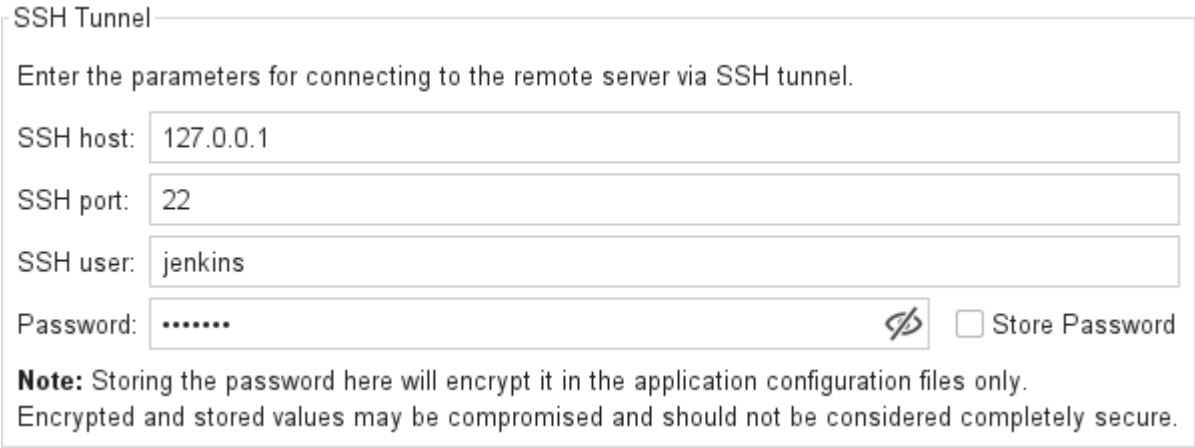
Embedded server mode only supports databases created with RED Database 5.

The following tools are not supported in embedded mode: Backup and Restore, Convert Database, Database Statistics, Grant Manager, Table Validator, Trace Manager, User Manager.

Users and jobs are not displayed in embedded mode.

4.1.3 SSH tunnel

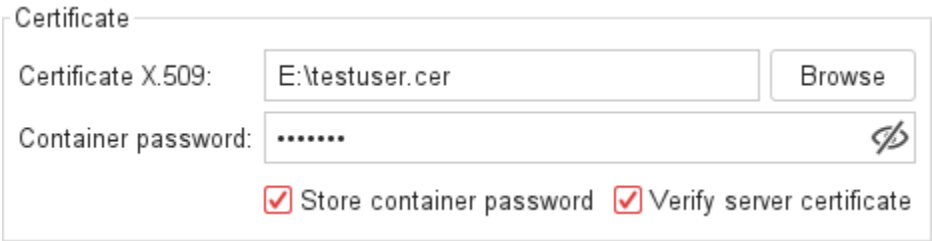
You can connect to the database via an SSH tunnel. As with any SSH connection, all traffic between you and the database will be encrypted. To do this, fill in the parameters for the SSH connection.



Img 4.3 — SSH tunnel

4.1.4 Certificate

For authentication by certificate, you must fill out the following form:



Img 4.4 — Certificate

4.1.5 Extended connection parameters

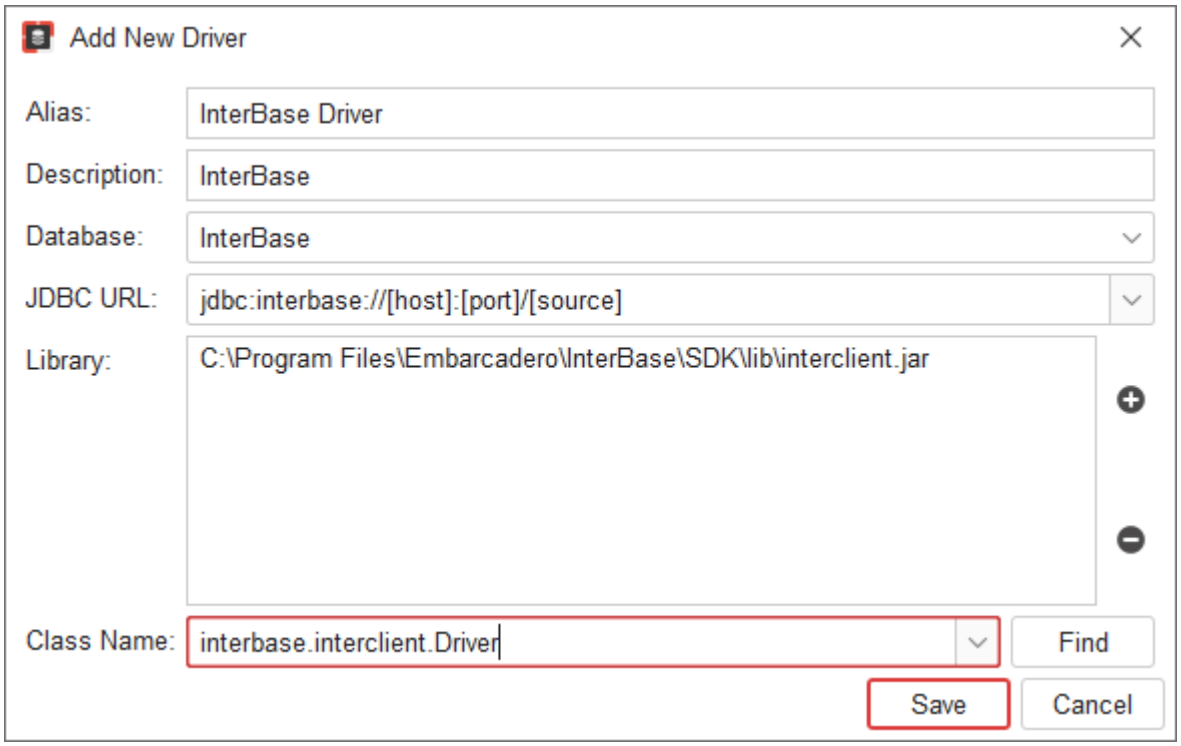
Additional connection properties can be set using the Extended tab. On this tab you can see a table with two columns. The left one corresponds to the connection parameter and the right one to its value. Refer to the JDBC driver documentation to find out what additional database connection parameters can be set.

You can also select the transaction isolation level. Different levels of transaction isolation determine the behaviour of the client application, running this transaction, in relation to other concurrent processes, running on any computer on the local network, simultaneously reading or modifying the same database as the current process. For Red Database and Firebird the default is READ_COMMITED. For detailed description of extended connection parameters see section Extended database connection parameters.

4.1.6 Connect to other servers

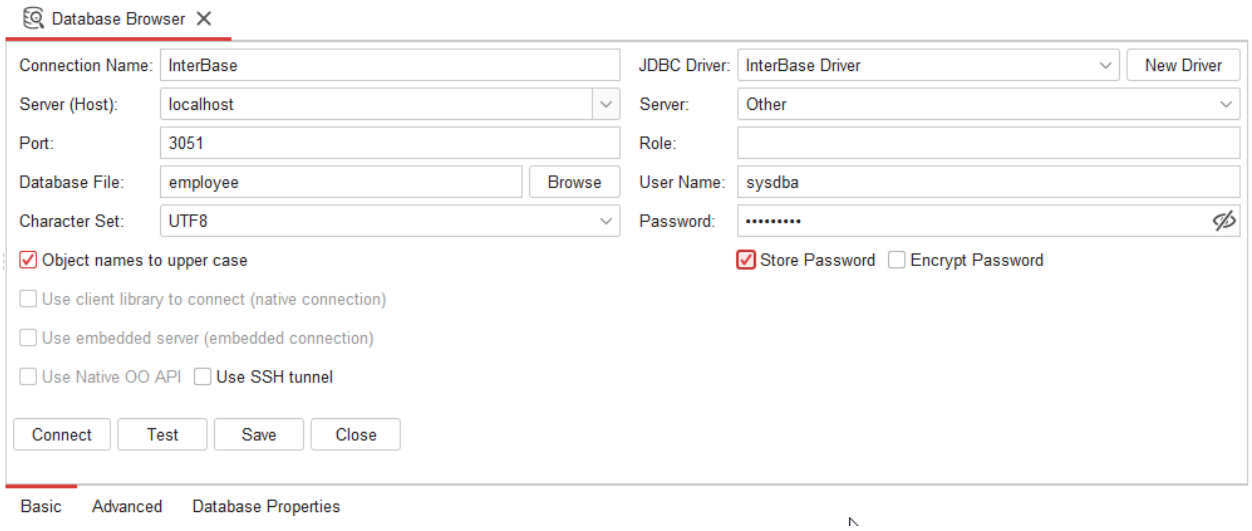
RDBExpert allows to connect to other servers (not Firebird or RedDatabase). To establish such a connection do the following:

1. Add driver for working with specified DBMS using menu System → Drivers → Add Driver button. In the opened window fill in all fields and click Save button.



Img 4.5 — Adding InterBase driver

2. Create a connection using menu Database → Create Connection. In opened tab select correct JDBC driver and Server, fill in all fields and press Connect button:

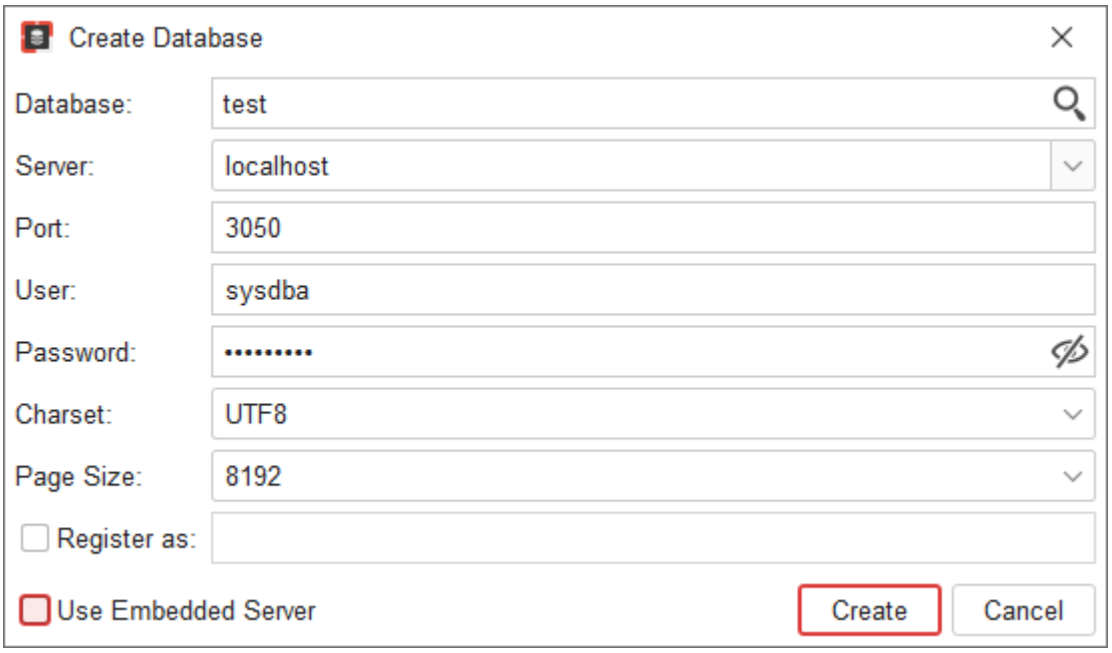


Img 4.6 — Connect to InterBase database

Currently, such connections are supported only by Query Editor and Execute SQL script from file tool.

4.2 Create database

To create a database, select the corresponding item in the Database menu or click the Create Database button in the toolbar. Fill in the fields in the opened window and click the Create button. For a detailed description of the fields, see the section Database connection parameters.

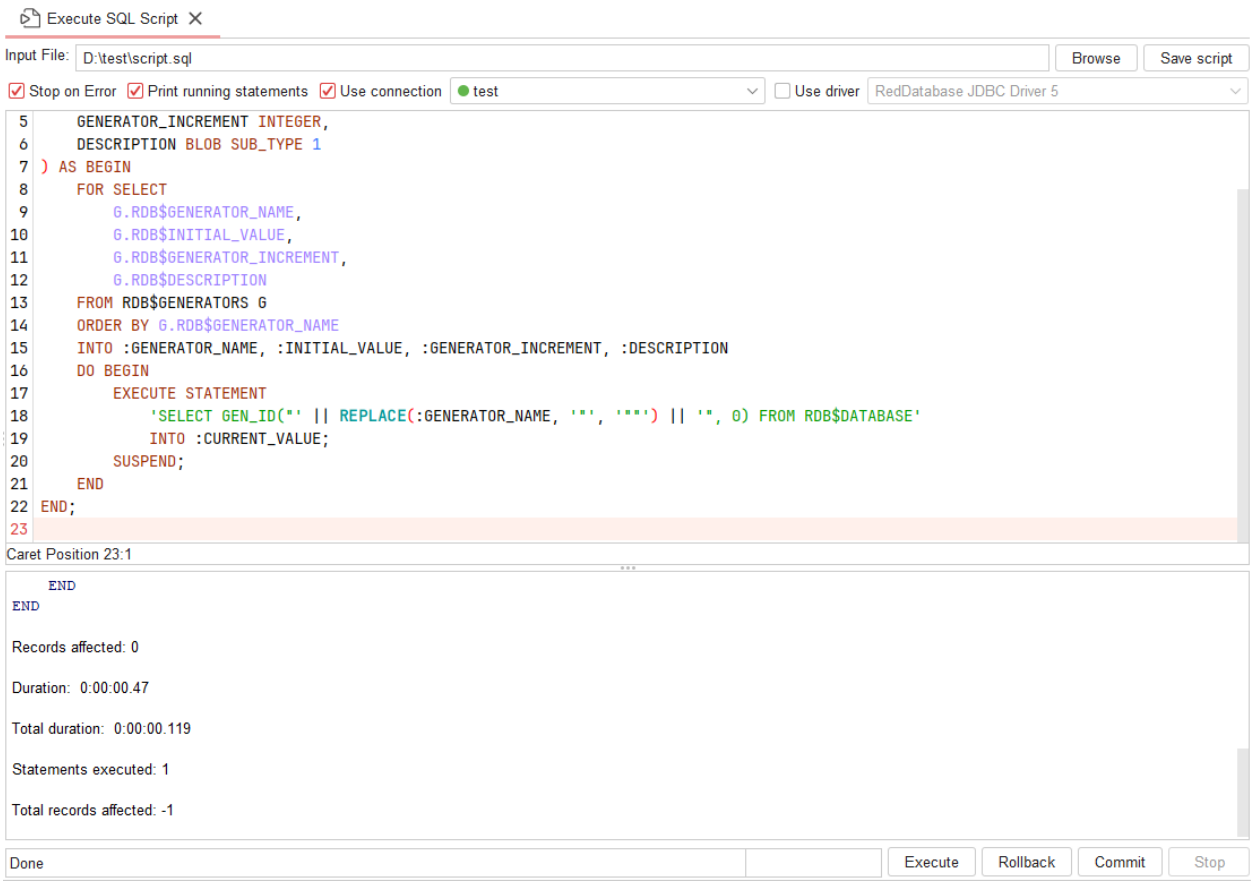


Img 4.7 — Database creation

When trying to create a database, a network connection encryption error may occur. To support encryption you need Java version at least 21 or JCE add-on installed. Otherwise, change the value of the WireCrypt = Disabled parameter in firebird.conf.

4.2.1 Execute SQL script from file

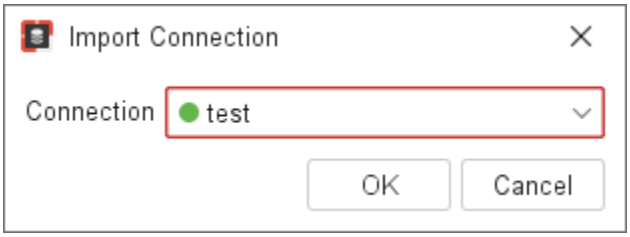
Select an open connection and specify the path to the file with SQL script and press the Execute SQL script button. Make a commit or rollback transaction by clicking on the corresponding buttons.



Img 4.8 — Execute SQL script from file

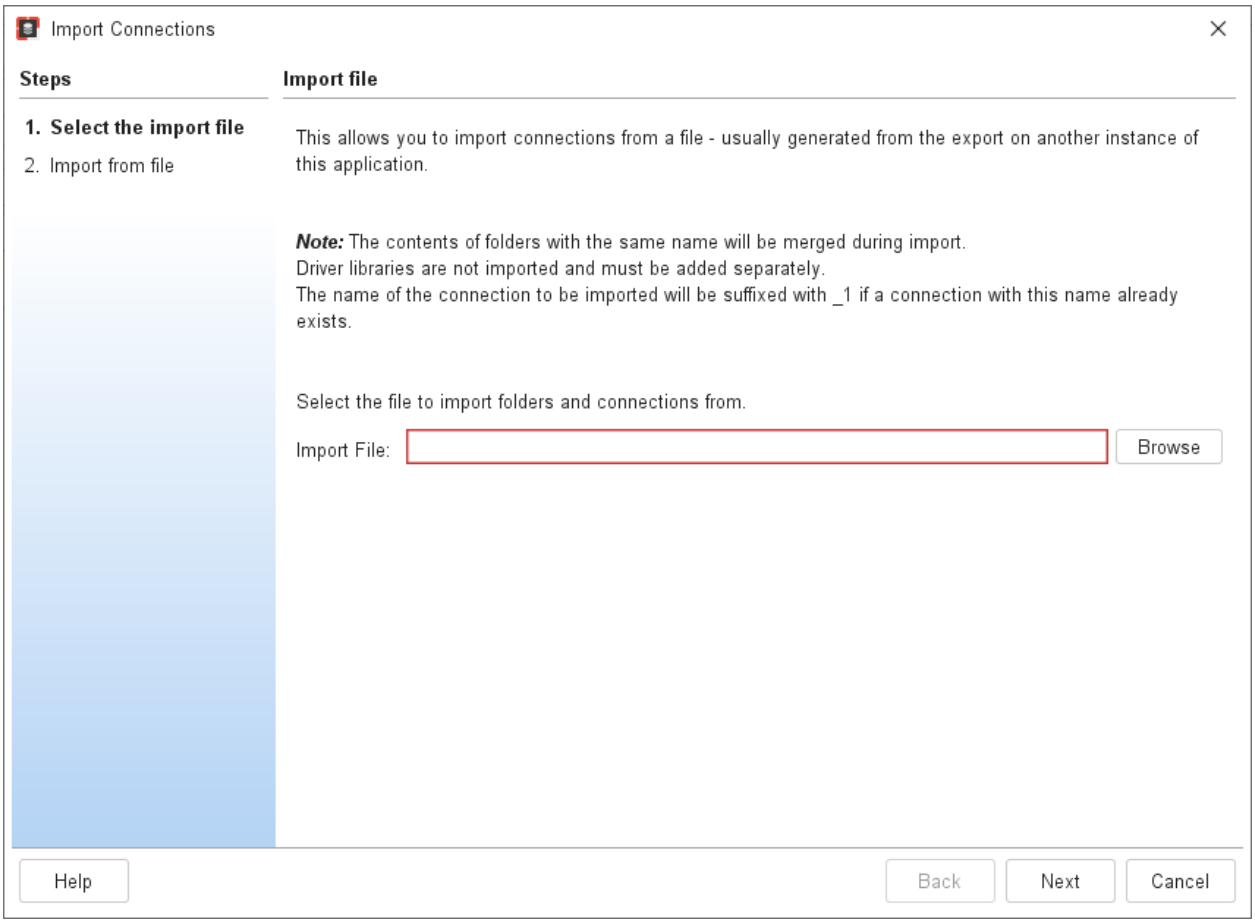
4.3 Import connection

If you already have connections configured in IBExpert, there is an option to import connections. Start RDBExpert and connect to the required user database. Select the menu item Database → Import connections → Import from DB and select the required connection in the opened window.



Img 4.9 — Import connection from database

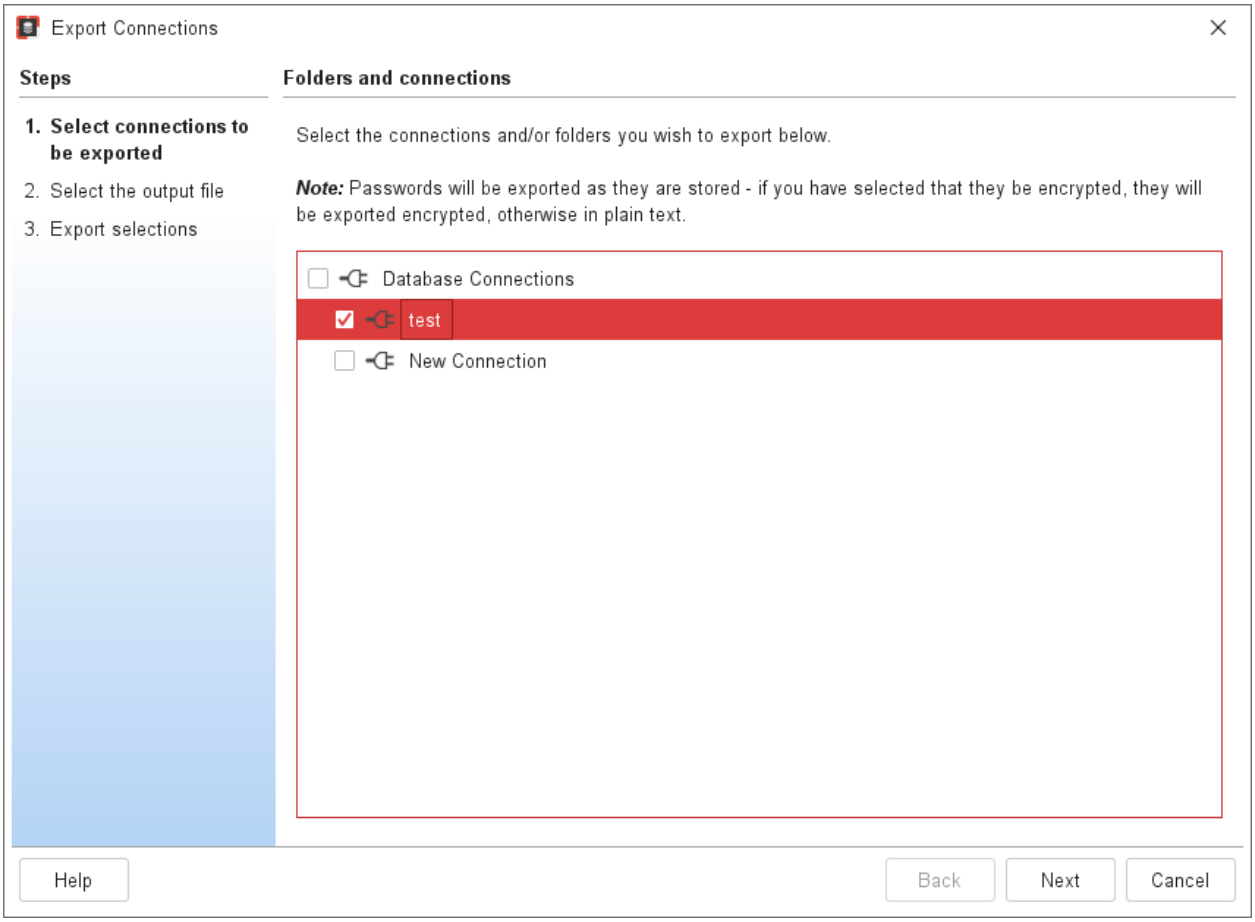
Importing a connection from a file is also available:



Img 4.10 — Import connection from file

4.4 Export connection

For exporting a connection to a file, select the menu item Database → Export connections and select the required connection in the opened window.



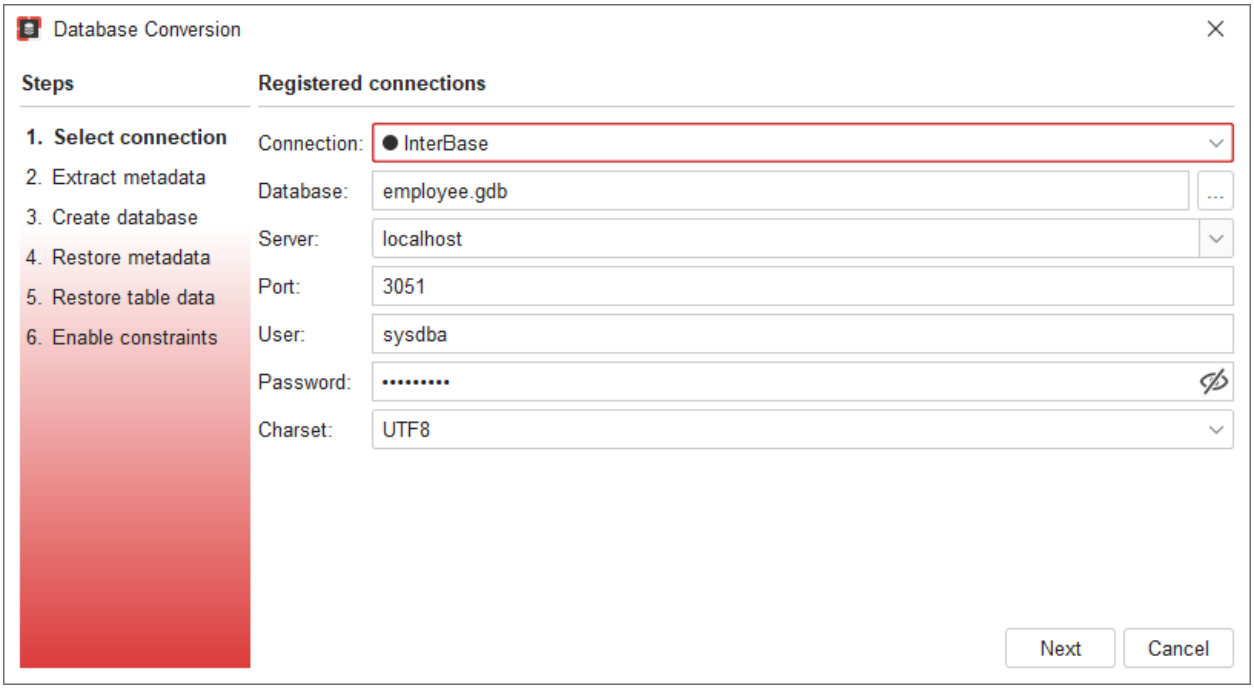
Img 4.11 — Export connection

4.5 Conversion of InterBase database

To convert the InterBase database to RedDatabase, select the menu item Database → Convert Database or right-click on the active connection to InterBase in the object tree and select Convert to RedDatabase in the menu that opens.

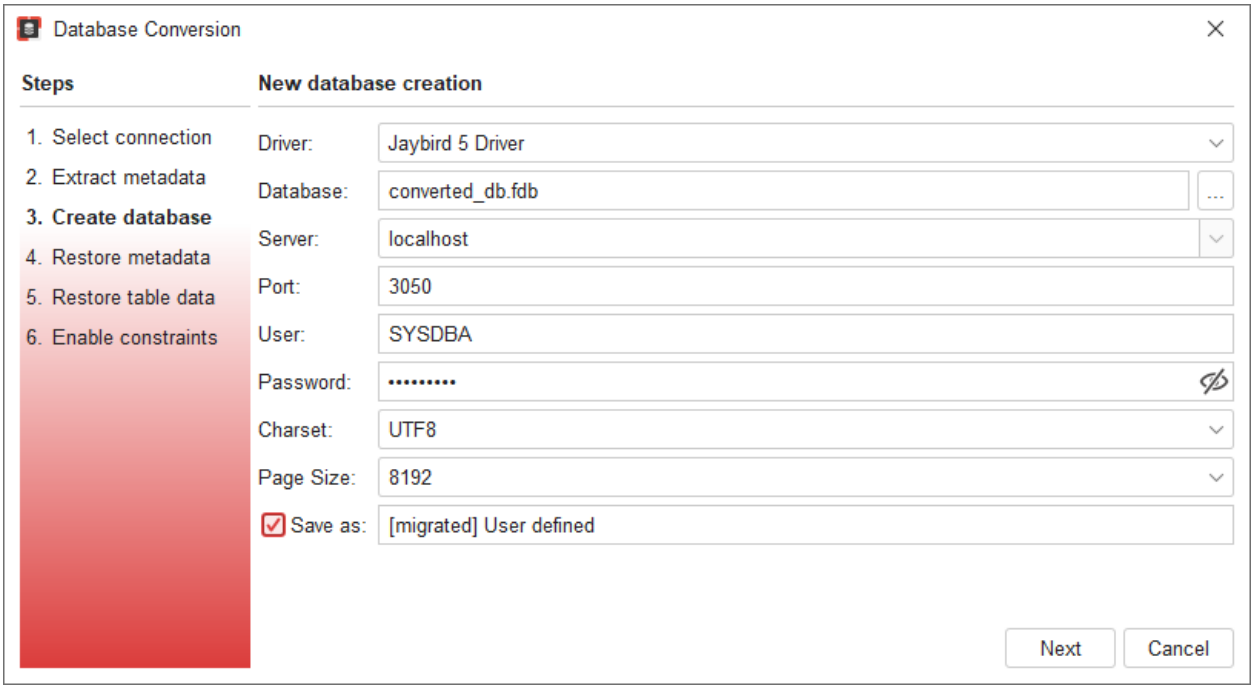
Database conversion is performed in 6 stages:

1. Select connection - define the database to be converted:



Img 4.12 — InterBase Database Conversion

2. Extract metadata - extract source database metadata into an SQL script, validate metadata:
    - Escaping object names with double quotes when the IDENTIFIER matches keywords/reserved words.
    - Removing the SUSPEND operator from the body of non-selective procedures.
    - Conversion of GROUP BY expressions. Expressions in queries with grouping must be aggregate functions or parts of expressions in the "GROUP BY` clause.
    - Conversion of external functions (UDF) using the ib_udf module into stored functions of RedDatabase.
3. Create a database - the definition of the RedDatabase database that will be created as a result of the conversion:



Img 4.13 — Creating RedDatabase database

- Driver - the driver used to create the database.
- Database - the path where the converted database will be created.
- Server - the server on which your Database is running.
- Port - the port where the Database is running.
- User - the user on whose behalf the database will be created.
- Password - the user's password.
- Charset - the encoding of the database, it is recommended to specify the encoding of the source database.
- Page Size - the page size with which the RedDatabase database will be created.
- Save As - add a connection with the specified name to the connection tree.

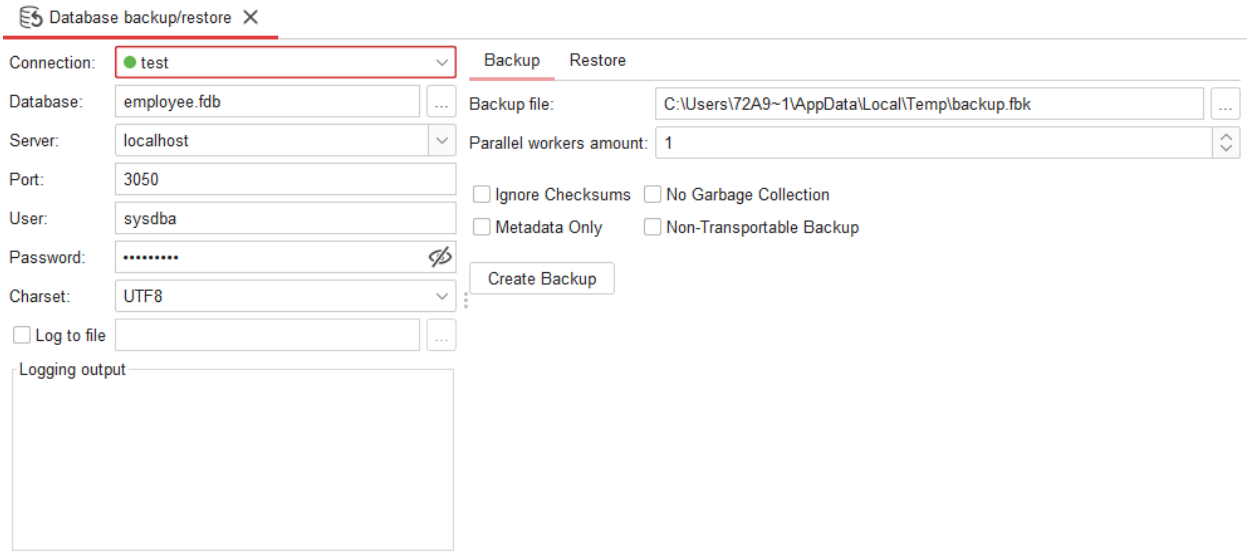
4. Restore metadata - to restore metadata, it applies the SQL script generated at the 2nd stage to the new database. In this case, triggers and indexes are created deactivated (INACTIVE), and tables without constraints.
5. Restore table date - adding data from the source database to the converted database.

> The ARRAY type fields in the converted database will be filled with NULL values.

6. Enable constraints - activate triggers and indexes, add table constraints (`PK", `FK", `UK").

4.6 Backup and restore

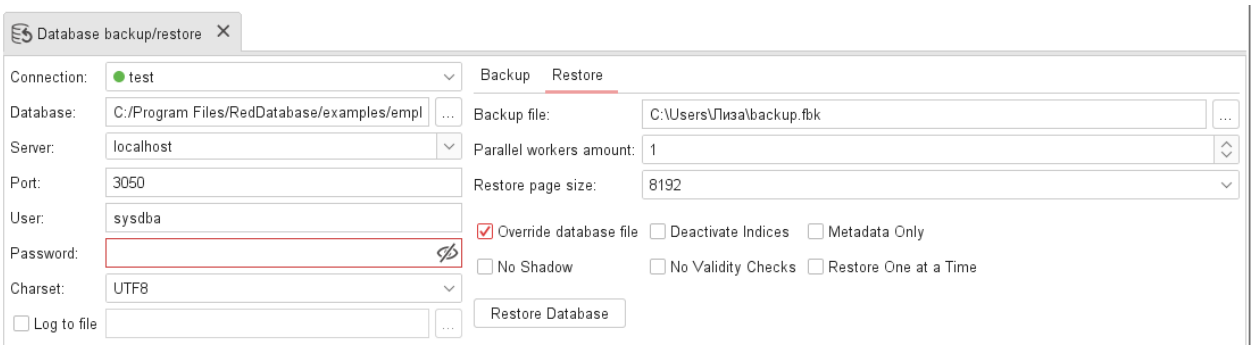
To perform a backup or restore, select the menu item Database → Backup and Restore.



Img 4.14 — Backup options Restore options

Backup options correspond to gbak keys:

- Ignore checksums - gbak -ignore;
- Metadata only - gbak -meta_data;
- No garbage collection - gbak -garbage_collect;
- Non-transoortable backup - gbak -nt.



Img 4.15 — Restore options

Restore options also correspond to gbak keys:

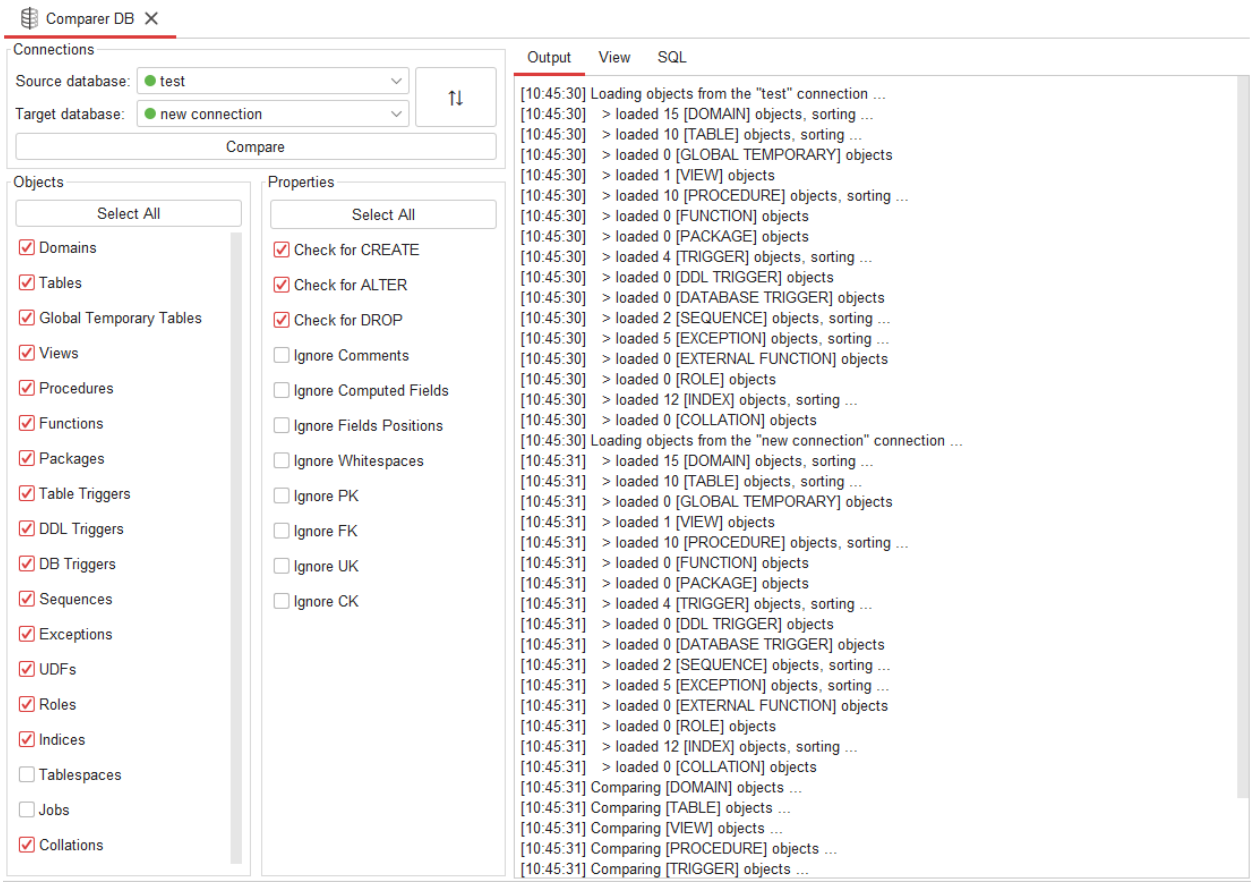
- Overwrite database file - gbak-replace_database;
- Deactivate indexes - gbak -inactive;
- Metadata only - gbak -meta_data;
- No shadow - gbak -kill;
- No validity check - gbak -no_validity;
- Restore one at time - gbak -one_at_a_time.

Chapter 5

Compare databases module

The tool compares two databases and generates a SQL script to make them identical.

> As a result of executing the generated SQL script, the selected databases will have identical structure, but not identical data.



Img 5.1 — Compare databases module

Source database - the database to the state of which the target database is to be brought to. Target database - the database to which the changes will be applied.

The Attributes block is a list of database elements that need/ do not need to be considered in the comparison.

The Parameters block is a list of conditions that affect comparing databases and forming an SQL script that brings target database structure to state of source database:

- Check for CREATE/ALTER/DROP - add to SQL script queries for creating/modifying/deleting objects in target database;
- Ignore comments - consider comments when comparing databases;
- Ignore calculated fields - consider calculated fields when comparing databases;

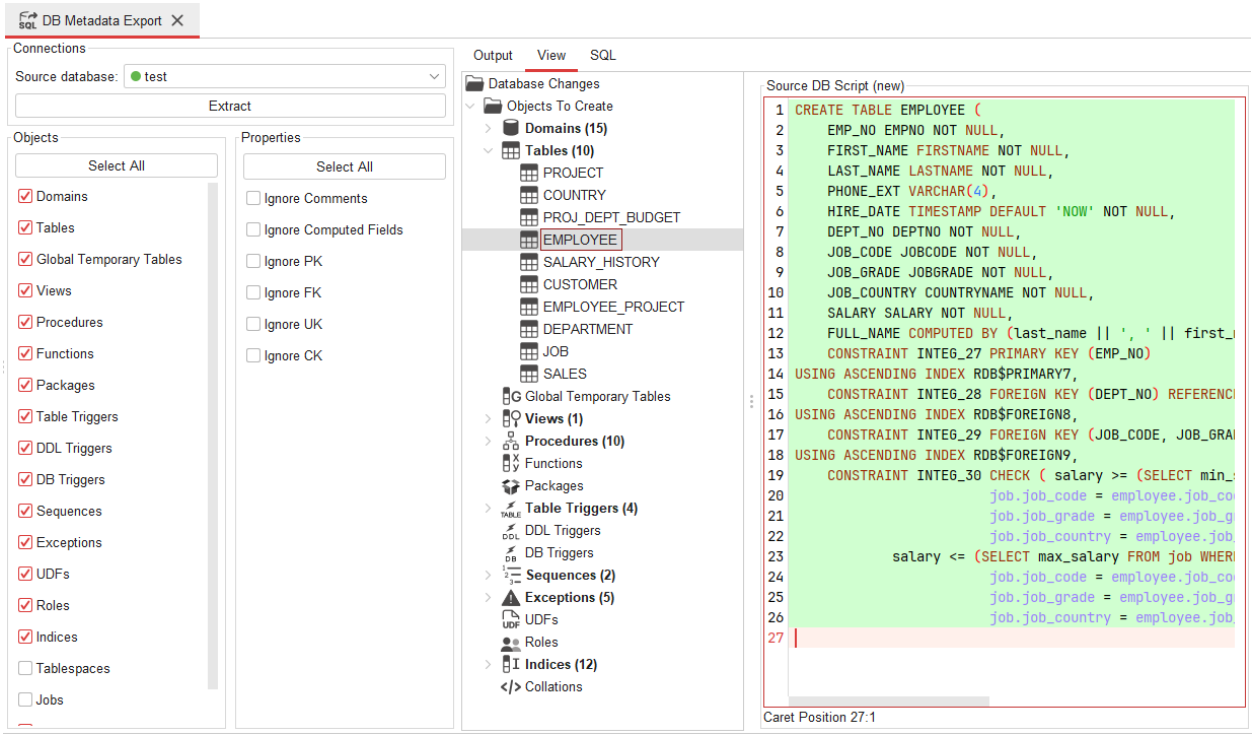
- Ignore fields positions - consider column positions when comparing databases;
- Ignore spaces - spaces will be ignored when comparing;
- Ignore PK/FK/UK/CK - consider constraints when comparing databases.

Found differences will be recorded in the Output tab. In SQL tab will be script that brings the structure of the target database to structure of source database.

Chapter 6

Export metadata

This tool extracts metadata of selected database into SQL script, execution of which allows you to create a duplicate of that database.



Img 6.1 — Export metadata

Source database is the database whose metadata needs to be extracted.

The Attributes block is a list of database elements that need/ do not need to be considered when exporting.

The Parameters block is a list of conditions that affect the extraction of metadata and the generation of the SQL script that creates the selected database:

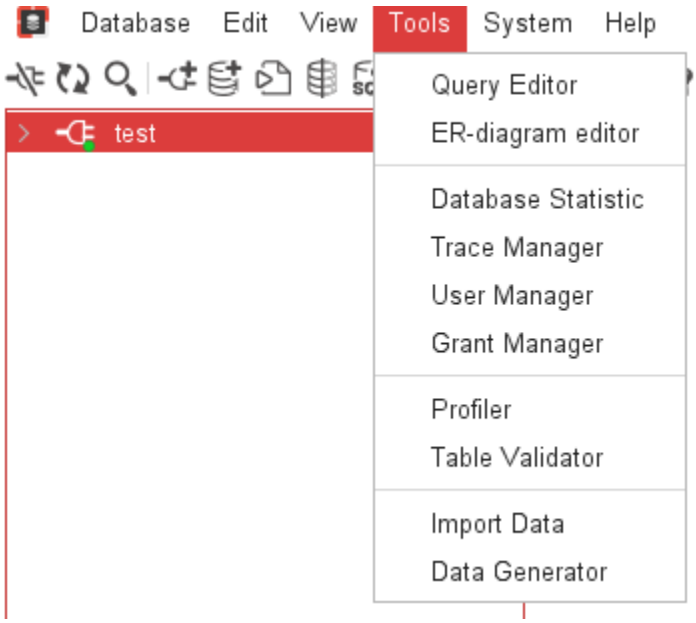
- Ignore comments - consider comments when exporting;
- Ignore calculated fields - consider calculated fields when exporting;
- Ignore PK/FK/UK/CK - consider restrictions when exporting.

You can view results of metadata export in Output, View, and SQL tabs. Output tab lists the items whose metadata has been extracted. View tab displays the extracted items that will be created when the generated script is executed. SQL tab contains the generated SQL script.

Chapter 7

Tools

This tab contains various tools for working with database.



Img 7.1 — Tools tab

Available tools:

- Query editor
- ER-diagram editor
- Database statistic
- Trace manager
- User manager
- Grant manager
- Profiler
- Table validation
- Import data
- Data generator

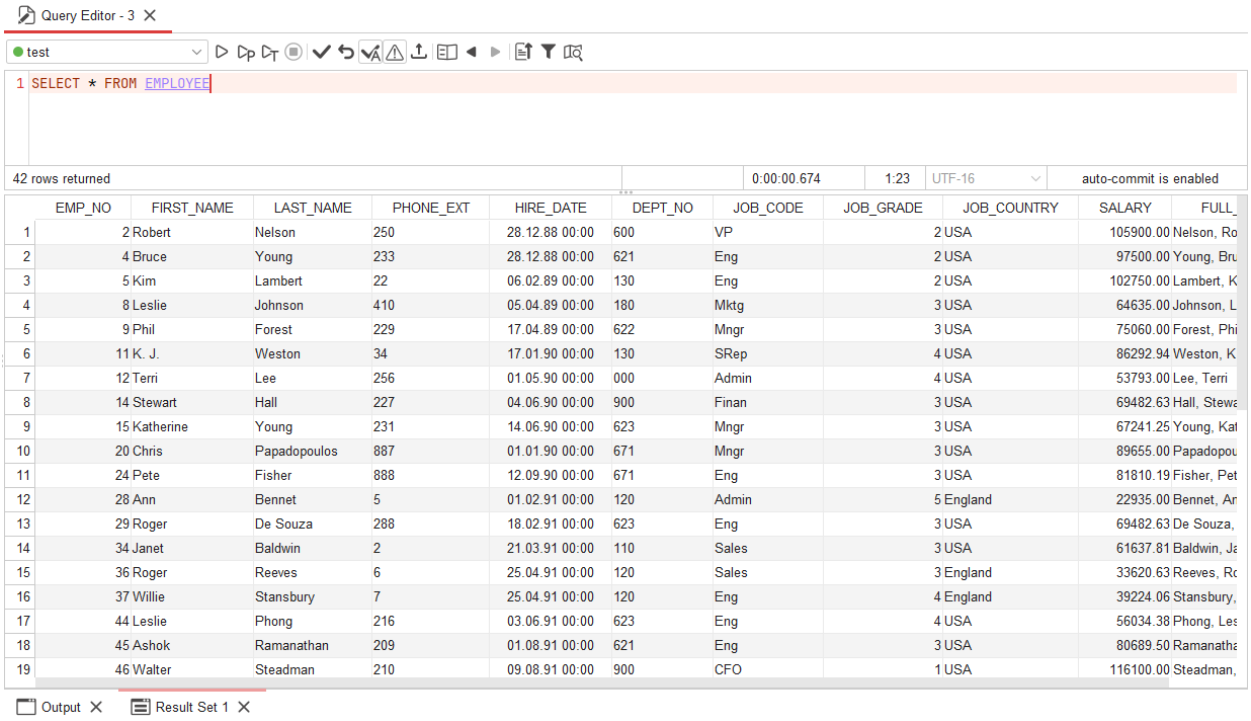
Chapter 8

Query editor

Query Editor is a customisable tool for viewing and executing SQL statements. Any number of editors can be open at the same time.

Query Editor supports the following functions:

- Customisable SQL syntax highlighting;
- Tooltips for keywords and database object names;
- Execution of multiple queries;
- Executing and displaying multiple queries with multiple results (Result Set);
- Output contains information about how table counter values have changed during query execution;
- Support for parameterised queries;
- Full printing support;
- Transaction management;
- IDE style text editor functions - search, replace, paste, etc.;
- Export results;
- Support for multiple open connections;
- Searchable executable history of SQL queries;
- Fast transition from editor to database object view by pressing CTRL + Left mouse button on the object name;
- Transaction isolation level selection.

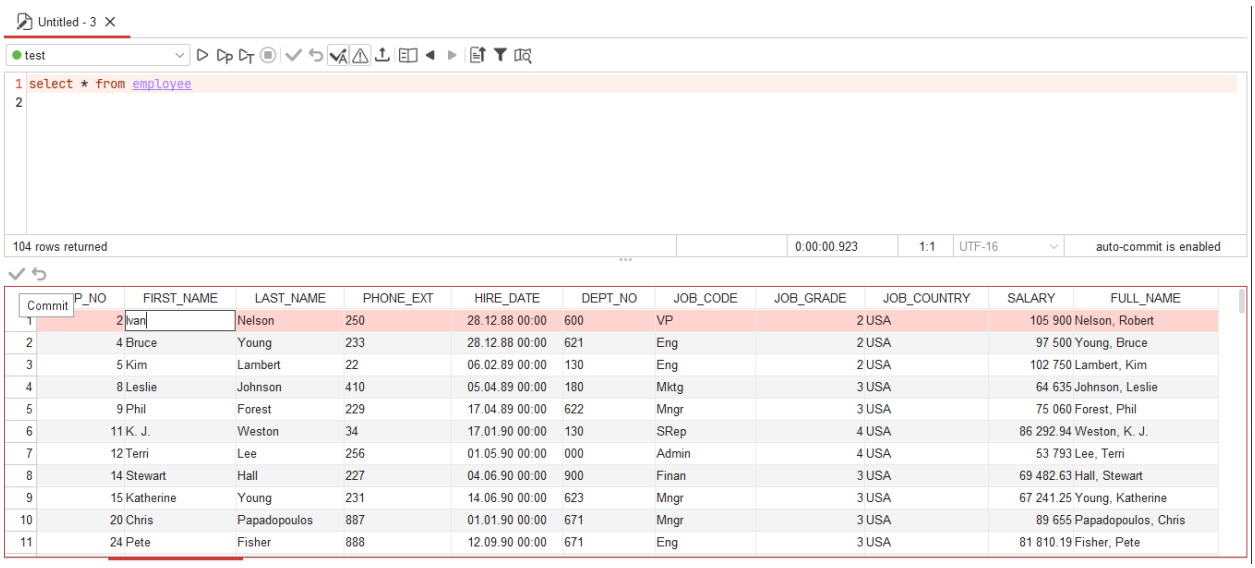


	EMP_NO	FIRST_NAME	LAST_NAME	PHONE_EXT	HIRE_DATE	DEPT_NO	JOB_CODE	JOB_GRADE	JOB_COUNTRY	SALARY	FULL_
1	2	Robert	Nelson	250	28.12.88 00:00	600	VP	2	USA	105900.00	Nelson, Ro
2	4	Bruce	Young	233	28.12.88 00:00	621	Eng	2	USA	97500.00	Young, Bru
3	5	Kim	Lambert	22	06.02.89 00:00	130	Eng	2	USA	102750.00	Lambert, K
4	8	Leslie	Johnson	410	05.04.89 00:00	180	Mktg	3	USA	64635.00	Johnson, L
5	9	Phil	Forest	229	17.04.89 00:00	622	Mngr	3	USA	75060.00	Forest, Phi
6	11	K. J.	Weston	34	17.01.90 00:00	130	SRep	4	USA	86292.94	Weston, K
7	12	Terri	Lee	256	01.05.90 00:00	000	Admin	4	USA	53793.00	Lee, Terri
8	14	Stewart	Hall	227	04.06.90 00:00	900	Finan	3	USA	69482.63	Hall, Stewa
9	15	Katherine	Young	231	14.06.90 00:00	623	Mngr	3	USA	67241.25	Young, Kat
10	20	Chris	Papadopoulos	887	01.01.90 00:00	671	Mngr	3	USA	89655.00	Papadopou
11	24	Pete	Fisher	888	12.09.90 00:00	671	Eng	3	USA	81810.19	Fisher, Pet
12	28	Ann	Bennet	5	01.02.91 00:00	120	Admin	5	England	22935.00	Bennet, Ar
13	29	Roger	De Souza	288	18.02.91 00:00	623	Eng	3	USA	69482.63	De Souza,
14	34	Janet	Baldwin	2	21.03.91 00:00	110	Sales	3	USA	61637.81	Baldwin, Ja
15	36	Roger	Reeves	6	25.04.91 00:00	120	Sales	3	England	33620.63	Reeves, Ro
16	37	Willie	Stansbury	7	25.04.91 00:00	120	Eng	4	England	39224.06	Stansbury,
17	44	Leslie	Phong	216	03.06.91 00:00	623	Eng	4	USA	56034.38	Phong, Les
18	45	Ashok	Ramanathan	209	01.08.91 00:00	621	Eng	3	USA	80689.50	Ramanatha
19	46	Walter	Steadman	210	09.08.91 00:00	900	CFO	1	USA	116100.00	Steadman,

Img 8.1 — Query editor

8.1 Editing result set

For SQL queries that involve exactly one table and the output contains the primary key, you can edit the data in the result set. When you click on the "Commit" button, the data changes will be applied to the table.



P_NO	FIRST_NAME	LAST_NAME	PHONE_EXT	HIRE_DATE	DEPT_NO	JOB_CODE	JOB_GRADE	JOB_COUNTRY	SALARY	FULL_NAME
2	Ivan	Nelson	250	28.12.88 00:00	600	VP	2	USA	105 900	Nelson, Robert
4	Bruce	Young	233	28.12.88 00:00	621	Eng	2	USA	97 500	Young, Bruce
5	Kim	Lambert	22	06.02.89 00:00	130	Eng	2	USA	102 750	Lambert, Kim
8	Leslie	Johnson	410	05.04.89 00:00	180	Mktg	3	USA	64 635	Johnson, Leslie
9	Phil	Forest	229	17.04.89 00:00	622	Mngr	3	USA	75 060	Forest, Phil
11	K. J.	Weston	34	17.01.90 00:00	130	SRep	4	USA	86 292.94	Weston, K. J.
12	Terri	Lee	256	01.05.90 00:00	000	Admin	4	USA	53 793	Lee, Terri
14	Stewart	Hall	227	04.06.90 00:00	900	Finan	3	USA	69 482.63	Hall, Stewart
15	Katherine	Young	231	14.06.90 00:00	623	Mngr	3	USA	67 241.25	Young, Katherine
20	Chris	Papadopoulos	887	01.01.90 00:00	671	Mngr	3	USA	89 655	Papadopoulos, Chris
24	Pete	Fisher	888	12.09.90 00:00	671	Eng	3	USA	81 810.19	Fisher, Pete

Img 8.2 — Редактирование результирующего набора

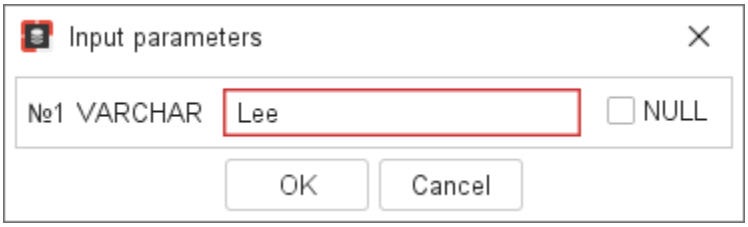
8.2 Parameterised queries

In some cases, you need to create a query that can be used multiple times, but with different input values each time. For example, you can write several queries to find data about an employee with a certain last name. Or you can write a single query, changing only the employee's last name.

To create a query that may have different input data at different times, query parameters are used. Parameters can be named or unnamed. An unnamed parameter is a question mark (?) that can be specified anywhere in the query, instead of a literal value. For example:

```
SELECT * FROM employee WHERE (last_name = ?)
```

After running such query, a dialogue window will open for entering the parameter value (employee's last name):

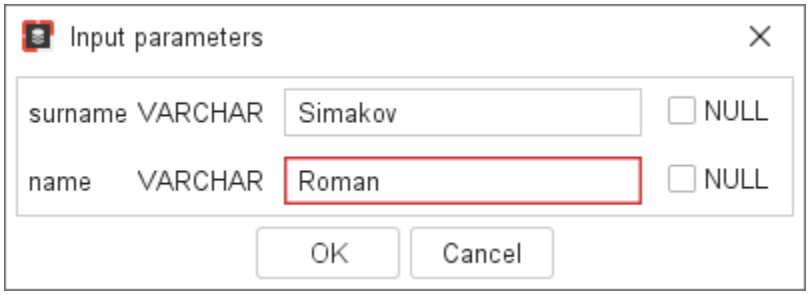


Img 8.3 — Unnamed parameter

Named parameters are a combination of a colon and the parameter name (:<paramname>), which can also be substituted for a literal value. Named parameters are especially useful if there are multiple parameters in a query. For example:

```
SELECT * FROM employee WHERE (last_name = :surname AND first_name =:name)
```

After running such query, a dialogue box will open for entering the values of the parameters (last name and first name of the employee):



Img 8.4 — Named parameters

8.3 Query history

After successful execution, the query is stored in the editor's log cache. The number of queries stored in the history is specified in the editor settings. Saved queries are not lost after restarting the application or the query editor.

8.4 Transaction Control

To manage transactions, there is a Enable autocommit button on the toolbar. It includes an automatic commit mode in which DDL and DML transactions are committed after completion.

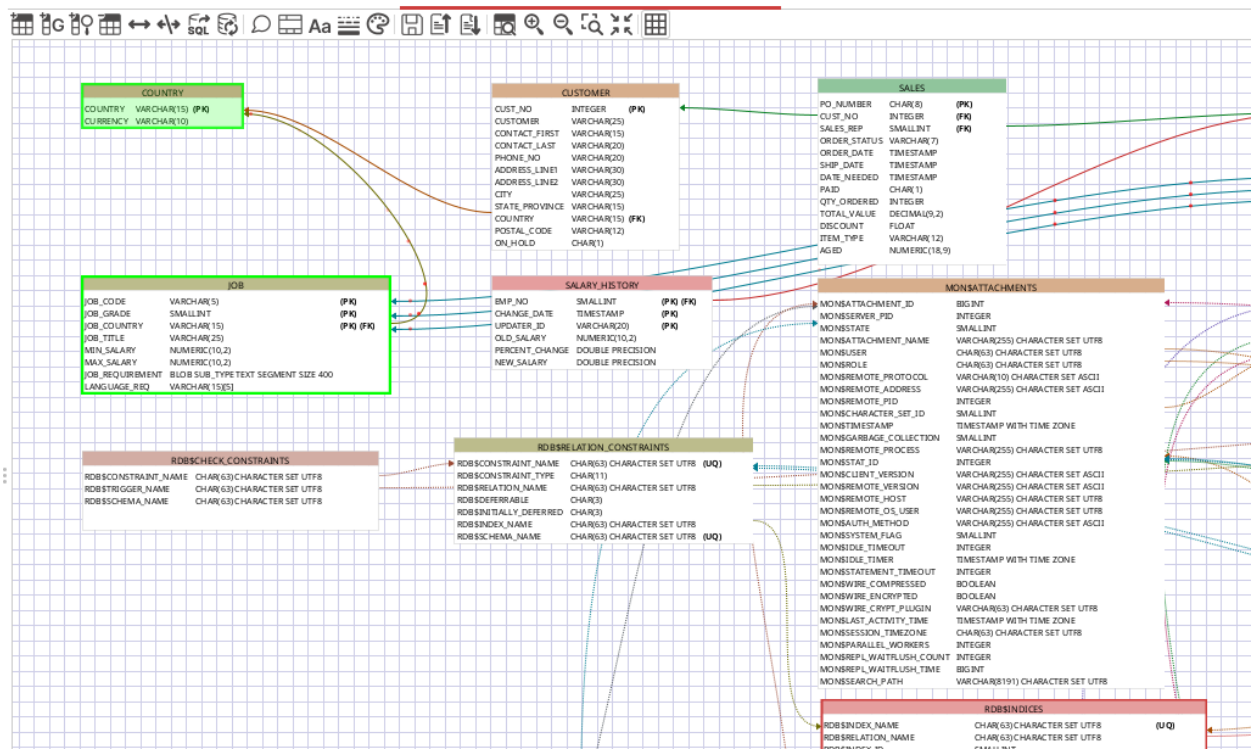
In the query editor, it is possible to enable the autoddl mode, which enables automatic confirmation of DDL operations after their execution. DML operations will be recorded if they are performed in the same transaction before DML. The autoddl mode is enabled by executing the following command in the query editor:

```
set autoddl on;
```

Chapter 9

ER-diagram editor

Tool is used to create and edit ER-diagrams of databases.



Img 9.1 — ER-diagrams editor

Main functions:

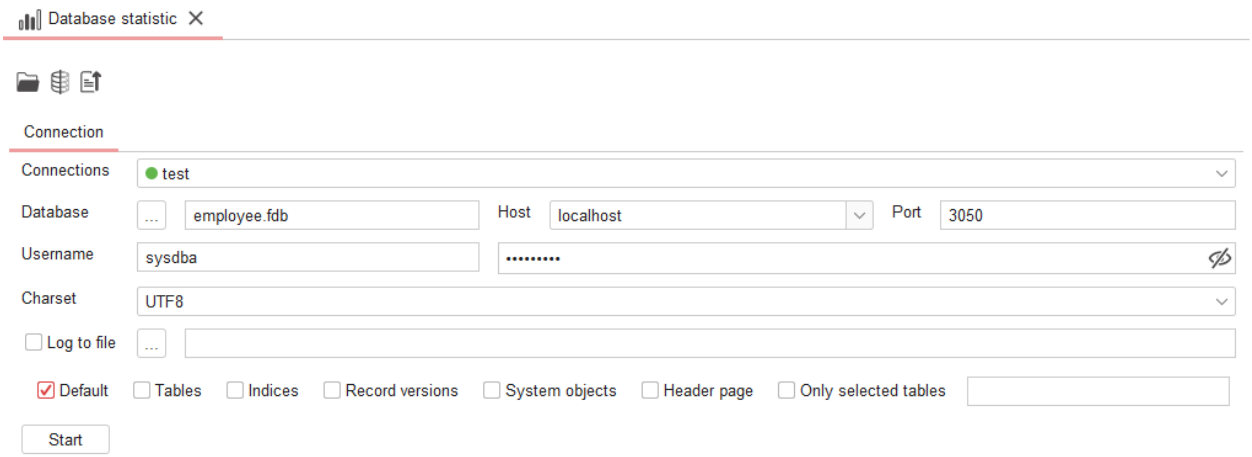
- Creating and editing an ER-diagram;
- Generating an SQL script to create the tables represented in the diagram;
- Reverse engineering an existing database into an ER diagram, with optional filtering of the object list by name and type;
- Working with views, global temporary tables, and system tables;
- Building logical relationships between database objects (import from JSON)[1];
- Exporting the diagram to various formats (PNG, JPG, SVG, Mermaid, draw.io) and exporting logical relationships to JSON..

[1] For more information about creating a JSON file for defining logical relationships, see Appendix D.

Chapter 10

Database statistic

Tool displays database statistics and also allows you to compare the results of analysing two databases.

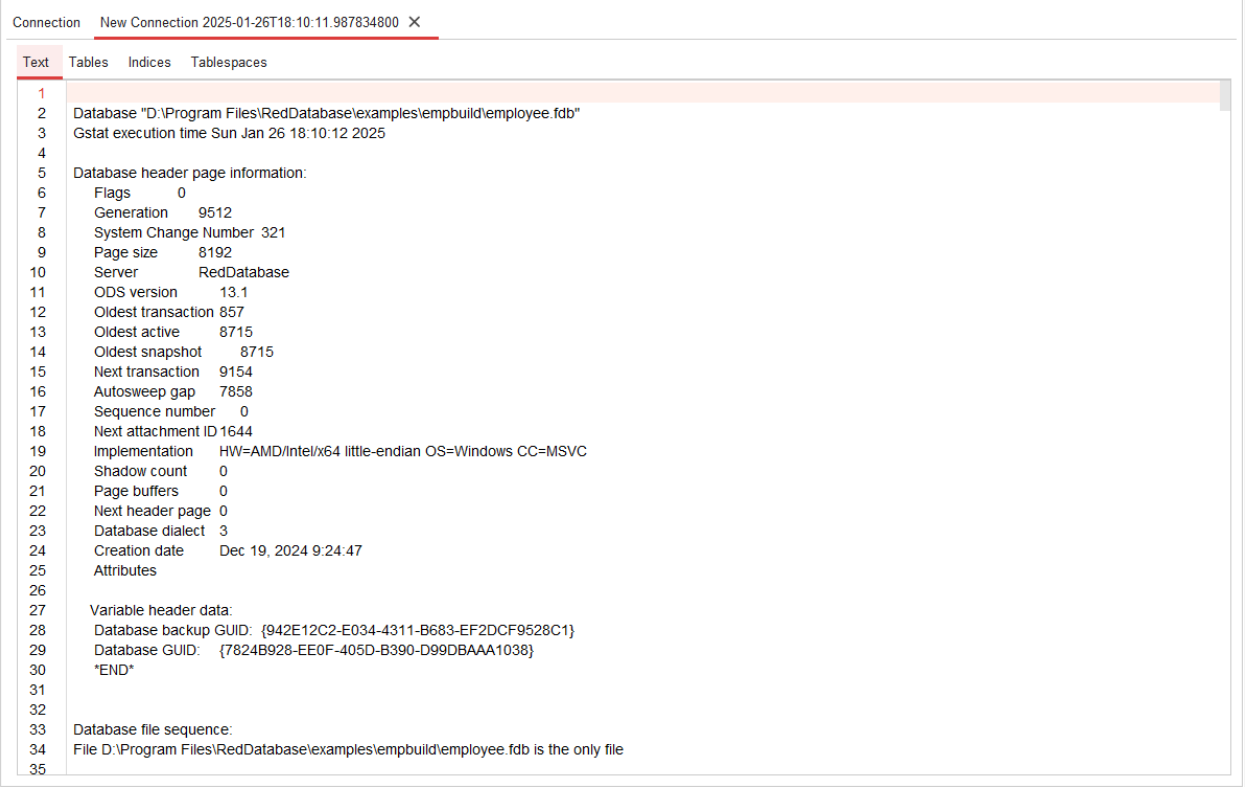


Img 10.1 — Database statistic

Statistical collection formats:

- Default - analysis of the whole database, output is similar to execution of gstat without options;
- Tables - data page statistics, output is similar to gstat -data;
- Indices - analyses indexes, output similar to gstat -index;
- Record Versions - adds statistics on average record lengths, number of versions and information about BLOB;
- System Objects - analyses system tables and indexes;
- Header page - static database data, output is similar to gstat -header;
- Only selected tables - analysis of selected tables, the parameter is available if a connection to the selected database is established.

Statistic is displayed in a separate tab:



Img 10.2 — Statistics

See Database statistics for a detailed description of the values to be collected.

10.1 Comparing statistics of two databases

For comparing the statistics of two databases, collect statistics for the second database and click the Compare button.

The Text tab will display text output of statistics:

Connection | New Connection 2025-01-26T18:12:06.280897500 | New Connection (Copy) 2025-01-26T18:12:09.236168200 | Compare

Text | Tables | Indices | Tablespaces

old

7	Generation 9672
8	System Change Number 321
9	Page size 8192
10	Server RedDatabase
11	ODS version 13.1
12	Oldest transaction 857
13	Oldest active 8962
14	Oldest snapshot 8715
15	Next transaction 9319
16	Autosweep gap 7858
17	Sequence number 0
18	Next attachment ID 1657
19	Implementation HW=AMD/Intel/x64 little-endian OS=Windows CC=MSVC
20	Shadow count 0
21	Page buffers 0
22	Next header page 0

new

7	Generation 9673
8	System Change Number 321
9	Page size 8192
10	Server RedDatabase
11	ODS version 13.1
12	Oldest transaction 857
13	Oldest active 8962
14	Oldest snapshot 8715
15	Next transaction 9322
16	Autosweep gap 7858
17	Sequence number 0
18	Next attachment ID 1660
19	Implementation HW=AMD/Intel/x64 little-endian OS=Windows CC=MSVC
20	Shadow count 0
21	Page buffers 0
22	Next header page 0

Img 10.3 — Textual output of statistics

In Tables, Indices and Tablespaces tabs, column values show difference between result of first and second database.

Connection | test 2025-12-09T09:50:50.598764500 | gstat_00.00.22.10.2021.txt | Compare

Text | Tables | Indices | Tablespaces

name	tablespace	primary pointer p...	index root page	pointer pages	data pages	data page slots	primary pages	secondary pages	swept pages	empty pages
COUNTRY	PRIMARY	251	252	1	1	1	1	0	0	0
CUSTOMER	PRIMARY	314	315	1	1	1	1	0	0	0
DEPARTMENT	PRIMARY	266	267	1	1	1	1	0	0	0
EMPLOYEE	PRIMARY	280	281	1	2	2	2	0	0	0
EMPLOYEE_PROJECT	PRIMARY	297	298	1	1	1	1	0	0	0
JOB	PRIMARY	258	259	1	2	2	1	1	0	0
PROJECT	PRIMARY	290	291	1	2	2	1	1	0	0
PROJ_DEPT_BUDGET	PRIMARY	303	304	1	2	2	1	1	0	0
SALARY_HISTORY	PRIMARY	308	309	1	1	1	1	0	0	0
SALES	PRIMARY	322	323	1	1	1	1	0	0	0
ACCIDENT		3862	3863	3	8696	8696	8668	28	8528	12
ACCIDENTDET		4530	4531	3	6568	6568	6558	10	6484	2
ACCIDENTDETMEK		4917	4918	1	448	448	448	0	445	0
ACCIDENTDETMEKRES		4919	4920	1	1032	1032	1032	0	1025	2
ACCIDENTDETNUM		4594	4595	1	2584	2584	2528	56	2138	380
ACCIDENTDETNUMRES		4780	4781	1	0	0	0	0	0	0
ADHOCPARAMS		4387	4388	1	0	0	0	0	0	0
ANALISATOR		3902	3903	1	1	1	1	0	1	0
ANALISATORHANDLERSET		5156	5157	1	0	0	0	0	0	0
ANALISATORMETHODSR...		4971	4972	1	0	0	0	0	0	0
ANALISATORPARAMS		3908	3909	1	16	16	16	0	10	6
ANALISATORPLATES		4861	4862	1	0	0	0	0	0	0
ANALISATORPLATESLINKS		4883	4884	1	0	0	0	0	0	0
ANALISATORPROTOCOLS		3914	3915	1	1	1	1	0	1	0
ANALISATORREAGENTS		4656	4657	1	0	0	0	0	0	0
ANALISATORREAGLINK		4674	4675	1	0	0	0	0	0	0
ANALISATORREAGPARA...		5152	5153	1	0	0	0	0	0	0
ANALISATOR_REF		5584	5585	1	1	1	1	0	1	0
ANAMNEZ		3264	3265	1	1	1	1	0	1	0
ANDODWRK		3306	3307	1	0	0	0	0	0	0

Img 10.4 — Result of statistics comparison

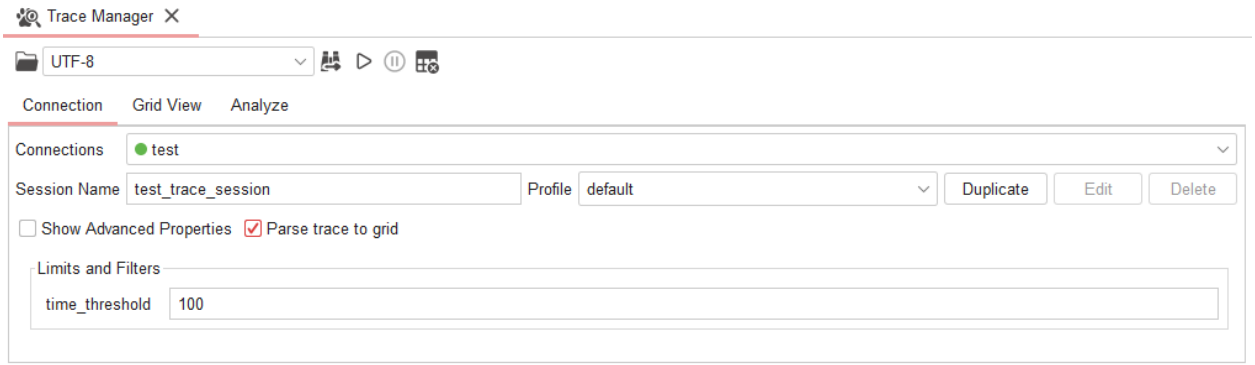
Green colour indicates what is in both databases. Red colour indicates tables and indexes that are

present in the first database but absent in the second database.

Chapter 11

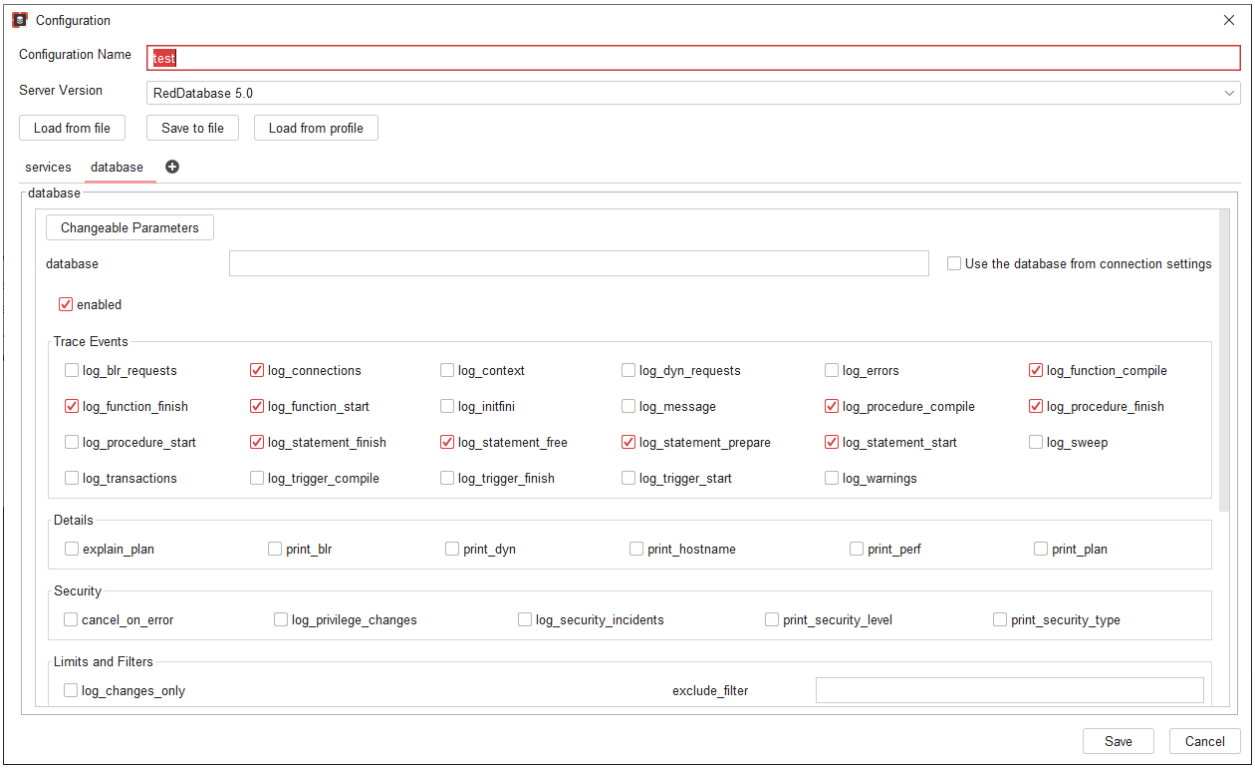
Trace manager

Trace Manager allows you monitor and analyse everything that happens in the database in real time. It tracks and logs such events as: connection to database and disconnection from it, database creation and deletion, execution of DML and DDL, stored procedures, etc.



Img 11.1 — Trace manager

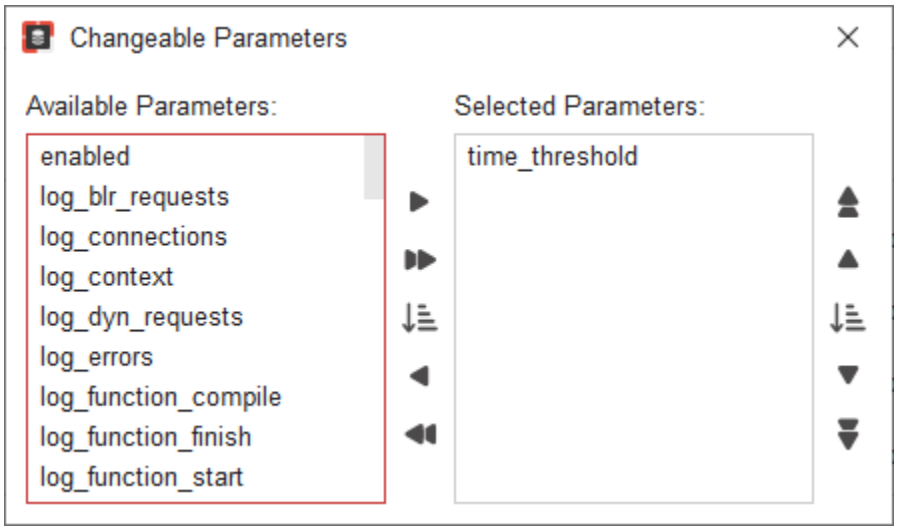
To start audit, you must select a connection and specify a profile with settings. You can specify configuration file in the extended properties, then it will be used instead of the profile.



Img 11.2 — Trace configuration

Depending on the server version, the audit parameters are slightly different, so select the server corresponding to the database from the drop-down list. For a description of the parameters, see Trace manager configuration file settings.

The Changeable parameters button allows you to define the parameters for quick access, they will be displayed on Connection tab :

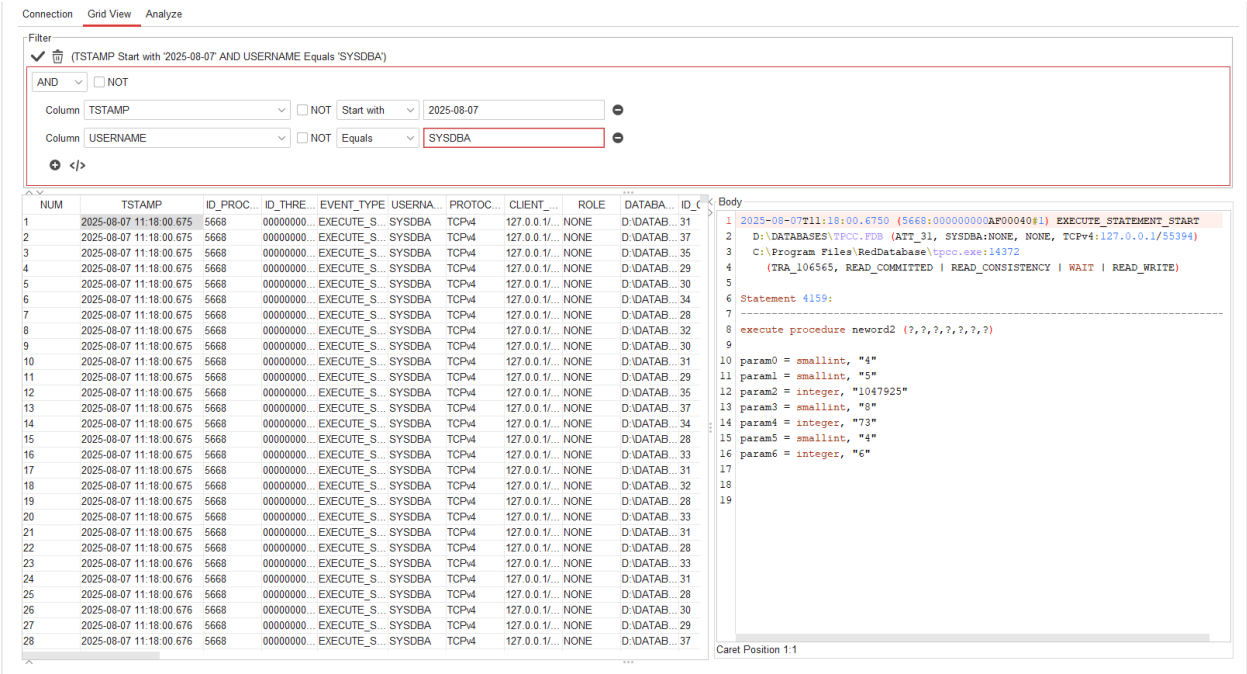


Img 11.3 — Changeable parameters

11.1 Grid view

Event table in Trace Manager is filled in either when tracing is enabled or when a saved log file is opened. When opening a log file, there is an option to select the encoding.

By default, the event table displays all possible columns containing information about the registered event. Some columns can be hidden. To do this, click the Visible columns button and modify them as required. The filter block allows you to add a condition for displaying data.



Img 11.4 — Grid view

When you right-click on any table, a context menu appears to export the table.

See Trace manager events table for a description of the event table columns.

11.2 Trace analysis

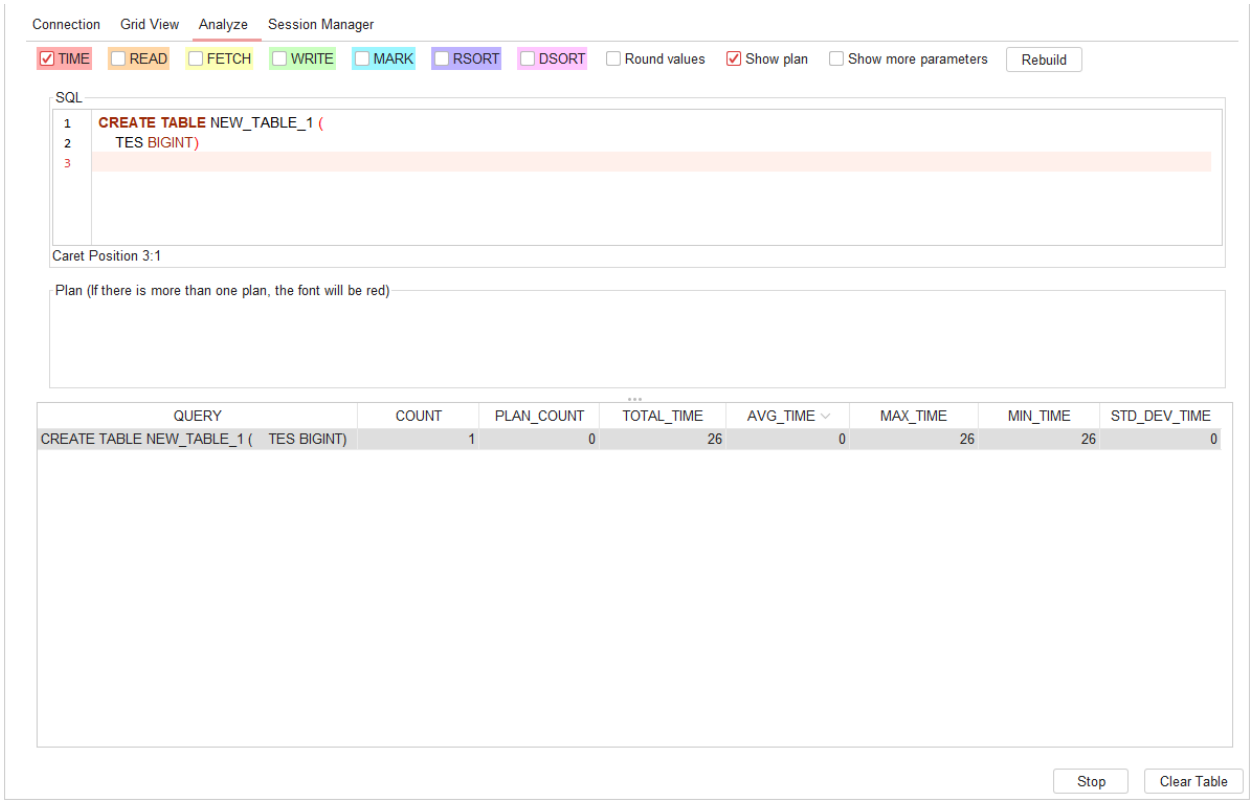
Trace analysis displays information about events that occurred during a defined time interval. Events are added either when tracing is enabled or when a log file is opened.

Trace analysis parameters:

- TIME - Information about query execution time;
- READ - Information about number of pages read from the disc;
- FETCH - Information about number of pages read from page cache;
- WRITE - Information about number of pages recorded on the disc;
- MARK - Information about number of pages changed in the page cache;
- RSORT - Information about RAM size used for sorting;
- DSORT - Information about the size of temporary files used in the query;
- Rround values - If the value is greater than 10000, it will be converted to a larger unit until it becomes less than 10000;
- Show Plan - Execution plan for query.

Additional parameters:

- Period - Time period to be analysed; after changing the period, press the Rebuild button;
- Compare queries by N symbols - Consider queries as identical if they have the same first N characters;
- Filter events - Allows you to select the types of events to be analysed.



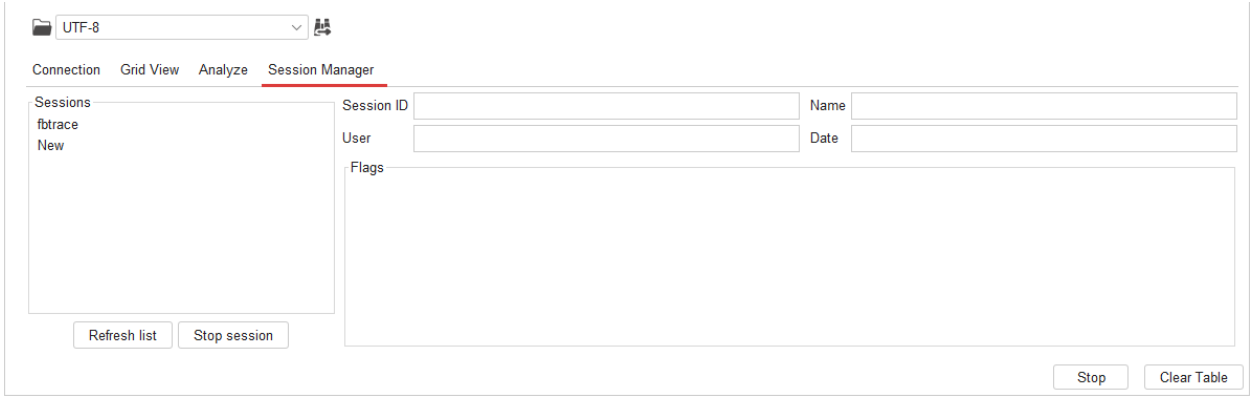
Img 11.5 — Result table

When you hover over a cell, a tooltip will show the sum of the column values and the average value. To view the full text of the query and its plan, you need to select the cell. Double-clicking will open a window with the event record in text format.

See Trace analysis for description of columns of the resulting event table.

11.3 Session Manager

The Session Manager displays a list of all currently available trace sessions. The manager tab is visible only when the current audit session is running.



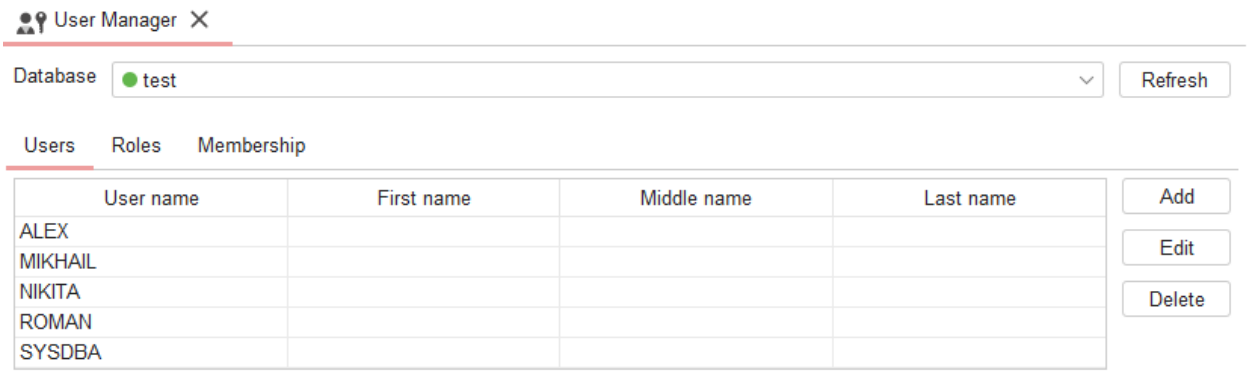
Img 11.6 — Session Manager

In the window on the left, you can select the name of the session and see information about it (ID, starting user, start time), and stop the tracing session.

Chapter 12

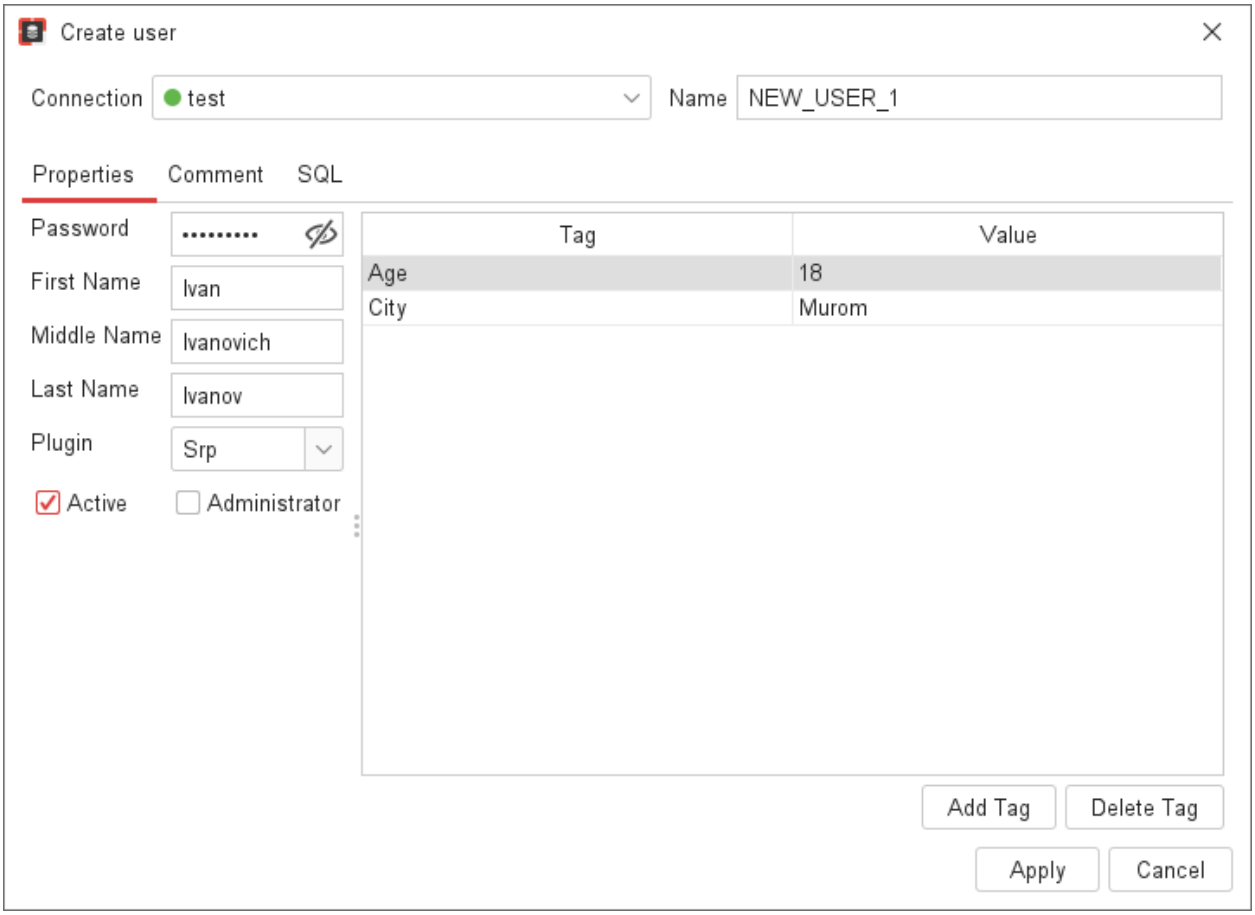
User manager

With the User Manager you can manage database users: add, edit and delete.



Img 12.1 — User manager

To add, edit or delete user, you should press the corresponding button and fill in all the fields in the opened window.

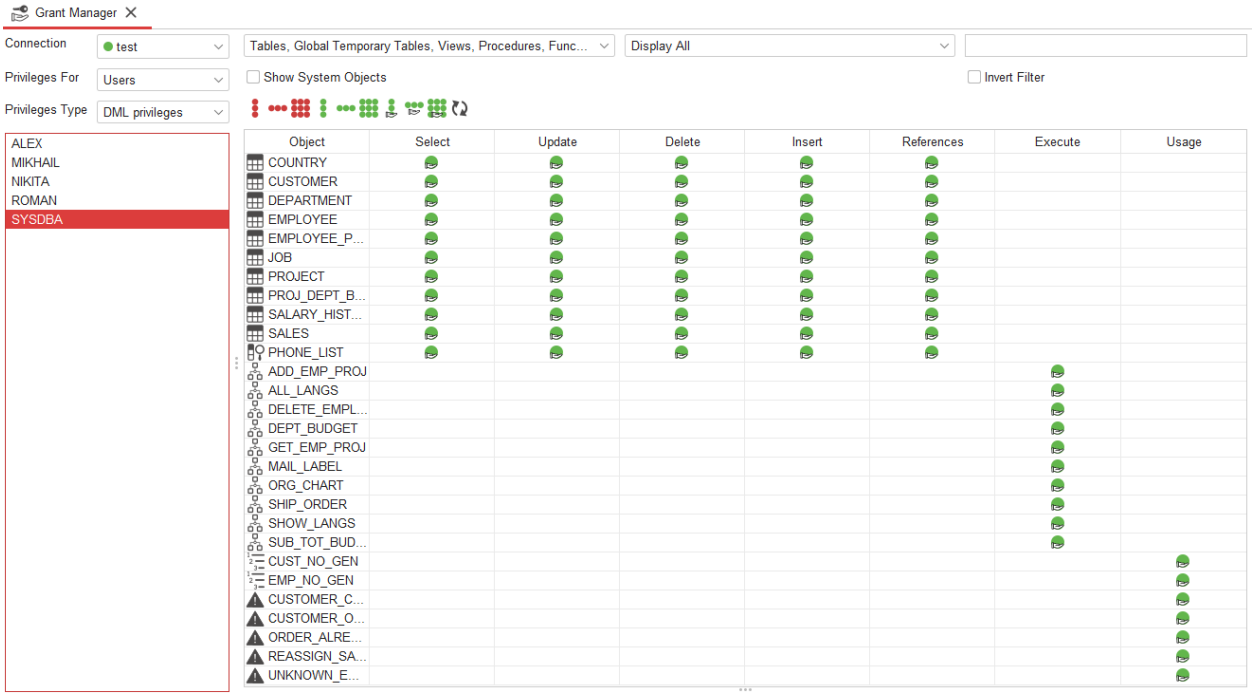


Img 12.2 — Adding user

Chapter 13

Grant manager

Grant manager displays privileges and allows you to manage them.

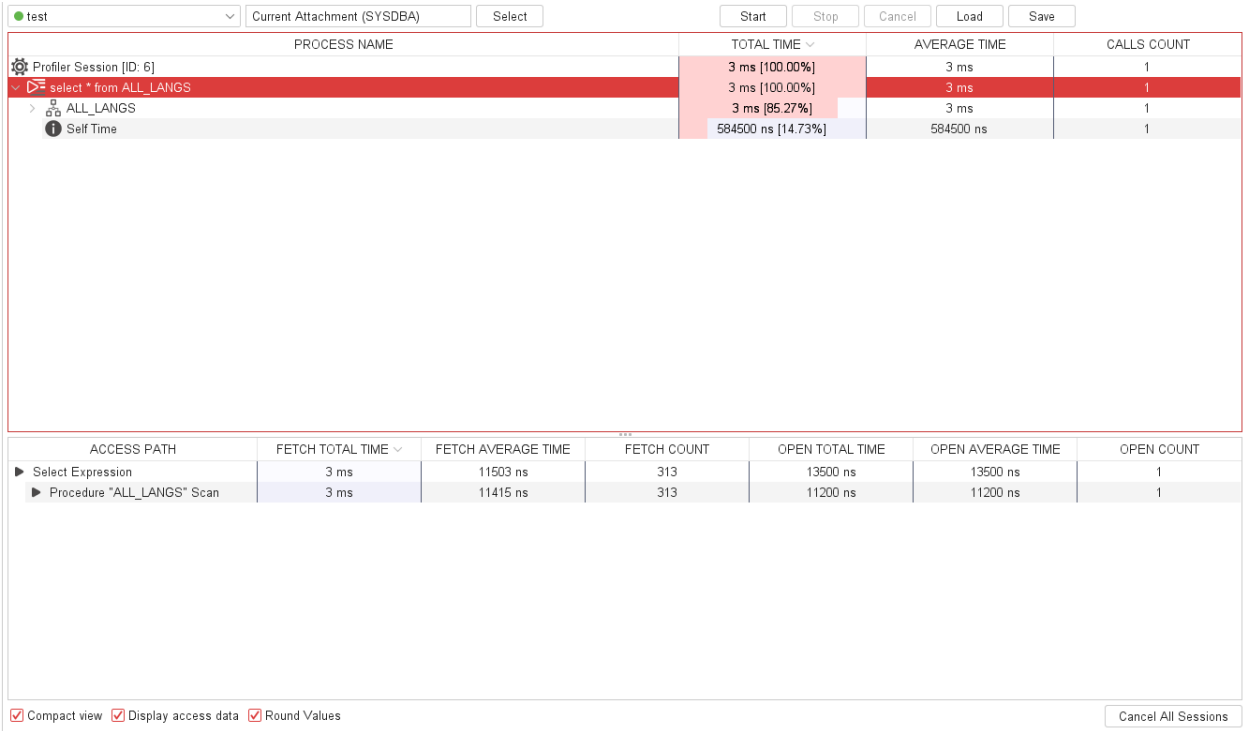


Img 13.1 — Grant manager

Chapter 14

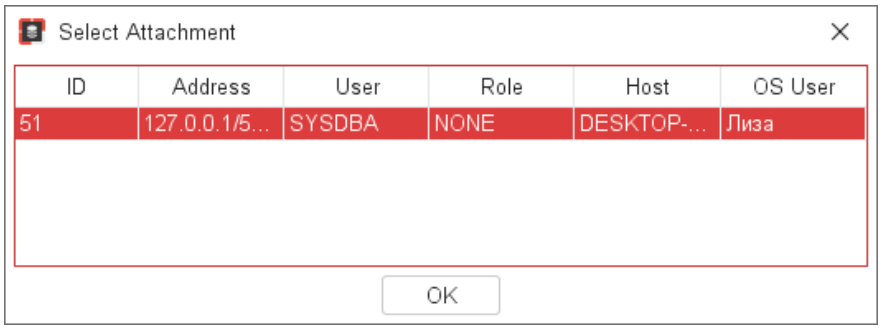
Profiler

Profiler allows you to measure the performance and execution cost of SQL and PSQL code.



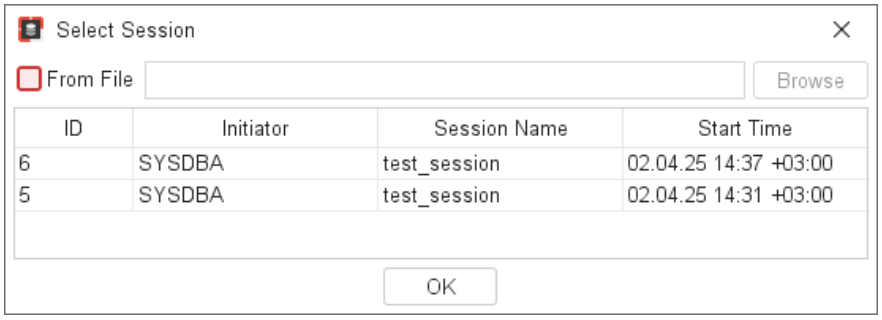
Img 14.1 — Profiler

1. Select the connection of interest from the drop-down list.
2. Click the Select button and in the window that opens, select the user connection to be profiled:



Img 14.2 — Selecting a user connection to profile

You can also open a saved profiler session by clicking the Load button:



Img 14.3 — Saved Sessions

Formats for displaying the result:

- Compact view - Displays an overall view of query execution. Repeating processes within a common parent will be merged into one. This is the default value.
- Display access data - Displays/hides the plan for executing the request. Enabled by default.
- Round values - If the total or average time is greater than 1000000ns, it will be converted to a larger unit until the value is less than 1000000ns. Enabled by default.

Cancel All Sessions button cancels all profiling sessions for the selected connection (with the specified ATTACHMENT_ID).

In compact view, for each non-last node (except for ROOT NODE - the root node) there is a node Total time, which shows the time spent without taking into account child processes.

In result table displays information collected by the profiler, viz:

- Process name or SQL code;
- Time per process in nanoseconds (including child processes) and the percentage of time from the parent process;
- Average time per process in nanoseconds (including child processes) for repetitive processes combined into one node;
- Number of calls of the recurring processes.

При двойном клике по узлу откроется окно просмотра данных:

Img 14.4 — Data view

A Profiler session can be run for a single query from the Query Editor by clicking the Run in Profiler button. In this case the following will be executed:

1. Starts profiler session.
2. Query in the editor will be executed.
3. Profiler session will finish.
4. Displays profiler panel with the collected information.

Chapter 15

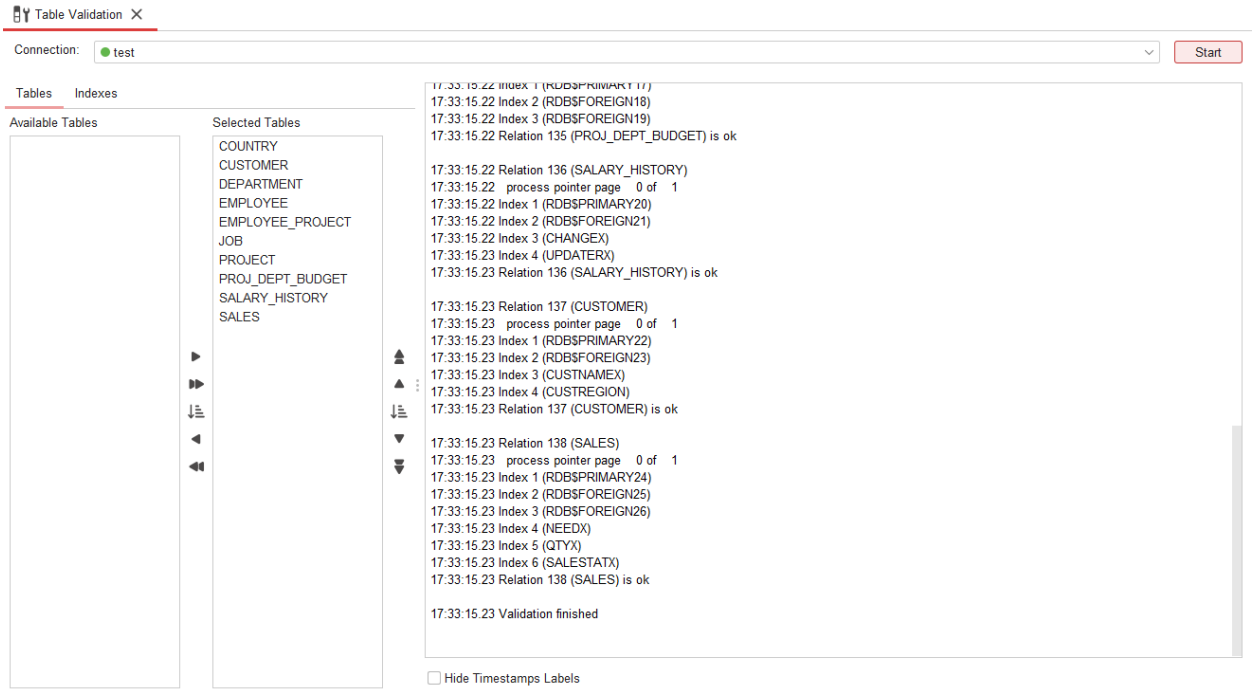
Table validation

Database validation allows you to perform low-level consistency checks for data on disc.

Online validation can do following:

- validate some (or all) user tables in the database; system tables are not validated;
- validate some (or all) indexes;

This tool performs online table validation only. Other ODS validations such as Header, PIP, TIP, Generators pages are not performed.

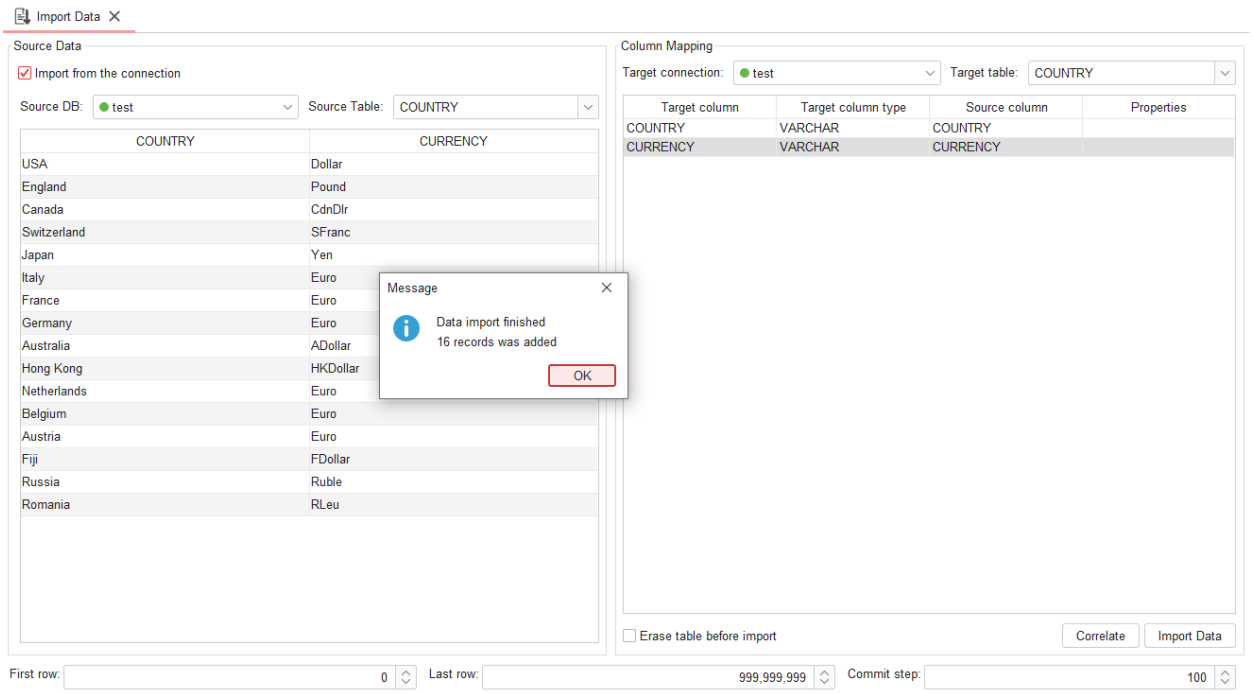


Img 15.1 — Table validation

Chapter 16

Import data

This tool is used to import data from a file into a table. Import from XLSX, XML and CSV files is supported.



Img 16.1 — Example of filling in fields for import

Data import parmeters:

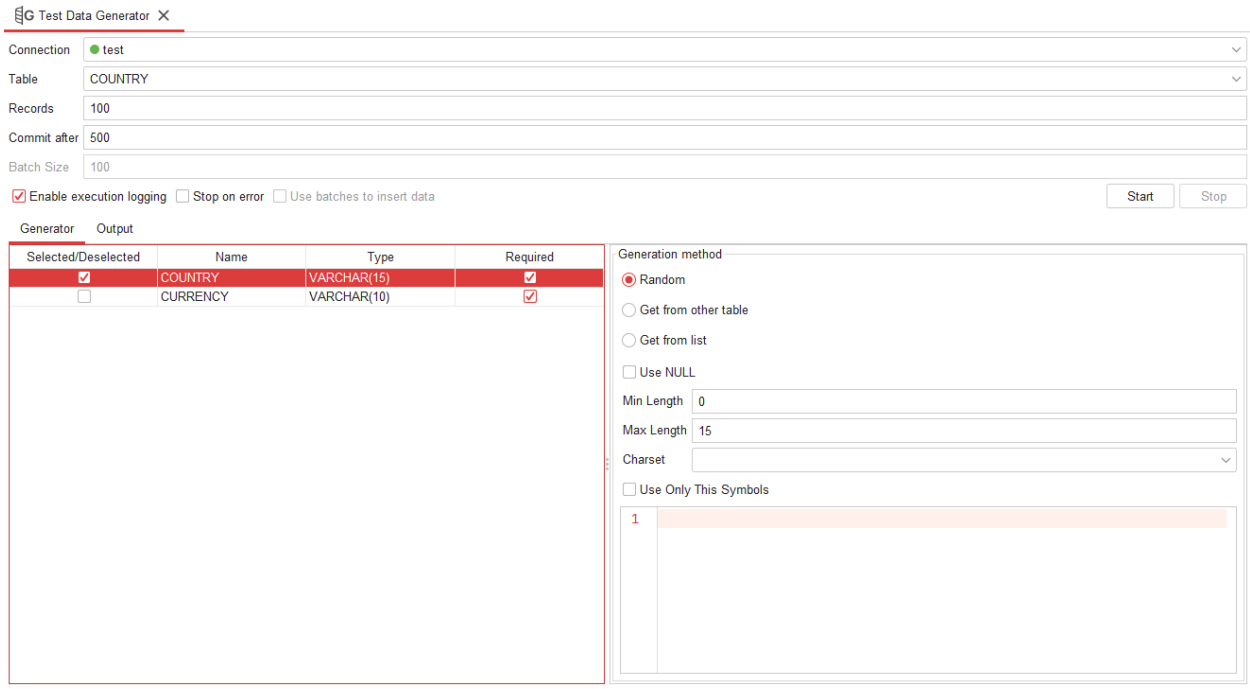
- Import from the connection - Allows to select the database as source.
- Data file - Path to data source file. Import from XLSX, XML and CSV files is supported.
- Blob file - Path to source file with blobs (with .lob extension).
- Target connection - Database the import will be performed to.
- Target table - Table the import will be performed to.
- Separator - Type of data separator in CSV files.
- Page number - For XLSX files allows to select the page of excel-file to import data from.
- First row - Row starting from which data will be imported.
- Last row - The row after which data import will be stopped. Rows that do not fall in the range between the first and last imported row will be ignored.
- Commit step - The number of records after which the transaction will be commited and data will be saved in the table.
- Erase table before import - Defines if target table should be cleared of data that was in it before import.
- Source column - Column name from which data should be imported. The Correlate button automatically assigns the imported columns to the target columns by their names.

- Properties - Import BLOB as a file or as text.

Chapter 17

Data generator

Data Generator tool is intended for quick and convenient filling of table fields with a large amount of data.



Img 17.1 — Data generator

Select a table. Fields and their types will be displayed. Choose checkbox for the field if you want to generate data for it. Otherwise this field will be filled with NULL values.

Specify number of records to be generated. Generating large amounts of data may take some time.

In Commit after field, enter the number of rows after insertion that will commit.

Errors may occur during generation. By default, they are not written to log file. Tick the corresponding checkbox so that all errors are recorded in the log.

If errors occur during the generation process for some records (e.g. due to column constraints), the generator continues by default. This behaviour can be changed by ticking the Stop on error checkbox.

Method of generation can be selected for each field of the table:

- Random - Depending on the field type, different generation parameters are configured.
- Get from another table - In this method you need to select a table, column and number of records. The records from the table are selected randomly in the specified number, then the main table is filled from this list of values.
- Get from list - The values of the list form the content of the field. The list must consist of elements of the corresponding data type. The delimiter can be any single character or escape-sequence starting with a backslash (\). The list itself can be entered manually in the field provided for this purpose, or loaded from a file.
- Autoincrement - For auto increment the initial value, step and direction of step movement (up or down) are configured.

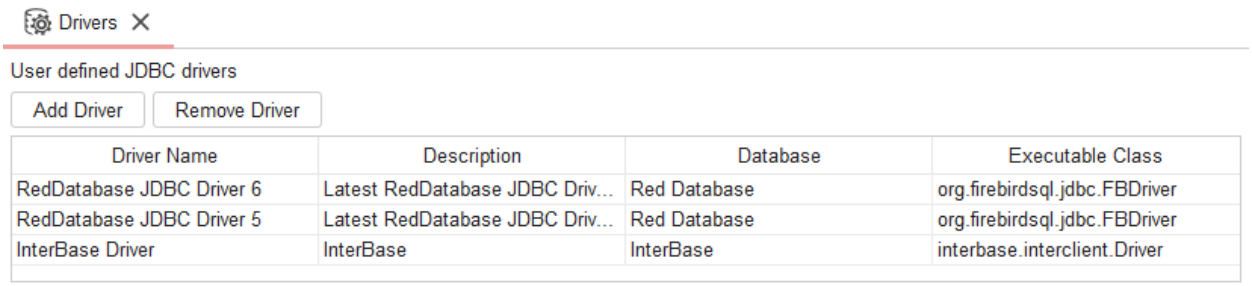
Chapter 18

System

18.1 Drivers

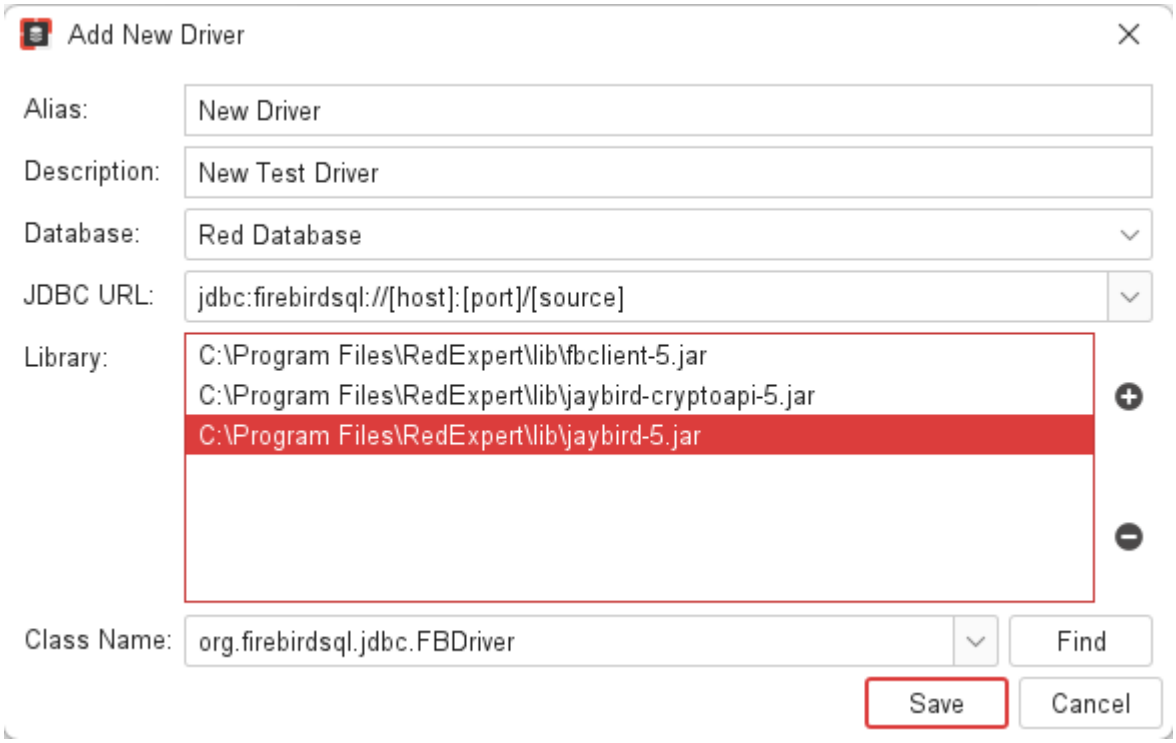
Drivers pane lists all installed JDBC drivers.

Libraries Jaybird 5 Driver, Jaybird 6 Driver are installed in RDBExpert by default, that allows to work with Firebird and Red Database.



Img 18.1 — Drivers

To add a new driver, click on Add Driver button and fill in all fields. See Parameters for adding a driver section for detailed description of the fields.



Img 18.2 — Adding driver

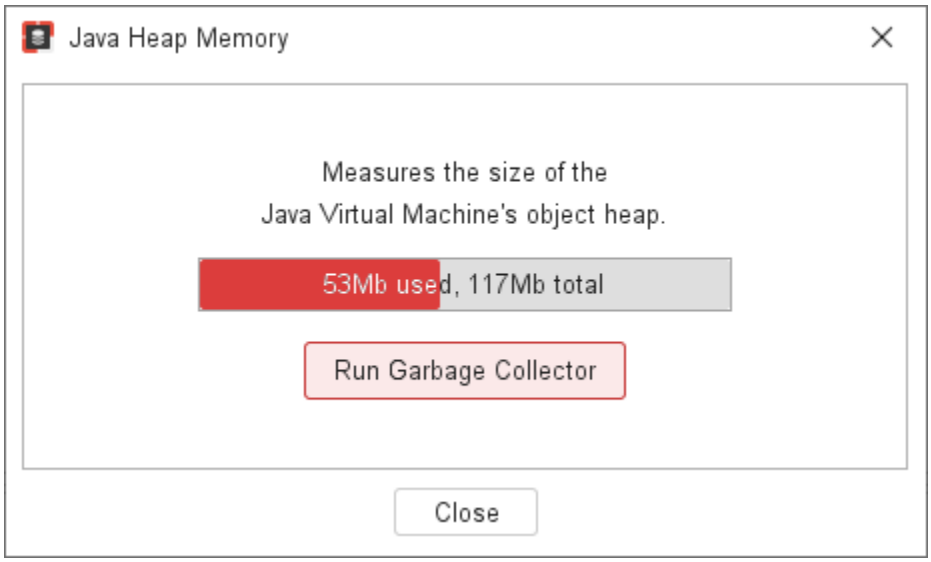
18.2 Application log

Log records all information that is output to the standard output stream, errors and warnings. Output level can be set in Settings to limit the information contained in the log.

System output log is stored in $HOME/.RDBExpert/logs. and can be opened with any text editor, but can also be viewed with RDBExpert.

18.3 Heap memory status

RDBExpert allows monitoring current memory usage and running gubbish collection.

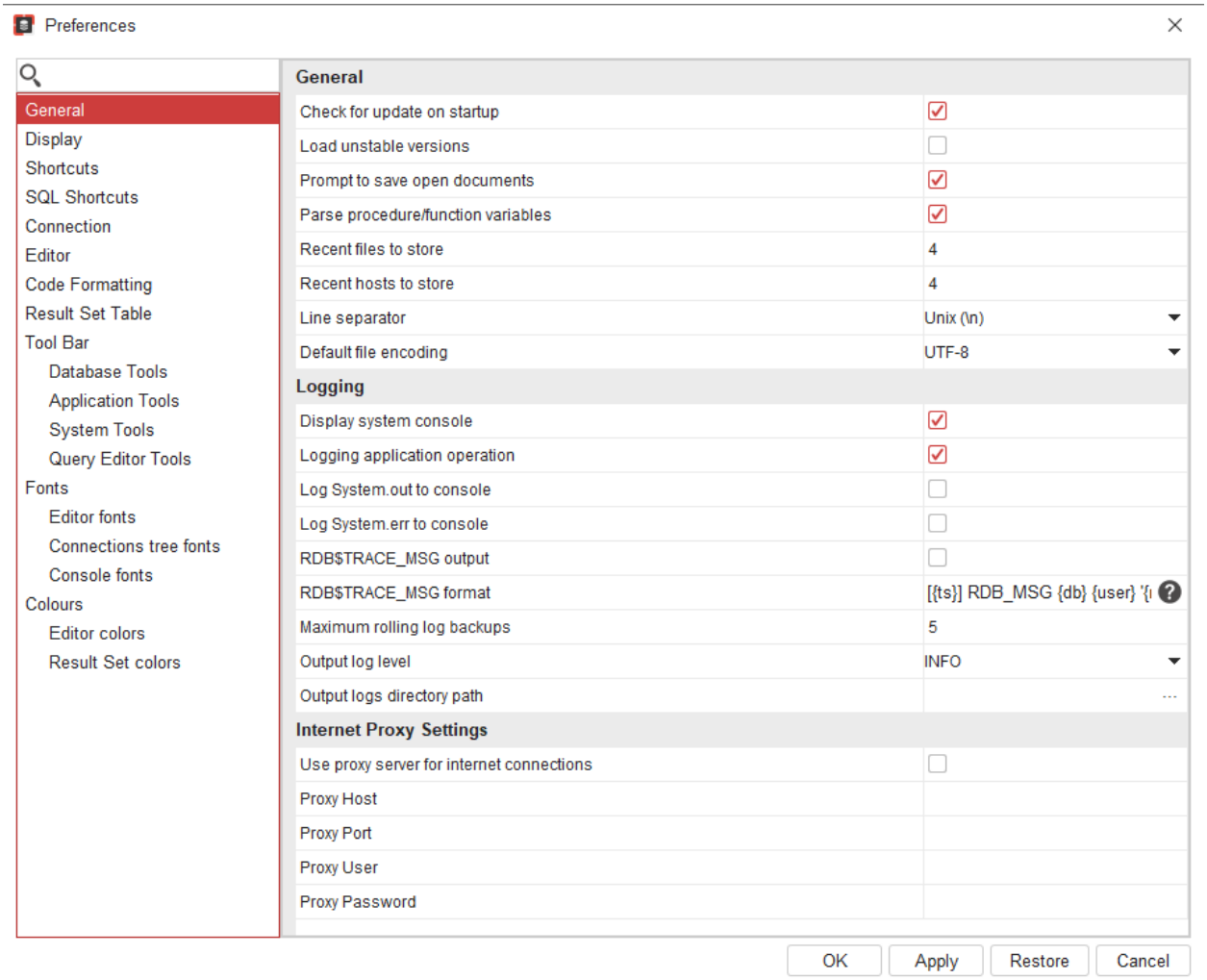


Img 18.3 — Heap memory status

18.4 Preferences

Select System → Preferences menu item to configure the application.

> Almost all changes take effect when RDBExpert is restarted.



Img 18.4 — Preferences

See Application settings appendix for a detailed description of settings.

18.4.1 Portability of settings

To store RDBExpert and its settings in the same folder, follow the steps below:

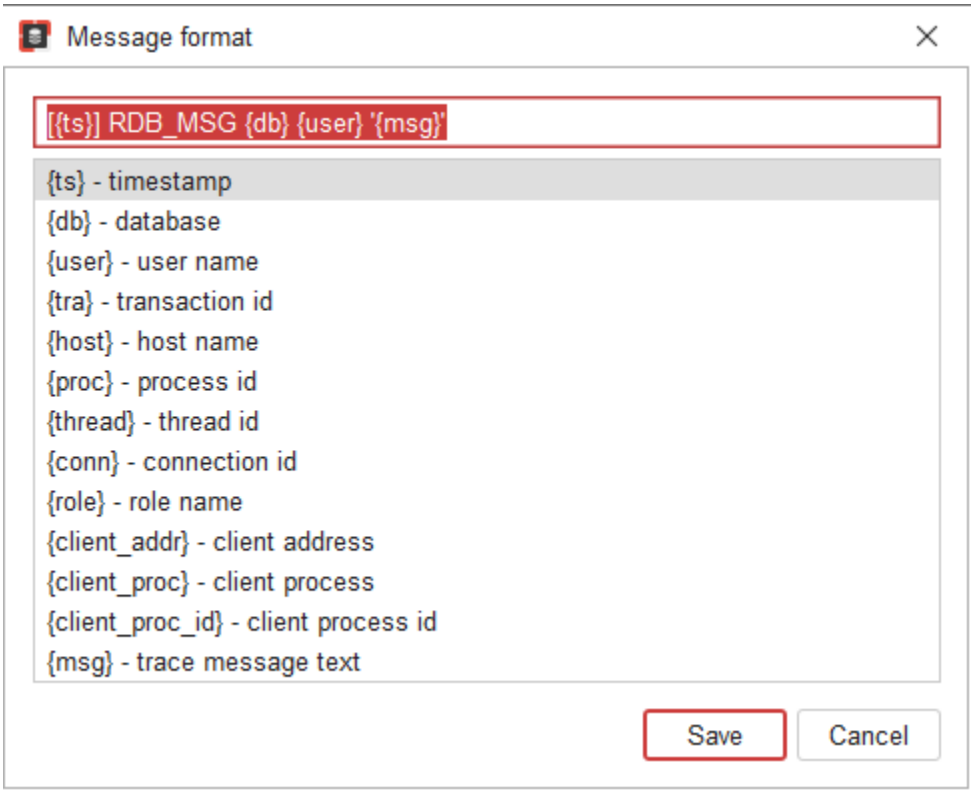
1. Close the programme;
2. In RDBExpert/config/launcher.conf file. specify app.settings.directory=.rdbexpert and save the changes.
    - if no path is specified for the app.settings.directory parameter, the settings will be stored in the path $HOME/.rdbexpert;
    - relative path for the app.settings.directory parameter is determined relative to the file /directory c RDBExpert/rdbexpert.jar.
3. Move the .rdbexpert folder to the root of the directory where RDBExpert is installed;
4. Run RDBExpert.

Chapter 19

Console

Log of application is displayed in the RDBExpert system console. You can enable the display of the system console in the menu View → Output Console `` or in the application settings: ``General → Logging → Display system console.

To output messages written to the log using RDB$TRACE_MSG, enable it by right-clicking on the console. Enabling the message output of the RDB$TRACE_MSG function starts trace sessions for all active connections. Configure the output format:



Img 19.1 — Output of RDB$TRACE_MSG messages

Appendix A Toolbar

Description of each toolbar and its associated buttons and actions is provided below.

Table A.1 — Toolbar

	Description	Shortcuts
	Hide/display the connection tree.	
	Connection to selected database.	
	Connect to all databases that are added to the connection tree.	
	Refresh all objects in current connection.	
	Search object in connection tree in established connection.	Ctrl + F
	Create new connection.	Ctrl + Shift + N
	Create database.	
	Execute SQL script from file.	
	Open a database metadata comparison tool.	
SQL	Open tool for extracting metadata into a script.	
	Open query editor.	
	Open ER diagram editor.	
	Open database statistics collection tool.	
	Open trace manager.	
	Open user manager.	
	Open grant manager.	
	Open profiler.	

(table breaks)

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	Description	Shortcuts
	Open table validation tool.	
	Open data import tool.	
	Open test data generator.	
	Open system console.	
	View system log.	
	Open application settings.	
	Open documentation.	

A.1 Query editor toolbar

Table A.2 — Query editor toolbar

	Description	Shortcuts
	Execute SQL script.	F9
	Execute script in one query.	F5
	Execute SQL script in the profiler.	Shift + F5
	Stop execution of query.	
	Commit transaction.	Ctrl + Shift + Q
	Rollback transaction.	Ctrl + Shift + R
	Switch on autocommit mode.	
	Stop execution of SQL script when an error occurs.	
	Export query result to file.	

(table breaks)

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	Description	Shortcuts
	Limit number of input rows.	
	Managing query bookmarks.	Ctrl + B
	Open query execution history.	Ctrl + Shift + H
	Enter previously executed query in editor.	Ctrl + Shift + Down
	Enter next query in editor.	Ctrl + Shift + Up
	Export selected dataset to file.	
	Show metadata of current result set.	
	Add filters for current result set.	
	Show query plan.	Ctrl + Shift + P
	Show transaction parameters.	
	Display results output panel.	Ctrl + E
	Change separator orientation.	Ctrl + Alt + Q

A.2 ER-diagram editor toolbar

Table A.3 — ER-diagram editor toolbar

	Description	Shortcuts
	Create table.	
	Delete selected object.	
	Add relation.	
	Delete relation between selected objects.	

(table breaks)

(table breaks)

	Description	Shortcuts
	Generate SQL script to create objects from diagram.	
	Build ER-diagram of existing database.	
	Add text block.	
	Add header for diagram.	
	Open font settings.	
	Open line settings.	
	Change colour of selected object.	
	Change background colour of diagram.	
	Zoom out.	
	Zoom in.	

Appendix B Description of parameters

B.1 Database connection parameters

Table B.1 — Database connection parameters

Parameter	Description
JDBC driver	Select JDBC driver from the drop-down list to create a new database. For Red Database and Firebird JDBC driver Jaybird 5 is recommended.
Connection name	Database connection name
Server name	Database server host or IP address
Port	Port for database connection
Database file	Path to database file or alias
Username	Username of user in whose name the database will be created
Password	User password
Save password	Should password be saved for connecting to database
Encrypt password	Should password be stored in encrypted form
Encoding	Specifies default character set for string (character) values of the entire database.
Page size	Size of the database page in bytes. Valid values are 4096, 8192 and 16384.

B.2 Extended database connection parameters

This table lists some parameters for the Jaybird 5 driver:

Table B.2 — Extended database connection parameters

Parameter	Type	Description
isc_dpb_user_name	string	Name of the connecting user.
isc_dpb_password	string	User Password.
isc_dpb_sql_role_name	string	Role
isc_dpb_sql_dialect	byte	SQL dialect.
isc_dpb_process_id	int	Process ID.
isc_dpb_process_name	string	Process name.
isc_dpb_lc_ctype	string	Connection character encoding. This parameter tells database server what encoding should be used to send string values to client.
isc_dpb_connect_timeout	int	Connection timeout (in seconds).
isc_dpb_gss	-	Use trusted authentication Gss.
isc_dpb_num_buffers	int	Number of database pages to be cached.
isc_dpb_set_db_readonly	boolean	Set database to read-only mode.

(table breaks)

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Parameter	Type	Description
isc_dpb_set_db_charset	string	Set character set for the database.
isc_dpb_max_inline_blob_size	-	Maximum size in bytes of inline blobs. A value of 0 disables transmission of inline blobs. Default 65535, maximum value 65535.
isc_dpb_max_blob_cache_size	-	Maximum size in bytes per connection of the inline blob cache. A value of 0 disables the cache. Disabling the cache does not disable transmission of inline blobs: set maxInlineBlobSize to 0 to disable transmission. Default 10485760 (10 MiB).
isc_dpb_set_db_sql_dialect	-	Set the SQL dialect of the database.
isc_dpb_parallel_workers	-	The number of parallel workers to use.

B.3 Parameters for adding a driver

Table B.3 — Parameters for adding a driver

Parameter	Description
Driver name	Driver name for identification
Description	Description of this driver
Database	Select DBMS for which this driver is used
JDBC URL	The URL address template for this JDBC driver. For example: jdbc:firebirdsql://[host]:[port]/[source].
Path	Path to jar file of JDBC driver
Class name	Class name of JDBC driver. Select the search button if the name is unknown and the system scans the jar file entered in the path field to find the driver class name

B.4 Trace manager configuration file settings

Table B.4 — Trace manager configuration file settings

Parameter	Description
log_security_incidents	Server security events (security incidents)
log_initfini/log_init	Events of start/stop of database logging
log_connections	Events of connection/disconnection to database
log_transactions	Transaction start and completion events
log_statement_prepare	Database query preparation events
log_statement_free	Database query release events
log_statement_start	Events of start execution of queries to database
log_statement_finish	Events of finish execution of queries to database
log_procedure_start	Events of start execution stored procedures

(table breaks)

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Parameter	Description
log_procedure_finish	Events of finish execution stored procedures
log_function_start	Events of start execution stored function
log_function_finish	Events of finish execution stored function
log_trigger_start	Trigger execution start events
log_trigger_finish	Trigger execution finish events
log_context	Events of context variable value changes
log_errors	Error logging
log_warnings	Warning logging
print_plan	Print query plans
print_perf	Print query execution statistics
log_blr_requests	Direct execution events of compiled queries in internal server view - BLR
print_blr	Content of BLR requests will be converted to text representation, otherwise it will remain in binary form
log_dyn_requests	Events of direct execution of compiled metadata change queries (DDL) in the internal server view - DYN
print_dyn	Content of DYN queries will be converted to text representation, otherwise it will remain in binary form
log_privilege_changes	Privilege change events
log_changes_only	Recording only those events that changed data in the database
print_stack_trace	Print stack of server function calls when an error event is terminated
log_auth_factors	Events of verification authentication factors
log_mandatory_access	Mandate access audit
log_record_mandatory_access	Events about mandate access to records
log_object_relabeling	Events of object label change
log_record_relabeling	Events of record label change
log_services	Connection/disconnection and service start events
log_service_query	Events of service queries
include_user_filter	Regular expression to which the user name must match
exclude_user_filter	Connections from users matching this regular expression will not be logged
include_process_filter	Regular expression to be matched by the name of the user process
exclude_process_filter	Connections from processes that match this regular expression will not be logged
include_filter	Regular expression in SQL syntax (SIMILAR TO), which must be matched by the text of SQL query.
exclude_filter	Regular expression in SQL syntax (SIMILAR TO), which must not be matched by the text of SQL query.
connection_id	Connection identifie on server that will be monitored

(table breaks)

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Parameter	Description
log_filename	Log file name
max_log_size	Maximum size of log files in megabytes. A value of 0 means unlimited size
time_threshold	Events whose execution time is less than specified time (in ms) will not be logged
max_sql_length	Maximum length of one SQL query record in log file, in bytes
max_blr_length	Maximum length of BLR query to be logged, in bytes
max_dyn_length	Maximum length of DYN-query to be logged, in bytes
max_arg_length	Maximum length of one query/procedure parameter in log file
max_arg_count	Maximum number of query/procedure parameters to be logged

B.5 Trace manager events table

Description of each column in events table is given below:

Table B.5 — Description of events table columns

Parameter	Description
NUM	Row number
TSTAMP	Time and date of event
ID_PROCESS	Process ID
ID_THREAD	Thread ID
EVENT_TYPE	Event type
FAILED	In case of unsuccessful or unauthorised attempt to execute query, the result FAILED or UNAUTHORIZED is logged
ID_SESSION	Session ID
NAME_SESSION	Session name
ID_SERVICE	Service ID
USERNAME	Username
PROTOCOL_CONNECTION	Connection protocol
CLIENT_ADDRESS	IP address or computer name
TYPE_QUERY_SERVICE	Service query type
OPTIONS_START_SERVICE	Options passed to service manager from client at start
ROLE	User role
DATABASE	Database name
CHARSET	Encoding
ID_CONNECTION	Connection ID
CLIENT_PROCESS	Client process
ID_CLIENT_PROCESS	Client process ID

(table breaks)

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Parameter	Description
ID_TRANSACTION	Transaction ID
LEVEL_ISOLATION	Isolation level
MODE_OF_BLOCK	Lock mode (WAIT or NO WAIT)
MODE_OF_ACCESS	Access mode
TIME_EXECUTION	Execution time (in ms)
COUNT_READS	Number of pages read from the disc
COUNT_WRITES	Number of pages written to disc
COUNT_FETCHES	Number of pages fetched from page cache
COUNT_MARKS	Number of pages modified in page cache
ID_STATEMENT	Query ID
RECORDS_FETCHED	Number of fetched records
STATEMENT_TEXT	Query content
PARAMETERS_TEXT	Query execution parameters
PLAN_TEXT	Query plan
TABLE_COUNTERS	Table counters
DECLARE_CONTEXT_VARIABLES	Name and value of context variable
EXECUTOR	Users, roles and database objects for which privileges have been granted
GRANTOR	User who grants privileges
PRIVILEGE	Assigned/revoked privilege
PRIVILEGE_OBJECT	Object for which the privilege is granted (revoked)
PRIVILEGE_USERNAME	User assigned the privilege
PRIVILEGE_ATTACHMENT	Connection ID
PRIVILEGE_TRANSACTION	Transaction ID
PROCEDURE_NAME	Procedure name
RETURN_VALUE	Return values of procedure
TRIGGER_INFO	<trigger_name> [FOR <table_name>] (ON <database event> | {BEFORE | AFTER} <table event or DDL event>)
SENT_DATA	Data passed to service manager
RECEIVED_DATA	Data received by service manager
ERROR_MESSAGE	Error message text
OLDEST_INTERESTING	Number of oldest interested transaction
OLDEST_ACTIVE	Oldest active transaction number
OLDEST_SNAPSHOT	Number of transaction that was active at the time the OAT transaction was started
NEXT_TRANSACTION	Next transaction number
SORT_MEMORY_USAGE_TOTAL	Total cache size (in bytes) allocated during the sorting process

(table breaks)

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Parameter	Description
SORT_MEMORY_USAGE_CACHED	RAM cache size (in bytes) allocated during the sorting process
SORT_MEMORY_USAGE_ON_DISK	Disc cache size

B.6 Trace analysis

Description of resulting table columns:

Table B.6 — Description of resulting table columns:

Parameter	Description
QUERY	Query text
COUNT	Query execution count
PLAN_COUNT	Query plan count
TOTAL_TIME	Total execution time in milliseconds
MIN_TIME	Minimum execution time in milliseconds
AVG_TIME	Average execution time in milliseconds
MAX_TIME	Maximum execution time in milliseconds
STD_DEV_TIME	Standard deviation of execution time
TOTAL_READ	Total pages read from disc
MIN_READ	Minimum number of pages read from disc
AVG_READ	Average number of pages read from disc
MAX_READ	Maximum number of pages read from disc
STD_DEV_READ	Standard deviation of number of pages read from disc
TOTAL_FETCH	Total number of pages read from page cache
MIN_FETCH	Minimum number of pages read from page cache
AVG_FETCH	Average number of pages read from page cache
MAX_FETCH	Maximum number of pages read from page cache
STD_DEV_FETCH	Standard deviation of number of pages read from page cache
TOTAL_WRITE	Total number of pages recorded on disc
MIN_WRITE	Minimum number of pages recorded on disc
AVG_WRITE	Average number of pages recorded on disc
MAX_WRITE	Maximum number of pages recorded on disc
STD_DEV_WRITE	Standard deviation of number of pages recorded on disc
TOTAL_MARK	Total number of pages edited in page cache
MIN_MARK	Minimum number of pages edited in page cache
AVG_MARK	Average number of pages edited in page cache
MAX_MARK	Maximum number of pages edited in page cache
STD_DEV_MARK	Standard deviation of number of pages edited in page cache

(table breaks)

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Parameter	Description
TOTAL_RSORT	Total RAM used for sorting (in bytes)
MIN_RSORT	Minimum RAM used for sorting (in bytes)
AVG_RSORT	Average RAM used for sorting (in bytes)
MAX_RSORT	Maximum RAM used for sorting (in bytes)
STD_DEV_RSORT	Standard deviation of RAM used for sorting
TOTAL_DSORT	Total temporary file size used in query (in bytes)
MIN_DSORT	Minimum temporary file size used in query (in bytes)
AVG_DSORT	Average size temporary files used in query (in bytes)
MAX_DSORT	Maximum temporary file size used in query (in bytes)
STD_DEV_DSORT	Standard deviation of temporary file size used in query

B.7 Database statistics

B.7.1 Statistics of data pages

Table B.7 — Statistics of data pages

Parameter	Description
name	Table name
primary pointer page	First page number of indirect pointers to pages storing table data
index root page	Page number, which is first page of index pointers to table indexes
pointer pages	Total indirect pointer pages to pages storing table data
data pages	Total pages that store table data. This count includes pages storing unconfirmed versions of records and garbage because gstat cannot distinguish them from each other
data page slots	Number of database page pointers contained in the pointer pages. Must be equal to number of data pages
primary pages	Number of pages equal to (Data pages - Secondary pages)
secondary pages	Number pages on which no primary versions of records are stored
swept pages	Number of pages that have only primary versions of records, and all of them were created by committed transactions. Such data pages should be skipped by sweep procedure
empty pages	Number of pages with no records
full pages	Number of full pages
big record pages	Number of pages that are filled with only one record
blob pages	Number of pages with blobs
average record length	Average size of a compressed record in bytes

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Parameter	Description
total records	Total number of rows in table
average version length	Average length of old versions in bytes
total versions	Total number of old versions in table
max versions	Maximum chain of old versions to be recorded
average fill	Histogram of memory usage distribution for all pages allocated in table
total formats	Total formats in RDB$FORMATS table
used formats	Number of used formats
average fragment length	Average fragment size in bytes
total fragments	Number of fragments in all records
max fragments	Maximum number of fragments per record
average unpacked length	Average record size in bytes (not compressed)
compression ratio	Ratio of average uncompressed key length (Average prefix length + Average data length) to average compressed key length (Average key length).
blobs	Number of all blobs (level 0, 1 and 2)
total length	Blob size, in bytes
level <n>	Number of blobs per level
table size(without blobs)	Table size in bytes (data pages * page size). Calculated column
size with blobs	Aggregate size of table data (table size(without blobs) + blobs total length). Calculated column
size with blob pages	(table size(without blobs) + blob pages * page size). Calculated column
size with indices	Aggregate size of table data and aggregate size of all indices on table. Calculated using following formula: $X = S + \sum_{i=0}^{n} E_i$, S – size with blob pages; n – number of indexes in table; E – estimated index size in bytes (estimated full size).
range <percentage full>	Number of pages that are filled by specified percentage

B.7.2 Index statistics

Table B.8 — Index statistics

Parameter	Description
name	Index name
table name	Table name
real selectivity	Calculated using following formula: 1 / (nodes - totalDup)

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Parameter	Description
average data length	Average length of each key in bytes. This is likely smaller than actual sum of column sizes because Red Database uses index compression to reduce the amount of data stored on an index sheet page
total dup	Total number of index duplicate rows
max dup	Number of nodes that have the highest number of duplicates. Will always be zero for unique indices. If the number is large compared to the number in total dup, it is a sign of low selectivity
root page	Index root page number
depth	Number of levels in index tree page. If the depth of the index page tree exceeds 3, access to records through the index will not be maximised. To reduce the depth of the index page tree, increase the page size. If increasing the page size does not reduce the depth, increase the page size again
leaf buckets	Number of the lowest level (leaf) pages in the index tree. These are pages that contain pointers to records. High-level pages contain indirect links.
leaf full size	Size of the lowest level (leaf) pages in the index tree (leaf buckets * page size). Calculated column
estimated full size	Approximate index size in bytes. Calculated using following formula: $N = L * (1 + \frac{A}{P})^{D-1} * P$ N – approximate index size in bytes; L – number of lowest level pages (leaf pages) in index tree (leaf buckets); A – average node size in bytes (average node length); P – average node size in bytes (average node length); D – number of levels in index tree page (depth).
nodes	Total number of records indexed in the tree. Must be equal to the number of indexed rows in the tree, although the gstat report may include nodes that were deleted but not cleaned up in the garbage collection. May also include multiple items for records that have had their index key changed
average node length	Average node size in bytes
average key length	Average key size in bytes including compression. The length of each key is added 1 to 5 bytes depending on the key size and prefix. The average key size is then calculated
compression ratio	Average key and prefix length in bytes
average prefix length	Average size (in bytes) used by node prefixes
average data length	Average length of each key in bytes. This is likely smaller than the actual sum of column sizes, because Red Database uses index compression to reduce the amount of data stored on an index sheet page

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Parameter	Description
clustering factor	It is a measure of how much I/O the database would perform if it had to read every row in the table by index, in index order. That is, it shows how ordered the rows in the table are by the index values. If the value is close to the total number of pages, then the table is very well ordered. In this case, index entries on the same page of the index sheet usually point to rows that are in the same data pages. If the value is close to the total number of rows, then the table is very disordered. In this case, it is unlikely that index entries on the same page of the index sheet point to the same data pages
ratio	Ratio of Clustering factor to the total number of nodes in the index
full size	Index size in bytes. Calculated by the formula: $L * (1 + \frac{A}{P})^{D-1} * P$, L – number of the lowest level pages (leaf pages) in the index tree (leaf buckets); A – average node size in bytes (average node length); P – database page size (page size); D – number of levels in a page of index tree(depth).

B.7.3 Tablespace statistics

Table B.9 — Tablespace statistics

Parameter	Description
name	Tablespace name
full path	Path to tablespace file
table count	Number of tables in the tablespace
index count	Number of indexes in tablespace

Appendix C Application settings

C.1 General

Table C.1 — General settings

Parameter	Description
Check for updates at startup	If enabled, the application will report new versions.
Load unstable versions	Enable/disable the ability to update to an unstable version of the application.
Prompt to save open documents	Ask to save changes before closing the document. If off, changes are not saved.
Parse procedure and function variables	Display procedure and function variables when viewing detailed information about an object
Recent file to store	Number of files displayed in the menu item Edit → Recent Files
Recent hosts to store	Number of last entered hosts displayed in the drop-down list for selection.
Line separator	The character to be used as a delimiter
Default file encoding	Default file encoding

Table C.2 — Logging

Parameter	Description
Display system console	Display/hide system console
Login application operation	Log application events to the system log
Log system out to console	Output System.out stream to console
Log system errors to console	Output System.err stream to console
Maximum rolling log backups	Number of log files saved. When the log (system.log) reaches a size greater than 1MB, the recording continues to a new file (system.log.1), etc. When the number of files equals the number specified in this parameter, the files will be overwritten. If 0 is specified, the number of files is unlimited.

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Parameter	Description
Output event log level	Level of output to the output status log and the output console: 1. FATAL - captures very serious errors that are likely to cause the application to stop being used; 2. ERROR - captures serious errors that need to be checked but will not terminate the application; 3. WARN - captures potentially dangerous situations; 4. INFO - informs about events of application operation at a high level; 5. DEBUG - informs about events at a lower level for debugging the application (for developers); 6. TRACE - detailed logging for very low-level debugging; 7. ALL - all of the above levels. Levels are ordered and each next level incorporates previous levels.
Path to logs directory	Specifies absolute or relative path to the logs directory containing log files. For example, if the relative path logs is specified, log files will be created at the path /<path_to_app>/logs.

Table C.3 — Internet proxy settings

Parameter	Description
Use proxy server for internet connections	Use/do not use a proxy server for internet connections
Proxy host	Name or IP of proxy server
Proxy port	Proxy server port number
Proxy user	User name for authorisation on proxy server (if required)
Proxy password	User password for authorisation on the proxy server (if required)

C.2 Display settings

Table C.4 — General

Parameter	Description
Display splash screen at startup	Show/skip splash screen at startup
Maximum window on startup	Open application window full screen at startup
Status bar	Show/hide status bar
Connections	Show/hide connection information window

Table C.5 — Appearance

Parameter	Description
Look and feel	Application design
Interface language	Application Language
Use anti-aliased fonts	Display the font smoothly by blurring corners

C.3 Shortcuts

Table C.6 — Shortcuts

Command	Shortcuts	Description
Upper case	Ctrl + Shift + U	Converts the selected text to uppercase
Execute SQL script	F9	Executes SQL-script in the query editor
Execute in the profiler	Shift + F5	Executes in the profiler the SQL script in the query editor
Execute single query	F5	Execute with a single query the SQL script in the query editor
Data generator		Open test data generator tool
Documentation	F1	Open application documentation
Drivers		Open the drivers window
Duplicate text up	Ctrl + Alt + Up	Duplicate the line the cursor is pointing at in the query editor to the line above it
Duplicate text down	Ctrl + Alt + Down	Duplicate the line the cursor is pointing to on the line below in the query editor
Comment text	Ctrl + Slash	Comment out the current line in the query editor
Replace	Ctrl + R	Find and replace the specified text
Commit transaction	Ctrl + Shift + C	Commit transaction
Extract database metadata into SQL script		Open export metadata tool
Change separator orientation	Ctrl + Alt + Q	Change the application window layout
Find previous	Shift + F3	Search specified text
Find next	F3	Search specified text
SQL command history	Ctrl + Shift + H	Open the history of executed queries
User Manager		Open User Manager
Grant Manager		Open Grant Manager
Preferences		Open application settings
Lower case	Ctrl + Shift + L	Makes the selected text lower case
About		Open programme information
System console window		Open the system console
Rollback all changes	Ctrl + Shift + R	Rollback transaction

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Command	Shortcuts	Description
Open file	Ctrl + O	Add selected file text to the query editor
Go to	Ctrl + G	Go to the specified line in the query editor
Print	Ctrl + P	Open the print window
Print plan	Ctrl + Shift + P	Show the plan of the query that is in the query editor
Show/hide editor output	Ctrl + E	Show/hide the output pane in the query editor
Previous statement	Ctrl + Shift + Down	Insert a previously executed SQL script into the query editor
Check for updates		Check that the version of the application you are using is up to date
Profiler		Open Profiler
ER-diagram editor		Open ER-diagram editor
Query Editor		Open the query editor
Move up	Alt + Up	Move selected text one line higher
Move down	Alt + Down	Move the highlighted text to the line below
Next statement	Ctrl + Shift + Up	Insert the following saved SQL script into the query editor
Create database		Open the window of database creation
New Connection	Ctrl + Shift + N	Open the Create Connection window
Heap memory status		Open a window with current information about the memory status
Save	Ctrl + S	Save
Save As	Ctrl + Shift + S	Save as
Compare database metadata		Open the database comparison tool
Database Statistics		Open the statistics tool
Trace Manager		Open Trace Manager
SQL format	Ctrl + Shift + F	Format the selected text fragment

C.4 SQL templates

Templates simplify the writing script. After pressing the space bar, the specified abbreviation will be converted into full text, for example: SF → SELECT * FROM.

You can add your own templates using the corresponding button.

C.5 Connection

Table C.7 — General

Parameter	Description
Startup connection	Automatically connect on startup
Server connection timeout (sec)	Time during which the application will try to connect to the database. If the connection is not established before it expires, an error will occur.
Timeout shutdown diagnostics (ms)	When an error occurs from the server, RDBExpert checks if the connection is active. The parameter defines the time during which the application will wait for a response from the server. If the timeout is reached, the connection will be disconnected.
Connection username at opening .fdb	User name, from which the connection will be made when opening .fdb
Connection password at opening .fdb	Password, with which connection will be executed when opening .fdb
Connection charset at opening .fdb	Charset with which the connection will be executed when opening .fdb
Allowed authentication plugins by default	List of plugins that will be used by the driver for authentication

Table C.8 — Tree connection

Parameter	Description
Node height	Distance between nodes in pixels
Connect on double-click	Connect to database after double-clicking on it in connection tree.
Expand database objects tree on connect	When this option is enabled, the object tree will automatically expand when connecting to the database.
Sort alphabetically	Sort nodes in the connection tree alphabetically
Show folders for tables	Form folders for table information in the connection tree
Show system objects	Show/hide system objects in the connection tree
Show connection properties panel	Show/hide connection parameters panel
Show full DB statistics	Display full database statistics in the connection parameters panel
Search in columns	Search not only in the connection tree objects, but also in the column names.

C.6 Editor

Table C.9 — General

Parameter	Description
Auto-complete only hotkeys	Suggest autocompletion only when Ctrl+Space is pressed
Auto-complete keywords on	Suggest autocompletion of keywords in the query editor
Auto-complete database objects on	Suggest autocompletion of database objects in the query editor
Default editor auto-commit	Automatically commit changes after query execution
Recycle resultset tabs	Close the previous result set when executing a query

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Parameter	Description
Remove comments for execution	Remove SQL comments in queries at runtime and send the query without them to the server
Print all SQL to output panel	Add the full text of the query to the output pane
Print extended query plan	Add a detailed query outline to the output pane
Open a new editor for new open connection	Switch to a new tab of the query editor when a connection is established
Use multiple connections	Add the ability to specify multiple connections in which to execute the query
Undo count	Number of returns to previous states. The return command is activated by pressing Ctrl+Z (Windows).
History count	The number of queries that can be stored in the history. When the specified number is reached, old queries will be deleted from the history

Table C.10 — Display

Parameter	Description
Tools panel	Display the query editor toolbar
Transaction Parameters	Display transaction parameters
Status bar	Show/hide status bar
Line numbers	Display line numbers in the query editor
Wrap line	Automatically move a line if it does not fit in the query editor.
Current line highlight	Highlight in colour the line on which the cursor is located

C.7 Result set table

Table C.11 — Result set table

Parameter	Description
Column resizable	Enable/disable the ability to change the size of columns in the result set
Column reordering	Enable/disable the ability to drag and drop columns, swapping them in places
Row number header	Show/hide row numbers in the resulting table
Column Width (pixels)	Column width in the resulting table
Row Height (pixels)	Row height in the resulting table
Save column widths between queries	Maintain the same column width in the resulting table
Use thousands separators for numeric values	If enabled, the thousands of the numeric values will be separated by a space.
Date pattern format	Date template for DATE data type. The table below describes the template parameters in detail

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Parameter	Description
Time pattern format	Time template for the TIME data type. The table below details the template parameters
Timestamp pattern format	Timestamp template for the TIMESTAMP data type. The table below details the parameters of the template
Time with time zone pattern format	Time template for the TIME WITH TIME ZONE data type. The table below details the template parameters
Timestamp with time zone pattern format	Timestamp time template for the TIMESTAMP WITH TIME ZONE data type. The table below details the parameters of the template
Null value cell text	Text to be added for NULL values
Transpose when single row result	Transpose a result consisting of a single row
Align numeric values	Arrangement of numeric values in a cell
Align text values	Alignment of text values in a cell
Align boolean values	Aligning boolean values in the cell
Align null values	Aligning null values in a cell
Align other values	Alignment of other types of values in the cell
Use form for adding/deleting records	Open a window when adding data to the table
Use other colour for null when adding/deleting records	Highlight a cell with a null value with a colour
Show dialog when records limit reached	Display a warning that the number of records in the result table has reached the maximum number of records that can be returned.
Maximum records returned	Maximum number of records to be returned in the resulting table
Fetch size	Number of records to be retrieved when opening the dataset table

C.8 Code formatting

The general parameters define the rules for formatting keywords.

Table C.12 — Editor

Parameter	Description
Convert tabs to spaces	Convert tabs to spaces
Tab size	Number of spaces to replace the tabulation with during conversion
Default query separator	The symbol used to separate queries. The default is ;

C.8.1 Datetime templates

Table C.13 — Datetime templates

Symbol	Description	Presentation	Examples
G	era	text	AD; Anno Domini; A

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Symbol	Description	Presentation	Examples
u	year	year	2004; 04
y	year-of-era	year	2004; 04
D	day-of-year	number	189
M/L	month-of-year	number/-text	7; 07; Jul; July; J
d	day-of-month	number	10
Q/q	quarter-of-year	number/-text	3; 03; Q3; 3rd quarter
Y	week-based-year	year	1996; 96
w	week-of-week-based-year	number	27
W	week-of-month	number	4
E	day-of-week	text	Tue; Tuesday; T
e/c	localized day-of-week	number/-text	2; 02; Tue; Tuesday; T
F	day-of-week-in-month	number	3
a	am-pm-of-day	text	PM
B	period-of-day	text	in the morning
h	clock-hour-of-am-pm (1-12)	number	12
K	hour-of-am-pm (0-11)	number	0
k	clock-hour-of-day (1-24)	number	24
H	hour-of-day (0-23)	number	0
m	minute-of-hour	number	30
s	second-of-minute	number	55
S	fraction-of-second	fraction	978
A	milli-of-day	number	1234
n	nano-of-second	number	987654321
N	nano-of-day	number	1234000000
O	localized zone-offset	offset-O	GMT+8; GMT+08:00; UTC-08:00
X	zone-offset 'Z' for zero	offset-X	Z; -08; -0830; -08:30; -083015; -08:30:15
x	zone-offset	offset-x	+0000; -08; -0830; -08:30; -083015; -08:30:15
p	pad next	pad modifier	1
'	escape for text	delimiter	
''	single quote	literal	'

C.9 Tool bar

Table C.14 — Visibility

Parameter	Description
Database tool bar	Display/hide the database toolbar
Application tool bar	Display/hide application toolbar
System tool bar	Display/hide the system toolbar

The Database Tools, Application Tools, System Tools, and Editor Tools tabs contain settings for defining the tool set of the respective panels.

C.10 Fonts

Font settings for the query editor, connection tree, and system console fonts.

C.11 Colours

Settings for the colours that are used in the application.

Appendix D Logical Relationships in ER Diagrams

In an ER diagram, a relationship between tables can be either physical or logical.

A physical relationship corresponds to a foreign key in the database. When creating such a relationship, the editor creates the corresponding foreign key constraint by generating an SQL ALTER TABLE statement.

A logical relationship exists only in the ER model. It represents an intended relationship between tables and columns but does not create a foreign key or any other constraint in the database.

The main differences between physical and logical relationships are as follows:

Property	Physical relationship	Logical relationship
Creates a foreign key	Yes	No
Generates an SQL ALTER TABLE statement	Yes	No
Stored in .eqd	Yes	Yes
Displayed on the diagram	Yes	Yes; by default, as a dotted line
Can be imported from JSON	No	Yes

Importing Logical Relationships from JSON

Logical relationships can be added to an ER diagram by importing them from a JSON file.

During the import, the editor creates logical relationships between the specified tables and columns. These relationships are displayed on the diagram as dotted lines but do not create foreign keys or other constraints in the database.

The import file must contain valid JSON encoded in UTF-8. The root element must be an array. Each array element describes one logical relationship.

For example:

```
[
  {
    "name": "CUSTOMER_ORDER",
    "sourceTable": "ORDERS",
    "sourceColumn": "CUSTOMER_ID",
    "targetTable": "CUSTOMERS",
    "targetColumn": "ID"
  },
  {
    "sourceTable": "ORDER_ITEMS",
    "sourceColumn": "ORDER_ID",
    "targetTable": "ORDERS",
    "targetColumn": "ID"
  }
]
```

A logical relationship is directed from the source table to the target table.

The object fields are:

- "name" - the display name of the relationship (optional);
- "sourceTable" - the source table;

- "sourceColumn" - the source column;
- "targetTable" - the target table;
- "targetColumn" - the target column.

The values of all the fields listed above must be strings. Additional fields in objects are ignored.

The "name" field is not used to determine relationship uniqueness. Two relationships are considered identical if all four endpoints match: the source table, source column, target table, and target column.

For known Firebird system objects (RDB$... and MON$...), the editor contains a built-in set of logical relationships. These relationships are displayed automatically on the diagram when both objects participating in the relationship are present on the diagram. These relationships do not create constraints in the database and cannot be deleted by the user.