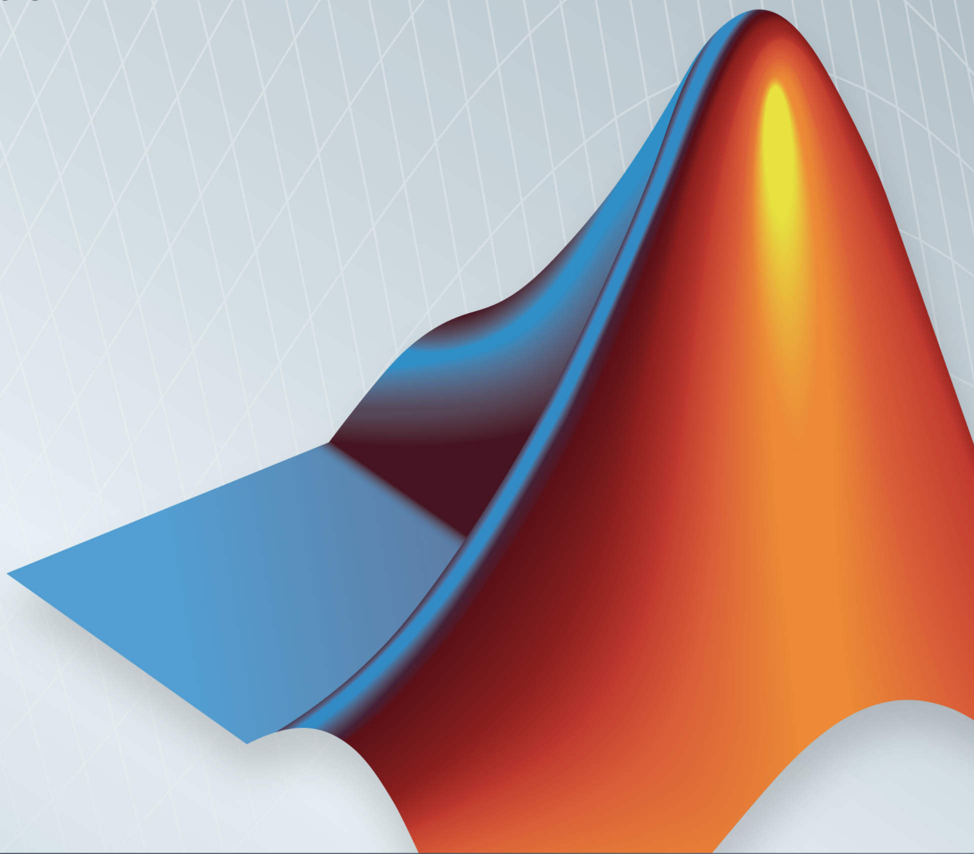
Database Toolbox™

User's Guide

R2014**b**



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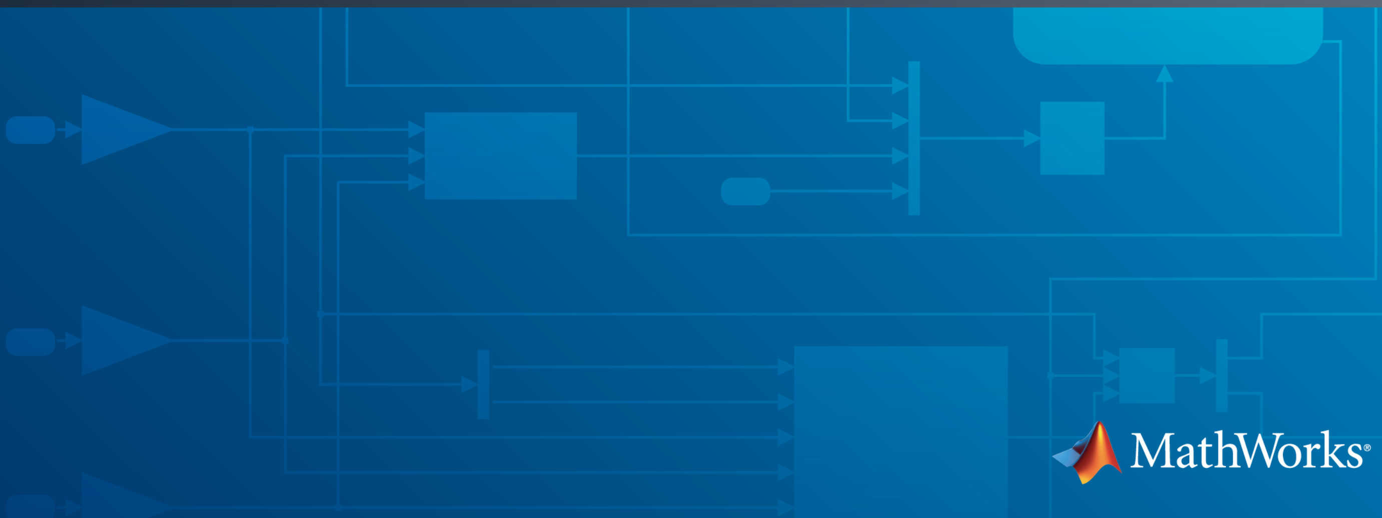

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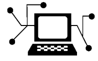

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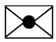

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Database Toolbox™ User's Guide

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- “Working with Databases” on page 1-3
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- “Data Retrieval Restrictions” on page 1-8
- “Creating and Running SQL Queries” on page 1-9

Database Toolbox Product Description

Exchange data with relational databases

Database Toolbox™ provides an app and functions for exchanging data between relational databases and MATLAB®. You can use SQL commands to read and write data or use the Database Explorer app to interact with a database without using SQL.

The toolbox supports ODBC-compliant and JDBC-compliant databases, including Oracle®, MySQL®, Sybase®, Microsoft® SQL Server®, and Informix®. You can apply simple and advanced conditions to database queries from MATLAB. The toolbox lets you access multiple databases simultaneously within a single MATLAB session and enables segmented import of large data sets.

Key Features

- Database Explorer app for working with databases interactively
- JDBC-compliant database connections
- ODBC-compliant database connections, with the option for fast access via a native ODBC driver
- Functions for executing queries using SQL files and SQL statements
- Data import and export with multiple databases in a single session
- Large data set import via a single transaction or via multiple transactions of segmented data
- Direct data import into numeric, cell, structure, and dataset arrays

Working with Databases

In this section...
"Connecting to Databases" on page 1-3
"Platform Support" on page 1-3
"Database Support" on page 1-3
"Driver Support" on page 1-4
"Structured Query Language (SQL)" on page 1-5

Connecting to Databases

Before you can use this toolbox to connect to a database, you must set up the data sources. For details, see "Configuring a Driver and Data Source" on page 2-13.

Platform Support

This toolbox runs on all platforms that the MATLAB software supports.

For details, see Database Toolbox system requirements at http://www.mathworks.com/products/database/requirements.html.

Note: This toolbox does not support running MATLAB software sessions with the `-nojvm` startup option enabled on UNIX® platforms. (UNIX is a registered trademark of The Open Group in the United States and other countries.)

Database Support

This toolbox supports importing and exporting data from any ODBC- and/or JDBC-compliant database management system, including:

- IBM DB2®
- IBM® Informix
- Ingres®

- Microsoft Access™
- Microsoft Excel®
- Microsoft SQL Server
- MySQL
- Oracle
- PostgreSQL (Postgres)
- Sybase SQL Anywhere®
- Sybase SQL Server®

If you are upgrading an earlier version of a database, you need not do anything special for this toolbox. Simply configure the data sources for the new version of the database application as you did for the original version.

Driver Support

This toolbox requires a database driver. Typically, you install a driver when you install a database. For instructions about how to install a database driver, consult your database administrator.

On Microsoft Windows® platforms, the toolbox supports Open Database Connectivity (ODBC) drivers and Oracle Java® Database Connectivity (JDBC) drivers.

Note: If you receive this message:

```
Invalid string or buffer length.
```

you might be using the wrong driver.

The JDBC/ODBC bridge is known to have issues with 64-bit database systems. Use a JDBC driver or the native ODBC interface to connect to these databases.

On UNIX platforms, the toolbox supports Java Database Connectivity (JDBC) drivers. If your database does not ship with JDBC drivers, download drivers from the Oracle JDBC Web site at `http://www.oracle.com/technetwork/database/enterprise-edition/jdbc-112010-090769.html`.

Structured Query Language (SQL)

This toolbox supports American National Standards Institute (ANSI®) standard SQL commands.

Data Type Support

You can import the following data types into the MATLAB Workspace and export them back to your database:

- `BOOLEAN`
- `CHAR`
- `DATE`
- `DECIMAL`
- `DOUBLE`
- `FLOAT`
- `INTEGER`
- `LONGCHAR`
- `NUMERIC`
- `REAL`
- `SMALLINT`
- `TIME`
- `TIMESTAMP`

  Note: When importing `TIMESTAMP` data into MATLAB, you might get an incorrect value near the daylight savings time change. Possible workarounds are to convert `TIMESTAMP` data to strings in your SQL query, and then convert them back to your desired type in MATLAB, or try using a different driver for your database.

- `TINYINT`

  Note: Database Toolbox interprets the `TINYINT` data type as `BOOLEAN` and imports it into the MATLAB workspace as logical `true (1)` or `false (0)`. For details about how Database Toolbox handles `BOOLEAN` data, see "Importing and Exporting Boolean Data" on page 4-56.

- `VARCHAR`
- `NTEXT`

You can import data of types not included in this list into the MATLAB Workspace. However, you might need to manipulate such data before you can process it in MATLAB.

Note: Data types `LONGCHAR` and `NTEXT` are not supported for the native ODBC interface.

Data Retrieval Restrictions

In this section...
"Spaces in Table Names or Column Names" on page 1-8
"Quotation Marks in Table Names or Column Names" on page 1-8
"Reserved Words in Column Names" on page 1-8

Spaces in Table Names or Column Names

Microsoft Access supports the use of spaces in table and column names, but most other databases do not. Queries that retrieve data from tables and fields whose names contain spaces require delimiters around table names and field names. In Access, enclose the table names or field names in quotation marks, for example, `"order id"`. Other databases use different delimiters, such as brackets, [ ]. In Visual Query Builder, table names and field names that include spaces appear in quotation marks.

Quotation Marks in Table Names or Column Names

Do not include quotation marks in table names or column names. The Database Toolbox software does not support data retrieval from table and column names that contain quotation marks.

Reserved Words in Column Names

You cannot use the Database Toolbox software to import or export data in columns whose names contain database reserved words, such as `DATE` or `TABLE`.

Creating and Running SQL Queries

You can select data from your database and import it into MATLAB by doing any of the following:

- Use Database Explorer or the command line.
- Write queries using SQL.
- Use MATLAB to generate the SQL.

Then, if you want to repeat your tasks, then automate them by generating a MATLAB script.

Writing a query requires knowledge of SQL and experience using the command line. Use the `exec` function to write SQL if you have short or simple SQL queries that are easy to write as a string. Also, use the `exec` function to add MATLAB variables to your SQL query string. If you have a long SQL query or multiple SQL queries that you want to run sequentially, then create an SQL script file containing your SQL queries and use the `runsqlscript` function.

If you are unfamiliar with writing SQL code, then you can use Database Explorer to create SQL queries. For details, see "Define Query Criteria to Refine Results". After creating the query using Database Explorer, you can generate the SQL for this query. For details, see "Save Queries as SQL Code". You can embed the generated SQL into the `exec` function SQL string. Or, you can create an SQL script file to use with the `runsqlscript` function.

If you want to automate the current task after the SQL is created, then generate a MATLAB script. For details, see "Generate MATLAB Code".

2

Getting Started with Database Toolbox

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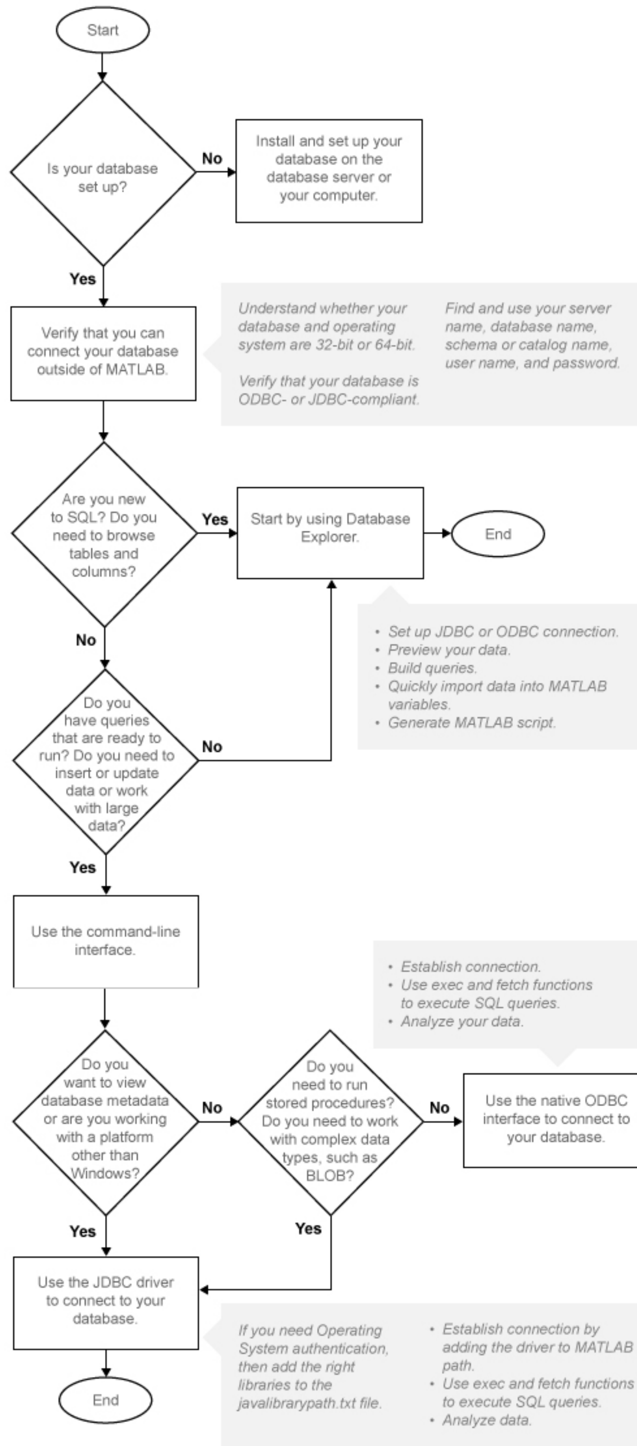
- "Configuring a Driver and Data Source" on page 2-13
- "Microsoft Access ODBC for Windows" on page 2-15
- "Microsoft SQL Server ODBC for Windows" on page 2-23
- "Microsoft SQL Server JDBC for Windows" on page 2-33
- "Oracle ODBC for Windows" on page 2-44
- "Oracle JDBC for Windows" on page 2-49
- "MySQL ODBC for Windows" on page 2-58
- "MySQL JDBC for Windows" on page 2-65
- "PostgreSQL ODBC for Windows" on page 2-71
- "PostgreSQL JDBC for Windows" on page 2-78
- "SQLite JDBC for Windows" on page 2-84
- "Sybase ODBC for Windows" on page 2-91
- "Sybase JDBC for Windows" on page 2-99
- "Microsoft SQL Server JDBC for Mac OS X" on page 2-106
- "Microsoft SQL Server JDBC for Linux" on page 2-113
- "Oracle JDBC for Mac OS X" on page 2-120
- "Oracle JDBC for Linux" on page 2-127
- "MySQL JDBC for Mac OS X" on page 2-134
- "MySQL JDBC for Linux" on page 2-141

- "PostgreSQL JDBC for Mac OS X" on page 2-148
- "PostgreSQL JDBC for Linux" on page 2-155
- "SQLite JDBC for Mac OS X" on page 2-162
- "SQLite JDBC for Linux" on page 2-169
- "Sybase JDBC for Mac OS X" on page 2-176
- "Sybase JDBC for Linux" on page 2-183
- "Other ODBC- or JDBC-Compliant Databases" on page 2-190
- "Connecting to a Database" on page 2-193
- "Selecting Data" on page 2-197
- "Inserting Data Using the Command Line" on page 2-199
- "Working with Large Data Sets" on page 2-200
- "Deploying a Database Application with MATLAB Compiler" on page 2-202

Working with a Database and MATLAB

This tutorial shows how to use Database Toolbox. You must make many decisions to start using this toolbox. Use these steps and flowchart as a guide for choosing the right options to get maximum benefit from using this toolbox and for understanding its capabilities.

1. Install your database. For details, refer to your database administrator or your database documentation.
2. Choose whether you want to use Database Explorer or the command line using the following flowchart.
3. Choose whether you want to use an ODBC or JDBC driver. For details, see "Choosing Between ODBC and JDBC Drivers" on page 2-10.
4. For ODBC drivers, the driver is typically preinstalled on your computer. For JDBC drivers, you must install the driver. For details about ODBC and JDBC drivers, see Driver Installation. If you have questions about which driver you need, refer to your database administrator or your database documentation.
5. Define your data source for ODBC-compliant drivers or add the full path of the driver to the static Java class path for JDBC-compliant drivers. For details, see "Configuring a Driver and Data Source" on page 2-13.
6. Test the connection to your database using Database Explorer or the command line.
7. Connect to your database using Database Explorer or the command line. For details, see "Connecting to a Database" on page 2-193.
8. Select data from your database and import the data into a MATLAB variable using Database Explorer or the command line `exec` and `fetch` functions. For details, see "Selecting Data" on page 2-197.
9. Insert data into your database by exporting data from a MATLAB variable using `datainsert`, `fastinsert`, and `insert` functions. For details, see "Inserting Data Using the Command Line" on page 2-199.
10. Generate a MATLAB script to automate your tasks using the Database Explorer import functionality. For details, see "Generate MATLAB Code" on page 4-96.
11. For a graphical representation of the steps and the decisions you must make, see the following flowchart.


Start
Is your database set up?
No
Install and set up your database on the database server or your computer.
Yes
Verify that you can connect your database outside of MATLAB.
Understand whether your database and operating system are 32-bit or 64-bit.
Verify that your database is ODBC- or JDBC-compliant.
Find and use your server name, database name, schema or catalog name, user name, and password.
Are you new to SQL? Do you need to browse tables and columns?
Yes
Start by using Database Explorer.
End
• Set up JDBC or ODBC connection.
• Preview your data.
• Build queries.
• Quickly import data into MATLAB variables.
• Generate MATLAB script.
No
Do you have queries that are ready to run? Do you need to insert or update data or work with large data?
No
Yes
Use the command-line interface.
• Establish connection.
• Use exec and fetch functions to execute SQL queries.
• Analyze your data.
Do you want to view database metadata or are you working with a platform other than Windows?
No
Do you need to run stored procedures? Do you need to work with complex data types, such as BLOB?
No
Use the native ODBC interface to connect to your database.
Yes
Yes
Use the JDBC driver to connect to your database.
End
If you need Operating System authentication, then add the right libraries to the javalibrarypath.txt file.
• Establish connection by adding the driver to MATLAB path.
• Use exec and fetch functions to execute SQL queries.
• Analyze data.

More About

- "Using Database Explorer" on page 4-63

Connection Options

In this section...
"Creating or Connecting to a Data Source" on page 2-6
"Defining Operating System Authentication" on page 2-6
"Connection Options" on page 2-6
"Working with Multiple Databases" on page 2-8

Creating or Connecting to a Data Source

If you already have your driver installed, you can create a data source for an ODBC driver or add the JDBC driver to the Java class path in MATLAB using the examples in "Configuring a Driver and Data Source" on page 2-13. Otherwise, see Driver Installation to help you install your driver. If your data sources are defined, then you are ready to connect to your database. If you created JDBC data sources using VQB, then see "Migrate from Visual Query Builder (VQB) to Database Explorer" on page 4-64. For details, see "Connecting to a Database" on page 2-193. Once connected, you can begin to explore your database using Database Explorer or the command line to view your data. For details, see "Selecting Data" on page 2-197.

Defining Operating System Authentication

Operating system authentication allows you to connect to your database using your operating system user account. The operating system performs user validation and the database does not require a different user name and password. Operating system authentication facilitates easy maintenance of database access credentials. For example, Windows provides operating system authentication that can be configured to work with a Microsoft SQL Server database. For details about Microsoft SQL Server Windows authentication, see "Step 3. Set up the Operating System authentication." on page 2-36

Connection Options

There are numerous ways to connect to your database using Database Toolbox. The following explains each option. Use this table to choose your best option.

Connection Option	Why Use This Option?
Database Explorer	Use Database Explorer to: • Visually inspect the structure, or schema, of your database. • View the tables and columns and rows in a table to assess the general size of your database. • Select the data in a table and import it into a MATLAB variable. • Generate a MATLAB script. • Generate a SQL query. For details, see “Selecting Data” on page 2-197.
Command line	Use the command line to: • Import data from a database into MATLAB. • Export data from MATLAB into a database. • Work with large amounts of data. • Run SQL queries stored in text files. • Run stored procedures and functions.

There are multiple options to connect to your database using the command line. Use this table to choose your best option.

Connection Option	Why Use This Option?
Native ODBC connection using the command line	Connect to your database with maximum performance. For details about the native ODBC interface, see “Connecting to a Database Using the Native ODBC Interface”.
JDBC connection using the command line	Achieve maximum platform independence. Use functionality not supported by native ODBC.
ODBC connection using the command line	Only use this option after trying to connect to your database using the native ODBC and JDBC connections.

Working with Multiple Databases

You can connect to multiple databases using Database Explorer or the command line. For details, see "Work with Multiple Databases" on page 4-91.

More About

- "Choosing Between ODBC and JDBC Drivers" on page 2-10
- "Connecting to a Database Using the Native ODBC Interface" on page 3-16
- "Selecting Data" on page 2-197

Initial Setup Requirements

Refer to the setup requirements below to establish the first connection to your database.

- For ODBC drivers, ensure 32-bit or 64-bit compatibility across your driver, database, operating system, and MATLAB. For details, see “Configuring a Driver and Data Source” on page 2-13.
- If you use Visual Query Builder (VQB) to explore the data in your database, you need to migrate to the Database Explorer app. For details, see “Migrate from Visual Query Builder (VQB) to Database Explorer” on page 4-64.
- Ensure you know the name of your database server or machine, the name of your database, the port number, and your user name and password. For ODBC drivers, once you create a data source, remember the data source name. For JDBC drivers, ensure you know the file path of where the JDBC driver is installed. For some JDBC drivers, you might need the URL string and the driver Java class object. For some databases, you might need to know more credentials. Contact your database administrator for all required database credentials needed for establishing connection to your database.
- Ensure you have access to your database and driver documentation.
- Check if your database uses Operating System Authentication. If you can connect to your database from outside of MATLAB without providing a user name and password, then your database uses Operating System Authentication. Exceptions to this rule are databases set up without any Operating System or database authentication requirements, such as Microsoft Access or SQLite database files. Additional steps might be required to set up connection to your database using Operating System Authentication from MATLAB.
- Ensure you have write access to the path MATLAB displays after executing `prefdir` on the command line.

Choosing Between ODBC and JDBC Drivers

In this section...
"Defining Database Drivers" on page 2-10
"Deciding Between ODBC and JDBC Drivers" on page 2-10

Defining Database Drivers

Different database vendors, such as Microsoft or Oracle, might implement their database systems using various technologies depending on customer needs, market demands, and several other factors. Software applications written in popular programming languages, such as C, C++, or Java, need a way to communicate with these databases. Open Database Connectivity (ODBC) and Java Database Connectivity (JDBC) are standards for drivers that enable programmers to write database-agnostic software applications. ODBC and JDBC are simply standards, or a set of rules recommended for efficient communication with a database. The database vendor is responsible for implementing and providing drivers that are committed to follow these rules.

Deciding Between ODBC and JDBC Drivers

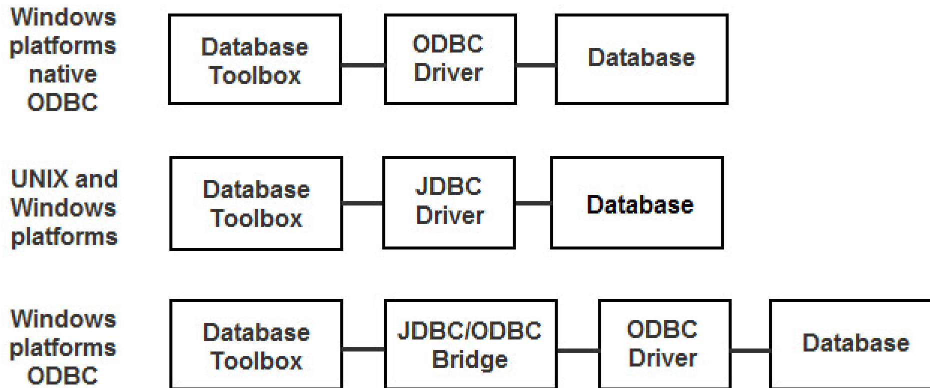
ODBC is a standard Microsoft Windows interface that enables communication between database management systems and applications typically written in C or C++.

JDBC is a standard interface that enables communication between applications based on Oracle Java and database management systems.

The JDBC/ODBC bridge is a Java library that allows Java applications to access the ODBC interface.

Database Toolbox has a Java library that connects directly to a pure JDBC driver or uses the JDBC/ODBC bridge to connect to an ODBC driver. The JDBC/ODBC bridge is automatically installed as part of the MATLAB JVM™. Database Toolbox also has a C++ library that connects natively to an ODBC driver.

The following figure illustrates how drivers interact with Database Toolbox.



Depending on your environment and what you want to accomplish, you need to decide whether using an ODBC driver or a JDBC driver suits your needs the best. Use the following to help you decide.

Use native ODBC for:

- Fastest performance for data imports and exports
- Memory-intensive data imports and exports

Use JDBC for:

- Platform independence allowing you to work with any operating system (including Mac and Linux®), driver version, or bitness (32-bit or 64-bit)
- Using Database Toolbox functions not supported by native ODBC (such as `runstoredprocedure` and metadata functions `tables` or `columnnames`)
- Working with complex or long data types (e.g., `LONG`, `BLOB`, text, etc.)

Tip: On Windows systems that support both ODBC and JDBC drivers, pure JDBC drivers and the native ODBC interface provide better connectivity and performance than the JDBC/ODBC bridge. First, use the native ODBC or JDBC drivers to connect to your database. Use the JDBC/ODBC bridge only after trying to connect through native ODBC or JDBC drivers.

For a list of native ODBC supported functionality and a full comparison of the JDBC/ODBC bridge to native ODBC, see “Connecting to a Database Using the Native ODBC Interface”.

Configuring a Driver and Data Source

Connect to a database and interact with the data by first installing the driver for the database. Then, define a data source for ODBC or add the full path of the driver to the static Java class path for JDBC so your computer can establish a connection to the database.

A Data Source Name (DSN) is the logical name that is used by Open Database Connectivity (ODBC) to refer to the drive and other information that is required to access data. This name is used to connect to an ODBC data source, such as a Microsoft SQL Server database.

Find your database environment in the following table by choosing your platform across the top and your database on the left. The link brings you to a page where you can find information about installing the correct driver, defining a data source for ODBC or adding the full path of your driver to the static Java class path for JDBC, and establishing a database connection.

Database	Platform		
	Windows	**Mac OS X 64-bit**	**Linux 64-bit**
Microsoft Access	"Microsoft Access ODBC for Windows" on page 2-15		
Microsoft SQL Server	"Microsoft SQL Server ODBC for Windows" on page 2-23 "Microsoft SQL Server JDBC for Windows" on page 2-33	"Microsoft SQL Server JDBC for Mac OS X" on page 2-106	"Microsoft SQL Server JDBC for Linux" on page 2-113
Oracle	"Oracle ODBC for Windows" on page 2-44 "Oracle JDBC for Windows" on page 2-49	"Oracle JDBC for Mac OS X" on page 2-120	"Oracle JDBC for Linux" on page 2-127

Database	Platform		
	Windows	**Mac OS X 64-bit**	**Linux 64-bit**
MySQL	"MySQL ODBC for Windows" on page 2-58 "MySQL JDBC for Windows" on page 2-65	"MySQL JDBC for Mac OS X" on page 2-134	"MySQL JDBC for Linux" on page 2-141
PostgreSQL	"PostgreSQL ODBC for Windows" on page 2-71 "PostgreSQL JDBC for Windows" on page 2-78	"PostgreSQL JDBC for Mac OS X" on page 2-148	"PostgreSQL JDBC for Linux" on page 2-155
SQLite	"SQLite JDBC for Windows" on page 2-84	"SQLite JDBC for Mac OS X" on page 2-162	"SQLite JDBC for Linux" on page 2-169
Sybase	"Sybase ODBC for Windows" on page 2-91 "Sybase JDBC for Windows" on page 2-99	"Sybase JDBC for Mac OS X" on page 2-176	"Sybase JDBC for Linux" on page 2-183

Mac 32-bit and Linux 32-bit platforms are not supported. Microsoft Access is not supported for Mac 64-bit and Linux 64-bit platforms.

For ODBC- or JDBC- compliant databases that are not listed in the table, see "Other ODBC- or JDBC-Compliant Databases" on page 2-190.

More About

- "Choosing Between ODBC and JDBC Drivers" on page 2-10

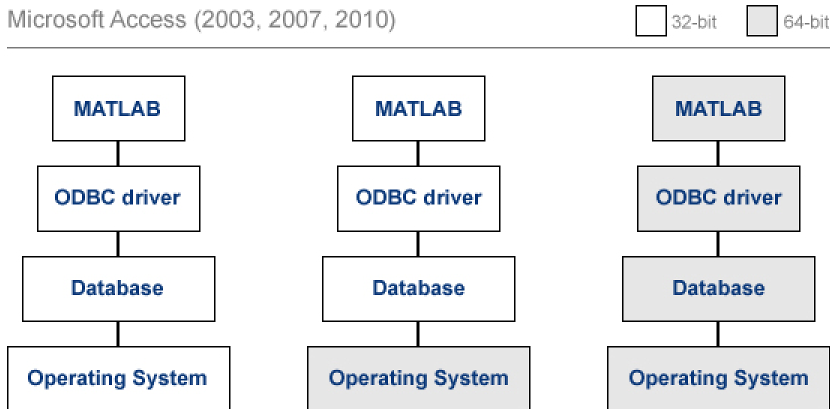
Microsoft Access ODBC for Windows

This tutorial shows how to set up a data source and connect to your Microsoft Access database. This tutorial uses the 32-bit Microsoft Access Driver (*.mdb, *accdb) Version 14.00.6015.1000 to connect to the Microsoft Access 2010 Version 14.0.6129.5000 (32-bit) database.

In this section...
"Step 1. Check the 32-bit and 64-bit compatibility." on page 2-15
"Step 2. Verify the driver installation." on page 2-16
"Step 3. Set up the data source using Database Explorer." on page 2-16
"Step 4. Connect using Database Explorer or the command line." on page 2-19

Step 1. Check the 32-bit and 64-bit compatibility.

The following diagram shows the supported compatibility for 32-bit and 64-bit across MATLAB, ODBC driver, database, and operating system. The diagram shows the operating system, ODBC driver, and MATLAB that are installed on your machine. However, you can install the database locally or remotely. MATLAB displays an error if the bitness is not matched correctly among these items. For related error messages, see "Database Connection Error Messages" on page 3-9. If you are running 32-bit or 64-bit MATLAB, the corresponding 32-bit or 64-bit Microsoft ODBC Administrator opens when you start creating a new ODBC data source using Database Explorer. The drivers listed in the Create New Data Source dialog box in the Microsoft ODBC Administrator are also 32-bit or 64-bit respectively.



Step 2. Verify the driver installation.

The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

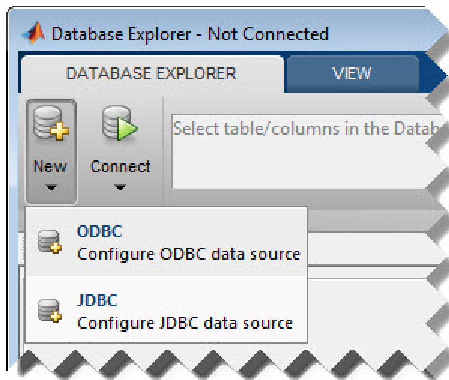
Step 3. Set up the data source using Database Explorer.

Set up your Microsoft Access database using Database Explorer. When setting up a data source for use with an ODBC driver, you can locate the target database on a PC running the Windows operating system or on another system to which the PC is networked. These instructions use the Microsoft ODBC Data Source Administrator Version 6.1 for the U.S. English version of Microsoft Access 2010 for Windows systems.

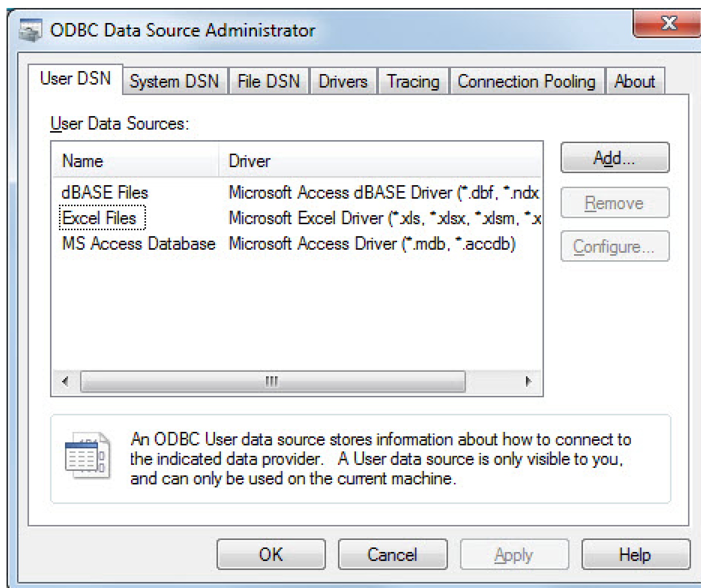
When using a 32-bit version of Microsoft Office, you must also use a 32-bit version of MATLAB to complete the following steps.

1. Close all open databases, including `tutorial.mdb`, in the database program.
2. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

3 Click the **Database Explorer** tab and then select **New** > **ODBC**.



The ODBC Data Source Administrator dialog box opens. Here, you can define the ODBC data source.

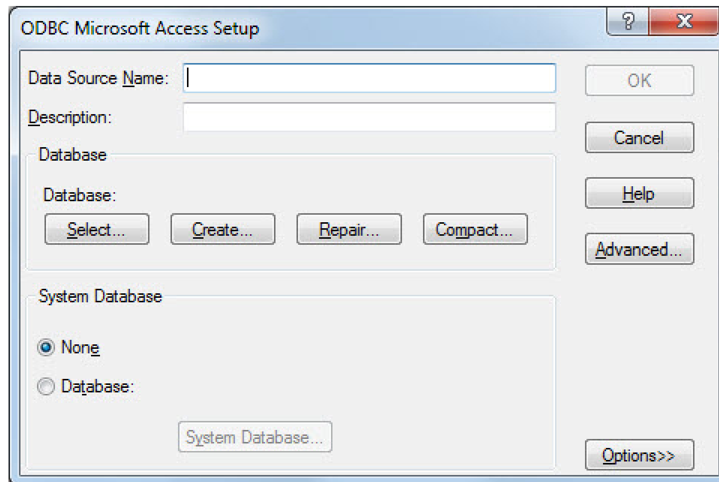


4 Click the **User DSN** tab and then click **Add**. When setting up an ODBC data source, you can use a User DSN or System DSN. A User DSN is specific to the user on a machine. Any data sources a user defines under User DSN are only seen by that

specific user. Conversely, a System DSN is not specific to the user on a machine. Any data sources a user defines under System DSN on a machine can be seen by any user who logs into that machine. Your ability to set up a User DSN or System DSN might depend on the database and ODBC driver you are using. For details, contact your database administrator or your database ODBC driver documentation.

5 A list of installed ODBC drivers appears in the Create New Data Source dialog box. Select `Microsoft Access Driver (*.mdb, *.accdb)` and click **Finish**.

6 The ODBC Microsoft Access Setup dialog box for your driver opens. Enter `dbtoolboxdemo` as the data source name. Enter `tutorial database` as the description. Click **Select** to open the Select Database dialog box.



7 Specify the database you want to use. For the `dbtoolboxdemo` data source, select `tutorial.mdb`. If your database is on a system to which your PC is connected:

   a Click **Network**. The Map Network Drive dialog box opens.

   b Specify the folder containing the database you want to use.

   c Click **Finish**.

8 Click **OK** to close the Select Database dialog box. In the ODBC Microsoft Access Setup dialog box, click **OK**. The ODBC Data Source Administrator dialog box displays the `dbtoolboxdemo` and any additional data sources that you added in the **User DSN** tab. Click **OK** to close the dialog box.

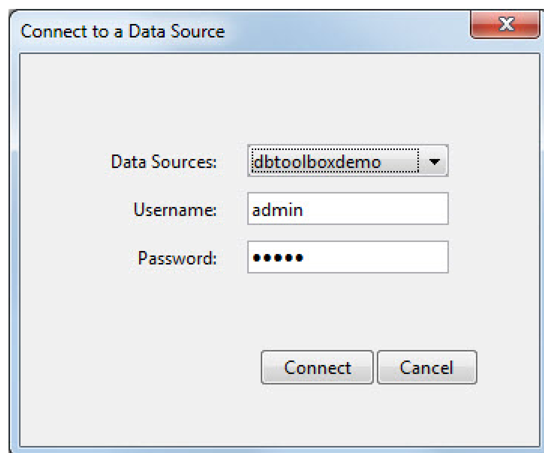
9 Test the connection to the data source by using Database Explorer to connect to the database.

With the data source setup completed, you can connect to the Microsoft Access database using Database Explorer or the command line with the native ODBC or ODBC connection.

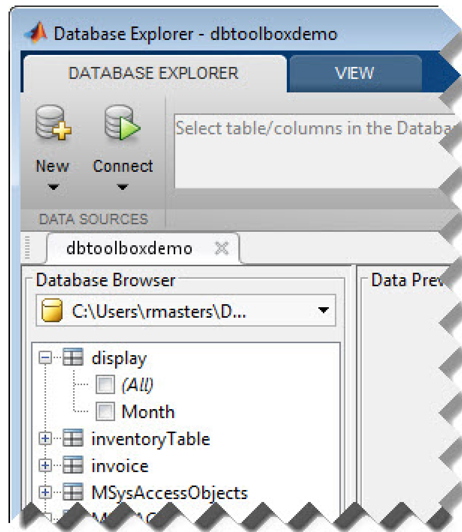
Step 4. Connect using Database Explorer or the command line.

Connect to Microsoft Access using Database Explorer.

1. After setting up the data source, click **Connect** in the **Database Explorer** tab. The Connect to a Data Source dialog box opens.
2. Connect to your database by selecting the data source name `dbtoolboxdemo` from the **Data Sources** list.
3. Enter a user name and password and click **Connect**.

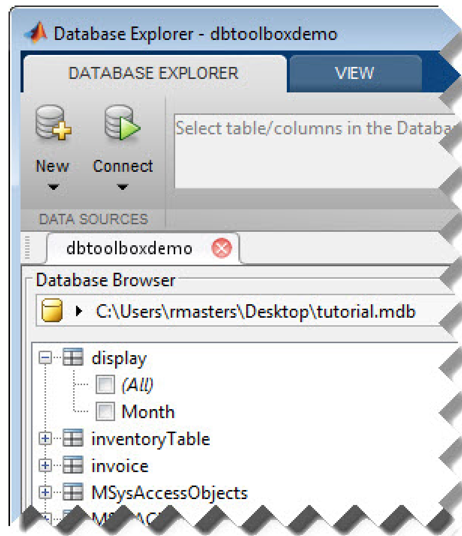


Database Explorer connects to the database and displays the tables list, or database schema, on the left of the window.



4 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **dbtoolboxdemo** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Microsoft Access using the native ODBC connection command line.

1 Connect to the database with the ODBC data source name. For example, the following code assumes you are connecting to a data source named `dbtoolboxdemo` with user name `admin` and password `admin`.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

2 Close the database connection `conn`.

```
close(conn)
```

Connect to Microsoft Access using the ODBC connection command line.

1 Connect to the database with the ODBC data source name. For example, the following code assumes you are connecting to a data source named `dbtoolboxdemo` with user name `admin` and password `admin`.

```
conn = database('dbtoolboxdemo','admin','admin');
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database`

More About

- "Using Database Explorer" on page 4-63

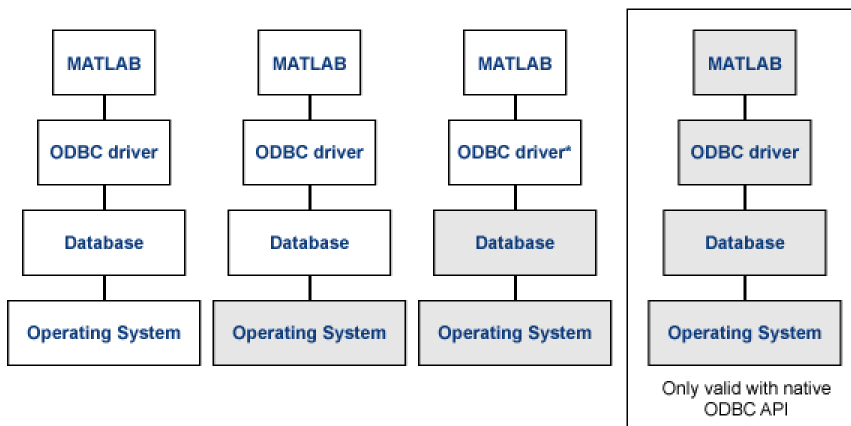
Microsoft SQL Server ODBC for Windows

This tutorial shows how to set up a data source and connect to your Microsoft SQL Server database. This tutorial uses the Microsoft SQL Server Native Client 11.0 Driver Version 2011.110.3000.00 to connect to the Microsoft SQL Server 2012 Express database.

In this section...
"Step 1. Check the 32-bit and 64-bit compatibility." on page 2-23
"Step 2. Verify the driver installation." on page 2-24
"Step 3. Set up the data source using Database Explorer." on page 2-24
"Step 4. Connect using Database Explorer or the command line." on page 2-29

Step 1. Check the 32-bit and 64-bit compatibility.

The following diagram shows the supported compatibility for 32-bit and 64-bit across MATLAB, ODBC driver, database, and operating system. The diagram shows the operating system, ODBC driver, and MATLAB that are installed on your machine. However, you can install the database locally or remotely. MATLAB displays an error if the bitness is not matched correctly among these items. For related error messages, see "Database Connection Error Messages" on page 3-9. If you are running 32-bit or 64-bit MATLAB, the corresponding 32-bit or 64-bit Microsoft ODBC Data Source Administrator opens when you start creating a new ODBC data source using Database Explorer. The drivers listed in the Create New Data Source dialog box in the Microsoft ODBC Data Source Administrator are also 32-bit or 64-bit respectively. The following steps use 64-bit for MATLAB, the ODBC driver, the database, and the operating system.



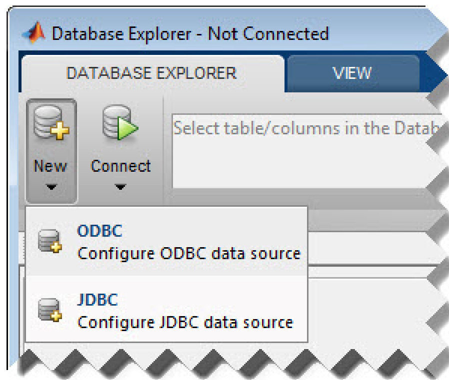
Step 2. Verify the driver installation.

The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

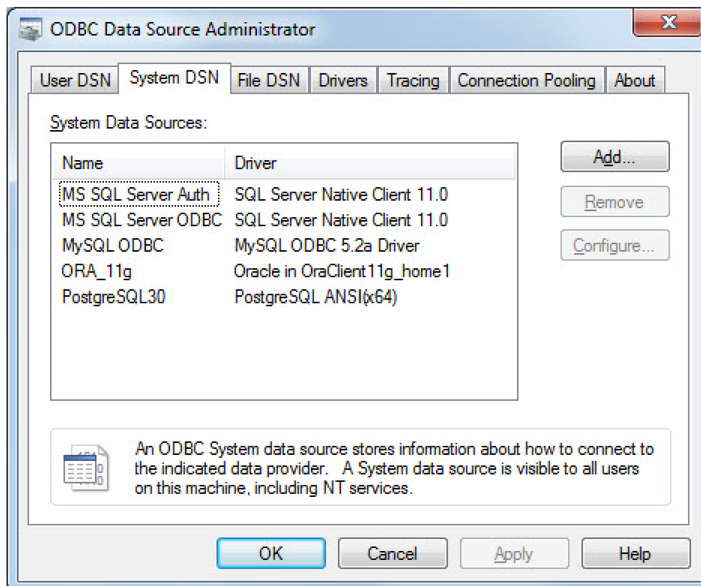
Step 3. Set up the data source using Database Explorer.

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **ODBC**.

Requirement: Ensure you use the correct 32-bit or 64-bit compatibility for MATLAB to complete the remaining steps.

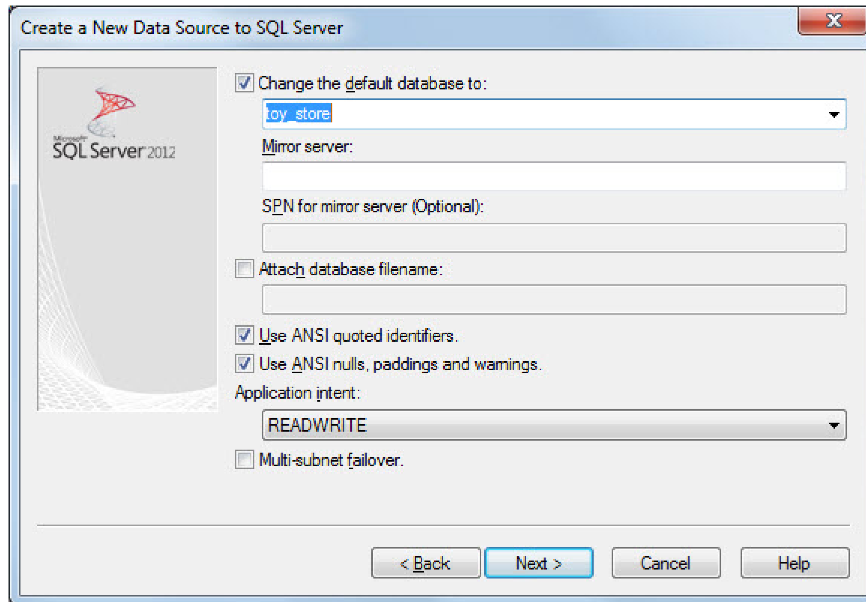


The ODBC Data Source Administrator dialog box opens. Here, you can define the ODBC data source.



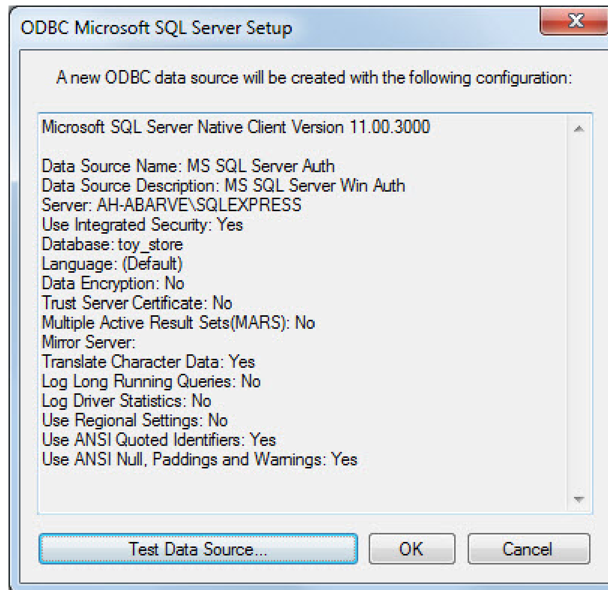
3. Click the **System DSN** tab and then click **Add**. When setting up an ODBC data source, you can use a User DSN or System DSN. A User DSN is specific to the user on a machine. Any data sources a user defines under User DSN are only seen by that specific user. Conversely, a System DSN is not specific to the user on a machine. Any data sources a user defines under System DSN on a machine can be seen by any user who logs into that machine. Your ability to set up a User DSN or System DSN might depend on the database and ODBC driver you are using. For details, contact your database administrator or your database ODBC driver documentation.
4. A list of installed ODBC drivers appears in the Create New Data Source dialog box. Select `SQL Server Native Client 11.0` and click **Finish**.
5. The Create a New Data Source to SQL Server dialog box opens. Enter an appropriate name for your data source. You use this name to establish a connection to your database. For this example, enter `MS SQL Server` as the data source name in the **Name** field. Enter `Microsoft SQL Server` as the description in the **Description** field. Select the database server for this data source to use in the **Server** field. Consult your database administrator for the name of your database server. Click **Next**.
6. If you want to connect to Microsoft SQL Server using Windows authentication, click the **With Integrated Windows Authentication** option button. Then click **Next**.

   Or, if you want to connect to Microsoft SQL Server without Windows authentication, click the **With SQL Server authentication using a login ID and password entered by the user** radio button. Enter your user name in the **Login ID** field and your password in the **Password** field. Then click **Next**.
7. The Create a New Data Source to SQL Server dialog box opens. Select the **Change the default database to** check box and enter the name of the default database on the database server for connection. This example is using the database `toy_store`. Then click **Next**.

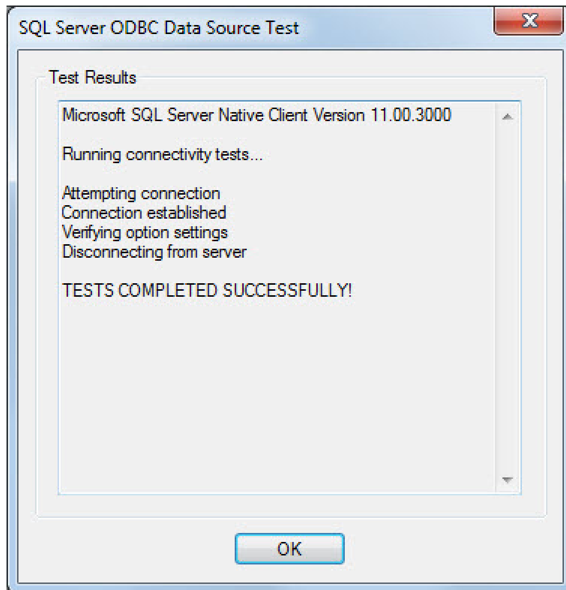


8 In this example, click **Finish** to accept the default settings.

9 The ODBC Microsoft SQL Server Setup dialog box opens. Test your connection by clicking **Test Data Source**.



10 The SQL Server ODBC Data Source Test dialog box opens. If the connection establishes successfully, then the TESTS COMPLETED SUCCESSFULLY! message appears. Click **OK** to close this dialog box. Click **OK** to close the ODBC Microsoft SQL Server Setup dialog box.



11 The ODBC Data Source Administrator dialog box shows the new data source under System Data Sources in the **System DSN** tab. Click **OK** to close the ODBC Data Source Administrator dialog box.

With the data source setup completed, you can connect to the Microsoft SQL Server database using Database Explorer or the command line with the native ODBC connection.

Step 4. Connect using Database Explorer or the command line.

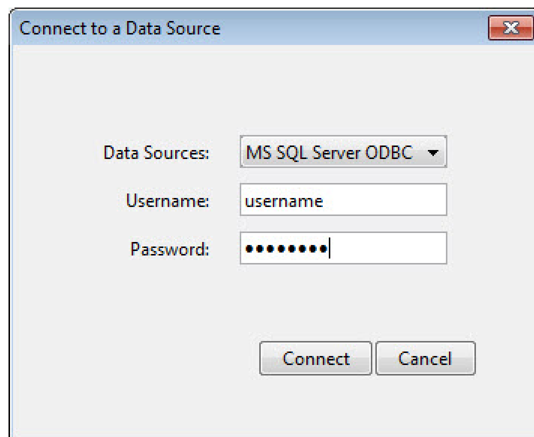
Connect to Microsoft SQL Server using Database Explorer.

If you experience issues connecting using Database Explorer, use the native ODBC interface with the command line or JDBC to connect to your database.

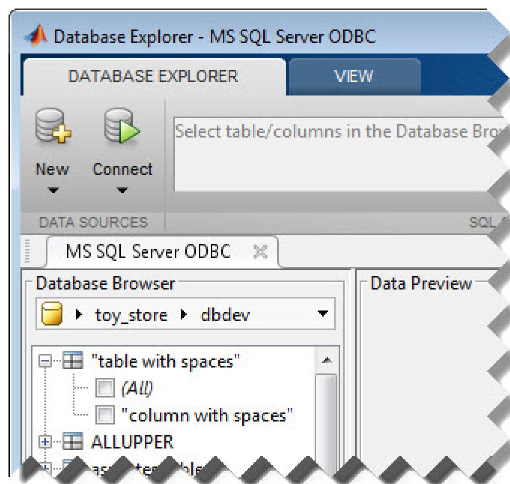
1 After setting up the data source, click **Connect** in the **Database Explorer** tab. The Connect to a Data Source dialog box opens.

2 Connect with Operating System authentication by selecting the data source that you set up with Windows authentication from the **Data Sources** list. Leave the user name and password blank. Click **Connect**.

3 Connect without Operating System authentication by selecting the data source that you set up without Windows authentication. Enter a user name and password. Click **Connect**.



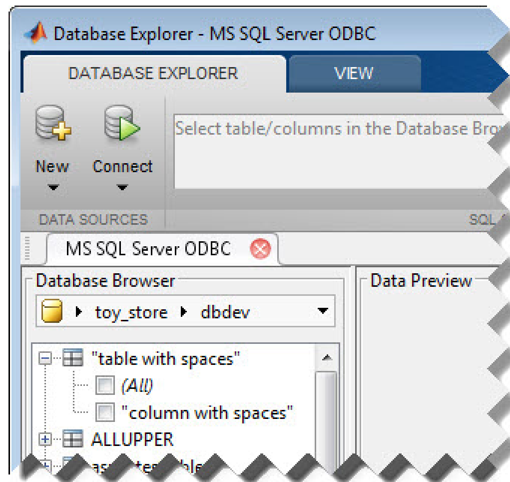
Database Explorer connects to your database and displays its contents in a tab named with the data source name.



4 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MS SQL Server ODBC** data source name on the database tab. The

Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Microsoft SQL Server using the native ODBC connection command line.

1. To connect with Windows authentication, connect to the database with the authenticated ODBC data source name and blank user name and password. For example, the following code assumes you are connecting to a data source named `MS SQL Server Auth`.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

   Or, to connect without Windows authentication, connect to the database with the ODBC data source name. For example, the following code assumes you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('MS SQL Server','username','pwd');
```

2. Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database`

More About

- "Using Database Explorer" on page 4-63

Microsoft SQL Server JDBC for Windows

This tutorial shows how to set up a data source and connect to your Microsoft SQL Server database. This tutorial uses the Microsoft JDBC Driver 4.0 for Microsoft SQL Server to connect to the Microsoft SQL Server 2012 Express database.

In this section...
“Step 1. Verify the driver installation.” on page 2-33
“Step 2. Verify the port number.” on page 2-33
“Step 3. Set up the Operating System authentication.” on page 2-36
“Step 4. Add the JDBC driver to the MATLAB static Java class path.” on page 2-37
“Step 5. Set up the data source using Database Explorer.” on page 2-38
“Step 6. Connect using Database Explorer or the command line.” on page 2-40

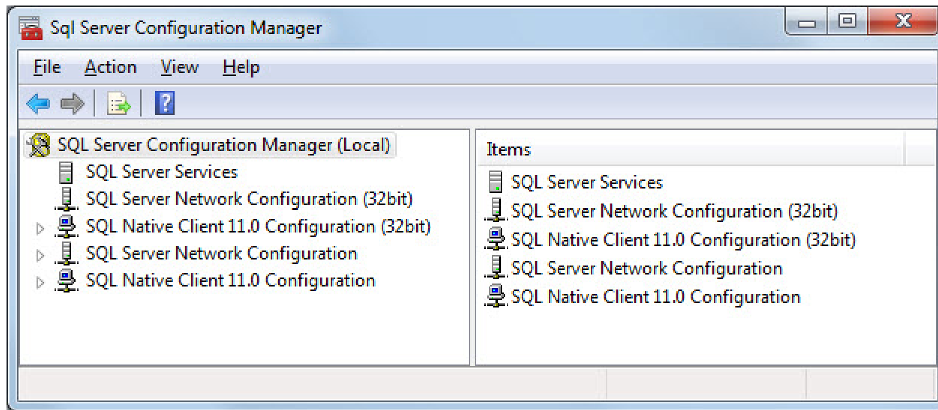
Step 1. Verify the driver installation.

If the JDBC driver for Microsoft SQL Server is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Verify the port number.

To connect to your database using a JDBC driver, you need to know the port number. Use the following steps on the machine where Microsoft SQL Server is installed to find your port number. If you experience connection issues with the port number you find using these steps, then contact your database administrator.

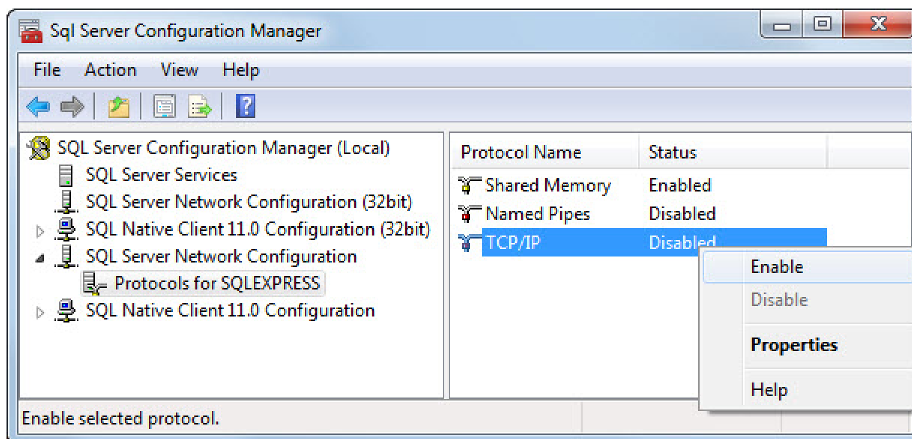
1 On the machine where your Microsoft SQL Server database is installed, click **Start**. Select your Microsoft SQL Server version folder and click **Configuration Tools**. Then click **SQL Server Configuration Manager**. The Sql Server Configuration Manager window opens.



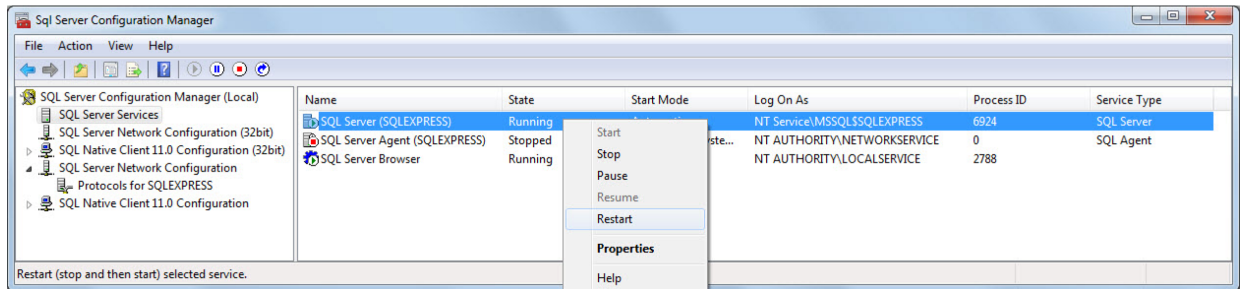
2 Click **SQL Server Network Configuration** on the left side. Double-click **Protocols for SQLEXPRESS**.

3 Check if TCP/IP is enabled. If so, skip the steps for enabling TCP/IP and restarting the server.

4 If TCP/IP is disabled, right-click **TCP/IP** on the right side and select **Enable**.

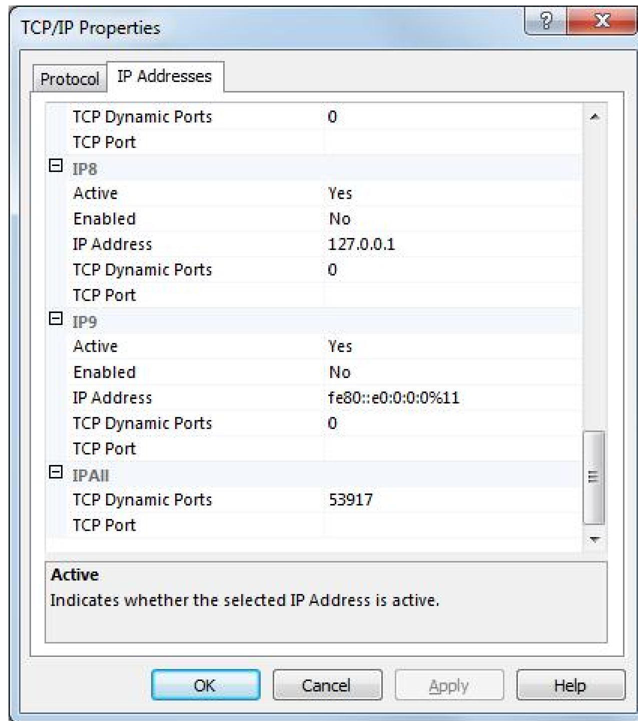


5 To finish the process of enabling the TCP/IP protocol, restart the server. Click **SQL Server Services** on the left side. Right-click **SQL Server (SQLEXPRESS)** and click **Restart**.



6 The server is restarted and TCP/IP is enabled. Click **Protocols for SQLEXPRESS** and right-click **TCP/IP**. Select **Properties**. The TCP/IP Properties dialog box opens.

7 In the **IP Addresses** tab, scroll to the bottom until you see **IP All** group. The number next to the **TCP Dynamic Ports** field is the port number. Use the port number you see in this dialog box in the JDBC connection parameters for Database Explorer or the command line. In this example, the port number is `53917`. If this number is `0` or you want to configure your Microsoft SQL Server database server to listen to a specific port, delete the entry in the **TCP Dynamic Ports** field and enter another port number in the **TCP Port** field.



Step 3. Set up the Operating System authentication.

Windows authentication lets you to connect to your database using your Windows user account. In this case, Windows performs user validation and the database does not require a different user name and password. Windows authentication facilitates easy maintenance of database access credentials. The Microsoft SQL Server JDBC driver allows connectivity using Windows authentication once the required libraries are added to the system path. The following steps show how to add these libraries to the Java library path in MATLAB. For details about Java libraries, see “Bringing Java Classes into MATLAB Workspace”.

1. Ensure you have the latest Java driver library installed on your computer. To install the latest library, see Driver Installation.
2. Run the `prefdir` command in the MATLAB Command Window. The output of this command is a file path to a folder on your computer.

3. Close MATLAB if it is running.
4. Navigate to the folder and create a file called `javalibrarypath.txt` in the folder.
5. Open `javalibrarypath.txt` and insert the path to the Java library file `sqljdbc_auth.dll`. The entry should include the full path to the library file. The entry should not contain the library file name. For example, `C:\DB_Drivers\sqljdbc_4.0\enu\auth\x64`.

   The `sqljdbc_auth.dll` file is installed in the following location:

   ```
   <installation>\sqljdbc_<version>\<language>\auth\<arch>
   ```

   where `<installation>` is the installation folder of the Microsoft SQL Server JDBC driver, `<version>` is the JDBC driver version, `<language>` is the JDBC driver language, and `<arch>` is the architecture.

   - For 64-bit MATLAB, use the x64 folder.
   - For 32-bit MATLAB, use the x86 folder.
6. Open MATLAB.

Step 4. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `C:\DB_Drivers\sqljdbc_4.0\enu\sqljdbc4.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

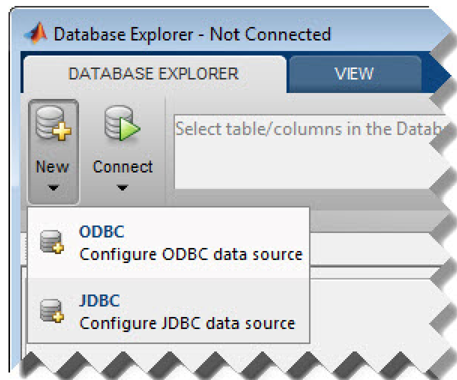
Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Bringing Java Classes into MATLAB Workspace”.

Step 5. Set up the data source using Database Explorer.

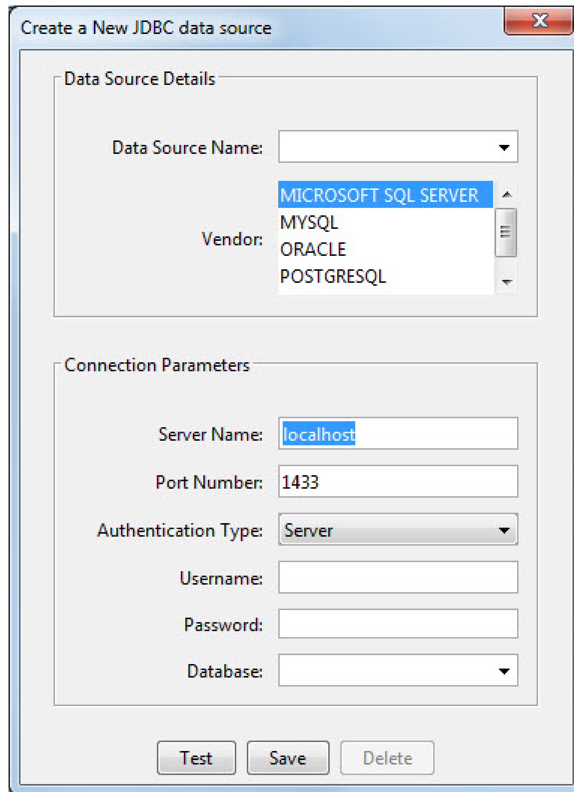
This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see "Connect to Microsoft SQL Server using the JDBC connection command line." on page 2-42

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

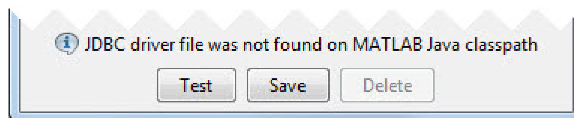
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `MICROSOFT SQL SERVER` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 4.



4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5. Create a data source without Windows authentication by setting the **Authentication Type** to `Server`.

   Or, create a data source with Windows authentication by setting the **Authentication Type** to `Windows` and leaving **Username** and **Password** blank.

6. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
7. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
8. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

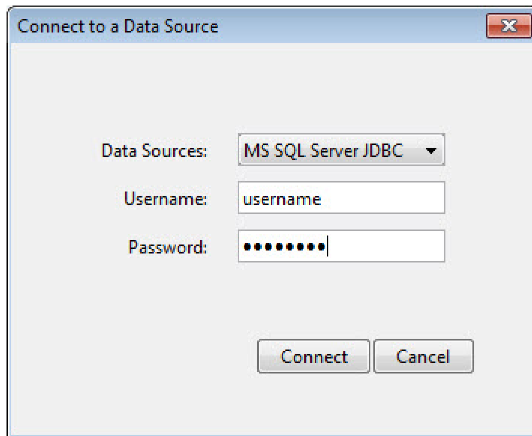
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Microsoft SQL Server database using Database Explorer or the command line with the JDBC connection.

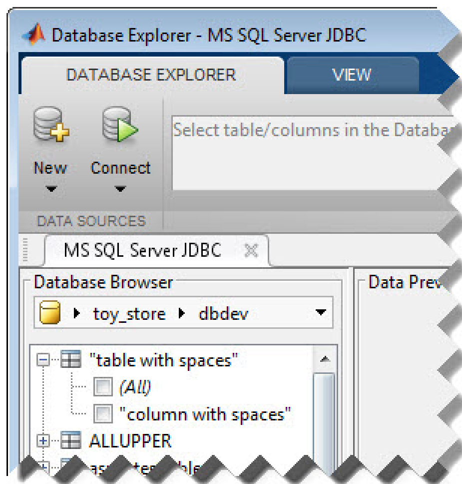
Step 6. Connect using Database Explorer or the command line.

Connect to Microsoft SQL Server using Database Explorer.

1. After setting up the data source, connect with Operating System authentication by selecting the data source that you set up with Windows authentication from the **Data Sources** list. Leave the user name and password blank. Click **Connect**.
2. Connect to your database without Operating System authentication by selecting the data source that you set up without Windows authentication. Enter a user name and password. Click **Connect**.

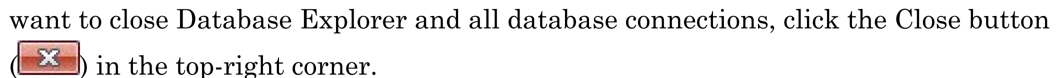


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



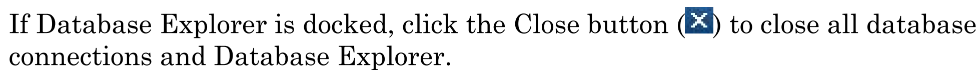
3 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MS SQL Server JDBC** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you

want to close Database Explorer and all database connections, click the Close button

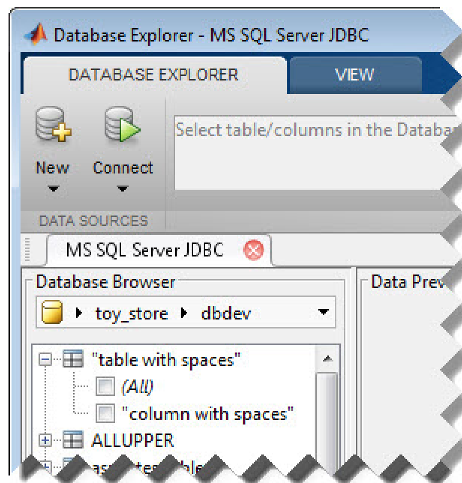


( ) in the top-right corner.

If Database Explorer is docked, click the Close button (



) to close all database connections and Database Explorer.



Connect to Microsoft SQL Server using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 To connect with Operating System authentication, use the `Vendor` name-value pair argument of `database` to specify a connection to a Microsoft SQL Server database. Use the `AuthType` name-value pair argument to connect with Windows authentication. Specify a blank user name and password. For example, the following code assumes you are connecting to a database named `dbname`, database server named `sname`, and port number `123456`.

```
conn = database('dbname','','','Vendor','Microsoft SQL Server',...
                'Server','sname','AuthType','Windows',...
                'PortNumber',123456);
```

Or, to connect without Operating System authentication, use the `AuthType` name-value pair argument of `database` to specify a connection to the database server

Server. For example, the following code assumes you are connecting to a database named dbname with user name username and password pwd.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server','Server','sname',...
                'AuthType','Server','PortNumber',123456);
```

2 Close the database connection conn.

```
close(conn)
```

See Also

close | database | javaaddpath

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

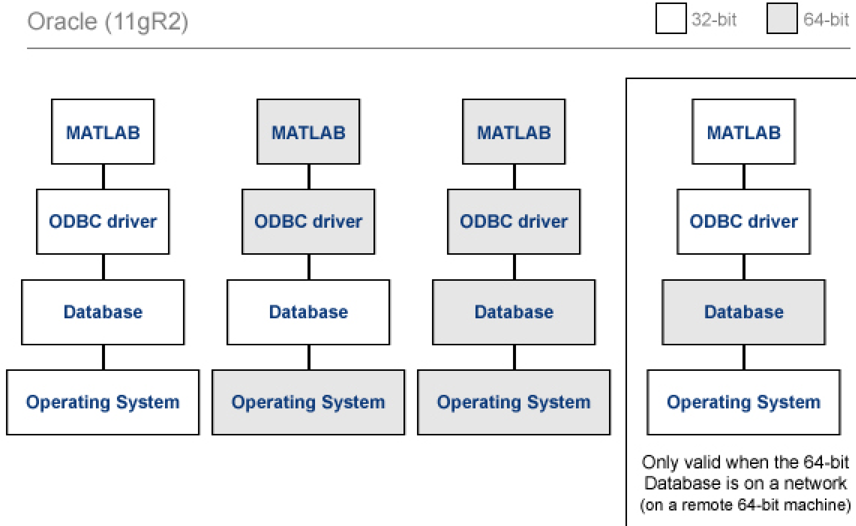
Oracle ODBC for Windows

This tutorial shows how to set up a data source and connect to your Oracle database. This tutorial uses the OraClient11g_home1 ODBC driver version 11.02.00.01 to connect to the Oracle 11g Enterprise Edition Release 11.2.0.1.0 database.

In this section...
“Step 1. Check the 32-bit and 64-bit compatibility.” on page 2-44
“Step 2. Verify the driver installation.” on page 2-45
“Step 3. Set up the data source using the ODBC Data Source Administrator.” on page 2-45
“Step 4. Connect using the native ODBC connection command line.” on page 2-48

Step 1. Check the 32-bit and 64-bit compatibility.

The following diagram shows the supported compatibility for 32-bit and 64-bit across MATLAB, ODBC driver, database, and operating system. The diagram shows the operating system, ODBC driver, and MATLAB that are installed on your machine. However, you can install the database locally or remotely. MATLAB displays an error if the bitness is not matched correctly among these items. For related error messages, see “Database Connection Error Messages” on page 3-9.



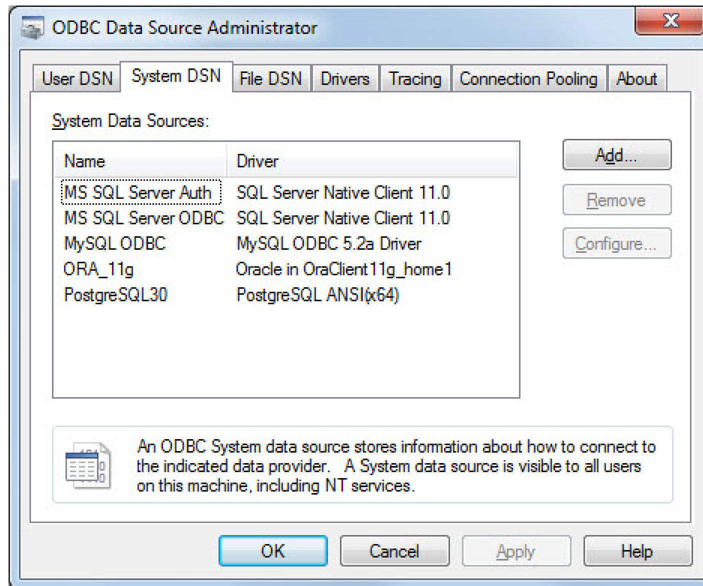
Step 2. Verify the driver installation.

The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

Step 3. Set up the data source using the ODBC Data Source Administrator.

Set up an ODBC data source using the ODBC Data Source Administrator for Oracle with or without Windows authentication. Database Explorer cannot work with the Oracle ODBC driver because of an issue with the JDBC/ODBC bridge. For details, see “Database Explorer Error Messages” on page 3-14.

1 Click **Start**. Select **Administrative Tools > Data Sources (ODBC)** to define the ODBC data source. The ODBC Data Source Administrator dialog box opens. For details about locating this program on your computer, see Driver Installation.



2. Click the **System DSN** tab and then click **Add**. When setting up an ODBC data source, you can use a User DSN or System DSN. A User DSN is specific to the user on a machine. Any data sources a user defines under User DSN are only seen by that specific user. Conversely, a System DSN is not specific to the user on a machine. Any data sources a user defines under System DSN on a machine can be seen by any user who logs into that machine. Your ability to set up a User DSN or System DSN might depend on the database and ODBC driver you are using. For details, contact your database administrator or your database ODBC driver documentation.

3. A list of installed ODBC drivers appears in the Create New Data Source dialog box. Select the ODBC driver `Oracle in OraClient11g_home1`. Your ODBC driver might have a different name. Click **Finish**.

4. The Oracle ODBC Driver Configuration dialog box opens. Enter an appropriate name for your data source in the **Data Source Name** field. You use this name to establish a connection to your database. For this example, enter `ORA` as the data source name. Enter a description for this data source, such as `Oracle database`, in the **Description** field. Enter your database name in the **TNS Service Name** field.

5 To establish the data source without Windows authentication, enter your user name in the **User ID** field. Or, to establish the data source with Windows authentication, leave this field blank. Leave **Application**, **Oracle**, **Workarounds**, and **SQLServer Migration** tabs with default settings.

6 Click **Test Connection** to test the connection to your database. The Oracle ODBC Driver Connect dialog box opens. If you are establishing the data source with Windows authentication, the Testing Connection dialog box opens instead.

7 Your database name and user name are automatically entered in the **Service Name** and **User Name** fields. Enter your password in the **Password** field. Click **OK**. The Testing Connection dialog box opens. If your computer successfully connects to the database, Connection successful appears. Click **OK**.

8 Click **OK** in the Oracle ODBC Driver Configuration dialog box. The ODBC Data Source Administrator dialog box shows the ODBC data source `ORA`.

With the data source setup completed, you can connect to the Oracle database using the command line with the native ODBC connection.

Step 4. Connect using the native ODBC connection command line.

1 To connect with Windows authentication, connect to the database with the authenticated ODBC data source name and with a blank user name and password. For example, the following code assumes you are connecting to a data source named Oracle_Auth.

```
conn = database.ODBCConnection('Oracle_Auth','','');
```

Or, to connect to your database without Windows authentication, connect to the database with the ODBC data source name. For example, the following code assumes you are connecting to a data source named Oracle with user name username and password pwd.

```
conn = database.ODBCConnection('Oracle','username','pwd');
```

2 Close the database connection conn.

```
close(conn)
```

See Also

close | database

Oracle JDBC for Windows

This tutorial shows how to set up a data source and connect to your Oracle database. This tutorial uses the Oracle Database 11g Release 2 (11.2.0.3) JDBC driver for use with JDK™ 1.6 to connect to the Oracle 11g Enterprise Edition Release 11.2.0.1.0 database.

In this section...
"Step 1. Verify the driver installation." on page 2-49
"Step 2. Set up the Operating System authentication." on page 2-49
"Step 3. Add the JDBC driver to the MATLAB static Java class path." on page 2-50
"Step 4. Set up the data source using Database Explorer." on page 2-50
"Step 5. Connect using Database Explorer or the command line." on page 2-53

Step 1. Verify the driver installation.

If the JDBC driver for Oracle is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Set up the Operating System authentication.

Set up Operating System authentication for Windows. Operating System authentication allows you to connect to your database using your system or network user name and password. In this case, the database does not require a different user name and password. Operating System authentication facilitates connection to the database and provides easy maintenance of database access credentials.

1. Ensure you have the latest Oracle OCI libraries installed on your computer. To install the latest library, see Driver Installation.
2. Run the `prefdir` command in the MATLAB Command Window. The output of this command is a file path to a folder on your computer.
3. Close MATLAB if it is running.
4. Navigate to the folder and create a file called `javalibrarypath.txt` in the folder.
5. Open `javalibrarypath.txt` and insert the path to the Oracle OCI libraries. The entry should include the full path to the library files. The entry should not contain the library file names. For example, `C:\DB_Libraries\instantclient_11_2`.

6 Add the Oracle OCI library full path to the Windows Path environment variable.
7 Open MATLAB.

For details about Java libraries, see “Bringing Java Classes into MATLAB Workspace”.

Step 3. Add the JDBC driver to the MATLAB static Java class path.

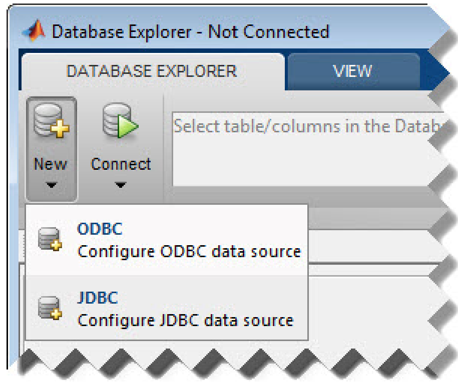
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `C:\DB_Drivers\ojdbc6.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Bringing Java Classes into MATLAB Workspace”.

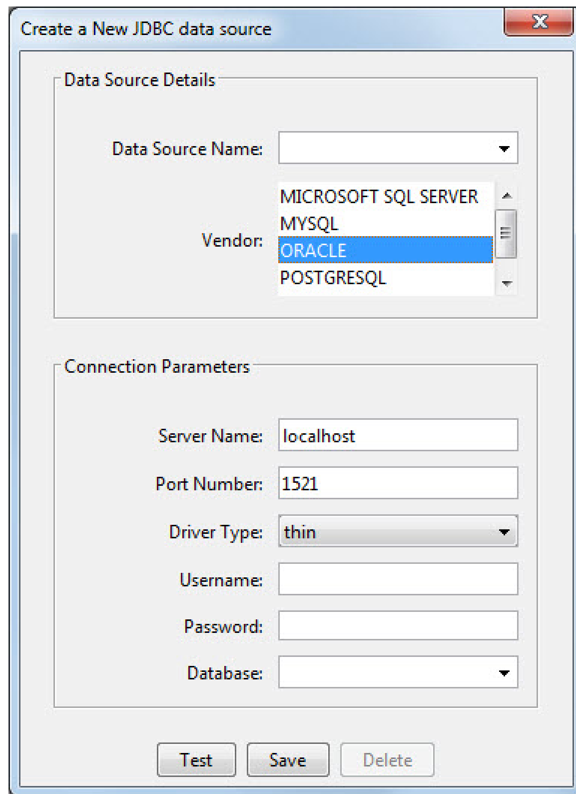
Step 4. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to Oracle using the JDBC connection command line.” on page 2-55

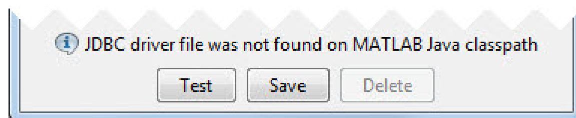
1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select ORACLE from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 3.



4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5 To establish the data source with Windows authentication, set **Driver Type** to `oci`.

6. To establish the data source without Windows authentication, set **Driver Type** to `thin`.
7. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
8. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
9. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

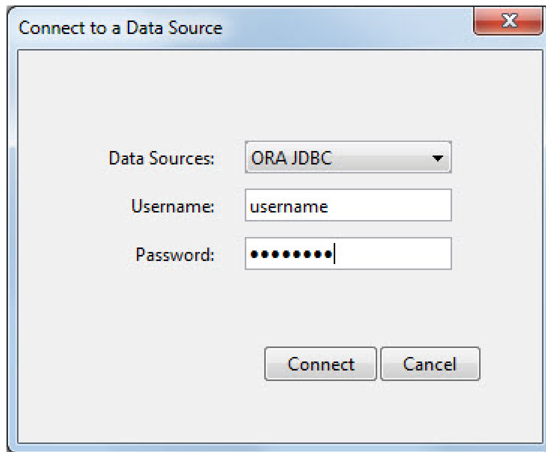
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Oracle database using Database Explorer or the command line with the JDBC connection.

Step 5. Connect using Database Explorer or the command line.

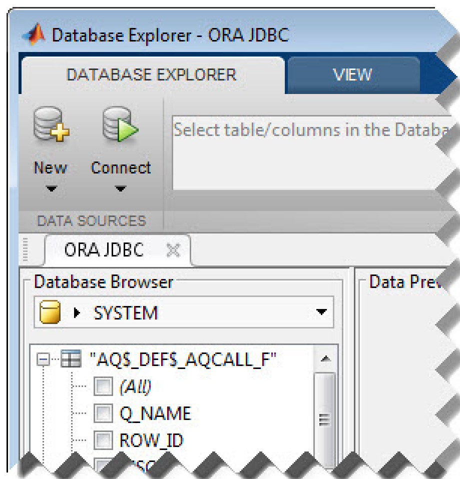
Connect to Oracle using Database Explorer.

1. After setting up the data source, to connect without Windows authentication, select the data source that you set up from the **Data Sources** list. Enter a user name and password. Click **Connect**.



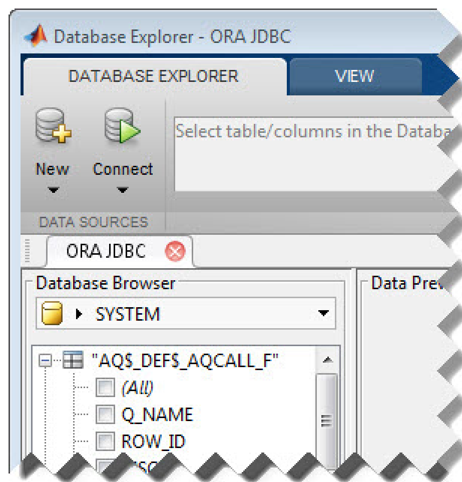
Or, to connect with Windows authentication, select the data source that you set up. Leave the user name and password blank. Click **Connect**.

Database Explorer connects to your database and displays its contents in a tab named with the data source name. You might need to select your database schema to display your database contents.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **ORA JDBC** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Oracle using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 To connect with Windows authentication, use the `Vendor` name-value pair argument of `database` to specify a connection to an Oracle database. Use the `DriverType` name-value pair argument to connect with Windows authentication by specifying the `oci` value. Specify a blank user name and password. For example, the following code assumes you are connecting to a database named `dbname`, database server named `sname`, and port number `123456`.

dbname can be the service name or the Oracle system identifier (SID) depending on your specific Oracle database setup. For details, see your tnsnames.ora file, which is often in <ORACLE_HOME>\NETWORK\ADMIN where <ORACLE_HOME> is the folder where the database or the Oracle client is installed.

```
conn = database('dbname','','',...
                'Vendor','Oracle','DriverType','oci',...
                'Server','sname','PortNumber',123456);
```

Or, to connect without Windows authentication, use the DriverType name-value pair argument of database to specify a connection to the database server by specifying the thin value. For example, the following code assumes you are connecting to a database named dbname with user name username and password pwd.

```
conn = database('dbname','username','pwd',...
                'Vendor','Oracle','DriverType','thin',...
                'Server','sname','PortNumber',123456);
```

If you have trouble using the database function to connect to your Oracle database, try using the full entry in your tnsnames.ora file in the URL string as one consecutive line. Leave the first argument blank. For example, the following code assumes the value of the URL name-value pair argument is set to the following tnsnames.ora file entry for an Oracle database.

```
conn = database('','username','pwd',...
                'Vendor','Oracle',...
                'URL',['jdbc:oracle:thin:@(DESCRIPTION = '...
                '(ADDRESS = (PROTOCOL = TCP)(HOST = sname)'...
                '(PORT = 123456)) (CONNECT_DATA = '...
                '(SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )']);
```

2 Close the database connection conn.

```
close(conn)
```

See Also

close | database | javaaddpath

More About

- “Using Database Explorer” on page 4-63

- "Bringing Java Classes into MATLAB Workspace"

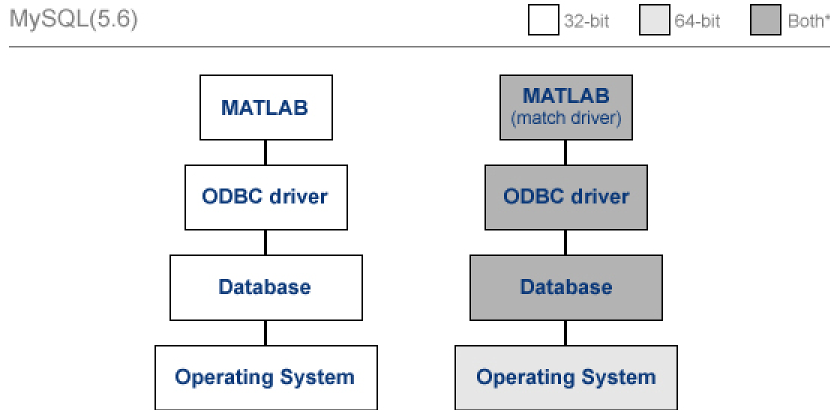
MySQL ODBC for Windows

This tutorial shows how to set up a data source and connect to your MySQL database. This tutorial uses the MySQL ODBC 5.2a Driver version 5.02.04.00 to connect to the MySQL Version 5.5.16 database.

In this section...
"Step 1. Check the 32-bit and 64-bit compatibility." on page 2-58
"Step 2. Verify the driver installation." on page 2-59
"Step 3. Set up the data source using Database Explorer." on page 2-59
"Step 4. Connect using Database Explorer or the command line." on page 2-62

Step 1. Check the 32-bit and 64-bit compatibility.

The following diagram shows the supported compatibility for 32-bit and 64-bit across MATLAB, ODBC driver, database, and operating system. The diagram shows the operating system, ODBC driver, and MATLAB that are installed on your machine. However, you can install the database locally or remotely. MATLAB displays an error if the bitness is not matched correctly among these items. For related error messages, see "Database Connection Error Messages" on page 3-9. If you are running 32-bit or 64-bit MATLAB, the corresponding 32-bit or 64-bit Microsoft ODBC Administrator opens when you start creating a new ODBC data source using Database Explorer. The drivers listed in the Create New Data Source dialog box in the Microsoft ODBC Administrator are also 32-bit or 64-bit respectively.

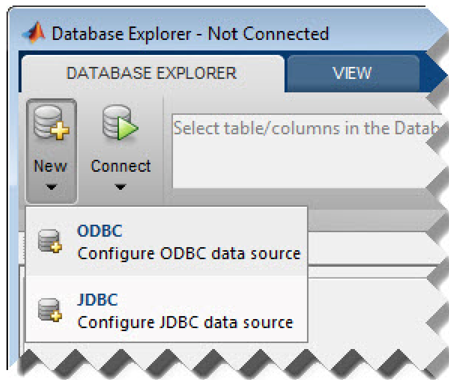


Step 2. Verify the driver installation.

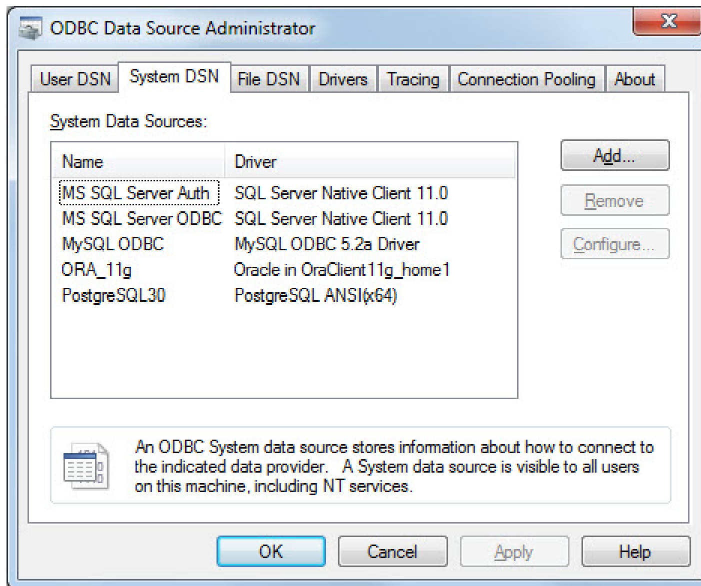
The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

Step 3. Set up the data source using Database Explorer.

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **ODBC**.



The ODBC Data Source Administrator dialog box to define the ODBC data source opens.

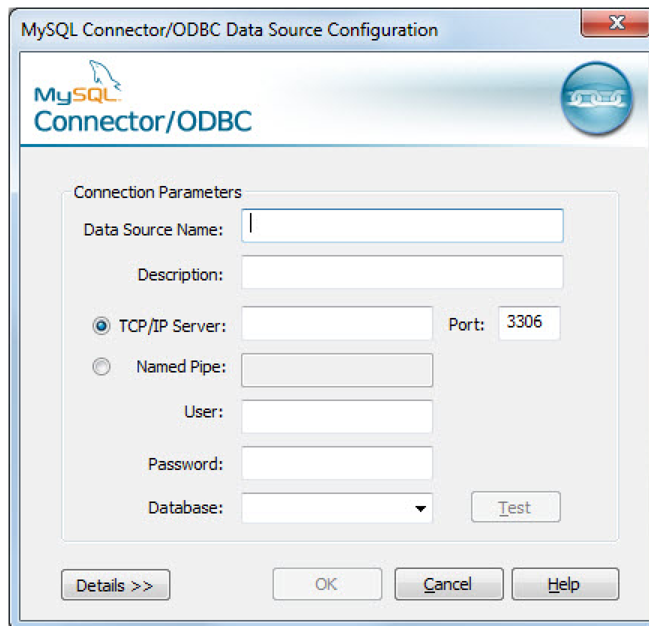


3 Click the **System DSN** tab and then click **Add**. When setting up an ODBC data source, you can use a User DSN or System DSN. A User DSN is specific to the user on a machine. Any data sources a user defines under User DSN are only seen by that specific user. Conversely, a System DSN is not specific to the user on a machine. Any

data sources a user defines under System DSN on a machine can be seen by any user who logs into that machine. Your ability to set up a User DSN or System DSN might depend on the database and ODBC driver you are using. For details, contact your database administrator or your database ODBC driver documentation.

4 A list of installed ODBC drivers appears in the Create New Data Source dialog box. Select the ODBC driver `MySQL ODBC 5.2a Driver`. Your ODBC driver might have a different name. Click **Finish**.

5 The MySQL Connector/ODBC Data Source Configuration dialog box opens. Enter an appropriate name for your data source in the **Data Source Name** field. You use this name to establish a connection to your database. For this example, enter `MySQL` as the data source name. Enter a description for this data source, such as `MySQL database`, in the **Description** field. Enter your database server name in the **TCP/IP Server** field. Enter your port number in the **Port** field. The default port number is `3306`. Enter your user name in the **User** field. Enter your password in the **Password** field. Enter your database name in the **Database** field. Leave all tabs under the **Details** button with default settings.



6 Click **Test** to test the connection to your database. The Test Result dialog box opens. If your computer successfully connects to the database, the dialog box displays Connection successful.

7 Click **OK** in the MySQL Connector/ODBC Data Source Configuration dialog box.

   The ODBC Data Source Administrator dialog box shows the ODBC data source `MySQL`.

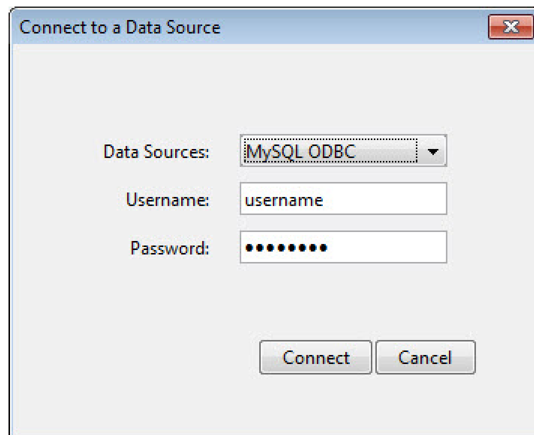
   With the data source setup completed, you can connect to the MySQL database using Database Explorer or the command line using the native ODBC connection.

Step 4. Connect using Database Explorer or the command line.

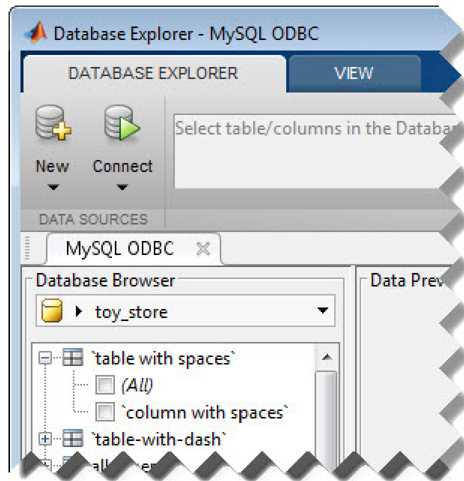
Connect to MySQL using Database Explorer.

1 After setting up the data source, click **Connect** in the **Database Explorer** tab. The Connect to a Data Source dialog box opens.

2 Connect to your database by selecting the data source name for the MySQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

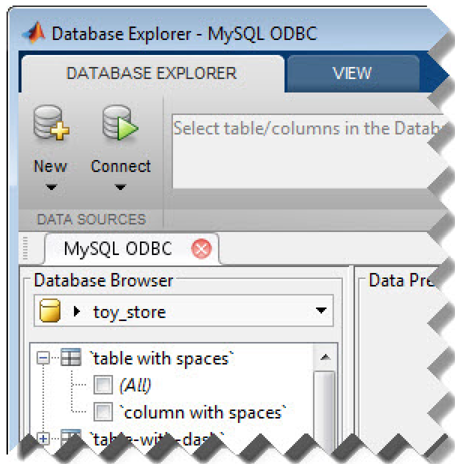


   Database Explorer connects to your database and displays its contents in a tab named with the data source name.



3 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MySQL ODBC** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to MySQL using the native ODBC connection command line.

1. Connect to the database with the ODBC data source name. For example, the following code assumes you are connecting to a data source named `MySQL` with user name `username` and password `pwd`.

   ```
   conn = database.ODBCConnection('MySQL','username','pwd');
   ```

2. Close the database connection `conn`.

   ```
   close(conn)
   ```

See Also

`close` | `database`

More About

- "Using Database Explorer" on page 4-63

MySQL JDBC for Windows

This tutorial shows how to set up a data source and connect to your MySQL database. This tutorial uses the MySQL Connector/J 5.1.17 driver to connect to the MySQL Version 5.5.16 database.

In this section...
"Step 1. Verify the driver installation." on page 2-65
"Step 2. Add JDBC driver to the MATLAB static Java class path." on page 2-65
"Step 3. Set up the data source using Database Explorer." on page 2-66
"Step 4. Connect using Database Explorer or the command line." on page 2-68

Step 1. Verify the driver installation.

If the JDBC driver for MySQL is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add JDBC driver to the MATLAB static Java class path.

1 Run the `prefdir` command in the MATLAB Command Window. The output of this command is a file path to a folder on your computer.
2 Close MATLAB if it is running.
3 Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4 Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name. For example, `C:\DB_Drivers\mysql-connector-java-5.1.17-bin.jar`. Save and close the `javaclasspath.txt` file.
5 Restart MATLAB.

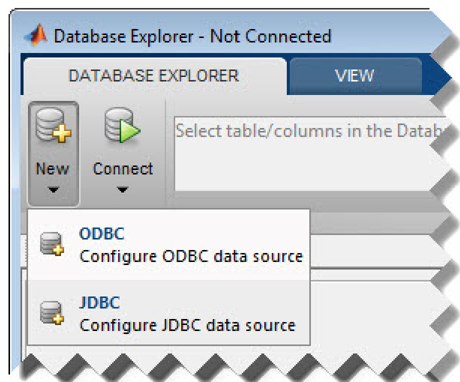
Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

Step 3. Set up the data source using Database Explorer.

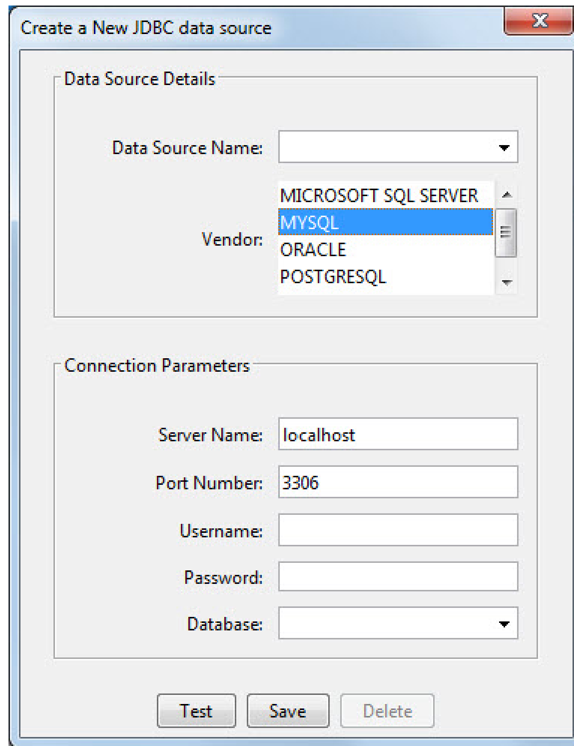
This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to MySQL using the JDBC connection command line.” on page 2-70

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

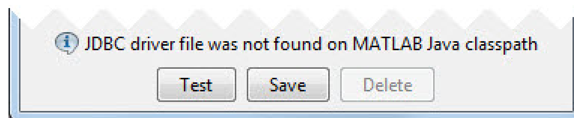
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select MYSQL from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.



4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

7 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

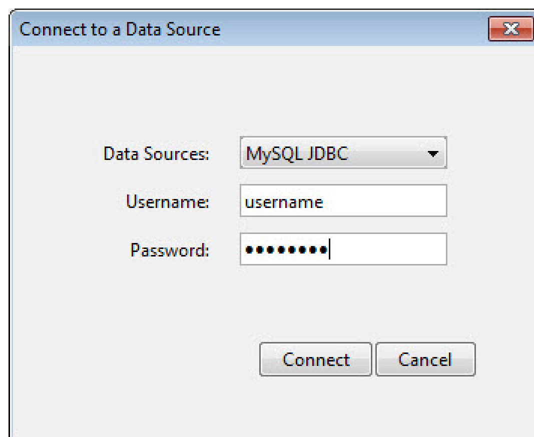
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the MySQL database using Database Explorer or the command line with the JDBC connection.

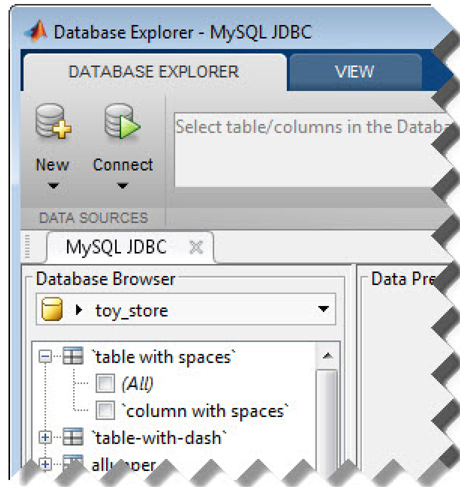
Step 4. Connect using Database Explorer or the command line.

Connect to MySQL using Database Explorer.

1 After setting up the data source, connect to your database by selecting the data source name for the MySQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

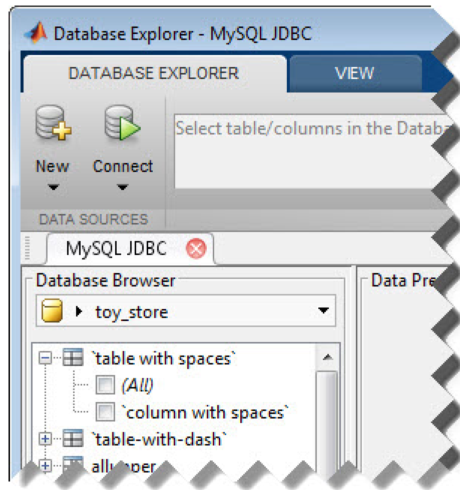


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MySQL JDBC** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to MySQL using the JDBC connection command line.

1. Use the `Vendor` name-value pair argument of `database` to specify a connection to a MySQL database. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`.

```
conn = database('dbname','username','pwd',...
                'Vendor','MySQL',...
                'Server','sname');
```

2. Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

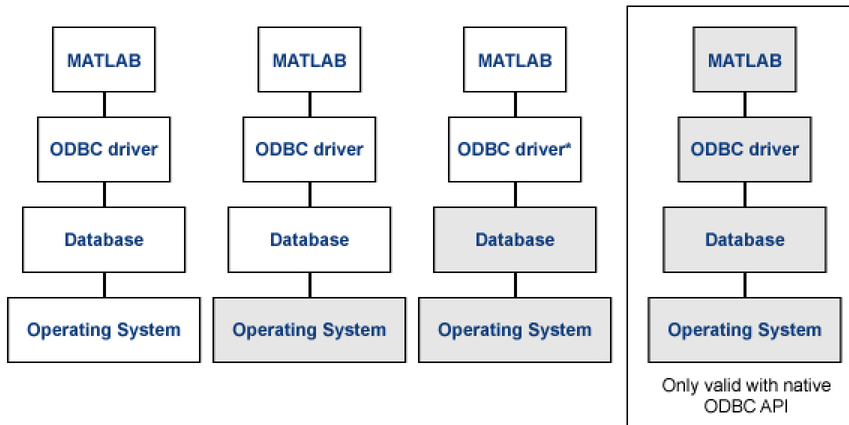
PostgreSQL ODBC for Windows

This tutorial shows how to set up a data source and connect to your PostgreSQL database. This tutorial uses the PostgreSQL ANSI(x64) driver version 9.01.02.00 to connect to the PostgreSQL 9.2 database.

In this section...
"Step 1. Check the 32-bit and 64-bit compatibility." on page 2-71
"Step 2. Verify the driver installation." on page 2-72
"Step 3. Set up the data source using Database Explorer." on page 2-72
"Step 4. Connect using Database Explorer or the command line." on page 2-75

Step 1. Check the 32-bit and 64-bit compatibility.

The following diagram shows the supported compatibility for 32-bit and 64-bit across MATLAB, ODBC driver, database, and operating system. The diagram shows the operating system, ODBC driver, and MATLAB that are installed on your machine. However, you can install the database locally or remotely. MATLAB displays an error if the bitness is not matched correctly among these items. For related error messages, see "Database Connection Error Messages" on page 3-9. If you are running 32-bit or 64-bit MATLAB, the corresponding 32-bit or 64-bit Microsoft ODBC Data Source Administrator opens when you start creating a new ODBC data source using Database Explorer. The drivers listed in the Create New Data Source dialog box in the Microsoft ODBC Data Source Administrator are also 32-bit or 64-bit respectively. The following steps use 64-bit for MATLAB, the ODBC driver, the database, and the operating system.

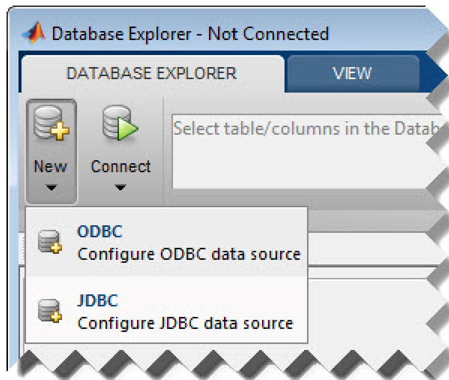


Step 2. Verify the driver installation.

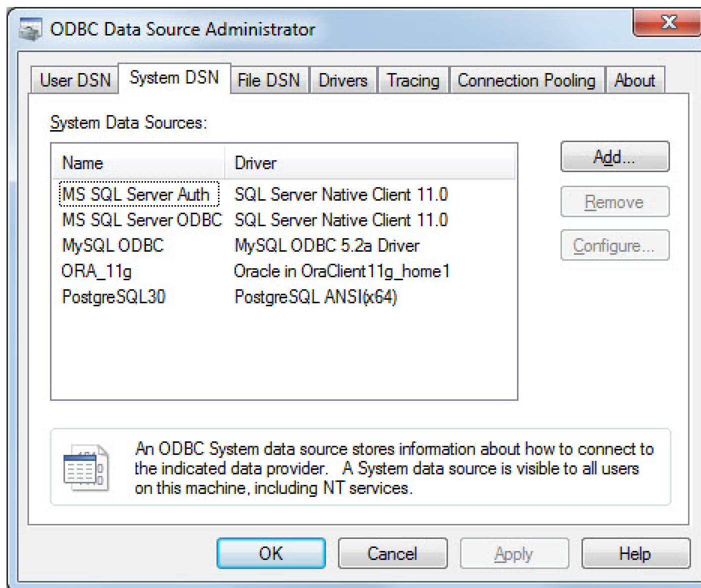
The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

Step 3. Set up the data source using Database Explorer.

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **ODBC**.



The ODBC Data Source Administrator dialog box opens. Here, you can define the ODBC data source

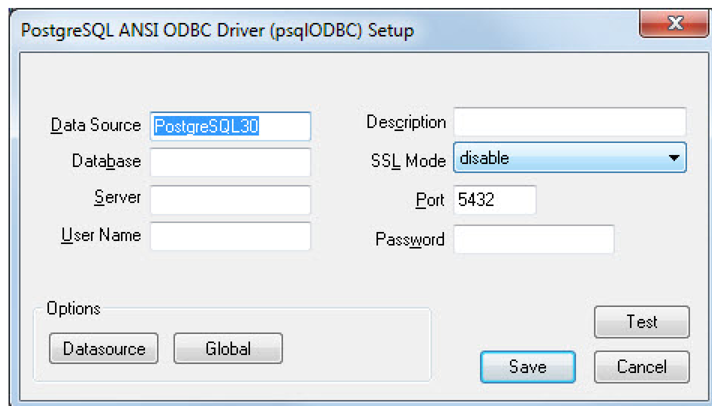


3 Click the **System DSN** tab and then click **Add**. When setting up an ODBC data source, you can use a User DSN or System DSN. A User DSN is specific to the user on a machine. Any data sources a user defines under User DSN are only seen by that specific user. Conversely, a System DSN is not specific to the user on a machine. Any

data sources a user defines under System DSN on a machine can be seen by any user who logs into that machine. Your ability to set up a User DSN or System DSN might depend on the database and ODBC driver you are using. For details, contact your database administrator or your database ODBC driver documentation.

4 A list of installed ODBC drivers appears in the Create New Data Source dialog box. Select the ODBC driver `PostgreSQL ANSI(x64)`. Your ODBC driver might have a different name. Click **Finish**.

5 The PostgreSQL ANSI ODBC Driver (psqlODBC) Setup dialog box opens. Enter an appropriate name for your data source in the **Data Source** field. You use this name to establish a connection to your database. For this example, enter `PostgreSQL30` as the data source name. Enter a description for this data source, such as `PostgreSQL database`, in the **Description** field. Enter your database name in the **Database** field. Enter your database server name in the **Server** field. Enter your port number in the **Port** field. The default port number is `5432`. Enter your user name in the **User Name** field. Enter your password in the **Password** field. Leave all settings in the **Options** section with default settings.



6 Click **Test** to test the connection to your database. The Connection Test dialog box opens. If your computer successfully connects to the database, the dialog box displays Connection successful.

7 Click **Save** in the PostgreSQL ANSI ODBC Driver (psqlODBC) Setup dialog box. The ODBC Data Source Administrator dialog box shows the ODBC data source `PostgreSQL30`.

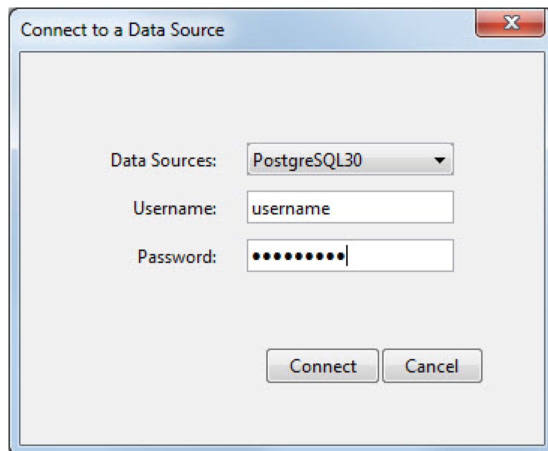
With the data source setup completed, you can connect to the PostgreSQL database using Database Explorer or the native ODBC connection command line.

Step 4. Connect using Database Explorer or the command line.

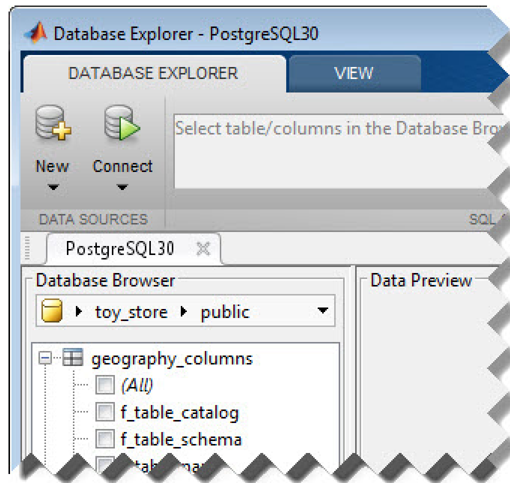
Connect to PostgreSQL using Database Explorer.

If you experience issues connecting using Database Explorer, use the command line with the native ODBC interface or JDBC to connect to your database.

1. After setting up the data source, click **Connect** in the **Database Explorer** tab. The Connect to a Data Source dialog box opens.
2. Connect to your database by selecting the data source name for the PostgreSQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

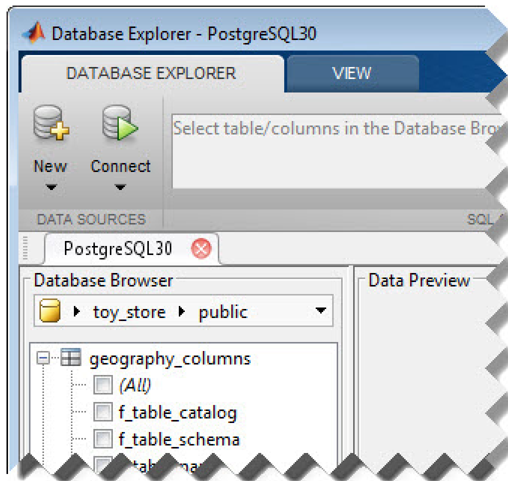


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



3. Close the connection using Database Explorer by hovering over the Close button ( ) next to the **PostgreSQL30** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

   If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to PostgreSQL using the native ODBC connection command line.

1 Connect to the database with the ODBC data source name. For example, the following code assumes you are connecting to a data source named `PostgreSQL` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('PostgreSQL','username','pwd');
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database`

More About

- "Using Database Explorer" on page 4-63

PostgreSQL JDBC for Windows

This tutorial shows how to set up a data source and connect to your PostgreSQL database. This tutorial uses the JDBC4 PostgreSQL Driver, Version 8.4 to connect to the PostgreSQL 9.2 database.

In this section...
"Step 1. Verify the driver installation." on page 2-78
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-78
"Step 3. Set up the data source using Database Explorer." on page 2-79
"Step 4. Connect using Database Explorer or the command line." on page 2-81

Step 1. Verify the driver installation.

If the JDBC driver for PostgreSQL is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

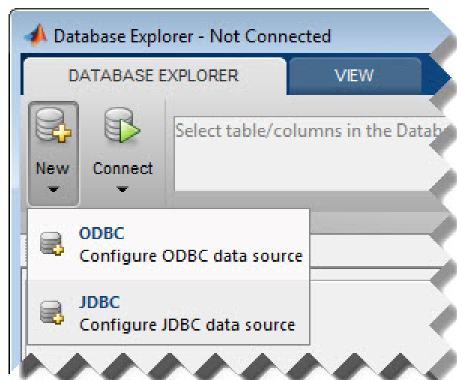
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `C:\DB_Drivers\postgresql-8.4-702.jdbc4.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

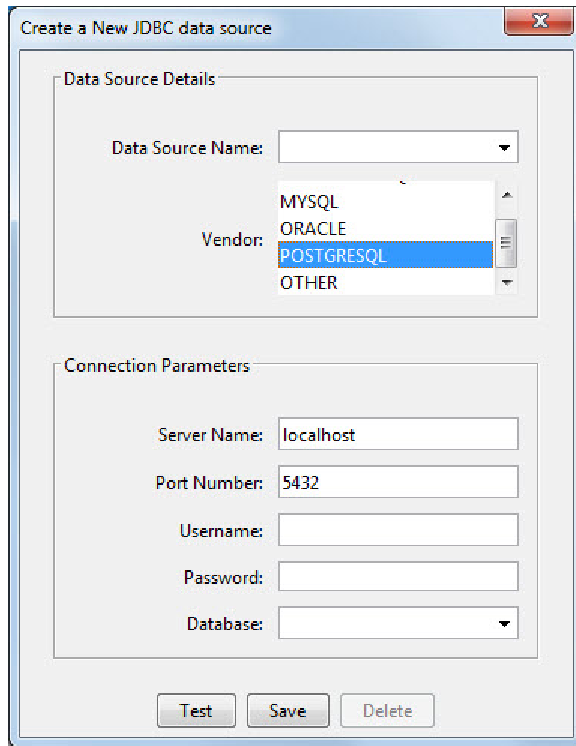
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to PostgreSQL using the JDBC connection command line.” on page 2-83

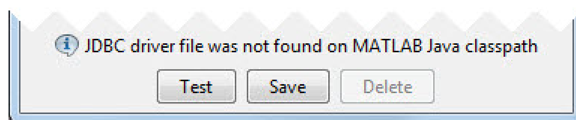
1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select POSTGRESQL from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.



4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

7 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

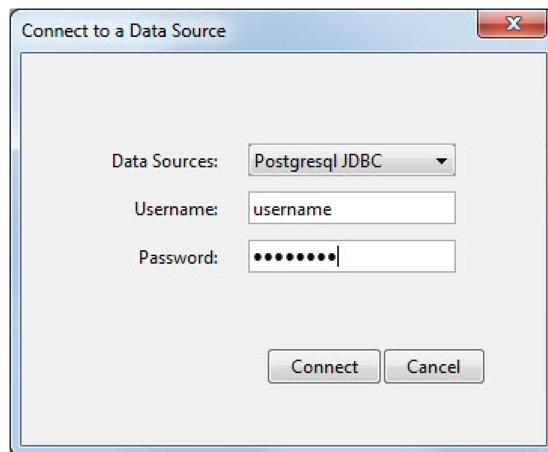
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the PostgreSQL database using Database Explorer or the command line with the JDBC connection.

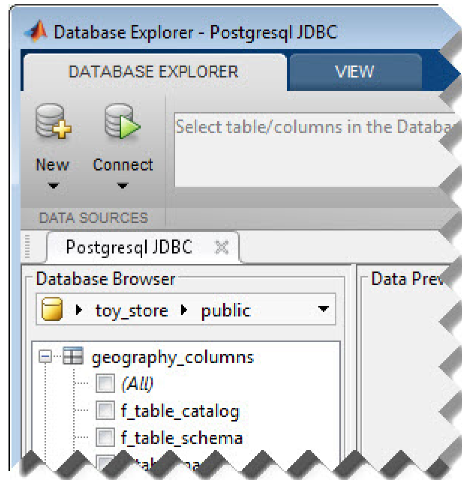
Step 4. Connect using Database Explorer or the command line.

Connect to PostgreSQL using Database Explorer.

1 After setting up the data source, connect to your database by selecting the data source name for the PostgreSQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

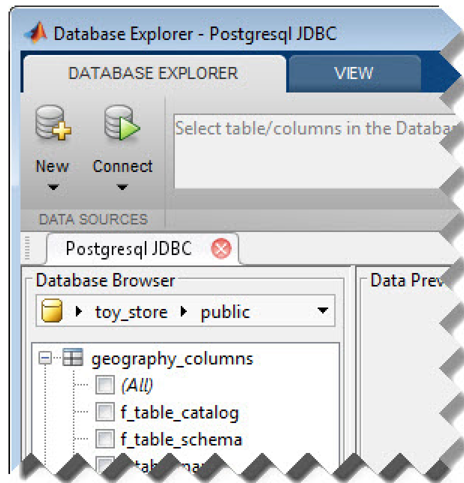


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **Postgresql JDBC** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to PostgreSQL using the JDBC connection command line.

1. Use the `Vendor` name-value pair argument of `database` to specify a connection to a PostgreSQL database. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`.

```
conn = database('dbname','username','pwd',...
                'Vendor','PostgreSQL',...
                'Server','sname');
```

2. Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- “Using Database Explorer” on page 4-63
- “Bringing Java Classes into MATLAB Workspace”

SQLite JDBC for Windows

This tutorial shows how to set up a data source and connect to your SQLite database. This tutorial uses the SQLite JDBC 3.7.2 Driver to connect to the SQLite Version 3.7.17 database.

In this section...
"Step 1. Verify the driver installation." on page 2-84
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-84
"Step 3. Set up the data source using Database Explorer." on page 2-85
"Step 4. Connect using Database Explorer or the command line." on page 2-87

Step 1. Verify the driver installation.

If the JDBC driver for SQLite is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

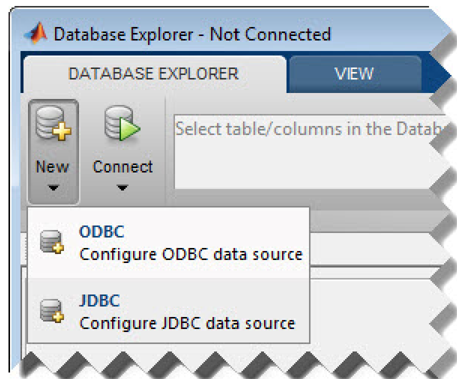
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `C:\DB_Drivers\sqlite-jdbc-3.7.2.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

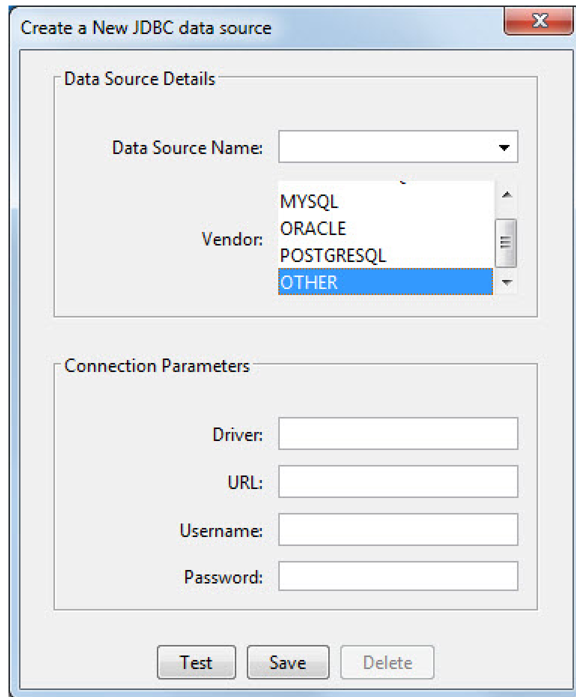
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to SQLite using the JDBC connection command line.” on page 2-89 The driver and URL fields (in Database Explorer Create a New JDBC data source dialog box and in the `database` function) can vary depending on the type and version of the JDBC driver and the database you are working with. For details about the driver and URL, see the JDBC driver documentation for your database.

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **JDBC**.

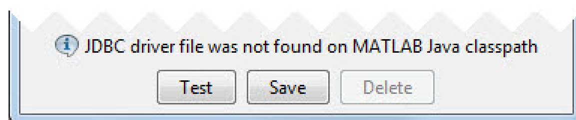


The Create a New JDBC data source dialog box opens.



3 Select `OTHER` from the **Vendor** list.

4 Enter the SQLite driver Java class object in the **Driver** field. For this example, use `org.sqlite.JDBC`. After entering the driver, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.



5 Connect to the SQLite database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sqlite`. The last part of the URL string is `subname`. For SQLite, this contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where

`dbpath` is the full path to your SQLite database on your computer. Enter your string into the **URL** field.

6. Enter your user name in the **Username** field and your password in the **Password** field, or leave them blank if your database does not need them. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
7. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
8. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

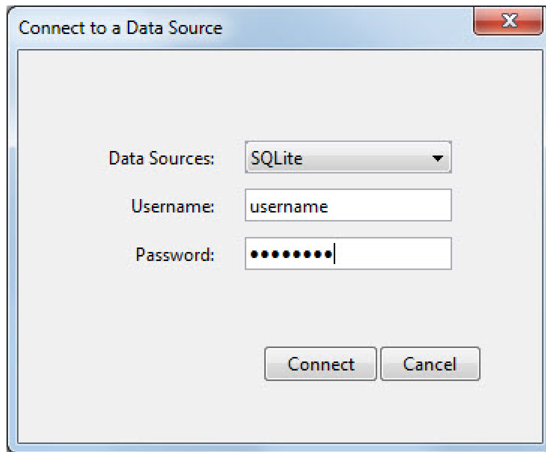
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the SQLite database using Database Explorer or the command line with the JDBC connection.

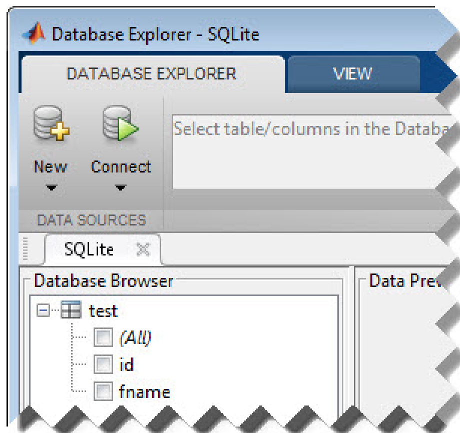
Step 4. Connect using Database Explorer or the command line.

Connect to SQLite using Database Explorer.

1. After setting up the data source, connect to your database by selecting the data source name for the SQLite database from the **Data Sources** list. Enter a user name and password or leave them blank if your database does not require them. Click **Connect**.

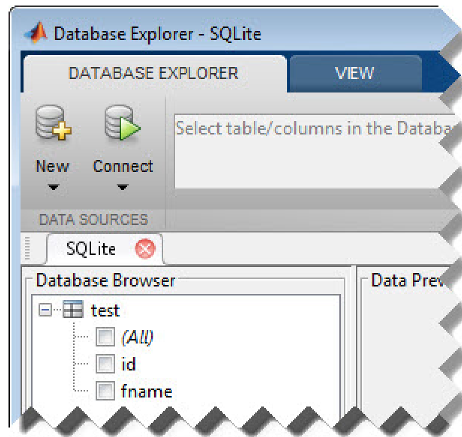


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **SQLite** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button (☒) to close all database connections and Database Explorer.



Connect to SQLite using the JDBC connection command line.

1. Create a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sqlite`. The last part of the URL string is `subname`. For SQLite, this contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer.

2. Connect to the SQLite database by using the `database` function. Enter the full path to your SQLite database `dbpath` for the first argument, or leave this argument blank and include the full path in the URL string `URL`. Enter your user name `username` and password `pwd`, or leave these blank if your database does not require them. The fourth argument is the driver Java class object. This code assumes the class object is `org.sqlite.JDBC`. The last argument is the URL string `URL`.

   ```
   conn = database(dbpath,username,pwd,'org.sqlite.JDBC','URL');
   ```

3. Close the database connection `conn`.

   ```
   close(conn)
   ```

See Also

`close` | `database` | `javaaddpath`

More About

- “Using Database Explorer” on page 4-63
- “Bringing Java Classes into MATLAB Workspace”

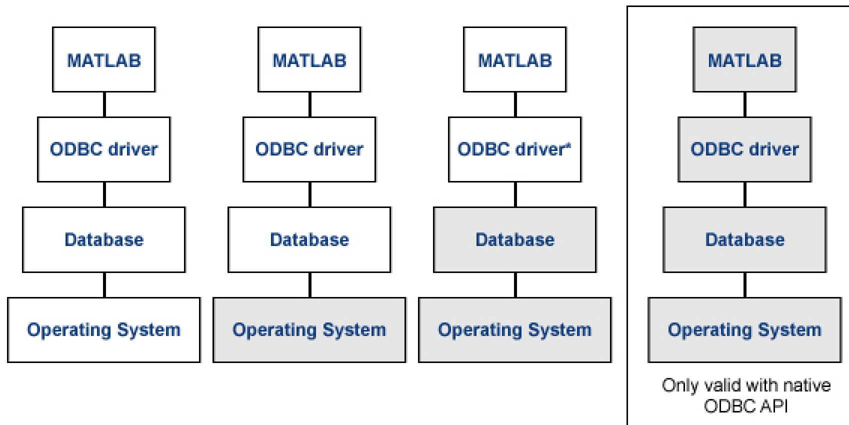
Sybase ODBC for Windows

This tutorial shows how to set up a data source and connect to your Sybase database. This tutorial uses the Adaptive Server Enterprise Version 15.07.00.401 ODBC Driver to connect to the Sybase Adaptive Server Enterprise 15.7 database.

In this section...
“Step 1. Check the 32-bit and 64-bit compatibility.” on page 2-91
“Step 2. Verify the driver installation.” on page 2-92
“Step 3. Set up the data source using Database Explorer.” on page 2-92
“Step 4. Connect using Database Explorer or the command line.” on page 2-96

Step 1. Check the 32-bit and 64-bit compatibility.

The following diagram shows the supported compatibility for 32-bit and 64-bit across MATLAB, ODBC driver, database, and operating system. The diagram shows the operating system, ODBC driver, and MATLAB that are installed on your machine. However, you can install the database locally or remotely. MATLAB displays an error if the bitness is not matched correctly among these items. For related error messages, see “Database Connection Error Messages” on page 3-9. If you are running 32-bit or 64-bit MATLAB, the corresponding 32-bit or 64-bit Microsoft ODBC Administrator opens when you start creating a new ODBC data source using Database Explorer. The drivers listed in the Create New Data Source dialog box in the Microsoft ODBC Administrator are also 32-bit or 64-bit respectively. The following steps use 64-bit for MATLAB, the ODBC driver, the database, and the operating system.

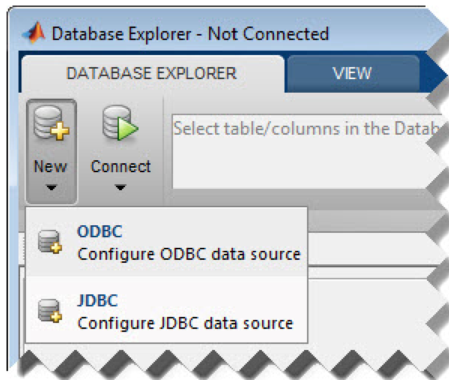


Step 2. Verify the driver installation.

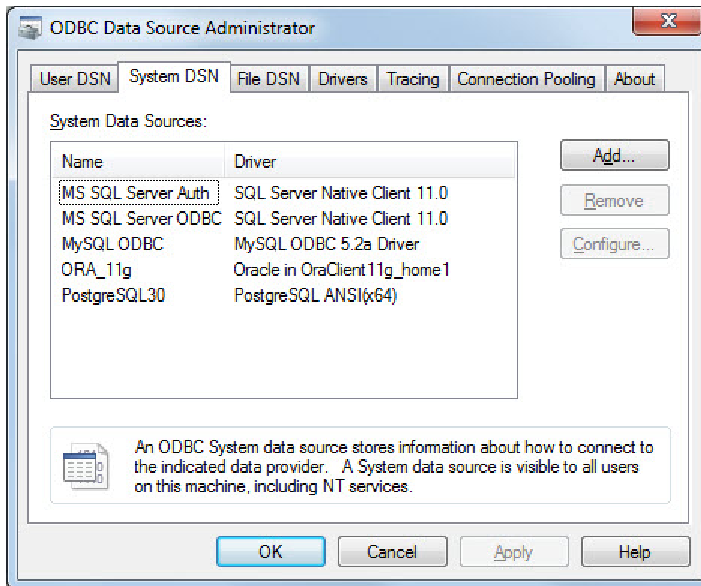
The ODBC driver is typically preinstalled on your computer. For details about the driver installation or troubleshooting the installation, contact your database administrator or refer to your database documentation on ODBC drivers. For information about the Microsoft ODBC Data Source Administrator, see Driver Installation.

Step 3. Set up the data source using Database Explorer.

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **ODBC**.



The ODBC Data Source Administrator dialog box to define the ODBC data source opens.

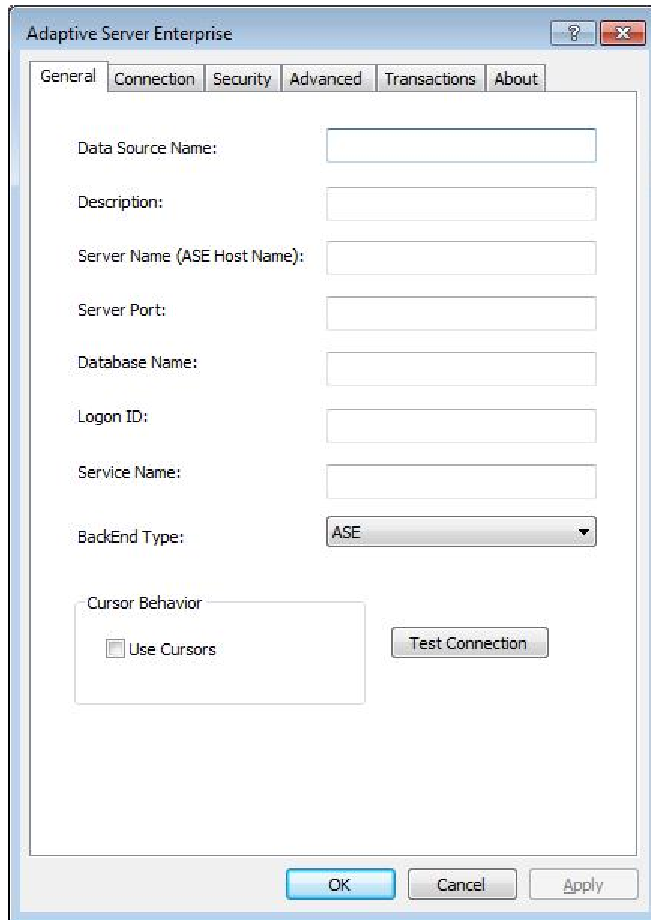


3 Click the **System DSN** tab and then click **Add**. When setting up an ODBC data source, you can use a User DSN or System DSN. A User DSN is specific to the user on a machine. Any data sources a user defines under User DSN are only seen by that specific user. Conversely, a System DSN is not specific to the user on a machine. Any

data sources a user defines under System DSN on a machine can be seen by any user who logs into that machine. Your ability to set up a User DSN or System DSN might depend on the database and ODBC driver you are using. For details, contact your database administrator or your database ODBC driver documentation.

4. A list of installed ODBC drivers appears in the Create New Data Source dialog box. Select the ODBC driver `Adaptive Server Enterprise`. Your ODBC driver might have a different name. Click **Finish**.

5. The Adaptive Server Enterprise dialog box opens. Enter an appropriate name for your data source in the **Data Source Name** field. You use this name to establish a connection to your database. For this example, enter `Sybase` as the data source name. Enter a description for this data source, such as `Sybase database`, in the **Description** field. Enter your database server name in the **Server Name (ASE Host Name)** field. Enter your port number in the **Server Port** field. Enter your database name in the **Database Name** field. Enter your user name in the **Logon ID** field. Leave all other tabs with default settings.



6 Click **Test Connection** to test the connection to your database. Another screen appears with login information. Enter your user name in the **Logon ID** field and your password in the **Password** field. The other three fields are prepopulated with your specific data.

7 Click **OK**. If your computer successfully connects to the database, the dialog box displays Login Succeeded.

8 Click **OK** in the Adaptive Server Enterprise dialog boxes to close them. The ODBC Data Source Administrator dialog box shows the ODBC data source `Sybase`.

With the data source setup completed, you can connect to the Sybase database using Database Explorer or the command line using the native ODBC connection.

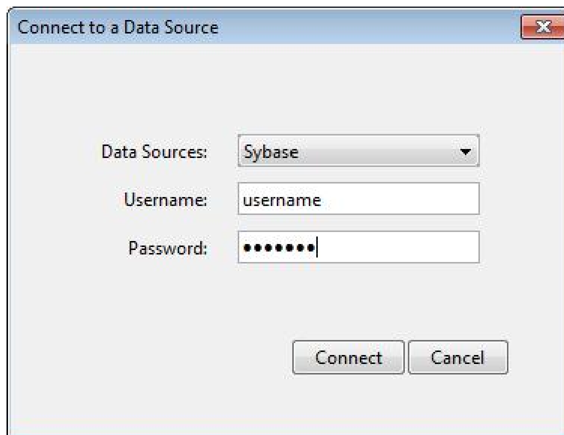
Step 4. Connect using Database Explorer or the command line.

Connect to Sybase using Database Explorer.

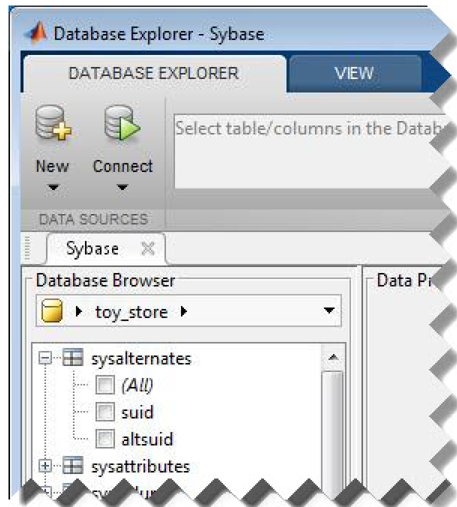
If you experience issues connecting using Database Explorer, use the native ODBC interface with the command line or JDBC to connect to your database.

1 After setting up the data source, click **Connect** in the **Database Explorer** tab. The Connect to a Data Source dialog box opens.

2 Connect to your database by selecting the data source name for the Sybase database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

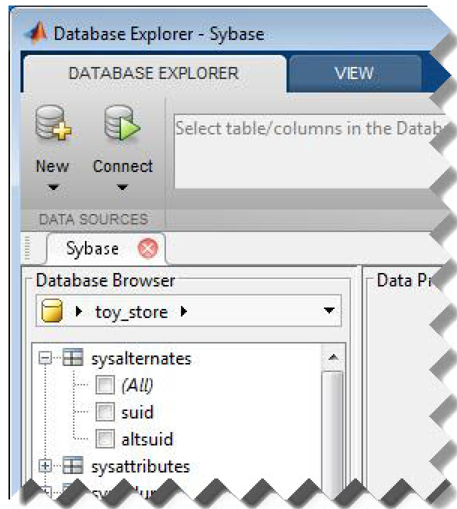


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



3 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **Sybase** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Sybase using the native ODBC connection command line.

1 Connect to your database with the ODBC data source name. For example, the following code assumes you are connecting to a data source named `Sybase` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('Sybase','username','pwd');
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database`

More About

- "Using Database Explorer" on page 4-63

Sybase JDBC for Windows

This tutorial shows how to set up a data source and connect to your Sybase database. This tutorial uses the jConnect 4 JDBC Driver to connect to the Sybase Adaptive Server Enterprise 15.7 database.

In this section…
“Step 1. Verify the driver installation.” on page 2-99
“Step 2. Add the JDBC driver to the MATLAB static Java class path.” on page 2-99
“Step 3. Set up the data source using Database Explorer.” on page 2-100
“Step 4. Connect using Database Explorer or the command line.” on page 2-102

Step 1. Verify the driver installation.

If the JDBC driver for Sybase is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

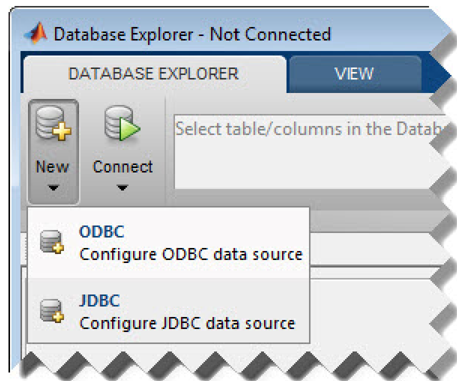
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `C:\DB_Drivers\jconn4.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Bringing Java Classes into MATLAB Workspace”.

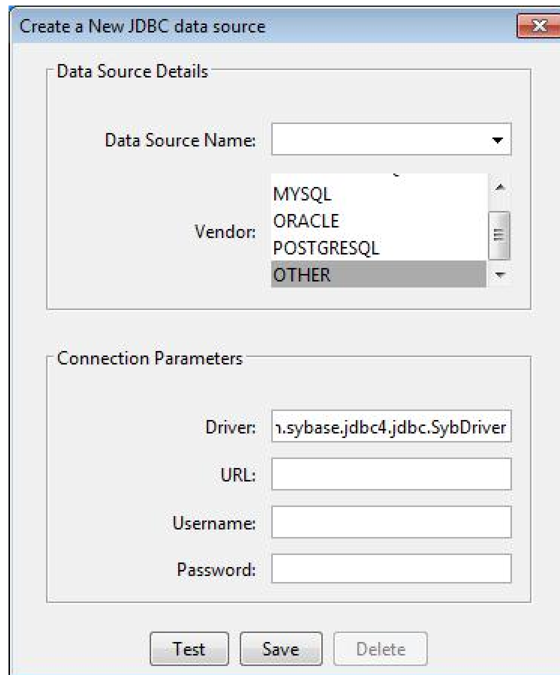
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see "Connect to Sybase using the JDBC connection command line." on page 2-104 The driver and URL fields (in the Database Explorer Create a New JDBC data source dialog box and in the `database` function) can vary depending on the type and version of the JDBC driver and the database you are working with. For details about the driver and URL, see the JDBC driver documentation for your database.

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **JDBC**.

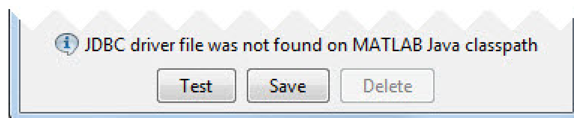


The Create a New JDBC data source dialog box opens.



3 Select `OTHER` from the **Vendor** list.

4 Enter the Sybase driver Java class object in the **Driver** field. For this example, use `com.sybase.jdbc4.jdbc.SybDriver`. After entering the driver, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.



5 Connect to the Sybase database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sybase:Tds`. The last part of the URL string is `subname`. For Sybase, this contains the server name, the port number, and the database name. For example, your string is `jdbc:sybase:Tds:ServerName:PortNumber/dbname`, where `ServerName` is

your server name, `PortNumber` is your port number, and `dbname` is your database name. Enter your full string into the **URL** field.

6 Enter your user name in the **Username** field and your password in the **Password** field. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

7 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

8 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

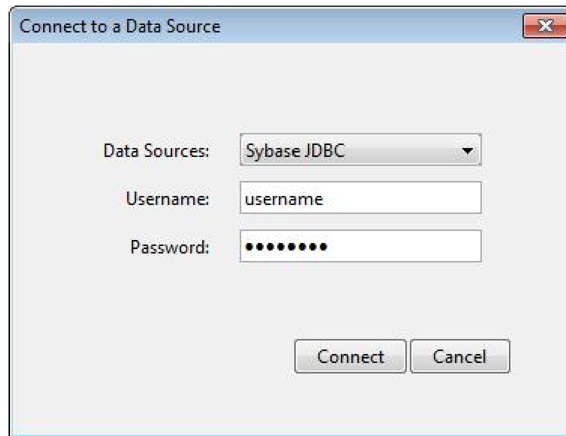
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Sybase database using Database Explorer or the command line with the JDBC connection.

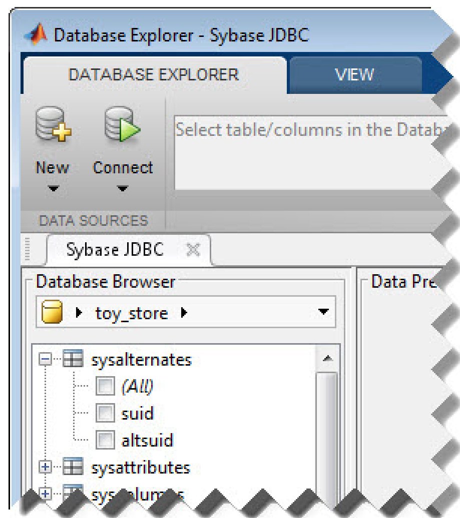
Step 4. Connect using Database Explorer or the command line.

Connect to Sybase using Database Explorer.

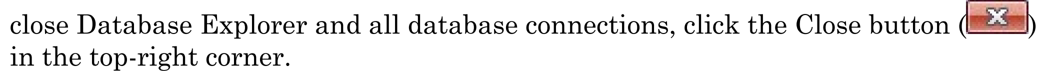
1 After setting up the data source, connect to your database by selecting the data source name for the Sybase database from the **Data Sources** list. Enter a user name and password. Click **Connect**.



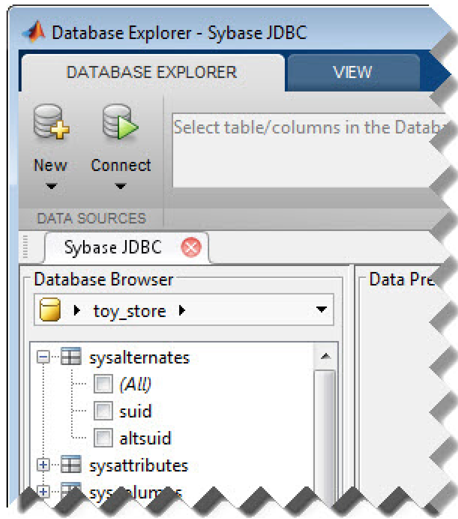
Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **Sybase JDBC** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to

close Database Explorer and all database connections, click the Close button () in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Sybase using the JDBC connection command line.

1. Create a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sybase:Tds`. The last part of the URL string is `subname`. For Sybase, this contains the server name, the port number, and the database name. For example, your URL string is `jdbc:sybase:Tds:ServerName:PortNumber/dbname`, where `ServerName` is your server name, `PortNumber` is your port number, and `dbname` is your database name.
2. Connect to the Sybase database using the `database` function. For example, the following code assumes you are connecting to a database named `dbname` with user name `username` and password `pwd`. The fourth argument is the driver Java class object. This code assumes the class object is `com.sybase.jdbc4.jdbc.SybDriver`. The last argument is the URL string `URL`.

```
conn = database('dbname','username','pwd',...
```

```
                'com.sybase.jdbc4.jdbc.SybDriver','URL');
```

3 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

Microsoft SQL Server JDBC for Mac OS X

This tutorial shows how to set up a data source and connect to your Microsoft SQL Server database. This tutorial uses the Microsoft JDBC Driver 4.0 for Microsoft SQL Server to connect to the Microsoft SQL Server 2012 Express database.

In this section...
“Step 1. Verify the driver installation.” on page 2-106
“Step 2. Add the JDBC driver to the MATLAB static Java class path.” on page 2-106
“Step 3. Set up the data source using Database Explorer.” on page 2-107
“Step 4. Connect using Database Explorer or the command line.” on page 2-109

Step 1. Verify the driver installation.

If the JDBC driver for Microsoft SQL Server is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/sqljdbc4.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

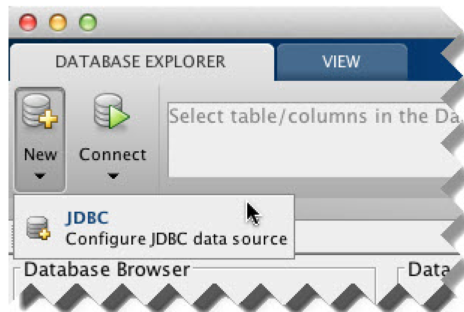
Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Bringing Java Classes into MATLAB Workspace”.

Step 3. Set up the data source using Database Explorer.

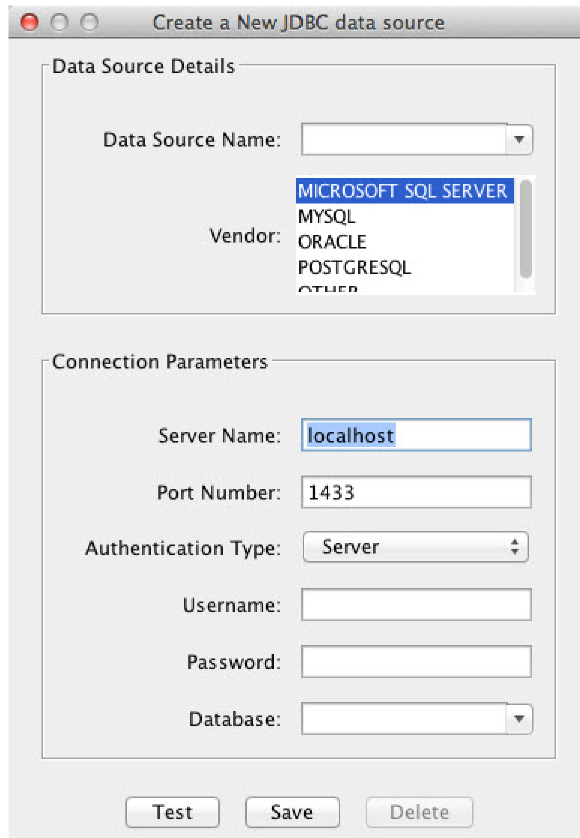
This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to Microsoft SQL Server using the JDBC connection command line.” on page 2-111

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `MICROSOFT SQL SERVER` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name**, port number in the **Port Number** field, user name in the **Username** field, password in the **Password**

field, and database name in the **Database** field. Set the **Authentication Type** to `Server`.

5 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

7 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

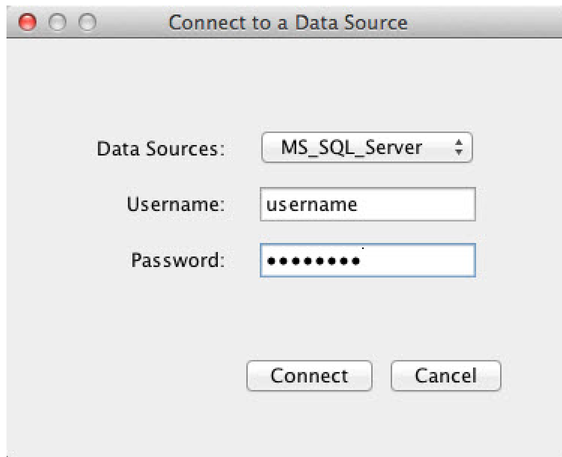
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Microsoft SQL Server database using Database Explorer or the command line with the JDBC connection.

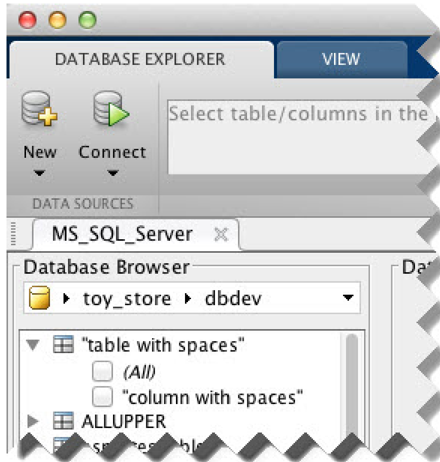
Step 4. Connect using Database Explorer or the command line.

Connect to Microsoft SQL Server using Database Explorer.

1 After setting up the data source, select the data source that you set up from the **Data Sources** list. Enter a user name and password. Click **Connect**.



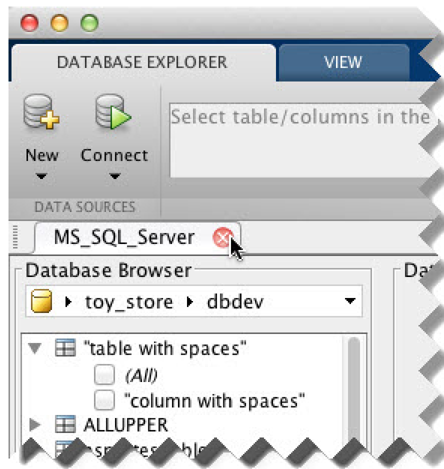
Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MS_SQL_Server** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you

want to close Database Explorer and all database connections, click the Close button ( ) in the top-left corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Microsoft SQL Server using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of `database` to specify a connection to a Microsoft SQL Server database. Set the `AuthType` name-value pair argument to `Server`. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username`, password `pwd`, and port number as `123456`.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server','Server','sname',...
                'AuthType','Server','PortNumber',123456);
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

Microsoft SQL Server JDBC for Linux

This tutorial shows how to set up a data source and connect to your Microsoft SQL Server database. This tutorial uses the Microsoft JDBC Driver 4.0 for Microsoft SQL Server to connect to the Microsoft SQL Server 2012 Express database.

In this section...
"Step 1. Verify the driver installation." on page 2-113
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-113
"Step 3. Set up the data source using Database Explorer." on page 2-114
"Step 4. Connect using Database Explorer or the command line." on page 2-116

Step 1. Verify the driver installation.

If the JDBC driver for Microsoft SQL Server is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

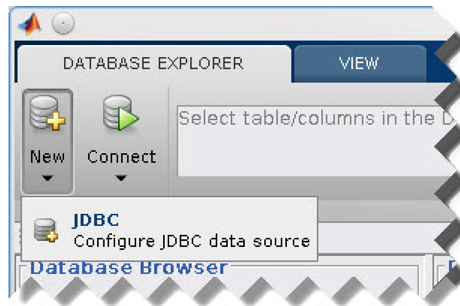
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/sqljdbc4.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

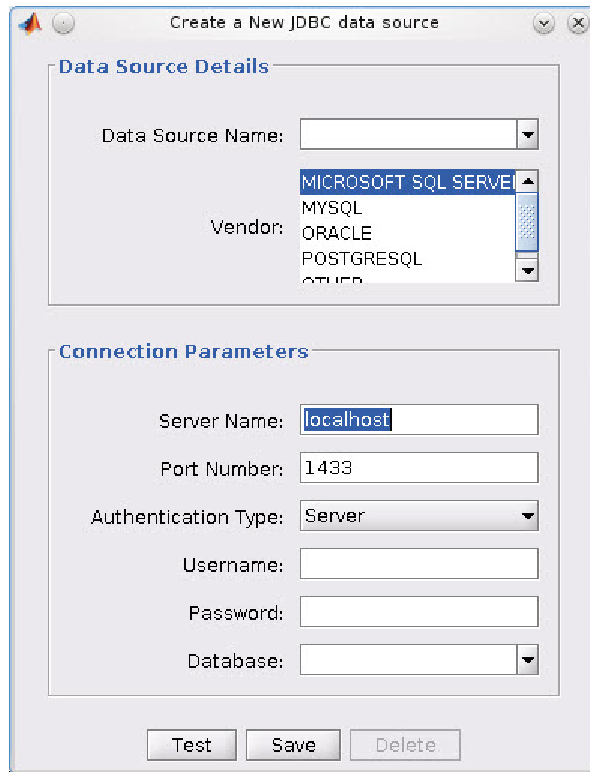
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see "Connect to Microsoft SQL Server using the JDBC connection command line." on page 2-118

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `MICROSOFT SQL SERVER` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field. Set the **Authentication Type** to `Server`.

5. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

7. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

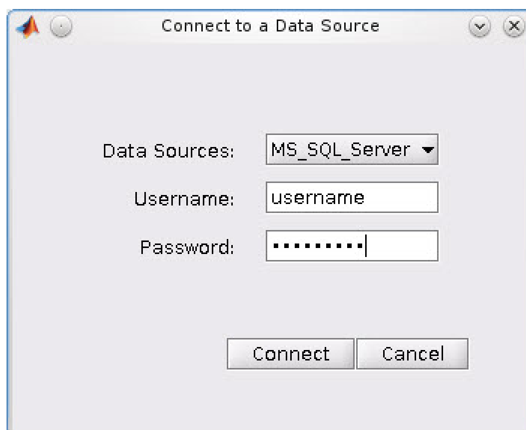
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Microsoft SQL Server database using Database Explorer or the command line with the JDBC connection.

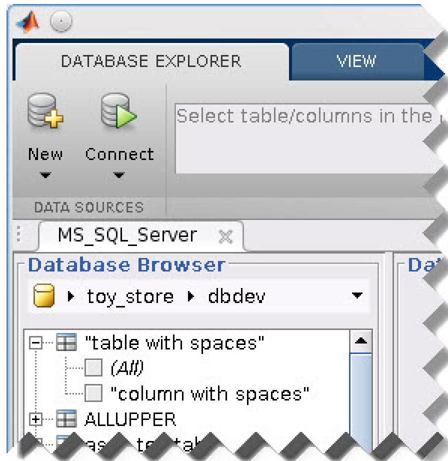
Step 4. Connect using Database Explorer or the command line.

Connect to Microsoft SQL Server using Database Explorer.

1. After setting up the data source, select the data source that you set up from the **Data Sources** list. Enter a user name and password. Click **Connect**.

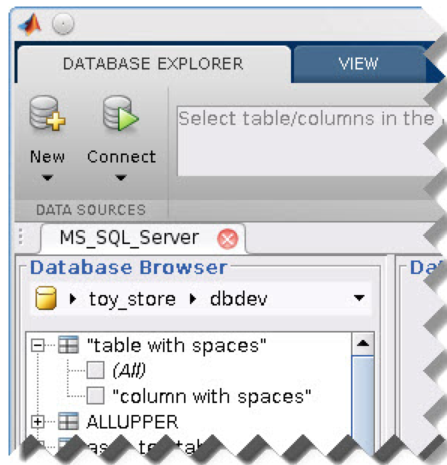


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MS_SQL_Server** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Microsoft SQL Server using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of `database` to specify a connection to a Microsoft SQL Server database. Set the `AuthType` name-value pair argument to `Server`. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username`, password `pwd`, and port number as `123456`.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server','Server','sname',...
                'AuthType','Server','PortNumber',123456);
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63

- "Bringing Java Classes into MATLAB Workspace"

Oracle JDBC for Mac OS X

This tutorial shows how to set up a data source and connect to your Oracle database. This tutorial uses the Oracle Database 11g Release 2 (11.2.0.3) JDBC driver for use with JDK 1.6 to connect to the Oracle 11g Enterprise Edition Release 11.2.0.1.0 database.

In this section...
“Step 1. Verify the driver installation.” on page 2-120
“Step 2. Add the JDBC driver to the MATLAB static Java class path.” on page 2-120
“Step 3. Set up the data source using Database Explorer.” on page 2-121
“Step 4. Connect using Database Explorer or the command line.” on page 2-123

Step 1. Verify the driver installation.

If the JDBC driver for Oracle is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

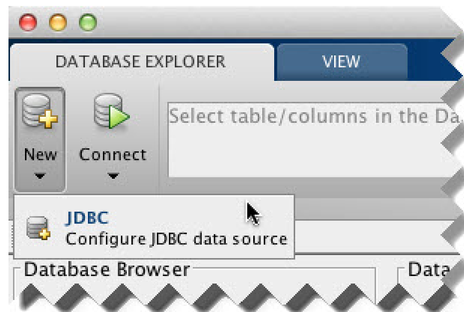
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/ojdbc6.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Bringing Java Classes into MATLAB Workspace”.

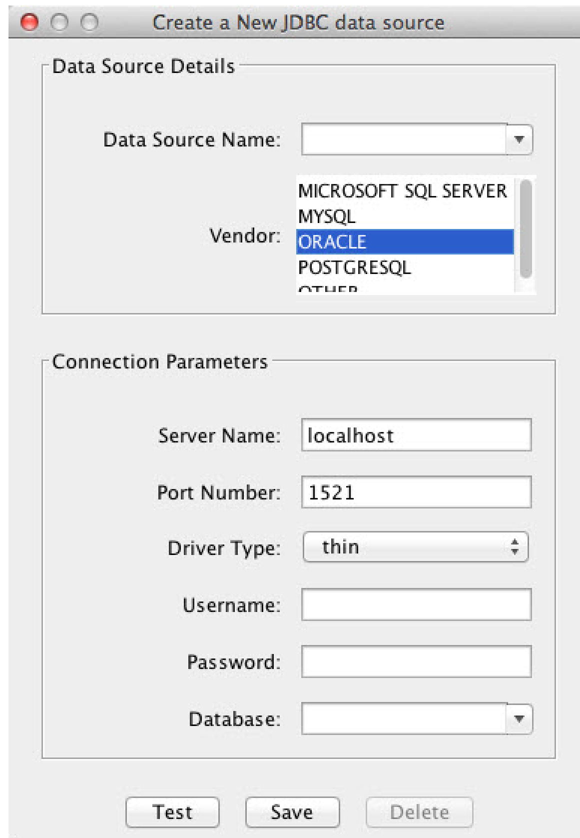
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see "Connect to Oracle using the JDBC connection command line." on page 2-125

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `ORACLE` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field,

and database name in the **Database** field. Select **Driver Type** of `thin` or `oci`. Use `thin` as the default driver. Use `oci` if you installed an OCI driver.

5. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
6. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
7. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

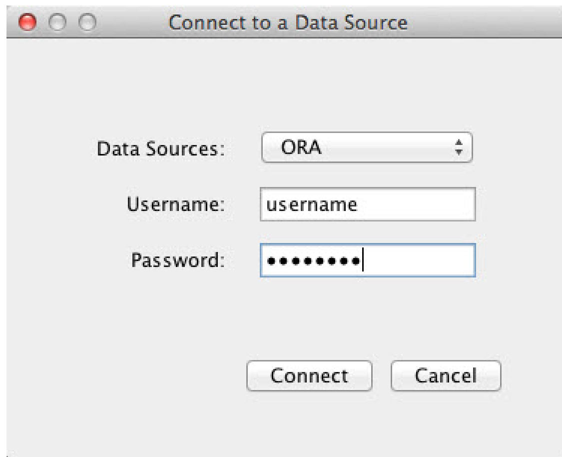
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Oracle database using Database Explorer or the command line with the JDBC connection.

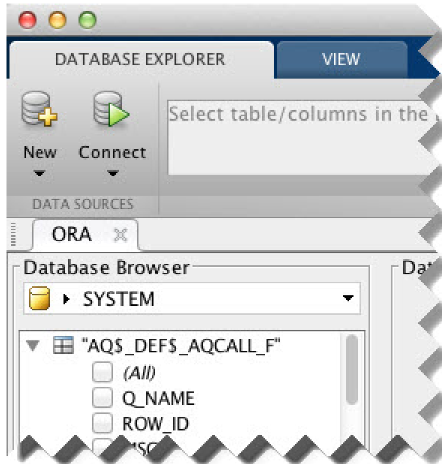
Step 4. Connect using Database Explorer or the command line.

Connect to Oracle using Database Explorer.

1. After setting up the data source, select the data source that you set up from the **Data Sources** list. Enter a user name and password. Click **Connect**.

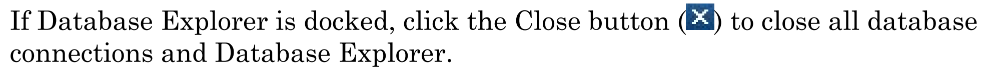


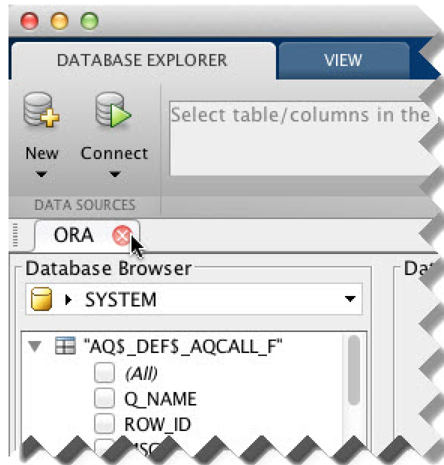
Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button (✕) next to the **ORA** data source name on the database tab. The Close button turns into a red circle (⊗). Click it to close the database connection. If you want to close

Database Explorer and all database connections, click the Close button ( ) in the top-left corner.

If Database Explorer is docked, click the Close button () to close all database connections and Database Explorer.



Connect to Oracle using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of `database` to specify a connection to an Oracle database. Set the `DriverType` name-value pair argument to `thin`. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username`, password `pwd`, and port number as `123456`.

`dbname` can be the service name or the Oracle system identifier (SID) depending on your specific Oracle database setup. For details, see your `tnsnames.ora` file, which is often in `<ORACLE_HOME>\NETWORK\ADMIN` where `<ORACLE_HOME>` is the folder where the database or the Oracle client is installed.

```
conn = database('dbname','username','pwd',...
                'Vendor','Oracle','DriverType','thin',...
```

```
                'Server','sname','PortNumber',123456);
```

Or, if you have trouble using the `database` function to connect to your Oracle database, try using the full entry in your `tnsnames.ora` file in the URL string as one consecutive line. Leave the first argument blank. For example, the following code assumes the value of the `URL` name-value pair argument is set to the following `tnsnames.ora` file entry for an Oracle database.

```
conn = database('','username','pwd',...
                'Vendor','Oracle',...
                'URL',['jdbc:oracle:thin:@(DESCRIPTION = '...
                '(ADDRESS = (PROTOCOL = TCP)(HOST = sname)'...
                '(PORT = 123456)) (CONNECT_DATA = '...
                '(SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )']);
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- “Using Database Explorer” on page 4-63
- “Bringing Java Classes into MATLAB Workspace”

Oracle JDBC for Linux

This tutorial shows how to set up a data source and connect to your Oracle database. This tutorial uses the Oracle Database 11g Release 2 (11.2.0.3) JDBC driver for use with JDK 1.6 to connect to the Oracle 11g Enterprise Edition Release 11.2.0.1.0 database.

In this section...
"Step 1. Verify the driver installation." on page 2-127
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-127
"Step 3. Set up the data source using Database Explorer." on page 2-128
"Step 4. Connect using Database Explorer or the command line." on page 2-130

Step 1. Verify the driver installation.

If the JDBC driver for Oracle is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1 Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2 Close MATLAB if it is running.
3 Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4 Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/ojdbc6.jar`. Save and close the `javaclasspath.txt` file.
5 Restart MATLAB.

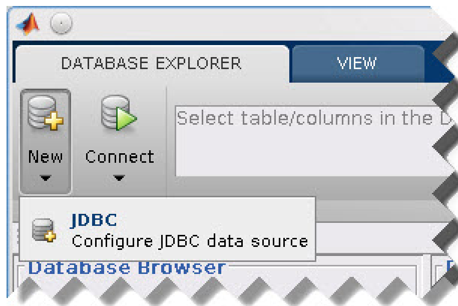
Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

Step 3. Set up the data source using Database Explorer.

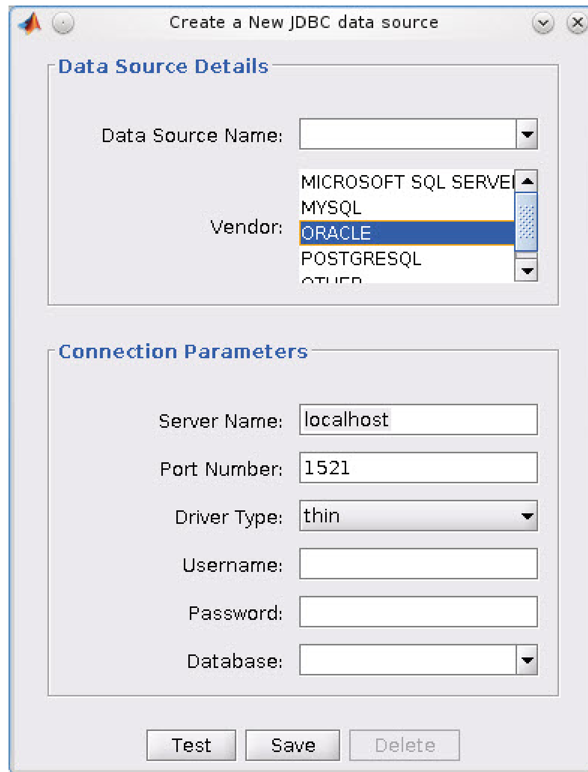
This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see "Connect to Oracle using the JDBC connection command line." on page 2-132

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `ORACLE` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field. Select **Driver Type** of `thin` or `oci`. Use `thin` as the default driver. Use `oci` if you installed an OCI driver.

5. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
6. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
7. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

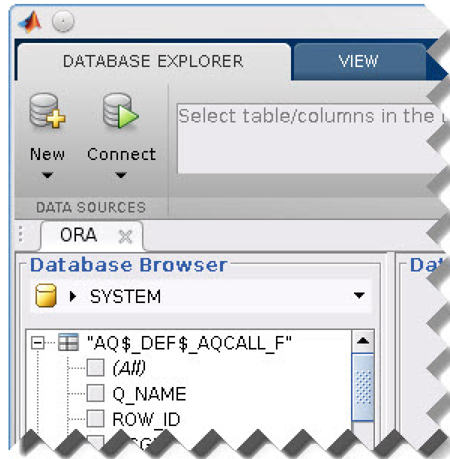
   With the data source setup completed, you can connect to the Oracle database using Database Explorer or the command line with the JDBC connection.

Step 4. Connect using Database Explorer or the command line.

Connect to Oracle using Database Explorer.

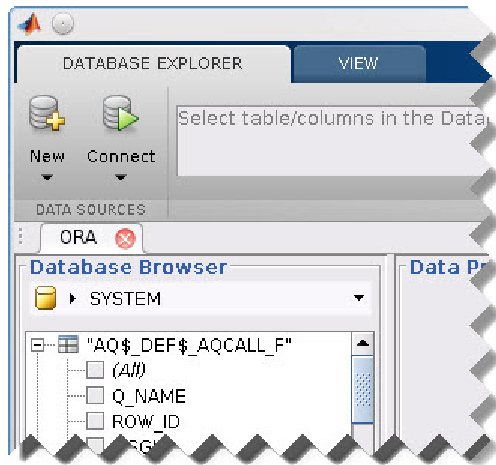
1. After setting up the data source, select the data source that you set up from the **Data Sources** list. Enter a user name and password. Click **Connect**.

Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **ORA** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Oracle using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of `database` to specify a connection to an Oracle database. Set the `DriverType` name-value pair argument to `thin`. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username`, password `pwd`, and port number as `123456`.

   `dbname` can be the service name or the Oracle system identifier (SID) depending on your specific Oracle database setup. For details, see your `tnsnames.ora` file, which is often in `<ORACLE_HOME>\NETWORK\ADMIN` where `<ORACLE_HOME>` is the folder where the database or the Oracle client is installed.

```
conn = database('dbname','username','pwd',...
                'Vendor','Oracle','DriverType','thin',...
                'Server','sname','PortNumber',123456);
```

   Or, if you have trouble using the `database` function to connect to your Oracle database, try using the full entry in your `tnsnames.ora` file in the URL string as one consecutive line. Leave the first argument blank. For example, the following

code assumes the value of the `URL` name-value pair argument is set to the following `tnsnames.ora` file entry for an Oracle database.

```
conn = database('','username','pwd',...
                'Vendor','Oracle',...
                'URL',['jdbc:oracle:thin:@(DESCRIPTION = '...
                '(ADDRESS = (PROTOCOL = TCP)(HOST = sname)'...
                '(PORT = 123456)) (CONNECT_DATA = '...
                '(SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )']);
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- “Using Database Explorer” on page 4-63
- “Bringing Java Classes into MATLAB Workspace”

MySQL JDBC for Mac OS X

This tutorial shows how to set up a data source and connect to your MySQL database. This tutorial uses the MySQL Connector/J 5.1.17 driver to connect to the MySQL Version 5.5.16 database.

In this section...
"Step 1. Verify the driver installation." on page 2-134
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-134
"Step 3. Set up the data source using Database Explorer." on page 2-135
"Step 4. Connect using Database Explorer or the command line." on page 2-137

Step 1. Verify the driver installation.

If the JDBC driver for MySQL is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/mysql-connector-java-5.1.17-bin.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

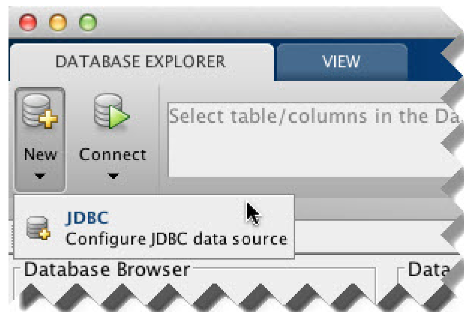
Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

Step 3. Set up the data source using Database Explorer.

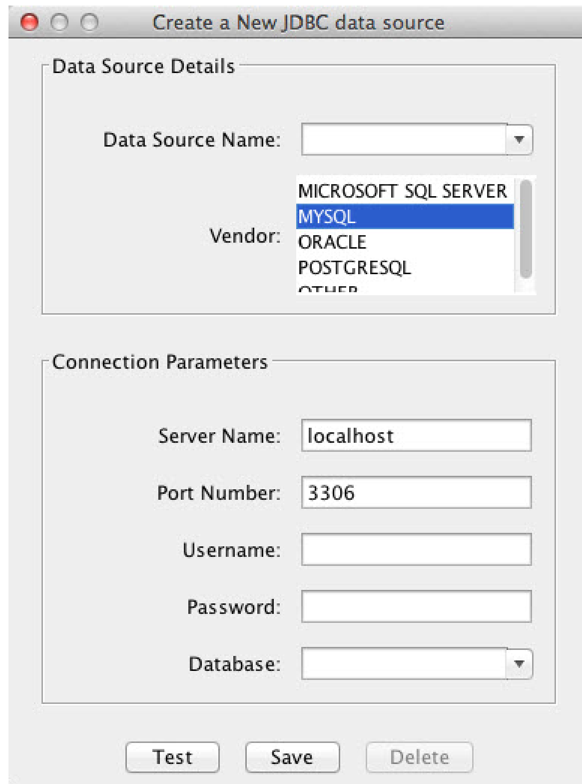
This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to MySQL using the JDBC connection command line.” on page 2-139

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `MYSQL` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

7 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

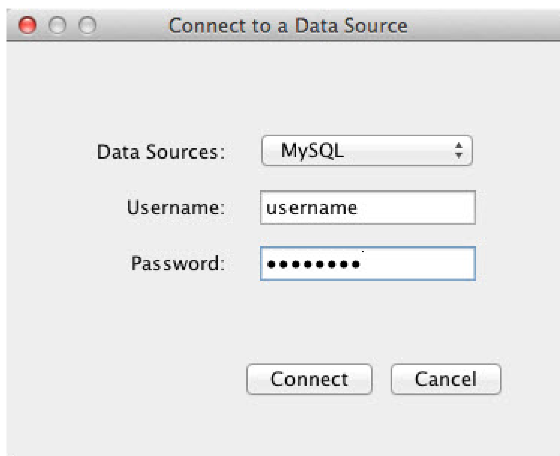
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the MySQL database using Database Explorer or the command line with the JDBC connection.

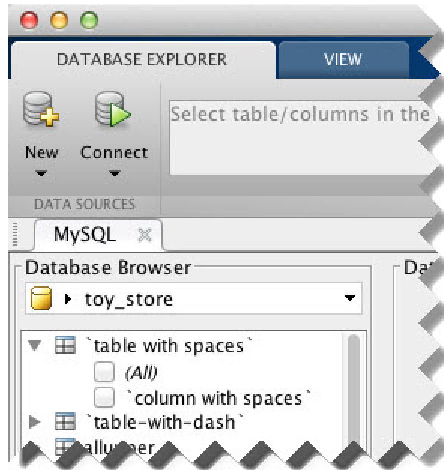
Step 4. Connect using Database Explorer or the command line.

Connect to MySQL using Database Explorer.

1 After setting up the data source, connect to your database by selecting the data source name for the MySQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

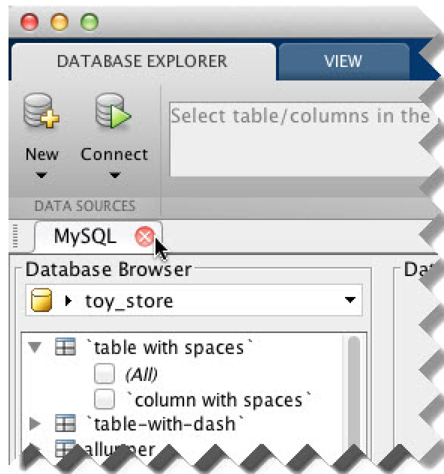


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MySQL** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-left corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to MySQL using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1. Use the `Vendor` name-value pair argument of `database` to specify a connection to a MySQL database. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`.

   ```
   conn = database('dbname','username','pwd',...
                   'Vendor','MySQL',...
                   'Server','sname');
   ```

2. Close the database connection `conn`.

   ```
   close(conn)
   ```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63

- "Bringing Java Classes into MATLAB Workspace"

MySQL JDBC for Linux

This tutorial shows how to set up a data source and connect to your MySQL database. This tutorial uses the MySQL Connector/J 5.1.17 driver to connect to the MySQL Version 5.5.16 database.

In this section...
"Step 1. Verify the driver installation." on page 2-141
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-141
"Step 3. Set up the data source using Database Explorer." on page 2-142
"Step 4. Connect using Database Explorer or the command line." on page 2-144

Step 1. Verify the driver installation.

If the JDBC driver for MySQL is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

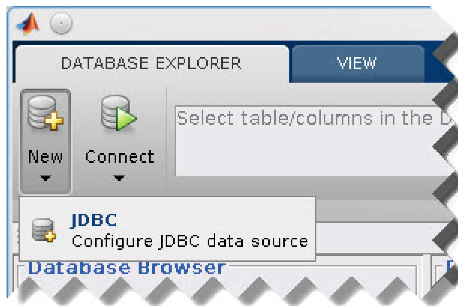
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/mysql-connector-java-5.1.17-bin.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

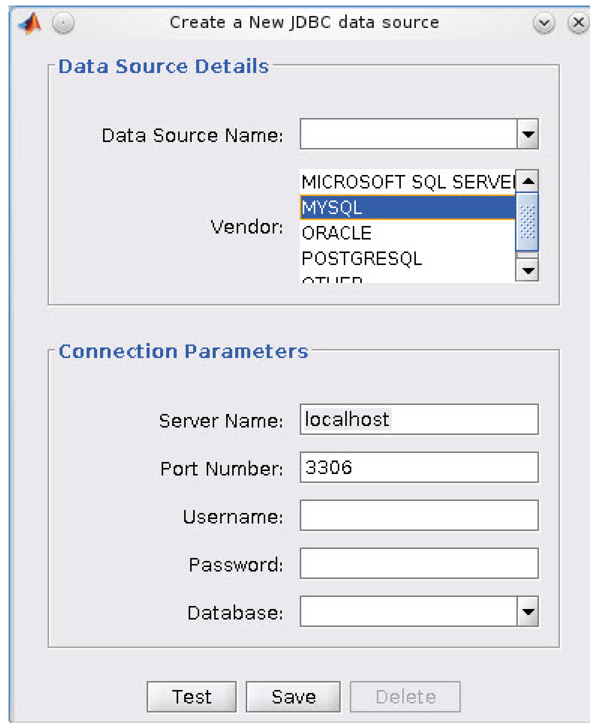
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to MySQL using the JDBC connection command line.” on page 2-146

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `MYSQL` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear

in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

7 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

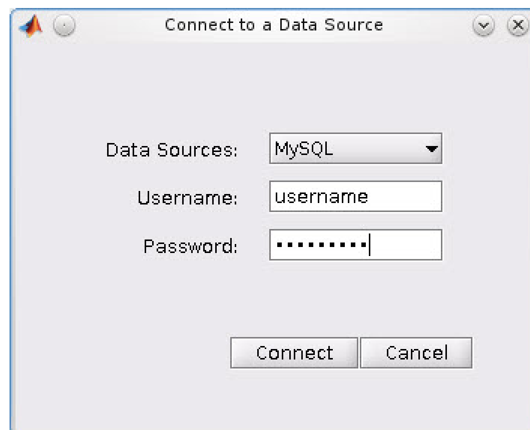
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the MySQL database using Database Explorer or the command line with the JDBC connection.

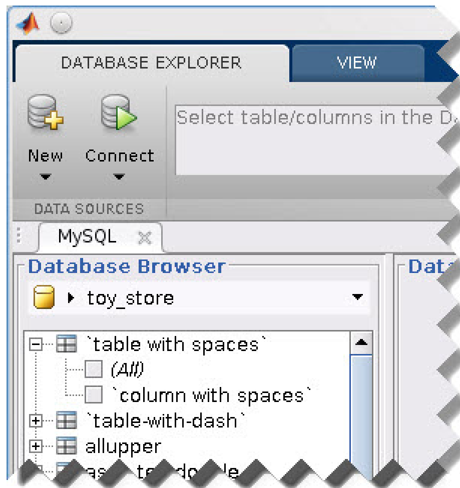
Step 4. Connect using Database Explorer or the command line.

Connect to MySQL using Database Explorer.

1 After setting up the data source, connect to your database by selecting the data source name for the MySQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

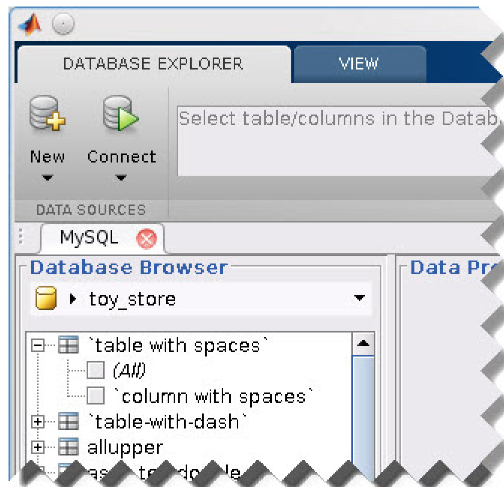


   Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **MySQL** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to MySQL using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of `database` to specify a connection to a MySQL database. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`.

```
conn = database('dbname','username','pwd',...
                'Vendor','MySQL',...
                'Server','sname');
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63

- "Bringing Java Classes into MATLAB Workspace"

PostgreSQL JDBC for Mac OS X

This tutorial shows how to set up a data source and connect to your PostgreSQL database. This tutorial uses the JDBC4 PostgreSQL Driver, Version 8.4 to connect to the PostgreSQL 9.2 database.

In this section...
“Step 1. Verify the driver installation.” on page 2-148
“Step 2. Add the JDBC driver to the MATLAB static Java class path.” on page 2-148
“Step 3. Set up the data source using Database Explorer.” on page 2-149
“Step 4. Connect using Database Explorer or the command line.” on page 2-151

Step 1. Verify the driver installation.

If the JDBC driver for PostgreSQL is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

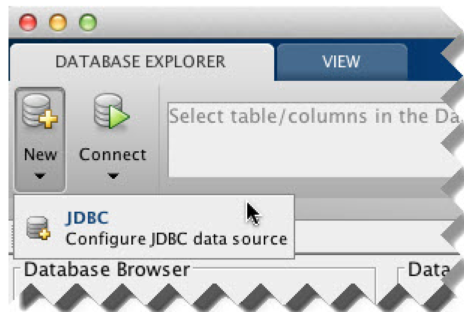
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/postgresql-8.4-702.jdbc4.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Bringing Java Classes into MATLAB Workspace”.

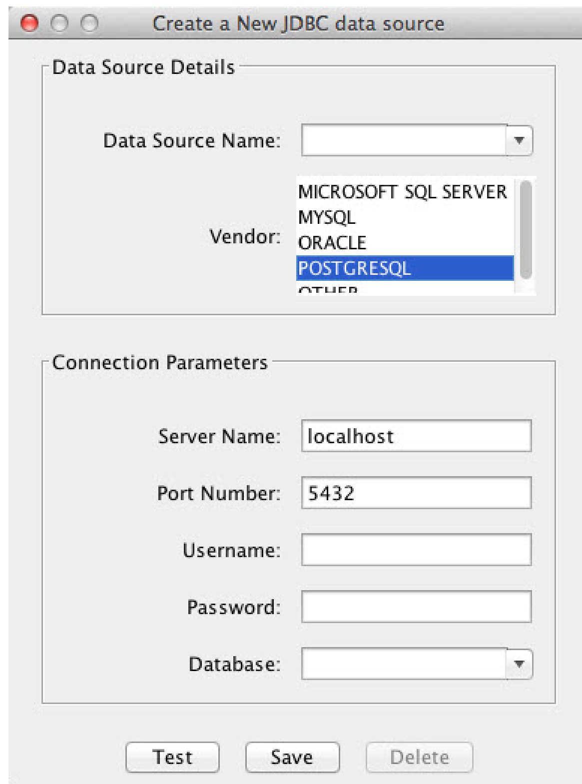
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to PostgreSQL using the JDBC connection command line.” on page 2-153

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `POSTGRESQL` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

7 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

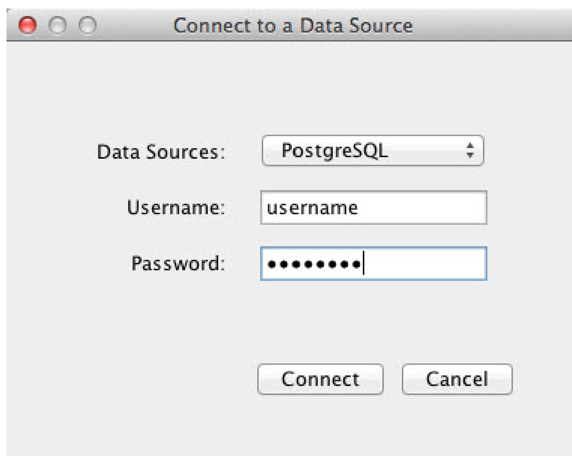
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the PostgreSQL database using Database Explorer or the command line with the JDBC connection.

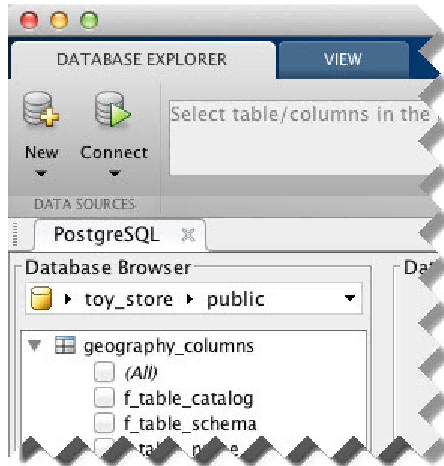
Step 4. Connect using Database Explorer or the command line.

Connect to PostgreSQL using Database Explorer.

1 After setting up the data source, connect to your database by selecting the data source name for the PostgreSQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

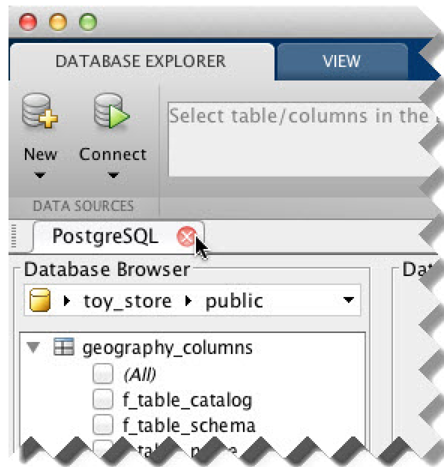


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **PostgreSQL** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-left corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to PostgreSQL using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of `database` to specify a connection to a PostgreSQL database. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`.

```
conn = database('dbname','username','pwd',...
                'Vendor','PostgreSQL',...
                'Server','sname');
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63

- “Bringing Java Classes into MATLAB Workspace”

PostgreSQL JDBC for Linux

This tutorial shows how to set up a data source and connect to your PostgreSQL database. This tutorial uses the JDBC4 PostgreSQL Driver, Version 8.4 to connect to the PostgreSQL 9.2 database.

In this section...
"Step 1. Verify the driver installation." on page 2-155
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-155
"Step 3. Set up the data source using Database Explorer." on page 2-156
"Step 4. Connect using Database Explorer or the command line." on page 2-158

Step 1. Verify the driver installation.

If the JDBC driver for PostgreSQL is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

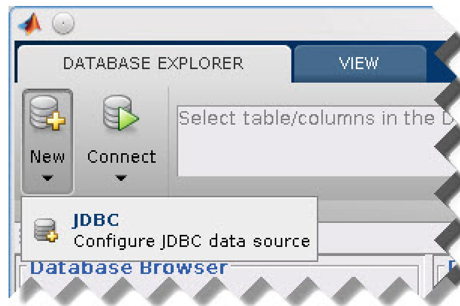
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/postgresql-8.4-702.jdbc4.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

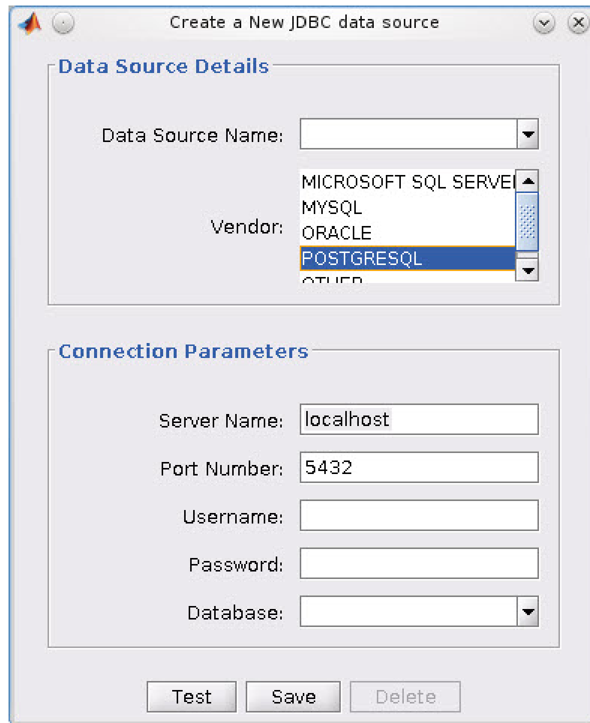
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see "Connect to PostgreSQL using the JDBC connection command line." on page 2-160

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `POSTGRESQL` from the **Vendor** list. After selecting the vendor, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

4 Enter the database server name in the **Server Name** field, port number in the **Port Number** field, user name in the **Username** field, password in the **Password** field, and database name in the **Database** field.

5 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

6. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
7. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

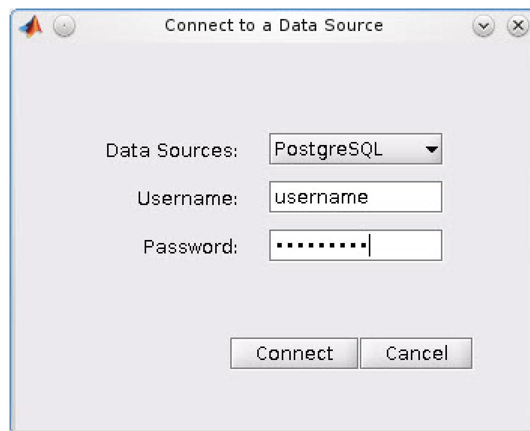
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the PostgreSQL database using Database Explorer or the command line with the JDBC connection.

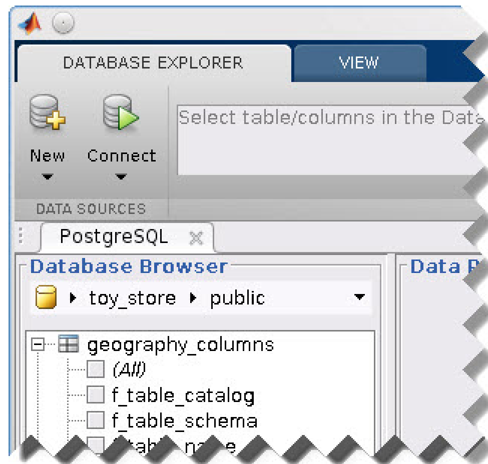
Step 4. Connect using Database Explorer or the command line.

Connect to PostgreSQL using Database Explorer.

1. After setting up the data source, connect to your database by selecting the data source name for the PostgreSQL database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

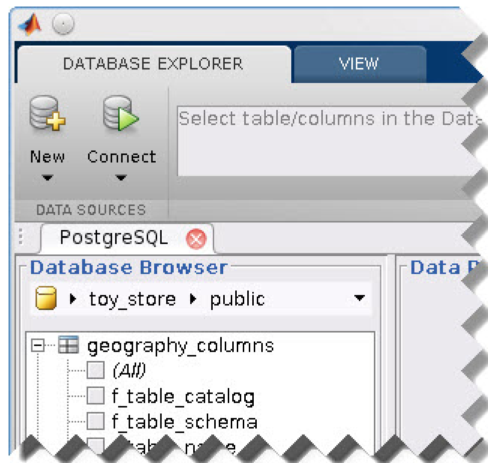


   Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **PostgreSQL** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to PostgreSQL using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Use the `Vendor` name-value pair argument of `database` to specify a connection to a PostgreSQL database. For example, the following code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`.

```
conn = database('dbname','username','pwd',...
                'Vendor','PostgreSQL',...
                'Server','sname');
```

2 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- “Using Database Explorer” on page 4-63

- “Bringing Java Classes into MATLAB Workspace”

SQLite JDBC for Mac OS X

This tutorial shows how to set up a data source and connect to your SQLite database. This tutorial uses the SQLite JDBC 3.7.2 Driver to connect to the SQLite Version 3.7.17 database.

In this section...
“Step 1. Verify the driver installation.” on page 2-162
“Step 2. Add the JDBC driver to the MATLAB static Java class path.” on page 2-162
“Step 3. Set up the data source using Database Explorer.” on page 2-163
“Step 4. Connect using Database Explorer or the command line.” on page 2-165

Step 1. Verify the driver installation.

If the JDBC driver for SQLite is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

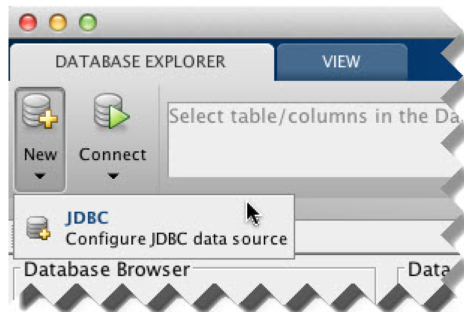
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/sqlite-jdbc-3.7.2.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see “Bringing Java Classes into MATLAB Workspace”.

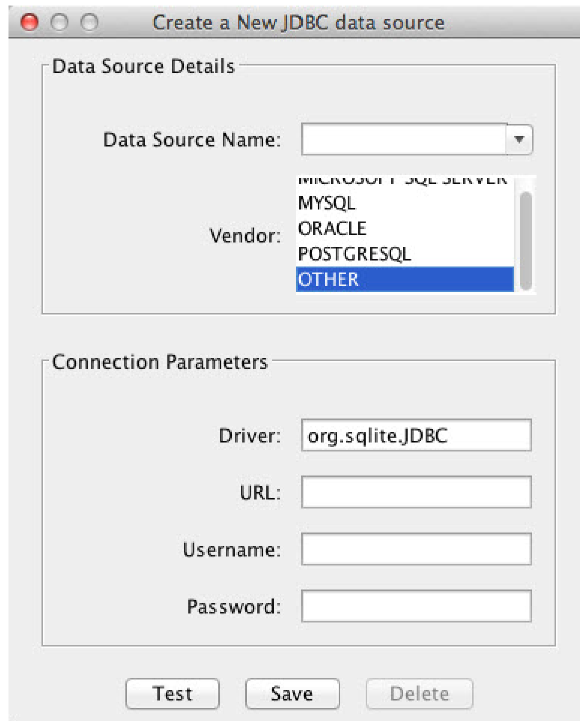
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to SQLite using the JDBC connection command line.” on page 2-167

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select OTHER from the **Vendor** list.

4 Enter the SQLite driver Java class object in the **Driver** field. For this example, use `org.sqlite.JDBC`. After entering the driver, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

5 Connect to the SQLite database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sqlite`. The last part of the URL string is `subname`. For SQLite, this contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where

`dbpath` is the full path to your SQLite database on your computer. Enter your string into the **URL** field.

6. Enter your user name in the **Username** field and your password in the **Password** field, or leave them blank if your database does not need them.
7. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
8. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
9. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

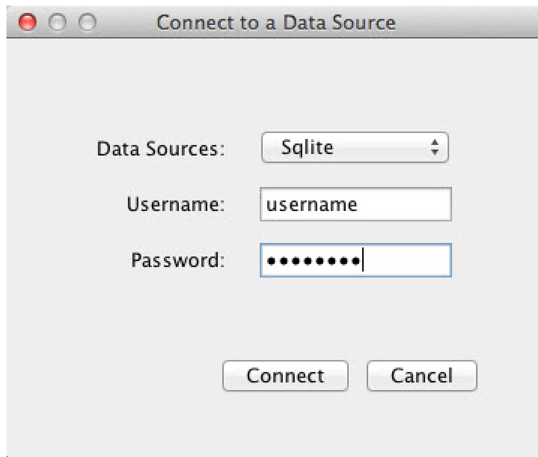
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the SQLite database using Database Explorer or the command line with the JDBC connection.

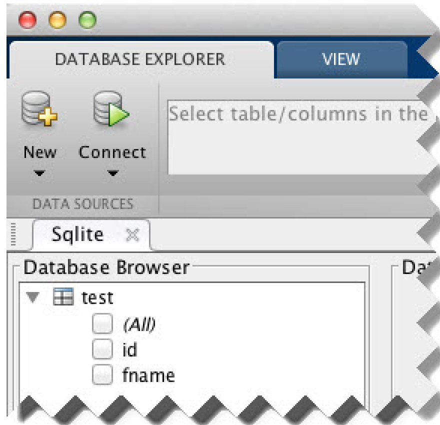
Step 4. Connect using Database Explorer or the command line.

Connect to SQLite using Database Explorer.

1. After setting up the data source, connect to your database by selecting the data source name for the SQLite database from the **Data Sources** list. Enter a user name and password or leave them blank if your database does not require them. Click **Connect**.

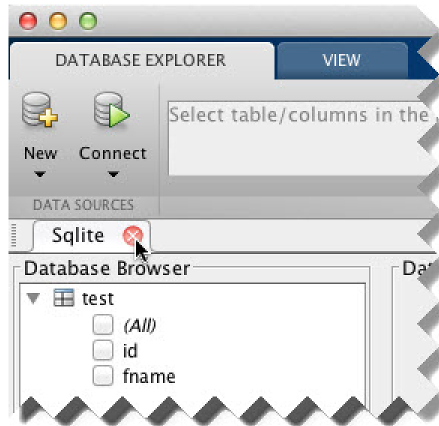


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **Sqlite** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-left corner.

If Database Explorer is docked, click the Close button (☒) to close all database connections and Database Explorer.



Connect to SQLite using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1. Create a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sqlite`. The last part of the URL string is `subname`. For SQLite, this contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer.
2. Connect to the SQLite database by using the `database` function. Enter the full path to your SQLite database `dbpath` for the first argument, or leave this argument blank and include the full path in the URL string `URL`. Enter your user name `username` and your password `pwd`, or leave these blank if your database does not require them. The fourth argument is the driver Java class object. This code assumes the class object is `org.sqlite.JDBC`. The last argument is the URL string `URL`.

   ```
   conn = database(dbpath,username,pwd,'org.sqlite.JDBC','URL');
   ```
3. Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

SQLite JDBC for Linux

This tutorial shows how to set up a data source and connect to your SQLite database. This tutorial uses the SQLite JDBC 3.7.2 Driver to connect to the SQLite Version 3.7.17 database.

In this section...
"Step 1. Verify the driver installation." on page 2-169
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-169
"Step 3. Set up the data source using Database Explorer." on page 2-170
"Step 4. Connect using Database Explorer or the command line." on page 2-172

Step 1. Verify the driver installation.

If the JDBC driver for SQLite is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

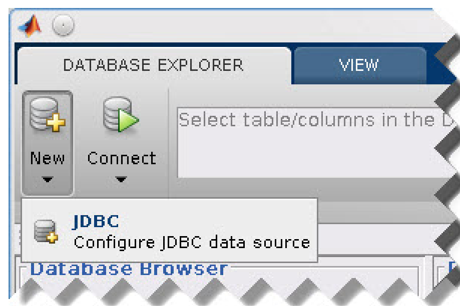
1. Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2. Close MATLAB if it is running.
3. Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4. Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/sqlite-jdbc-3.7.2.jar`. Save and close the `javaclasspath.txt` file.
5. Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

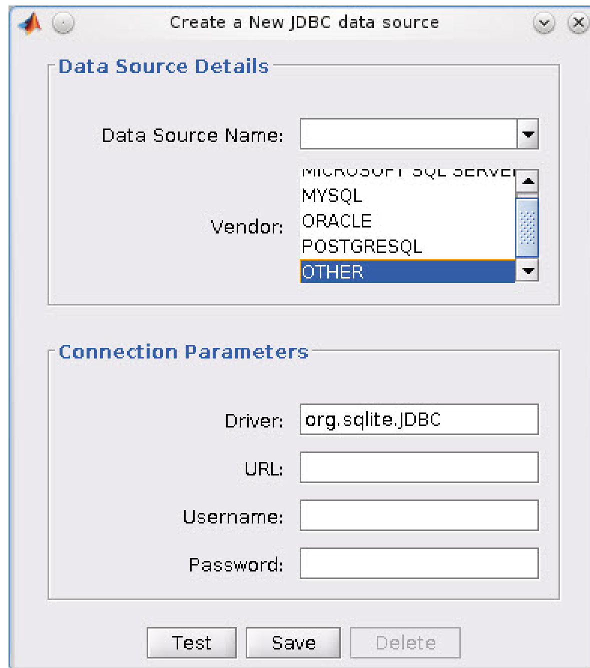
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see "Connect to SQLite using the JDBC connection command line." on page 2-174

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2 Click the **Database Explorer** tab and then select **New** > **JDBC**.

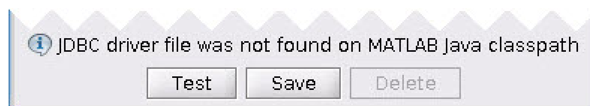


The Create a New JDBC data source dialog box opens.



3 Select `OTHER` from the **Vendor** list.

4 Enter the SQLite driver Java class object in the **Driver** field. For this example, use `org.sqlite.JDBC`. After entering the driver, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.



5 Connect to the SQLite database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sqlite`. The last part of the URL string is `subname`. For SQLite, this contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer. Enter your string into the **URL** field.

6 Enter your user name in the **Username** field and your password in the **Password** field, or leave them blank if your database does not need them.

7 Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.

8 Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.

9 If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

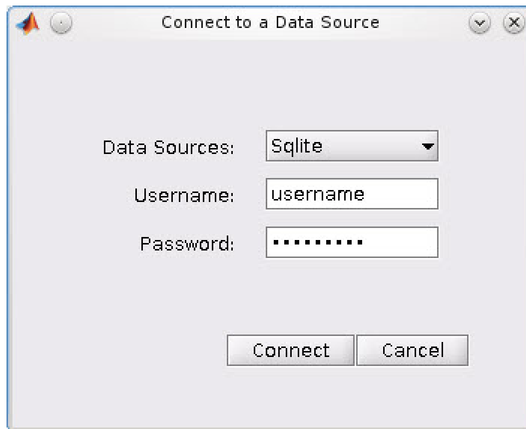
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the SQLite database using Database Explorer or the command line with the JDBC connection.

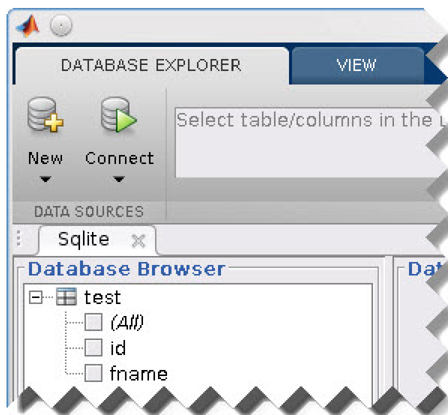
Step 4. Connect using Database Explorer or the command line.

Connect to SQLite using Database Explorer.

1 After setting up the data source, connect to your database by selecting the data source name for the SQLite database from the **Data Sources** list. Enter a user name and password or leave them blank if your database does not require them. Click **Connect**.

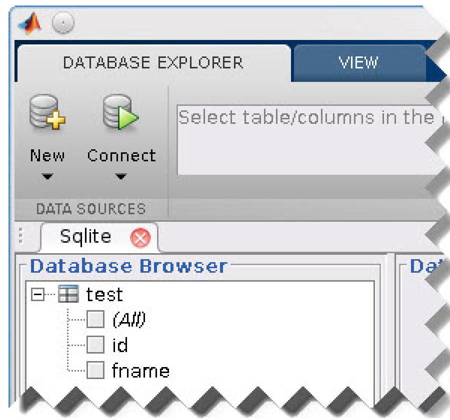


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **Sqlite** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button (☒) to close all database connections and Database Explorer.



Connect to SQLite using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1. Create a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sqlite`. The last part of the URL string is `subname`. For SQLite, this contains the location of the database. For example, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer.
2. Connect to the SQLite database by using the `database` function. Enter the full path to your SQLite database `dbpath` for the first argument, or leave this argument blank and include the full path in the URL string `URL`. Enter your user name `username` and your password `pwd`, or leave these blank if your database does not require them. The fourth argument is the driver Java class object. This code assumes the class object is `org.sqlite.JDBC`. The last argument is the URL string `URL`.

```
conn = database(dbpath,username,pwd,'org.sqlite.JDBC','URL');
```

3. Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

Sybase JDBC for Mac OS X

This tutorial shows how to set up a data source and connect to your Sybase database. This tutorial uses the jConnect 4 JDBC Driver to connect to the Sybase Adaptive Server Enterprise 15.7 database.

In this section...
"Step 1. Verify the driver installation." on page 2-176
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-176
"Step 3. Set up the data source using Database Explorer." on page 2-177
"Step 4. Connect using Database Explorer or the command line." on page 2-179

Step 1. Verify the driver installation.

If the JDBC driver for Sybase is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

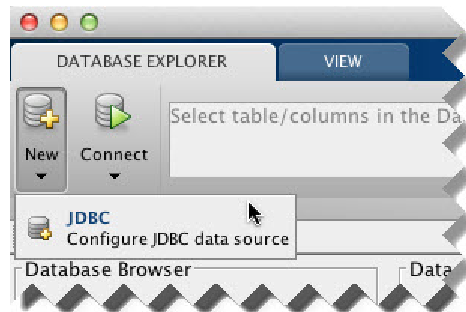
1 Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2 Close MATLAB if it is running.
3 Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4 Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/jconn4.jar`. Save and close the `javaclasspath.txt` file.
5 Restart MATLAB.

Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

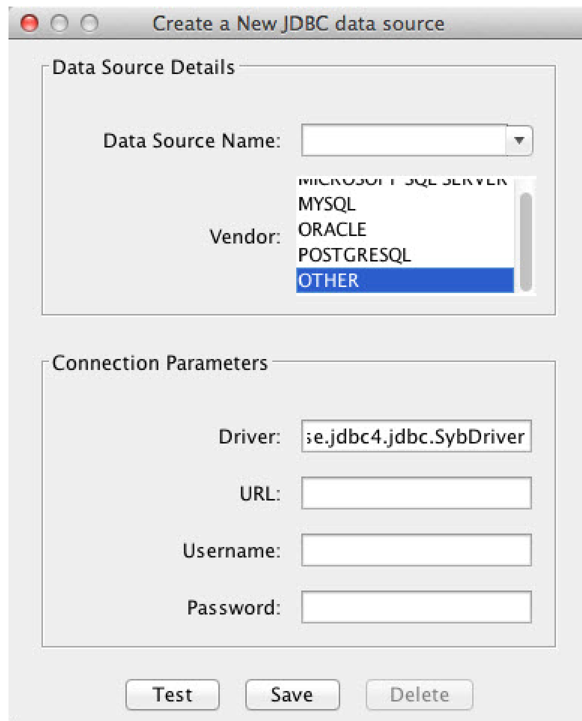
Step 3. Set up the data source using Database Explorer.

This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to Sybase using the JDBC connection command line.” on page 2-181

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.
2. Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `OTHER` from the **Vendor** list.

4 Enter the Sybase driver Java class object in the **Driver** field. For this example, use `com.sybase.jdbc4.jdbc.SybDriver`. After entering the driver, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

5 Connect to the Sybase database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sybase:Tds`. The last part of the URL string is `subname`. For Sybase, this contains the server name, the port number, and the database name. For example, your string

is `jdbc:sybase:Tds:ServerName:PortNumber/dbname`, where `ServerName` is your server name, `PortNumber` is your port number, and `dbname` is your database name. Enter your full string into the **URL** field.

6. Enter your user name in the **Username** field and your password in the **Password** field.
7. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
8. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
9. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

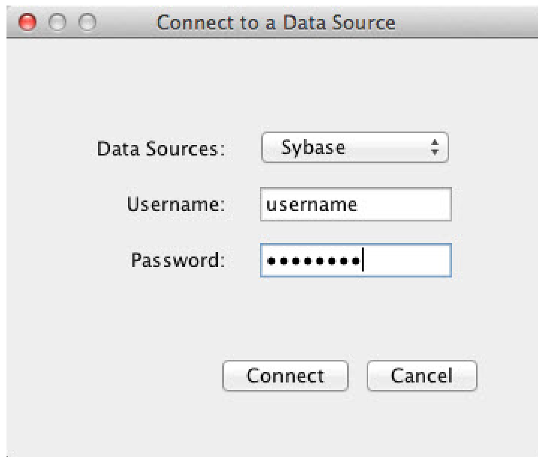
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Sybase database using Database Explorer or the command line with the JDBC connection.

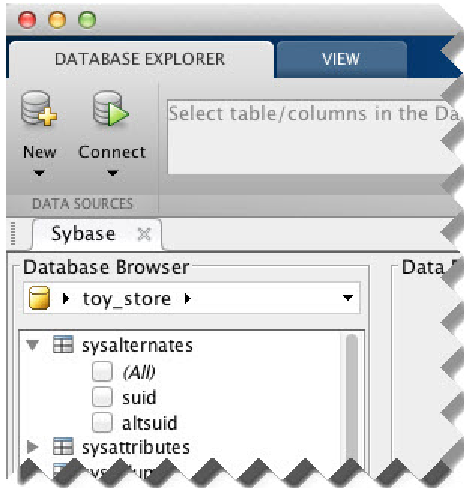
Step 4. Connect using Database Explorer or the command line.

Connect to Sybase using Database Explorer.

1. After setting up the data source, connect to your database by selecting the data source name for the Sybase database from the **Data Sources** list. Enter a user name and password. Click **Connect**.



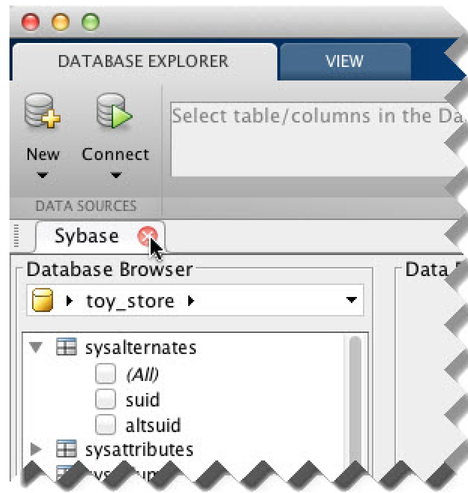
Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **Sybase** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close

Database Explorer and all database connections, click the Close button ( ) in the top-left corner.

If Database Explorer is docked, click the Close button ( ) to close all database connections and Database Explorer.



Connect to Sybase using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Create a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sybase:Tds`. The last part of the URL string is `subname`. For Sybase, this contains the server name, the port number, and the database name. For example, your URL string is `jdbc:sybase:Tds:ServerName:PortNumber/dbname`, where `ServerName` is your server name, `PortNumber` is your port number, and `dbname` is your database name.

2 Connect to the Sybase database using the `database` function. For example, the following code assumes you are connecting to a database named `dbname` with user name `username` and password `pwd`. The fourth argument is the driver Java class

object. This code assumes the class object is `com.sybase.jdbc4.jdbc.SybDriver`. The last argument is the URL string `URL`.

```
conn = database('dbname','username','pwd',...
                'com.sybase.jdbc4.jdbc.SybDriver','URL');
```

3 Close the database connection `conn`.

```
close(conn)
```

See Also

`close` | `database` | `javaaddpath`

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

Sybase JDBC for Linux

This tutorial shows how to set up a data source and connect to your Sybase database. This tutorial uses the jConnect 4 JDBC Driver to connect to the Sybase Adaptive Server Enterprise 15.7 database.

In this section...
"Step 1. Verify the driver installation." on page 2-183
"Step 2. Add the JDBC driver to the MATLAB static Java class path." on page 2-183
"Step 3. Set up the data source using Database Explorer." on page 2-184
"Step 4. Connect using Database Explorer or the command line." on page 2-186

Step 1. Verify the driver installation.

If the JDBC driver for Sybase is not installed on your computer, then find the link on the Driver Installation page to install the driver. Follow the instructions to download and install this driver on your computer.

Step 2. Add the JDBC driver to the MATLAB static Java class path.

1 Run the `prefdir` command in the MATLAB Command Window. The output is a file path to a folder on your computer.
2 Close MATLAB if it is running.
3 Navigate to the folder and create a file called `javaclasspath.txt` in the folder.
4 Open `javaclasspath.txt` and insert the path to the database driver JAR file. The entry should include the full path to the driver including the driver file name, for example, `/home/user/DB_Drivers/jconn4.jar`. Save and close the `javaclasspath.txt` file.
5 Restart MATLAB.

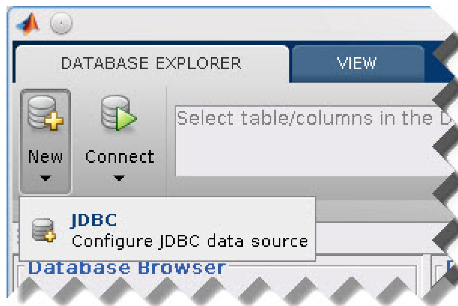
Alternatively, you can use `javaaddpath` to add your JDBC driver to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".

Step 3. Set up the data source using Database Explorer.

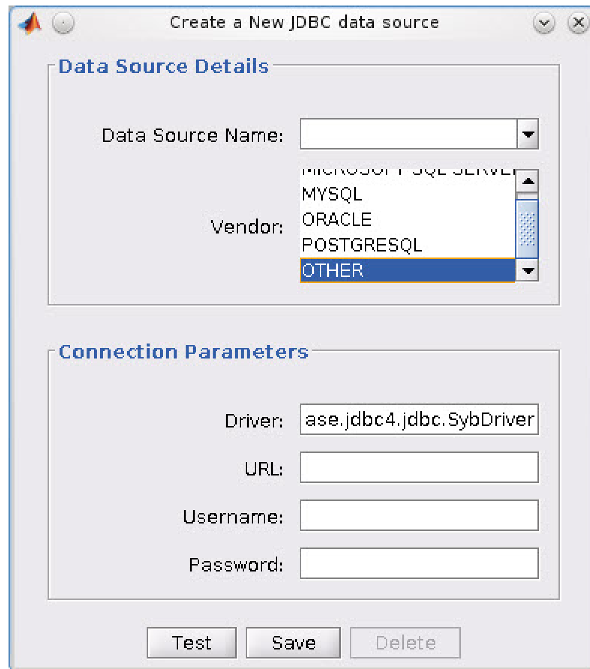
This step is required only for connecting to Database Explorer. If you want to use the command line to connect to your database, see “Connect to Sybase using the JDBC connection command line.” on page 2-188

1 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip. Then, select **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, enter `dexplore` at the command line. If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

2 Click the **Database Explorer** tab and then select **New** > **JDBC**.



The Create a New JDBC data source dialog box opens.



3 Select `OTHER` from the **Vendor** list.

4 Enter the Sybase driver Java class object in the **Driver** field. For this example, use `com.sybase.jdbc4.jdbc.SybDriver`. After entering the driver, if you did not add the JDBC driver file path to the Java class path, this dialog box displays this warning at the bottom. Address this warning by following the steps as described in Step 2.

5 Connect to the Sybase database by creating a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sybase:Tds`. The last part of the URL string is `subname`. For Sybase, this contains the server name, the port number, and the database name. For example, your string is `jdbc:sybase:Tds:ServerName:PortNumber/dbname`, where `ServerName` is

your server name, `PortNumber` is your port number, and `dbname` is your database name. Enter your full string into the **URL** field.

6. Enter your user name in the **Username** field and your password in the **Password** field.
7. Click **Test** to test the connection. Database Explorer displays Connection Successful! if your connection succeeded.
8. Enter a data source name in the **Data Source Name** field in the Create a New JDBC data source dialog box. Use a new data source name that does not appear in the existing list of data source names. Click **Save**. The new JDBC data source appears in the list of data sources in the Connect to a Data Source dialog box.
9. If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

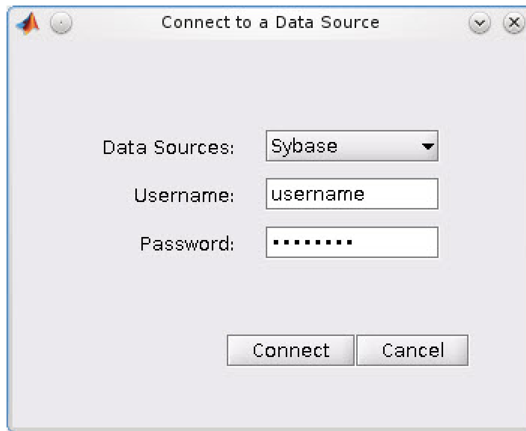
   Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

   With the data source setup completed, you can connect to the Sybase database using Database Explorer or the command line with the JDBC connection.

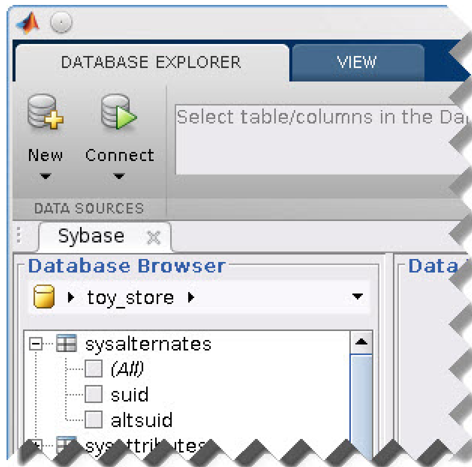
Step 4. Connect using Database Explorer or the command line.

Connect to Sybase using Database Explorer.

1. After setting up the data source, connect to your database by selecting the data source name for the Sybase database from the **Data Sources** list. Enter a user name and password. Click **Connect**.

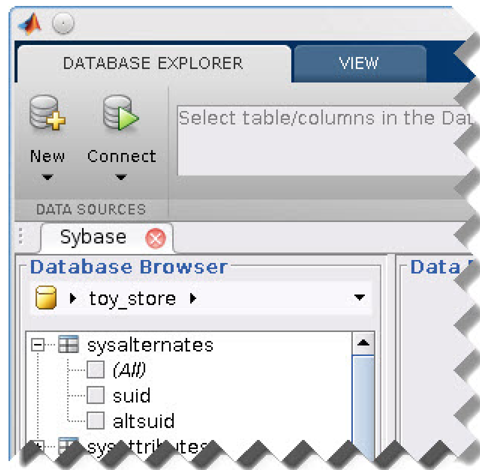


Database Explorer connects to your database and displays its contents in a tab named with the data source name.



2 Close the connection using Database Explorer by hovering over the Close button ( ) next to the **Sybase** data source name on the database tab. The Close button turns into a red circle ( ). Click it to close the database connection. If you want to close Database Explorer and all database connections, click the Close button ( ) in the top-right corner.

If Database Explorer is docked, click the Close button (☒) to close all database connections and Database Explorer.



Connect to Sybase using the JDBC connection command line.

When using the command line, you do not have to set up a data source with Database Explorer. You can use the command line to pass all the required parameters for connection.

1 Create a URL string using the format `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. `subprotocol` is a database type. In this case, `subprotocol` is `sybase:Tds`. The last part of the URL string is `subname`. For Sybase, this contains the server name, the port number, and the database name. For example, your URL string is `jdbc:sybase:Tds:ServerName:PortNumber/dbname`, where `ServerName` is your server name, `PortNumber` is your port number, and `dbname` is your database name.

2 Connect to the Sybase database using the `database` function. For example, the following code assumes you are connecting to a database named `dbname` with user name `username` and password `pwd`. The fourth argument is the driver Java class object. This code assumes the class object is `com.sybase.jdbc4.jdbc.SybDriver`. The last argument is the URL string `URL`.

```
conn = database('dbname','username','pwd',...
```

```
                    'com.sybase.jdbc4.jdbc.SybDriver','URL');
```

3 Close the database connection conn.

```
close(conn)
```

See Also

close | database | javaaddpath

More About

- "Using Database Explorer" on page 4-63
- "Bringing Java Classes into MATLAB Workspace"

Other ODBC- or JDBC-Compliant Databases

This tutorial provides high-level workflows for using other ODBC- or JDBC-compliant databases.

In this section...
"ODBC-Compliant Databases" on page 2-190
"JDBC-Compliant Databases" on page 2-190

ODBC-Compliant Databases

This tutorial shows how to configure your driver and connect to your ODBC-compliant database with MATLAB. Database Toolbox can connect to any ODBC-compliant database that is relational and that uses ANSI SQL. For example, if your database is Microsoft Excel or IBM DB2, here are some basic steps to follow.

1. If your driver is not preinstalled on your computer, find a compatible driver and install it on your computer. You can view preinstalled drivers using the Microsoft Data Source ODBC Administrator.
2. Create a data source that uses the installed driver using the Microsoft Data Source ODBC Administrator. For details about the Microsoft Data Source ODBC Administrator, see Driver Installation.
3. Use Database Explorer to test your connection. For details, see "Configure ODBC Data Sources" on page 4-66.
4. Use Database Explorer to connect to your database. For details, see "Connect to a Data Source" on page 4-74.
5. Alternatively, you can connect to your database using the command line function `database`.
6. For more in-depth assistance, contact your database administrator or database documentation. For more in-depth instructions, see the example "MySQL ODBC for Windows" on page 2-58.

JDBC-Compliant Databases

This tutorial shows how to configure your driver and connect to your JDBC-compliant database with MATLAB. Database Toolbox can connect to any JDBC-compliant database that is relational and that uses ANSI SQL. For example, if your database is Apache™

Derby or Microsoft Windows Azure, here are some basic steps to follow. The details of the steps below can vary depending on your database and database version. For details about your database, contact your database administrator or refer to your database documentation. The driver and URL fields (in Database Explorer Create a New JDBC data source dialog box and in the database command) can vary depending on the type and version of the JDBC driver and the database you are working with. For details about the driver and URL, see the JDBC driver documentation for your database.

1. If your driver is not preinstalled on your computer, find a compatible driver and install it on your computer.
2. Add the JDBC driver path to the static Java class path, or alternatively to the dynamic Java class path. For details about static and dynamic class paths, see "Bringing Java Classes into MATLAB Workspace".
3. To connect to a JDBC-compliant database, you need to know your database driver Java class object string. For example, the Java class object for a SQLite database is `org.sqlite.JDBC`. Use this string for establishing a connection either with Database Explorer in the **Driver** field or the command line in the `driver` argument.
4. To connect to a JDBC-compliant database, you need to create a URL string. The URL string is in the form `jdbc:subprotocol:subname`. The `jdbc` part of this string stays constant for any JDBC driver. The `subprotocol` is the database type. The last part of the URL string is the `subname`. The `subname` contains the location of the database and additional connection information such as the port number. For example, if you are using SQLite, your string is `jdbc:sqlite:dbpath`, where `dbpath` is the full path to your SQLite database on your computer. Use this string for establishing a connection either with Database Explorer or the command line.
5. Use Database Explorer to test your connection. For details, see "Configure JDBC Data Sources" on page 4-70.
6. Use Database Explorer to connect to your database. For details, see "Connect to a Data Source" on page 4-74.
7. Alternatively, you can connect to your database using the command line function `database`.
8. For more in-depth assistance, contact your database administrator or database documentation. For more in-depth instructions, see the example "Sybase JDBC for Windows" on page 2-99.

See Also

`close` | `database`

Related Examples

- "MySQL ODBC for Windows" on page 2-58
- "Sybase JDBC for Windows" on page 2-99

More About

- "Bringing Java Classes into MATLAB Workspace"
- "Using Database Explorer" on page 4-63

Connecting to a Database

To connect to your database, your ODBC or JDBC driver must be installed and your data source must be defined. For details about driver installation and data source setup, see "Configuring a Driver and Data Source" on page 2-13.

In this section...
"Connection Options" on page 2-193
"Microsoft Access" on page 2-193
"Microsoft SQL Server" on page 2-193
"Oracle" on page 2-194
"MySQL" on page 2-194
"PostgreSQL" on page 2-194
"SQLite" on page 2-195
"Sybase" on page 2-195
"Other ODBC- or JDBC-Compliant Databases" on page 2-195

Connection Options

You can connect to your database using Database Explorer or the command line. You can perform different actions using Database Explorer than you can using the command line. For details about deciding which option to use, see "Connection Options" on page 2-6.

Microsoft Access

- ODBC
  - "Connect to Microsoft Access using Database Explorer." on page 2-19
  - "Connect to Microsoft Access using the native ODBC connection command line." on page 2-21

Microsoft SQL Server

- ODBC
  - "Connect to Microsoft SQL Server using Database Explorer." on page 2-29

  - "Connect to Microsoft SQL Server using the native ODBC connection command line." on page 2-31
- JDBC
  - "Connect to Microsoft SQL Server using Database Explorer." on page 2-40
  - "Connect to Microsoft SQL Server using the JDBC connection command line." on page 2-42

Oracle

- ODBC
  - Database Explorer cannot work with the Oracle ODBC driver because of an issue with the JDBC/ODBC bridge. For details, see "Database Explorer Error Messages" on page 3-14.
  - To connect using the command line, see "Step 4. Connect using the native ODBC connection command line." on page 2-48
- JDBC
  - "Connect to Oracle using Database Explorer." on page 2-53
  - "Connect to Oracle using the JDBC connection command line." on page 2-55

MySQL

- ODBC
  - "Connect to MySQL using Database Explorer." on page 2-62
  - "Connect to MySQL using the native ODBC connection command line." on page 2-64
- JDBC
  - "Connect to MySQL using Database Explorer." on page 2-68
  - "Connect to MySQL using the JDBC connection command line." on page 2-70

PostgreSQL

- ODBC

  - “Connect to PostgreSQL using Database Explorer.” on page 2-75
  - “Connect to PostgreSQL using the native ODBC connection command line.” on page 2-77
- JDBC
  - “Connect to PostgreSQL using Database Explorer.” on page 2-81
  - “Connect to PostgreSQL using the JDBC connection command line.” on page 2-83

SQLite

- JDBC
  - “Connect to SQLite using Database Explorer.” on page 2-87
  - “Connect to SQLite using the JDBC connection command line.” on page 2-89

Sybase

- ODBC
  - “Connect to Sybase using Database Explorer.” on page 2-96
  - “Connect to Sybase using the native ODBC connection command line.” on page 2-98
- JDBC
  - “Connect to Sybase using Database Explorer.” on page 2-102
  - “Connect to Sybase using the JDBC connection command line.” on page 2-104

Other ODBC- or JDBC-Compliant Databases

For an example of how to connect to a database that is not listed previously, see “Other ODBC- or JDBC-Compliant Databases” on page 2-190.

See Also

`close` | `database`

More About

- “Choosing Between ODBC and JDBC Drivers” on page 2-10

- "Configuring a Driver and Data Source" on page 2-13

Selecting Data

In this section...
"Use Database Explorer to Select Data" on page 2-197
"Use the Command Line to Select Data" on page 2-197
"Working with Custom Data Types" on page 2-198
"Running SQL Queries Saved in Scripts or Files" on page 2-198

You can open two different connections to the same database, one using Database Explorer and another using the command line. If you are working with large data sets, use the command line instead of Database Explorer for maximum performance.

Use Database Explorer to Select Data

If you have minimal proficiency writing SQL queries or want to quickly browse the data in your database, use Database Explorer. For an overview of selecting data using Database Explorer, see these examples:

- "Display Data from a Single Database Table" on page 4-78
- "Join Data from Multiple Database Tables" on page 4-80
- "Define Query Criteria to Refine Results" on page 4-84
- "Query Rules Using the SQL Criteria Panel" on page 4-85
- "Query Example Using a Left Outer Join" on page 4-87
- "Work with Multiple Databases" on page 4-91

Use the Command Line to Select Data

Exploring your database data using the command line requires knowledge of writing SQL queries to perform the selection. Use the `exec` and `fetch` functions to select data from your database. The `exec` function executes your SQL statement and the `fetch` function retrieves the data from the database into a MATLAB variable. If you are not comfortable with writing SQL, then use Database Explorer to select data from your database.

If you have a stored procedure you want to run using Database Toolbox, you can use the `runstoredprocedure` or `exec` function.

Working with Custom Data Types

Database Toolbox functions return custom data types, for example Oracle ref cursors, as Java objects. You can manually parse these objects to retrieve their data contents. Use the `methods` function to access all the methods of your Java object. Use the available methods to retrieve data from your Java object. The steps for your object are specific to your database. For details, refer to your JDBC driver or database-specific documentation.

Running SQL Queries Saved in Scripts or Files

If you have SQL queries stored in `.sql` or text files that you want to run from MATLAB, you can use the `runsqlscript` function.

More About

- “Working with Large Data Sets” on page 2-200
- “Connecting to a Database Using the Native ODBC Interface” on page 3-16

Inserting Data Using the Command Line

You can use `datainsert`, `fastinsert`, or `insert` to insert data using the command line. To understand which function is best for your purposes and setup, see this table.

	`datainsert`	`fastinsert`	`insert`
Methodology	Creates a single parameterized query and performs a batch insert for all rows of data at once	Creates a single parameterized query and performs a batch insert for all rows of data at once	Creates a SQL insert query for each row of data
Input data format	Matrix, cell array	Matrix, cell array, structure, dataset array, table	Matrix, cell array, structure, dataset array, table
Input data size	Large	Large	Small
Special formatting	Special formatting is required for dates and timestamps, `null` and `NaN`.	Special formatting is required for dates and timestamps.	Special formatting is required for dates and timestamps.
JDBC performance	Fastest	Fast. Use if `datainsert` is not an option.	Slow. Use only if `datainsert` and `fastinsert` are not options.
Native ODBC performance	Not supported	Fast	Fast

If you still experience performance issues using these functions, then use the bulk insert functionality of your database. For details, see “Exporting Data Using Bulk Insert”.

To fetch data in your database, use the `exec` and `fetch` functions.

Working with Large Data Sets

In this section...

"Connect to a Database with Maximum Performance" on page 2-200
"Import Large Data Sets into MATLAB" on page 2-200
"Export Large Data Sets from MATLAB" on page 2-201
"Access Data Stored in a Database Using a DatabaseDatastore" on page 2-201

Connect to a Database with Maximum Performance

When you are using MATLAB with a database containing large volumes of data, you might experience out-of-memory issues or slow processing. To achieve the fastest performance, connect to your database using the native ODBC interface. For details, see "Connecting to a Database Using the Native ODBC Interface". If the native ODBC interface does not work, connect to your database using a JDBC driver. For details, see "Connecting to a Database" on page 2-193.

Import Large Data Sets into MATLAB

If you are selecting large volumes of data in a database to import into MATLAB, you might experience out-of-memory issues or slow processing. To achieve the fastest performance, you can import the data in batches.

When working with a native ODBC connection, you might be restricted by the amount of memory available to MATLAB. You might have to process parts of your data in MATLAB rather than processing your whole set of data at once. Use the `fetch` function to limit the number of rows your query returns by using the row limit argument. Using a MATLAB script, you can fetch data in increments using the row limit until all data is retrieved. For an example, see `fetch`.

When working with a JDBC connection, you might run into out-of-memory issues because of JVM heap memory restrictions. To achieve the best performance with importing large sets of data into MATLAB, you might need to fetch the data in batches by setting database preferences. To assess your memory needs and for options on running an SQL query that returns large amounts of data, see "Preference Settings for Large Data Import" on page 4-19.

Export Large Data Sets from MATLAB

When inserting large volumes of data into a database, you might experience slow processing. To achieve the fastest performance, use the appropriate function to insert the data.

If you are using native ODBC, use the `fastinsert` or `insert` function for fastest processing. If you are using a JDBC driver, use `datainsert` for the fastest processing to export your data from MATLAB.

For a comparison of these functions, see “Inserting Data Using the Command Line” on page 2-199.

Access Data Stored in a Database Using a DatabaseDatastore

An alternative for importing large data sets in a database into MATLAB is using a `DatabaseDatastore`. A `DatabaseDatastore` is a datastore that contains a collection of data stored in a database. You can use MapReduce to analyze large data sets stored in a `DatabaseDatastore` object. For details, see “Working with a DatabaseDatastore”.

More About

- “Choosing Between ODBC and JDBC Drivers” on page 2-10

Deploying a Database Application with MATLAB Compiler

In this section...

"Create and Deploy a Database Application" on page 2-202
"About Driver Configurations" on page 2-202

If you want to share your MATLAB code with others in your organization, then you must create a standalone database application using MATLAB Compiler™. After compiling the database application, you can deploy it to the target machines. Use this procedure and driver-specific information to create and deploy a database application.

Create and Deploy a Database Application

1 Write your database application code and save it as a MATLAB function in a file. Do not save the code as a MATLAB script file. Write the code in function form for database application deployment. Further, you must keep certain things in mind as you write your database application code. For details, see "Write Deployable MATLAB Code".
2 Compile your database application with MATLAB Compiler using the standalone application packaging process. For details, see "Package Standalone Application with Application Compiler App". The bitness of the MATLAB session used to create the database application determines the bitness of the resulting database application.
   - Compile the database application using a 32-bit MATLAB to create a 32-bit database application.
   - Compile the database application using a 64-bit MATLAB to create a 64-bit database application.
3 The generated output from the compilation process contains a folder called `for_testing`. Conduct a test on a target machine using the files found in this folder.
4 After the test is successful, you can distribute the database application to the target machines in your organization.

About Driver Configurations

Ensure the target machines have the correct driver configuration for your database application. See the following driver-specific tasks to configure data sources and drivers.

Native ODBC and ODBC Drivers

After compiling your database application, you must define the data sources referenced in your code on the target machine using the ODBC Data Source Administrator. Then, you can run your database application on the target machine.

JDBC Drivers

For applications that use JDBC drivers, use either option to specify the JDBC driver on the target machine:

- Use `javaaddpath` in your function code to add your JDBC driver JAR file. Do not include the JAR file in the `javaclasspath.txt` file.
- Add the JDBC driver JAR file to your `javaclasspath.txt` file. Do not use `javaaddpath` in your function code. For Microsoft SQL Server Operating System Authentication, add the full path of the library file to the `javalibrarypath.txt` file. For details, see “Microsoft SQL Server JDBC for Windows” on page 2-33.

Caution: Do not add driver JAR files using `javaclasspath` as this might cause issues on the target machine. For details, see “Bringing Java Classes into MATLAB Workspace”.

See Also

`javaaddpath`

More About

- “Write Deployable MATLAB Code”
- “Create Functions in Files”
- “Package Standalone Application with Application Compiler App”
- “Bringing Java Classes into MATLAB Workspace”

Working with Data Sources

- "Setting Up ODBC Data Sources" on page 3-2
- "Setting Up JDBC Data Sources" on page 3-3
- "Accessing Existing JDBC Data Sources" on page 3-4
- "Modifying Existing JDBC Data Sources" on page 3-5
- "Removing JDBC Data Sources" on page 3-6
- "Fetching Data Common Errors" on page 3-7
- "Database Connection Error Messages" on page 3-9
- "Database Explorer Error Messages" on page 3-14
- "Connecting to a Database Using the Native ODBC Interface" on page 3-16

Setting Up ODBC Data Sources

For instructions on setting up ODBC data sources, see "Configuring a Driver and Data Source" on page 2-13.

Setting Up JDBC Data Sources

For instructions on setting up JDBC data sources, see "Configuring a Driver and Data Source" on page 2-13.

Accessing Existing JDBC Data Sources

To access an existing data source from Visual Query Builder in future MATLAB sessions:

1. In Visual Query Builder, select **Query** > **Define JDBC data source**.
2. In the Define JDBC data sources dialog box, click **Use Existing File**.
3. In the Specify Existing JDBC data source MAT-file dialog box, select the MAT-file that contains the data sources you want to use and click **Open**.

   The data sources in the selected MAT-file appear in the Define JDBC data sources dialog box.
4. Click **OK** to close the Define JDBC data sources dialog box. The data sources now appear in the Visual Query Builder **Data source** list.

Modifying Existing JDBC Data Sources

1. Access the existing data source as described in “Accessing Existing JDBC Data Sources” on page 3-4.
2. Select the data source in the Define JDBC Data Sources dialog box.
3. Modify the data in the **Driver** and **URL** fields.
4. Click **Add/Update**.
5. Click **OK** to save your changes and close the Define JDBC data sources dialog box.

Removing JDBC Data Sources

1. Access the existing data source as described in "Accessing Existing JDBC Data Sources" on page 3-4.
2. Click **Remove**.
3. Click **OK** to save your changes and close the Define JDBC data sources dialog box.

Fetching Data Common Errors

This table describes how to address common errors you might encounter while working with Database Toolbox. These errors might occur in either Database Explorer or the command line when using `exec` or `fetch`.

Vendor	Error Message	Probable Causes	Resolution
Microsoft SQL Server	The statement did not return a result set.	There are other SQL statements in the middle of the stored procedure. This error happens after executing `exec` but before executing `fetch`. This error happens only with the command line.	Add `'SET NOCOUNT ON'` at the beginning of your stored procedure. For details, see `exec`.
Microsoft SQL Server	JDBC Driver 3.0 returns incorrect date values when used with JRE™ 1.7 by a Java application.	There is an issue with the Microsoft SQL Server JDBC Driver 3.0. This error happens after executing `fetch`. This error happens either with Database Explorer or the command line.	Install a hotfix from Microsoft for JDBC Driver 3.0. Alternatively, upgrade your Microsoft SQL Server JDBC driver to version 4.0.
Microsoft SQL Server	Connection is busy with results for another command.	You are connecting to Microsoft SQL Server using a driver that `preview` does not support.	Connect to Microsoft SQL Server using the JDBC driver.
Oracle	Stored procedures and functions return result sets as cursor types.	The JDBC driver returns stored procedure and function result sets as custom Java objects. This	Write custom MATLAB code to process the Java objects into MATLAB variables.

Vendor	Error Message	Probable Causes	Resolution
		error happens after executing `fetch`. This error happens only with the command line.	

PostgreSQL	Java exception occurred: java.lang.OutOfMemo
	Java heap space
		The JDBC driver caches results in the memory. There is not enough memory in the Java heap to store the large amount of data fetched from your database. This error happens after executing `exec` but before executing `fetch`. This error happens either with Database Explorer or the command line.	Write custom code. Write the code for connecting to your database via the command line. Then write the following.
			`set(conn,'AutoCommit','off`
			`h = conn.Handle;`
			`stmt = h.createStatement();`
			`stmt.setFetchSize(50);`
			`rs = stmt.executeQuery(java.lan * from largeData where productnumber <= 3000000'));`
			Modify the previous statement to include your SQL query instead.
			Then process the resultset object `rs` in batches.

Database Connection Error Messages

This table describes how to address common errors you might encounter while connecting to the Database Toolbox using either Database Explorer or the command line.

Connection Error Messages and Probable Causes

Vendor	Error Message	Probable Causes	Resolution
All	Undefined variable 'database' or class 'database.ODBCConnection	• Database Toolbox software is not installed. • You are connecting using the native ODBC interface with MATLAB R2013a or earlier.	• Ensure Database Toolbox software is installed. • If you want to use the native ODBC interface, ensure MATLAB R2013b or later is installed.
All ODBC-Compliant Databases	[Microsoft][ODBC Driver Manager] Data source name not found and no default driver specified	Data source name is not spelled correctly.	Verify your data source name.
All JDBC-Compliant Databases	Unable to find JDBC driver.	• Path to the JDBC driver JAR file is not on the static or dynamic class path. • Incorrect driver name provided while using the `'driver'` and `'url'` syntax.	Verify that the path to your JDBC driver is added to the static or dynamic path. Ensure you provide the correct JDBC driver name for the `driver` and `databaseurl` arguments.
All ODBC-Compliant Databases	[Microsoft][ODBC Driver Manager] The specified DSN contains an architecture mismatch between Driver and Application	You tried to open a 32-bit application when running MATLAB in 64-bit mode.	Restart MATLAB to run in 32-bit mode using the command `matlab –win32`.
Microsoft Access	[Microsoft][ODBC Microsoft Access Driver] '(unknown)' is not a valid	Error occurs in the Connection Failure dialog box after clicking	Verify the location of the database file and modify the existing file location

Vendor	Error Message	Probable Causes	Resolution
	path. make sure that the path name is spelled correctly and that you are connected to the server on which the file resides	**Connect** in the Connect to a Data Source dialog box. The file location of the Microsoft Access database is incorrect.	by selecting **New > ODBC** and selecting the existing database name from the ODBC Data Source Administrator dialog box. Then select **Configure** to change the database file location.
Microsoft SQL Server	The TCP/IP connection to the host `hostname`, port `portnumber` has failed. Error: “null. Verify the connection properties, check that an instance of SQL Server is running on the host and accepting TCP/IP connections at the port, and that no firewall is blocking TCP connections to the port.”	Incorrect server name or port number.	Verify your database server name and your port number. Microsoft SQL Server uses a dynamic port for JDBC and the value should be verified using Microsoft SQL Server Configuration Manager. For details, see “Step 2. Verify the port number.” on page 2-33
Microsoft SQL Server	This driver is not configured for integrated authentication.	The Microsoft SQL Server Windows authentication library is not added to `javalibrarypath.txt`	Add the Microsoft SQL Server Windows authentication library to `javalibrarypath.txt`. For details about configuring a Microsoft SQL Server Authenticated Database Connection, see “Microsoft SQL Server JDBC for Windows” on page 2-33.
Microsoft SQL Server or Sybase	Invalid string or buffer length.	64-bit ODBC driver error.	Use a JDBC driver or the native ODBC interface instead.

Vendor	Error Message	Probable Causes	Resolution
Microsoft SQL Server	JDBC Driver Error: com.microsoft.sqlserver.jdb Not Found/Loaded.	The full path to the JAR file was not added to the `javaclasspath.txt` file, or it was only added using the `javaaddpath` command. Alternatively, the path to the JAR file is incorrect.	Ensure the path to the JAR file is not misspelled. Ensure the path is added to the static class path.
Microsoft SQL Server	com.microsoft.sqlserver.jdb <clinit> WARNING: Failed to load the sqljdbc_auth.dll	The path to the folder containing the file `sqljdbc_auth.dll` was not added to the `javalibrarypath.txt` file, or the full path to the file was added instead of the path to the folder. Alternatively, this happens when the path to the 64-bit version of the DLL was added when using a 32-bit version of MATLAB, or the path to the 32-bit version of the DLL was added when using a 64-bit version of MATLAB.	Add the path to the folder containing the file `sqljdbc_auth.dll` to the `javalibrarypath.txt` file. Ensure the correct bitness, 32-bit or 64-bit, when adding the path to the `javalibrarypath.txt` file. For details about configuring a Microsoft SQL Server Authenticated Database Connection, see "Microsoft SQL Server JDBC for Windows" on page 2-33.
Microsoft SQL Server	Login failed for user 'DOMAIN\username'.	Either the login credentials you are using are incorrect or your user account does not have enough rights to access the remote machine. Also,	Ensure your user name and password are correct. Refer to your system administrator for appropriate access rights to the machines you need.

Vendor	Error Message	Probable Causes	Resolution
		this happens when the database server is not configured to accept Integrated Windows Authentication login credentials.	Check with your database administrator to understand if your database is set up with Windows Authentication.
MySQL	Access denied for user `'user'@'machinename'` (using password: YES)	Incorrect user name and password combination.	Verify your user name and password.
MySQL	Communications link failure. The last packet sent successfully to the server was 0 milliseconds ago. The driver has not received any packets from the server.	Incorrect server name or port number.	Verify your database server name and port number.
MySQL	Unknown database `'databasename'`.	Provided database name is incorrect.	Verify your database name.

Oracle	Error when connecting to Oracle `oci8` database using JDBC driver:
	`Error using com.mathworks.toolbox`
	`Java exception occurred:`
	`java.lang.UnsatisfiedLinkError: n`
	`java.library.pathat`
	`java.lang.ClassLoader.loadLibrary`
	`java.lang.Runtime.loadLibrary0...`
		MATLAB cannot find the Oracle DLL that the `oci8` drivers need.	Add the path for the location of the Oracle DLLs to `$MATLAB/toolbox/local/javalibrarypath.txt`.

Oracle	Invalid Oracle URL specified: `OracleDataSource.makeURL`	The `DriverType` parameter is not specified.	Specify the `DriverType` parameter as either `thin` for connecting without Windows authentication or `oci` for connecting with Windows authentication.

Vendor	Error Message	Probable Causes	Resolution
Oracle	The Network Adapter could not establish the connection.	Either `Server` or `Portnumber` is not specified or has an incorrect value.	Verify the server name and port number for your Oracle database.
Oracle	TNS:listener does not currently know of SID given in connect descriptor: Incorrect database name or incorrect URL.	The service name for your database is incorrect.	Verify the service name for your Oracle database.

See Also

`database`

More About

- "Configuring a Driver and Data Source"
- "Connecting to a Database Using the Native ODBC Interface"

Database Explorer Error Messages

This table describes how to address common errors you might encounter while working with Database Explorer. For details about Database Toolbox connection errors, see "Database Connection Error Messages" on page 3-9.

Database Explorer Error Messages and Probable Causes

Vendor	Error Location	Error Message	Probable Causes	Resolution
All JDBC-Complian Database	Error occurs in the Connecti Failure dialog box after clicking **Connect** in the Connect to a Data Source dialog box.	[Microsoft][ODBC Driver Manager] Data source name not found and no default driver specified	JDBC data sources created by Visual Query Builder cannot be used in Database Explorer.	You must run the following command: `setdbprefs(...` `'JDBCDataSourceFile','')` and then create a new JDBC data source from Database Explorer.
Microsoft SQL Server	Error occurs in the Data Preview Error dialog box after selecting a column of a table in the	Invalid Object Name catalog name.table name	The selected schema name in Database Explorer is incorrect.	You must select the appropriate schema name in Database Explorer using the **Catalog/Schema** address bar above the table columns tree.

Vendor	Error Location	Error Message	Probable Causes	Resolution
	Database Browser pane.			
Oracle	Error occurs inside the Database Browser pane.	No tables found in this schema Consider changing the schema.	Database Explorer has a conflict with the Oracle ODBC driver due to issues in the JDBC/ODBC bridge.	Switch your database connection to use a JDBC driver. For details, see "Configuring a Driver and Data Source" on page 2-13.
Oracle	Error occurs after clicking **Connect** in the Connect to a Data Source dialog box.	Unable to get meta data:[Oracle][ODBC]Driver not capable.	Database Explorer has a conflict with the Oracle ODBC driver due to issues in the JDBC/ODBC bridge.	Switch your database connection to use a JDBC driver. For details, see "Configuring a Driver and Data Source" on page 2-13.
Oracle	Error occurs after trying to change the schema using Oracle ODBC driver.	Error changing catalog/schema: [Oracle][ODBC]Driver not capable	Database Explorer has a conflict with the Oracle ODBC driver due to issues in the JDBC/ODBC bridge.	Switch your database connection to use a JDBC driver. For details, see "Configuring a Driver and Data Source" on page 2-13.

Connecting to a Database Using the Native ODBC Interface

In this section...

"About the Native ODBC Interface" on page 3-16
"Native ODBC Interface Workflow" on page 3-16
"Native ODBC, JDBC/ODBC Bridge and JDBC Interface Comparison" on page 3-18
"Compatibility and Limitations" on page 3-20

About the Native ODBC Interface

The native ODBC interface is a C++ library that allows direct communication with the ODBC driver instead of using the Oracle JDBC/ODBC bridge. This eliminates issues from using the bridge and eliminates heap memory outages caused by the JVM heap memory restrictions. Using the native ODBC interface results in an improved data import and export experience, especially when working with large amounts of data.

Native ODBC Interface Workflow

This example shows how to connect to a database using the native ODBC interface, execute an SQL statement and fetch the returned data, insert data, and then close the connection.

Connect to the Database Using the Native ODBC Interface

Connect to the database with the ODBC data source name, `dbtoolboxdemo`, using the user name, `admin`, and password, `admin`.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

`database.ODBCConnection` returns `conn` as a `database.ODBCConnection` object.

Import Data Using the Native ODBC Interface

Select data in column `productDescription` from `productTable` using the database connection, `conn`. Assign the returned cursor object to the variable `curs`.

```
curs = exec(conn,'select productDescription from productTable');
```

With the native ODBC interface, `exec` returns `curs` as an `ODBCCursor Object` instead of a `Database Cursor Object`.

Note: The native ODBC interface has a default batch size of 100,000 that enables acceptable performance. To override this value, you must use `setdbprefs` as follows. Set `FetchInBatches` to `yes` and set `FetchBatchSize` to a specific batch size number `<h>`.

```
setdbprefs('FetchInBatches','yes')
setdbprefs('FetchBatchSize','<h>')
```

Use `fetch` to import all data into the cursor object `curs`, and store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = fetch(curs);
```

View the contents of the `Data` element in the cursor object `curs`.

```
curs.Data
```

```
ans =

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
    'Tin Soldier'
    'Sail Boat'
    'Slinky'
    'Teddy Bear'
```

Export Data Using the Native ODBC Interface

Define the columns of data to insert in the cell array `colnames`.

```
colnames = {'productNumber','stockNumber','supplierNumber',...
     'unitCost','productDescription'}
```

```
colnames =

  Columns 1 through 3

    'productNumber'    'stockNumber'    'supplierNumber'

  Columns 4 through 5
```

```
    'unitCost'    'productDescription'
```

Define the data for the row to insert in the cell array `coldata`.

```
coldata = {11,800999,1006,9.00,'Toy Car'}

coldata =

    [11]    [800999]    [1006]    [9]    'Toy Car'
```

Insert the data in `coldata` into the `productTable` with the defined column names, `colnames`.

```
insert(conn,'productTable',colnames,coldata);
```

Caution: The Microsoft Access ODBC driver demonstrates unexpected behavior during large inserts. When inserting large amounts of data with Microsoft Access, insert the data in batches. For example, if you want to insert 100,000 rows of data, insert 10,000 rows at a time.

Close the cursor object `curs`, and then close the database connection `conn`.

```
close(curs)
close(conn)
```

Caution: Leaving cursor and connection objects open or overwriting open objects can result in unexpected behavior. Once you are finished working with these objects, you must close them using `close`.

Native ODBC, JDBC/ODBC Bridge and JDBC Interface Comparison

This table highlights the differences between using the native ODBC, JDBC/ODBC bridge, and JDBC interfaces to access and manipulate data in a database.

Item	Native ODBC	JDBC/ODBC Bridge	JDBC
Connection function	Use `database.ODBCConn`	Use `database`	Use `database`
Actions	Can perform the following actions:	Can perform the following actions:	Can perform the following actions:

Item	Native ODBC	JDBC/ODBC Bridge	JDBC
	• Query data (`exec`) • Import data (`fetch`) • Run stored procedure (`exec`) • Export data (`insert`, `fastinsert`) • Close connection (`close`)	• Query data (`exec`) • Import data (`fetch`) • Export data (`insert`, `fastinsert`, `datainsert`, `update`) • Run stored procedure (`exec`, `runstoredprocedure`) • Retrieve metadata (`dmd`, `tables`, `columns`, `database.catalogs`, and many others) • Use Database Explorer (`dexplore`) • Close connection (`close`)	• Query data (`exec`) • Import data (`fetch`) • Export data (`insert`, `fastinsert`, `datainsert`, `update`) • Run stored procedure (`exec`, `runstoredprocedure`) • Retrieve metadata (`dmd`, `tables`, `columns`, `database.catalogs`, and many others) • Use Database Explorer (`dexplore`) • Close connection (`close`)
Underlying technology	C++	Java	Java
Memory performance	Restricted by MATLAB memory, but not JVM heap memory	Restricted by both JVM heap memory and MATLAB memory	Restricted by both JVM heap memory and MATLAB memory
Data access performance	Fastest	Slowest	Medium

Item	Native ODBC	JDBC/ODBC Bridge	JDBC
64-bit systems	No major issues	Several known issues with connectivity and data access	No major issues
Data type support	Long data types are not supported (e.g. `LONG`, `BLOB`, etc.)	Long data types are supported	Long data types are supported

Note: For details about the `database.ODBCConnection` syntax, see the native ODBC interface example in `database`.

Compatibility and Limitations

The native ODBC interface has the following compatibility and limitation considerations:

- Native ODBC database connections are supported on MATLAB 32-bit and 64-bit versions using the `database` function. The native ODBC interface supports 64-bit database vendors. This interface is backward compatible for 32-bit versions. The bitness of MATLAB must always match the bitness of the database driver.
- The native ODBC interface is available only for the command line. You cannot use Database Explorer to access the native ODBC interface.
- The native ODBC interface does not support long data types such as Oracle `LONG` and SQL Server `NTEXT`. If you get one of the following errors, you are accessing an unsupported data type:
  - `Driver unable to retrieve length for column number: <index of column in the query>`
  - `Out of memory. Type HELP MEMORY for your options.`

More About

- “Selecting Data Using the exec Function” on page 5-47
- “Importing Data Using the fetch Function” on page 5-55

Using Visual Query Builder

- "Getting Started with Visual Query Builder" on page 4-2
- "Working with Preferences" on page 4-15
- "Preference Settings for Large Data Import" on page 4-19
- "Displaying Query Results" on page 4-23
- "Fine-Tuning Queries Using Advanced Query Options" on page 4-33
- "Retrieving BINARY and OTHER Data Types" on page 4-54
- "Importing and Exporting Boolean Data" on page 4-56
- "Saving Queries in Files" on page 4-60
- "Using Database Explorer" on page 4-63

Getting Started with Visual Query Builder

In this section...

"What Is Visual Query Builder?" on page 4-2
"Using Queries to Import Data" on page 4-2
"Using Queries to Export Data" on page 4-9
"Clearing Variables from the VQB Data Area" on page 4-14

What Is Visual Query Builder?

Visual Query Builder (VQB) is an easy-to-use graphical user interface (GUI) for exchanging data with your database. To start VQB, use `querybuilder`. You can use VQB to:

- Build queries to retrieve data by selecting information from lists instead of using MATLAB functions.
- Store data retrieved from a database in a MATLAB cell array, structure, or numeric matrix.
- Process the retrieved data using the MATLAB suite of functions.
- Display retrieved information in relational tables, reports, and charts.
- Export data from the MATLAB workspace into new rows in a database.

Using Queries to Import Data

The following steps summarize how to use VQB to import data.

To start the Visual Query Builder, type `querybuilder` at the MATLAB prompt.

*Required step

1* Specify **Select**.

2* Select data source.

3 Select catalog and schema.

4* Select tables.

5* Select fields to retrieve.

6 Refine query.

7 View SQL statement.

8 Set preferences for data retrieval.

9* Assign variable for results.

10* Run query.

11 Double-click to view query results in MATLAB Array Editor.

12 View query results in table, chart, and report formats.

13 Save, load, and run queries, and generate M-files.

You can graphically construct and run SQL queries to import database data using:

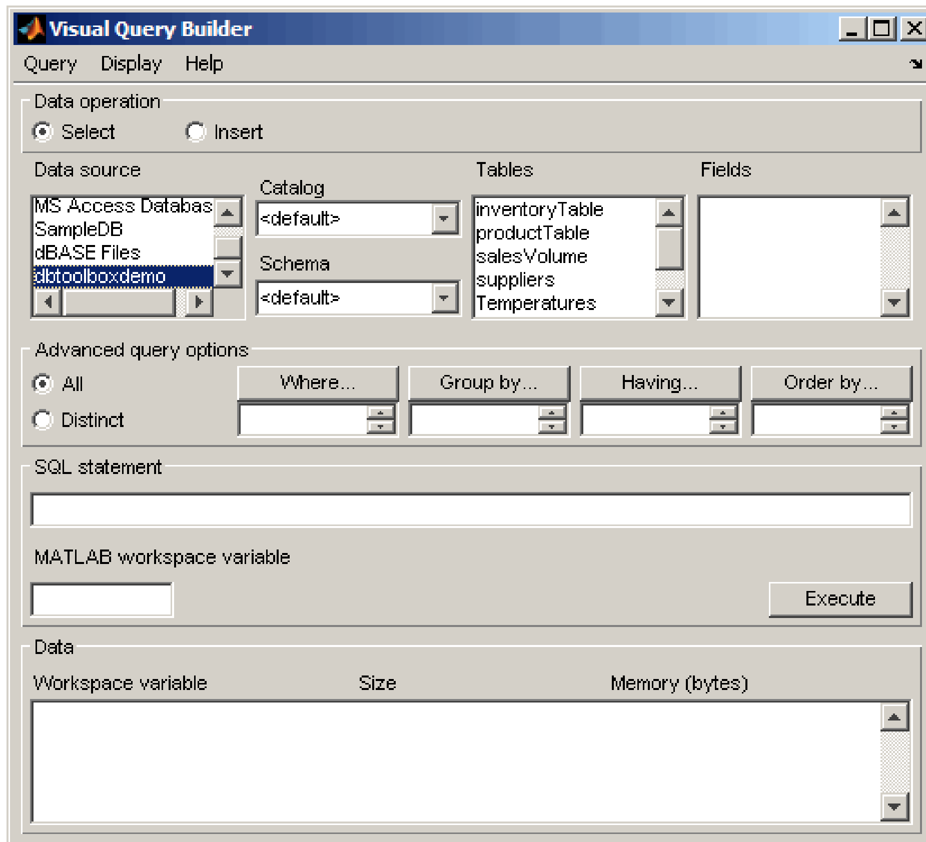
- Visual Query Builder (`querybuilder`)
- Database Explorer

  `dexplore` starts Database Explorer, which is the Database Toolbox app for connecting to a database and importing data to the MATLAB Workspace. Alternatively, you can start Database Explorer by selecting **Database Explorer** from the **Database Connectivity and Reporting** section of the **Apps** tab in the MATLAB Toolstrip. For details about Database Explorer, after starting Database Explorer, click **Help** on the Database Explorer Toolstrip.

To create and run a query using Visual Query Builder to import data from a database into the MATLAB workspace:

1. Select data from a database by clicking the **Select** button under **Data operation**. The data sources that you defined in "Configuring a Driver and Data Source" on page 2-13 appear.
2. Select `dbtoolboxdemo` as the data source from which to import data.

   After you select a data source, the catalog, schema, and tables for your specified data source appear in the **Catalog**, **Schema**, and **Tables** fields.



3 Accept the default values `<default>` for the **Catalog** and **Schema** fields. Setting these fields to the default values indicates that you have not specified a catalog or schema.

Tip To populate the VQB **Schema** and **Catalog** fields, you must associate your user name with schemas or catalogs before starting VQB.

- To specify a **Catalog**, select one from the list, and then select a schema from within that catalog. The **Schema** field updates to reflect your selections.

- Alternatively, you can select a schema without specifying a catalog; that is, when the **Catalog** field set to `<default>`. The **Tables** field updates to reflect the schema you selected.

---

4. In the **Tables** list, select `salesVolume` as the table that contains the data you want to import.

   The set of **Fields** (column names) in the table appears.

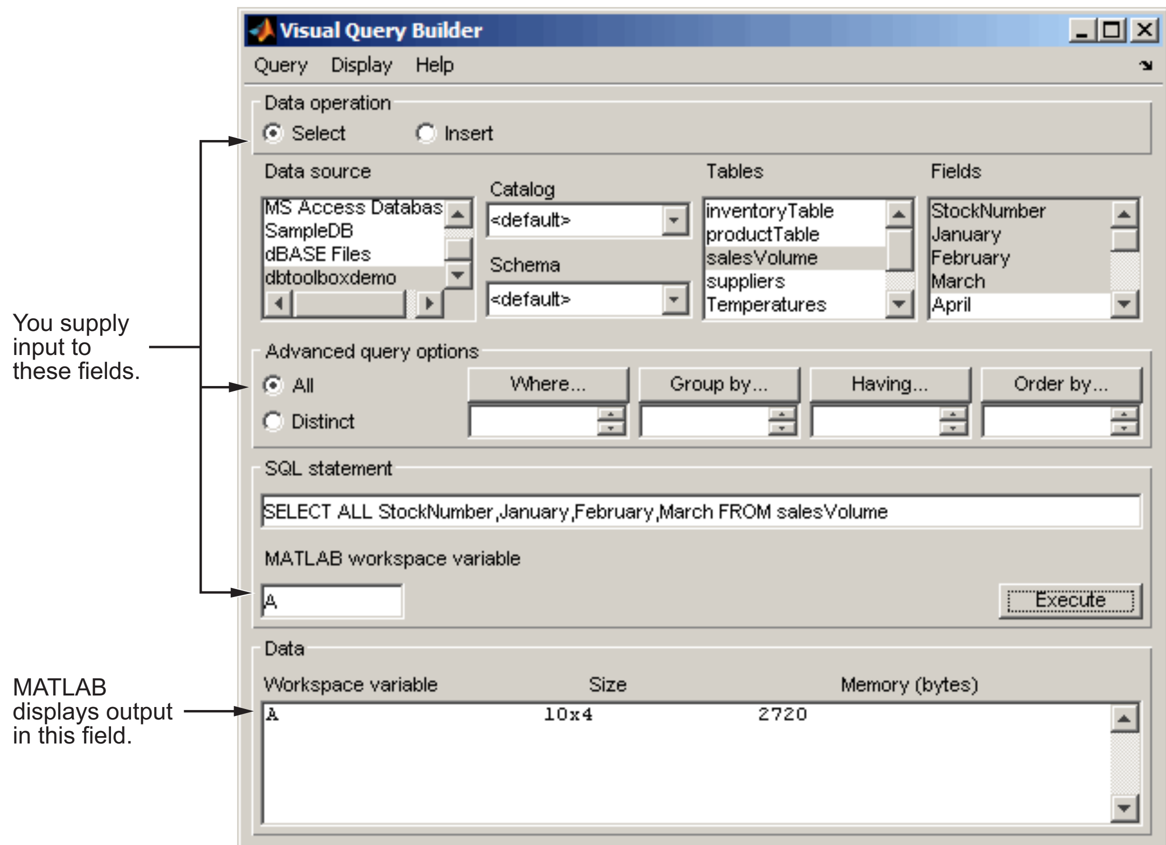
5. In the **Fields** list, select `StockNumber`, `January`, `February`, and `March` as the fields that contain the data you want to import.

   Tip To select more than one field, hold down the **Ctrl** or **Shift** key while selecting multiple fields. To clear an entry, use **Ctrl**+click.

   VQB adds each field you select to the query in the **SQL statement** field.

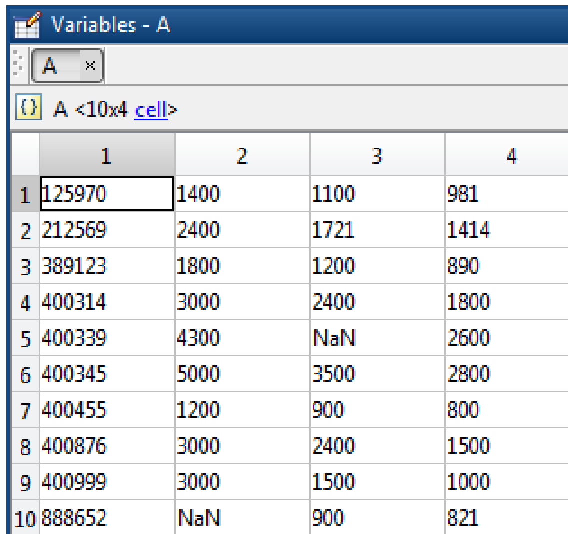
6. Enter the name `A` in the **MATLAB workspace variable** field. `A` is a cell array that stores the data that the query returns.

7. Click **Execute** to run the query and import the data. The **Data** field displays information about the query result.



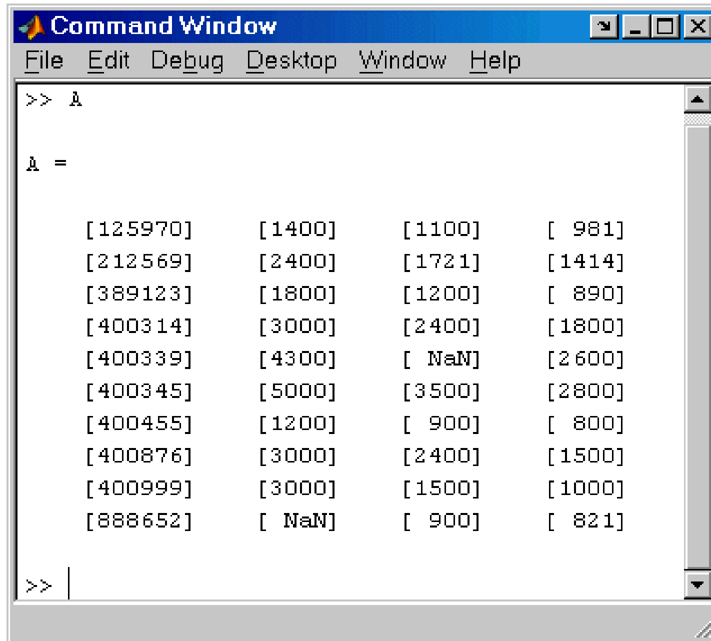
8 Double-click A in the **Data** area. The contents of A appear in the Variables editor, where you can view and edit the data. In this example, sales for item 400876 are 3000 in January, 2400 in February, and 1500 in March.

For details about using the Variables editor, see "View, Edit, and Copy Variables".



	1	2	3	4
1	125970	1400	1100	981
2	212569	2400	1721	1414
3	389123	1800	1200	890
4	400314	3000	2400	1800
5	400339	4300	NaN	2600
6	400345	5000	3500	2800
7	400455	1200	900	800
8	400876	3000	2400	1500
9	400999	3000	1500	1000
10	888652	NaN	900	821

Alternatively, you can view the contents of A by entering A in the MATLAB Command Window.



Using Queries to Export Data

The following steps summarize how to use VQB to export data.

To start the Visual Query Builder, type `querybuilder` at the MATLAB prompt.

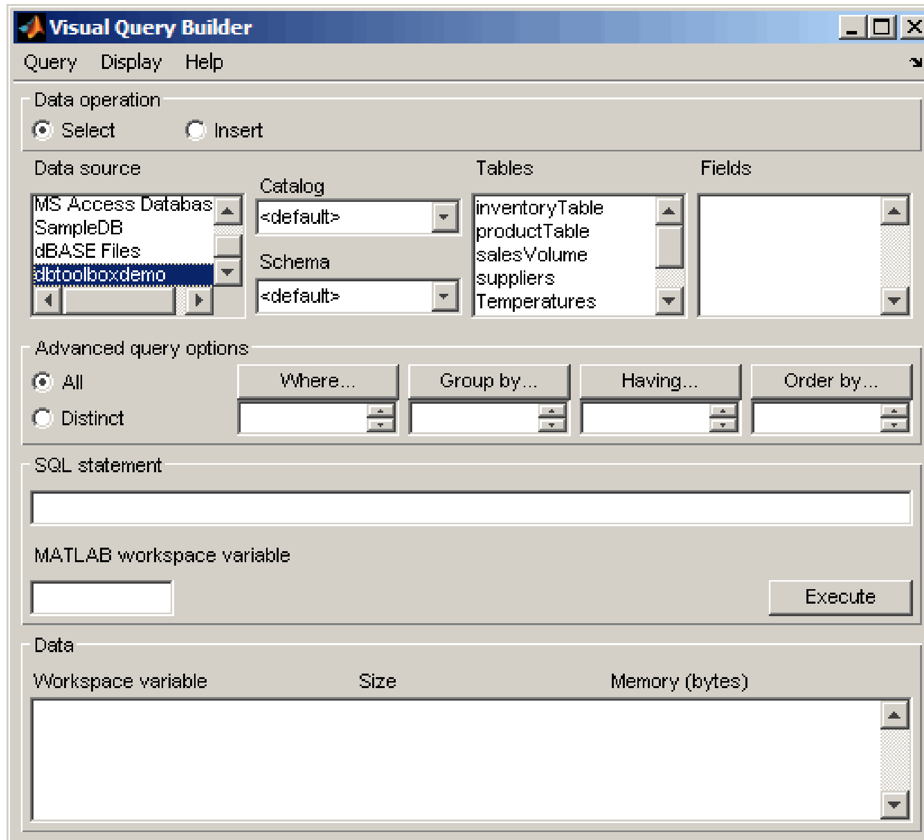
*Required step

1* Specify **Insert.**
2* Select data source.
3 Select catalog and schema.
4* Select tables.
5* Select fields to which to export data.
6* Specify variable containing data to export.
7 View MATLAB statement.
8* Run query.
9 Save, load, and run queries, set preferences for exporting NULLs, and generate M-files.

To build, run, and save a query that exports data from the MATLAB workspace into new rows in a database:

1 Select **Data Operation** > **Insert** to select data to export.

2 Select `dbtoolboxdemo` as the data source to which to export data from the **Data source** list box. The **Catalog**, **Schema**, and **Tables** fields for `dbtoolboxdemo` appear.



3 Do not specify values for **Catalog** and **Schema**.

4 In the **Tables** list box, select `inventoryTable` as the table to which you want to export data from the MATLAB software.

The set of **Fields** (column names) in your selected table appears.

5 In the **Fields** list box, select `productNumber`, `Quantity`, and `Price` as the fields to which you want to export data from the MATLAB software.

VQB adds each field you select to the query in the **MATLAB command** field.

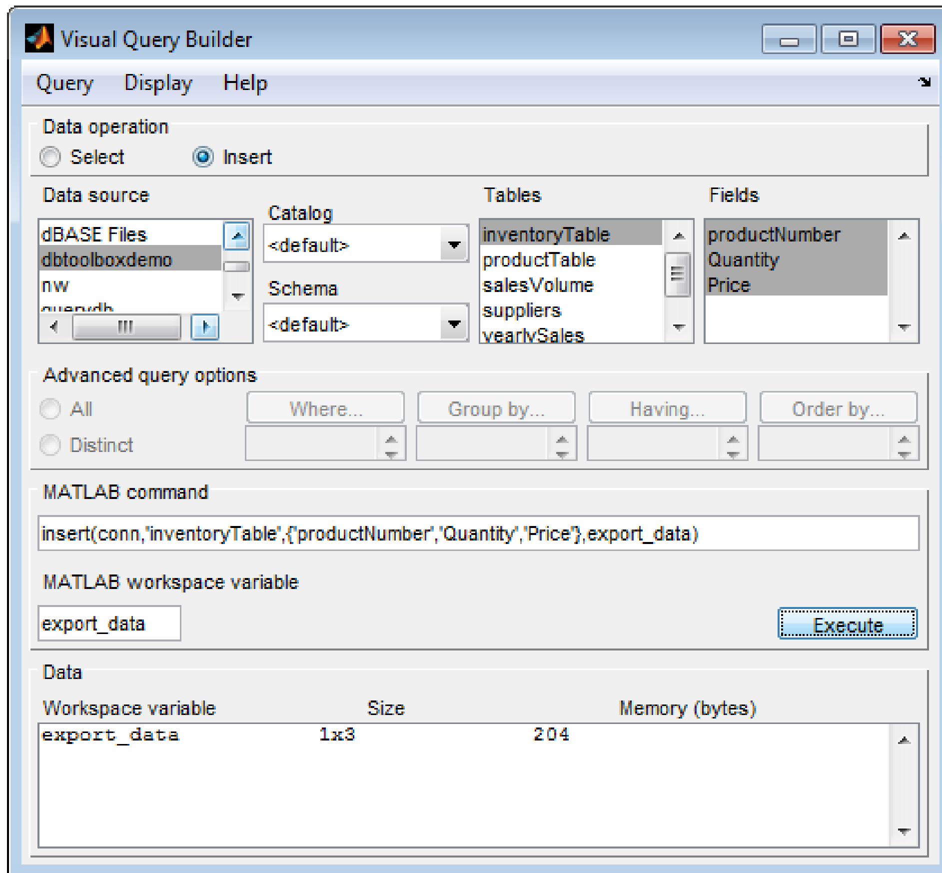
6 In the MATLAB workspace, assign the data you want to export to a cell array, `export_data`.

```
export_data = {14,1500,18.50};
```

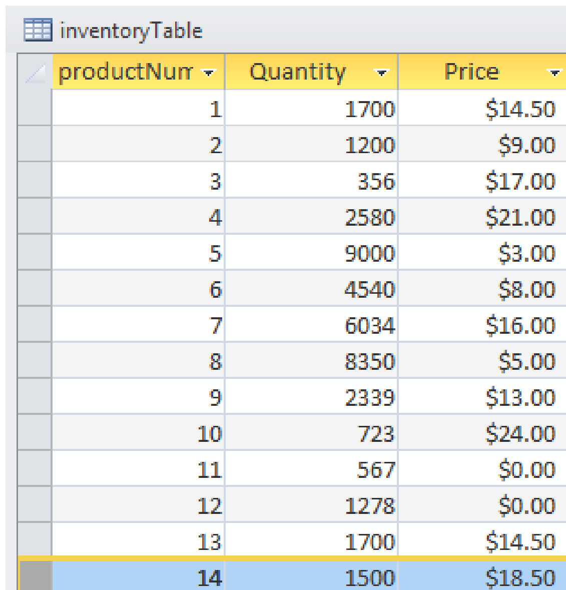
7 In the **MATLAB workspace variable** field, enter the name of the variable containing data to export, `export_data`. Press **Enter** or **Return** to view the **MATLAB command** that exports the data.

8 Click **Execute** to run the query to export the data.

Information about the exported data appears in the **Data** area.



9 View the `inventoryTable` table in the Microsoft Access database to verify the query results.



inventoryTable

productNum	Quantity	Price
1	1700	$14.50
2	1200	$9.00
3	356	$17.00
4	2580	$21.00
5	9000	$3.00
6	4540	$8.00
7	6034	$16.00
8	8350	$5.00
9	2339	$13.00
10	723	$24.00
11	567	$0.00
12	1278	$0.00
13	1700	$14.50
14	1500	$18.50

10 To save this query, select **Query** > **Save** and name it `export.qry`.

Clearing Variables from the VQB Data Area

Variables in the **Data** area include those you assigned in the Command Window and those that contain query results. The variables do not appear in the **Data** area until you execute a query. They then remain in the **Data** area until you clear them. To clear the variables, run the `clear` function in the Command Window.

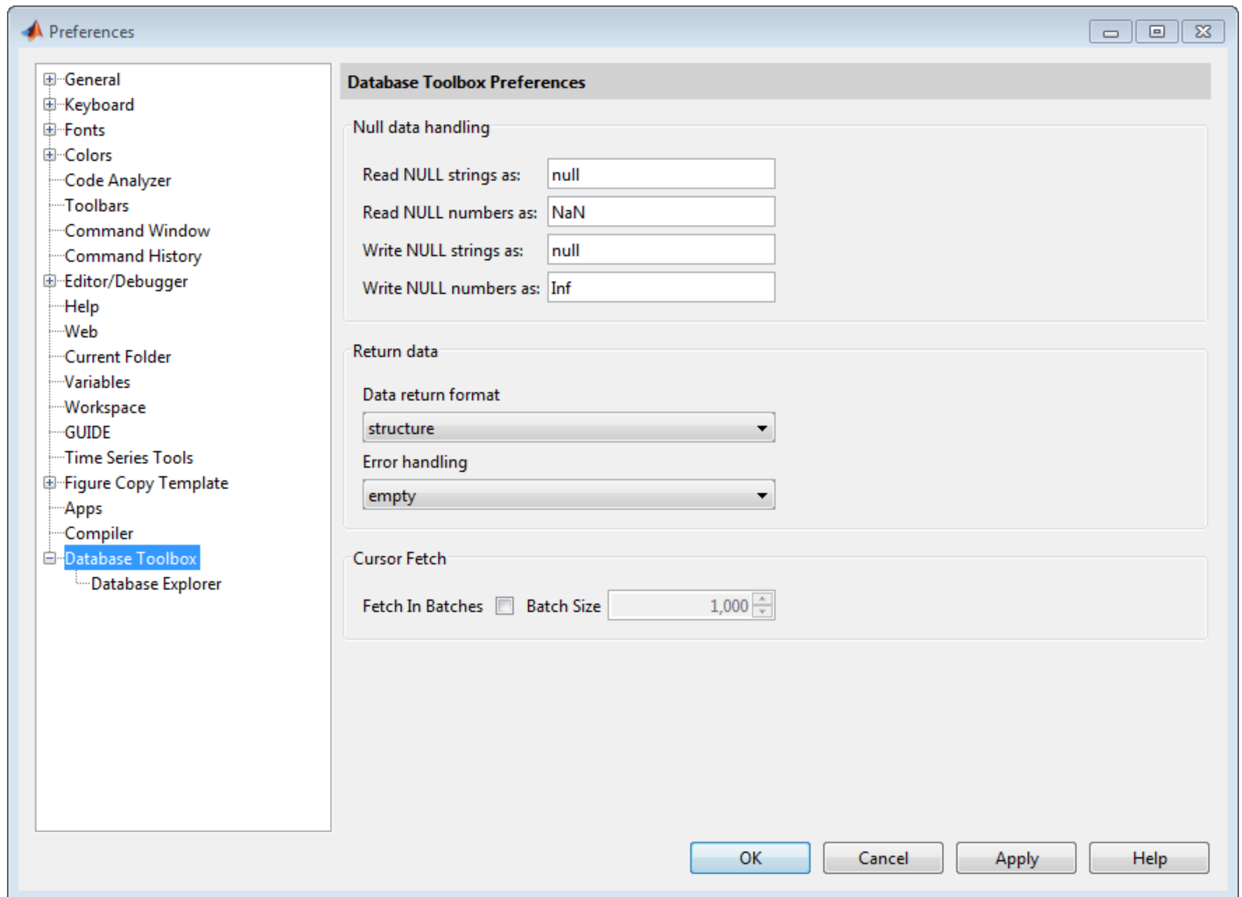
Working with Preferences

Specifying Preferences

Database Toolbox preferences enable you to specify:

- How NULL data in a database is represented after you import it into the MATLAB workspace
- The format of data retrieved from databases
- The method of error notification
- The preference for fetching in batches

1 From Visual Query Builder, select **Query** > **Preferences**. The Preferences dialog box appears. Alternatively, from the MATLAB Toolstrip, click **Preferences** and select **Database Toolbox**.



2 Specify the Preferences settings as described in the following table.

Preference	Acceptable Values	Description
Read NULL strings as:	`null` (default)	Specifies how `NULL` strings appear after being fetched from a database.
Read NULL	`Nan` (default)	Specifies how `NULL` numbers appear after being fetched from a database. If you accept the default value for this field, `NULL` data imported from databases into the MATLAB workspace appears

Preference	Acceptable Values	Description
numbers as:		as NaN. Setting this field to 0 causes NULL data imported into the MATLAB workspace to appear as 0s.
Write NULL strings as:	null (default)	Specifies how NULL strings appear after being exported to a database. This setting does not apply to Database Explorer (dexplore).
Write NULL numbers as:	Nan (default)	Specifies how NULL numbers appear after being exported to a database. This setting does not apply to Database Explorer (dexplore).
Data return format	cell array, numeric, structure, or dataset	Select a data format based on the type of data you are importing, memory considerations, and your preferred method of working with retrieved data. • cellarray (default) — Imports nonnumeric data into MATLAB cell arrays. • numeric — Imports data into MATLAB matrix of doubles. Nonnumeric data types are considered NULL and appear as specified in the **Read NULL numbers as:** setting. Use only when data to retrieve is in numeric format, or when nonnumeric data to retrieve is not relevant. • structure — Imports data into a MATLAB structure. Use for all data types. Facilitates working with returned columns. • dataset — Imports data into MATLAB dataset objects. This option requires Statistics Toolbox™. This setting does not apply to Database Explorer (dexplore). If you are using Database Explorer, the data return format is specified using **Imported Data** panel in the Database Explorer interface.
Error handling	store, report, or empty	• Set this field to store or empty to direct errors to either a dialog box when using Visual Query Builder or a message field when using the Database Toolbox command line interface. • Set this field to report to display query errors in the MATLAB Command Window. This setting does not apply to Database Explorer (dexplore).

Preference	Acceptable Values	Description
Cursor Fetch	`Fetch In Batches` and `Batch Size`	Specifies if `fetch` retrieves data in batches with a user-defined `Batch Size`. The default `Batch Size` is 1,000. For details, see "Preference Settings for Large Data Import" on page 4-19. This setting does not apply to Database Explorer (`dexplore`). If you are using Database Explorer, the import batch size is specified using **Preferences** on the Database Explorer Toolstrip.

3 Click **OK**. For details about Preferences, see the `setdbprefs` function reference page.

Preference Settings for Large Data Import

In this section...
"Will All Data (Size n) Fit in a MATLAB Variable?" on page 4-20
"Will All of This Data Fit in the JVM Heap?" on page 4-20
"How Do I Perform Batching?" on page 4-21

When using the `setdbprefs` to set `'FetchInBatches'` and `'FetchBatchSize'` or the **Cursor Fetch** option for the Preference dialog box, use the following guidelines to determine what batch size value to use. These guidelines are based on evaluating:

- The size of your data (n rows) to import into MATLAB
- The JVM heap requirements for the imported data

The general logic for making these evaluations are:

- If your data (n rows) will fit in a MATLAB variable, then will all your data fit in the JVM heap?
  - If yes, use the following preference setting:

    ```
    setdbprefs('FetchInBatches','no')
    ```
  - If no, evaluate `h` such that `h` < n and data of size `h` rows fits in the JVM heap. Use the following preference setting:

    ```
    setdbprefs('FetchInBatches','yes')
    setdbprefs('FetchBatchSize','h')
    ```
- If your data (n rows) will not fit in a MATLAB variable, then:
  - Evaluate `m` such that `m` < n and the data of size `m` rows fits in a MATLAB variable.
  - Evaluate `h` such that `h` < `m` < n and data of size `h` rows fits in the JVM heap. Use the following preference setting:

    ```
    setdbprefs('FetchInBatches','yes')
    setdbprefs('FetchBatchSize','h')
    ```
    Then import data using `fetch` or `runsqlscript` by using the value `'m'` to limit the number of rows in the output:

    ```
    curs = fetch(curs,m)
    ```

    or

```
results = runsqlscript(conn,'filename.sql','rowInc','m')
```

- If you are using the native ODBC interface to import large amounts of data, you do not need to change these settings because the native ODBC interface always fetches data in batches of 100,000 rows. You can still override the default batch size by setting `'FetchInBatches'` to `'yes'` and `'FetchBatchSize'` to a number of your choice. Note that JVM heap memory restrictions do not apply in this case since the native ODBC interface is a C++ API.

Will All Data (Size n) Fit in a MATLAB Variable?

This example shows how to estimate the size of data to import from a database.

It is important to have an idea of the size of data that you are looking to import from a database. Finding the size of the table(s) in the database can be misleading because MATLAB representation of the same data is most likely going to consume more memory. For instance, say your table has one numeric column and one text column and you are looking to import it in a cell array. Here is how you can estimate the total size.

```
data = {1001, 'some text here'};
whos data
```

```
 Name      Size            Bytes  Class    Attributes

  data      1x2               156  cell
```

If you are looking to import a thousand rows of the table, the approximate size in MATLAB would be 156 * 1000 = 156 KB. You can replicate this process for a structure or a dataset array depending on which data type you want to import the data in. Once you know the size of data to be imported in MATLAB, you can determine whether it fits in a MATLAB variable by executing the command `memory` in MATLAB.

A conservative approach is recommended here so as to take into account memory consumed by other MATLAB tasks and other processes running on your machine. For example, even if you have 12 GB RAM and the memory command in MATLAB shows 14 GB of longest array possible, it might still be a good idea to limit your imported data to a reasonable 2 or 3 GB to be able to process it without issues. Note that these numbers vary from site to site.

Will All of This Data Fit in the JVM Heap?

This example shows how to determine the size of the JVM heap.

The value of your JVM heap can be determined by selecting MATLAB **Preferences** and **General** > **Java Heap Memory**. You can increase this value to an allowable size, but keep in mind that increasing JVM heap reduces the total memory available to MATLAB arrays. Instead, consider fetching data in small batches to keep a low to medium value for heap memory.

How Do I Perform Batching?

There are three different methods based on your evaluations of the data size and the JVM heap size. Let n be the total number of rows in the data you are looking to import, `m` be the number of rows that fit in a MATLAB variable, and `h` be the number of rows that fit in the JVM heap.

Method 1 — Data Does Not Fit in MATLAB Variable or JVM Heap

If your data (n) does not fit in a MATLAB variable or a JVM heap, you need to find `h` and `m` such that `h` < `m` < n.

To use automated batching to fetch those `m` rows in MATLAB:

```
setdbprefs('FetchInBatches','yes')
setdbprefs('FetchBatchSize','h')
```

If using `exec`, `fetch`, and connection object `conn`:

```
curs = exec(conn,'Select….');
curs = fetch(curs,m);
```

If using `runsqlscript` to run a query from an SQL file `'filename.sql'`:

```
results = runsqlscript(conn,'filename.sql','rowInc','m')
```

Once you are done processing these `m` rows, you can import the next `m` rows using the same commands. Keep in mind, however, that using the same cursor object `curs` for this results in the first `curs` being overwritten, including everything in `curs.Data`.

Note: If `'FetchInBatches'` is set to `'yes'` and the total number of rows fetched is less than `'FetchBatchSize'`, MATLAB shows a warning message and then fetches all the rows. The message is `Batch size specified was larger than the number of rows fetched.`

Method 2 — Data Does Fit In MATLAB Variable But Not in JVM Heap

If your data (n) does fit in a MATLAB variable but not in a JVM heap, you need to find `h` such that `h` < n.

To use automated batching to fetch where `h` rows fit in the JVM heap:

```
setdbprefs('FetchInBatches','yes')
setdbprefs('FetchBatchSize','h')
```

If using `exec`, `fetch`, and the connection object `conn`:

```
curs = exec(conn,'Select….');
curs = fetch(curs);
```

If using `runsqlscript` to run a query from an SQL file `'filename.sql'`:

```
results = runsqlscript(conn,'filename.sql')
```

Note that when you use automated batching and do not supply the `rowLimit` parameter to `fetch` or the `rowInc` parameter to `runsqlscript`, a count query is executed internally to get the total number of rows to be imported. This is done to preallocate the output variable for better performance. In most cases, the count query overhead is not much, but you can easily avoid it if you know or have a good idea of the value of `n`:

```
curs = fetch(curs,n)
```
or

```
results = runsqlscript(conn,'filename.sql’,'rowInc','n')
```

Method 3 — Data Fits in MATLAB Variable and JVM Heap

If your data (n) fits in a MATLAB variable and also in a JVM heap, then you need not use batching at all.

```
setdbprefs('FetchInBatches','no')
```

If using `fetch`:

```
curs = fetch(curs);
```

If using `runsqlscript` to run a query from an SQL file `'filename.sql'`:

```
results = runsqlscript(conn,'filename.sql')
```

Displaying Query Results

In this section...

"How to Display Query Results" on page 4-23
"Displaying Data Relationally" on page 4-23
"Charting Query Results" on page 4-26
"Displaying Query Results in an HTML Report" on page 4-28
"Displaying Query Results with MATLAB Report Generator" on page 4-29

How to Display Query Results

To display query results, perform one of the following actions:

- Enter the variable name to which to assign the query results in the MATLAB Command Window.
- Double-click the variable in the VQB **Data** area to view the data in the Variables editor.

The examples in this section use the saved query `basic.qry`. To load and configure this query:

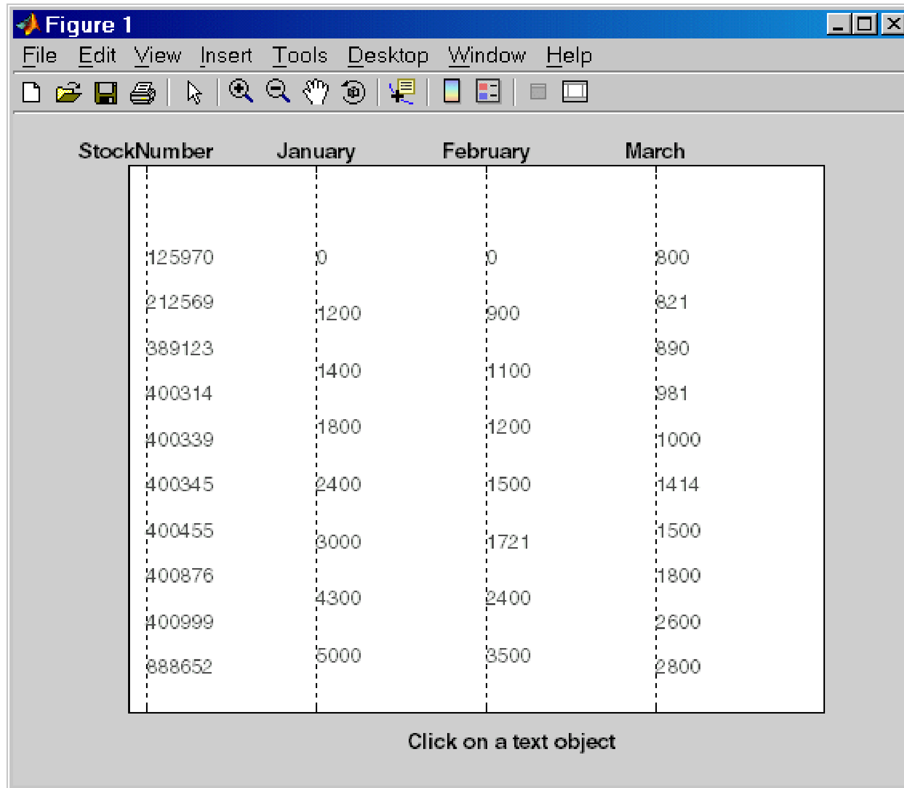
1. Select **Query** > **Preferences**, and set **Read NULL numbers as** to `0`.
2. Select **Query** > **Load**.
3. In the Load SQL Statement dialog box, select `basic.qry` from the **File name** field and click **Open**.
4. In VQB, enter a value for the **MATLAB workspace variable**, for example, `A`, and click **Execute**.

Displaying Data Relationally

To display the results of `basic.qry`:

1. Execute `basic.qry`.
2. Select **Display** > **Data**.

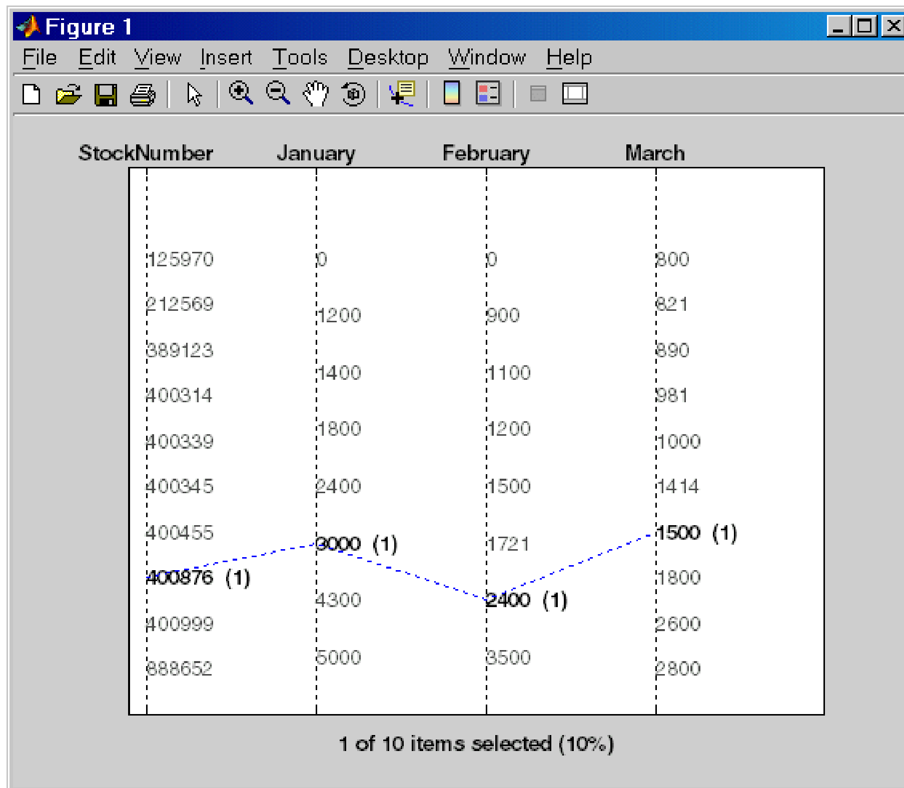
   The query results appear in a figure window.



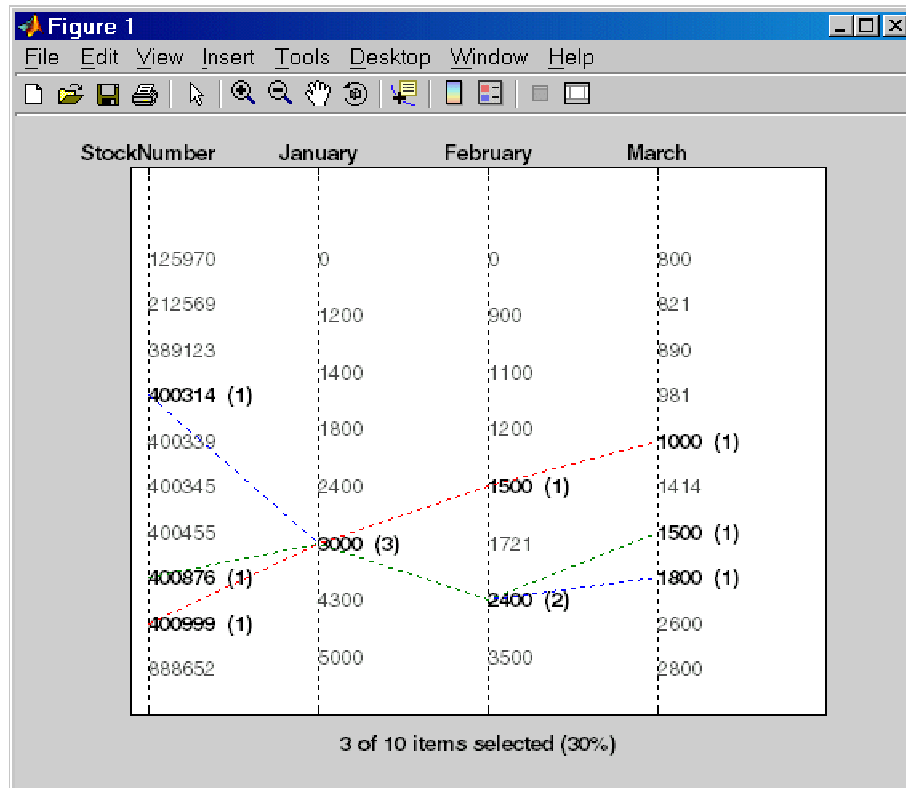
This display shows only unique values for each field, so you should not read each row as a single record. In this example, there are 10 entries for **StockNumber**, eight entries for **January** and **February**, and 10 entries for **March**. The number of entries in each field corresponds to the number of unique values in the field.

3 Click a value in the figure window, for example, **StockNumber** `400876`, to see its associated values.

   The data associated with the selected value appears in bold font and is connected with a dotted line. The data shows that sales for item 400876 are 3000 in January, 2400 in February, and 1500 in March.



4 As another example, click 3000 under **January**. It shows three different items with sales of 3000 units in January: 400314, 400876, and 400999.

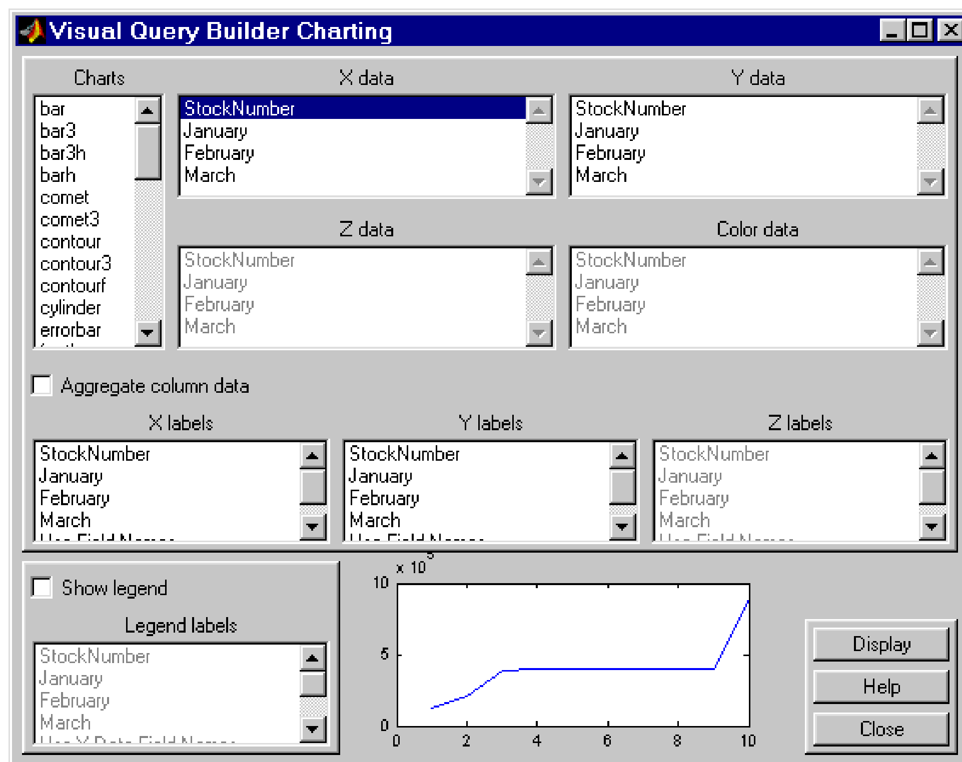


Charting Query Results

To chart the results of `basic.qry`:

1 Select **Display** > **Chart**.

The Visual Query Builder Charting dialog box appears.



2 Select a type of chart from the **Charts** list. In this example, choose a pie chart by specifying `pie`.

A preview of the pie chart, with each stock item displayed in a different color, appears at the bottom of the dialog box.

3 Select the data to display in the chart from the **X data**, **Y data**, and **Z data** list boxes. In this example, select `March` from the **X data** list box to display a pie chart of March data.

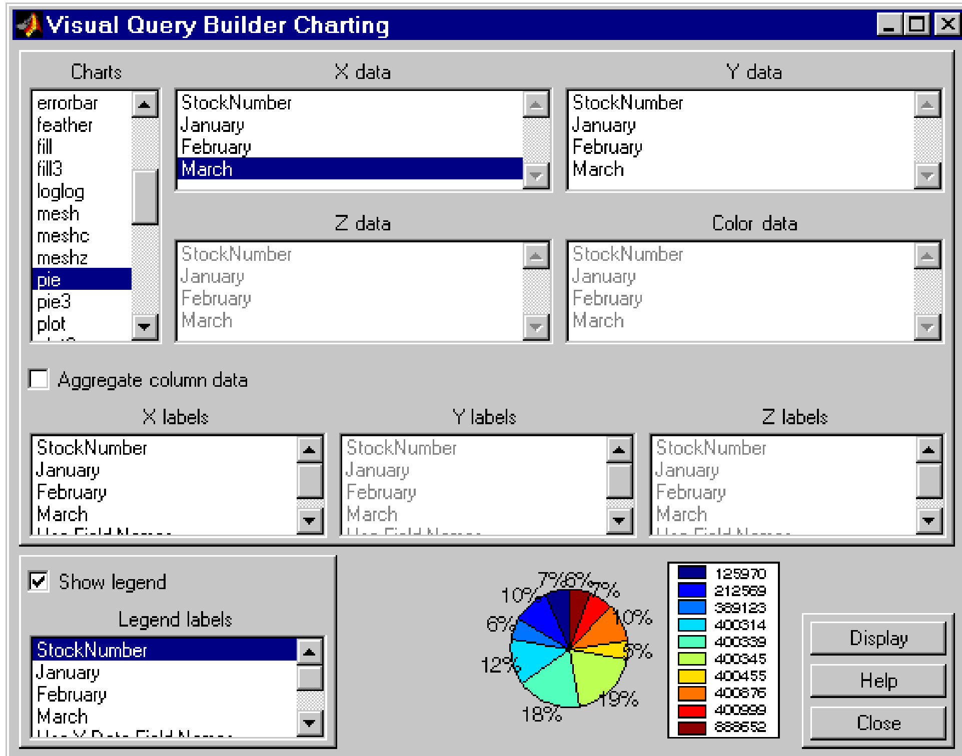
The pie chart preview now shows percentages for March data.

4 To display a legend, which maps colors to the stock numbers, select the **Show legend** check box.

The **Legend labels** field becomes active.

5 Select `StockNumber` from the **Legend labels** list box.

A legend appears in the chart preview. Drag and move the legend in the preview as needed.



6 Click **Close** to close the Charting dialog box.

Displaying Query Results in an HTML Report

To display results for `basic.qry` in an HTML report, select **Display** > **Report**.

The query results appear as a table in a Web browser. Each row represents a record from the database. In this example, sales for item 400876 are 3000 in January, 2400 in February, and 1500 in March.

Web Browser - file:///C:/Users/tflessa/databasetlbx.html

Location: file:///C:/Users/tflessa/databasetlbx.html

Table 1. Database Toolbox Default Report

StockNumber	January	February	March
125970	1400	1100	981
212569	2400	1721	1414
389123	1800	1200	890
400314	3000	2400	1800
400339	4300	NaN	2600
400345	5000	3500	2800
400455	1200	900	800
400876	3000	2400	1500
400999	3000	1500	1000
888652	NaN	900	821

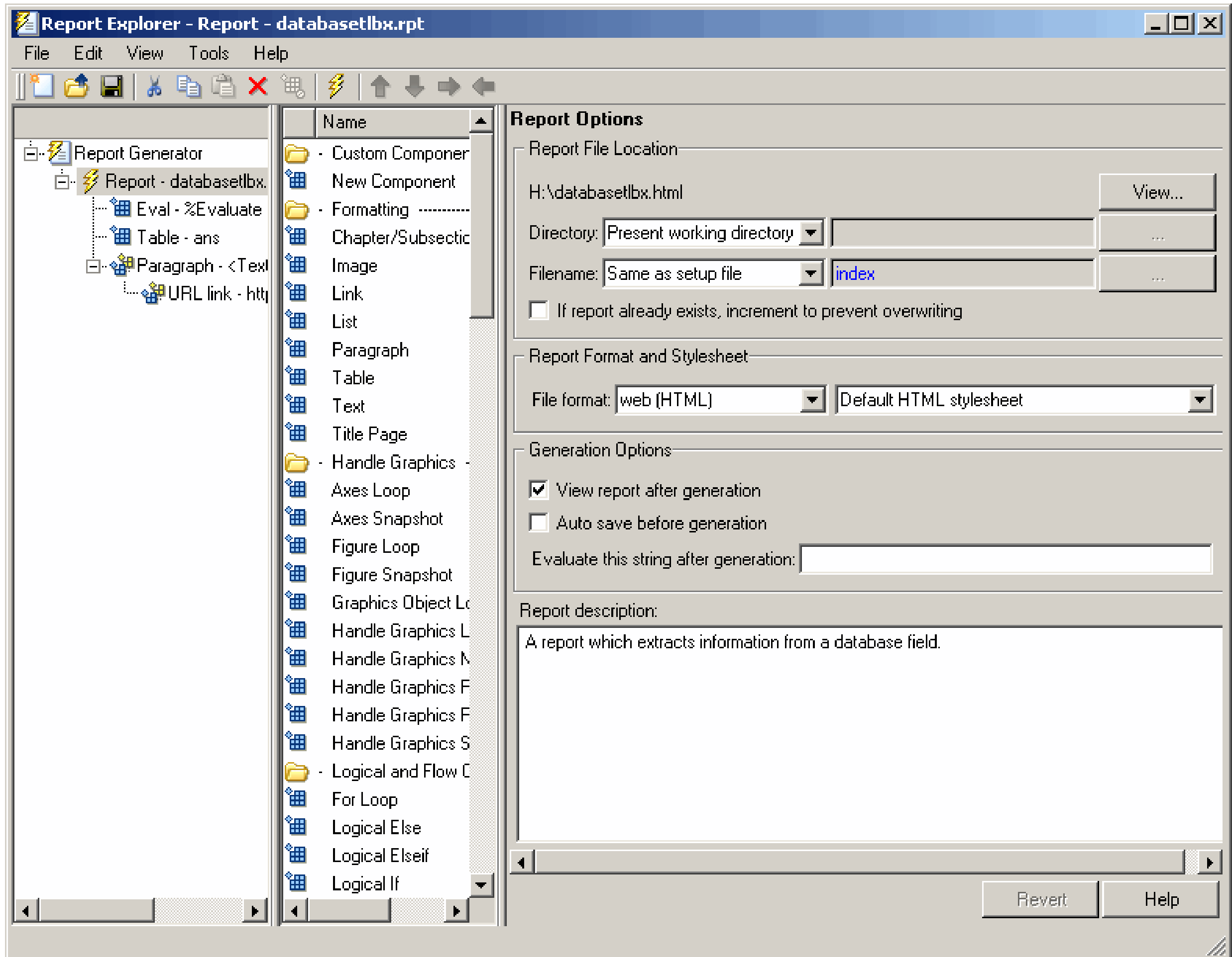
The MathWorks Inc

Tip Because some browsers do not start automatically, you may need to open your Web browser before displaying the query results.

Displaying Query Results with MATLAB Report Generator

To use the MATLAB Report Generator™ software to customize the display of the results of `basic.qry`:

1. Select **Display** > **Report Generator**.
2. The Report Explorer opens, listing sample report templates that you can use to create custom reports. Select the template `matlabroot/toolbox/database/vqb/databasetlbx.rpt` from the Options pane in the middle of the Report Explorer window.



3 Open the report template for editing by clicking **Open a Report file or stylesheet**.

a In the Outline pane on the left, under **Report Generator > databasetlbx.rpt**, select `Table`.

b In the Properties pane on the right, do the following:

i In **Table Content** > **Workspace Variable Name**, enter the name of the variable to which you assigned the query results in VQB, for example, `'A'`.

  ii Under **Header/Footer Options**, set **Number of header rows** to 0.

 c Click **Apply**.

4 Select **File > Report** to run the report.

The report appears in a Web browser.

Web Browser - file:///C:/Users/tflessa/databasetlbx.html

databasetlbx.html

Location: file:///C:/Users/tflessa/databasetlbx.html

Table 1. Database Toolbox Default Report

StockNumber	January	February	March
125970	1400	1100	981
212569	2400	1721	1414
389123	1800	1200	890
400314	3000	2400	1800
400339	4300	NaN	2600
400345	5000	3500	2800
400455	1200	900	800
400876	3000	2400	1500
400999	3000	1500	1000
888652	NaN	900	821

The MathWorks Inc

5 Field names do not automatically display as column headers in the report. To display the field names:

 a Modify the workspace variable A as follows:

```
A = [{'Stock Number', 'January', 'February', 'March'};A]
```

 b In the MATLAB Report Generator Properties pane, change **Number of header rows** to 1 and regenerate the report. The report now displays field names as headings.

Each row represents a record from the database. For example, sales for item 400876 are 3000 in January, 2400 in February, and 1500 in March.

Web Browser - file:///C:/Users/tflessa/databasetlbx.html

databasetlbx.html

Location: file:///C:/Users/tflessa/databasetlbx.html

Table 1. Database Toolbox Default Report

StockNumber	January	February	March
125970	1400	1100	981
212569	2400	1721	1414
389123	1800	1200	890
400314	3000	2400	1800
400339	4300	NaN	2600
400345	5000	3500	2800
400455	1200	900	800
400876	3000	2400	1500
400999	3000	1500	1000
888652	NaN	900	821

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For details about the MATLAB Report Generator product, click the **Help** button in the Report Explorer.

Tip Because some browsers are not configured to launch automatically, you may need to open your Web browser before displaying the report.

Fine-Tuning Queries Using Advanced Query Options

In this section...

"Retrieving All Occurrences vs. Unique Occurrences of Data" on page 4-33
"Retrieving Data That Meets Specified Criteria" on page 4-34
"Grouping Statements" on page 4-37
"Displaying Results in a Specified Order" on page 4-41
"Using Having Clauses to Refine Group by Results" on page 4-44
"Creating Subqueries for Values from Multiple Tables" on page 4-47
"Creating Queries That Include Results from Multiple Tables" on page 4-51
"Additional Advanced Query Options" on page 4-53

Note: For details about advanced query options, select **Help** in any of the dialog boxes for the options.

Retrieving All Occurrences vs. Unique Occurrences of Data

To use the `dbtoolboxdemo` data source to demonstrate how to retrieve all versus distinct occurrences of data:

1. Set the **Data return format** preference to `cellarray`.
2. Set **Read NULL numbers as** to `NaN`.
3. In **Data operation**, choose **Select**.
4. In **Data source**, select `dbtoolboxdemo`.

   Do not specify **Catalog** or **Schema**.
5. In **Tables**, select `SalesVolume`.
6. In **Fields**, select `January`.
7. To retrieve all occurrences of `January`:
   a. In **Advanced query options**, select **All**.
   b. Assign the query results to the **MATLAB workspace variable** `All`.
   c. Click **Execute** to run the query.

8 To retrieve only unique occurrences of data:

   a In **Advanced query options**, select **Distinct**.

   b Assign the query results to a **MATLAB workspace variable** `Distinct`.

   c Click **Execute** to run the query.

9 In the MATLAB Command Window, enter `All, Distinct` to display the query results:

```
All =

    [1400]
    [2400]
    [1800]
    [3000]
    [4300]
    [5000]
    [1200]
    [3000]
    [3000]
    [ NaN]


Distinct =

    [ NaN]
    [1200]
    [1400]
    [1800]
    [2400]
    [3000]
    [4300]
    [5000]
```

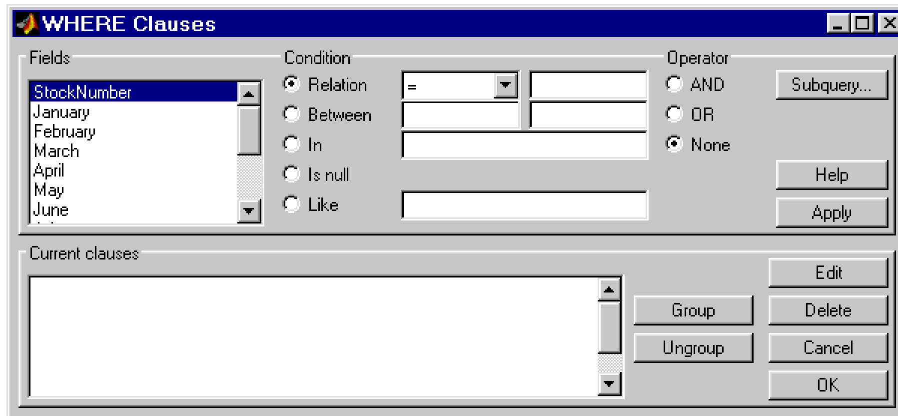
The value `3000` appears three times in `All`, but appears only once in `Distinct`.

Retrieving Data That Meets Specified Criteria

Use `basic.qry` and the **Where** field in **Advanced query options** to retrieve stock numbers greater than 400000 and less than 500000:

1. Load `basic.qry`.
2. Set the **Data return format** preference to `cellarray`.
3. Set **Read NULL numbers as** to `NaN`.
4. In **Advanced query options**, click **Where**.

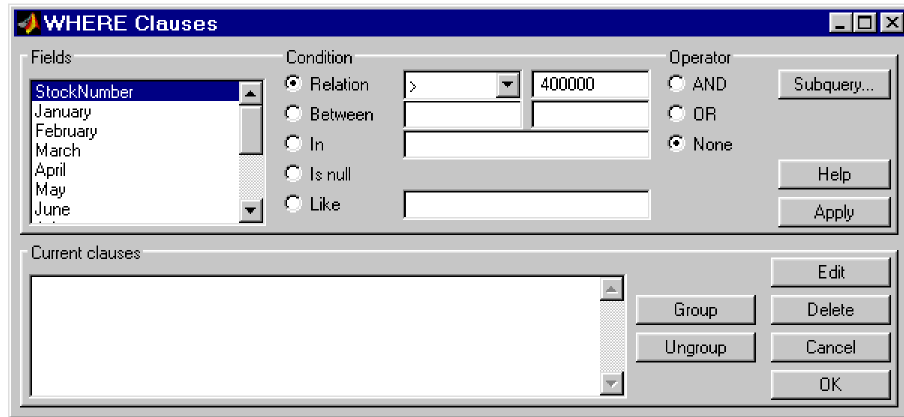
   The WHERE Clauses dialog box appears.



5. In **Fields**, select the field whose values you want to restrict, `StockNumber`.
6. In **Condition**, specify that `StockNumber` must be greater than `400000`.

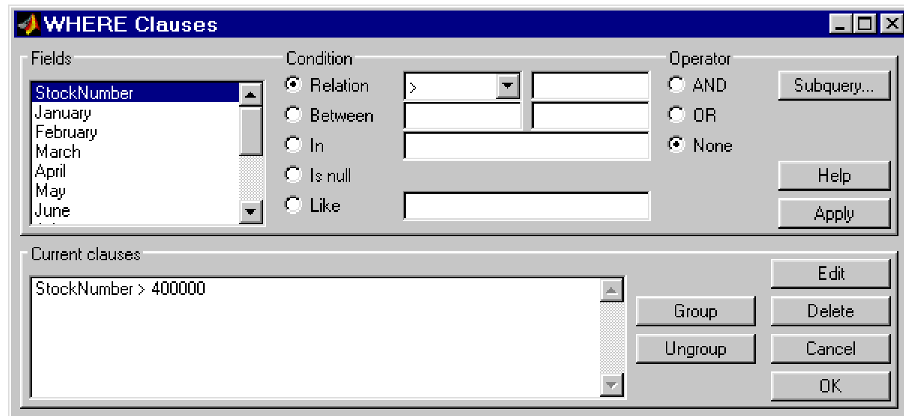
   a. Select **Relation**.
   b. In the drop-down list to the right of **Relation**, select `>`.
   c. In the field to the right of the drop-down list, enter `400000`.

      The WHERE Clauses dialog box now looks as follows.



d Click **Apply**.

The clause that you defined, `StockNumber > 400000`, appears in the **Current clauses** area.



7 Add the condition that `StockNumber` must also be less than `500000`.

a In **Current clauses**, select `StockNumber > 400000`.

b In **Current clauses**, click **Edit** or double-click the `StockNumber` entry.

c For **Operator**, select **AND**.

d Click **Apply**.

The **Current clauses** field now displays:

```
StockNumber > 400000 AND
```

- **e** In **Fields**, select `StockNumber`.
- **f** In **Condition**, select **Relation**.
- **g** In the drop-down list to the right of **Relation**, select `<`.
- **h** In the field to the right of the drop-down list, enter `500000`.
- **i** Click **Apply**.

The **Current clauses** field now displays:

```
StockNumber > 400000 AND
StockNumber < 500000
```

8 Click **OK**.

The WHERE Clauses dialog box closes. The **Where** field and **SQL statement** display the Where Clause you specified.

9 Assign the query results to the **MATLAB workspace variable** `A`.

10 Click **Execute**.

11 To view the results, enter `A` in the Command Window:

```
A =

    [400314]    [3000]    [2400]    [1800]
    [400339]    [4300]    [ NaN]    [2600]
    [400345]    [5000]    [3500]    [2800]
    [400455]    [1200]    [ 900]    [ 800]
    [400876]    [3000]    [2400]    [1500]
    [400999]    [3000]    [1500]    [1000]
```

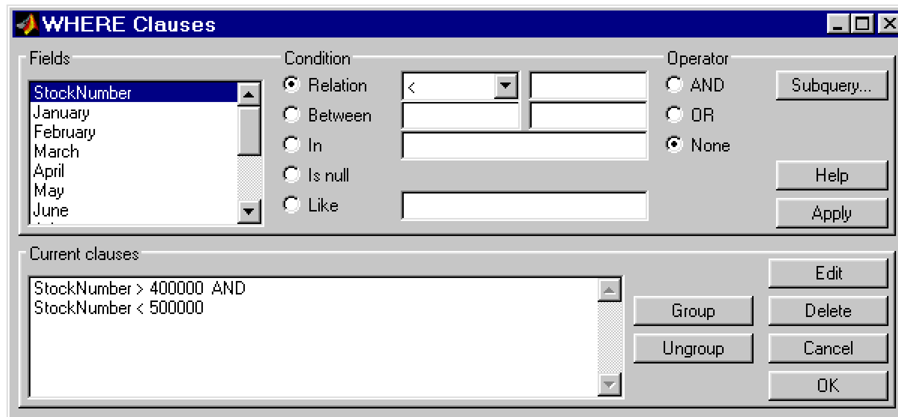
12 Save this query as `basic_where.qry`.

Grouping Statements

Use the WHERE Clauses dialog box to group query statements. In this example, modify `basic_where.qry` to retrieve data where sales in January, February, or March exceed `1500` units, if sales in each month exceed `1000` units.

To modify `basic_where.qry`:

1 Click **Where** in VQB. The WHERE Clauses dialog box appears.



2 Modify the query to retrieve data if sales in January, February, or March exceed 1500 units.

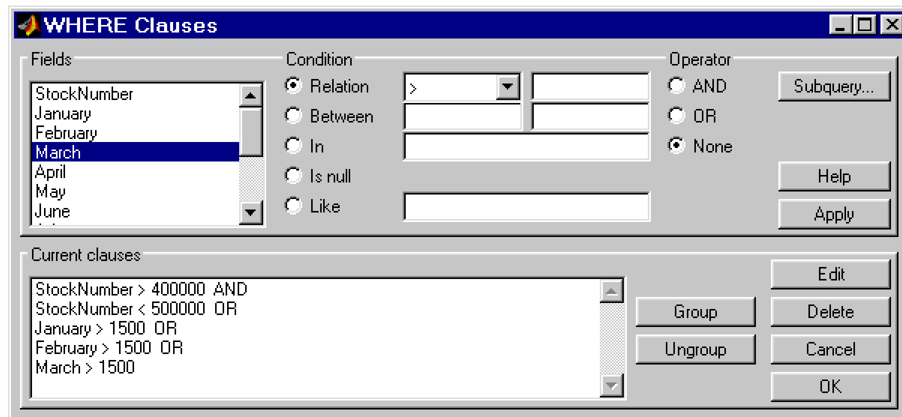
a In **Current clauses**, select `StockNumber < 500000` and click **Edit**.

b For **Operator**, select `OR` and click **Apply**.

c In **Fields**, select `January`. For **Relation**, select `>` and enter `1500` in its field. For **Operator**, select `OR`. Click **Apply**.

d Repeat step c twice, specifying `February` and `March` in **Fields**.

The WHERE Clauses dialog box now looks as follows.

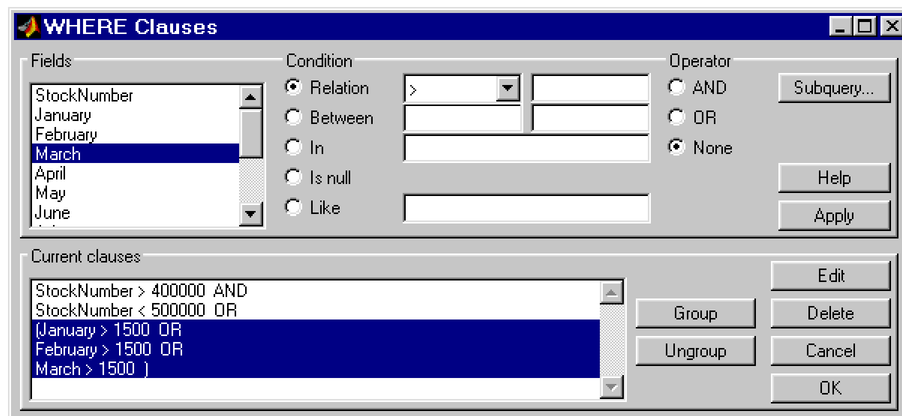


3 Group the criteria that require sales in each month to exceed 1500 units.

a In **Current clauses**, select the statement `January > 1500 OR`. Press **Shift**+click to select `February > 1500 OR` and `March > 1500` also.

b Click **Group**.

An opening parenthesis is added before `January` and a closing parenthesis is added after `March > 1500`, indicating that these statements are evaluated as a group.



4 Modify the query to retrieve data if sales in each month exceed 1000 units.

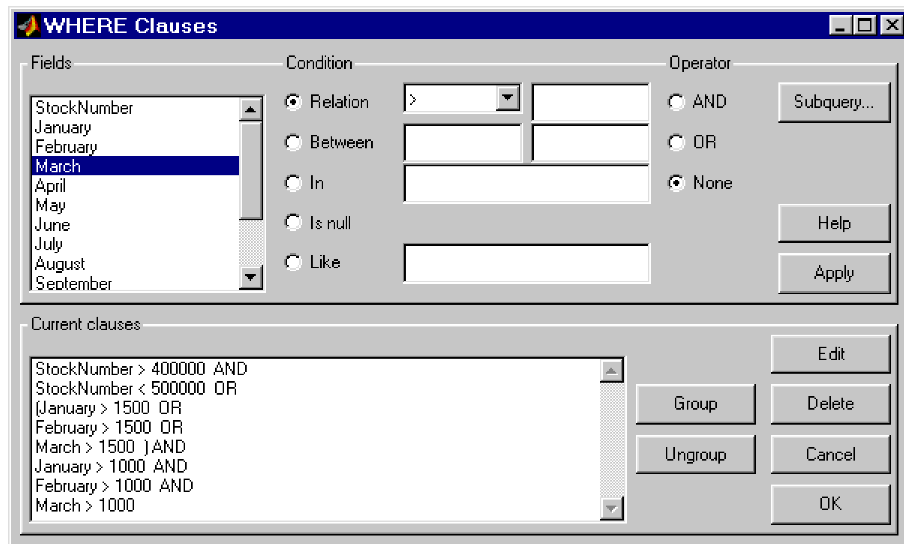
a Select `March > 1500 )` in **Current clauses** and click **Edit**.

b Select AND for **Operator** and click **Apply**.

c Select `January` in **Fields**. Select > for **Relation** and enter `1000` in its field. Select AND for **Operator**. Click **Apply**.

d Repeat step c twice, specifying `February` and `March` in **Fields**.

The WHERE Clauses dialog box now looks as follows.



e Click **OK**.

The WHERE Clauses dialog box closes. The **SQL statement** dialog box displays the modified where clause.

5 Assign the query results to the **MATLAB workspace variable** AA.

6 Click **Execute** to run the query.

7 To view the results, enter AA in the MATLAB Command Window.

```
AA =

    [212569]    [2400]    [1721]    [1414]
    [400314]    [3000]    [2400]    [1800]
    [400339]    [4300]    [ NaN]    [2600]
    [400345]    [5000]    [3500]    [2800]
    [400455]    [1200]    [ 900]    [ 800]
    [400876]    [3000]    [2400]    [1500]
    [400999]    [3000]    [1500]    [1000]
```

Removing Grouping of Statements

To use the WHERE Clauses dialog box to remove grouping criteria from the previous example:

1 In **Current clauses**, select `(January > 1000 AND`.
2 Press **Shift**+click to select `February > 1000 AND` and `March > 1000)` also.
3 Click **Ungroup**.

The parentheses are removed from the statements, indicating that their grouping is removed.

Displaying Results in a Specified Order

Use **Order by** in **Advanced query options** to specify the order in which query results display.

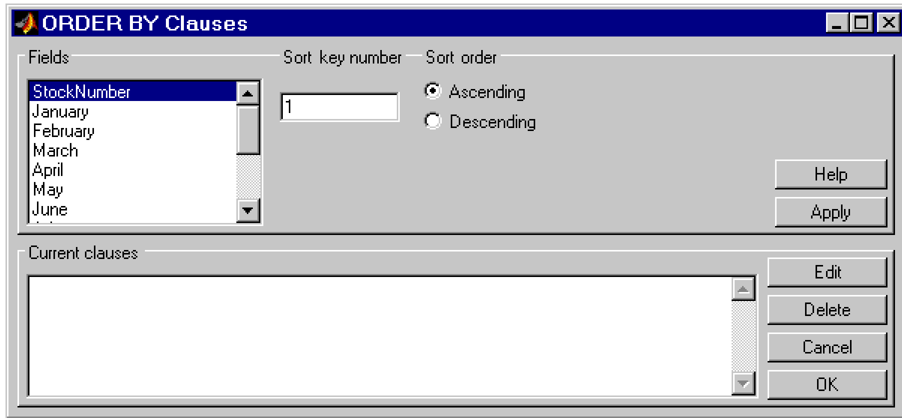
This example uses the `basic_where.qry` query you created in "Retrieving Data That Meets Specified Criteria" on page 4-34. The results of `basic_where.qry` are sorted so that January is the primary sort field, February the secondary, and March the last. Results for January and February appear in ascending order, and results for March appear in descending order.

To specify the order in which results appear in `basic_where.qry`:

1 Load `basic_where.qry`.
2 Set the **Data return format** preference to `cellarray`.
3 Set **Read NULL numbers** to `NaN`.

4 In **Advanced query options**, select **Order by**.

The ORDER BY Clauses dialog box appears.



5 Enter values for the **Sort key number** and **Sort order** fields for the appropriate **Fields**.

To specify `January` as the primary sort field and display results in ascending order:

a In **Fields**, select `January`.

b For **Sort key number**, enter `1`.

c For **Sort order**, select **Ascending**.

d Click **Apply**.

The **Current clauses** area now displays:

```
January ASC
```

6 To specify `February` as the second sort field and display results in ascending order:

a In **Fields**, select `February`.

b For **Sort key number**, enter `2`.

c For **Sort order**, select **Ascending**.

d Click **Apply**.

The **Current clauses** area now displays:

```
January ASC
February ASC
```

7 To specify `March` as the third sort field and display results in descending order:

   a In **Fields**, select `March`.

   b For **Sort key number**, enter `3`.

   c For **Sort order**, select **Descending**.

   d Click **Apply**.

   The **Current clauses** area now displays:

```
January ASC
February ASC
March DESC
```

8 Click **OK**.

The ORDER BY Clauses dialog box closes. The **Order by** field and the **SQL statement** in VQB display the specified Order By clause.

9 Assign the query results to the **MATLAB workspace variable** `B`.

10 Click **Execute** to run the query.

11 To view the results, enter `B` in the MATLAB Command Window. Enter `A` to display the unordered query results and compare them to `B`. Your results look as follows:

```
A =

    [400314]    [3000]    [2400]    [1800]
    [400339]    [4300]    [ NaN]    [2600]
    [400345]    [5000]    [3500]    [2800]
    [400455]    [1200]    [ 900]    [ 800]
    [400876]    [3000]    [2400]    [1500]
    [400999]    [3000]    [1500]    [1000]


B =

    [400455]    [1200]    [ 900]    [ 800]
    [400999]    [3000]    [1500]    [1000]
    [400314]    [3000]    [2400]    [1800]
    [400876]    [3000]    [2400]    [1500]
    [400339]    [4300]    [ NaN]    [2600]
    [400345]    [5000]    [3500]    [2800]
```

For `B`, results are first sorted by `January sales,` in ascending order. The lowest value for `January sales`, 1200 (for item number 400455), appears first. The highest value, 5000 (for item number for 400345), appears last.

For items 400999, 400314, and 400876, `January sales` were 3000. Therefore, the second sort key `February sales`applies. February sales appear in ascending order: 1500, 2400, and 2400 respectively.

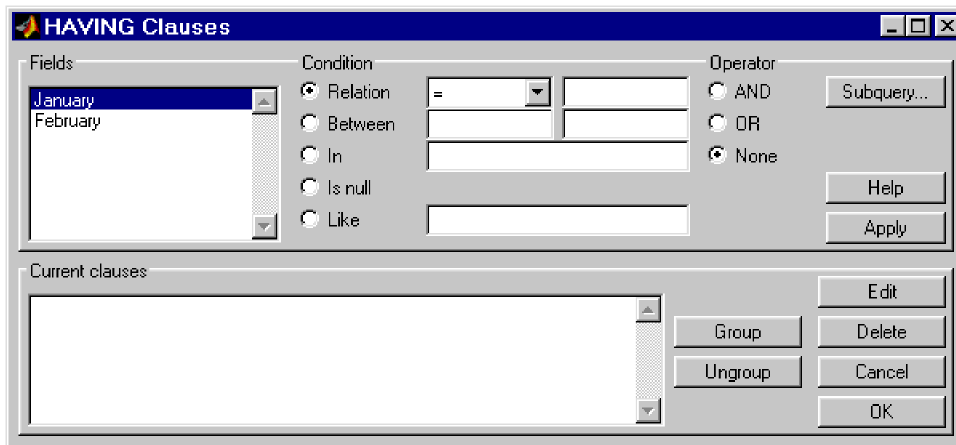
For items 400314 and 400876, `February sales` were 2400, so the third sort key, `March sales`, applies. March sales appear in descending order: 1800 and 1500, respectively.

Using Having Clauses to Refine Group by Results

Using the HAVING Clauses Dialog Box

Use the **Having** function to refine the results of a **Group By** clause.

After specifying a group-by clause in **Advanced query options**, click **Having**. The HAVING Clauses dialog box appears.



1. From the **Fields** list box, select the entry whose value to restrict.
2. Define the **Condition** for the selected field, as described in "Retrieving Data That Meets Specified Criteria" on page 4-34.
3. Select **Operator** to add another condition.
4. Click **Apply** to create the clause.

   The subquery appears in the **Current clauses** area.
5. Repeat steps 1 through 4 to add more conditions as needed.
6. Change the clauses as needed:

   - To edit a clause:

     a. Select the clause from **Current clauses** and click **Edit**.
     b. Modify the **Fields**, **Condition**, and **Operator** fields as needed.
     c. Click **Apply**.
   - To group clauses:

     a. Select the clauses to group from **Current clauses**. Press **Ctrl**+click or **Shift**+click to select multiple clauses.
     b. Click **Group**. Parentheses are added around the set of clauses.

        To ungroup clauses, select the clauses and then click **Ungroup**.

- To delete a clause, Select the clause from **Current clauses** and click **Delete**. Use **Ctrl**+click or **Shift**+click to select multiple clauses.

7 Specify a subquery in the HAVING Clauses dialog box, as needed. For details, see "Creating Subqueries for Values from Multiple Tables" on page 4-47.

8 Click **OK**.

The HAVING Clauses dialog box closes. The **SQL statement** in the Visual Query Builder dialog box updates to reflect the specified having clause.

Example: Using Having Clauses

This example restricts the results from `basic_where.qry` to sales greater than 2000 for January and February:

1 In **Advanced query options**, click **Having**. The HAVING Clauses dialog box appears.

2 For `January`:

   a Select > as the **Relation Condition**.

   b Enter `2000` as the **Relation** value.

   c Select the `AND` **Operator**.

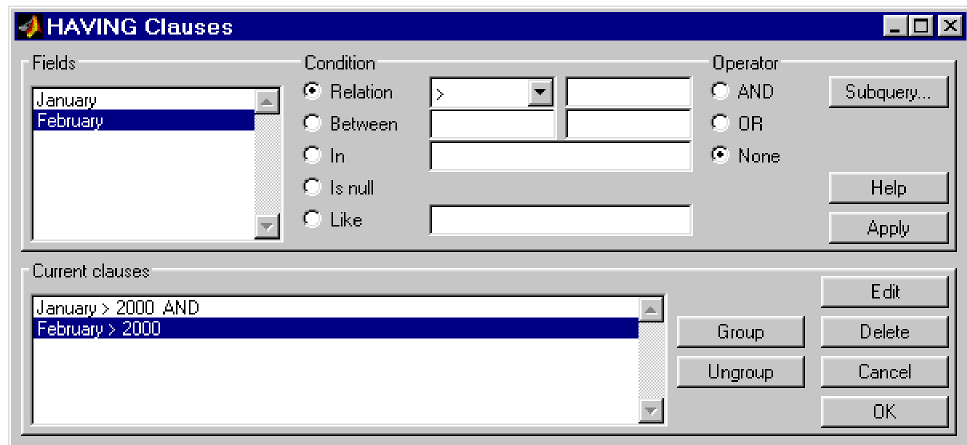
   d Click **Apply**.

3 For `February`:

   a Select > as the **Relation Condition**.

   b Enter `2000` as the **Relation** value.

   c Click **Apply**. The HAVING Clauses dialog box appears as follows.



4 Click **OK**.

The HAVING Clauses dialog box closes. The **SQL statement** field in the VQB dialog box reflects the specified Having clause.

5 Assign a MATLAB workspace variable `C`, and click **Execute** to run the query.

```
C =
    [3000]    [2400]
    [5000]    [3500]
```

Compare these results to those in "Displaying Results in a Specified Order" on page 4-41.

Creating Subqueries for Values from Multiple Tables

Use the **Where** feature in **Advanced query options** to create subqueries. Creating subqueries in this way is referred to as *nested SQL*.

This example uses `basic.qry`, which you created by selecting **Query** > **Save** and saving your query as `basic.qry` in the **File name** field.

The `salesVolume` table has sales volumes and stock number fields, but no product description field. The `productTable` has product description and stock number fields, but no sales volumes. This example retrieves the stock number for the product whose description is `Building Blocks` from the `productTable` table. It then gets the sales volume values for that stock number from the `salesVolume` table.

1 Load `basic.qry`.

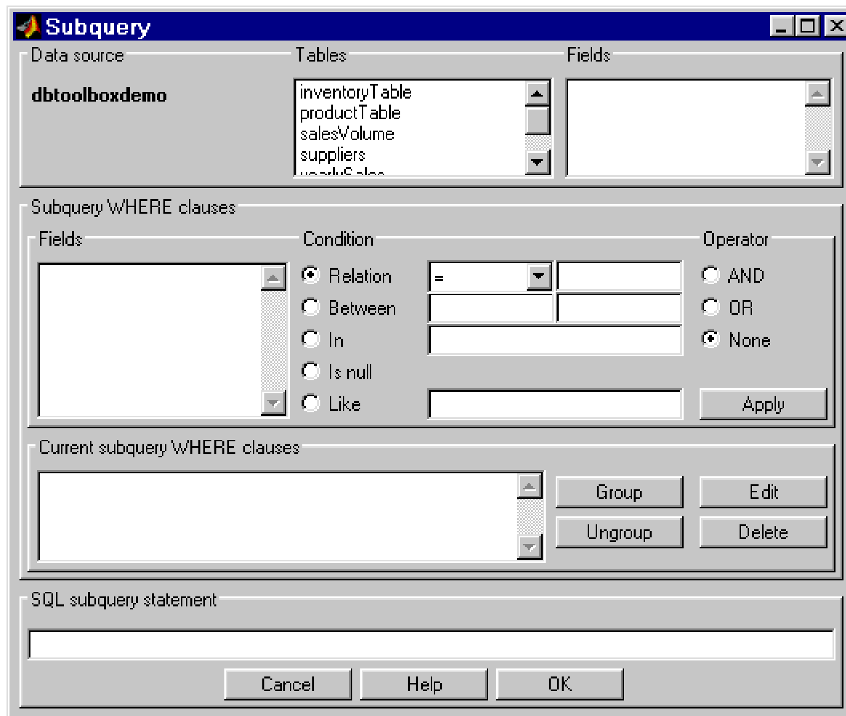
2 Set the **Data return format** Preference to `cellarray` and **Read NULL numbers as** to `NaN`.

3 Click **Where** in **Advanced query options**.

The WHERE Clauses dialog box appears.

4 Click **Subquery**.

The Subquery dialog box appears.



5 In **Tables**, select `productTable`, which includes the association between the stock number and the product description. The fields in that table appear.

6 In **Fields**, select `stockNumber`, the field that is common to this table and the table from which you are retrieving results.

The statement `SELECT stockNumber FROM productTable` is created in the **SQL subquery statement**.

7 Limit the query to product descriptions that are Building Blocks.

a In **Fields** in **Subquery WHERE clauses**, select `productDescription`.

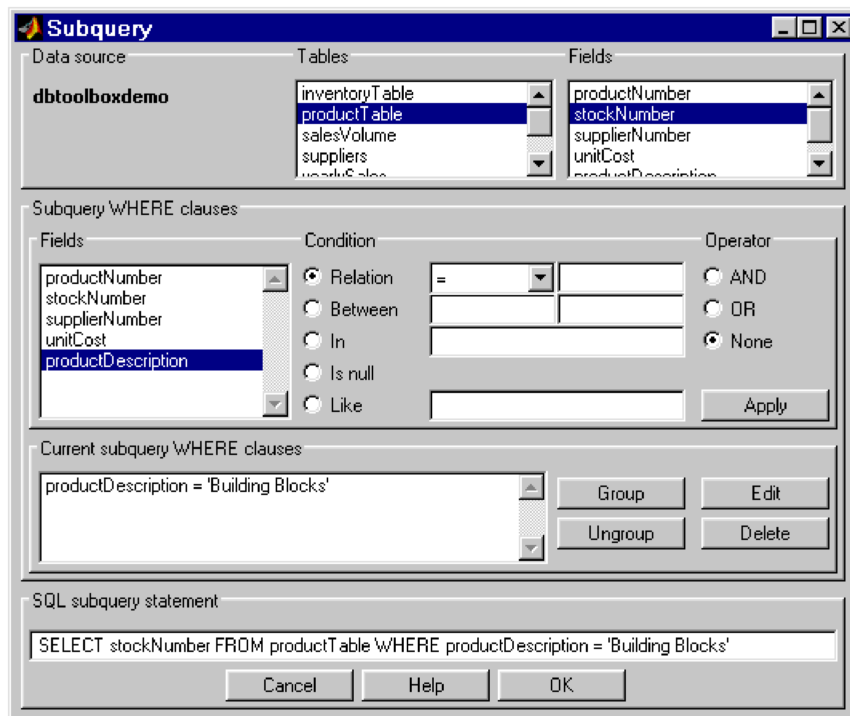
b For **Condition**, select **Relation**.

c In the drop-down list to the right of **Relation**, select `=`.

d In the field to the right of the drop-down list, enter `'Building Blocks'`.

e Click **Apply**.

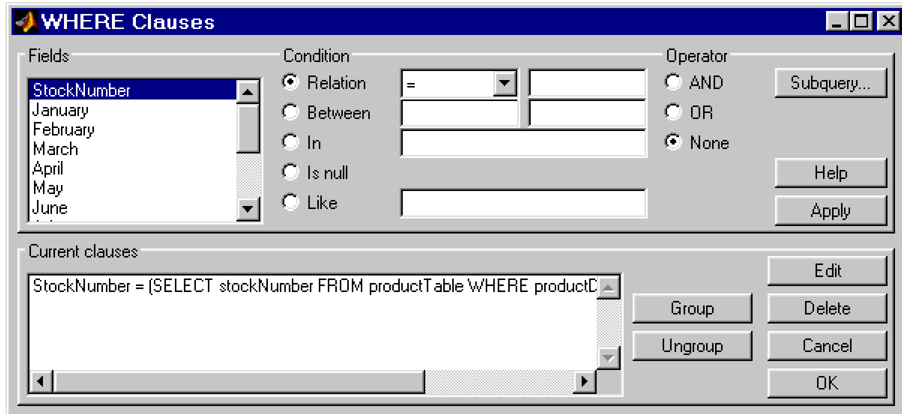
The clause appears in the **Current subquery WHERE clauses** field and is added to the **SQL subquery statement**.



8 Click **OK** to close the Subquery dialog box.

9 In the WHERE Clauses dialog box, click **Apply**.

This updates the **Current clauses** area using the subquery criteria specified in steps 3 through 8.



10 In the WHERE Clauses dialog box, click **OK**.

The WHERE Clauses dialog box closes. The **SQL statement** in the VQB dialog box updates.

11 Assign the query results to the **MATLAB workspace variable** `C`.

12 Click **Execute**.

13 Type `C` at the prompt in the MATLAB Command Window to see the results.

```
C =

    [400345]    [5000]    [3500]    [2800]
```

14 The results are for item 400345, which has the product description `Building Blocks`, although that is not evident from the results. Create and run a query to verify that the product description is `Building Blocks`:

a For **Data source**, select `dbtoolboxdemo`.

b In **Tables**, select `productTable`.

c In **Fields**, select `stockNumber` and `productDescription`.

d Assign the query results to the **MATLAB workspace variable** `P`.

e Click **Execute**.

f Type `P` at the prompt in the MATLAB Command Window to view the results.

```
P =

    [125970]    'Victorian Doll'
    [212569]    'Train Set'
    [389123]    'Engine Kit'
    [400314]    'Painting Set'
    [400339]    'Space Cruiser'
    [400345]    'Building Blocks'
    [400455]    'Tin Soldier'
    [400876]    'Sail Boat'
    [400999]    'Slinky'
    [888652]    'Teddy Bear'
```

The results show that item 400345 has the product description `Building Blocks.` In the next section, you create a query that includes `product description` in the results.

Note: You can include only one subquery in a query using VQB; you can include multiple subqueries using Database Toolbox functions.

Creating Queries That Include Results from Multiple Tables

A query whose results include values from multiple tables is said to perform a *join* operation in SQL.

This example retrieves sales volumes by product description. It is like the one in "Creating Subqueries for Values from Multiple Tables" on page 4-47, but this example creates a query that returns `product description` rather than `stock number`.

The `salesVolume` table has `sales volume` and `stock number` fields, but no `product description` field. The `productTable` table has `product description` and `stock number` fields, but no `sales volume` field. To create a query that retrieves data from both tables and equates the stock number from `productTable` with the stock number from `salesVolume`:

1. Set the **Data return format** preference to `cellarray` and the **Read NULL numbers as** preference to `NaN`.
2. For **Data operation**, click **Select**.
3. For **Data source**, select `dbtoolboxdemo`.

   The **Catalog**, **Schema**, and **Tables** for `dbtoolboxdemo` appear.

   Do not specify **Catalog** or **Schema**.
4. In **Tables**, select the tables from which you want to retrieve data. For this example, press **Ctrl**+click and select both `productTable` and `salesVolume`.

   The fields (columns) in those tables appear in **Fields**. Field names appear in the format `tableName.fieldName`. Therefore, `productTable.stockNumber` indicates the stock number in the product table and `salesVolume.StockNumber` indicates the stock number in the sales volume table.
5. In **Fields**, press **Ctrl**+click to select the following fields:
   - `productTable.productDescription`
   - `salesVolume.January`
   - `salesVolume.February`
   - `salesVolume.March`
6. In this example, the Where clause equates the `productTable.stockNumber` with the `salesVolume.StockNumber`, so that product description is associated with sales volumes in the query results.

   In **Advanced query options**, click **Where** to associate fields from different tables. The WHERE Clauses dialog box appears.
7. In the WHERE clauses dialog box:

   a. In **Fields**, select `productTable.stockNumber`.

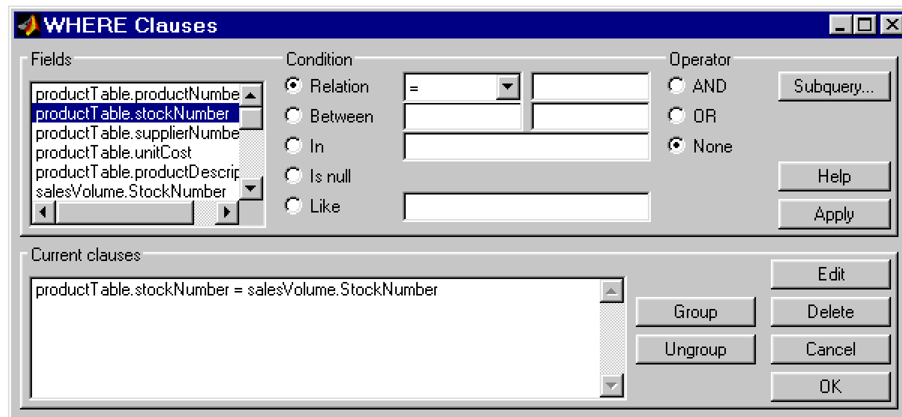
   b. For **Condition**, select **Relation**.

   c. In the drop-down list to the right of **Relation**, select `=`.

   d. In the field to the right of the drop-down list, enter `salesVolume.StockNumber`.

   e. Click **Apply**.

      The clause appears in the **Current clauses** field.



f Click **OK** to close the WHERE Clauses dialog box. The **Where** field and **SQL statement** in VQB display the Where clause.

8 Assign the query results to the **MATLAB workspace variable** `P1`.

9 Click **Execute** to run the query.

10 Type `P1` in the MATLAB Command Window.

```
P1 =

    'Victorian Doll'      [1400]    [1100]    [ 981]
    'Train Set'           [2400]    [1721]    [1414]
    'Engine Kit'          [1800]    [1200]    [ 890]
    'Painting Set'        [3000]    [2400]    [1800]
    'Space Cruiser'       [4300]    [ NaN]    [2600]
    'Building Blocks'     [5000]    [3500]    [2800]
    'Tin Soldier'         [1200]    [ 900]    [ 800]
    'Sail Boat'           [3000]    [2400]    [1500]
    'Slinky'              [3000]    [1500]    [1000]
    'Teddy Bear'          [ NaN]    [ 900]    [ 821]
```

Additional Advanced Query Options

For details about advanced query options, choose an option and click **Help** in its dialog box. For example, click **Group by** in **Advanced query options**, and then click **Help** in the Group by Clauses dialog box.

Retrieving BINARY and OTHER Data Types

This example shows how to retrieve data of types `BINARY` and `OTHER`, which may require manipulation before it can undergo MATLAB processing. To retrieve images using the `dbtoolboxdemo` data source and a sample file that parses image data, *`matlabroot`*`/toolbox/database/vqb/parsebinary.m`:

1. For **Data Operation**, select **Select**.
2. In **Data source**, select `dbtoolboxdemo`.
3. In **Tables**, select `Invoive`.
4. In **Fields**, select `InvoiceNumber` and `Receipt` (which contains bitmap images).
5. Select **Query** > **Preferences**.
6. In the **Data return format** field, specify `cellarray`.
7. As the **MATLAB workspace variable**, specify `A`.
8. Click **Execute** to run the query.
9. Type `A` in the MATLAB Command Window to view the query results.

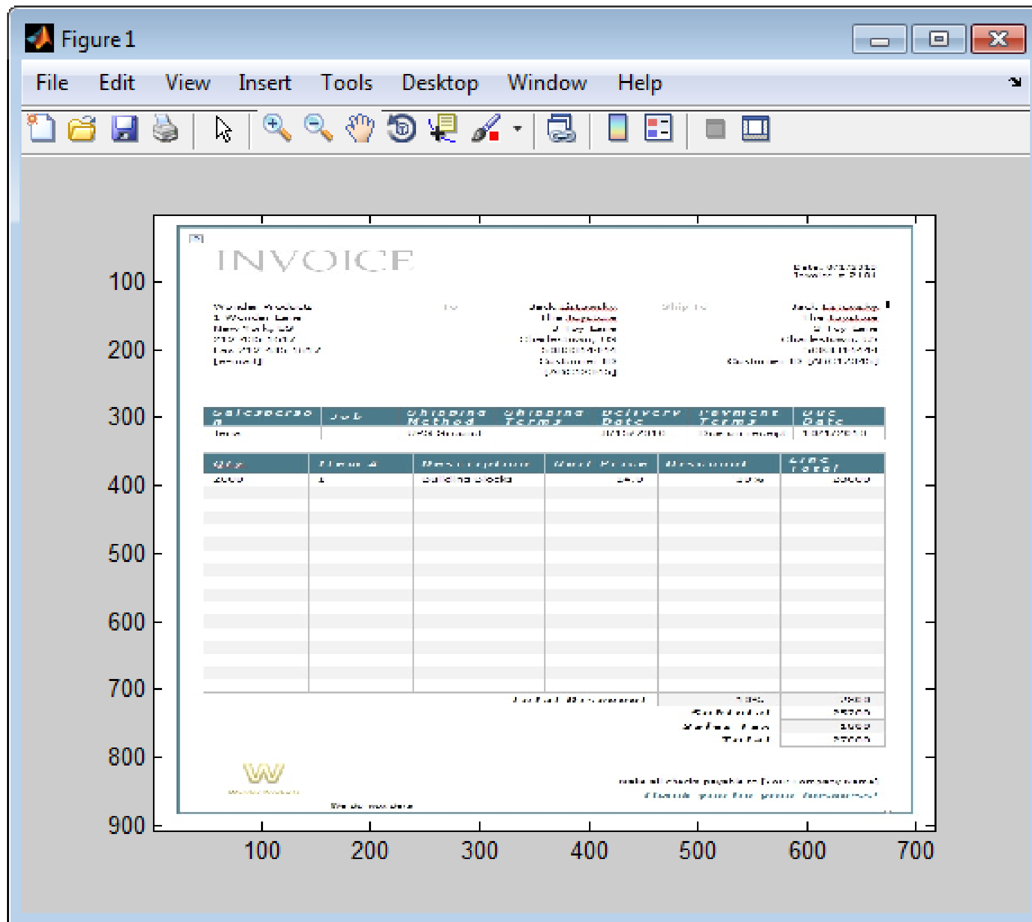
```
A =

     [1]    [21626x1 int8]
     [2]    [21626x1 int8]
     [3]    [21722x1 int8]
     [4]    [21626x1 int8]
     [5]    [21626x1 int8]
     [6]    [21626x1 int8]
     [7]    [21626x1 int8]
     [8]    [21626x1 int8]
     [9]    [21626x1 int8]
```

10. Assign the first element in A to the variable `photo`.

```
photo = A{1,2};
```

11. Make sure your current folder is writable.
12. Run the sample program `parsebinary`, which writes the retrieved data to a file, strips ODBC header information, and displays `photo` as a bitmap image.

```
cd I:\MATLABFiles\myfiles
parsebinary(photo, 'BMP');
```



For details about `parsebinary`, enter `help parsebinary`, or view the `parsebinary` file in the MATLAB Editor/Debugger by entering `open parsebinary` in the Command Window.

Importing and Exporting Boolean Data

In this section...
"Import Boolean Data from Databases" on page 4-56
"Exporting Boolean Data to Databases" on page 4-58

Import Boolean Data from Databases

`BOOLEAN` data is imported from databases into the MATLAB workspace as data type `logical`. This data has a value of `0` (false) or `1` (true), and is stored in a cell array or structure.

This example imports data from the `Invoice` table in the `dbtoolboxdemo` database into the MATLAB workspace.

1. Set **Data return format** to `cellarray`.
2. For **Data operation**, choose **Select**.
3. In **Data source**, select `dbtoolboxdemo`.
4. In **Tables**, select `Invoice`.
5. In **Fields**, select `Paid` and `InvoiceNumber`.
6. Assign the query results to the **MATLAB workspace variable** `D`.
7. Click **Execute** to run the query.

   VQB retrieves a 10-by-2 array.
8. Enter `D` in the MATLAB Command Window. 10 records are returned:

```
D =

    [ 2101]    [0]
    [ 3546]    [1]
    [33116]    [1]
    [34155]    [0]
    [34267]    [1]
    [37197]    [1]
    [37281]    [0]
    [41011]    [1]
```

```
[61178]      [0]
[62145]      [1]
```

9 Compare these results to the data in Microsoft Access.

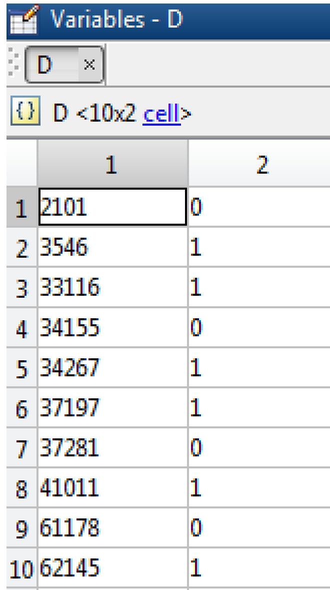
invoice

InvoiceNum	InvoiceDate	ProductNumber	Paid	Receipt
2101	8/1/2010	1	☐	Bitmap Image
3546	3/1/2010	2	☑	Bitmap Image
33116	5/15/2011	3	☑	Bitmap Image
34155	7/12/2011	4	☐	Bitmap Image
34267	7/22/2011	5	☑	Bitmap Image
37197	9/3/2011	6	☑	Bitmap Image
37281	9/21/2011	7	☐	Bitmap Image
41011	12/12/2011	8	☑	Bitmap Image
61178	1/15/2012	9	☐	Bitmap Image
62145	1/23/2012	10	☑	Bitmap Image

invoice

Field Name	Data Type
InvoiceNumber	Number
InvoiceDate	Date/Time
ProductNumber	Number
Paid	Yes/No
Receipt	OLE Object

10 In the VQB **Data** area, double-click `D` to view its contents in the Variables editor.



	1	2
1	2101	0
2	3546	1
3	33116	1
4	34155	0
5	34267	1
6	37197	1
7	37281	0
8	41011	1
9	61178	0
10	62145	1

Exporting Boolean Data to Databases

Logical data is exported from the MATLAB workspace to a database as type `BOOLEAN`. This example adds two rows of data to the `Invoice` table in the `dbtoolboxdemo` database.

1 In the MATLAB workspace, create `I`, the structure you want to export.

```
I.InvoiceNumber{1,1}=456789;
I.Paid{1,1}=logical(0);
I.InvoiceNumber{2,1}=987654;
I.Paid{2,1}=logical(1);
```

2 For **Data operation**, choose **Insert**.

3 In **Data source**, select `dbtoolboxdemo`.

4 In **Tables**, select `Invoice`.

5 In **Fields**, select `Paid` and `InvoiceNumber`.

6 Assign results to the **MATLAB workspace variable** `I`.

7 Click **Execute** to run the query.

VQB inserts two new rows into the `Invoice` table.

View the table in Microsoft Access to verify that the data was correctly inserted.

invoice

InvoiceNum	InvoiceDate	ProductNumber	Paid	Receipt
987654			☑	
456789			☐	
2101	8/1/2010	1	☐	Bitmap Image
3546	3/1/2010	2	☑	Bitmap Image
33116	5/15/2011	3	☑	Bitmap Image
34155	7/12/2011	4	☐	Bitmap Image
34267	7/22/2011	5	☑	Bitmap Image
37197	9/3/2011	6	☑	Bitmap Image
37281	9/21/2011	7	☐	Bitmap Image
41011	12/12/2011	8	☑	Bitmap Image
61178	1/15/2012	9	☐	Bitmap Image
62145	1/23/2012	10	☑	Bitmap Image

Saving Queries in Files

In this section...

"About Generated Files" on page 4-60
"VQB Query Elements in Generated Files" on page 4-61
"Saving Queries" on page 4-61
"Running Saved Queries" on page 4-61
"Editing Queries" on page 4-62

About Generated Files

Select **Query** > **Generate MATLAB File** to create a file that contains the equivalent Database Toolbox functions required to run an existing query that was created in VQB. Edit the file to include MATLAB or related toolbox functions, as needed. To run the query, execute the file.

The following is an example of a file generated by VQB:

```
% Set preferences with setdbprefs.
s.DataReturnFormat = 'cellarray';
s.ErrorHandling = 'store';
s.NullNumberRead = 'NaN';
s.NullNumberWrite = 'NaN';
s.NullStringRead = 'null';
s.NullStringWrite = 'null';
s.JDBCDataSourceFile = '';
s.UseRegistryForSources = 'yes';
s.TempDirForRegistryOutput = '';
s.FetchInBatches = 'yes';
s.FetchBatchSize = '10000'
setdbprefs(s)

% Make connection to database. Note that the password has been omitted.
% Using ODBC driver.
conn = database('dbtoolboxdemo','','password');

% Read data from database.
e = exec(conn,'SELECT ALL StockNumber,January,February FROM salesVolume');
e = fetch(e);
close(e)


 Close database connection.
close(conn)
```

VQB Query Elements in Generated Files

The following VQB query elements do not appear in generated files:

- Generated code files do not include MATLAB workspace variables to which you assigned query results in the VQB query. The file assigns the query results to `e`; access these results using the variable `e.Data`. For example, you can add a statement to the file that assigns a variable name to `e.Data` as follows:

  ```
  myVar = e.Data
  ```

- For security reasons, generated files do not include passwords required to connect to databases. Instead, the `database` statement includes the string `'password'` as a placeholder. To run files to connect to databases that require passwords, substitute your password for the string `password` in the `database` statement.

Saving Queries

1 Click **Query** > **Save**. The Save SQL Statement dialog box appears.
2 Enter a name (without spaces) for the query into the **File name** field and click **Save**. Save the query as `basic.qry`.

Note: When you save a **Select** query (a query that imports data), MATLAB does not save your specified preferences or the workspace variable that contains the query results. This prevents you from inadvertently overwriting an existing variable in the MATLAB workspace when you run a saved query.

When you save an **Insert** query (a query that exports data), MATLAB saves the workspace variable whose data you exported, but does not save your preferences.

Running Saved Queries

1 Click **Query** > **Load**. The Load SQL Statement dialog box appears.
2 Select the name of the query you want to load and click **Open**. The VQB fields reflect the values for the saved query.
3 Run a **Select** query to import data into the MATLAB workspace, or an **Insert** query to export data from the MATLAB workspace.

- To run a **Select** query, use the **MATLAB workspace variable** field to assign a variable to the data and click **Execute**.
- For an **Insert** query, the saved query may include a workspace variable, which appears as part of the **MATLAB command** field. Type that variable name or enter a new name in the **MATLAB workspace variable** field. Press **Return** or **Enter** to see the updated **MATLAB command**.

4 Click **Execute** to run the query.

Tip You can generate a file that runs the query from the MATLAB Command Window in the future. For details, see "Saving Queries in Files" in the Database Toolbox documentation.

Editing Queries

Edit a query using one of the following options:

- Changing your selections.
- Editing the **SQL statement** field.
- Editing the **MATLAB command** field.

Using Database Explorer

In this section...

"About Database Explorer" on page 4-63
"Migrate from Visual Query Builder (VQB) to Database Explorer" on page 4-64
"Configure Your Environment" on page 4-64
"Modify and Delete Database Connections" on page 4-75
"Set Database Preferences" on page 4-76
"Display Data from a Single Database Table" on page 4-78
"Join Data from Multiple Database Tables" on page 4-80
"Define Query Criteria to Refine Results" on page 4-84
"Query Rules Using the SQL Criteria Panel" on page 4-85
"Query Example Using a Left Outer Join" on page 4-87
"Work with Multiple Databases" on page 4-91
"Import Data to the MATLAB Workspace" on page 4-92
"Save Queries as SQL Code" on page 4-95
"Generate MATLAB Code" on page 4-96

About Database Explorer

`dexplore` starts Database Explorer, which is a Database Toolbox app for connecting to a database and importing data to the MATLAB workspace.

Database Explorer is an interactive app that lets you:

- Create and configure JDBC and ODBC data sources.
- Establish multiple connections to databases.
- Select tables and columns of interest.
- Fine-tune your selection using SQL query criteria.
- Preview selected data.
- Import selected data into the MATLAB workspace.
- Save generated SQL queries.

- Generate MATLAB code.

Migrate from Visual Query Builder (VQB) to Database Explorer

Database Explorer replaces VQB as an app for exploring the data in your database. If you are using VQB, refer to the following points to help migrate from VQB to Database Explorer:

- If you previously used Visual Query Builder (`querybuilder`) to access a JDBC data source, before starting Database Explorer for the first time, execute this command because you cannot use this JDBC data source with Database Explorer.

  ```
  setdbprefs('JDBCDataSourceFile','')
  ```
  Then, define your JDBC data source using Database Explorer.
- If you use VQB to export data from MATLAB to your database, use the command-line functions `datainsert` or `fastinsert`.
- If you use VQB to generate reports, use MATLAB reporting and plotting functionality to generate reports. You can also use MATLAB Report Generator to generate reports.
- If you use VQB to display charts, use the MATLAB plotting tools to generate charts and graphics.
- If you generate MATLAB files using VQB, open Database Explorer and recreate your SQL query. Then, using Database Explorer you can generate a script (`.m` file) that includes your SQL query, preference settings, and connection.
- If you save your SQL queries using VQB, open Database Explorer and recreate your SQL query. Then, using Database Explorer you can generate a script with just your SQL query. Save the SQL script file with a `.sql` extension in MATLAB.

Configure Your Environment

Before using Database Explorer to connect to a database, you must set up a *data source*. A data source consists of:

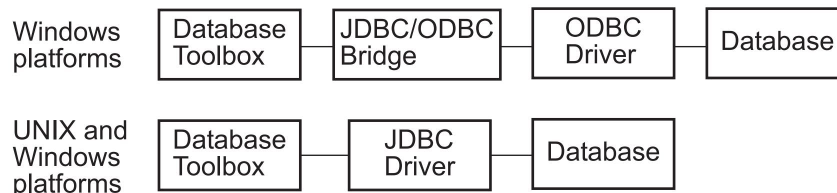
- Data that the toolbox accesses
- Information required to find the data, such as driver, folder, server, or network names

Data sources interact with *ODBC drivers* or *JDBC drivers*. An ODBC driver is a standard Microsoft Windows interface that enables communication between database management systems and SQL-based applications. A JDBC driver is a standard interface

that enables communication between applications based on Oracle Java and database management systems.

Database Toolbox software is based on Java. It uses a JDBC/ODBC bridge to connect to the ODBC driver of a database, which is automatically installed as part of the MATLAB JVM.

This figure illustrates how drivers interact with Database Toolbox software.



Tip Some Windows systems support both ODBC and JDBC drivers. On such systems, JDBC drivers generally provide better performance than ODBC drivers because the JDBC/ODBC bridge is not used to access databases.

Before You Begin

Before you can use Database Explorer with the examples in this documentation, do the following:

1. Set up the data sources that are provided with Database Toolbox.

   Caution If you previously used Visual Query Builder (`querybuilder`) to access a JDBC data source, before starting Database Explorer for the first time, execute this command because you cannot use this JDBC data source with Database Explorer.

   ```
   setdbprefs('JDBCDataSourceFile', '')
   ```

   ---

2. Configure the data sources for use with your database driver.

   - If you are using an ODBC driver, see "Configure ODBC Data Sources" on page 4-66.
   - If you are using a JDBC driver, see "Configure JDBC Data Sources" on page 4-70.

Set Up the dbtoolboxdemo Data Source

The `dbtoolboxdemo` data source uses the `tutorial` database located in *`matlabroot`*`/toolbox/database/dbdemos/tutorial.mdb`.

1 Copy `tutorial.mdb` into a folder to which you have write access.

2 Confirm you have write access to `tutorial.mdb`.

3 Open `tutorial.mdb` from the MATLAB Current Folder by right-clicking the file and selecting **Open Outside MATLAB**. The file opens in Microsoft Access.

Note: You might need to convert the database to the version of Access you are currently running. For example, beginning in Microsoft Access 2007, you see the option to save as `*.accdb`. For details, consult your database administrator.

Configure ODBC Data Sources

When setting up a data source for use with an ODBC driver, the target database can be located on a PC running the Windows operating system or on another system to which the PC is networked. These instructions use the Microsoft ODBC Data Source Administrator Version 6.1 for the U.S. English version of Microsoft Access 2010 for Windows systems. If you have a different configuration, you might need to modify these instructions. For details, consult your database administrator.

1 Close open databases, including `tutorial.mdb` in the database program.

2 Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip and then selecting **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, at the command line, enter:

```
dexplore
```

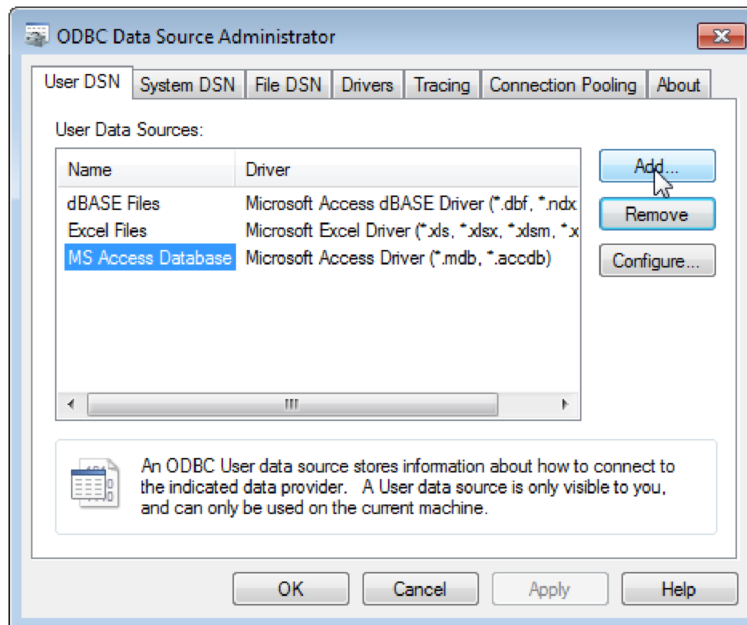
If no data sources are set up, a message box opens. Click **OK** to close it. Otherwise, the Connect to a Data Source dialog box opens. Click **Cancel** to close this dialog box.

3 Click the **Database Explorer** tab and then select **New** > **ODBC** to open the ODBC Data Source Administrator dialog box to define the ODBC data source.

Requirement When using a 32-bit version of Microsoft Office, you must also use a 32-bit version of MATLAB to complete the remaining steps.

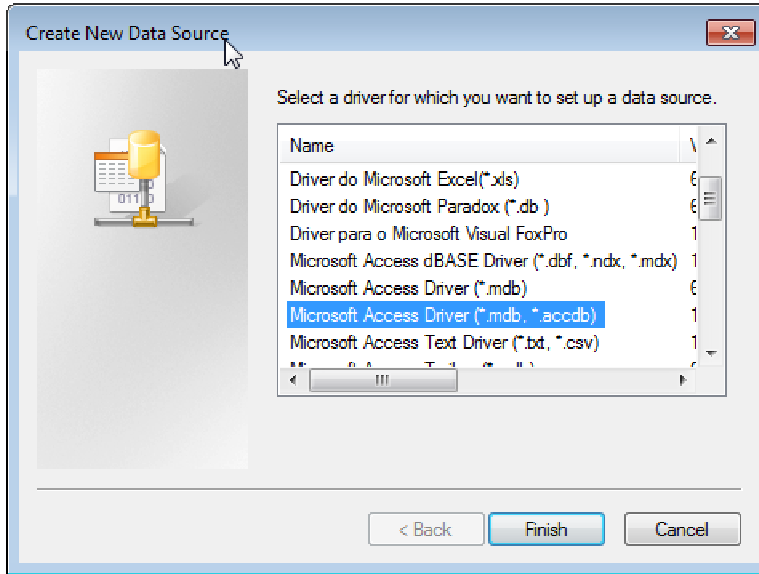
---

4 Click the **User DSN** tab and click **Add**.

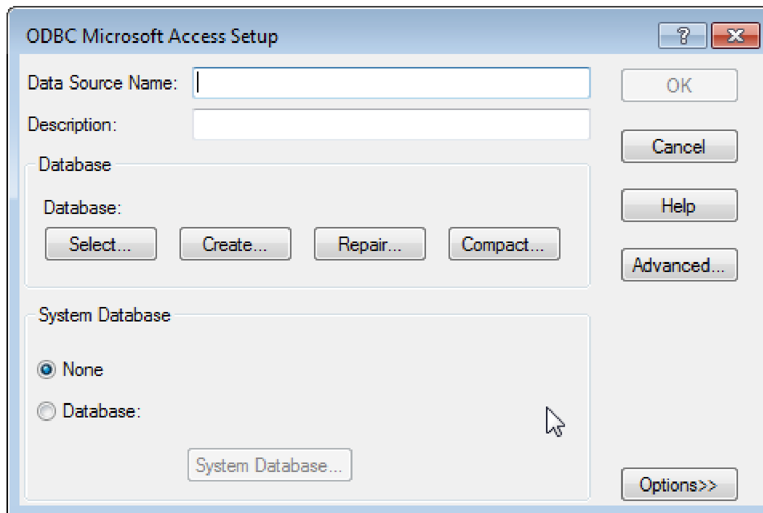


A list of installed ODBC drivers appears in the Create New Data Source dialog box.

5 Select `Microsoft Access Driver (*.mdb, *.accdb)` and click **Finish**.



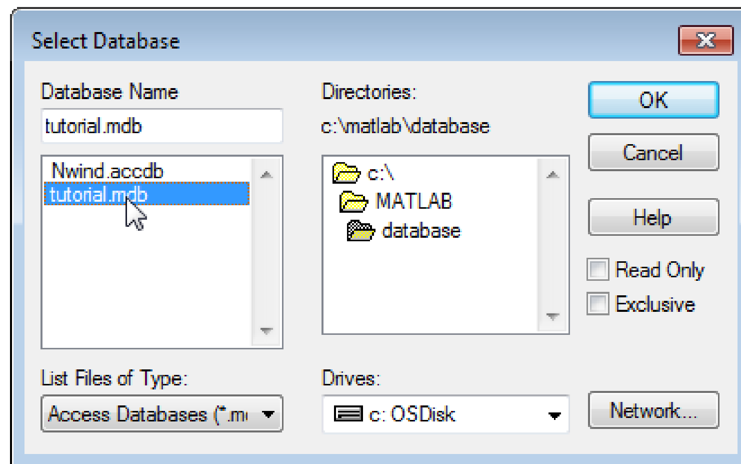
The ODBC Microsoft Access Setup dialog box for your driver opens. The dialog box for your driver might differ from the following.



6 Enter `dbtoolboxdemo` as the data source name and `tutorial database` as the description.

7 Select the database for this data source to use. For some drivers, you can skip this step. If you are unsure about skipping this step, consult your database administrator.

   a In the ODBC Microsoft Access Setup dialog box, click **Select**.



   b Specify the database you want to use. For the `dbtoolboxdemo` data source, select `tutorial.mdb`.

   c If your database is on a system to which your PC is connected:

      i Click **Network**. The Map Network Drive dialog box opens.

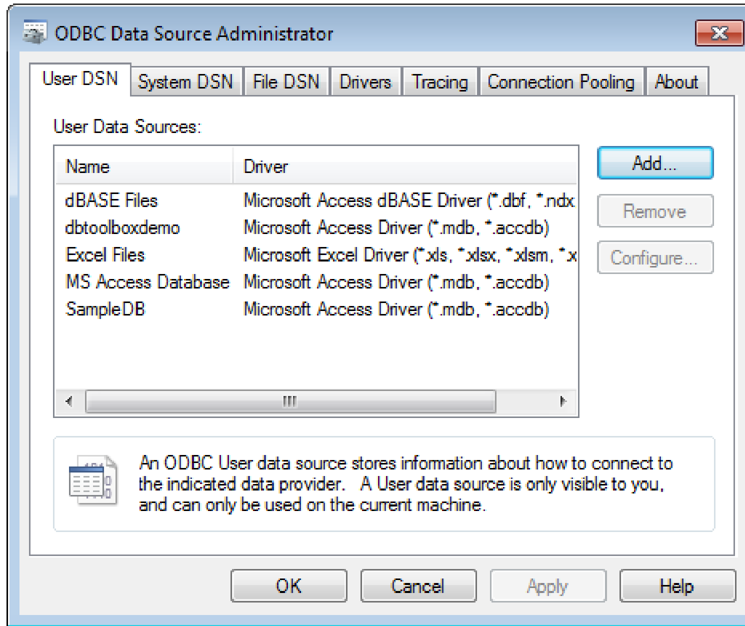
      ii Specify the folder containing the database you want to use and click **Finish**.

   d Click **OK** to close the Select Database dialog box.

8 In the ODBC Microsoft Access Setup dialog box, click **OK**.

9 Repeat steps 6 through 8 with the following changes to define the data source for any additional databases that you want to use.

   The ODBC Data Source Administrator dialog box displays the `dbtoolboxdemo` and any additional data sources that you have added in the **User DSN** tab.



10 Click **OK** to close the dialog box.

Configure JDBC Data Sources

1 Find the name of the JDBC driver file. This file is provided by your database vendor. The name and location of this file differ for each system. If you do not know the name or location of this file, consult your database administrator.

Caution If you previously used Visual Query Builder (`querybuilder`) to access a JDBC data source, before starting Database Explorer for the first time, execute this command because you cannot use this JDBC data source with Database Explorer.

```
setdbprefs('JDBCDataSourceFile', '')
```

Then follow these instructions to set up the JDBC data source using Database Explorer.

---

2 Specify the location of the JDBC drivers file in the MATLAB Java class path by adding this file's path to the `javaclasspath.txt` file. MATLAB loads the static class path at the start of each session. The static path offers better class loading

performance than the dynamic path. To add folders to the static path, create the file `javaclasspath.txt`, and then restart MATLAB.

Create an ASCII file in your preferences folder named `javaclasspath.txt`. To view the location of the preferences folder, type:

```
prefdir
```

Each line in the file is the path name of a folder or JAR file. For example:

```
d:\work\javaclasses
```

To simplify the specification of folders in cross-platform environments, use any of these macros: `$matlabroot`, `$arch`, and `$jre_home`. You can also create a `javaclasspath.txt` file in your MATLAB startup folder. Classes specified in this file override classes specified in the `javaclasspath.txt` file in the preferences folder.

Note: MATLAB reads the static class path only at startup. If you edit `javaclasspath.txt` or change your `.class` files while MATLAB is running, you must restart MATLAB to put those changes into effect.

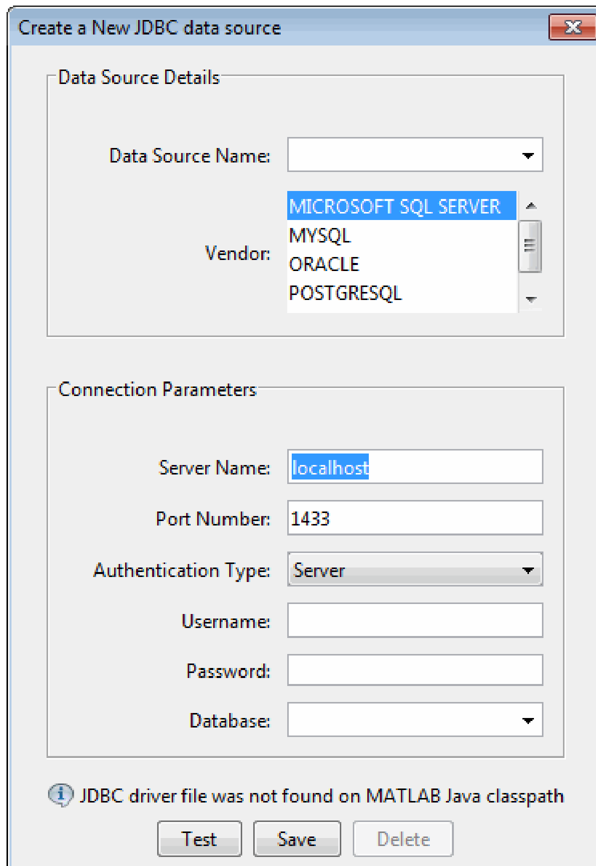
If the drivers file is not located where `javaclasspath.txt` indicates, errors do not appear, and Database Explorer does not establish a database connection.

For details, see "Bringing Java Classes into MATLAB Workspace".

3. Close the open database, `tutorial.mdb`, in the database program.
4. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip and then selecting **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, at the command line, enter:

   ```
   dexplore
   ```

5. Click the **Database Explorer** tab and then select **New > JDBC** to open the Create a New JDBC data source dialog box.



6 Use the following table to set up JDBC drivers for use with Database Explorer.

a Using the Create a New JDBC data source dialog box, this table describes the fields that you use to define your JDBC data source. For examples of syntax used in these fields, see "JDBC Driver Name and Database Connection URL" on the `database` function reference page.

Field	Description
Data Source Name	The name you assign to the data source. For some databases, **Name** must match the name of the database as recognized by the machine it runs on.

Field	Description
Vendor	The vendor's name for the data source. When using **Other**: • **Driver** — The JDBC driver name (sometimes referred to as the class that implements the Java SQL driver for your database). • **URL** — The JDBC URL object, of the form `jdbc:`*`subprotocol`*`:`*`subname`*. *`subprotocol`*, is a database type. *`subname`* can contain other information used by **Driver**, such as the location of the database and/or a port number. It can take the form `//`*`hostname`*`:`*`port`*`/`*`databasename`*. **Note:** When using **Other** as the **Vendor**, your driver manufacturer's documentation specifies the **Driver** and **URL** formats. You might need to consult your database system administrator for this information.
Server Name	Server name.
Port Number	Server port number.
Authentication Type	(Microsoft SQL Server only) Server or Windows authentication.
Driver Type	(Oracle only) Driver type is **thin** or **oci**.
Username	User name to access the database.
Password	Password.
Database	Database name.

b In the Create a New JDBC data source dialog box, click **Save**.

c If this is the first time you are creating a data source using Database Explorer, the New file to store JDBC connection parameters dialog box opens. Use this dialog box to create a MAT-file that saves your specified data source information for future Database Explorer sessions.

Navigate to the folder where you want to put the MAT-file, specify a name for it that includes a `.mat` extension, and click **Save**.

d Test the connection by clicking **Test**.

If your database requires a user name and password, a dialog box prompting you to supply them opens. Enter values into these fields and click **OK**.

A confirmation dialog box states that the database connection succeeded.

e. To add more data sources, repeat steps 5 and 6 for each new data source.

Note: You can use tabs in Database Explorer to access different data sources. All of the data sources created using Database Explorer are stored in a single MAT-file for easy access. This MAT-file name is stored in `setdbprefs('JDBCDataSourceFile')` and is valid for all MATLAB sessions.

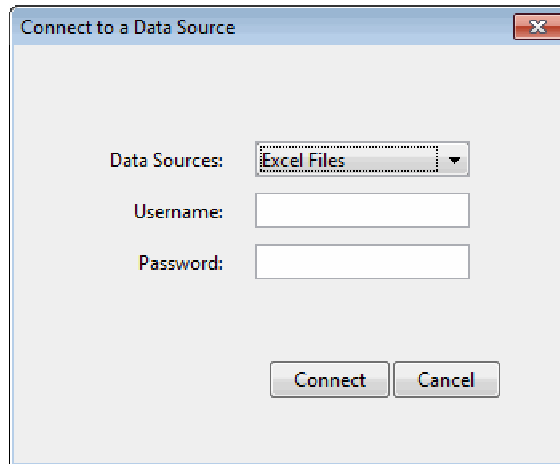
Connect to a Data Source

After configuring your OBDC or JDBC data sources, use Database Explorer to connect to the database.

1. Open Database Explorer by clicking the **Apps** tab on the MATLAB Toolstrip and then selecting **Database Explorer** from the **Database Connectivity and Reporting** section in the apps gallery. Alternatively, at the command line, enter:

   ```
   dexplore
   ```

2. Select your data source from the Connect to a Data Source dialog box or click **Cancel** and then click the **Database Explorer** tab and then click **Connect** to select your data source.
3. Select your data source from the **Data Sources** list and enter your user name and password.



For details about potential errors, see “Database Connection Error Messages”.

Modify and Delete Database Connections

ODBC Drivers

For data sources created with ODBC drivers, you can modify the data source using the ODBC Data Source Administrator. For details, see “Configuring a Driver and Data Source” on page 2-13.

1. Click **Start**. Select **Administrative Tools > Data Sources (ODBC)**. The ODBC Data Source Administrator dialog box opens. For details about locating this program on your computer, see Driver Installation.
2. Select the data source you want to modify. Click **Configure**.
3. Modify the settings as needed.

For data sources created with ODBC drivers, you can delete the data source using the ODBC Data Source Administrator.

1. After opening the ODBC Data Source Administrator, select the data source you want to delete.
2. Click **Remove**.

JDBC Drivers

For data sources created with JDBC drivers, you can modify the data source using Database Explorer. For details, see "Configuring a Driver and Data Source" on page 2-13.

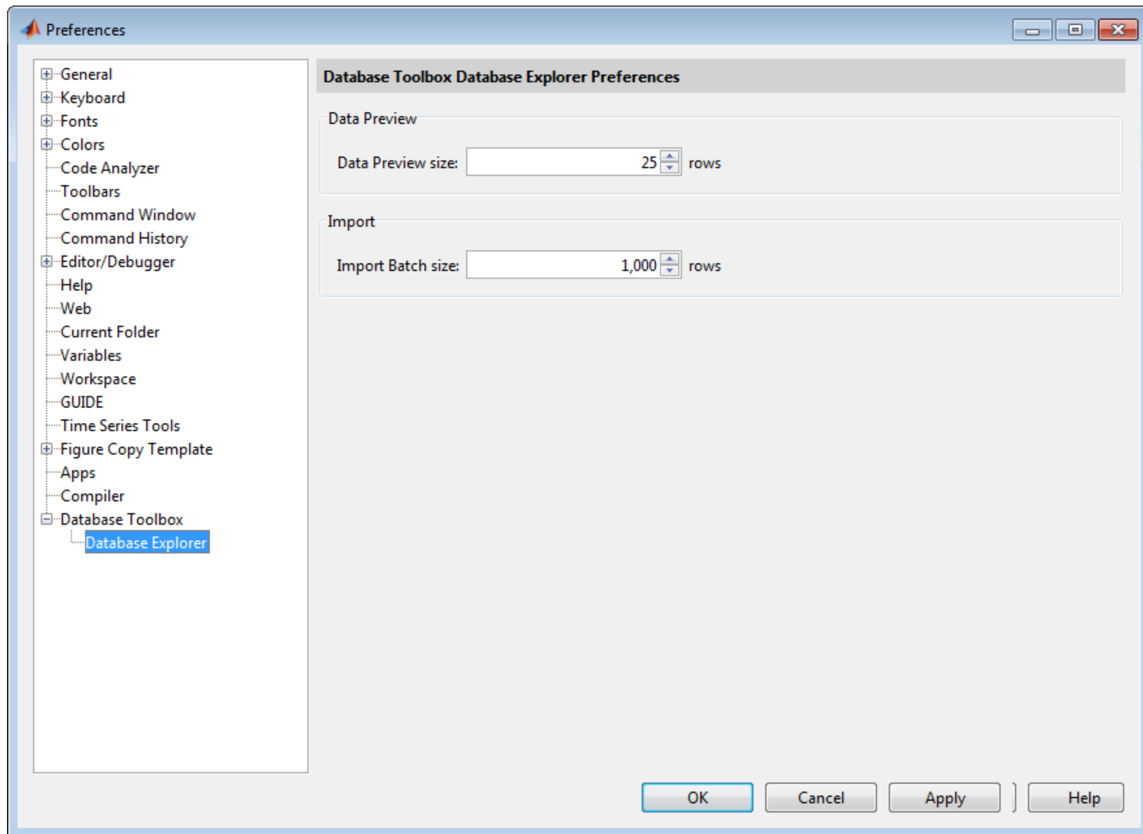
1. Open Database Explorer and click the **Database Explorer** tab. Select **New** > **JDBC**.
2. Select the data source name you want to modify from the drop-down list.
3. Modify the settings as needed in the Create a New JDBC data source dialog box. If you leave the data source name alone, the data source name is overwritten with the new settings. If you do not want to overwrite the existing data source, enter a new data source name. Click **Save**.

For data sources created with JDBC drivers, you can delete the data source using the Database Explorer.

1. After opening Database Explorer, select **New** > **JDBC**.
2. Select the data source name you want to delete from the drop-down list. Click **Delete**.

Set Database Preferences

1. Select **Preferences** from the Database Explorer Toolstrip to open the Database Explorer Preferences dialog box. These preference settings apply only to Database Explorer.



2 Specify the **Preferences** settings that apply to Database Explorer as described in the following table.

Preference	Allowable Values	Description
Data Preview size	5 to 10,000 rows	The number of rows you see in the **Data Preview** pane of Database Explorer.
Import batch size	1,000 to 1,000,000 rows	The number of rows fetched at one time from a database. When importing large amounts of data using Database Explorer, tune this value for optimum performance. For details, see "Preference Settings for Large Data Import" on page 4-19.

From this Preferences dialog box, select **Database Toolbox** to manage additional preferences for Database Toolbox. For details, see “Working with Preferences”. Alternatively, you can use `setdbprefs` to specify preferences for the retrieved data.

3 Click **OK**.

Display Data from a Single Database Table

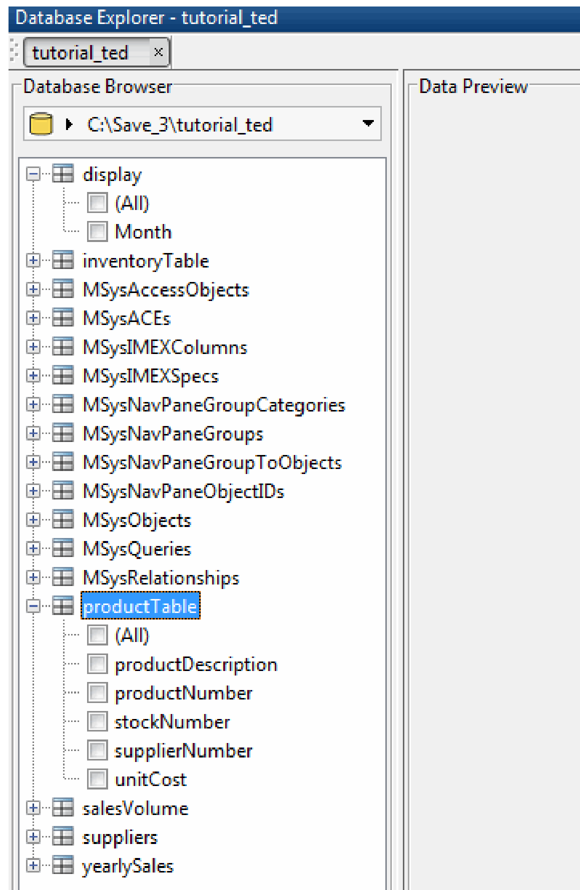
After connecting to your database, you can display data in database tables in the **Data Preview** pane.

1 Display data in the **Data Preview** pane by opening the database table of interest in the **Database Browser** pane. When a database table is selected in the **Database Browser** pane, it is highlighted and there is a corresponding entry in the **SQL Criteria** panel on the Database Explorer Toolstrip. The **SQL Criteria** panel is where you enter query conditions for the selected table.

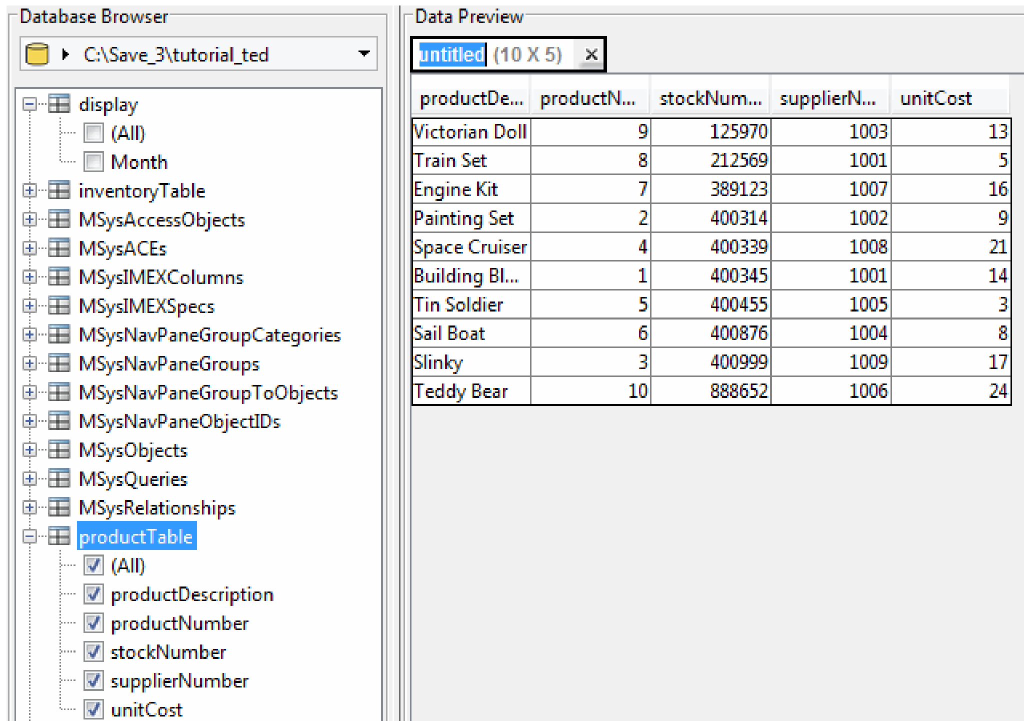
   For any given table, you can select the table information any of three ways:

   - Click to highlight the database table name. This does not display data in the **Data Preview** pane but does update the **SQL Criteria** panel.
   - Select **(All)** to choose all table columns and display them in the **Data Preview** pane.
   - Select specific check boxes to choose individual table columns and display them in the **Data Preview** pane.

   Note: The order of the columns in the **Data Preview** pane matches the order in which you select them in the **Database Browser** pane.



2 Select **(All)** to choose all database columns or select check boxes for specific table columns.



3 To change your display, select or clear check boxes in the **Database Browser** pane. The data updates in the **Data Preview** pane.

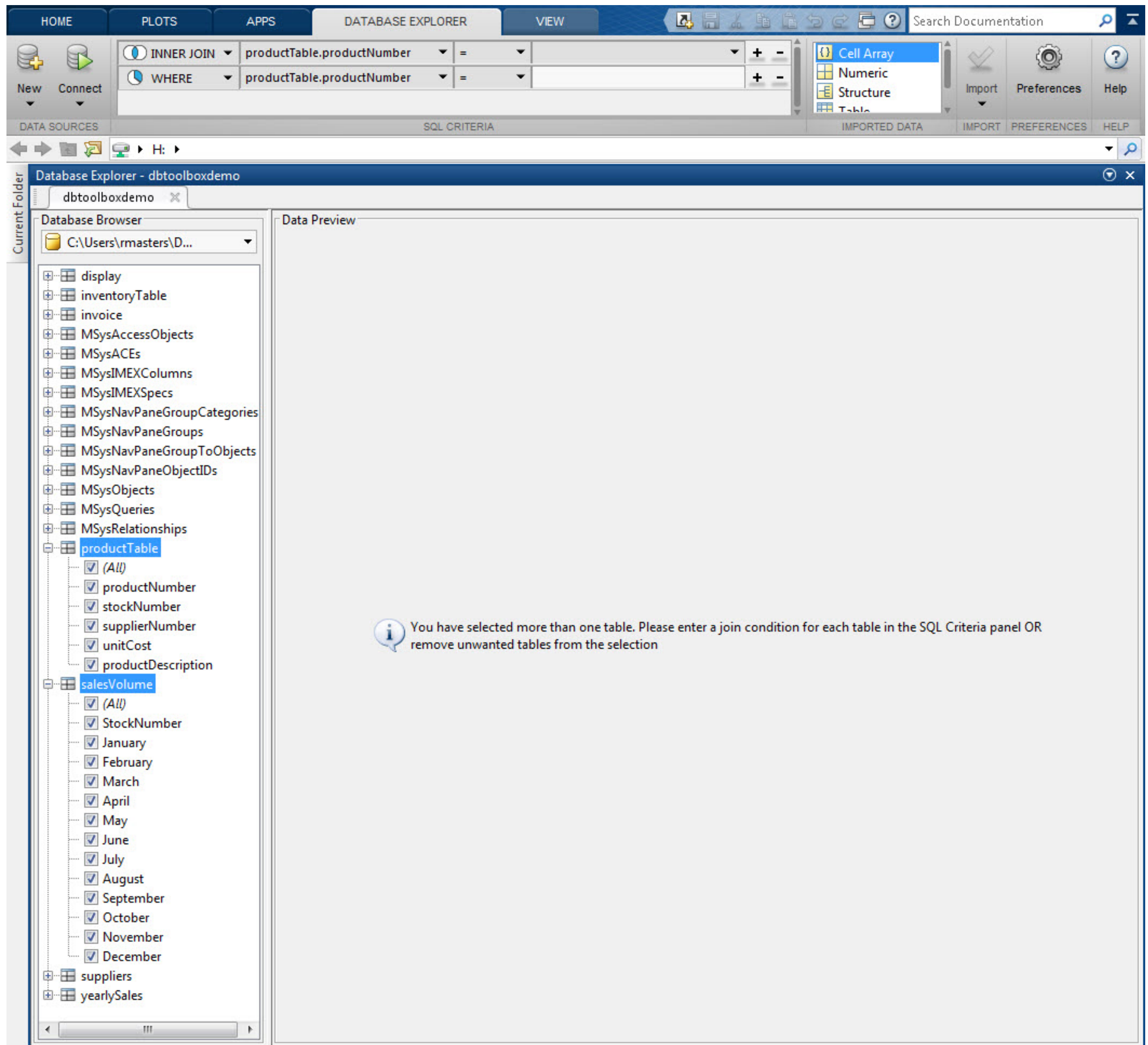
The **Data Preview** pane displays a limited number of rows. The total number of rows actually selected in the database appears at the right of the display. You can change the display size by clicking **Preferences** and adjusting the **Data Preview size**.

Join Data from Multiple Database Tables

After connecting to your database, you can display data from database tables in the **Data Preview** pane.

1 Display data in the **Data Preview** pane by opening the desired database table in the **Database Browser** pane. The **SQL Criteria** panel on the Database Explorer Toolstrip is updated.

2 When you select additional tables in the **Database Browser** pane, the **SQL Criteria** panel is updated.



3 Display the contents for the selected table using the **SQL Criteria** panel to define a join of the selected tables. Click the drop-down lists to specify which table column to join the selected tables. The join results appear in the **Data Preview** pane.

HOME | PLOTS | APPS | DATABASE EXPLORER | VIEW

New | Connect — DATA SOURCES

INNER JOIN | productTable.stockNumber | = | salesVolume.StockNumber — SQL CRITERIA

Cell Array | Numeric | Structure | Table — IMPORTED DATA

Import — IMPORT | Preferences — PREFERENCES | Help — HELP

Database Explorer - dbtoolboxdemo

dbtoolboxdemo

Database Browser

C:\Users\rmasters\D...

- display
- inventoryTable
- invoice
- MSysAccessObjects
- MSysACEs
- MSysIMEXColumns
- MSysIMEXSpecs
- MSysNavPaneGroupCategories
- MSysNavPaneGroups
- MSysNavPaneGroupToObjects
- MSysNavPaneObjectIDs
- MSysObjects
- MSysQueries
- MSysRelationships
- productTable
  - (All)
  - productNumber
  - stockNumber
  - supplierNumber
  - unitCost
  - productDescription
- salesVolume
  - (All)
  - StockNumber
  - January
  - February
  - March
  - April
  - May
  - June
  - July
  - August
  - September
  - October
  - November
  - December
- suppliers
- yearlySales

Data Preview

untitled (10 X 18)

10 of 10 rows

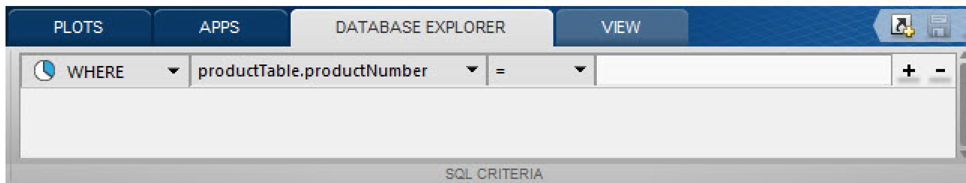
productDe...	productN...	StockNum...	supplierN...	unitCost	StockNum...	January	February	March	April	May
Victorian Doll	9	125970	1003	13	125970	1400	1100	981	882	
Train Set	8	212569	1001	5	212569	2400	1721	1414	1191	
Engine Kit	7	389123	1007	16	389123	1800	1200	890	670	
Painting Set	2	400314	1002	9	400314	3000	2400	1800	1500	
Space Cruiser	4	400339	1008	21	400339	4300	NaN	2600	1800	
Building Bl...	1	400345	1001	14	400345	5000	3500	2800	2300	
Tin Soldier	5	400455	1005	3	400455	1200	900	800	500	
Sail Boat	6	400876	1004	8	400876	3000	2400	1500	1500	
Slinky	3	400999	1009	17	400999	3000	1500	1000	900	
Teddy Bear	10	888652	1006	24	888652	NaN	900	821	701	

Define Query Criteria to Refine Results

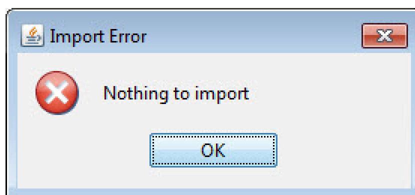
Database Browser selections and SQL criteria work together.

Using the **Database Browser** pane and the **SQL Criteria** panel, you can define query conditions and display the results in the **Data Preview** pane. Each row in the **SQL Criteria** panel has drop-down controls to define SQL query conditions. You can create SQL query conditions that span multiple rows in the **SQL Criteria** panel.

Requirement: When the right side of a query condition is a custom value that you enter in the text box, you must press the **Enter** or **Tab** key for the query condition to take effect. Alternatively, you can press the **Import** button to apply the condition as well as import data into a MATLAB variable.



Tip: If you do not use the **Enter** or **Tab** key to apply the query condition, selecting **Import** > **Import** applies the condition to the **Data Preview** pane and imports the data into a MATLAB variable. If there is no data to satisfy the condition, then the `Nothing to import` error message appears.



Each row in the **SQL Criteria** panel has four columns to define your SQL query.

Column 1	Column 2	Column 3	Column 4
Column 1 defines the SQL condition type where the supported values are: • **INNER JOIN** • **LEFT JOIN** • **RIGHT JOIN** • **FULL JOIN** • **WHERE** • **ORDER BY** • **AND** • **OR**	Column 2 defines the column names for every table selected in the **Database Browser** pane.	Column 3 defines the mathematical operator for each row of SQL statements where the supported values are: • **=** • **!=** • **>** • **<** • **<=** • **>=** • **LIKE** • **NOT LIKE** • **IS** • **IN** • **NOT IN** • **ASC** • **DES**	Depending on the preceding condition of the query statement, Column 4 displays column names for every table selected in the **Database Browser** pane.

Use multiple rows in the **SQL Criteria** panel to define multiple SQL query statements.

Query Rules Using the SQL Criteria Panel

The control options for the **SQL Criteria** panel depend on your selections in the **Database Browser** pane. The **SQL Criteria** panel supports multiple rows for specifying your query criteria. You can add more rows for these options in the **SQL Criteria** panel by clicking **+** or you can remove a row by clicking **-**.

- If one table is selected in the **Database Browser** pane, the available options for the first query condition are **WHERE** and **ORDER BY**.
- If two tables are selected in the **Database Browser** pane, the available options for the first query condition are:

    - **INNER JOIN**
    - **LEFT JOIN**
    - **RIGHT JOIN**
    - **FULL JOIN**
    - **WHERE**
    - **ORDER BY**
    - **AND**
    - **OR**

- After you apply a condition for a row in the **SQL Criteria** panel using the **Enter** or **Tab** keys, for every subsequent condition that you add, the first (leftmost) column contains only those query options that produce semantically correct SQL statements. For example, if the leftmost column of an applied condition contains an **ORDER BY** option, if you click **+** to add a new query option in a new row, the **ORDER BY** option from the previous row can only be followed by another **ORDER BY** option.

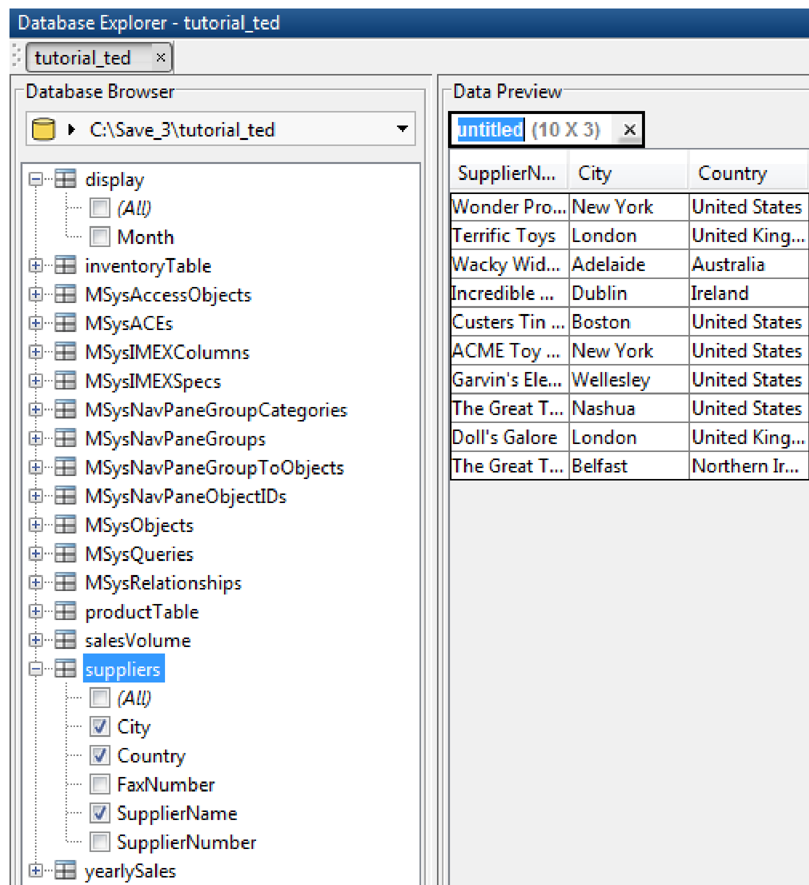
  In addition, a **Join** option can only be followed by another **JOIN** or **WHERE** and a **JOIN** option cannot follow a **WHERE** or **ORDER BY** option.
- When defining a new query line in the **SQL Criteria** panel for any conditions other than a **JOIN**, the new SQL line does not take effect until you apply the new line. When you apply a condition, all preceding and succeeding conditions that are not applied are removed from the **SQL Criteria** panel. Similarly, if you click **-** to remove a query line, if that query line has been applied, all succeeding conditions are removed. If the query line has not yet been applied, then only that line is removed from the **SQL Criteria** panel.
- When using a **WHERE** SQL statement with a mathematical operator, to match a string, you must include the string value in `'  '` to successfully apply the condition. If you use the **LIKE** or **NOT LIKE** SQL operator to match a string, the `'  '` are automatically added to the string value.

Note: If you click **+** to add a new query condition between two previously entered conditions, the available query options do not always produce semantically correct SQL statements. In this case, you must ensure that your query options are semantically correct. For best results using the **SQL Criteria** panel, add and apply your conditions in sequence.

Query Example Using a Left Outer Join

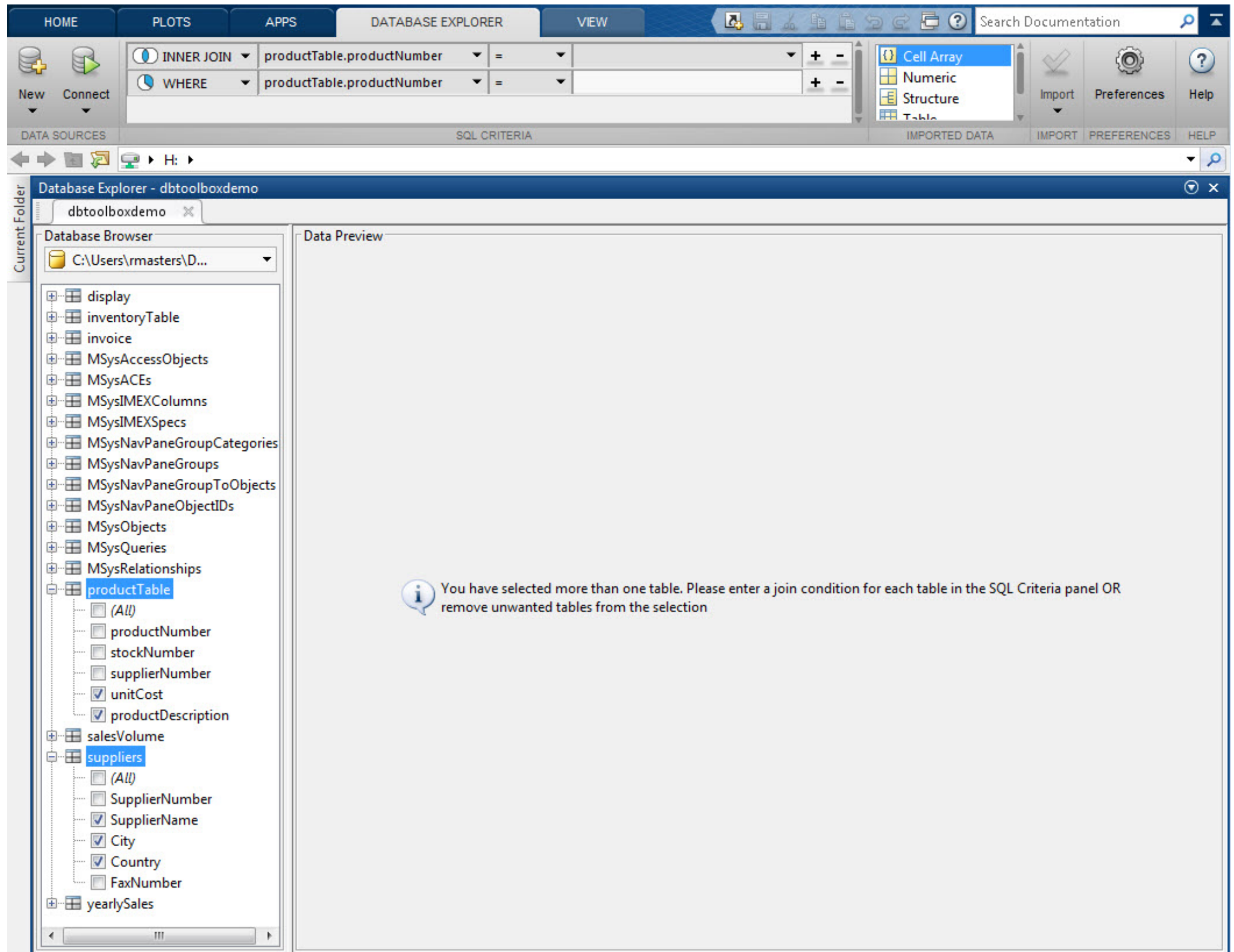
This example shows how to use a query to obtain supplier and product information using a **LEFT JOIN**. To use this example, you must set up a data source for the `tutorial.mdb` database. For information on setting up this data source, see "Set Up the dbtoolboxdemo Data Source" on page 4-66.

1 Open `tutorial.mdb` in Database Explorer and expand the table `suppliers` and select the fields `SupplierName`, `City`, and `Country`.



2 Expand the table `producttable` and select the fields `productDescription` and `unitCost`. The **Data Preview** pane displays a message prompting you to enter a

join condition. Also, there are two empty conditions in the **SQL Criteria** panel on the Database Explorer Toolstrip.



3 From the **SQL Criteria** panel, in the first (topmost) condition, change the first combo box for condition type to **LEFT JOIN**. Change the second combo box to `suppliers.SupplierNumber`. Change the last combo box to `producttable.SupplierNumber`. A left join, with the `suppliers` table on the left, implies that all the rows in the `suppliers` table are included in the final result, and

the rows in `suppliers` that do not have a match with any row in `producttable`, are padded with null values in the final result.

In the **Data Preview**, there are 11 rows that match the query conditions. For the supplier named `The Great Teddy Bear Company`, notice that there is a `null` in `productDescription` and a `NaN` for `unitCost`. This is because there is no product that is supplied by `The Great Teddy Bear Company`. If the condition type were **INNER JOIN** instead of **LEFT JOIN**, this row would not appear in the final result.

SupplierName	City	Country	productDescription	unitCost
Wonder Products	New York	United States	Building Blocks	14.0
Wonder Products	New York	United States	Train Set	5.0
Terrific Toys	London	United Kingdom	Painting Set	9.0
Wacky Widgets	Adelaide	Australia	Victorian Doll	13.0
Incredible Machines	Dublin	Ireland	Sail Boat	8.0
Custers Tin Soldiers	Boston	United States	Tin Soldier	3.0
ACME Toy Company	New York	United States	Teddy Bear	24.0
Garvin's Electrical Gizmos	Wellesley	United States	Engine Kit	16.0
The Great Train Company	Nashua	United States	Space Cruiser	21.0
Doll's Galore	London	United Kingdom	Slinky	17.0
The Great Teddy Bear Company	Belfast	Northern Ireland	null	NaN

4 From the **SQL Criteria** pane, click **+** at the end of the **LEFT JOIN** condition to add a new query condition. Change the first combo box to **WHERE**, the second to `suppliers.Country`, and the third to **NOT LIKE**. In the last text box, type `United States` and then enter the new condition using the **Enter** or **Tab** key. The query results appear in the **Data Preview** pane.

5 Enter the variable name as `data` in the text box `untitled` located above the table preview, and select **Import** > **Import** to import the data displayed in the **Data**

Preview pane into MATLAB as a variable named `data`. For details about using the MATLAB Variables editor, see "View, Edit, and Copy Variables".

Work with Multiple Databases

1. If you have not defined the OBDC or JDBC connection for your new data source, click **Open** and select **ODBC** or **JDBC** and complete the associated dialog box. For details, see "Configure ODBC Data Sources" on page 4-66 or "Configure JDBC Data Sources" on page 4-70.
2. Select **Connect** > **Connect** to select your new data source.

3. The new data source appears in a new tab in the **Database Browser** pane. You can change databases by clicking the associated tab.

   You can only use Database Explorer to create SQL queries for a single database at a time.

In addition, you can work with a different catalog and schema on the same database server as the one connected to your current data source. To change to a different catalog and schema:

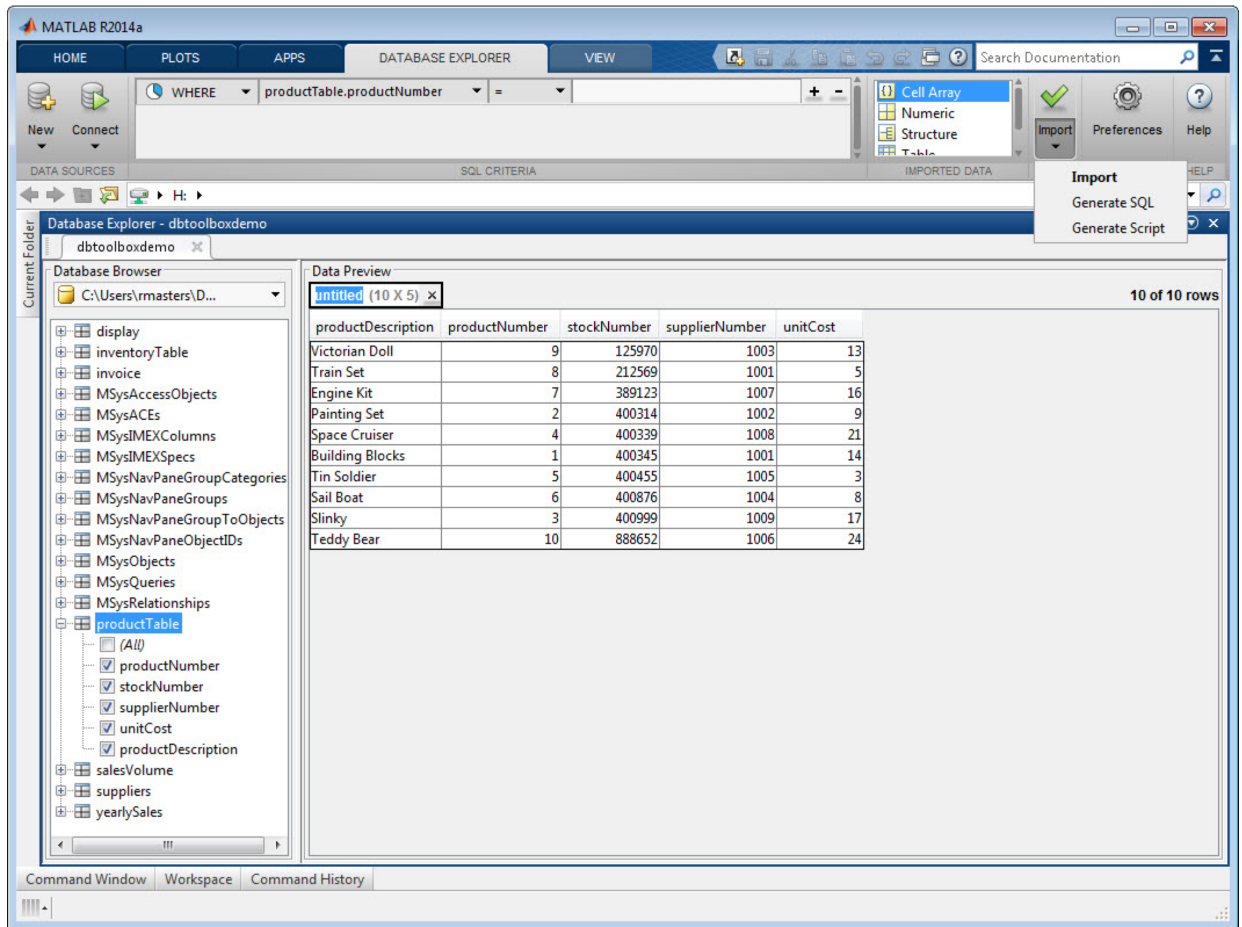
- Select the catalog/schema from the drop-down list in the address bar of the Database Browser. For a database system like Microsoft SQL Server that has a hierarchy of catalogs and schemas, make sure you choose the correct value for both to access data in your tables.

Import Data to the MATLAB Workspace

1. Use the **Database Browser** pane to select data from a single table or use the **SQL Criteria** panel to create a query and display the results in the **Data Preview** pane.
2. Name the MATLAB variable by entering it in the **untitled** text box in the **Data Preview** pane.
3. Use the **Imported Data** panel to define the data type for a MATLAB variable to store the data displayed in the **Data Preview** pane. Supported data types are:

   - **Cell Array**
   - **Numeric**
   - **Structure**
   - **Table**
   - **Dataset** (requires Statistics Toolbox)

4 Select **Import > Import** to import the data displayed in the **Data Preview** pane.



Tip When importing large amounts of data, Database Explorer imports data in batches. The batch size is set to 1,000 rows by default. To change the batch size, click **Preferences** and adjust **Import batch size**.

5 (Optional) Display the imported data in the MATLAB workspace using the Variables editor. For details about using the Variables editor, see “View, Edit, and Copy Variables”.

untitled <10x5 cell>

	1	2	3	4	5	6
1	'Victorian D...	9	125970	1003	13	
2	'Train Set'	8	212569	1001	5	
3	'Engine Kit'	7	389123	1007	16	
4	'Painting Set'	2	400314	1002	9	
5	'Space Crui...	4	400339	1008	21	
6	'Building Bl...	1	400345	1001	14	
7	'Tin Soldier'	5	400455	1005	3	
8	'Sail Boat'	6	400876	1004	8	
9	'Slinky'	3	400999	1009	17	
10	'Teddy Bear'	10	888652	1006	24	
11						
12						
13						

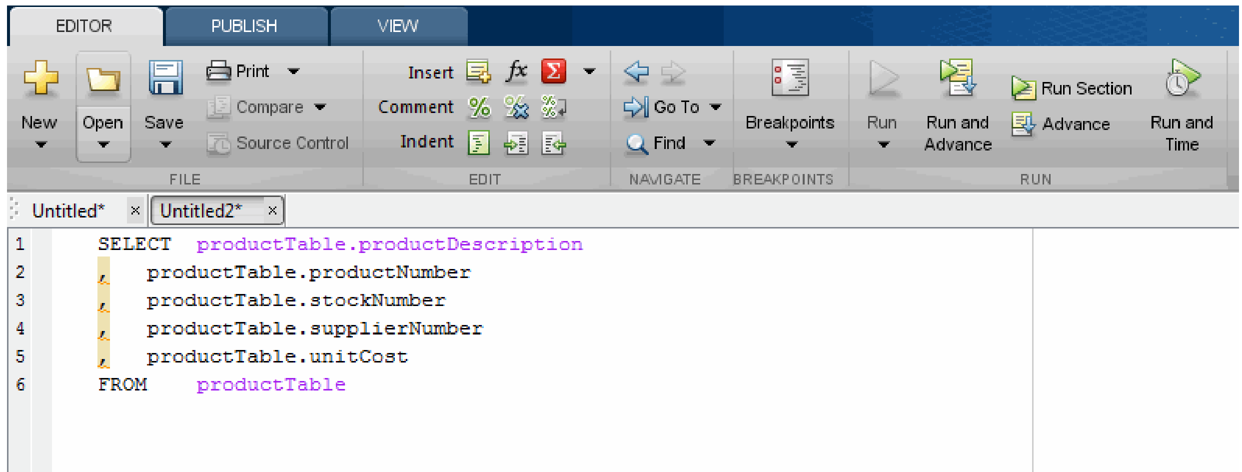
6 (Optional) Use MATLAB functions to manipulate the data.

Save Queries as SQL Code

You can save a Database Explorer query as SQL code.

1 Use the **Database Browser** pane to select data from a single table or multiple tables. Then use the **SQL Criteria** panel to create queries and display the results in the **Data Preview** pane.

2 After you have created a query using the **SQL Criteria** panel, select **Import** > **Generate SQL** to display the SQL code in the MATLAB Editor.



3. Save the SQL code to a `.txt` or `.sql` file. You can then use the SQL statements to manually rebuild a query using the **SQL Criteria** panel. Alternatively, you can use the `.sql` file to import data programmatically into MATLAB by using `runsqlscript`.

Generate MATLAB Code

You can generate MATLAB code to automate the steps for accessing data that you display in the **Data Preview** pane.

1. Connect to a data source and then use the **Database Browser** pane to select data from a single table or use the **SQL Criteria** panel to create a query and display the results in the **Data Preview** pane.
2. Select **Import** > **Generate Script** to display MATLAB code in the MATLAB Editor.

```
%Set preferences with setdbprefs.
setdbprefs('DataReturnFormat', 'cellarray');
setdbprefs('NullNumberRead', 'NaN');
setdbprefs('NullStringRead', 'null');


%Make connection to database.  Note that the password has been omitted
%Using ODBC driver.
conn = database('tutorial_ted', 'admin', '');

%Read data from database.
curs = exec(conn, ['SELECT  productTable.productDescription'...
    ' , productTable.productNumber'...
    ' , productTable.stockNumber'...
    ' , productTable.supplierNumber'...
    ' , productTable.unitCost'...
    ' FROM  productTable ']);

curs = fetch(curs);
close(curs);

%Assign data to output variable
untitled = curs.Data;

%Close database connection.
close(conn);

%Clear variables
clear curs conn
```

3 Save the MATLAB code to a file. You can run this code file from the command line to connect to a data source and run a query.

Using Database Toolbox Functions

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Getting Started with Database Toolbox Functions

The following sections provide examples of how to use Database Toolbox functions. MATLAB files that include functions used in some of these examples are available in `matlab/toolbox/database/dbdemos`.

Follow these simple examples consecutively when you first start using the product. Once you are familiar with Database Toolbox usage, refer to these examples as needed.

Import Data from Databases into MATLAB

This example shows how to import data from a Microsoft Access database called `dbtoolboxdemo` into the MATLAB workspace.

Connect to the Database

Connect to the Microsoft Access database with the data source name `dbtoolboxdemo` using native ODBC.

```
conn = database.ODBCConnection('dbtoolboxdemo','','');
```

If you are connecting to a database using a JDBC connection, then specify a different syntax for the `database` function.

Import Data Using a Simple SQL Query

Select the product number `productNumber` and description `productDescription` from the product table `productTable`. Create an SQL query to select this data. Then, use the `exec` function to execute the SQL query using the database connection object `conn`.

```
sqlquery = 'select productNumber,productDescription from productTable';
curs = exec(conn,sqlquery);
```

The data contains strings. Set the data return format to support strings. Use the `setdbprefs` function to specify the format `cellarray`.

```
setdbprefs('DataReturnFormat','cellarray')
```

Display the data. Use the `fetch` function to fetch the data from the executed SQL query.

```
curs = fetch(curs);
curs.Data
```

```
ans =

    [ 9]    'Victorian Doll'
    [ 8]    'Train Set'
    [ 7]    'Engine Kit'
    [ 2]    'Painting Set'
    [ 4]    'Space Cruiser'
    [ 1]    'Building Blocks'
    [ 5]    'Tin Soldier'
    [ 6]    'Sail Boat'
```

```
    [ 3]    'Slinky'
    [10]    'Teddy Bear'
```

Close the cursor object and database connection.

```
close(curs)
close(conn)
```

Import Data Using Multiple Joins in the SQL Query

Connect to the Microsoft Access database with the data source name `dbtoolboxdemo` using the JDBC/ODBC bridge.

```
conn = database('dbtoolboxdemo','','');
```

Create an SQL script file named `salesvolume.sql` with this SQL query. This SQL query uses multiple joins to join these tables in the `dbtoolboxdemo` database:

- `producttable`
- `salesvolume`
- `suppliers`

The purpose of the query is to import sales volume data for suppliers located in the United States.

```
SELECT  salesvolume.January
,   salesvolume.February
,   salesvolume.March
,   salesvolume.April
,   salesvolume.May
,   salesvolume.June
,   salesvolume.July
,   salesvolume.August
,   salesvolume.September
,   salesvolume.October
,   salesvolume.November
,   salesvolume.December
,   suppliers.Country
FROM     ((producttable
INNER JOIN salesvolume
ON  producttable.stockNumber = salesvolume.StockNumber)
INNER JOIN suppliers
ON  producttable.supplierNumber = suppliers.SupplierNumber)
WHERE suppliers.Country LIKE 'United States%'
```

Run the SQL script file named `salesvolume.sql` using the `runsqlscript` function.

```
results = runsqlscript(conn,'salesvolume.sql')
```

```
results =

        Attributes: []
              Data: {6x13 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'SELECT  salesvolume.January ,   salesvolume.February ,   salesvolume.March ,   salesv...'
           Message: ''
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

`results` contains a cursor array with the returned data from running the SQL query in the SQL script file.

Display the data in the cursor object containing the returned data.

```
results(1).Data
```

```
ans =

  Columns 1 through 8

    [5000.00]    [3500.00]    [2800.00]    [2300.00]    [1700.00]    [1400.00]    [1000.00]    [900.00]
    [2400.00]    [1721.00]    [1414.00]    [1191.00]    [ 983.00]    [ 825.00]    [ 731.00]    [653.00]
    [1200.00]    [ 900.00]    [ 800.00]    [ 500.00]    [ 399.00]    [ 345.00]    [ 300.00]    [175.00]
    ...

  Columns 9 through 13

    [1600.00]    [3300.00]    [12000.00]    [20000.00]    'United States'
    [ 723.00]    [ 790.00]    [ 1400.00]    [ 5000.00]    'United States'
    [ 760.00]    [1500.00]    [ 5500.00]    [17000.00]    'United States'
    ...
```

Display the column names for the returned data.

```
columnnames(results(1))
```

```
ans =

'January','February','March','April','May','June','July','August',...
'September','October','November','December','Country'
```

Close the Database Connection

Close the cursor array and database connection.

```
close(results)
```

```
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch` | `runsqlscript` | `setdbprefs`

More About

- "Connecting to a Database Using the Native ODBC Interface" on page 3-16

Create a Query Using a Date

This example shows how to format a date in an SQL query.

When you want to write an SQL statement that selects data from your database using a date, you need to format the date according to your database specifications. Consult your database documentation for the right formatting. This example shows date formatting for an Oracle database.

Connect to the Database

Connect to Oracle using native ODBC. For example, the following code assumes you are connecting to a data source named `Oracle` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('Oracle','username','pwd');
```

Create and Execute a Query Using a Date

Create an SQL statement `sqlquery` that contains the full query. Execute the query using the `exec` function. The following code uses the table `test_types` and the column `test_dt`. The WHERE clause contains Oracle SQL code for filtering the records based on the date. The `test_dt` column data type is an Oracle date type. Filter records for the dates after June 9, 2013 using the `test_dt` column by entering this date in the Oracle function `to_date` to convert your date string to an Oracle date type. For a string `'2013-06-09'`, specify the format as `'YYYY-MM-DD'`. This is one way to format a date in Oracle. Consult your Oracle documentation for alternatives.

```
sqlquery = ['select * from test_types '...
            'where test_dt > to_date(''2013-06-09'',''YYYY-MM-DD'')'];
curs = exec(conn,sqlquery);
```

Display the selected data using the `fetch` function.

```
curs = fetch(curs);
curs.Data
```

```
ans =

    '2013-06-10 15:11:00'    '2013-06-10 15:11:22.500000'
    '2013-06-10 15:13:00'    '2013-06-10 15:13:21.870003'
    '2013-06-10 15:16:00'    '2013-06-10 15:16:45.099998'
    ...
```

The query returns the records where the date in the column `test_dt` is after June 9, 2013.

Close the Cursor and Database Connection

```
close(curs)
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch`

More About

- "Connecting to a Database Using the Native ODBC Interface"

Create a Query Using a String

This example shows how to include a string in your SQL query using a Microsoft Access database.

Connect to the Database

Connect to Microsoft Access using native ODBC. For example, the following code assumes you are connecting to a data source named `dbtoolboxdemo` with a blank user name and password.

```
conn = database.ODBCConnection('dbtoolboxdemo','','');
```

Create a Query Using a String

Select all records from the table `productTable` where the product description is `'Slinky'`. Create an SQL query string `sqlquery` that embeds the product description string into the SQL query string by using an extra pair of single quotes.

```
sqlquery = ['select * from productTable '...
            'where productDescription = ''Slinky'''];
```

Or, you can write the SQL query as a concatenation of two strings using brackets.

```
sqlquery = ['select * from productTable '...
           'where productDescription = ' '''Slinky'''];
```

Execute the Query

Execute the SQL query using the `exec` function and display the data using the `fetch` function.

```
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data

ans =

    [3.00]    [400999.00]    [1009.00]    [17.00]    'Slinky'
```

Close the Cursor and Database Connection

```
close(curs)
```

```
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch`

More About

- "Connecting to a Database Using the Native ODBC Interface"

Create a Query Using a MATLAB Variable

This example shows how to include a MATLAB variable in your SQL query. This example uses a Microsoft SQL Server database.

Connect to the Database

Connect to the Microsoft SQL Server database using a JDBC driver without Operating System authentication. For example, this code assumes you are connecting to a database named `dbname` with the user name `username`, password `pwd`, database server name `sname`, and port number `123456`.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server','Server','sname',...
                'AuthType','Server','portnumber',123456);
```

Create a Query Using a MATLAB Variable

Suppose you want to select all invoice data for the first product. Create a MATLAB variable `productID` and set it to the first product number.

```
productId = 1;
```

Select all records from the table `invoice` where the product number is equal to the first product. Create an SQL query string `sqlquery` that concatenates the SQL query with the MATLAB variable `productID` by using brackets. `productID` is a numeric variable but the SQL query is a string. You need convert the number to a string by using the `num2str` function.

```
sqlquery = ['select * from invoice '...
           'where ProductNumber = ' num2str(productId)];
```

Execute the Query

Execute the SQL query using the `exec` function and display the data using the `fetch` function.

```
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data

ans =
```

```
    [2101.00]    '2010-08-01 00:00...'    [1.00]    [0]    [1948410x1 int8]
```

The `fetch` function returns the invoice data record for the first product.

Close the Cursor and Database Connection

```
close(curs)
close(conn)
```

See Also

`close` | `database` | `exec` | `fetch` | `num2str`

Create a Query Using Special Characters

This example shows how to write an SQL query for table names or columns names with special characters.

These characters require using escape characters that are specific to your database. Consult your database documentation for the right escape characters. This example uses a Microsoft SQL Server database.

Connect to the Database

Connect to the Microsoft SQL Server database using a JDBC driver without Operating System authentication. For example, this code assumes you are connecting to a database named `dbname` with the user name `username`, password `pwd`, database server name `sname`, and port number `123456`.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server','Server','sname',...
                'AuthType','Server','portnumber',123456);
```

Create a Query with Special Characters

Suppose you want to select all data in a column with a column name that contains spaces. This column resides in a table with a table name that contains spaces. A space is a special character that needs to be enclosed by escape characters for the SQL query to execute. Brackets are the escape characters for a Microsoft SQL Server database. Create an SQL query string `sqlquery` that contains the column name and table name enclosed by brackets.

```
sqlquery = 'select [column with spaces] from [table with spaces]';
```

Execute the Query

Execute the SQL query using the `exec` function and display the data using the `fetch` function.

```
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data
```

```
ans =

    'some text'
```

```
    'some text'
```

Close the Cursor and Database Connection

```
close(curs)
close(conn)
```

See Also

close | database | exec | fetch

Viewing Information About Imported Data

This example shows how to view information about imported data from the `dbtoolboxdemo` data source and close the connection to the database using the following Database Toolbox functions:

- `attr`
- `close`
- `cols`
- `columnnames`
- `rows`
- `width`

For details about these functions, see `matlab\toolbox\database\dbdemos\dbinfodemo.m`.

1 Open the cursor and connection if needed:

```
conn = database('dbtoolboxdemo', '', '');
curs = exec(conn, 'select productDescription from productTable');
setdbprefs('DataReturnFormat','cellarray')
curs = fetch(curs, 10);
```

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

2 Use `rows` to return the number of rows in the data set:

```
numrows = rows(curs)
numrows =
    10
```

3 Use `cols` to return the number of columns in the data set:

```
numcols = cols(curs)
numcols =
     1
```

4 Use `columnnames` to return the names of the columns in the data set:

```
colnames = columnnames(curs)
colnames =
 'productDescription'
```

5 Use `width` to return the column width, or size of the field, for the specified column number:

```
colsize = width(curs, 1)
colsize =
    50
```

6 Use `attr` to view multiple attributes for a column:

```
 attributes = attr(curs)

attributes =

      fieldName: 'productDescription'
       typeName: 'VARCHAR'
      typeValue: 12
    columnWidth: 50
      precision: []
          scale: []
       currency: 'false'
       readOnly: 'false'
       nullable: 'true'
        Message: []
```

Tip To import multiple columns, include a `colnum` argument in `attr` to specify the number of columns whose information you want.

---

7 Close the cursor.

```
close(curs)
```

8 Continue with the next example. To stop working now and resume working on the next example at a later time, close the connection.

```
close(conn)
```

Delete Data from Databases

This example shows how to delete data from your database using MATLAB.

To do this, create the SQL string with your deletion SQL statement. Consult your database documentation for the correct SQL syntax. Use the `exec` function with your SQL string to execute the delete operation on your database. The following example demonstrates deleting data records in a Microsoft Access database.

Connect to the Database

Connect to the Microsoft Access database using native ODBC and the data source name `dbtoolboxdemo`.

```
conn = database.ODBCConnection('dbtoolboxdemo','','');
```

Display the data in the table `inventoryTable`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [ 1.00]    [2700.00]    [14.50]
    [ 2.00]    [1700.00]    [ 9.00]
    [ 3.00]    [ 356.00]    [17.00]
    [ 4.00]    [2580.00]    [21.00]
    [ 5.00]    [9000.00]    [ 3.00]
    [ 6.00]    [4540.00]    [ 8.00]
    [ 7.00]    [6034.00]    [16.00]
    [ 8.00]    [8350.00]    [ 5.00]
    [ 9.00]    [2339.00]    [13.00]
    [10.00]    [ 723.00]    [24.00]
    [11.00]    [ 567.00]    [    0]
    [12.00]    [1278.00]    [    0]
    [13.00]    [1700.00]    [14.50]
    [30.00]    [ 500.00]    [ 1.00]
    [35.00]    [ 100.00]    [ 1.00]
```

Delete a Specific Record

Delete the data for the product number `30` from the table `inventoryTable`. Specify the product number using the WHERE clause in the SQL statement.

```
curs = exec(conn,'delete * from inventoryTable where productNumber = 30');
```

Display the data in the table `inventoryTable` after the deletion.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [ 1.00]    [2700.00]    [14.50]
    [ 2.00]    [1700.00]    [ 9.00]
    [ 3.00]    [ 356.00]    [17.00]
    [ 4.00]    [2580.00]    [21.00]
    [ 5.00]    [9000.00]    [ 3.00]
    [ 6.00]    [4540.00]    [ 8.00]
    [ 7.00]    [6034.00]    [16.00]
    [ 8.00]    [8350.00]    [ 5.00]
    [ 9.00]    [2339.00]    [13.00]
    [10.00]    [ 723.00]    [24.00]
    [11.00]    [ 567.00]    [    0]
    [12.00]    [1278.00]    [    0]
    [13.00]    [1700.00]    [14.50]
    [35.00]    [ 100.00]    [ 1.00]
```

The record with product number `30` is missing.

Delete a Record Using a MATLAB Variable

Define a MATLAB variable `productID` by setting it to the product number `35`.

```
productID = 35;
```

Delete the data using the MATLAB variable `productID`. You need to build an SQL statement string that combines the SQL for the delete operation with the MATLAB variable. Since the variable is numeric and the SQL statement is a string, you need to convert the number to a string. Use the `num2str` function for the conversion. Concatenate the delete SQL statement and the numeric conversion using the square brackets.

```
curs = exec(conn,['delete * from inventoryTable where '...
            'productNumber = ' num2str(productID)]);
```

Display the data in the table `inventoryTable` after the deletion.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [ 1.00]    [2700.00]    [14.50]
    [ 2.00]    [1700.00]    [ 9.00]
    [ 3.00]    [ 356.00]    [17.00]
    [ 4.00]    [2580.00]    [21.00]
    [ 5.00]    [9000.00]    [ 3.00]
    [ 6.00]    [4540.00]    [ 8.00]
    [ 7.00]    [6034.00]    [16.00]
    [ 8.00]    [8350.00]    [ 5.00]
    [ 9.00]    [2339.00]    [13.00]
    [10.00]    [ 723.00]    [24.00]
    [11.00]    [ 567.00]    [    0]
    [12.00]    [1278.00]    [    0]
    [13.00]    [1700.00]    [14.50]
```

The record with product number 35 is missing.

Close the Cursor and Database Connection

```
close(curs)
close(conn)
```

See Also

exec | fetch | num2str

Exporting Data to New Record in Database

This example does the following:

1. Retrieves sales data from a `salesVolume` table.
2. Calculates the sum of sales for 1 month.
3. Stores this data in a cell array.
4. Exports this data to a `yearlySales` table.

You learn to use the following Database Toolbox functions:

- `get`
- `fastinsert`
- `setdbprefs`

For details about these functions, see `matlab\toolbox\database\dbdemos\dbinsertdemo.m`.

1. Connect to the data source, `dbtoolboxdemo`, if needed:

   ```
   conn = database('dbtoolboxdemo', '', '');
   ```

   Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.
2. Use `setdbprefs` to set the format for retrieved data to `numeric`:

   ```
   setdbprefs('DataReturnFormat','numeric')
   ```
3. Import ten rows of data the `March` column of data from the `salesVolume` table.

   ```
   curs = exec(conn, 'select March from salesVolume');
   curs = fetch(curs);
   ```
4. Assign the data to the **MATLAB workspace variable** `AA`:

   ```
   AA = curs.Data
   AA =

   981
   1414
   890
   1800
   2600
   ```

```
2800
800
1500
1000
821
```

5 Calculate the sum of the March sales and assign the result to the variable `sumA`:

```
sumA = sum(AA(:))
sumA =

   14606
```

6 Assign the month and sum of sales to a cell array to export to a database. Put the month in the first cell of `exdata`:

```
exdata(1,1) = {'March'}
exdata =
  'March'
```

Put the sum in the second cell of `exdata`:

```
exdata(1,2) = {sumA}
exdata =
    'March'    [14606]
```

7 Define the names of the columns to which to export data. In this example, the column names are `Month` and `salesTotal`, from the `yearlySales` table in the `dbtoolboxdemo` database. Assign the cell array containing the column names to the variable `colnames`:

```
colnames = {'Month','salesTotal'};
```

8 Use the `get` function to determine the current status of the `AutoCommit` database flag. This status determines whether the exported data is automatically committed to the database. If the flag is `off`, you can undo an update; if it is `on`, data is automatically committed to the database.

```
get(conn, 'AutoCommit')
ans =
 on
```

The `AutoCommit` flag is set to `on`, so the exported data is automatically committed to the database.

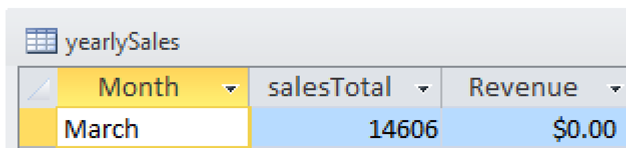
9 Use the `fastinsert` function to export the data into the `yearlySales` table. Pass the following arguments to this function:

- `conn`, the connection object for the database
- `yearlySales`, the name of the table to which you are exporting data
- The cell arrays `colnames` and `exdata`

```
fastinsert(conn, 'yearlySales', colnames, exdata)
```

`fastinsert` appends the data as a new record at the end of the `yearlySales` table.

10 In Microsoft Access, view the `yearlySales` table to verify the results.



Month	salesTotal	Revenue
March	14606	$0.00

11 Close the cursor.

```
close(curs)
```

12 Continue with the next example ("Replacing Existing Database Data with Exported Data" on page 5-24). To stop now and resume working with the next example at a later time, close the connection.

```
close(conn)
```

Replacing Existing Database Data with Exported Data

This example updates the `Month` field that you previously imported (“Exporting Data to New Record in Database” on page 5-21) into the `yearlySales` table of the `dbtoolboxdemo` data source using the following Database Toolbox functions:

- `close`
- `update`

For details about these functions, see `matlab\toolbox\database\dbdemos\dbupdatedemo.m`.

1. Change the month in `yearlySales` table from `March` to `March2010`. Assign the new month value to the `newdata` cell array.

```
colnames = {'Month'};
newdata = {'March2010'}
newdata =
    'March2010'
```

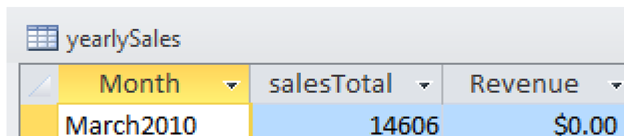
2. Specify the record to update in the database by defining a SQL `where` statement and assigning it to the variable `whereclause`. The record to update is the record whose `Month` is `March`. Because the date string is within a string, it is embedded within two single quotation marks rather than one.

```
whereclause = 'where Month = ''March'''
whereclause =
 where Month = 'March'
```

3. Export the data, replacing the record whose `Month` is `March`.

```
update(conn,'yearlySales',colnames,newdata,whereclause)
```

4. In Microsoft Access, view the `yearlySales` table to verify the results.



5. Disconnect from the database.

```
close(conn);
```

Exporting Multiple Records from the MATLAB Workspace

This example does the following:

1. Imports monthly sales figures for all products from the `dbtoolboxdemo` data source into the MATLAB workspace.
2. Computes total sales for each month.
3. Exports the totals to a new table.

You use the following Database Toolbox functions:

- `fastinsert`
- `setdbprefs`

For details about these functions, see `matlab\toolbox\database\dbdemos\dbinsert2demo.m`.

1. Ensure that the `dbtoolboxdemo` data source is writable, that is, not read only.
2. Use the `database` function to connect to the data source, assigning the returned connection object as `conn`. Pass the following arguments to this function:

   - `dbtoolboxdemo`, the name of the data source
   - `username` and `password`, which are passed as empty strings because no user name or password is required to access the database

   ```
   conn = database('dbtoolboxdemo', '', '');
   ```

   Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.
3. Use the `setdbprefs` function to specify preferences for the retrieved data. Set the data return format to `numeric` and specify that `NULL` values read from the database are converted to `0` in the MATLAB workspace.

   ```
   setdbprefs...
   ({'NullNumberRead';'DataReturnFormat'},{'0';'numeric'})
   ```

   When you specify `DataReturnFormat` as `numeric`, the value for `NullNumberRead` must also be numeric.
4. Import data from the `salesVolume` table.

   ```
   curs = exec(conn, 'select * from salesVolume');
   ```

```
curs = fetch(curs);
```

5 Use `columnnames` to view the column names in the fetched data set:

```
columnnames(curs)
ans =
 'StockNumber', 'January', 'February', 'March', 'April',
 'May', 'June', 'July', 'August', 'September', 'October',
 'November', 'December'
```

6 View the data for January (column 2).

```
curs.Data(:,2)
ans =
        1400
        2400
        1800
        3000
        4300
        5000
        1200
        3000
        3000
           0
```

7 Assign the dimensions of the matrix containing the fetched data set to `m` and `n`.

```
[m,n] = size(curs.Data)
m =
    10
n =
    13
```

8 Use `m` and `n` to compute monthly totals. The variable `tmp` is the sales volume for all products in a given month `c`. The variable `monthly` is the total sales volume of all products for that month. For example, if `c` is `2`, row `1` of `monthly` is the total of all rows in column `2` of `curs.Data`, where column `2` is the sales volume for January.

```
for c = 2:n
 tmp = curs.Data(:,c);
 monthly(c-1,1) = sum(tmp(:));
end
```

View the result.

```
monthly
```

```
25100
15621
14606
11944
9965
8643
6525
5899
8632
13170
48345
172000
```

9 Create a string array containing the column names into which you want to insert the data, and assign the array to the variable `colnames`.

```
colnames{1,1} = 'salesTotal';
```

10 Use `fastinsert` to insert the data into the `yearlySales` table:

```
fastinsert(conn, 'yearlySales', colnames, monthly)
```

11 To verify that the data was imported correctly, in Microsoft Access, view the `yearlySales` table from the `tutorial` database.

yearlySales : Table

	Month	salesTotal	Revenue
▶		25100	$0.00
		15621	$0.00
		14606	$0.00
		11944	$0.00
		9965	$0.00
		8643	$0.00
		6525	$0.00
		5899	$0.00
		8632	$0.00
		13170	$0.00
		48345	$0.00
		172000	$0.00
*		0	$0.00

Record: 1 of 12

12 Close the cursor and the database connection.

```
close(curs)
close(conn)
```

Exporting Data Using Bulk Insert

In this section...
“About Bulk Insert Functionality” on page 5-29
“Bulk Insert into Oracle” on page 5-29
“Bulk Insert into Microsoft SQL Server 2005” on page 5-31
“Bulk Insert into MySQL” on page 5-33

About Bulk Insert Functionality

Many ways exist to insert data into your database using the command line. You can use `datainsert`, `fastinsert`, or `insert`. For best performance with large volumes of data, use `datainsert` or `fastinsert`.

If you still experience performance issues, create a data file with every record in your data set. Then, you can use this data file as input into the bulk insert functionality of your database to process the large data set. Additionally, you can insert data with special characters such as double quotes with this file. Bulk insert provides performance gains by using the bulk insert utilities that are native to different database systems. For details about working with large data sets, see “Working with Large Data Sets”.

Bulk Insert into Oracle

This example shows how to export data to the Oracle server using bulk insert. For this example, use a data file on the local machine where Oracle is installed.

1 Connect to the Oracle database.

```
javaaddpath 'path\ojdbc5.jar';
conn = database('databasename','user','password',...
   'oracle.jdbc.driver.OracleDriver',...
   'jdbc:oracle:thin:@machine:port:databasename');
```

2 Create a table named `BULKTEST`.

```
e = exec(conn,['create table BULKTEST (salary number, '...
'player varchar2(25), signed varchar2(25), '...
'team varchar2(25))']);
close(e)
```

3 Enter data records. A sample record appears as follows.

```
A = {100000.00,'KGreen','06/22/2011','Challengers'};
```

4 Expand A to a 10,000-record data set.

```
A = A(ones(10000,1),:);
```

5 Write data to a file for bulk insert.

Tip When connecting to a database on a remote machine, you must write this file to the remote machine. Oracle has problems trying to read files that are not on the same machine as the instance of the database.

```
fid = fopen('c:\temp\tmp.txt','wt');
for i = 1:size(A,1)
   fprintf(fid,'%10.2f \t %s \t %s \t %s \n',A{i,1},...
   A{i,2},A{i,3},A{i,4});
end
fclose(fid);
```

6 Set the folder location.

```
e = exec(conn,...
   'create or replace directory ext as ''C:\\Temp''');
close(e)
```

7 Delete the temporary table if it exists.

```
e = exec(conn,'drop table testinsert');
try,close(e),end
```

8 Create a temporary table and bulk insert it into the table BULKTEST.

```
e = exec(conn,['create table testinsert (salary number, '...
   'player varchar2(25), signed varchar2(25), '...
   'team varchar2(25)) organization external '...
   '( type oracle_loader default directory ext access '...
   'parameters ( records delimited by newline fields '...
   'terminated by ''\t'') location (''tmp.txt'')) '...
   'reject limit 10000']);
close(e)
e = exec(conn,'insert into BULKTEST select * from testinsert');
close(e)
```

9 Confirm the number of rows and columns in BULKTEST.

```
e = exec(conn, 'select * from BULKTEST');
results = fetch(e)
```

```
results =

        Attributes: []
              Data: {10000x4 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select * from BULKTEST'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 oracle.jdbc.driver.OracleResultSetImpl]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 oracle.jdbc.driver.OracleStatementWrapper]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]

columnnames(results)

ans =

'SALARY','PLAYER','SIGNED','TEAM'
```

10 Close the connection.

```
close(conn)
```

Bulk Insert into Microsoft SQL Server 2005

1 Connect to the Microsoft SQL Server. For JDBC driver use, add the JAR file to the MATLAB Java class path.

```
javaaddpath 'path\sqljdbc4.jar';
conn = database('databasename','user','password',...
   'com.microsoft.sqlserver.jdbc.SQLServerDriver',...
   'jdbc:sqlserver://machine:port;
   database=databasename');
```

2 Create a table named BULKTEST.

```
e = exec(conn,['create table BULKTEST (salary '...
'decimal(10,2), player varchar(25), signed_date '...
'datetime, team varchar(25))']);
close(e)
```

3 Enter data records. A sample record appears as follows.

```
A = {100000.00,'KGreen','06/22/2011','Challengers'};
```

4 Expand A to a 10,000-record data set.

```
A = A(ones(10000,1),:);
```

5 Write data to a file for bulk insert.

Tip When connecting to a database on a remote machine, you must write this file to the remote machine. Microsoft SQL Server has problems trying to read files that are not on the same machine as the instance of the database.

```
fid = fopen('c:\temp\tmp.txt','wt');
for i = 1:size(A,1)
   fprintf(fid,'%10.2f \t %s \t %s \t %s \n',A{i,1},...
   A{i,2},A{i,3},A{i,4});
end
fclose(fid);
```

6 Run the bulk insert.

```
e = exec(conn,['bulk insert BULKTEST from '...
'''c:\temp\tmp.txt''with (fieldterminator = ''\t'', '...
'rowterminator = ''\n'')']);
```

7 Confirm the number of rows and columns in BULKTEST.

```
e = exec(conn, 'select * from BULKTEST');
results = fetch(e)

results =

        Attributes: []
              Data: {10000x4 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select * from BULKTEST'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 com.microsoft.sqlserver.jdbc.SQLServerResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 com.microsoft.sqlserver.jdbc.SQLServerStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]

columnnames(results)

ans =

'salary','player','signed_date','team'
```

8 Close the connection.

```
close(conn)
```

Bulk Insert into MySQL

1 Connect to the MySQL server. For JDBC driver use, add the JAR file to the MATLAB Java class path.

```
javaaddpath 'path\mysql-connector-java-5.1.13-bin.jar';
conn = database('databasename', 'user', 'password',...
   'com.mysql.jdbc.Driver',...
   'jdbc:mysql://machine:port/databasename');
```

2 Create a table named `BULKTEST`.

```
e = exec(conn,['create table BULKTEST (salary decimal, '...
   'player varchar(25), signed_date varchar(25), '...
   'team varchar(25))']);
close(e)
```

3 Create a data record, such as the one that follows.

```
A = {100000.00,'KGreen','06/22/2011','Challengers'};
```

4 Expand `A` to be a 10,000-record data set.

```
A = A(ones(10000,1),:);
```

5 Write data to a file for bulk insert.

Note: MySQL reads files saved locally, even if you are connecting to a remote machine.

```
fid = fopen('c:\temp\tmp.txt','wt');
for i = 1:size(A,1)
   fprintf(fid,'%10.2f \t %s \t %s \t %s \n',...
   A{i,1},A{i,2},A{i,3},A{i,4});
end
fclose(fid);
```

6 Run the bulk insert. Note the use of `local infile`.

```
e = exec(conn,['load data local infile '...
   ' ''C:\\temp\\tmp.txt'' into table BULKTEST '...
   'fields terminated by ''\t'' lines terminated '...
   'by ''\n''']);
close(e)
```

7 Confirm the number of rows and columns in BULKTEST.

```
e = exec(conn, 'select * from BULKTEST');
results = fetch(e)

results =

        Attributes: []
              Data: {10000x4 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select * from BULKTEST'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 com.mysql.jdbc.JDBC4ResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 com.mysql.jdbc.StatementImpl]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]

columnnames(results)

ans =

'salary','player','signed_date','team'
```

8 Close the connection.

```
close(conn)
```

Retrieve Image Data Types

This example retrieves images from the `dbtoolboxdemo` data source using a sample file that parses image data, *`matlabroot`*`/toolbox/database/vqb/parsebinary.m`.

1. Connect to the `dbtoolboxdemo` data source.

   ```
   conn = database('dbtoolboxdemo','','');
   ```

   Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

2. Specify `cellarray` as the data return format preference.

   ```
   setdbprefs('DataReturnFormat','cellarray')
   ```

3. Import the `InvoiceNumber` and `Receipt` columns of data from the `Invoice` table.

   ```
   curs = exec(conn,'select InvoiceNumber, Receipt from Invoice')
   curs = fetch(curs);
   ```

4. View the data you imported.

   ```
   curs.Data

   ans =

       [  2101]    [1948410x1 int8]
       [  3546]    [2059994x1 int8]
       [ 33116]    [ 487034x1 int8]
       [ 34155]    [2059994x1 int8]
       [ 34267]    [2454554x1 int8]
       [ 37197]    [1926362x1 int8]
       [ 37281]    [2403674x1 int8]
       [ 41011]    [1920474x1 int8]
       [ 61178]    [2378330x1 int8]
       [ 62145]    [ 492314x1 int8]
       [456789]                  []
       [987654]                  []
   ```

   Note: Some `OTHER` data type fields may be empty, indicating that the data could not pass through the JDBC/ODBC bridge.

5. Assign the image element you want to the variable `receipt`.

```
receipt = curs.Data{1,2};
```

6 Run `parsebinary`. This program writes the retrieved data to a file, strips ODBC header information from it, and displays `receipt` as a bitmap image in a figure window. Ensure that your current folder is writable so that the output of `parsebinary` can be written to it.

```
cd 'I:\MATLABFiles\myfiles'
parsebinary(receipt,'BMP');
```

For details about `parsebinary`, enter `help parsebinary` or view its file in the MATLAB Editor/Debugger by entering `open parsebinary`.

Working with Database Metadata

In this section...
"Accessing Metadata" on page 5-37
"Resultset Metadata Objects" on page 5-42

Accessing Metadata

In this example, you use the following Database Toolbox functions to access metadata:

- `dmd`
- `get`
- `supports`
- `tables`

1 Connect to the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo', '', '')
conn =
       Instance: 'dbtoolboxdemo'
       UserName: ''
         Driver: []
            URL: []
    Constructor: [1x1...
    com.mathworks.toolbox.database.databaseConnect]
        Message: []
         Handle: [1x1 sun.jdbc.odbc.JdbcOdbcConnection]
        TimeOut: 0
     AutoCommit: 'on'
           Type: 'Database Object'
```

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

2 Use the `dmd` function to create a database metadata object`dbmeta` and return its handle, or identifier:

```
dbmeta = dmd(conn)

dbmeta = DMDHandle:...
```

```
[1x1 sun.jdbc.odbc.JdbcOdbcDatabaseMetaData]
```

3 Use the `get` function to assign database properties data, `dbmeta`, to the variable v:

```
v = get(dbmeta)
v =
              AllProceduresAreCallable: 1
                AllTablesAreSelectable: 1
 DataDefinitionCausesTransactionCommit: 1
   DataDefinitionIgnoredInTransactions: 0
            DoesMaxRowSizeIncludeBlobs: 0
                              Catalogs: {4x1 cell}
                       CatalogSeparator: '.'
                           CatalogTerm: 'DATABASE'
                   DatabaseProductName: 'ACCESS'
                DatabaseProductVersion: '04.00.0000'
           DefaultTransactionIsolation: 2
                    DriverMajorVersion: 2
                    DriverMinorVersion: 1
                            DriverName: [1x31 char]
                         DriverVersion: '2.0001 (04.00.6200)'
                   ExtraNameCharacters: [1x29 char]
                 IdentifierQuoteString: '`'
                      IsCatalogAtStart: 1
                MaxBinaryLiteralLength: 255
                  MaxCatalogNameLength: 260
                  MaxCharLiteralLength: 255
                   MaxColumnNameLength: 64
                   MaxColumnsInGroupBy: 10
                     MaxColumnsInIndex: 10
                   MaxColumnsInOrderBy: 10
                    MaxColumnsInSelect: 255
                     MaxColumnsInTable: 255
                        MaxConnections: 64
                   MaxCursorNameLength: 64
                        MaxIndexLength: 255
                MaxProcedureNameLength: 64
                            MaxRowSize: 4052
                   MaxSchemaNameLength: 0
                    MaxStatementLength: 65000
                         MaxStatements: 0
                    MaxTableNameLength: 64
                     MaxTablesInSelect: 16
                     MaxUserNameLength: 0
                      NumericFunctions: [1x73 char]
```

```
                ProcedureTerm: 'QUERY'
                      Schemas: {}
                   SchemaTerm: ''
           SearchStringEscape: '\'
                  SQLKeywords: [1x461 char]
              StringFunctions: [1x91 char]
   StoresLowerCaseIdentifiers: 0
StoresLowerCaseQuotedIdentifiers: 0
   StoresMixedCaseIdentifiers: 0
StoresMixedCaseQuotedIdentifiers: 1
   StoresUpperCaseIdentifiers: 0
StoresUpperCaseQuotedIdentifiers: 0
              SystemFunctions: ''
                   TableTypes: {13x1 cell}
            TimeDateFunctions: [1x111 char]
                     TypeInfo: {16x1 cell}
                          URL: ...
    'jdbc:odbc:dbtoolboxdemo'
                     UserName: 'admin'
          NullPlusNonNullIsNull: 0
            NullsAreSortedAtEnd: 0
          NullsAreSortedAtStart: 0
             NullsAreSortedHigh: 0
              NullsAreSortedLow: 1
          UsesLocalFilePerTable: 0
                 UsesLocalFiles: 1
```

Tip For details about the database metadata properties returned by `get`, see the methods of the `DatabaseMetaData` object on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

---

4 Some information is too long to fit in the display area of the field, so the size of the field data appears instead. The `Catalogs` element is shown as a 4-by-1 cell array. View the `Catalog` information.

```
v.Catalogs

ans =
 'D:\Work\databasetoolboxfiles\tutorial'
 'D:\Work\databasetoolboxfiles\tutorial_copy'
```

5 Use the `supports` function to see what properties this database supports:

```
a = supports(dbmeta)
a =
                          AlterTableWithAddColumn: 1
                         AlterTableWithDropColumn: 1
                              ANSI92EntryLevelSQL: 1
                                    ANSI92FullSQL: 0
                            ANSI92IntermediateSQL: 0
                       CatalogsInDataManipulation: 1
                       CatalogsInIndexDefinitions: 1
                   CatalogsInPrivilegeDefinitions: 0
                         CatalogsInProcedureCalls: 0
                       CatalogsInTableDefinitions: 1
                                   ColumnAliasing: 1
                                          Convert: 1
                                   CoreSQLGrammar: 0
                             CorrelatedSubqueries: 1
    DataDefinitionAndDataManipulationTransactions: 1
                 DataManipulationTransactionsOnly: 0
                   DifferentTableCorrelationNames: 0
                             ExpressionsInOrderBy: 1
                               ExtendedSQLGrammar: 0
                                   FullOuterJoins: 0
                                          GroupBy: 1
                              GroupByBeyondSelect: 1
                                 GroupByUnrelated: 0
                     IntegrityEnhancementFacility: 0
                                 LikeEscapeClause: 0
                                LimitedOuterJoins: 0
                                MinimumSQLGrammar: 1
                             MixedCaseIdentifiers: 1
                       MixedCaseQuotedIdentifiers: 0
                               MultipleResultSets: 0
                             MultipleTransactions: 1
                               NonNullableColumns: 0
                          OpenCursorsAcrossCommit: 0
                        OpenCursorsAcrossRollback: 0
                       OpenStatementsAcrossCommit: 1
                     OpenStatementsAcrossRollback: 1
                                 OrderByUnrelated: 0
                                       OuterJoins: 1
                                 PositionedDelete: 0
                                 PositionedUpdate: 0
                        SchemasInDataManipulation: 0
```

```
        SchemasInIndexDefinitions: 0
    SchemasInPrivilegeDefinitions: 0
          SchemasInProcedureCalls: 0
        SchemasInTableDefinitions: 0
                  SelectForUpdate: 0
                 StoredProcedures: 1
          SubqueriesInComparisons: 1
               SubqueriesInExists: 1
                  SubqueriesInIns: 1
          SubqueriesInQuantifieds: 1
            TableCorrelationNames: 1
                     Transactions: 1
                            Union: 1
                         UnionAll: 1
```

A `1` for a given property indicates that the database supports that property; a `0` means that the database does not support the property.

Tip For details about properties that the database supports, see the methods of the `DatabaseMetaData` object on the Oracle Java Web site at `http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

---

6 Alternatively, use the `tables` function to retrieve metadata, such as the names and types of the tables in a catalog in the database. Pass the following arguments to this function:

- `dbmeta`, the name of the database metadata object.
- `tutorial`, the name of the catalog from which you want to retrieve table names.

```
t = tables(dbmeta, 'tutorial')
t =
    'MSysAccessObjects'    'SYSTEM TABLE'
    'MSysIMEXColumns'      'SYSTEM TABLE'
    'MSysIMEXSpecs'        'SYSTEM TABLE'
    'MSysObjects'          'SYSTEM TABLE'
    'MSysQueries'          'SYSTEM TABLE'
    'MSysRelationships'    'SYSTEM TABLE'
    'inventoryTable'       'TABLE'
    'productTable'         'TABLE'
    'salesVolume'          'TABLE'
    'suppliers'            'TABLE'
    'yearlySales'          'TABLE'
    'display'              'VIEW'
```

7 Close the database connection.

```
close(conn)
```

Resultset Metadata Objects

Use the `resultset` function to create resultset objects for cursor object. Then, use the `rsmd` function to get metadata information about the resultset objects.

For details, see the `resultset` and `rsmd` function reference pages.

Using Driver Functions

This example uses the following Database Toolbox functions to create driver and drivermanager objects, and to get and set their properties:

- `driver`
- `drivermanager`
- `get`
- `isdriver`
- `set`

Note There is no equivalent MATLAB example available because this example relies on a specific system-to-JDBC connection and database. Your configuration is different from the one in this example, so you cannot run these examples exactly as written. Instead, substitute appropriate values for your own system. See your database administrator for details.

---

1 Connect to the database.

```
c = database('orc1','scott','tiger',...
'oracle.jdbc.driver.OracleDriver',...
'jdbc:oracle:thin:@144.212.123.24:1822:');
```

2 Use the `driver` function to construct a driver object and return its handle, for a specified database URL string of the form `jdbc:`*`subprotocol`*`:`*`subname`*.

```
d = driver('jdbc:oracle:thin:@144.212.123.24:1822:')
DriverHandle: [1x1 oracle.jdbc.driver.OracleDriver]
```

3 Use the `get` function to get information, such as version data, for the driver object.

```
v = get(d)
v =
 MajorVersion: 1
 MinorVersion: 0
```

4 Use `isdriver` to verify that `d` is a valid JDBC driver object.

```
isdriver(d)
ans =
 1
```

This result shows that `d` is a valid JDBC driver object. If it is a not valid JDBC driver object, the returned result is `0`.

5 Use the `drivermanager` function to create a drivermanager object `dm`.

```
dm = drivermanager
```

6 Get properties of the drivermanager object.

```
v = get(dm)
v =
       Drivers: {'sun.jdbc.odbc.JdbcOdbcDriver@761630'...
   [1x38 char]}
  LoginTimeout: 0
     LogStream: []
```

7 Set the `LoginTimeout` value to `10` for all drivers loaded during this session.

```
set(dm,'LoginTimeout',10)
```

Verify the `LoginTimeout` value.

```
v = get(dm)
v =
      Drivers: {'sun.jdbc.odbc.JdbcOdbcDriver@761630'}
 LoginTimeout: 10
    LogStream: []
```

About Database Toolbox Objects and Methods

This toolbox is an object-oriented application. You do not need to be familiar with the product's object-oriented implementation to use it; this information is provided for reference purposes.

Database Toolbox software includes the following objects:

- Cursor
- Database
- Database metadata
- Driver
- Drivermanager
- Resultset
- Resultset metadata

Each object has its own method folder, whose name begins with an `@` sign, in the `*matlabroot*/toolbox/database/database` folder. Functions in the folder for each object provide methods for operating on the object.

Object-oriented characteristics of the toolbox enable you to:

- Use constructor functions to create and return information about objects.

  For example, to create a cursor object containing query results, run the `fetch` function. The object and stored information about the object are returned. Because objects are MATLAB structures, you can view elements of the returned object.

  This example uses the `fetch` function to create a cursor object `curs`.

  ```
  curs = exec(conn, 'select productdescription from producttable');

  curs = fetch(curs)

  curs =
        Attributes: []
              Data: {10x1 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select productdescription from producttable'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
  ```

```
      Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
   Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
       Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

View the contents of the `Data` element in the cursor object.

```
 curs.Data

ans = 

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
    'Tin Soldier'
    'Sail Boat'
    'Slinky'
    'Teddy Bear'
```

- Use overloaded functions.

  Objects allow the use of overloaded functions, which simplify usage because you only need to use one function to operate on objects.For example, use the `get` function to view properties of an object.
- Create custom methods that operate on Database Toolbox objects and store them in the MATLAB workspace.

Selecting Data Using the exec Function

In this section...

"About the exec Function" on page 5-47
"Using Cursor Objects" on page 5-47
"Working with Microsoft Excel" on page 5-48
"Database Considerations" on page 5-48

About the exec Function

Use the `exec` function to execute an SQL statement and return the database cursor object. Here are some general points about using `exec`:

- Use Database Explorer to query databases as an alternative to using `exec`.
- `exec` supports the native ODBC interface.
- Unless noted in this reference page, the `exec` function supports all valid SQL statements, such as nested queries.
- The `sqlquery` argument can be a stored procedure for the database connection of the form `{call sp_name (parm1,parm2,...)}`.
- Use `exec` when the stored procedure returns one or more result sets. For procedures that return output parameters, use `runstoredprocedure`.

Using Cursor Objects

- Check `curs.Message` to find any error messages returned from the database after query execution. If you would like the error messages to be thrown to the MATLAB command prompt, use `setdbprefs` as follows.

  ```
  setdbprefs('Errorhandling','report');
  curs = exec(conn,'select * invalidtablename')
  ```

  To store error messages in `curs.Message` instead of sending them to the MATLAB command prompt, use `setdbprefs` as follows.

  ```
  setdbprefs('Errorhandling','store');
  ```
- After opening a cursor, use `fetch` to import data from the cursor. Use `resultset`, `rsmd`, and access the `Statement` property to get properties of the cursor.
- You can have multiple cursors open at one time.

- A cursor stays open until you close it using the `close` function.

Working with Microsoft Excel

For Microsoft Excel, tables in `sqlquery` are Excel worksheets. By default, some worksheet names include `$`. To select data from a worksheet with this name format, use a SQL statement of the form `select * from "Sheet1$"` (or `'Sheet1$'`) .

Database Considerations

- The order of records in your database is not constant. Use values in column names to identify records. Use the SQL `ORDER BY` command to sort records.
- Before you modify database tables, ensure that the database is not open for editing. If you try to edit the database while it is open, you receive this MATLAB error:

  ```
  [Vendor][ODBC Driver] The database engine could not lock
  table 'TableName' because it is already in use by
  another person or process.
  ```
- You might experience issues with text field formats in the Microsoft SQL Server database management system. Workarounds for these issues are as follows:
  - Convert fields of format `NVARCHAR`, `TEXT`, `NTEXT`, and `VARCHAR` to `CHAR` in the database.
  - Use `sqlquery` to convert data to `VARCHAR`. For example, run a `sqlquery` statement of the form `'select convert(varchar(20),field1) from table1'`.
- The PostgreSQL database management system supports multidimensional fields, but SQL `select` statements fail when retrieving these fields unless you specify an index.
- Some databases require that you include a symbol, such as `#`, before and after a date in a query as follows:

  ```
  curs = exec(conn,'select * from mydb where mydate > #03/05/2005#')
  ```
- Some databases require that you include a symbol, such as `#`, before and after a date in a query as follows:

  ```
  curs = exec(conn,'select * from mydb where mydate > #03/05/2005#')
  ```

See Also

`close` | `database` | `exec` | `resultset` | `rsmd` | `runstoredprocedure`

Run a Stored Procedure That Returns Data

This example shows how to run a stored procedure that returns data using the `exec` function. Use the JDBC interface to connect to a Microsoft SQL Server database, run a stored procedure, and return data. For this example, the stored procedure `getSupplierInfo` is defined in the Microsoft SQL Server database. This stored procedure returns the supplier information for suppliers of a given city. This code defines the procedure.

```
CREATE PROCEDURE dbo.getSupplierInfo
 (@cityName varchar(20))
AS
BEGIN
 -- SET NOCOUNT ON added to prevent extra result sets from
 -- interfering with SELECT statements.
 SET NOCOUNT ON;

    SELECT * from suppliers where city = @cityName
END
GO
```

For Microsoft SQL Server, the statement `'SET NOCOUNT ON'` suppresses the results of INSERT, UPDATE, or any non-SELECT statements that might be before the final SELECT query so you can fetch the results of the SELECT query.

Use `exec` when the stored procedure returns one or more result sets. For procedures that return output parameters, use `runstoredprocedure`.

Create the Database Connection

Using the JDBC interface, connect to the Microsoft SQL Server database called `'test_db'` with the user name `'root'` and password `'matlab'` using port number `1234`. This example assumes your database server is located on the machine `servername`.

```
conn = database('test_db','root','matlab',...
      'Vendor','Microsoft SQL Server',...
      'Server','servername','PortNumber',1234)
```

```
conn =

       Instance: 'test_db'
       UserName: 'root'
```

```
        Driver: []
           URL: []
   Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
       Message: []
        Handle: [1x1 com.microsoft.sqlserver.jdbc.SQLServerConnection]
       TimeOut: 0
    AutoCommit: 'on'
          Type: 'Database Object'
```

`database` returns `conn`, a connection `Database Object` for the `'test_db'` database.

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

Run the Stored Procedure

To return the result set in table format, use `setdbprefs` to set `'DataReturnFormat'` to `'table'`.

```
setdbprefs('DataReturnFormat','table')
```

Run the stored procedure, `getSupplierInfo`, to return supplier information for the city of `New York` using `exec` with `conn`.

```
sqlquery = '{call getSupplierInfo(''New York'')}';
curs = exec(conn,sqlquery)
```

```
curs =

        Attributes: []
              Data: 0
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: '{call getSupplierInfo('New York')}'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 com.microsoft.sqlserver.jdbc.SQLServerResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 com.microsoft.sqlserver.jdbc.SQLServerStatement]
             Fetch: 0
```

`exec` returns a `Database Cursor Object`, `curs`, containing the supplier information.

Retrieve Output Data from the Stored Procedure

Retrieve supplier data from `curs` using `fetch`.

```
curs = fetch(curs)

curs =

        Attributes: []
              Data: [3x5 table]
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: '{call getSupplierInfo('New York')}'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 com.microsoft.sqlserver.jdbc.SQLServerResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 com.microsoft.sqlserver.jdbc.SQLServerStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

`curs` contains the supplier data from running the stored procedure, `getSupplierInfo`, in table format.

Display the supplier data in table format by accessing the contents of the `Data` element of `curs`.

```
curs.Data

ans =

    SupplierNumber       SupplierName          City
    --------------    ------------------    ----------
    1001              'Wonder Products'     'New York'
    1006              'ACME Toy Company'    'New York'
    1012              'Aunt Jemimas'        'New York'


        Country           FaxNumber
    ---------------    --------------
    'United States'    '212 435 1617'
    'United States'    '212 435 1618'
    'USA'              '14678923104'
```

Close the Database Connection

Close the cursor object and the database connection.

```
close(curs)
```

```
close(conn)
```

See Also

database | exec | fetch | runstoredprocedure

Run a Custom Database Function

This example shows how to run a custom database function on Microsoft SQL Server.

Consider a database function `get_prodCount` that retrieves row counts in the table `productTable`. The table `productTable` contains 30 rows where each row represents a product. This code defines this database function and assumes a schema name `dbo`.

```
CREATE FUNCTION dbo.get_prodCount()
RETURNS int
AS
BEGIN
     DECLARE @PROD_COUNT int
     SELECT @PROD_COUNT = count(*) from productTable
     RETURN(@PROD_COUNT)
END
GO
```

Create the Database Connection

Connect to Microsoft SQL Server. For example, this code assumes you are connecting to a data source named `MS SQL Server` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('MS SQL Server','username','pwd');
```

Execute the Custom Function

Construct an SQL query string `sqlquery` that executes the custom function code. Execute the custom function by running `exec`.

```
sqlquery = 'SELECT dbo.get_prodCount() as num_products';
curs = exec(conn,sqlquery);
curs = fetch(curs);
```

Display the result.

```
curs = fetch(curs);
curs.Data
```

```
ans =

    [30.00]
```

The custom function `get_prodCount` returns the product count `30`.

Close the Database Connection

Close the cursor and database connection.

```
close(curs)
close(conn)
```

See Also

close | database | exec | fetch

Importing Data Using the fetch Function

In this section...

"About the fetch Function" on page 5-55
"fetch Workflow" on page 5-55
"Using fetch with a Cursor Object" on page 5-56
"Using fetch with Cursor and Database Connection Objects" on page 5-57
"Database Consideration" on page 5-58

About the fetch Function

Use the `fetch` function to import data into the MATLAB workspace. Here are general points about using `fetch`:

- Use Database Explorer to retrieve data as an alternative to using `fetch`.
- `fetch` supports the native ODBC interface.

fetch Workflow

The `fetch` function runs the appropriate processes to retrieve data depending on what object you provide to it as an input argument. This function works with cursor objects and database connection objects for JDBC/ODBC bridge and JDBC interfaces. This function works with cursor objects only for the native ODBC interface.

For the JDBC database driver, use the `database` function to establish a database connection.

```
conn = database(...)
```

`fetch` then runs when you pass a cursor object, `curs`, to retrieve as an argument.

```
curs = exec(conn,sqlquery)
curs = fetch(curs)
```

The `fetch` function runs when you pass a database object, `conn`, to retrieve as an argument.

```
fetch(conn,sqlquery)
```

Note: You can pass `conn` as an input argument to `fetch` when using an JDBC/ODBC bridge or a JDBC interface. For the native ODBC interface, use `curs` as the input argument.

To create a database connection using the native ODBC interface, use `database.ODBCConnection`.

```
conn = database.ODBCConnection(...)
```

`fetch` then runs when you pass a native ODBC cursor object, `curs`, to retrieve as an argument.

```
curs = exec(conn,sqlquery)
curs = fetch(curs)
```

When `fetch` returns a cursor object, you can run many other functions, such as `get` and `rows`. To import data into the MATLAB workspace without metadata, use `fetch` with a database connection object as the input argument.

Using fetch with a Cursor Object

- `fetch` returns data stored in a MATLAB cell array, table, dataset array, structure, or numeric matrix. You can specify the data output format by using `setdbprefs`.
- When working with a JDBC or JDBC/ODBC bridge connection established using `database`, running `fetch` on the cursor object returns a new object of type cursor that points to the same underlying Java objects as the input cursor. It is therefore best practice to overwrite the input cursor object. This practice results in only one open cursor object, which consumes less memory than multiple open cursor objects.

  ```
  curs = fetch(curs)
  ```
  After this, you simply need to close this one object. Creating a different variable for the output cursor object will unnecessarily create two objects pointing to the same underlying Java statement and result set objects.

  With a native ODBC connection established using `database.ODBCConnection`, running `fetch` on the cursor object updates the input cursor object itself. Depending on whether or not you provide an output argument, the same object gets copied over to the output. Thus, there is always only one cursor object created in memory for any of the following usages:

  ```
  curs = fetch(curs)
  ```

```
fetch(curs)
curs2 = fetch(curs)
```

- The next time `fetch` is run, records are imported starting with the row following the specified number of rows in `rowlimit`. If you specify a row limit of `0`, all the rows of data are fetched.
- Fetching large amounts of data can result in memory or speed issues. Use `rowlimit` to limit how much data you retrieve at once.
- If `'FetchInBatches'` is set to `'yes'` in the preferences using `setdbprefs`, `fetch` incrementally fetches the number of rows specified in the `'FetchBatchSize'` setting until all the rows returned by the query are fetched, or until the limited number of rows are fetched, if `rowlimit` is specified. Use this method when fetching many rows from the database.

Caution: Leaving cursor and connection objects open or overwriting open objects can result in unexpected behavior. Once you finish working with these objects, you must close them using `close`.

Using fetch with Cursor and Database Connection Objects

`fetch` behaves differently when you specify a cursor object or a database connection object as the first argument. This table explains these differences.

Difference	Cursor Object	Database Connection Object
Syntax	For details, see `fetch`.	For details, see `fetch`.
Driver	This syntax works with native ODBC, JDBC, and the JDBC/ODBC bridge.	This syntax works with JDBC and the JDBC/ODBC bridge.
Output	Returns a cursor object with properties.	Returns a MATLAB variable with the output data.
Initialization	You must run `exec` to create the cursor object.	You can run `fetch` immediately.
Row limit	You can limit the number of total rows returned by using the row limit input argument.	`fetch` returns all rows in the MATLAB variable.

Difference	Cursor Object	Database Connection Object
Fetching in batches	You can fetch data in batches by using `setdbprefs`.	This syntax always fetches data in batches despite the value of the database preference property `'FetchInBatches'`. This syntax uses the value of the database preference property `'FetchBatchSize'` as the default number of records to fetch in a single batch.
Batch size	You can change the batch size by using `setdbprefs`.	You can change the batch size immediately by using the batch size input argument.

Database Consideration

The order of records in your database does not remain constant. Sort data using the SQL `ORDER BY` command in your `sqlquery` statement.

See Also

`database` | `exec` | `fetch` | `setdbprefs`

Fetch Data Incrementally Using the Cursor Object

This example shows how to work with large data sets by retrieving data incrementally to avoid Java heap errors.

Create the Database Connection

Create a connection `conn` using the native ODBC interface and the `dbtoolboxdemo` data source.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

Retrieve Data in Batches

Use `fetch` with the `setdbprefs` properties for `FetchInBatches` and `FetchBatchSize` to fetch large data sets. Select data from the `productTable` table.

```
setdbprefs('FetchInBatches','yes')
setdbprefs('FetchBatchSize','2')

curs = exec(conn,'select * from productTable');
curs = fetch(curs);
A = curs.Data
```

```
A =

    [ 9]    [125970]    [1003]    [13]    'Victorian Doll'
    [ 8]    [212569]    [1001]    [ 5]    'Train Set'
    [ 7]    [389123]    [1007]    [16]    'Engine Kit'
    [ 2]    [400314]    [1002]    [ 9]    'Painting Set'
    [ 4]    [400339]    [1008]    [21]    'Space Cruiser'
    [ 1]    [400345]    [1001]    [14]    'Building Blocks'
    [ 5]    [400455]    [1005]    [ 3]    'Tin Soldier'
    [ 6]    [400876]    [1004]    [ 8]    'Sail Boat'
    [ 3]    [400999]    [1009]    [17]    'Slinky'
    [10]    [888652]    [1006]    [24]    'Teddy Bear'
```

`fetch` internally retrieves data in increments of two rows at a time. Tune the `FetchBatchSize` setting depending on the size of the resultset you expect to fetch. For example, if you expect about 100,000 rows in the output, a batch size of 10,000 is a good starting point. The larger the `FetchBatchSize` value, the fewer trips between Java and MATLAB, and the memory consumption is greater for each batch. The optimal value for `FetchBatchSize` is based on factors such as the:

- Size per row being retrieved
- Java heap memory value
- Driver's default fetch size
- System architecture

Hence, the optimal value can vary across sites.

If `'FetchInBatches'` is set to `'yes'` and the total number of rows fetched is less than `'FetchBatchSize'`, MATLAB shows a warning message and then fetches all the rows. The message is: `Batch size specified was larger than the number of rows fetched`.

Retrieve Data Using a Row Limit

You can set a row limit on the final output even when the `FetchInBatches` setting is `'yes'`.

```
setdbprefs('FetchInBatches','yes')
setdbprefs('FetchBatchSize','2')

curs = exec(conn,'select * from productTable');
curs = fetch(curs,3);
A = curs.Data
```

```
A =

    [9]    [125970]    [1003]    [13]    'Victorian Doll'
    [8]    [212569]    [1001]    [ 5]    'Train Set'
    [7]    [389123]    [1007]    [16]    'Engine Kit'
```

In this case, `fetch` retrieves the first three rows of `productTable`, two rows at a time.

Close the Cursor Object

After finishing with the cursor object, close it.

```
close(curs)
```

See Also

`database` | `exec` | `fetch` | `setdbprefs`

More About

- "Importing Data Using the fetch Function" on page 5-55

- “Connecting to a Database Using the Native ODBC Interface”
- “Preference Settings for Large Data Import”

View Information About Data Using the Database Connection Object

This example shows how to import data and view information about the imported data. `fetch` imports data from the specified SQL statement when you pass a database object `conn` as the first argument. Use this example when working with an JDBC/ODBC bridge or a JDBC interface. For the native ODBC interface, use `curs` as the input argument.

Create the Database Connection

Create a connection `conn` using the native ODBC interface and the `dbtoolboxdemo` data source.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

Retrieve Data Using a Database Connection Object

Import the `InvoiceNumber` and `Paid` columns from the `Invoice` table. Set the data return format to `'cellarray'` using `setdbprefs`.

```
setdbprefs('DataReturnFormat','cellarray')
sqlquery = 'select InvoiceNumber, Paid from Invoice';

results = fetch(conn,sqlquery);
```

Display the Data Size

View the size of the cell array into which the results were returned.

```
size(results)

ans =

    12     2
```

View the results for the first row of data.

```
results(1,:)

ans =

    [2101]    [0]
```

Display the Data Type

View the data type of the second element in the first row of data.

```
class(results{1,2})
```

```
ans =

logical
```

Close the Database Connection

```
close(conn)
```

See Also

`class` | `database` | `fetch` | `setdbprefs` | `size`

More About

- “Connecting to a Database Using the Native ODBC Interface”

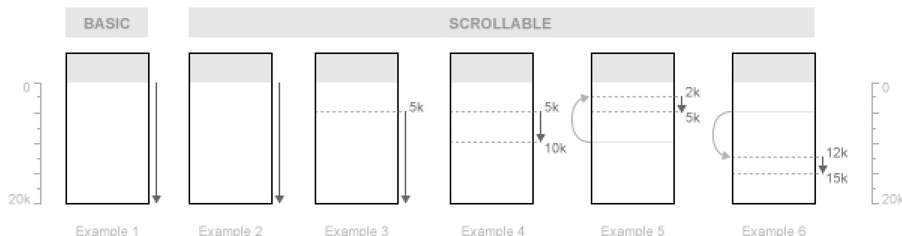
Importing Data Using a Scrollable Cursor

In this section...
"About Scrollable Cursors" on page 5-64
"Differences Between Native ODBC and JDBC Scrollable Cursors" on page 5-65

About Scrollable Cursors

A basic cursor lets you fetch the data in your SQL query sequentially. With a scrollable cursor, you can fetch data sequentially or scroll up or down in the data without rerunning the query. The cursor changes position based on an absolute or relative offset value. Scrolling within the data offers advantages when you are working with a large data set.

This diagram shows the differences between the basic and scrollable cursors. Each example in the diagram shows fetching data in the same table that contains 20,000 records.



As shown in Example 1, the basic cursor lets you fetch data sequentially. As shown by Examples 2 through 6, the scrollable cursor lets you do this and fetch data from an absolute or relative cursor position. Examples 3 and 4 use an absolute position offset and Examples 5 and 6 use a relative position offset.

Scrollable cursors let you fetch data from a specific position. Example 3 fetches all records starting from the absolute cursor position of 5000. Example 4 fetches 5000 records starting from the absolute cursor position of 5000.

Further, scrollable cursors let you fetch data relative to your current cursor position. Assuming your current cursor position is 10,000, Example 5 fetches 3000 records using a relative cursor position offset of -8000. A negative position offset moves the scrollable cursor backwards in the data set. The `fetch` function adds -8000 to the current cursor position of 10,000 to start fetching data from 2000. Assuming your cursor stays at the

position of 5000 after fetching data in Example 5, Example 6 fetches 3000 records using a relative cursor position offset of 7000. A positive position offset moves the scrollable cursor forward in the data set. The `fetch` function adds 7000 to the current cursor position of 5000 to start fetching data from 12,000.

To use a scrollable cursor, first you need to create it by using the `exec` function. This code creates a scrollable cursor `curs` using a database connection `conn` and an SQL query `sqlquery`.

```
curs = exec(conn,sqlquery,'cursorType','scrollable');
```

Then, you can use `fetch` to retrieve data in the cursor with an offset. The offset lets you retrieve data starting from the middle of the data set. You cannot retrieve data with an offset using a basic cursor object. As you continue to fetch, the position of the cursor changes. You can enter `curs.Position` to see the current position of the cursor object `curs`, or you can use `get`.

The database driver for your database determines if scrollable cursor functionality is available. Consult your database documentation to ensure your database driver supports scrollable cursors.

Differences Between Native ODBC and JDBC Scrollable Cursors

Native ODBC and JDBC drivers implement scrollable cursor functionality differently. Further, database drivers implement scrollable cursor functionality differently. Both tables illustrate the differences in scrollable cursor behavior across drivers. The rows depict examples of using a scrollable cursor with native ODBC and JDBC connections. For each row, the full data set has 15 records. Each table row shows the values for the input arguments in a specific call of the `fetch` function. The column descriptions show that:

- The Initial Scrollable Cursor Position column captures the value of the cursor position before calling `fetch`.
- The Row Limit column shows values for the `rowlimit` input argument in `fetch`.
- The Scrollable Cursor Position Type column specifies the name in the name-value pair argument for the cursor position offset.
- The Offset column specifies the value in the name-value pair argument for the cursor position offset.
- The Ending Scrollable Cursor Position column captures the value of the cursor position after calling `fetch`.

- The `fetch` Action column describes the rows of data to retrieve based on the specified input arguments.

For example, this code demonstrates the syntax for calling `fetch` shown in the second row of either table.

```
curs = fetch(curs,2,'absolutePosition',1);
```

Native ODBC

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
Any	Not specified	`'absolutePos`	1	After the result set	Retrieves all rows in the cursor starting from the first row in the data set
Any	2	`'absolutePos`	1	1	Retrieves two rows in the cursor starting from the first row in the data set
Any	2	`'absolutePos`	5	5	Retrieves two rows in the cursor starting from the fifth row in the data set
Any	3	`'absolutePos`	-5	11	Retrieves three rows in the cursor starting from the fifth row

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
					from the end of the data set
Before result set	Not specified	`'relativePos`	1	After the result set	Retrieves all rows in the cursor starting from the first row in the data set
Before result set	Any	`'relativePos`	Any	Varies	Retrieving with a relative position that starts before the result set causes behavior to vary based on the driver
5	2	`'relativePos`	5	10	Retrieves two rows in the cursor starting from the tenth row in the data set
11	3	`'relativePos`	-5	6	Retrieves three rows in the cursor starting from the sixth row in the data set

JDBC

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
Any	Not specified	`'absolutePo`	1	0	Retrieves all rows in the cursor starting from the first row in the data set
Any	2	`'absolutePo`	1	2	Retrieves two rows in the cursor starting from the first row in the data set
Any	2	`'absolutePo`	5	6	Retrieves two rows in the cursor starting from the fifth row in the data set
Any	3	`'absolutePo`	-5	13	Retrieves three rows in the cursor starting with the fifth row from the end of the data set. This assumes there are 15

Initial Scrollable Cursor Position	Row Limit	Scrollable Cursor Position Type	Offset	Ending Scrollable Cursor Position	`fetch` Action
					records in the data set.
0	Not specified	`'relativePo:`	1	0	Retrieves all rows in the cursor starting from the first row in the data set
0	2	`'relativePo:`	1	2	Retrieves the first two rows in the data set
5	2	`'relativePo:`	5	11	Retrieves two rows in the data set starting from five rows from the initial position of five, which is nine
11	3	`'relativePo:`	-5	8	Retrieves three rows in the cursor starting from five rows before the eleventh row in the data set

See Also

`exec` | `fetch` | `get`

Import Data Using a Scrollable Cursor with a Relative Position Offset

This example shows how to use a scrollable cursor to import data using both absolute and relative position offsets. This example assumes you are connecting to a MySQL database that contains a table called `productTable`. This table contains 15 records, where each record represents one product. The scrollable cursor functionality behaves differently depending on your database driver. For details about the scrollable cursor functionality in your database, consult your database documentation.

Connect to the Database

Connect to the MySQL database using the native ODBC interface. This code assumes you are connecting to a data source named `MySQL` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('MySQL','username','pwd');
```

Create a Scrollable Cursor

Select all products from the `productTable` table and sort them in ascending order by product number. Create a scrollable cursor using the name-value pair argument `'cursorType'`.

```
curs = exec(conn,'select * from productTable order by productNumber',...
            'cursorType','scrollable');
```

Retrieve Data Using an Absolute Position Offset

Import the data for two products in the middle of the data set. Use the row limit `2` to import data for two products. Use the absolute position offset `5` to import data starting from the fifth product in the data set.

```
curs = fetch(curs,2,'absolutePosition',5);
```

Display the data for the two products.

```
curs.Data
```

```
ans =

    [5]    [400455]    [1005]    [3]    'Tin Soldier'
    [6]    [400876]    [1004]    [8]    'Sail Boat'
```

The columns in `curs.Data` are:

- Product number
- Stock number
- Supplier number
- Unit cost
- Product description

Display the position of the cursor.

```
curs.Position
```

```
ans =

     5
```

The position of the cursor stays at the absolute position offset 5.

Retrieve Data Using a Relative Position Offset

Import the data for three products in the data set using the relative position offset 5. A scrollable cursor adds the current position offset 5 to the specified relative position offset 5. The scrollable cursor advances to cursor position 10 and imports data.

```
curs = fetch(curs,3,'relativePosition',5);
```

Display the data for the three products.

```
curs.Data
```

```
ans =

    [10]    [888652]    [1006]    [24]    'Teddy Bear'
    [11]    [408143]    [1004]    [11]    'Convertible'
    [12]    [210456]    [1010]    [22]    'Hugsy'
```

Display the position of the cursor.

```
curs.Position
```

```
ans =

    10
```

Close the Cursor Object

After finishing with the cursor object, close it.

```
close(curs)
```

See Also

`close` | `database` | `exec` | `fetch`

More About

- "Importing Data Using a Scrollable Cursor" on page 5-64

Inserting Data Using the fastinsert Function

In this section...
"About the fastinsert Function" on page 5-74
"Database Considerations" on page 5-75

About the fastinsert Function

- When working with a JDBC driver connection or a JDBC/ODBC bridge connection established using the `database` function, `fastinsert` offers improved performance over `insert`. `insert` creates and executes an SQL insert query for each row of data. `fastinsert` creates the insert query only once and then allows for the data values to be plugged in. All rows of data get inserted as a batch resulting in an overall faster performance over `insert`. However, since `fastinsert` relies more on driver functions compared to `insert`, it is possible in some edge case scenarios that the driver functions do not work as expected. In such cases, `insert` might be preferred, especially if the data to be inserted is small. `datainsert` is faster than `fastinsert` but needs data to be formatted in a specific way and accepts cell arrays and numeric matrices as input data.
- When working with a native ODBC connection established using the `database.ODBCConnection` function, `fastinsert` and `insert` are identical. `datainsert` is not supported for native ODBC connections.
- To insert dates and timestamps with the native ODBC interface, use the format `'YYYY-MM-DD HH:MM:SS.MS'`.
- `fastinsert` provides up to millisecond precision for timestamps. For greater precision, use `datainsert`.
- To reduce conversion time, convert dates to serial date numbers using `datenum` before calling `fastinsert`.
- To insert data into a structure, table, or dataset array, use the following special formatting. Each field or variable in a structure, table or dataset array must be a cell array or double vector of size m-by-1, where m is the number of rows to be inserted.
- The status of the `AutoCommit` flag determines whether `fastinsert` automatically commits the data to the database. Use `get` to view the `AutoCommit` flag status for the connection and use `set` to change it. Use `commit` or issue an SQL commit statement using `exec` to commit the data to the database. Use `rollback` or issue an SQL rollback statement using `exec` to roll back the data.

- Use `update` to replace existing data in a database.

Database Considerations

- The order of records in your database is not constant. Use values in column names to identify records.
- If an error message like the following appears when you run `fastinsert`, the table might be open in edit mode.

  ```
  [Vendor][ODBC Product Driver] The database engine could
  not lock table 'TableName' because it is already in use
  by another person or process.
  ```

  In this case, close the table in the database and rerun the `fastinsert` function.

Retrieving Object Properties Using the get Function

In this section...

"Database Connection Objects" on page 5-76
"Cursor Objects" on page 5-77
"Driver Objects" on page 5-78
"Database Metadata Objects" on page 5-78
"Drivermanager Objects" on page 5-79
"Resultset Objects" on page 5-79
"Resultset Metadata Objects" on page 5-79

Database Connection Objects

Allowable property names and returned values for database connection objects appear in the following table.

Property	Value
`'AutoCommit'`	Status of the `AutoCommit` flag. It is either `on` or `off`, as specified by `set`.
`'Catalog'`	Name of the catalog in the data source. You might need to extract a single catalog name from `'Catalog'` for functions such as `columns`, which accept only a single catalog.
`'Driver'`	Driver used for a JDBC connection, as specified by `database`.
`'Handle'`	Identifies a JDBC connection object.
`'Instance'`	Name of the data source for an ODBC connection or the name of a database for a JDBC connection, as specified by `database`.
`'Message'`	Error message returned by `database`.
`'ReadOnly'`	`1` if the database is read only; `0` if the database is writable.
`'TimeOut'`	Value for `LoginTimeout`.
`'TransactionIsolation'`	Value of the current transaction isolation mode.

Property	Value
'Type'	Object type, specifically `Database Object`.
'URL'	For JDBC connections only, the JDBC URL object `jdbc:`*`subprotocol`*`:`*`subname`*, as specified by `database`.
'UserName'	User name required to connect to a given database, as specified by `database`.
'Warnings'	Warnings returned by `database`.

You cannot use the `get` function to retrieve the password property.

Cursor Objects

Allowable property names and returned values for cursor objects appear in the following table.

Property	Value
'Attributes'	Cursor attributes. This field is always empty. Use the `attr` function to retrieve cursor attributes.
'Data'	Data in the cursor object data element (the query results).
'DatabaseObject'	Information about a given database object.
'RowLimit'	Maximum number of rows returned by `fetch`, as specified by `set`.
'SQLQuery'	SQL statement for a cursor, as specified by `exec`.
'Message'	Error message returned from `exec` or `fetch`.
'Type'	Object type, specifically `Database Cursor Object`.
'ResultSet'	Resultset object identifier.
'Cursor'	Cursor object identifier.
'Statement'	Statement object identifier. **Note:** If you specify a value (in seconds) for the `timeout` argument, queries time out after the time exceeds the given value.

Property	Value
'Fetch'	0 for the cursor created using exec; fetchTheData for the cursor created using fetch.
'Scrollable'	Contains a logical value to identify the cursor object as scrollable or basic. This property is set to 1 for a scrollable cursor and 0 otherwise. This property is hidden and read-only.
'Position'	Contains a number that specifies the current position of the cursor in the data set. This property is only available for a scrollable cursor. This property behaves differently for native ODBC, JDBC, and different database drivers. This property is read-only.

Driver Objects

Allowable property names and examples of values for driver objects appear in the following table.

Property	Example of Value
'MajorVersion'	1
'MinorVersion'	1001

Database Metadata Objects

Database metadata objects have many properties. Some allowable property names and examples of their values appear in the following table.

Property	Example of Value
'Catalogs'	{4x1 cell}
'DatabaseProductName'	'ACCESS'
'DatabaseProductVersion'	'03.50.0000'
'DriverName'	'JDBC-ODBC Bridge (odbcjt32.dll)'
'MaxColumnNameLength'	64
'MaxColumnsInOrderBy'	10

Property	Example of Value
'URL'	'jdbc:odbc:dbtoolboxdemo'
'NullsAreSortedLow'	1

Drivermanager Objects

Allowable property names and examples of values for drivermanager objects appear in the following table.

Property	Example of Value
'Drivers'	{'oracle.jdbc.driver.OracleDriver@1d8e09ef' [1x37 char]}
'LoginTimeout'	0
'LogStream'	[]

Resultset Objects

Allowable property names and examples of values for resultset objects appear in the following table.

Property	Example of Value
'CursorName'	{'SQL_CUR92535700x' 'SQL_CUR92535700x'}
'MetaData'	{1x2 cell}
'Warnings'	{[] []}

Resultset Metadata Objects

Allowable property names and examples of values for a resultset metadata objects appear in the following table.

Property	Example of Value
'CatalogName'	{'' ''}
'ColumnCount'	2
'ColumnName'	{'Calc_Date' 'Avg_Cost'}

Property	Example of Value
'ColumnTypeName'	{'TEXT' 'LONG'}
'isNullable'	{[1] [1]}
'isReadOnly'	{[0] [0]}
'TableName'	{'' ''}

The empty strings for `CatalogName` and `TableName` indicate that databases do not return these values.

Setting Database Preferences Using the setdbprefs Function

In this section...
“About the setdbprefs Function” on page 5-81
“Allowable Properties” on page 5-81

About the setdbprefs Function

- From the Database Explorer Toolstrip, select **Preferences** to open the Database Toolbox Preferences dialog box.
- Preferences are retained across MATLAB sessions.
- Regardless of the value of `'NullNumberWrite'`, a `NULL` value is always written to the database when you input `[]` or `NaN` for a numeric data type.
- For string inputs, a `NULL` value is written to the database only when the input value matches the value of `'NullStringWrite'`.

Allowable Properties

DataReturnFormat and ErrorHandling Properties and Values for setdbprefs

Property	Allowable Values	Description
`'DataReturnFormat'`	`'cellarray'` (default), `'table'`, `'dataset'`, `'numeric'`, or `'structure'`	Format for data to import into the MATLAB workspace. Set the format based on the type of data being retrieved, memory considerations, and your preferred method of working with retrieved data.
	`'cellarray'` (default)	Import nonnumeric data into MATLAB cell arrays.
	`'table'`	Import data into MATLAB `table` objects. Use for all data types. Facilitates working with returned columns.
	`'dataset'`	Import data into MATLAB `dataset` objects. Use for all data types. Facilitates working with returned columns. This option requires Statistics Toolbox.

Property	Allowable Values	Description
	'numeric'	Import data into MATLAB matrix of doubles. Nonnumeric data types are considered NULL and appear as specified in the NullNumberRead property. Use only when data to retrieve is in numeric format, or when nonnumeric data to retrieve is not relevant.
	'structure'	Import data into a MATLAB structure. Use for all data types. Facilitates working with returned columns.
'ErrorHandling'	'store' (default), 'report', or 'empty'	Specify how to handle errors when importing data. Set this parameter before you run exec.
	'store' (default)	Errors from running database are stored in the Message field of the returned connection object. Errors from running exec are stored in the Message field of the returned cursor object.
	'report'	Errors from running database or exec appear immediately in the MATLAB Command Window.
	'empty'	Errors from running database are stored in the Message field of the returned connection object. Errors from running exec are stored in the Message field of the returned cursor object. Objects that cannot be created are returned as empty handles ([ ]).

Null Data Handling Properties and Values for setdbprefs

Property	Allowable Values	Description
'NullNumberRead'	Input value, for example, '0'	Specify how NULL numbers appear after being imported from a database into the MATLAB workspace. NaN is the default value. String values such as 'NULL' cannot be set if 'DataReturnFormat' is set to 'numeric'. Set this parameter before running fetch.
'NullNumberWrite'	Input value, for example, 'NaN' (default)	Numbers in the specified format, for example, NaN appears as NULL after being exported from the MATLAB workspace to a database.

Property	Allowable Values	Description
'NullStringRead'	Input value, for example, 'null' (default)	Specify how NULL strings appear after being imported from a database into the MATLAB workspace. Set this parameter before running fetch.
'NullStringWrite'	Input value, for example, 'null' (default)	Strings in the specified format, for example, 'NULL', appear as NULL after being exported from the MATLAB workspace to a database.

Additional Properties and Values for setdbprefs

Property	Allowable Values	Description
'JDBCDataSourceFile'	Input value, for example, 'D:/file.mat'	Path to MAT-file containing JDBC data sources.
'UseRegistryForSources'	'yes' (default) or 'no'	When set to yes, VQB searches the Microsoft Windows registry for ODBC data sources that are not uncovered in the system ODBC.INI file. This message might appear: Registry editing has been disabled by your administrator. You can ignore this harmless message.
'TempDirForRegistryOutput'	Input value, for example, 'D:/work'	Folder where VQB writes ODBC registry settings when you run getdatasources. Use when you add data sources and do not have write access to the MATLAB Current Folder. The default is the Windows temporary folder, which is returned by the command getenv('temp')). If you specify a folder to which you do not have write access or which does not exist, this error appears: Cannot export <folder-name>\ODBC.INI: Error opening the file. There may be a disk or file system error.

Property	Allowable Values	Description
'DefaultRowPreFetch'	Input numeric value, default value is '10000'	Number of rows fetched from the Database server at a time for any query. The higher the number, the fewer the number of trips to the server. **Caution** This property is applicable only for databases that allow setting this number, such as Oracle.
'FetchInBatches'	'yes' or 'no' (default)	Automates fetching in batches for large data sets where you might run into Java heap memory errors in MATLAB. When the value is 'yes', fetch and runsqlscript import the data in batches in size of 'FetchBatchSize'. For an example, see fetch.
'FetchBatchSize'	Input numeric value, default value is '1000'. Supported values are 1000 through 1000000.	Automates fetching in batches for large data sets when used with 'FetchInBatches'. When the value of 'FetchInBatches' is 'yes', fetch and runsqlscript import the data in batches in size of 'FetchBatchSize'. For an example, see fetch. For details about estimating a 'FetchBatchSize' value, see “Preference Settings for Large Data Import”.

Working with a DatabaseDatastore

In this section...
"About DatabaseDatastore Objects" on page 5-85
"Advantages of DatabaseDatastore Objects Over Basic Fetching" on page 5-85

About DatabaseDatastore Objects

A `DatabaseDatastore` object is a type of datastore in MATLAB. `DatabaseDatastore` objects let you import data into MATLAB from relational databases.

You can connect to your database using native ODBC or JDBC interfaces and create a `DatabaseDatastore` object. This object creates a data set from the SQL query you specify in `datastore`. Using a `DatabaseDatastore` object, you can perform these tasks:

- Preview data.
- Read data in chunks.
- Read every record in the data set.
- Reset the cursor position to the start of the data set.
- Continue reading data until the cursor position reaches the end of the data set.
- Analyze a large data set stored in a database using MapReduce.

Tip: Running MapReduce using a `DatabaseDatastore` object with Parallel Computing Toolbox™ installed does not support using a parallel pool. For details about controlling parallel resources, see "Run mapreduce on a Local Cluster".

Advantages of DatabaseDatastore Objects Over Basic Fetching

Reading data from `DatabaseDatastore` objects is the same as executing `exec` and `fetch` on the data set. Here are the advantages of using `DatabaseDatastore` objects:

- Work with databases containing large amounts of data.
- Write custom functions to implement MapReduce to analyze large amounts of data using `mapreduce`. For an example, see "Analyze Large Data Sets in a Database with

MapReduce” on page 5-91. For more MapReduce examples, see “Building Effective Algorithms with MapReduce”.

See Also

`close` | `datastore` | `hasdata` | `mapreduce` | `preview` | `read` | `readall` | `reset`

Related Examples

- “Import Data Using a DatabaseDatastore” on page 5-87
- “Analyze Large Data Sets in a Database with MapReduce” on page 5-91
- “Building Effective Algorithms with MapReduce”

More About

- “What Is a Datastore?”

Import Data Using a DatabaseDatastore

This example shows how to import data into MATLAB using a `DatabaseDatastore`. You can use a `DatabaseDatastore` to access collections of data stored in a relational database. After creating a `DatabaseDatastore` object, you can preview data, read data in chunks, and read every record in the data set.

After importing data from a `DatabaseDatastore` object, you can run calculations on the data using MapReduce. For an example, see “Analyze Large Data Sets in a Database with MapReduce” on page 5-91. For more MapReduce examples, see “Building Effective Algorithms with MapReduce”.

Create the DatabaseDatastore

The default output data type of any datastore is a table. Set the database preference for the data return format `'DataReturnFormat'` to `table` for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection `conn` using the native ODBC interface. This code assumes you are connecting to a MySQL database with the data source named `MySQL`, user name `username`, and password `pwd`. `MySQL` contains the table named `productTable` with 15 product records.

```
 conn = database.ODBCConnection('MySQL','username','pwd');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable` ordered by product number.

```
sqlquery = 'select * from productTable order by productNumber';
```

```
dbds = datastore(conn,sqlquery);
```

Preview Data in the DatabaseDatastore

Preview the first eight records in the data set returned by executing `sqlquery`.

```
preview(dbds)
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
```

```
    _____________    ___________    ______________    ________    __________________

    1.00             400345.00      1001.00           14.00       'Building Blocks'
    2.00             400314.00      1002.00            9.00       'Painting Set'
    3.00             400999.00      1009.00           17.00       'Slinky'
    4.00             400339.00      1008.00           21.00       'Space Cruiser'
    5.00             400455.00      1005.00            3.00       'Tin Soldier'
    6.00             400876.00      1004.00            8.00       'Sail Boat'
    7.00             389123.00      1007.00           16.00       'Engine Kit'
    8.00             212569.00      1001.00            5.00       'Train Set'
```

Read Data in the DatabaseDatastore

Read the first five records.

```
read(dbds,5)
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1.00             400345.00      1001.00           14.00       'Building Blocks'
    2.00             400314.00      1002.00            9.00       'Painting Set'
    3.00             400999.00      1009.00           17.00       'Slinky'
    4.00             400339.00      1008.00           21.00       'Space Cruiser'
    5.00             400455.00      1005.00            3.00       'Tin Soldier'
```

Read the remaining data in the `DatabaseDatastore` object `dbds` five records at a time.

```
while(hasdata(dbds))
    read(dbds,5)
end
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'


ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    11.00            408143.00      1004.00           11.00       'Convertible'
    12.00            210456.00      1010.00           22.00       'Hugsy'
    13.00            470816.00      1012.00           16.50       'Pancakes'
    14.00            510099.00      1011.00           19.00       'Shawl'
    15.00            899752.00      1011.00           20.00       'Snacks'


ans =
```

```
    'No Data'
```

`read` returns the cell array containing the string `'No Data'` when you connect to the database using the native ODBC interface.

Reset the Cursor Position in the DatabaseDatastore

Reset the cursor position to the start of the data set.

```
reset(dbds)
```

Read Every Record in the DatabaseDatastore

Read every record in the `DatabaseDatastore` object `dbds`.

```
readall(dbds)
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     1.00            400345.00      1001.00           14.00       'Building Blocks'
     2.00            400314.00      1002.00            9.00       'Painting Set'
     3.00            400999.00      1009.00           17.00       'Slinky'
     4.00            400339.00      1008.00           21.00       'Space Cruiser'
     5.00            400455.00      1005.00            3.00       'Tin Soldier'
     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'
    11.00            408143.00      1004.00           11.00       'Convertible'
    12.00            210456.00      1010.00           22.00       'Hugsy'
    13.00            470816.00      1012.00           16.50       'Pancakes'
    14.00            510099.00      1011.00           19.00       'Shawl'
    15.00            899752.00      1011.00           20.00       'Snacks'
```

Close the DatabaseDatastore

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

See Also

`close` | `database` | `datastore` | `hasdata` | `preview` | `read` | `readall` | `reset`

Related Examples

- "Analyze Large Data Sets in a Database with MapReduce" on page 5-91

- “Building Effective Algorithms with MapReduce”

More About

- “Working with a DatabaseDatastore” on page 5-85

Analyze Large Data Sets in a Database with MapReduce

This example shows how to analyze large data sets that are stored in a database. You can access large data sets using a `DatabaseDatastore` object with Database Toolbox. After creating a `DatabaseDatastore`, you can run algorithms on large data sets by integrating with MapReduce.

This example uses MapReduce to calculate the mean arrival delay of a large flight data set that is stored in a database. This example modifies the "Compute Mean Value with MapReduce" example to use a `DatabaseDatastore` instead of a `TabularTextDatastore`. You can similarly modify other MATLAB examples that analyze data using MapReduce as described in "Building Effective Algorithms with MapReduce".

Create the DatabaseDatastore

The default output data type of any datastore is a table. Set the database preference for the data return format `'DataReturnFormat'` to `table` for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

The file `airlinesmall.csv` contains the large flight data set. Load this file into a MySQL database table named `flightdelay`. This table contains 123,523 records.

Create a database connection `conn` using the JDBC driver. Use the `Vendor` name-value pair argument of `database` to specify a connection to a MySQL database. This code assumes you are connecting to a database named `dbname` on a database server named `sname` with user name `username` and password `pwd`. `dbname` contains the table `flightdelay`.

```
conn = database('dbname','username','pwd',...
                'Vendor','MySQL',...
                'Server','sname');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves flight arrival delay data `ArrDelay` from the table `flightdelay`.

```
sqlquery = 'select ArrDelay from flightdelay';

dbds = datastore(conn,sqlquery);
```

Define the Mapper and Reducer Functions

You can write your own mapper function to process large data sets in chunks. This example uses the mapper function `meanArrivalDelayMapper.m`. This mapper function reads in arrival delay data from the `DatabaseDatastore` object, calculates the number of delays and the total arrival delay in the chunk, and stores both values in `KeyValueStore`. Display the code for this function using the command `type`.

```
type meanArrivalDelayMapper.m
```

```
function meanArrivalDelayMapper (data, info, intermKVStore)
% Mapper function for the MeanMapReduceExample.

% Copyright 2014 The MathWorks, Inc.

% Data is an n-by-1 table of the ArrDelay. Remove missing value first:
data(isnan(data.ArrDelay),:) = [];

% Record the partial counts and sums and the reducer will accumulate them.
partCountSum = [length(data.ArrDelay), sum(data.ArrDelay)];
add(intermKVStore, 'PartialCountSumDelay',partCountSum);
```

Add this code at the beginning of the mapper function if you are using the native ODBC interface to connect to the database.

```
if iscell(data)
     return
end
```

This code skips the final output of the `read` function. The final output is a cell array containing the string `'No Data'`.

You can write your own reducer function to process large data sets in chunks. This example uses the reducer function `meanArrivalDelayReducer.m`. This reducer function reads in intermediate values for the number of delays and the total arrival delay. Then, this function calculates the overall mean arrival delay. `mapreduce` calls this reducer function once since the mapper function only adds one key to `KeyValueStore`. Display the code for this function by using the command `type`.

```
type meanArrivalDelayReducer.m
```

```
function meanArrivalDelayReducer(intermKey, intermValIter, outKVStore)
% Reducer function for the MeanMapReduceExample.

% Copyright 2014 The MathWorks, Inc.
```

```
% intermKey is 'PartialCountSumDelay'
count = 0;
sum = 0;
while hasnext(intermValIter)
   countSum = getnext(intermValIter);
   count = count + countSum(1);
   sum = sum + countSum(2);
end

meanDelay = sum/count;

% The key-value pair added to outKVStore will become the output of mapreduce
add(outKVStore,'MeanArrivalDelay',meanDelay);
```

Run MapReduce Using the Mapper and Reducer Functions

Run MapReduce with the `DatabaseDatastore` object `dbds`, mapper function `meanArrivalDelayMapper`, and reducer function `meanArrivalDelayReducer` to calculate the mean arrival delay in the flight data.

```
outds = mapreduce(dbds,@meanArrivalDelayMapper,@meanArrivalDelayReducer);
```

Display the Output from MapReduce

Read the table `outtab` from the output datastore `outds` using `readall`.

```
outtab = readall(outds)
```

```
outtab = 

      Key                  Value 
    ______                ________

    'MeanArrivalDelay'     [7.12]
```

The table has only one row containing one key-value pair.

Display the mean arrival delay `meanArrDelay` from the table `outtab`.

```
meanArrDelay = outtab.Value{1}
```

```
meanArrDelay =

         7.12
```

Close the DatabaseDatastore

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

See Also

`close` | `database` | `datastore` | `mapreduce` | `readall` | `setdbprefs`

Related Examples

- "Import Data Using a DatabaseDatastore" on page 5-87
- "Building Effective Algorithms with MapReduce"

More About

- "Working with a DatabaseDatastore" on page 5-85
- "Getting Started with MapReduce"

Functions — Alphabetical List

attr

Retrieve attributes of columns in fetched data set

Syntax

```
attributes = attr(curs)
attributes = attr(curs,colnum)
```

Description

`attributes = attr(curs)` retrieves attribute information for all columns in the fetched data set `curs`.

`attributes = attr(curs,colnum)` retrieves attribute information for the column number `colnum` in the fetched data set `curs`.

Examples

Retrieve Attribute Data for a Fetched Data Set

Using an ODBC connection to an Oracle database, retrieve all attribute data for a fetched data set.

Create an Oracle connection. For example, the following code assumes you are connecting a data source named `dbname` with user name `username` and password `pwd`.

```
conn = database(dbname,username,pwd);
```

Fetch all the data from the table `inventoryTable` into a fetched data set `curs`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
```

Retrieve attribute information for all the fetched data `curs`.

```
attributes = attr(curs)

attributes =
```

```
1x3 struct array with fields:

    fieldName
    typeName
    typeValue
    columnWidth
    precision
    scale
    currency
    readOnly
    nullable
    Message
```

`attributes` contains a structure array for three columns in the table `inventoryTable`.

Display the attribute data for the first column in the table `inventoryTable`.

```
attributes(1)
```

```
ans =

      fieldName: 'PRODUCTNUMBER'
       typeName: 'DECIMAL'
      typeValue: 3.00
    columnWidth: 40.00
      precision: 38.00
          scale: []
       currency: 'false'
       readOnly: 'false'
       nullable: 'true'
        Message: []
```

Close the cursor and connection.

```
close(curs)
close(conn)
```

Retrieve Attribute Data for a Specific Column

Using an ODBC connection to an Oracle database, retrieve the attribute data for a specific column in the fetched data set.

Create an Oracle connection. For example, the following code assumes you are connecting a data source named `dbname` with user name `username` and password `pwd`.

```
conn = database(dbname,username,pwd);
```

Fetch all the data from the table `inventoryTable` into a fetched data set `curs`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
```

Retrieve attribute information for the third column in the table `inventoryTable` in the fetched data `curs`.

```
attributes = attr(curs,3)
```

```
attributes =

b =

      fieldName: 'PRICE'
       typeName: 'NUMBER'
      typeValue: 6.00
    columnWidth: 40.00
      precision: 38.00
          scale: []
       currency: 'false'
       readOnly: 'false'
       nullable: 'true'
        Message: []
```

`attributes` contains a structure with the attribute data for the third column `PRICE` in the table `inventoryTable`.

Close the cursor and connection.

```
close(curs)
close(conn)
```

Input Arguments

`curs` — Database cursor

database cursor object

Database cursor, specified as an open SQL database cursor object created using `exec`.

`colnum` — Column number

scalar

Column number, specified as a scalar to denote the column in the fetched data set `curs` for retrieving attribute information.

Data Types: `double`

Output Arguments

`attributes` — Attribute data

structure array

Attribute data, returned as a structure array containing attribute information for each column in the fetch data set `curs`. The following attributes are available.

Attribute	Description
`fieldName`	Name of the column.
`typeName`	Data type.
`typeValue`	Numerical representation of the data type.
`columnWidth`	Size of the field.
`precision`	Precision value for floating and double data types; an empty value is returned for strings.
`scale`	Precision value for real and numeric data types; an empty value is returned for strings.
`currency`	If this equals `true`, the data format is currency.
`readOnly`	If this equals `true`, the data cannot be overwritten.
`nullable`	If this equals `true`, the data can be `NULL`.
`Message`	Error message returned by `fetch`.

See Also

`cols` | `columnnames` | `columns` | `dmd` | `fetch` | `get` | `tables` | `width`

bestrowid

Unique identifier for row in database table

Syntax

```
b = bestrowid(dbmeta,'cata','sch')
b = bestrowid(dbmeta,'cata','sch','tab')
```

Description

`b = bestrowid(dbmeta,'cata','sch')` returns the optimal set of columns in a table that uniquely identifies a row in the schema `sch`, in the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`b = bestrowid(dbmeta,'cata','sch','tab')` returns the optimal set of columns that uniquely identifies a row in table `tab`, in the schema `sch`, in the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Run `bestrowid`, passing it the following arguments:

- `dbmeta`, the database metadata object
- `msdb`, the catalog
- `geck`, the schema
- `builds`, the table

```
b = bestrowid(dbmeta, 'msdb', 'geck', 'builds')
b =
     'build_id'
```

The result indicates that each entry in the `build_id` column is unique and identifies the row.

See Also

`columns` | `dmd` | `get` | `tables`

clearwarnings

Clear warnings for database connection or resultset

Syntax

```
clearwarnings(conn)
clearwarnings(rset)
```

Description

`clearwarnings(conn)` clears warnings reported for the database connection object `conn`.

`clearwarnings(rset)` clears warnings reported for the `resultset` object `rset`.

Tip For command-line help on `clearwarnings`, use the overloaded methods:

```
help database/clearwarnings
help resultset/clearwarnings
```

See Also

`database` | `get` | `resultset`

close

Close database connection, DatabaseDatastore, cursor, or resultset object

Syntax

```
close(object)
```

Description

close(object) closes the database and driver resource utilizer object to free up database and driver resources.

Examples

Close the Database Connection Object

Using the native ODBC interface, connect to the database with the ODBC data source name dbtoolboxdemo with the user name admin and password admin.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

Close the database connection conn.

```
close(conn)
```

Close the DatabaseDatastore Object

Using the native ODBC interface, connect to the database with the ODBC data source name dbtoolboxdemo with the user name admin and password admin.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

Create a DatabaseDatastore object dbds using the database connection conn and SQL query sqlquery. This SQL query retrieves all products from the product table productTable ordered by product number.

```
sqlquery = 'select * from productTable order by productNumber';
```

```
dbds = datastore(conn,sqlquery);
```

Close the `DatabaseDatastore` object `dbds`.

```
close(dbds)
```

Close the Cursor Object

Using the native ODBC interface, connect to the database with the ODBC data source name `dbtoolboxdemo` with the user name `admin` and password `admin`.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

Select data from `productTable` that you access using the `database.ODBCConnection` object `conn`. Assign the returned cursor object to the variable `curs`.

```
sqlquery = 'select * from productTable';
curs = exec(conn,sqlquery);
```

Close the cursor object `curs` before closing the database connection.

```
close(curs)
```

Close the database connection `conn`.

```
close(conn)
```

Close the Resultset Object

Connect to the database with the ODBC data source name `dbtoolboxdemo` with the user name `admin` and password `admin`.

```
conn = database('dbtoolboxdemo','admin','admin');
```

Select data from `productTable` that you access using the database connection object `conn`. Assign the returned cursor object to the variable `curs`.

```
sqlquery = 'select * from productTable';
curs = exec(conn,sqlquery);
```

Construct a resultset object `rset`.

```
rset = resultset(curs);
```

Close the resultset object `rset`.

```
close(rset)
```

Close the cursor object `curs` before closing the database connection.

```
close(curs)
```

Close the database connection `conn`.

```
close(conn)
```

Input Arguments

`object` — Database and driver resource utilizer
database connection object | `DatabaseDatastore` object | cursor object | resultset object

Database and driver resource utilizer, specified as a database connection object created using `database`, a `DatabaseDatastore` object created using `datastore`, a cursor object created using `exec`, or a resultset object created using `resultset`. This table describes the allowable objects for `close`.

Object	Description
`conn`	Database connection object or native ODBC database connection object
`dbds`	`DatabaseDatastore` object
`curs`	Cursor object or native ODBC cursor object
`rset`	Resultset object

Database connections, `DatabaseDatastore` objects, cursors, and resultset objects remain open until you close them using the `close` function. Always close a cursor, `DatabaseDatastore`, connection, or resultset object when you finish using it. Close a cursor before closing the connection used for that cursor. Executing `close` with a `DatabaseDatastore` object releases the MATLAB resources associated with database connection and cursor objects.

Note: The MATLAB session closes open cursors, `DatabaseDatastore` objects, and connections when exiting, however, the database might not free up the cursors and connections.

See Also

database | datastore | exec | fetch | resultset

cols

Retrieve number of columns in fetched data set

Syntax

```
numcols = cols(curs)
```

Description

`numcols = cols(curs)` returns the number of columns in the fetched data set `curs`.

Examples

Display the Number of Columns in a Data Set

Create a database connection `conn` using the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo','','');
```

Working with the `dbtoolboxdemo` data source, use `fetch` to import all data into `Database Cursor Object` `curs`. Store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select * from productTable');
curs = fetch(curs);
```

View the contents of the `Data` element in the cursor object.

```
curs.Data
```

```
ans = 

    [ 9]    [125970]    [1003]    [13]    'Victorian Doll'
    [ 8]    [212569]    [1001]    [ 5]    'Train Set'
    [ 7]    [389123]    [1007]    [16]    'Engine Kit'
    [ 2]    [400314]    [1002]    [ 9]    'Painting Set'
    [ 4]    [400339]    [1008]    [21]    'Space Cruiser'
    [ 1]    [400345]    [1001]    [14]    'Building Blocks'
    [ 5]    [400455]    [1005]    [ 3]    'Tin Soldier'
```

```
    [ 6]    [400876]    [1004]    [ 8]    'Sail Boat'
    [ 3]    [400999]    [1009]    [17]    'Slinky'
    [10]    [888652]    [1006]    [24]    'Teddy Bear'
```

`Data` contains the `productTable` data.

Display the number of columns in the `Data` element in the cursor object.

```
numcols = cols(curs)
```

```
numcols =

     5
```

The data in the cursor object contains five columns.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Input Arguments

`curs` — Database cursor
database cursor object

Database cursor, specified as an open SQL database cursor object created using `exec`.

Output Arguments

`numcols` — Number of columns
scalar

Number of columns in a data set, returned as a scalar.

More About

- "Connecting to a Database Using the Native ODBC Interface"

See Also

`attr` | `columnnames` | `columnprivileges` | `columns` | `fetch` | `get` | `rows` | `width`

columnnames

Retrieve names of columns in fetched data set

Syntax

```
columnlist = columnnames(curs)
columnlist = columnnames(curs,returnCellArray)
```

Description

`columnlist = columnnames(curs)` returns the column names of the data selected from a database table in the cursor object `curs`. The `columnnames` function is not supported for a cursor object returned by the `fetchmulti` function.

`columnlist = columnnames(curs,returnCellArray)` returns the column names as a cell array of strings when `returnCellArray` is set to `true`.

Examples

Return Column Names from the Selected Data

Create a database connection `conn` using the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo','','');
```

Working with the `dbtoolboxdemo` data source, use `fetch` to import all data into `Database Cursor Object` `curs`.

```
curs = exec(conn,'select * from suppliers');
curs = fetch(curs);
```

Return the column names in the `suppliers` table.

```
columnlist = columnnames(curs)

columnlist =
```

```
'SupplierNumber','SupplierName','City','Country','FaxNumber'
```

`columnlist` contains one long string with the column names in the `suppliers` table in quotes and separated by commas.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Return Column Names as a Cell Array

Create a database connection `conn` using the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo','','');
```

Working with the `dbtoolboxdemo` data source, use `fetch` to import all data into `Database Cursor Object` `curs`. Store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select * from productTable');
curs = fetch(curs);
```

Return the column names in the `suppliers` table as a cell array.

```
columnlist = columnnames(curs,true)
```

```
columnlist =

    'SupplierNumber'
    'SupplierName'
    'City'
    'Country'
    'FaxNumber'
```

`columnlist` contains a cell array of the column names in the `suppliers` table. The cell array has five rows for each column name.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Input Arguments

`curs` — Database cursor
database cursor object

Database cursor, specified as an open SQL database cursor object created using `exec`.

`returnCellArray` — Return format
`true` | `false`

Return format, specified as Boolean values `true` or `false`. When set to `true`, `columnnames` returns the column names as a cell array. When set to `false`, `columnnames` returns the column names as a long string.

Data Types: `logical`

Output Arguments

`columnlist` — Column name list
string | cell array

Column name list of columns in the selected data, returned as a string or a cell array. Without the argument returnCellArray, `columnnames` returns the list of column names as a long string. The string encloses the column names in quotes and separates the column names by commas. If you use the argument returnCellArray and set it to `true`, then `columnnames` returns the column names as a cell array.

See Also

`attr` | `cols` | `columnprivileges` | `columns` | `fetch` | `get` | `width`

columnprivileges

List database column privileges

Syntax

```
lp = columnprivileges(dbmeta,'cata','sch','tab')
lp = columnprivileges(dbmeta,'cata','sch','tab','l')
```

Description

`lp = columnprivileges(dbmeta,'cata','sch','tab')` returns a list of privileges for all columns in the table `tab`, in the schema `sch`, in the catalog `cata` for the database whose database metadata object is `dbmeta`.

`lp = columnprivileges(dbmeta,'cata','sch','tab','l')` returns a list of privileges for column `l` in the table `tab`, in the schema `sch`, in the catalog `cata` for the database whose database metadata object is `dbmeta`.

Examples

Return a list of privileges for the given database, catalog, schema, table, and column name:

```
lp = columnprivileges(dbmeta,'msdb','geck','builds',...
'build_id')
lp =
     'builds'    'build_id'    {1x4 cell}
```

View the contents of the third column in `lp`:

```
lp{1,3}
ans =
     'INSERT'    'REFERENCES'    'SELECT'    'UPDATE'
```

See Also

`cols` | `columns` | `dmd` | `get` | `columnnames`

columns

Return database table column names

Syntax

```
columnlist = columns(conn,catalog)
columnlist = columns(conn,catalog,schema)
columnlist = columns(conn,catalog,schema,tablename)

columnlist = columns(dbmeta,catalog)
columnlist = columns(dbmeta,catalog,schema)
columnlist = columns(dbmeta,catalog,schema,tablename)
```

Description

`columnlist = columns(conn,catalog)` returns a list of all column names in the catalog `catalog` for the database with the database connection `conn`.

`columnlist = columns(conn,catalog,schema)` returns a list of all column names in the schema `schema`.

`columnlist = columns(conn,catalog,schema,tablename)` returns a list of all column names for the table `tablename`.

`columnlist = columns(dbmeta,catalog)` returns a list of all column names in the catalog `catalog` for the database whose database metadata object is `dbmeta`.

`columnlist = columns(dbmeta,catalog,schema)` returns a list of all column names in the schema `schema`.

`columnlist = columns(dbmeta,catalog,schema,tablename)` returns a list of all column names for the table `tablename`.

Examples

Retrieve the Column List for a Catalog Using the Database Connection

Create a database connection `conn`. For example, the following code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'portnumber',123456);
```

Retrieve the column names for each table in a catalog using the catalog name `toy_store`.

```
columnlist = columns(conn,'toy_store')

columnlist = 

    'salesVolume'                                    {1x13   cell}
    'suppliers'                                      {1x5    cell}
    'yearlySales'                                    {1x3    cell}
    ...
```

`columns` returns a cell array where the first column contains the table names as strings and the second column contains the corresponding column name lists as cell arrays.

Display the column names for the suppliers table.

```
 columnlist{1,2}

columnlist =

    'SupplierNumber'    'SupplierName'    'City'    'Country'    'FaxNumber'
```

Close the database connection.

```
close(conn)
```

Retrieve the Column List for a Catalog and Schema Using the Database Connection

Create a database connection `conn`. For example, the following code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'portnumber',123456);
```

Retrieve the column names for each table in a schema using the catalog name `toy_store` and the schema name `schema`.

```
columnlist = columns(conn,'toy_store','schema')
```

```
columnlist =

    'inventoryTable'                {1x3  cell}
    'invoice'                       {1x5  cell}
    'productTable'                  {1x5  cell}
    ...
```

`columns` returns a cell array where the first column contains the table names as strings and the second column contains the corresponding column name lists as cell arrays.

Display the column names for the `inventoryTable` table.

```
 columnlist{1,2}
```

```
columnlist =

    'productNumber'    'Quantity'    'Price'
```

Close the database connection.

```
close(conn)
```

Retrieve the Column List for a Catalog, Schema, and Table Name Using the Database Connection

Create a database connection `conn`. For example, the following code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'portnumber',123456);
```

Retrieve the column names in a database table using the catalog name `toy_store`, the schema name `schema`, and the table name `inventoryTable`.

```
columnlist = columns(conn,'toy_store','schema','inventoryTable')
```

```
columnlist = 

    'productNumber'    'Quantity'    'Price'
```

`columns` returns a cell array with the column names as strings.

Close the database connection.

```
close(conn)
```

Retrieve the Column List for a Catalog Using the Database Metadata Object

Create a database connection `conn`. For example, the following code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'portnumber',123456);
```

Create the database metadata object `dbmeta`.

```
dbmeta = dmd(conn);
```

Retrieve the column names for each table in a catalog using the catalog name `toy_store`.

```
columnlist = columns(dbmeta,'toy_store')
```

```
columnlist = 

    'salesVolume'                                 {1x13   cell}
    'suppliers'                                   {1x5    cell}
    'yearlySales'                                 {1x3    cell}
    ...
```

`columns` returns a cell array where the first column contains the table names as strings and the second column contains the corresponding column name lists as cell arrays.

Display the column names for the `suppliers` table.

```
 columnlist{1,2}
```

```
columnlist =

    'SupplierNumber'    'SupplierName'    'City'    'Country'    'FaxNumber'
```

Close the database connection.

```
close(conn)
```

Retrieve the Column List for a Catalog and Schema Using the Database Metadata Object

Create a database connection `conn`. For example, the following code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'portnumber',123456);
```

Create the database metadata object `dbmeta`.

```
dbmeta = dmd(conn);
```

Retrieve the column names for each table in a schema using the catalog name `toy_store` and the schema name `schema`.

```
columnlist = columns(dbmeta,'toy_store','schema')

columnlist =

    'inventoryTable'              {1x3  cell}
    'invoice'                     {1x5  cell}
    'productTable'                {1x5  cell}
    ...
```

`columns` returns a cell array where the first column contains the table names as strings and the second column contains the corresponding column name lists as cell arrays.

Display the column names for the `inventoryTable` table.

```
 columnlist{1,2}

columnlist =

    'productNumber'    'Quantity'    'Price'
```

Close the database connection.

```
close(conn)
```

Retrieve the Column List for a Catalog, Schema, and Table Name Using the Database Metadata Object

Create a database connection `conn`. For example, the following code uses database name `dbname`, user name `username`, password `pwd`, database server name `sname`, and port number `123456` to connect to a Microsoft SQL Server database.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'portnumber',123456);
```

Create the database metadata object `dbmeta`.

```
dbmeta = dmd(conn);
```

Retrieve the column names in a database table using the catalog name `toy_store`, the schema name `schema`, and the table name `inventoryTable`.

```
columnlist = columns(dbmeta,'toy_store','schema','inventoryTable')
```

```
columnlist =

    'productNumber'    'Quantity'    'Price'
```

`columns` returns a cell array with the column names as strings.

Close the database connection.

```
close(conn)
```

Input Arguments

`conn` — Database connection
connection object

Database connection, specified as a database connection object created using `database`.

`dbmeta` — Database metadata
object

Database metadata, specified as a database metadata object created using `dmd`.

`catalog` — Database catalog name
string

Database catalog name, specified as a string.

Data Types: `char`

`schema` — Database schema name
string

Database schema name, specified as a string.

Data Types: `char`

`tablename` — Database table name
string

Database table name, specified as a string denoting the name of a table in your database.

Data Types: `char`

Output Arguments

`columnlist` — List of columns
cell array

List of columns, returned as a cell array.

See Also
`attr` | `bestrowid` | `cols` | `columnnames` | `columnprivileges` | `dmd` | `get` | `versioncolumns`

commit

Make database changes permanent

Syntax

```
commit(conn)
```

Description

`commit(conn)` makes permanent changes made to the database connection `conn` since the last `commit` or `rollback` function was run. To run this function, the `AutoCommit` flag for `conn` must be `off`.

Examples

Example 1 — Check the Status of the Autocommit Flag

Check that the status of the `AutoCommit` flag for connection `conn` is `off`.

```
get(conn,'AutoCommit')
ans =
 off
```

Example 2 — Commit Data to a Database

1. Insert `exdata` into the columns `DEPTNO`, `DNAME`, and `LOC` in the table `DEPT`, for the data source `conn`.

   ```
   fastinsert(conn, 'DEPT', {'DEPTNO';'DNAME';'LOC'},...
   exdata)
   ```

2. Commit this data.

   ```
   commit(conn)
   ```

See Also

`database` | `get` | `exec` | `fastinsert` | `rollback` | `update`

confds

Configure JDBC data source for Visual Query Builder

Alternatives

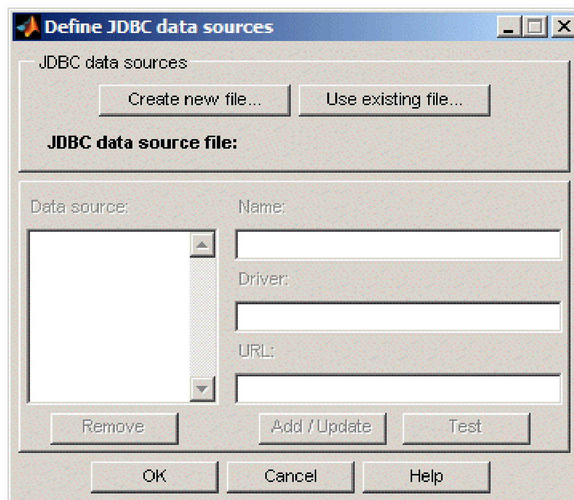
Select **Define JDBC data sources** from the Visual Query Builder **Query** menu.

Syntax

```
confds
```

Description

`confds` displays the VQB Define JDBC data sources dialog box. Use `confds` only to build and run queries using Visual Query Builder with JDBC drivers.



For information about how to use the Define JDBC data sources dialog box to configure JDBC drivers, see "Configuring a Driver and Data Source" on page 2-13.

Tip Use the `database` function to define JDBC data sources programmatically.

See Also

`database` | `querybuilder`

crossreference

Retrieve information about primary and foreign keys

Syntax

```
f = crossreference(dbmeta, 'pcata', 'psch', 'ptab', 'fcata', 'fsch',
'ftab')
```

Description

`f = crossreference(dbmeta, 'pcata', 'psch', 'ptab', 'fcata', 'fsch', 'ftab')` returns information about the relationship between foreign keys and primary keys for the database whose database metadata object is `dbmeta`. The primary key information is for the table `ptab` in the primary schema `psch`. The primary catalog is `pcata`. The foreign key information is for the foreign table `ftab` in the foreign schema `fsch`. The foreign catalog is `fcata`.

Examples

Run `crossreference` to get primary and foreign key information. The database metadata object is `dbmeta`, the primary and foreign catalog is `orcl`, the primary and foreign schema is `SCOTT`, the table that contains the referenced primary key is `DEPT`, and the table that contains the foreign key is `EMP`.

```
f = crossreference(dbmeta,'orcl','SCOTT','DEPT',...
 'orcl','SCOTT','EMP')
f = Columns 1 through 7
    'orcl'   'SCOTT'   'DEPT'   'DEPTNO'    'orcl'...
    'SCOTT'    'EMP'
Columns 8 through 13
    'DEPTNO'    '1'    'null'    '1'    'FK_DEPTNO'...
    'PK_DEPT'
```

The results show the following primary and foreign key information.

Column	Description	Value
1	Catalog that contains primary key, referenced by foreign imported key	`orcl`
2	Schema that contains primary key, referenced by foreign imported key	`SCOTT`
3	Table that contains primary key, referenced by foreign imported key	`DEPT`
4	Column name of primary key, referenced by foreign imported key	`DEPTNO`
5	Catalog that has foreign key	`orcl`
6	Schema that has foreign key	`SCOTT`
7	Table that has foreign key	`EMP`
8	Foreign key column name that references the primary key in another table	`DEPTNO`
9	Sequence number within foreign key	`1`
10	Update rule, that is, what happens to the foreign key when the primary key updates	`null`
11	Delete rule, that is, what happens to the foreign key when the primary key is deleted	`1`
12	Foreign imported key name	`FK_DEPTNO`
13	Primary key name in referenced table	`PK_DEPT`

There is only one foreign key in the schema `SCOTT`. The table `DEPT` contains a primary key `DEPTNO` that is referenced by the field `DEPTNO` in the table `EMP`. The field `DEPTNO` in the `EMP` table is a foreign key.

Tip For a description of the codes for update and delete rules, see the `getCrossReference` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

`dmd` | `exportedkeys` | `get` | `importedkeys` | `primarykeys`

cursor.fetch

Import data into MATLAB Workspace from cursor object created by `exec`

Alternatives

Retrieve data using Database Explorer (`dexplore`).

Syntax

```
curs = fetch(curs,rowLimit)
curs = fetch(curs)
```

Description

`curs = fetch(curs,rowLimit)` imports rows of data into the object `curs` from the open SQL cursor `curs`, up to the maximum `rowLimit`.

`curs = fetch(curs)` imports rows of data from the open SQL cursor `curs` into the object `curs`, up to `rowLimit`. Use the `set` function to specify `rowLimit`.

Data is stored in a MATLAB cell array, table, dataset array, structure, or numeric matrix. It is a best practice to assign the object returned by `fetch` to the variable `curs` from the open SQL cursor. This practice results in only one open cursor object, which consumes less memory than multiple open cursor objects.

The next time `fetch` is run, records are imported starting with the row following the specified `rowLimit`. If you specify a `rowLimit` of `0`, all the rows in the resultset are fetched.

If `'FetchInBatches'` is set to `'yes'` in the preferences using `setdbprefs`, `cursor.fetch` incrementally fetches the number of rows specified in the `'FetchBatchSize'` setting until all the rows returned by the query are fetched, or until `rowLimit` number of rows are fetched, if `rowLimit` is specified. Use this method when fetching a large number of rows from the database.

Fetching large amounts of data can result in memory or speed issues. In this case, use `rowLimit` to limit how much data you retrieve at once.

Caution: Leaving cursor and connection objects open or overwriting open objects can result in unexpected behavior. Once you are finished working with these objects, you must close them using `close`.

Examples

Import All Rows of Data Using the Native ODBC Interface

Create a connection `conn` using the native ODBC interface and the `dbtoolboxdemo` data source.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin')
```

```
conn = 

  ODBCConnection with properties:

      Instance: 'dbtoolboxdemo'
      UserName: 'admin'
       Message: []
        Handle: [1x1 database.internal.ODBCConnectHandle]
       TimeOut: 0
    AutoCommit: 0
          Type: 'ODBCConnection Object'
```

`conn` has an empty `Message` property, which means a successful connection.

Use `fetch` to import all data into the `database.ODBCCursor` object, `curs`, and store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select productDescription from productTable');
curs = fetch(curs)
```

```
curs = 

  ODBCCursor with properties:

         Data: {10x1 cell}
     RowLimit: 0
     SQLQuery: 'select productDescription from productTable'
      Message: []
         Type: 'ODBCCursor Object'
```

```
    Statement: [1x1 database.internal.ODBCStatementHandle]
```

With the native ODBC interface, `curs` returns an `ODBCCursor Object` instead of a `Database Cursor Object`.

View the contents of the `Data` element in the cursor object.

```
curs.Data

ans =

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
    'Tin Soldier'
    'Sail Boat'
    'Slinky'
    'Teddy Bear'
```

Close the cursor object.

```
close(curs)
```

Import All Rows of Data

Working with the `dbtoolboxdemo` data source, use `exec` to select data in column `City`, for example, in table `suppliers`. Then, use `fetch` to import all data from the SQL statement into the cursor object `curs`, and store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select City from suppliers');
curs = fetch(curs)

curs =

        Attributes: []
              Data: {10x1 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select City from suppliers'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

View the contents of the `Data` element in the cursor object.

```
curs.Data
```

```
ans =

    'New York'
    'London'
    'Adelaide'
    'Dublin'
    'Boston'
    'New York'
    'Wellesley'
    'Nashua'
    'London'
    'Belfast'
```

Close the cursor object.

```
close(curs)
```

Import a Specified Number of Rows

Working with the `dbtoolboxdemo` data source, use the `rowLimit` argument to retrieve only the first three rows of data.

```
curs = exec(conn,'select productdescription from producttable');
curs = fetch(curs,3)
```

```
curs =

        Attributes: []
              Data: {3x1 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select productdescription from producttable'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

View the data.

```
curs.Data
```

```
ans =

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
```

Rerun the `fetch` function to return the second three rows of data.

```
curs = fetch(curs,3);
```

View the data.

```
curs.Data
```

```
ans =

    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
```

Close the cursor object.

```
close(curs)
```

Import Rows Iteratively Until You Retrieve All Data

Working with the `dbtoolboxdemo` data source, use the `rowLimit` argument to retrieve the first two rows of data, and then rerun the import using a `while` loop, retrieving two rows at a time. Continue until you have retrieved all data, which occurs when `curs.Data` is `'No Data'`.

```
curs = exec(conn,'select productdescription from producttable');
% Initialize rowLimit
rowLimit = 2
% Check for more data. Retrieve and display all data.
while ~strcmp(curs.Data,'No Data')
 curs = fetch(curs,rowLimit);
 curs.Data(:)
end
```

```
rowLimit =

     2
```

```
ans =

    'Victorian Doll'
    'Train Set'


ans =

    'Engine Kit'
    'Painting Set'


ans =

    'Space Cruiser'
    'Building Blocks'


ans =

    'Tin Soldier'
    'Sail Boat'


ans =

    'Slinky'
    'Teddy Bear'

ans =
    'No Data'
```

Close the cursor object.

```
close(curs)
```

Import Numeric Data

Working with the `dbtoolboxdemo` data source, import a column of numeric data, using the `setdbprefs` function to specify `numeric` as the format for the retrieved data.

```
curs = exec(conn,'select unitCost from productTable');
setdbprefs('DataReturnFormat','numeric')
curs = fetch(curs,3);
curs.Data
```

```
ans =

    13
     5
    16
```

Close the cursor object.

```
close(curs)
```

Import Boolean Data

Import data that includes a BOOLEAN field, using the setdbprefs function to specify cellarray as the format for the retrieved data.

```
curs = exec(conn,['select InvoiceNumber, '...
'Paid from Invoice']);
setdbprefs('DataReturnFormat','cellarray')
curs = fetch(curs,5);
A = curs.Data
```

```
A =

    [ 2101]    [0]
    [ 3546]    [1]
    [33116]    [1]
    [34155]    [0]
    [34267]    [1]
```

View the class of the second column of A.

```
class(A{1,2})
```

```
ans =
logical
```

Close the cursor object.

```
close(curs)
```

Perform Incremental Fetch

Working with the dbtoolboxdemo data source, retrieve data incrementally to avoid Java heap errors. Use cursor.fetch with the setdbprefs properties for FetchInBatches and FetchBatchSize to fetch large data sets.

```
setdbprefs('FetchInBatches','yes')
setdbprefs('FetchBatchSize','2')
conn = database('dbtoolboxdemo','','');
curs = exec(conn,'select * from productTable');
curs = fetch(curs);
A = curs.Data

A =

    [ 9]    [125970]    [1003]    [13]    'Victorian Doll'
    [ 8]    [212569]    [1001]    [ 5]    'Train Set'
    [ 7]    [389123]    [1007]    [16]    'Engine Kit'
    [ 2]    [400314]    [1002]    [ 9]    'Painting Set'
    [ 4]    [400339]    [1008]    [21]    'Space Cruiser'
    [ 1]    [400345]    [1001]    [14]    'Building Blocks'
    [ 5]    [400455]    [1005]    [ 3]    'Tin Soldier'
    [ 6]    [400876]    [1004]    [ 8]    'Sail Boat'
    [ 3]    [400999]    [1009]    [17]    'Slinky'
    [10]    [888652]    [1006]    [24]    'Teddy Bear'
```

`cursor.fetch` internally retrieves data in increments of two rows at a time. Tune the `FetchBatchSize` setting depending on the size of the result set you expect to fetch. For example, if you expect about a 100,000 rows in the output, a batch size of 10,000 is a good starting point. The larger the `FetchBatchSize` value, the fewer trips between Java and MATLAB, and the memory consumption is greater for each batch. The optimal value for `FetchBatchSize` is decided based on several factors like the size per row being retrieved, the Java heap memory value, the driver's default fetch size, and system architecture, and hence, can vary from site to site.

If `'FetchInBatches'` is set to `'yes'` and the total number of rows fetched is less than `'FetchBatchSize'`, MATLAB shows a warning message and then fetches all the rows. The message is `Batch size specified was larger than the number of rows fetched.`

You can exercise a row limit on the final output even when the `FetchInBatches` setting is `'yes'`.

```
setdbprefs('FetchInBatches','yes')
setdbprefs('FetchBatchSize','2')
curs = exec(conn,'select * from productTable');
curs = fetch(curs,3);
A = curs.Data

A =
```

```
    [9]    [125970]    [1003]    [13]    'Victorian Doll'
    [8]    [212569]    [1001]    [ 5]    'Train Set'
    [7]    [389123]    [1007]    [16]    'Engine Kit'
```

In this case, `cursor.fetch` retrieves the first three rows of `productTable`, two rows at a time.

Close the cursor object.

```
close(curs)
```

- “Getting Started with Visual Query Builder” on page 4-2
- “Preference Settings for Large Data Import”

More About

Tips

- This page documents `fetch` for a cursor object. For details about using `fetch`, `cursor.fetch`, and `database.fetch`, see `fetch`. Unless otherwise noted, `fetch` in this documentation refers to `cursor.fetch`, rather than `database.fetch`.
- `cursor.fetch` now supports the native ODBC interface.

- “Retrieving BINARY and OTHER Data Types”
- “Connecting to a Database Using the Native ODBC Interface”

See Also

`attr` | `cols` | `columnnames` | `database` | `database.fetch` | `exec` | `fetch` | `fetchmulti` | `get` | `logical` | `rows` | `resultset` | `set` | `width`

database

Connect to database

Syntax

```
conn = database(instance,username,password)
conn = database.ODBCConnection(instance,username,password)

conn = database(instance,username,password,driver,databaseurl)

conn = database(instance,username,password,Name,Value)
```

Description

`conn = database(instance,username,password)` returns a database connection object for the connection to the ODBC data source setup `instance` using an ODBC driver.

`conn = database.ODBCConnection(instance,username,password)` returns a database connection object for the connection to the ODBC data source setup `instance` using a native ODBC interface.

`conn = database(instance,username,password,driver,databaseurl)` connects to the database `instance` using a JDBC driver.

`conn = database(instance,username,password,Name,Value)` connects to the database `instance` using a JDBC driver with connection properties specified by one or more Name,Value pair arguments.

Examples

Connect Using the Native ODBC Interface

Connect to the `dbtoolboxdemo` database using the native ODBC interface.

Connect to the database with the ODBC data source name `dbtoolboxdemo` using the user name `username` and password `pwd`.

```
conn = database.ODBCConnection('dbtoolboxdemo','username','pwd')
```

```
conn =

  ODBCConnection with properties:

       Instance: 'dbtoolboxdemo'
       UserName: 'username'
        Message: []
         Handle: [1x1 database.internal.ODBCConnectHandle]
        TimeOut: 0
     AutoCommit: 0
           Type: 'ODBCConnection Object'
```

`database.ODBCConnection` returns `conn` as `database.ODBCConnection` object. `conn` has an empty `Message` property, which indicates a successful connection.

Close the database connection `conn`.

```
close(conn)
```

ODBC Connection

Connect to the `dbtoolboxdemo` database using the JDBC/ODBC bridge.

Connect to the database with the ODBC data source name `dbtoolboxdemo` using the user name `username` and password `pwd`.

```
conn = database('dbtoolboxdemo','username','pwd')
```

```
conn =

       Instance: 'dbtoolboxdemo'
       UserName: 'username'
         Driver: []
            URL: []
    Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
        Message: []
         Handle: [1x1 sun.jdbc.odbc.JdbcOdbcConnection]
        TimeOut: 0
     AutoCommit: 'on'
```

```
         Type: 'Database Object'
```

`database` returns `conn` as a `Database Object`. `conn` has an empty `Message` property, which indicates a successful connection.

Close the database connection `conn`.

```
close(conn)
```

Microsoft SQL Server Windows Authenticated Database Connection

Connect to a Microsoft SQL Server database with integrated Windows Authentication using a JDBC driver.

Use the AuthType parameter to establish a Windows Authentication connection. For details about how to set up Windows Authentication and find your port number, see "Microsoft SQL Server JDBC for Windows" on page 2-33.

```
conn = database('test_db','','',...
   'Vendor','Microsoft SQL Server','Server','servername',...
   'AuthType','Windows','portnumber',123456)

conn =

       Instance: 'test_db'
       UserName: ''
         Driver: []
            URL: []
    Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
        Message: []
         Handle: [1x1 com.microsoft.sqlserver.jdbc.SQLServerConnection]
        TimeOut: 0
     AutoCommit: 'on'
           Type: 'Database Object'
```

`conn` has an empty `Message` property, which indicates a successful connection.

Close the database connection `conn`.

```
close(conn)
```

Sybase JDBC Connection Using a URL

Connect to a Sybase database using the JDBC driver.

Connect to the database `dbname` using the user name `username` and password `pwd`. Use the JDBC driver `com.sybase.jdbc4.jdbc.SybDriver` to make the connection. Use the URL defined by the driver vendor including your server name, port number, and database name. For details, see "Sybase JDBC for Windows" on page 2-99.

```
conn = database('dbname','username','pwd',...
                'com.sybase.jdbc4.jdbc.SybDriver','URL')

conn =

       Instance: 'dbname'
       UserName: 'username'
         Driver: 'com.sybase.jdbc4.jdbc.SybDriver'
            URL: 'URL'
    Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
        Message: []
         Handle: [1x1 com.sybase.jdbc4.jdbc.SybConnection]
        TimeOut: 0
     AutoCommit: 'on'
           Type: 'Database Object'
```

`conn` has an empty `Message` property, which indicates a successful connection.

Close the database connection `conn`.

```
close(conn)
```

Oracle JDBC Connection Using Name-Value Connection Properties

Connect to an Oracle database using the JDBC driver. Specify the vendor and connection options using name-value pair arguments.

Connect to the database `test_db` using the user name `username` and password `pwd`. Enter the driver type as `thin` for a default connection to Oracle. To connect to Oracle with Windows authentication use `oci`. The database server machine name is `remotehost` and the port number that the server is listening on is `1234`. For details, see "Oracle JDBC for Windows" on page 2-49.

```
conn = database('test_db','username','pwd','Vendor','Oracle',...
          'DriverType','thin','Server','remotehost','PortNumber',1234)

conn =
```

```
       Instance: 'test_db'
       UserName: 'username'
         Driver: []
            URL: []
    Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
        Message: []
         Handle: [1x1 oracle.jdbc.driver.T4CConnection]
        TimeOut: 0
     AutoCommit: 'on'
           Type: 'Database Object'
```

conn has an empty Message property, which indicates a successful connection.

Close the database connection conn.

```
close(conn)
```

MySQL JDBC Connection on the Default Port

Connect to a MySQL database via a JDBC driver. Specify the vendor and connection options using name-value pair arguments.

Connect to the database test_db on the machine remotehost. Use the user name username and password pwd. For details, see “MySQL JDBC for Windows” on page 2-65.

```
conn = database('test_db','username','pwd','Vendor','MySQL',...
          'Server','remotehost')

conn =

       Instance: 'test_db'
       UserName: 'username'
         Driver: []
            URL: []
    Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
        Message: []
         Handle: [1x1 com.mysql.jdbc.JDBC4Connection]
        TimeOut: 0
     AutoCommit: 'on'
           Type: 'Database Object'
```

conn has an empty Message property, which indicates a successful connection.

Close the database connection conn.

```
close(conn)
```

Microsoft Access Connection Using a File DSN

Connect to a Microsoft Access database with `.accdb` format using an OBDC driver.

Specify the location of the database on the disk.

```
dbpath = ['C:\Data\Matlab\MyDatabase.accdb'];
```

Create the connection URL.

```
url = [['jdbc:odbc:Driver={Microsoft Access Driver (*.mdb, *.accdb)};DSN='';DBQ='] dbpath];
```

Connect to the database `MyDatabase.accdb` using `dpath` and `url`.

```
conn = database('','','','sun.jdbc.odbc.JdbcOdbcDriver',url);
```

Fetch data from the database.

```
curs = exec(conn,'SELECT ALL January FROM salesVolume');
curs = fetch(curs);
data = curs.Data;
```

Close the database connection `conn`.

```
close(conn)
```

PostgreSQL JDBC Connection to localhost on the Default Port

Connect to a local PostgreSQL database using the JDBC driver.

Connect to the database `test_db` using the user name `username` and password `pwd` on the machine `remotehost`. For details, see "PostgreSQL JDBC for Windows" on page 2-78.

```
conn = database('test_db','username','pwd','Vendor','PostgreSQL',...
                'Server','remotehost')

conn =

       Instance: 'test_db'
       UserName: 'username'
         Driver: []
            URL: []
    Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
        Message: []
```

```
        Handle: [1x1 org.postgresql.jdbc4.Jdbc4Connection]
       TimeOut: 0
    AutoCommit: 'on'
          Type: 'Database Object'
```

`conn` has an empty `Message` property, which indicates a successful connection.

Close the database connection `conn`.

```
close(conn)
```

Input Arguments

`instance` — Data source setup or database name
string

Data source setup or database name, specified as a string. Specify a data source for ODBC connection, and the database name for JDBC connection. For an ODBC driver, `instance` is the name you provide for your data source when you create a data source using the Microsoft ODBC Administrator. For a JDBC driver, `instance` is the name of your database. The name might differ for different database systems. For example, `instance` might be the SID or the service name when you are connecting to an Oracle database or `instance` might be the catalog name when you are connecting to a MySQL database. For details about your database name, contact your database administrator or refer to your database documentation.

`username` — User name
string

User name required to access the database, specified as a string. If no user name is required, specify empty strings, `''`.

`password` — Password
string

Password required to access the database, specified as a string. If no password is required, specify empty strings, `''`.

`driver` — JDBC driver name
string

JDBC driver name, specified as a string. This is the name of the Java driver that implements the java.sql.Driver interface. For details, see JDBC driver name and database connection URL.

`databaseurl` — Database connection URL
string

Database connection URL, specified as a string. This is a vendor-specific URL that is typically constructed using connection properties like server name, port number, database name, and so on. For details, see JDBC driver name and database connection URL. If you do not know the driver name or the URL, you can use name-value pair arguments to specify individual connection properties.

Name-Value Pair Arguments

Specify optional comma-separated pairs of Name,Value arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'Vendor','MySQL','Server','remotehost'` connects to a MySQL database on a machine named `remotehost`.

`'Vendor'` — Database vendor
`'MySQL'` | `'Oracle'` | `'Microsoft SQL Server'` | `'PostgreSQL'`

Database vendor, specified as the comma-separated pair consisting of `'Vendor'` and one of the following strings:

- `'MySQL'`
- `'Oracle'`
- `'Microsoft SQL Server'`
- `'PostgreSQL'`

If connecting to a database system not listed here, use the driver and databaseurl syntax.

Example: `'Vendor','Oracle'`

`'Server'` — Database server
`'localhost'` (default) | string

Database server name or address, specified as the comma-separated pair consisting of `'Server'` and a string value.

Example: `'Server','remotehost'`

`'PortNumber'` — Server port
scalar

Server port number that the server is listening on, specified as the comma-separated pair consisting of `'PortNumber'` and a scalar value.

Example: `'PortNumber',1234`

Data Types: `double`

`'AuthType'` — Authentication
`'Server'` (default) | `'Windows'`

Authentication type (valid only for Microsoft SQL Server), specified as the comma-separated pair consisting of `'AuthType'` and one of the following strings:

- `'Server'`
- `'Windows'`

Specify `'Windows'` for Windows Authentication.

Example: `'AuthType','Windows'`

`'DriverType'` — Driver type
`'thin'` | `'oci'`

Driver type (required only for Oracle), specified as the comma-separated pair consisting of `'DriverType'` and one of the following strings:

- `'thin'`
- `'oci'`

Specify `'oci'` for Windows Authentication.

Example: `'DriverType','thin'`

`'URL'` — Connection URL
string

Connection URL, specified as the comma-separated pair consisting of `'URL'` and a string value. If you specify `URL`, you might not need to specify any other properties.

Output Arguments

`conn` — Database connection

database connection object

Database connection, returned as a database connection object. The database connection object has the following properties.

Property	Description
`Instance`	Data source name when using ODBC or database name when using JDBC
`UserName`	User name used for database login
`Driver`	JDBC or JDBC/ODBC driver object used for database connection
`URL`	Driver vendor specific string for database connection
`Constructor`	Internal Java or C++ representation of database connection object
`Message`	Database connection status message that is empty when a successful connection is established
`Handle`	Internal Java or C++ representation of database connection object
`TimeOut`	Number of seconds that the driver waits while trying to establish a database connection before throwing an error
`AutoCommit`	Set to `on` if you want updates to be applied to the database automatically and set to `off` when you want updates to be explicitly committed to the database
`Type`	Database connection object or `database.ODBCConnection` object

The native ODBC database connection object, `database.ODBCConnection`, excludes `Driver`, `URL`, and `Constructor` properties. For `database.ODBCConnection`, the `Type` property is equal to `database.ODBCConnection` object. The `Handle` property for a `database.ODBCConnection` object is `database.internal.ODBCConnectHandle`,

and for JDBC/ODBC bridge connection, it is `sun.jdbc.odbc.JdbcOdbcConnection`. For ODBC, the `Instance` property contains the data source name, and, for JDBC, the `Instance` property contains the database name.

More About

JDBC Driver Name and Database Connection URL

The JDBC driver name and database connection URL take different forms for different databases, as shown in the following table.

Database	JDBC Driver Name and Database URL Example Syntax
IBM Informix	**JDBC driver:** `com.informix.jdbc.IfxDriver` **Database URL:** `jdbc:informix-sqli://161.144.202.206:3000: INFORMIXSERVER=stars`
Microsoft SQL Server 2005	**JDBC driver:** `com.microsoft.sqlserver.jdbc.SQLServerDriver` **Database URL:** `jdbc:sqlserver:// localhost:port;database=databasename`
MySQL	**JDBC driver:** `twz1.jdbc.mysql.jdbcMysqlDriver` **Database URL:** `jdbc:z1MySQL://natasha:3306/metrics` **JDBC driver:** `com.mysql.jdbc.Driver` **Database URL:** `jdbc:mysql://devmetrics.mrkps.com/testing` To insert or select characters with encodings that are not default, append the string `useUnicode=true&characterEncoding=...` to the URL, where `...` is any valid MySQL character encoding. For example, `useUnicode=true&characterEncoding=utf8`.
Oracle oci7 drivers	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:oci7:@rex`
Oracle oci8 drivers	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:oci8:@111.222.333.44:1521:`

Database	JDBC Driver Name and Database URL Example Syntax
	Database URL: `jdbc:oracle:oci8:@frug`
Oracle 10 Connections with JDBC (Thin drivers)	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:thin:`
Oracle Thin drivers	**JDBC driver:** `oracle.jdbc.driver.OracleDriver` **Database URL:** `jdbc:oracle:thin:@144.212.123.24:1822:` **Database URL:** `jdbc:oracle:thin:@(DESCRIPTION = (ADDRESS = (PROTOCOL = TCP)(HOST = ServerName)(PORT = 1234)) (CONNECT_DATA = (SERVER = DEDICATED) (SERVICE_NAME = dbname) ) )`
PostgreSQL	**JDBC driver:** `org.postgresql.Driver` **Database URL:** `jdbc:postgresql://host:port/database`
PostgreSQL with SSL Connection	**JDBC driver:** `org.postgresql.Driver` **Database URL:** `jdbc:postgresql:servername:dbname:ssl=true&sslfactory=org.postgresql.ssl.NonValidatingFactory&` *The trailing* `&` *is required.*
Sybase SQL Server and Sybase SQL Anywhere	**JDBC driver:** `com.sybase.jdbc.SybDriver` **Database URL:** `jdbc:sybase:Tds:yourhostname:yourportnumber/`

Tips

- Use `logintimeout` before `database` to set the maximum time for a connection attempt.
- Alternatively use Database Explorer to connect to databases.
- When making a JDBC connection using name-value connection properties:
  - You can skip the Server parameter when connecting to a database locally.
  - You can skip the PortNumber parameter when connecting to a database server listening on the default port (except for Oracle connections).

- “Database Connection Error Messages”
- “Bringing Java Classes into MATLAB Workspace”
- “Connecting to a Database Using the Native ODBC Interface”

See Also

`close` | `dexplore` | `dmd` | `exec` | `fastinsert` | `get` | `getdatasources` | `isconnection` | `isreadonly` | `logintimeout` | `ping` | `querybuilder` | `supports` | `update`

database.catalogs

Get database catalog names

Syntax

```
P = catalogs(conn)
```

Description

`P = catalogs(conn)` returns the catalogs for the database connection `conn`.

See Also

`get` | `database.columns` | `database.schemas` | `database.tables`

database.columns

Get database table column names

Syntax

```
P = columns(conn)
P = columns(conn,C)
P = columns(conn,C,S)
P = columns(conn,C,S,T)
```

Description

`P = columns(conn)` returns all columns for all tables given the database connection `conn`.

`P = columns(conn,C)` returns all columns for all tables of all schemas for the given catalog `C`.

`P = columns(conn,C,S)` returns the columns for all tables for the given catalog `C` and schema `S`.

`P = columns(conn,C,S,T)` returns the columns for the given database connection `conn`, the catalog `C`, the schema `S`, and the table `T`.

See Also

`get` | `database.schemas` | `database.tables`

database.fetch

Execute SQL statement to import data into MATLAB workspace

Syntax

```
results = fetch(conn,sqlquery)
results = fetch(conn,sqlquery,fetchbatchsize)
```

Description

`results = fetch(conn,sqlquery)` executes the SQL statement `sqlquery`, imports data for the open connection object `conn`, and returns the data to `results`. (For details about SQL statements, see `exec`.)

`results = fetch(conn,sqlquery,fetchbatchsize)` imports `fetchbatchsize` rows of data at a time.

Input Arguments

`conn`

A database connection object.

`sqlquery`

An SQL statement.

`fetchbatchsize`

Specifies the number of rows of data to import at a time. Use `fetchbatchsize` when importing large amounts of data. Retrieving data in increments, as specified by `fetchbatchsize`, helps reduce overall retrieval time. If `fetchbatchsize` is not provided, a default value of `FetchBatchSize` is used. `FetchBatchSize` is set using `setdbprefs`.

Output Arguments

`results`

A cell array, table, dataset array, structure, or numeric matrix depending on specifications set by `setdbprefs`.

Examples

Import Data

Import the `productDescription` column from the `productTable` table in the `dbtoolboxdemo` database.

```
conn = database('dbtoolboxdemo','','');
setdbprefs('DataReturnFormat','cellarray')
results = fetch(conn,'select productdescription from producttable')
```

```
results = 

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
    'Tin Soldier'
    'Sail Boat'
    'Slinky'
    'Teddy Bear'
```

If you experience speed and memory issues, use the `fetchbatchsize` argument.

View the size of the cell array into which the results were returned.

```
size(results)
```

```
ans =
```

```
    10     1
```

Import Two Columns of Data and View Information About the Data

Import the `InvoiceNumber` and `Paid` columns from the `Invoice` table in the `dbtoolboxdemo` database.

```
conn = database('dbtoolboxdemo','','');
setdbprefs('DataReturnFormat','cellarray')
results = fetch(conn,['select InvoiceNumber, '...
'Paid from Invoice']);
```

View the size of the cell array into which the results were returned.

```
size(results)

ans =

    12     2
```

View the results for the first row of data.

```
results(1,:)

ans =

    [2101]    [0]
```

View the data type of the second element in the first row of data.

```
class(results{1,2})

ans =

logical
```

More About

Tips

- You call the `database.fetch` function with `fetch` rather than `database.fetch`. You implicitly call `database.fetch` by passing a database object, `conn`, to `fetch`. The `fetch` function also works with a cursor object. See `cursor.fetch`.

- The order of records in your database does not remain constant. Use the SQL `ORDER BY` command in your `sqlquery` statement to sort data.
- “ Retrieve Image Data Types”
- “Preference Settings for Large Data Import”

See Also

`cursor.fetch` | `exec` | `fetch` | `database` | `logical`

database.schemas

Get database schema names

Syntax

```
P = schemas(conn)
```

Description

`P = schemas(conn)` returns the schema names for the database connection `conn`.

See Also

`get` | `database.catalogs` | `database.columns` | `database.tables`

database.tables

Get database table names

Syntax

```
T = tables(conn)
T = tables(conn,C)
T = tables(conn,C,S)
```

Description

`T = tables(conn)` returns all tables and table types for the database connection object `conn`.

`T = tables(conn,C)` returns all tables and table types for all schemas of the given catalog name `C`.

`T = tables(conn,C,S)` returns the list of tables and table types for the database with the catalog name `C` and schema name `S`.

See Also

`get` | `database.catalogs` | `database.schemas`

datastore

Create datastore to access collection of data in a database

This `datastore` function creates a `DatabaseDatastore` object. You can use this object to read large volumes of data in a relational database.

A `DatabaseDatastore` is one of the available datastore types. You can create other types of datastores using the MATLAB function `datastore`. After creating any datastore, you can analyze data by writing custom functions to run MapReduce using the `mapreduce` function. For details, see "Getting Started with MapReduce".

Syntax

```
dbds = datastore(conn,sqlquery)
```

Description

`dbds = datastore(conn,sqlquery)` creates a `DatabaseDatastore` object `dbds` using the database connection `conn`. This datastore contains query results from the executed SQL query `sqlquery`.

Examples

Create a DatabaseDatastore

Create a database connection `conn` using the native ODBC interface. This code assumes you are connecting to a MySQL database with the data source named `MySQL`, user name `username`, and password `pwd`. `MySQL` contains the table named `productTable` with 15 product records.

```
conn = database.ODBCConnection('MySQL','username','pwd');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable`.

```
sqlquery = 'select * from productTable';

dbds = datastore(conn,sqlquery)

dbds =

  DatabaseDatastore with properties:

    Connection: [1x1 database.ODBCConnection]
        Cursor: [1x1 database.ODBCCursor]
         Query: 'select * from productTable'
```

`datastore` executes the SQL query `sqlquery` and creates a cursor object with the resulting data. `dbds` contains these properties:

- Database connection object
- Database cursor object
- Executed SQL query

Display the database connection property `Connection`.

```
dbds.Connection

ans =

  ODBCConnection with properties:

      Instance: 'MySQL'
      UserName: 'username'
       Message: []
        Handle: [1x1 database.internal.ODBCConnectHandle]
       TimeOut: 0
    AutoCommit: 0
          Type: 'ODBCConnection Object'
```

The `Message` property is blank when the database connection is successful.

Display the database cursor property `Cursor`.

```
dbds.Cursor

ans =

  ODBCCursor with properties:
```

```
        Data: 0
    RowLimit: 0
    SQLQuery: 'select * from productTable'
     Message: []
        Type: 'ODBCCursor Object'
   Statement: [1x1 database.internal.ODBCStatementHandle]
```

The `Message` property is blank when the SQL query executes successfully.

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

- "Import Data Using a DatabaseDatastore"

Input Arguments

`conn` — Database connection
connection object

Database connection, specified as a database connection object created using `database`.

`sqlquery` — SQL statement
SQL string

SQL statement, specified as an SQL string to execute.

Data Types: `char`

Output Arguments

`dbds` — Datastore containing data in database
`DatabaseDatastore` object

Datastore containing data in database, returned as a `DatabaseDatastore` object.

More About

- Using DatabaseDatastore Objects

- “Working with a DatabaseDatastore”
- “What Is a Datastore?”

See Also

`close` | `database` | `datastore` | `exec` | `preview` | `read` | `reset`

hasdata

Determine if cursor in DatabaseDatastore contains more data

Syntax

```
tf = hasdata(dbds)
```

Description

tf = hasdata(dbds) returns logical 1 (true) if additional data exists in the cursor object of the DatabaseDatastore object dbds. Otherwise, it returns logical 0 (false). For JDBC drivers, hasdata uses the driver to check if the cursor position is located at the end of the data set. For the native ODBC interface, hasdata checks the Data field in the cursor object for remaining data in the data set.

Examples

Determine the Presence of More Data in DatabaseDatastore

The default output data type of any datastore is a table. Set the database preference for the data return format 'DataReturnFormat' to table for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection conn using the native ODBC interface with Windows Authentication. This code assumes you are connecting to a Microsoft SQL Server database with the data source named MS SQL Server Auth. MS SQL Server Auth contains the table named productTable with 15 product records.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a DatabaseDatastore object dbds using the database connection conn and SQL query sqlquery. This SQL query retrieves all products from the product table productTable ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
            'order by productNumber'];

dbds = datastore(conn,sqlquery);
```

Read the first five records.

```
read(dbds,5)

ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1.00             400345.00      1001.00           14.00       'Building Blocks'
    2.00             400314.00      1002.00            9.00       'Painting Set'
    3.00             400999.00      1009.00           17.00       'Slinky'
    4.00             400339.00      1008.00           21.00       'Space Cruiser'
    5.00             400455.00      1005.00            3.00       'Tin Soldier'
```

Determine if the `DatabaseDatastore` has additional data.

```
hasdata(dbds)

ans =

       1
```

`hasdata` returns `1`. There is more data to read in the cursor object of the `DatabaseDatastore` object `dbds`.

Read the rest of the data in the `DatabaseDatastore` object `dbds` five records at a time.

```
while(hasdata(dbds))
      read(dbds,5)
end

ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'


ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________
```

```
    11.00          408143.00      1004.00          11.00       'Convertible'
    12.00          210456.00      1010.00          22.00       'Hugsy'
    13.00          470816.00      1012.00          16.50       'Pancakes'
    14.00          510099.00      1011.00          19.00       'Shawl'
    15.00          899752.00      1011.00          20.00       'Snacks'

ans =

    'No Data'
```

`read` returns the cell array containing the string `'No Data'` when you connect to the database using the native ODBC interface.

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

- "Import Data Using a DatabaseDatastore"
- "Analyze Large Data Sets in a Database with MapReduce"

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in database, specified as a `DatabaseDatastore` object created using `datastore`.

More About

- Using DatabaseDatastore Objects
- "Working with a DatabaseDatastore"

See Also

`close` | `database` | `datastore` | `read` | `setdbprefs`

preview

Display first eight records of data in `DatabaseDatastore`

Syntax

```
data = preview(dbds)
```

Description

`data = preview(dbds)` displays the first eight records of data in the `DatabaseDatastore` object `dbds`.

Examples

Preview Data in a DatabaseDatastore

The default output data type of any datastore is a table. Set the database preference for the data return format `'DataReturnFormat'` to `table` for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection `conn` using the native ODBC interface. This code assumes you are connecting to a MySQL database with the data source named `MySQL`, user name `username`, and password `pwd`. `MySQL` contains the table named `productTable` with 15 product records.

```
 conn = database.ODBCConnection('MySQL','username','pwd');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable` ordered by product number.

```
sqlquery = 'select * from productTable order by productNumber';

dbds = datastore(conn,sqlquery);
```

Preview the first eight records in the data set returned by executing the SQL query `sqlquery`.

```
preview(dbds)
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1.00             400345.00      1001.00           14.00       'Building Blocks'
    2.00             400314.00      1002.00            9.00       'Painting Set'
    3.00             400999.00      1009.00           17.00       'Slinky'
    4.00             400339.00      1008.00           21.00       'Space Cruiser'
    5.00             400455.00      1005.00            3.00       'Tin Soldier'
    6.00             400876.00      1004.00            8.00       'Sail Boat'
    7.00             389123.00      1007.00           16.00       'Engine Kit'
    8.00             212569.00      1001.00            5.00       'Train Set'
```

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

- "Import Data Using a DatabaseDatastore"
- "Analyze Large Data Sets in a Database with MapReduce"

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in database, specified as a `DatabaseDatastore` object created using `datastore`.

Output Arguments

`data` — Query results

cell array | matrix | table | structure | dataset

Query results, returned as a cell array, matrix, table, structure, or dataset array of the first eight records in the data set. Executing the SQL statement specified in the `DatabaseDatastore` object creates the data set. The format of the data is specified by the preference setting `'DataReturnFormat'` in `setdbprefs`.

More About

- Using DatabaseDatastore Objects
- “Working with a DatabaseDatastore”

See Also

`close` | `database` | `datastore` | `read` | `readall` | `reset`

read

Read data in `DatabaseDatastore`

Syntax

```
data = read(dbds)
data = read(dbds,rowcount)
[data,info] = read( ___ )
```

Description

`data = read(dbds)` retrieves data from the `DatabaseDatastore` object in increments specified using `setdbprefs` and in the format specified using `setdbprefs`.

`data = read(dbds,rowcount)` retrieves data from the `DatabaseDatastore` object in increments specified by `rowcount` and in the format specified using `setdbprefs`.

`[data,info] = read( ___ )` retrieves data from the `DatabaseDatastore` object using the input arguments in the previous syntaxes.

Examples

Retrieve Data

The default output data type of any datastore is a table. Set the database preference for the data return format `'DataReturnFormat'` to `table` for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection `conn` using the native ODBC interface with Windows Authentication. This code assumes you are connecting to a Microsoft SQL Server database with the data source named `MS SQL Server Auth`. `MS SQL Server Auth` contains the table named `productTable` with 15 product records.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a DatabaseDatastore object dbds using the database connection conn and SQL query sqlquery. This SQL query retrieves all products from the product table productTable ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
            'order by productNumber'];

dbds = datastore(conn,sqlquery);
```

Read the data in the DatabaseDatastore object dbds.

```
data = read(dbds)

data = 

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     1.00            400345.00      1001.00           14.00       'Building Blocks'
     2.00            400314.00      1002.00            9.00       'Painting Set'
     3.00            400999.00      1009.00           17.00       'Slinky'
     4.00            400339.00      1008.00           21.00       'Space Cruiser'
     5.00            400455.00      1005.00            3.00       'Tin Soldier'
     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'
    11.00            408143.00      1004.00           11.00       'Convertible'
    12.00            210456.00      1010.00           22.00       'Hugsy'
    13.00            470816.00      1012.00           16.50       'Pancakes'
    14.00            510099.00      1011.00           19.00       'Shawl'
    15.00            899752.00      1011.00           20.00       'Snacks'
```

data contains the query results. The preference setting 'FetchBatchSize' in setdbprefs determines the maximum number of records read returns.

Close the DatabaseDatastore, cursor, and database connection.

```
close(dbds)
```

Retrieve Data Using a Row Count

The default output data type of any datastore is a table. Set the database preference for the data return format 'DataReturnFormat' to table for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection conn using the native ODBC interface with Windows Authentication. This code assumes you are connecting to a Microsoft SQL Server

database with the data source named MS SQL Server Auth. MS SQL Server Auth contains the table named productTable with 15 product records.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a DatabaseDatastore object dbds using the database connection conn and SQL query sqlquery. This SQL query retrieves all products from the product table productTable ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
            'order by productNumber'];
```

```
dbds = datastore(conn,sqlquery);
```

Read the first five records in the DatabaseDatastore object dbds.

```
data = read(dbds,5)
```

```
data = 

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1.00             400345.00      1001.00           14.00       'Building Blocks'
    2.00             400314.00      1002.00            9.00       'Painting Set'
    3.00             400999.00      1009.00           17.00       'Slinky'
    4.00             400339.00      1008.00           21.00       'Space Cruiser'
    5.00             400455.00      1005.00            3.00       'Tin Soldier'
```

data contains the query results. The row count argument 5 determines the number of records read returns.

Close the DatabaseDatastore, cursor, and database connection.

```
close(dbds)
```

Retrieve Data and Database Information

The default output data type of any datastore is a table. Set the database preference for the data return format 'DataReturnFormat' to table for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection conn using the native ODBC interface with Windows Authentication. This code assumes you are connecting to a Microsoft SQL Server

database with the data source named `MS SQL Server Auth`. `MS SQL Server Auth` contains the table named `productTable` with 15 product records.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable` ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
            'order by productNumber'];

dbds = datastore(conn,sqlquery);
```

Read the data in the `DatabaseDatastore` object `dbds` and retrieve information `info` about the database.

```
[data,info] = read(dbds)

data = 

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     1.00            400345.00      1001.00           14.00       'Building Blocks'
     2.00            400314.00      1002.00            9.00       'Painting Set'
     3.00            400999.00      1009.00           17.00       'Slinky'
     4.00            400339.00      1008.00           21.00       'Space Cruiser'
     5.00            400455.00      1005.00            3.00       'Tin Soldier'
     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'
    11.00            408143.00      1004.00           11.00       'Convertible'
    12.00            210456.00      1010.00           22.00       'Hugsy'
    13.00            470816.00      1012.00           16.50       'Pancakes'
    14.00            510099.00      1011.00           19.00       'Shawl'
    15.00            899752.00      1011.00           20.00       'Snacks'

info = 

    datasource: 'MS SQL Server Auth'
        offset: 0
```

`data` contains the query results. The structure `info` contains the data source name `datasource` and current cursor position `offset`.

The preference setting `'FetchBatchSize'` in `setdbprefs` determines the maximum number of records `read` returns.

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

Retrieve Data and Database Information Using a Row Count

The default output data type of any datastore is a table. Set the database preference for the data return format `'DataReturnFormat'` to `table` for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection `conn` using the native ODBC interface with Windows Authentication. This code assumes you are connecting to a Microsoft SQL Server database with the data source named `MS SQL Server Auth`. `MS SQL Server Auth` contains the table named `productTable` with 15 product records.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable` ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
            'order by productNumber'];

dbds = datastore(conn,sqlquery);
```

Read the first five records in the `DatabaseDatastore` object `dbds` and retrieve information `info` about the database.

```
[data,info] = read(dbds,5)
```

```
data = 

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

    1.00             400345.00      1001.00           14.00       'Building Blocks'
    2.00             400314.00      1002.00            9.00       'Painting Set'
    3.00             400999.00      1009.00           17.00       'Slinky'
    4.00             400339.00      1008.00           21.00       'Space Cruiser'
    5.00             400455.00      1005.00            3.00       'Tin Soldier'

info = 

    datasource: 'MS SQL Server Auth'
        offset: 0
```

`data` contains the query results. The row count argument `5` determines the number of records `read` returns. The structure `info` contains the data source name `datasource` and current cursor position `offset`.

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

- "Import Data Using a DatabaseDatastore"
- "Analyze Large Data Sets in a Database with MapReduce"

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in database, specified as a `DatabaseDatastore` object created using `datastore`.

`rowcount` — Record count

scalar

Record count, specified as a scalar to denote the number of records to retrieve from the `DatabaseDatastore` object dbds.

Data Types: `double`

Output Arguments

`data` — Query results

cell array | matrix | table | structure | dataset

Query results, returned as a cell array, matrix, table, structure, or dataset array of the records in the data set. Executing the SQL statement specified in the `DatabaseDatastore` object creates the data set. The number of records returned is specified by the preference setting `'FetchBatchSize'` in `setdbprefs` or the input argument rowcount. The format of the data is specified by the preference setting `'DataReturnFormat'` in `setdbprefs`.

`info` — Database information

structure

Database information, returned as a structure with these fields.

Field	Description
datasource	Data source name for ODBC drivers or a database name for JDBC drivers
offset	Current cursor position in the returned data set

More About

- Using DatabaseDatastore Objects
- “Working with a DatabaseDatastore”

See Also

close | database | datastore | hasdata | preview | readall | reset | setdbprefs

readall

Read every record in `DatabaseDatastore`

Syntax

```
data = readall(dbds)
```

Description

`data = readall(dbds)` retrieves data from the `DatabaseDatastore` object `dbds` in the format specified using `setdbprefs`.

Examples

Read Every Record in a DatabaseDatastore

The default output data type of any datastore is a table. Set the database preference for the data return format `'DataReturnFormat'` to `table` for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection `conn` using the native ODBC interface with Windows Authentication. This code assumes you are connecting to a Microsoft SQL Server database with the data source named `MS SQL Server Auth`. `MS SQL Server Auth` contains the table named `productTable` with 15 product records.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable` ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
            'order by productNumber'];

dbds = datastore(conn,sqlquery);
```

Read every record in the `DatabaseDatastore` object `dbds`.

```
data = readall(dbds)
```

```
data = 

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     1.00            400345.00      1001.00           14.00       'Building Blocks'
     2.00            400314.00      1002.00            9.00       'Painting Set'
     3.00            400999.00      1009.00           17.00       'Slinky'
     4.00            400339.00      1008.00           21.00       'Space Cruiser'
     5.00            400455.00      1005.00            3.00       'Tin Soldier'
     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'
    11.00            408143.00      1004.00           11.00       'Convertible'
    12.00            210456.00      1010.00           22.00       'Hugsy'
    13.00            470816.00      1012.00           16.50       'Pancakes'
    14.00            510099.00      1011.00           19.00       'Shawl'
    15.00            899752.00      1011.00           20.00       'Snacks'
```

To change the output data format, see the preference setting `'DataReturnFormat'` in `setdbprefs`.

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

- "Import Data Using a DatabaseDatastore"
- "Analyze Large Data Sets in a Database with MapReduce"

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in database, specified as a `DatabaseDatastore` object created using `datastore`.

Output Arguments

`data` — Query results

cell array | matrix | table | structure | dataset

Query results, returned as a cell array, matrix, table, structure, or dataset array of the records in the data set. Executing the SQL statement specified in the `DatabaseDatastore` object creates the data set. The format of the data is specified by the preference setting `'DataReturnFormat'` in `setdbprefs`.

More About

- Using DatabaseDatastore Objects
- “Working with a DatabaseDatastore”

See Also

`close` | `database` | `datastore` | `preview` | `read` | `reset` | `setdbprefs`

reset

Reset cursor position in DatabaseDatastore

Syntax

```
reset(dbds)
```

Description

reset(dbds) repositions the cursor object in the DatabaseDatastore object dbds to the start of the data set by executing the SQL query again.

Examples

Reset the Cursor Position

The default output data type of any datastore is a table. Set the database preference for the data return format 'DataReturnFormat' to table for consistency across data types.

```
setdbprefs('DataReturnFormat','table')
```

Create a database connection conn using the native ODBC interface with Windows Authentication. This code assumes you are connecting to a Microsoft SQL Server database with the data source named MS SQL Server Auth. MS SQL Server Auth contains the table named productTable with 15 product records.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a DatabaseDatastore object dbds using the database connection conn and SQL query sqlquery. This SQL query retrieves all products from the product table productTable ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
            'order by productNumber'];
```

```
dbds = datastore(conn,sqlquery);
```

Read the data in the data set.

```
readall(dbds)
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     1.00            400345.00      1001.00           14.00       'Building Blocks'
     2.00            400314.00      1002.00            9.00       'Painting Set'
     3.00            400999.00      1009.00           17.00       'Slinky'
     4.00            400339.00      1008.00           21.00       'Space Cruiser'
     5.00            400455.00      1005.00            3.00       'Tin Soldier'
     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'
    11.00            408143.00      1004.00           11.00       'Convertible'
    12.00            210456.00      1010.00           22.00       'Hugsy'
    13.00            470816.00      1012.00           16.50       'Pancakes'
    14.00            510099.00      1011.00           19.00       'Shawl'
    15.00            899752.00      1011.00           20.00       'Snacks'
```

`readall` displays every record in the data set. The cursor position is at the end of the data set.

Reposition the cursor object to the start of the data set.

```
reset(dbds)
```

Read data from the start of the data set.

```
readall(dbds)
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    _____________    ___________    ______________    ________    __________________

     1.00            400345.00      1001.00           14.00       'Building Blocks'
     2.00            400314.00      1002.00            9.00       'Painting Set'
     3.00            400999.00      1009.00           17.00       'Slinky'
     4.00            400339.00      1008.00           21.00       'Space Cruiser'
     5.00            400455.00      1005.00            3.00       'Tin Soldier'
     6.00            400876.00      1004.00            8.00       'Sail Boat'
     7.00            389123.00      1007.00           16.00       'Engine Kit'
     8.00            212569.00      1001.00            5.00       'Train Set'
     9.00            125970.00      1003.00           13.00       'Victorian Doll'
    10.00            888652.00      1006.00           24.00       'Teddy Bear'
    11.00            408143.00      1004.00           11.00       'Convertible'
    12.00            210456.00      1010.00           22.00       'Hugsy'
    13.00            470816.00      1012.00           16.50       'Pancakes'
    14.00            510099.00      1011.00           19.00       'Shawl'
```

```
    15.00          899752.00     1011.00          20.00      'Snacks'
```

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

- "Import Data Using a DatabaseDatastore"
- "Analyze Large Data Sets in a Database with MapReduce"

Input Arguments

`dbds` — Datastore containing data in database

`DatabaseDatastore` object

Datastore containing data in database, specified as a `DatabaseDatastore` object created using `datastore`.

More About

- Using DatabaseDatastore Objects
- "Working with a DatabaseDatastore"

See Also

`close` | `database` | `datastore` | `exec` | `read`

Using DatabaseDatastore Objects

Access collection of data stored in database

MATLAB has various datastores that let you import large data sets into MATLAB for analysis. A `DatabaseDatastore` object is a type of datastore that contains the resulting data from executing an SQL query in a relational database.

With a `DatabaseDatastore` object, you can perform these tasks:

- Preview data.
- Read data in chunks.
- Read every record in the data set.
- Reset the cursor position to the start of the data set.
- Continue reading data until the cursor position reaches the end of the data set.
- Analyze a large data set stored in a database using MapReduce.

After creating a `DatabaseDatastore` object, you can write custom functions to run MapReduce. For details, see “Getting Started with MapReduce”.

Examples

Create a DatabaseDatastore Object

Connect to a Microsoft SQL Server database with Windows Authentication. This code assumes you are creating a database connection `conn` using the native ODBC interface with the authenticated ODBC data source name `MS SQL Server Auth` and blank user name and password.

```
conn = database.ODBCConnection('MS SQL Server Auth','','');
```

Create a `DatabaseDatastore` object `dbds` using the database connection `conn` and SQL query `sqlquery`. This SQL query retrieves all products from the product table `productTable` ordered by product number.

```
sqlquery = ['select * from [toy_store].[dbo].[productTable] '...
           'order by productNumber'];
```

```
dbds = datastore(conn,sqlquery)

dbds = 

  DatabaseDatastore with properties:

    Connection: [1x1 database.ODBCConnection]
        Cursor: [1x1 database.ODBCCursor]
         Query: 'select * from [toy_store].[dbo].[productTable] order by productNumber'
```

`datastore` executes the SQL query `sqlquery` and creates a cursor object with the resulting data. `dbds` contains these properties:

- Database connection object
- Database cursor object
- Executed SQL query

Close the `DatabaseDatastore`, cursor, and database connection.

```
close(dbds)
```

- “Import Data Using a DatabaseDatastore”
- “Analyze Large Data Sets in a Database with MapReduce”

Properties

`Connection` — Database connection

connection object

Database connection, specified as a connection object created using `database`.

`Cursor` — Database cursor

database cursor object

Database cursor, specified as a database cursor object created using `exec` with the SQL query `query`.

`Query` — SQL query

string

SQL query, specified as a string to denote the SQL query to execute in the database.

Data Types: `char`

Object Functions

`hasdata` `preview` `read` `readall` `reset` `close`

Create Object

Create a `DatabaseDatastore` object using `datastore`.

More About

- “What Is a Datastore?”
- “Working with a DatabaseDatastore”
- “Getting Started with MapReduce”

datainsert

Export MATLAB data into database table

Syntax

```
datainsert(conn,tablename,colnames,data)
```

Description

`datainsert(conn,tablename,colnames,data)` inserts data from the MATLAB workspace into a database table.

- Use `datainsert` when you want maximum performance, are able to format your input data in a specific way, and your input data is only cell arrays and numeric matrices.
- Use `fastinsert` when your input data is a structure, dataset array, or table, or you are using a native ODBC database connection.
- Use `insert` only if `datainsert` or `fastinsert` do not work for you and you want to insert a small set of data.

Examples

Export MATLAB Cell Array Data

Insert data in a MATLAB cell array into a database.

Establish the connection `conn` to a MySQL database with the user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Display data in `inventoryTable` before insertion of data.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [   1]    [1700]    [14.5000]
    [   2]    [1200]    [ 9.3000]
    [   3]    [ 356]    [17.2000]
    [   4]    [2580]    [21.4000]
    [   5]    [9000]    [ 3.0500]
    [   6]    [4540]    [ 8.1000]
    [   7]    [6034]    [16.2000]
    [   8]    [8350]    [ 5.1000]
    [   9]    [2339]    [13.2000]
    [  10]    [ 723]    [24.3000]
    [  11]    [ 567]    [11.2000]
    [  12]    [1278]    [22.3000]
    [  13]    [1700]    [16.8000]
    [  14]    [2000]    [19.1000]
    [  15]    [1200]    [20.3000]
    [7777]    [ 100]    [      50]
    [7777]    [ 100]    [      50]
    [8888]    [ 200]    [     101]
```

Create cell array of column names for the database table `inventoryTable`.

```
colnames = {'productNumber','Quantity','Price'};
```

Define the cell array of input data to insert.

```
data = {50 100 15.50};
```

Insert the input data into the table `inventoryTable` using database connection `conn`.

```
tablename = 'inventoryTable';
datainsert(conn,tablename,colnames,data)
```

Display inserted data in `inventoryTable`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [   1]    [1700]    [14.5000]
    [   2]    [1200]    [ 9.3000]
    [   3]    [ 356]    [17.2000]
```

```
    [   4]    [2580]    [21.4000]
    [   5]    [9000]    [ 3.0500]
    [   6]    [4540]    [ 8.1000]
    [   7]    [6034]    [16.2000]
    [   8]    [8350]    [ 5.1000]
    [   9]    [2339]    [13.2000]
    [  10]    [ 723]    [24.3000]
    [  11]    [ 567]    [11.2000]
    [  12]    [1278]    [22.3000]
    [  13]    [1700]    [16.8000]
    [  14]    [2000]    [19.1000]
    [  15]    [1200]    [20.3000]
    [7777]    [ 100]    [      50]
    [7777]    [ 100]    [      50]
    [8888]    [ 200]    [     101]
    [  50]    [ 100]    [15.5000]
```

Close the connection.

```
close(conn)
```

Export MATLAB Numeric Matrix Data

Insert data in a MATLAB numeric matrix into a database.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Display data in `inventoryTable` before inserting data.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [   1]    [1700]    [14.5000]
    [   2]    [1200]    [ 9.3000]
    [   3]    [ 356]    [17.2000]
    [   4]    [2580]    [21.4000]
    [   5]    [9000]    [ 3.0500]
    [   6]    [4540]    [ 8.1000]
    [   7]    [6034]    [16.2000]
```

```
    [   8]    [8350]    [ 5.1000]
    [   9]    [2339]    [13.2000]
    [  10]    [ 723]    [24.3000]
    [  11]    [ 567]    [11.2000]
    [  12]    [1278]    [22.3000]
    [  13]    [1700]    [16.8000]
    [  14]    [2000]    [19.1000]
    [  15]    [1200]    [20.3000]
    [7777]    [ 100]    [      50]
    [7777]    [ 100]    [      50]
    [8888]    [ 200]    [     101]
    [  50]    [ 100]    [15.5000]
```

Create a cell array of column names for the database table `inventoryTable`.

```
colnames = {'productNumber','Quantity','Price'};
```

Define the numeric matrix of input data to insert.

```
data = [55 200 20.50];
```

Insert the input data into the table `inventoryTable` using database connection `conn`.

```
tablename = 'inventoryTable';
datainsert(conn,tablename,colnames,data)
```

Display inserted data in `inventoryTable`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [   1]    [1700]    [14.5000]
    [   2]    [1200]    [ 9.3000]
    [   3]    [ 356]    [17.2000]
    [   4]    [2580]    [21.4000]
    [   5]    [9000]    [ 3.0500]
    [   6]    [4540]    [ 8.1000]
    [   7]    [6034]    [16.2000]
    [   8]    [8350]    [ 5.1000]
    [   9]    [2339]    [13.2000]
    [  10]    [ 723]    [24.3000]
    [  11]    [ 567]    [11.2000]
```

```
    [    12]    [1278]    [22.3000]
    [    13]    [1700]    [16.8000]
    [    14]    [2000]    [19.1000]
    [    15]    [1200]    [20.3000]
    [7777]    [  100]    [       50]
    [7777]    [  100]    [       50]
    [8888]    [  200]    [     101]
    [    50]    [  100]    [15.5000]
    [    55]    [  200]    [20.5000]
```

Close the connection.

```
close(conn)
```

Input Arguments

conn — Database connection
connection object

Database connection, specified as a database connection object created using `database`.

tablename — Database table name
string

Database table name, specified as a string denoting the name of a table in your database.

Data Types: `char`

colnames — Database table column names
cell array of strings

Database table column names, specified as a cell array of one or more strings to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell`

data — Insert data
cell array | numeric matrix

Insert data, specified as a MATLAB cell array or numeric matrix. If `data` is a cell array containing MATLAB dates, times, or timestamps, the dates must be date strings

of the form `yyyy-mm-dd`, times must be time strings of the form `HH:MM:SS`, and timestamps must be strings of the form `yyyy-mm-dd HH:MM:SS.FFF`. Any `null` entries and any `NaN`s in the cell array must be converted to empty strings before calling `datainsert`. MATLAB date numbers and `NaN`s are supported for insert when `data` is a numeric matrix. Date numbers inserted into database date and time columns convert to `java.sql.Date`. Any converted date and time data is accurately converted back to the native database format in the target database upon insertion.

Data Types: `double` | `cell`

More About

- "Inserting Data Using the Command Line" on page 2-199

See Also

`fastinsert` | `insert` | `update`

dexplore

Start SQL Database Explorer to import data

Syntax

```
dexplore
```

Description

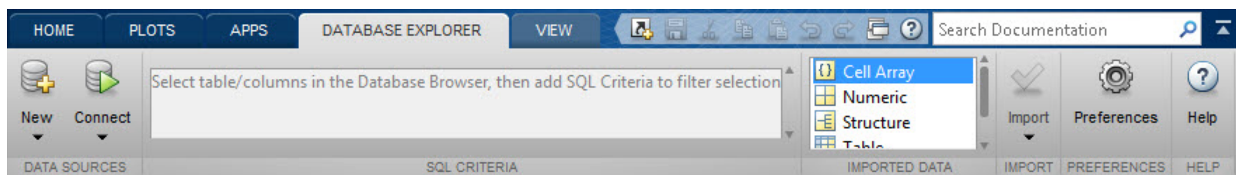
`dexplore` starts Database Explorer, which is the Database Toolbox app for connecting to a database and importing data to the MATLAB workspace.

Database Explorer is an interactive app that allows you to:

- Create and configure JDBC and ODBC data sources
- Establish multiple connections to databases
- Select tables and columns of interest
- Fine-tune selection using SQL query criteria
- Preview selected data
- Import selected data into MATLAB workspace
- Save generated SQL queries
- Generate MATLAB code

Examples

For details about Database Explorer, after starting Database Explorer, click **Help** on the Database Explorer Toolstrip:



Related Examples

- "Using Database Explorer"

dmd

Construct database metadata object

Syntax

```
dbmeta = dmd(conn)
```

Description

`dbmeta = dmd(conn)` constructs a database metadata object for the database connection `conn`. Use `get` and `supports` to obtain properties of `dbmeta`. Use `dmd` and `get(dbmeta)` to obtain information you need about a database, such as table names required to retrieve data.

For a list of functions that operate on database metadata objects, enter:

```
help dmd/Contents
```

Examples

Create a database metadata object `dbmeta` for the database connection `conn` and list its properties:

```
dbmeta = dmd(conn);
v = get(dbmeta)
```

See Also

`columns` | `get` | `database` | `supports` | `tables`

driver

Construct database driver object

Syntax

```
d = driver('s')
```

Description

`d = driver('s')` constructs a database driver object `d` from `s`, where `s` is a database URL string of the form `jdbc:odbc:`*`name`* or *`name`*. The driver object `d` is the first driver that recognizes `s`.

Examples

`d = driver('jdbc:odbc:thin:@144.212.123.24:1822:')` creates driver object `d`.

See Also

`get` | `isdriver` | `isurl` | `isjdbc` | `register`

drivermanager

Construct database drivermanager object

Syntax

```
dm = drivermanager
```

Description

`dm = drivermanager` constructs a database drivermanager object which comprises the properties for all loaded database drivers. Use `get` and `set` to obtain and change the properties of `dm`.

Examples

Create a database drivermanager object and return its properties.

```
dm = drivermanager
get(dm)
```

See Also

`get` | `register` | `set`

exec

Execute SQL statement and open cursor

Syntax

```
curs = exec(conn,sqlquery)
curs = exec(conn,sqlquery,qTimeOut)
curs = exec(conn,sqlquery,Name,Value)
```

Description

`curs = exec(conn,sqlquery)` executes the SQL statement sqlquery for the database connection conn and returns the cursor object curs.

`curs = exec(conn,sqlquery,qTimeOut)` executes the SQL statement with a timeout value qTimeOut.

`curs = exec(conn,sqlquery,Name,Value)` executes the SQL statement and creates a scrollable cursor.

Examples

Select Data from a Database Table Using the Native ODBC Interface

Create a connection `conn` using the native ODBC interface and the `dbtoolboxdemo` data source.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

Select data from `productTable` that you access using the `database.ODBCConnection` object, `conn`. Assign the SQL statement to the variable `sqlquery`. Assign the returned cursor object to the variable `curs`.

```
sqlquery = 'select * from productTable';
curs = exec(conn,sqlquery)
```

```
curs =

  ODBCCursor with properties:
```

```
         Data: 0
     RowLimit: 0
     SQLQuery: 'select * from productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1x1 database.internal.ODBCStatementHandle]
```

With the native ODBC interface, `exec` returns `curs` a `database.ODBCCursor` object instead of a `Database Cursor Object`.

After finishing with the cursor object, close it.

```
close(curs)
```

Select Data from a Database Table

Using the `dbtoolboxdemo` data source, select data from the `suppliers` table that you access using the database connection, `conn`. Assign the SQL statement to the variable `sqlquery`. Assign the returned cursor object to the variable `curs`.

```
sqlquery = 'select City from suppliers';
curs = exec(conn,sqlquery)
```

```
curs =

        Attributes: []
              Data: 0
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select City from suppliers'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: 0
```

After finishing with the cursor object, close it.

```
close(curs)
```

Select Data from a Database Table Using a Scrollable Cursor

Using a MySQL database, select data from a table that you access using the native ODBC database connection `conn` and create a scrollable cursor.

Connect to the MySQL database. This code assumes you are connecting to a data source named MySQL with user name username and password pwd.

```
conn = database.ODBCConnection('MySQL','username','pwd');
```

Select all rows from the productTable table and create a scrollable cursor. Assign the SQL statement to the variable sqlquery. Assign the returned cursor object to the variable curs.

```
sqlquery = 'select * from productTable';
curs = exec(conn,sqlquery,'cursorType','scrollable')
```

```
curs =

  ODBCCursor with properties:

         Data: 0
     RowLimit: 0
     SQLQuery: 'select * from productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1x1 database.internal.ODBCStatementHandle]
```

To verify that exec creates a scrollable cursor, display the hidden Scrollable property.

```
curs.Scrollable
```

```
ans =

     1
```

The Scrollable property equals 1 when the cursor is scrollable.

After finishing with the cursor object, close it.

```
close(curs)
```

Select Data from a Database Table with a Timeout Value

Using the dbtoolboxdemo data source, select data from productTable that you access using the database connection conn with a timeout of 10 seconds. The timeout value specifies the maximum amount of time exec tries to execute the SQL statement. Assign the SQL statement to the variable sqlquery. Assign the returned cursor object to the variable curs.

```
sqlquery = 'select * from productTable';
```

```
curs = exec(conn,sqlquery,10)

curs =

        Attributes: []
              Data: 0
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select * from productTable'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: 0
```

After finishing with the cursor object, close it.

```
close(curs)
```

Use a Variable in a Query

Using the `dbtoolboxdemo` data source, select data from the `productTable` table that you access using the database connection `conn`, where `productdesc` is a variable. In this example, you are prompted to specify the product description. Your input is assigned to the variable `productdesc`.

```
productdesc = input('Enter your product description: ', 's')
```

The following prompt appears.

```
Enter your product description:
```

Type the following into the MATLAB Command Window.

```
Train Set
```

To perform the query using your input, run the following code.

```
sqlquery = ['select * from productTable'...
'where productDescription = ' '''' productdesc ''''];
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data

ans =
```

```
    [8]    [212569]    [1001]    [5]    'Train Set'
```

The select statement is created by using square brackets to concatenate the two strings `select * from productTable where productDescription =` and `'productdesc'`. The pairs of four quotation marks are needed to create the pair of single quotation marks that appears in the SQL statement around `productdesc`. The outer two marks delineate the next string to concatenate, and two marks are required inside them to denote a quotation mark inside a string.

Perform the query without a variable.

```
sqlquery = ['select * from productTable'...
'where productDescription = ' '''Engine Kit'''];
curs = exec(conn,sqlquery);
curs = fetch(curs);
curs.Data
```

```
ans =

    [7]    [389123]    [1007]    [16]    'Engine Kit'
```

After finishing with the cursor object, close it.

```
close(curs)
```

Roll Back and Commit Data in a Database

Use `exec` to roll back and commit data after running `fastinsert`, `insert`, or `update` for which the `AutoCommit` flag is `off`.

Roll back data for the database connection `conn`.

```
sqlquery = 'rollback';
exec(conn,sqlquery);
```

When you do not specify an output argument, MATLAB returns the results of calling `exec` into cursor object `ans`. Assign `ans` to variable `curs` so that MATLAB does not overwrite the cursor object. After finishing with the cursor object, close it.

```
curs = ans;
close(curs)
```

Commit the data.

```
sqlquery = 'commit';
```

```
exec(conn,sqlquery);
```

After finishing with the cursor object, close it.

```
curs = ans;
close(curs)
```

Change the Database Connection Catalog

Change the catalog for the database connection `conn` to `intlprice`.

```
sqlquery = 'Use intlprice';
curs = exec(conn,sqlquery);
```

After finishing with the cursor object, close it.

```
close(curs)
```

Create a Table and Add a New Column

Use the SQL `CREATE` command to create the table.

```
sqlquery = ['CREATE TABLE Person(LastName varchar, '...
        'FirstName varchar,Address varchar,Age int)'];
```

Create the table for the database connection object `conn`.

```
exec(conn,sqlquery);
```

Use the SQL `ALTER` command to add a new column, `City`, to the table.

```
sqlquery = 'ALTER TABLE Person ADD City varchar(30)';
curs = exec(conn,sqlquery);
```

After finishing with the cursor object, close it.

```
close(curs)
```

- “Run a Stored Procedure That Returns Data”
- “Run a Custom Database Function”

Input Arguments

`conn` — Database connection
connection object

Database connection, specified as a database connection object created using `database`.

`sqlquery` — SQL statement
SQL string

SQL statement, specified as an SQL string to execute.

Data Types: `char`

`qTimeOut` — Timeout value
scalar

Timeout value, specified as a scalar denoting the maximum amount of time in seconds `exec` tries to execute the SQL statement, `sqlquery`.

Data Types: `double`

Name-Value Pair Arguments

Specify optional comma-separated pairs of Name,Value arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'cursorType','scrollable'`

`'cursorType'` — Cursor type
`'scrollable'`

Cursor type, specified as an enumerated string `'scrollable'` that creates a scrollable cursor. For details, see “Importing Data Using a Scrollable Cursor”.

Data Types: `char`

Output Arguments

`curs` — Database cursor
database cursor object

Database cursor, returned as a database cursor object. The properties of this object are different based on the database connection object.

For a JDBC/ODBC bridge or a JDBC driver database connection, the cursor object has the following properties.

Property	Description
Attributes	Not used.
Data	Contains the resulting data after executing fetch.
DatabaseObject	Database connection object or database.ODBCConnection object that opened the cursor object.
RowLimit	Number of rows to fetch at a time.
SQLQuery	SQL statement to execute.
Message	Contains the error messages generated from executing the SQL statement. If this property is empty, then the SQL statement executed successfully.
Type	Database cursor object or database.ODBCCursor object type.
ResultSet	Java result set object.
Cursor	Internal Java representation of a cursor object.
Statement	Java statement object.
Fetch	Internal Java representation of the fetched data.
Scrollable	Contains a logical value to identify the cursor object as scrollable or basic. This property is set to 1 for a scrollable cursor and 0 otherwise. This property is hidden and read only.
Position	Contains a number that specifies the current position of the cursor in the data set. This property is only available for a scrollable cursor. This property behaves differently for native ODBC, JDBC, and different database drivers. This property is read only.

For a native ODBC connection, the cursor object has only these properties from the previous list: Data, RowLimit, SQLQuery, Message, Type, Statement, Scrollable, and Position.

More About

- "Selecting Data Using the exec Function" on page 5-47

- "Importing Data Using a Scrollable Cursor"
- "Connecting to a Database Using the Native ODBC Interface"
- "Data Retrieval Restrictions" on page 1-8

See Also

`close` | `database` | `fastinsert` | `fetch` | `procedures` | `querybuilder` | `querytimeout` | `resultset` | `rsmd` | `set` | `update`

exportedkeys

Retrieve information about exported foreign keys

Syntax

```
e = exportedkeys(dbmeta, 'cata', 'sch')
e = exportedkeys(dbmeta, 'cata', 'sch', 'tab')
```

Description

`e = exportedkeys(dbmeta, 'cata', 'sch')` returns foreign exported key information (that is, information about primary keys that are referenced by other tables) for the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`e = exportedkeys(dbmeta, 'cata', 'sch', 'tab')` returns exported foreign key information for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get foreign exported key information for the schema `SCOTT` for the database metadata object `dbmeta`.

```
e = exportedkeys(dbmeta,'orcl','SCOTT')
e =
  Columns 1 through 7
    'orcl'   'SCOTT'   'DEPT'   'DEPTNO'    'orcl'...
    'SCOTT'    'EMP'
  Columns 8 through 13
    'DEPTNO'    '1'    'null'    '1'    'FK_DEPTNO'...
  'PK_DEPT'
```

The results show the foreign exported key information.

Column	Description	Value
1	Catalog containing primary key that is exported	`null`

Column	Description	Value
2	Schema containing primary key that is exported	SCOTT
3	Table containing primary key that is exported	DEPT
4	Column name of primary key that is exported	DEPTNO
5	Catalog that has foreign key	null
6	Schema that has foreign key	SCOTT
7	Table that has foreign key	EMP
8	Foreign key column name, that is the column name that references the primary key in another table	DEPTNO
9	Sequence number within the foreign key	1
10	Update rule, that is, what happens to the foreign key when the primary key updates	null
11	Delete rule, that is, what happens to the foreign key when the primary key is deleted	1
12	Foreign key name	FK_DEPTNO
13	Primary key name that is referenced by foreign key	PK_DEPT

In the schema `SCOTT`, only one primary key is exported to (referenced by) another table. `DEPTNO`, the primary key of the table `DEPT`, is referenced by the field `DEPTNO` in the table `EMP`. The referenced table is `DEPT` and the referencing table is `EMP`. In the `DEPT` table, `DEPTNO` is an exported key. Reciprocally, the `DEPTNO` field in the table `EMP` is an imported key.

For a description of codes for update and delete rules, see the `getExportedKeys` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

`crossreference` | `dmd` | `get` | `importedkeys` | `primarykeys`

fastinsert

Add MATLAB data to database table

Syntax

```
fastinsert(conn,tablename,colnames,data)
```

Description

`fastinsert(conn,tablename,colnames,data)` exports records from the MATLAB variable `data` into new rows in an existing database table `tablename` and in existing columns `colnames` using the connection `conn`. You do not specify the type of data you are exporting; the data is exported in its current MATLAB format.

- Use `datainsert` when you want maximum performance, are able to format your input data in a specific way, and your input data is only cell arrays and numeric matrices.
- Use `fastinsert` when your input data is a structure, dataset array, or table, or you are using a native ODBC database connection.
- Use `insert` only if `datainsert` or `fastinsert` do not work for you and you want to insert a small set of data.

Examples

Insert a Table Record Using Native ODBC

Create a connection `conn` using the native ODBC interface and the `dbtoolboxdemo` data source.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin')
```

```
conn =

  ODBCConnection with properties:
```

```
      Instance: 'dbtoolboxdemo'
      UserName: 'admin'
       Message: []
        Handle: [1x1 database.internal.ODBCConnectHandle]
       TimeOut: 0
    AutoCommit: 0
          Type: 'ODBCConnection Object'
```

`conn` has an empty `Message` property, which means a successful connection.

Select and display the data from the `productTable`.

```
curs = exec(conn,'select * from productTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    -------------    -----------    --------------    --------    ------------------
     9               125970         1003              13          'Victorian Doll'
     8               212569         1001               5          'Train Set'
     7               389123         1007              16          'Engine Kit'
     2               400314         1002               9          'Painting Set'
     4               400339         1008              21          'Space Cruiser'
     1               400345         1001              14          'Building Blocks'
     5               400455         1005               3          'Tin Soldier'
     6               400876         1004               8          'Sail Boat'
     3               400999         1009              17          'Slinky'
    10               888652         1006              24          'Teddy Bear'
```

Store the column names of `productTable` in a cell array.

```
tablename = 'productTable';
colnames = {'productNumber','stockNumber','supplierNumber',...
    'unitCost','productDescription'};
```

Store the data for the insert in a cell array, `data`. The data contains `productNumber` equal to 11, `stockNumber` equal to 500565, `supplierNumber` equal to 1010, `unitCost` equal to $20, and `productDescription` equal to `'Cooking Set'`. Then, convert the cell array to a table, `data_table`.

```
data = {11, 500565, 1010, 20, 'Cooking Set'};
data_table = cell2table(data,'VariableNames',colnames)
```

```
data_table = 

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    -------------    -----------    --------------    --------    ------------------
    11               500565         1010              20          'Cooking Set'
```

Insert the table data into the productTable.

```
fastinsert(conn,tablename,colnames,data_table)
```

Display the data from the productTable again.

```
curs = exec(conn,'select * from productTable');
curs = fetch(curs);
curs.Data
```

```
ans = 

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    -------------    -----------    --------------    --------    ------------------
     9               125970         1003              13          'Victorian Doll'
     8               212569         1001               5          'Train Set'
     7               389123         1007              16          'Engine Kit'
     2               400314         1002               9          'Painting Set'
     4               400339         1008              21          'Space Cruiser'
     1               400345         1001              14          'Building Blocks'
     5               400455         1005               3          'Tin Soldier'
     6               400876         1004               8          'Sail Boat'
     3               400999         1009              17          'Slinky'
    10               888652         1006              24          'Teddy Bear'
    11               500565         1010              20          'Cooking Set'
```

A new row appears in the productTable with the data from data_table.

Close the database connection.

```
close(conn)
```

Insert a Record

Using the dbtoolboxdemo data source, establish the database connection conn using database.ODBCConnection or database. Assign the data to the cell array data. The data for insertion is productNumber equals 7777, Quantity equals 100, and Price equals 50.00.

```
data = {7777,100,50.00};
```

Create a cell array containing the column names of three columns, productNumber, Quantity, and Price.

```
tablename = 'inventoryTable';
colnames = {'productNumber','Quantity','Price'};
```

Insert the data into the inventoryTable.

```
fastinsert(conn,tablename,colnames,data)
```

Close the database connection.

```
close(conn)
```

Insert Multiple Records

Using the `dbtoolboxdemo` data source, establish the database connection `conn` using `database.ODBCConnection` or `database`. Assign multiple rows of data to the cell array `data`. Each row contains data for `productNumber`, `Quantity`, and `Price`. For example, the first row data for insertion is `productNumber` equals 7778, `Quantity` equals 125, and `Price` equals 23.00.

```
data = {7778,125,23.00; 7779,1160,14.7; 7780,150,54.5};
```

Create a cell array containing the column names of three columns, `productNumber`, `Quantity`, and `Price`.

```
tablename = 'inventoryTable';
colnames = {'productNumber','Quantity','Price'};
```

Insert the data into the `inventoryTable`.

```
fastinsert(conn,tablename,colnames,data)
```

For details, there are three sample files for different database vendors that demonstrate bulk insert:

- *matlabroot*`/toolbox/database/dbdemos/mssqlserverbulkinsert.m`
- *matlabroot*`/toolbox/database/dbdemos/mysqlbulkinsert.m`
- *matlabroot*`/toolbox/database/dbdemos/oraclebulkinsert.m`

Close the database connection.

```
close(conn)
```

Import Records, Perform Calculations, and Export Data

This example shows how to retrieve sales data from a `salesVolume` table, calculate the sum of sales for 1 month, store this data in a cell array, and export this data to a `yearlySales` table.

Connect to the data source `dbtoolboxdemo`.

```
conn = database('dbtoolboxdemo','admin','admin');
```

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

Use `setdbprefs` to set the format for retrieved data to `numeric`.

```
setdbprefs('DataReturnFormat','numeric')
```

Import 10 rows of data from the `March` column in the `salesVolume` table.

```
curs = exec(conn,'select March from salesVolume');
curs = fetch(curs);
```

Assign the data to the MATLAB workspace variable `AA`.

```
AA = curs.Data
```

```
AA =

981
1414
890
1800
2600
2800
800
1500
1000
821
```

Calculate the sum of the `March` sales and assign the result to the variable `sumA`.

```
sumA = sum(AA(:))
```

```
sumA =

   14606
```

Assign the month and sum of sales to a cell array to export to a database. Put the month in the first cell of `data`.

```
data(1,1) = {'March'}
```

```
data =
  'March'
```

Put the sum in the second cell of `data`.

```
data(1,2) = {sumA}
```

```
data =
    'March'    [14606]
```

Define the names of the columns to which to export data. In this example, the column names are `Month` and `salesTotal`, from the `yearlySales` table in the `dbtoolboxdemo` database. Assign the cell array containing the column names to the variable `colnames`.

```
tablename = 'yearlySales';
colnames = {'Month','salesTotal'};
```

Access the current status of the `AutoCommit` database flag. This status determines whether the exported data is automatically committed to the database. If the flag is `off`, you can undo an update; if it is `on`, data is automatically committed to the database.

```
conn.AutoCommit
```

```
ans =
 on
```

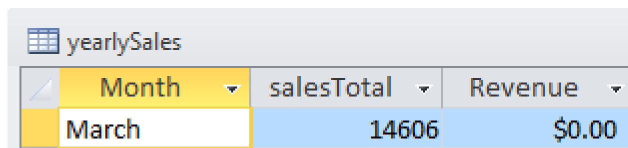
The `AutoCommit` flag is set to `on`, so the exported data is automatically committed to the database.

Use `fastinsert` to export the data into the `yearlySales` table.

```
fastinsert(conn,tablename,colnames,data)
```

`fastinsert` appends the data as a new record at the end of the `yearlySales` table.

In Microsoft Access, view the `yearlySales` table to verify the results.


yearlySales

Month	salesTotal	Revenue
March	14606	$0.00

Close the cursor and database connection.

```
close(curs)
```

```
close(conn)
```

Insert Numeric Data

Using the `dbtoolboxdemo` data source, establish the database connection `conn` using `database.ODBCConnection` or `database`. Then, insert `data`, a numeric matrix consisting of three columns denoted by `colnames`, into the `inventoryTable` table.

```
data = [25,439,60.00];
tablename = 'inventoryTable';
colnames = {'productNumber','Quantity','Price'};
fastinsert(conn,tablename,colnames,data)
```

Close the database connection.

```
close(conn)
```

Insert and Commit Data

Using the `dbtoolboxdemo` data source, establish the database connection `conn` using `database.ODBCConnection` or `database`. Then, set the `AutoCommit` flag to `off`.

```
set(conn,'AutoCommit','off')
```

Insert the cell array `data` into the `inventoryTable` with column names `colnames`.

```
data = {157,358,740.00};
colnames = {'productNumber','Quantity','Price'};
tablename = 'inventoryTable';
fastinsert(conn,tablename,colnames,data)
```

Commit the inserted data.

```
commit(conn)
```

Alternatively, commit the data using an SQL `commit` statement with the `exec` function.

```
curs = exec(conn,'commit');
```

Close the database connection.

```
close(conn)
```

Insert Boolean Data

Using the `dbtoolboxdemo` data source, insert `BOOLEAN` data (which is represented as MATLAB type `logical`) into a database.

Connect to the data source `dbtoolboxdemo`.

```
conn = database('dbtoolboxdemo','admin','admin');
```

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

Create `data` as a structure containing the invoice number `2101` and the `BOOLEAN` data of `1` to signify paid.

```
data.InvoiceNumber{1} = 2101;
data.Paid{1} = logical(1);
```

Insert the paid invoice data into the `invoice` table with column names `colnames`.

```
colnames = {'InvoiceNumber';'Paid'};
tablename = 'invoice';
fastinsert(conn,tablename,colnames,data)
```

View the new record in the database to verify that the `Paid` field is `BOOLEAN`. In some databases, the MATLAB logical value `0` is shown as a `BOOLEAN` `false`, `No`, or a cleared check box.

Close the database connection.

```
close(conn)
```

Input Arguments

`conn` — Database connection

connection object

Database connection, specified as a database connection object created using `database`.

`tablename` — Database table name

string

Database table name, specified as a string denoting the name of a table in your database.

Data Types: `char`

`colnames` — Database table column names

cell array of strings

Database table column names, specified as a cell array of one or more strings to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell`

`data` — Insert data
numeric matrix | cell array | table | dataset | structure

Insert data, specified as a numeric matrix, cell array, table, dataset array, or structure, that contains all data for insertion into the existing database table `tablename`. If `data` is a structure, field names in the structure must match `colnames`. If `data` is a table or a dataset array, the variable names in the table or dataset array must match `colnames`.

Data Types: `double` | `cell` | `table` | `struct`

More About

- “Inserting Data Using the fastinsert Function” on page 5-74
- “Connecting to a Database Using the Native ODBC Interface”
- “Getting Started with Visual Query Builder” on page 4-2

See Also

`commit` | `database` | `exec` | `get` | `insert` | `logical` | `querybuilder` | `rollback` | `set` | `update`

fetch

Import data into MATLAB workspace from cursor object or from execution of SQL statement

Syntax

```
curs = fetch(curs)
curs = fetch(curs,rowlimit)
curs = fetch(curs,Name,Value)
curs = fetch(curs,rowlimit,Name,Value)

results = fetch(conn,sqlquery)
results = fetch(conn,sqlquery,fetchbatchsize)
```

Description

`curs = fetch(curs)` imports all rows of data into the cursor object `curs` from the open SQL cursor object `curs`.

`curs = fetch(curs,rowlimit)` imports rows of data up to the maximum number of rows `rowlimit`.

`curs = fetch(curs,Name,Value)` imports rows of data using a scrollable cursor.

`curs = fetch(curs,rowlimit,Name,Value)` imports rows of data up to the maximum number of rows `rowlimit` using a scrollable cursor.

`results = fetch(conn,sqlquery)` executes the SQL statement sqlquery, imports all rows of data in batches for the open database connection conn, and returns the resulting data results.

`results = fetch(conn,sqlquery,fetchbatchsize)` imports all rows of data in batches of a specified number of rows fetchbatchsize at a time.

Examples

Import All Data Using the Native ODBC Interface and Cursor Object

Create a connection `conn` using the native ODBC interface and the `dbtoolboxdemo` data source.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin')
```

```
conn =

  ODBCConnection with properties:

       Instance: 'dbtoolboxdemo'
       UserName: 'admin'
        Message: []
         Handle: [1x1 database.internal.ODBCConnectHandle]
        TimeOut: 0
     AutoCommit: 0
           Type: 'ODBCConnection Object'
```

`conn` has an empty `Message` property, which means a successful connection.

Working with the `dbtoolboxdemo` data source, use `fetch` to import all data into the `database.ODBCCursor` object, `curs`, and store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select productDescription from productTable');
curs = fetch(curs)
```

```
curs =

  ODBCCursor with properties:

         Data: {10x1 cell}
     RowLimit: 0
     SQLQuery: 'select productDescription from productTable'
      Message: []
         Type: 'ODBCCursor Object'
    Statement: [1x1 database.internal.ODBCStatementHandle]
```

With the native ODBC interface, `curs` returns an `ODBCCursor Object` instead of a `Database Cursor Object`.

View the contents of the `Data` element in the cursor object.

```
curs.Data
```

```
ans = 

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
    'Tin Soldier'
    'Sail Boat'
    'Slinky'
    'Teddy Bear'
```

After finishing with the cursor object, close it.

```
close(curs)
```

Import All Data Using the Cursor Object

Working with the `dbtoolboxdemo` data source, use `exec` to select data in column `City` in the table `suppliers`. Then, use `fetch` to import all data from the SQL statement into the cursor object `curs`, and store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select City from suppliers');
curs = fetch(curs)

curs = 

        Attributes: []
              Data: {10x1 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select City from suppliers'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

View the contents of the `Data` element in the cursor object.

```
curs.Data

ans = 

    'New York'
```

```
    'London'
    'Adelaide'
    'Dublin'
    'Boston'
    'New York'
    'Wellesley'
    'Nashua'
    'London'
    'Belfast'
```

After finishing with the cursor object, close it.

```
close(curs)
```

Import Specified Rows Using the Cursor Object

Working with the `dbtoolboxdemo` data source, use the `rowlimit` argument to retrieve only the first three rows of data.

```
curs = exec(conn,'select productdescription from producttable');
curs = fetch(curs,3)
```

```
curs =

        Attributes: []
              Data: {3x1 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select productdescription from producttable'
           Message: []
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

View the data.

```
curs.Data
```

```
ans =

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
```

Rerun the `fetch` function to return the second three rows of data.

```
curs = fetch(curs, 3);
```

View the data.

```
curs.Data
```

```
ans =

    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
```

After finishing with the cursor object, close it.

```
close(curs)
```

Import Data Iteratively Using the Cursor Object

Working with the `dbtoolboxdemo` data source, use the `rowlimit` argument to retrieve the first two rows of data, and then rerun the import using a `while` loop, retrieving two rows at a time. Continue until you have retrieved all data, which occurs when `curs.Data` is `'No Data'`.

```
curs = exec(conn,'select productdescription from producttable');
% Initialize rowlimit
rowlimit = 2
% Check for more data. Retrieve and display all data.
while ~strcmp(curs.Data,'No Data')
 curs = fetch(curs,rowlimit);
 curs.Data(:)
end
```

```
rowlimit =

     2


ans =

    'Victorian Doll'
    'Train Set'


ans =
```

```
    'Engine Kit'
    'Painting Set'


ans =

    'Space Cruiser'
    'Building Blocks'


ans =

    'Tin Soldier'
    'Sail Boat'


ans =

    'Slinky'
    'Teddy Bear'

ans =
    'No Data'
```

After finishing with the cursor object, close it.

```
close(curs)
```

Import Data with an Absolute Position Offset Using the Scrollable Cursor

This example assumes you are connecting to a MySQL database that contains a table called `productTable`. This table contains 15 records, where each record represents one product.

Connect to the MySQL database using the native ODBC interface. This code assumes you are connecting to a data source named `MySQL` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('MySQL','username','pwd');
```

Select all products from the `productTable` table and sort them in ascending order by product number. Create a scrollable cursor using the name-value pair argument `'cursorType'`.

```
curs = exec(conn,'select * from productTable order by productNumber',...
            'cursorType','scrollable');
```

Import the last five products in the data set using the absolute position offset 11.

```
curs = fetch(curs,'absolutePosition',11);
```

Display the data for the five products.

```
curs.Data
```

```
ans =

    [11]    [408143]    [1004]    [      11]    'Convertible'
    [12]    [210456]    [1010]    [      22]    'Hugsy'
    [13]    [470816]    [1012]    [16.5000]    'Pancakes'
    [14]    [510099]    [1011]    [      19]    'Shawl'
    [15]    [899752]    [1011]    [      20]    'Snacks'
```

The columns in `curs.Data` are:

- Product number
- Stock number
- Supplier number
- Unit cost
- Product description

After calling `fetch`, the position of the cursor is located after the data set.

After finishing with the cursor object, close it.

```
close(curs)
```

Import Data with a Row Limit Using the Scrollable Cursor

This example assumes you are connecting to a MySQL database that contains a table called `productTable`. This table contains 15 records, where each record represents one product.

Connect to the MySQL database using the native ODBC interface. This code assumes you are connecting to a data source named `MySQL` with user name `username` and password `pwd`.

```
conn = database.ODBCConnection('MySQL','username','pwd');
```

Select all products from the `productTable` table and sort them in ascending order by product number. Create a scrollable cursor using the name-value pair argument `'cursorType'`.

```
curs = exec(conn,'select * from productTable order by productNumber',...
            'cursorType','scrollable');
```

Import the data for two products in the middle of the data set. Use the row limit `2` to import data for two products. Use the absolute position offset `3` to import data starting from the third product in the data set.

```
curs = fetch(curs,2,'absolutePosition',3);
```

Display the data for the two products.

```
curs.Data
```

```
ans =

    [3]    [400999]    [1009]    [17]    'Slinky'
    [4]    [400339]    [1008]    [21]    'Space Cruiser'
```

The columns in `curs.Data` are:

- Product number
- Stock number
- Supplier number
- Unit cost
- Product description

Display the position of the cursor.

```
curs.Position
```

```
ans =

     3
```

The position of the cursor stays at the absolute position offset `3`.

After finishing with the cursor object, close it.

```
close(curs)
```

Import Data with Different Formats Using the Cursor Object

Import data that includes a `BOOLEAN` field, using the `setdbprefs` function to specify `cellarray` as the format for the retrieved data.

```
curs = exec(conn,['select InvoiceNumber, '...
'Paid from Invoice']);
setdbprefs('DataReturnFormat','cellarray')
curs = fetch(curs,5);
A = curs.Data

A =

    [ 2101]    [0]
    [ 3546]    [1]
    [33116]    [1]
    [34155]    [0]
    [34267]    [1]
```

View the class of the second column of `A`.

```
class(A{1,2})

ans =
logical
```

After finishing with the cursor object, close it.

```
close(curs)
```

Import Data Using the Database Connection Object

`fetch` imports data from the specified SQL statement when you pass a database object, `conn`, as the first argument. Use this example when using a JDBC/ODBC bridge or a JDBC interface. For the native ODBC interface, use `curs` as the input argument.

Using the `dbtoolboxdemo` data source that you access using the database connection object, `conn`, import the `productDescription` column from `productTable`. Set the data return format to `'cellarray'` using `setdbprefs`.

```
setdbprefs('DataReturnFormat','cellarray')
```

```
sqlquery = 'select productdescription from productTable';

results = fetch(conn, sqlquery)

results = 

    'Victorian Doll'
    'Train Set'
    'Engine Kit'
    'Painting Set'
    'Space Cruiser'
    'Building Blocks'
    'Tin Soldier'
    'Sail Boat'
    'Slinky'
    'Teddy Bear'
```

View the size of the cell array into which the results were returned.

```
size(results)

ans =

    10     1
```

Close the database connection.

```
close(conn)
```

Import Data with fetchbatchsize Using the Database Connection Object

`fetch` imports data from the specified SQL statement when you pass a database object, `conn`, as the first argument. Use this example when using a JDBC/ODBC bridge or a JDBC interface. For the native ODBC interface, use `curs` as the input argument.

Using the `dbtoolboxdemo` data source that you access using the database connection object, `conn`, import the `productDescription` column from the `productTable` by using the `fetchbatchsize` argument.

```
setdbprefs('DataReturnFormat','cellarray')
sqlquery = 'select productdescription from productTable';
fetchbatchsize = 5;

results = fetch(conn,sqlquery,fetchbatchsize);
```

`fetch` returns all the data by importing it in batches of five rows at a time.

Close the database connection.

```
close(conn)
```

- “Fetch Data Incrementally Using the Cursor Object”
- “View Information About Data Using the Database Connection Object”
- “Import Data Using a Scrollable Cursor with a Relative Position Offset”
- “ Retrieve Image Data Types”

Input Arguments

`curs` — Database cursor
database cursor object

Database cursor, specified as an open SQL database cursor object created using `exec`.

`conn` — Database connection
connection object

Database connection, specified as a database connection object created using `database`.

`sqlquery` — SQL statement
SQL string

SQL statement, specified as an SQL string to execute.

Data Types: `char`

`rowlimit` — Row limit
scalar

Row limit, specified as a scalar denoting the number of rows of data to import from the open SQL cursor object, `curs`.

Data Types: `double`

`fetchbatchsize` — Fetch batch size
scalar

Fetch batch size, specified as a scalar denoting the number of rows of data to batch at a time. Use `fetchbatchsize` when importing large amounts of data. Retrieving data in batches reduces overall retrieval time. If `fetchbatchsize` is not provided, a default value of `'FetchBatchSize'` is used. `'FetchBatchSize'` is set using `setdbprefs`.

Data Types: `double`

Name-Value Pair Arguments

Specify optional comma-separated pairs of Name,Value arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'absolutePosition',5`

`'absolutePosition'` — Absolute position offset
scalar

Absolute position offset, specified as a scalar to denote the absolute position offset value. When you specify an absolute position offset value, `fetch` imports data starting from the cursor position equal to this value regardless of the current cursor location. The scalar can be a positive number to signify fetching data from the start of the data set. Or, the scalar can be a negative number to signify fetching data from the end of the data set. This name-value pair argument is only available when you create a scrollable cursor object using `exec`. For details, see "Importing Data Using a Scrollable Cursor".

Data Types: `double`

`'relativePosition'` — Relative position offset
scalar

Relative position offset, specified as a scalar to denote the relative position offset value. When you specify a relative position offset value, `fetch` adds the current cursor position value to the relative position offset value. Then, `fetch` imports data starting from the resulting value. The scalar can be a positive number to signify importing data after the current cursor position in the data set. Or, the scalar can be a negative number to signify importing data before the current cursor position in the data set. This name-value pair argument is only available when you create a scrollable cursor object using `exec`. For details, see "Importing Data Using a Scrollable Cursor".

Data Types: `double`

Output Arguments

`curs` — Database cursor

database cursor object

Database cursor, returned as a database cursor object populated with fetched data in the `Data` property. You can specify the output data format in the `Data` property by using `setdbprefs`.

`results` — Result data

cell array | table | dataset | structure | numeric matrix

Result data, returned as a cell array, table, dataset array, structure, or numeric matrix as specified by `'DataReturnFormat'` in `setdbprefs`.

More About

- “Importing Data Using the fetch Function” on page 5-55
- “Importing Data Using a Scrollable Cursor”
- “Connecting to a Database Using the Native ODBC Interface”
- “Preference Settings for Large Data Import”
- “Data Retrieval Restrictions” on page 1-8

See Also

`close` | `database` | `exec` | `logical` | `setdbprefs`

fetchmulti

Import data from multiple resultsets

Syntax

```
curs = fetchmulti(curs)
```

Description

`curs = fetchmulti(curs)` imports data from the open SQL cursor object `curs` into the object `curs`, where the open SQL cursor object contains multiple resultsets.

Multiple resultsets are retrieved via `exec` with a `sqlquery` statement that runs a stored procedure consisting of two select statements.

`cursmulti.Data` contains data from each resultset associated with `cursmulti.Statement`. `cursmulti.Data` is a cell array consisting of cell arrays, structures, or numeric matrices as specified in `setdbprefs`; the data type is the same for all resultsets.

Examples

Use `exec` to run a stored procedure that includes multiple select statements and `fetchmulti` to retrieve the resulting multiple resultsets.

```
conn = database(...)
setdbprefs('DataReturnFormat','cellarray')
curs = exec(conn, '{call sp_1}');
curs = fetchmulti(curs)
Attributes: []
              Data: {{10x1 cell} {12x4 cell}}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: '{call sp_1}'
           Message: []
              Type: 'Database Cursor Object'
```

```
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
          [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: ...
     [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
           [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: ...
     [1x1 com.mathworks.toolbox.database.fetchTheData]
```

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

See Also

`fetch` | `database` | `exec` | `setdbprefs`

get

Retrieve object properties

Syntax

```
s = get(object)
v = get(object,property)
```

Description

`s = get(object)` returns a structure that contains `object` and its corresponding properties, and assigns the structure to `s`.

`v = get(object,property)` retrieves the value of `property` for `object` and assigns the value to `v`.

Examples

Get Database Metadata Object Properties

Retrieve the properties of a database metadata object created using a database connection object.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Construct a database metadata object `dbmeta` using the database connection object `conn`.

```
dbmeta = dmd(conn);
```

Retrieve the properties of `dbmeta` and assign them to MATLAB variable `v`.

```
v = get(dbmeta)
```

```
v =

                AllProceduresAreCallable: 1
                  AllTablesAreSelectable: 1
    DataDefinitionCausesTransactionCommit: 1
      DataDefinitionIgnoredInTransactions: 0
               DoesMaxRowSizeIncludeBlobs: 0
                                 Catalogs: {8x1 cell}
                         CatalogSeparator: '.'
                              CatalogTerm: 'DATABASE'
                      DatabaseProductName: 'ACCESS'
                   DatabaseProductVersion: '04.00.0000'
              DefaultTransactionIsolation: 2
                       DriverMajorVersion: 2
                       DriverMinorVersion: 1
                               DriverName: 'JDBC-ODBC Bridge (ACEODBC.DLL)'
                            DriverVersion: '2.0001 (Microsoft Access database engine)'
                      ExtraNameCharacters: '~@#$%^&*_-+=\}{"';:?/><,.![]|'
                    IdentifierQuoteString: '`'
                         IsCatalogAtStart: 1
                   MaxBinaryLiteralLength: 255
                     MaxCatalogNameLength: 260
                     MaxCharLiteralLength: 255
                      MaxColumnNameLength: 64
                      MaxColumnsInGroupBy: 10
                        MaxColumnsInIndex: 10
                      MaxColumnsInOrderBy: 10
                       MaxColumnsInSelect: 255
                        MaxColumnsInTable: 255
                           MaxConnections: 64
                      MaxCursorNameLength: 64
                           MaxIndexLength: 255
                   MaxProcedureNameLength: 64
                               MaxRowSize: 4052
                      MaxSchemaNameLength: 0
                       MaxStatementLength: 65000
                            MaxStatements: 0
                       MaxTableNameLength: 64
                        MaxTablesInSelect: 16
                        MaxUserNameLength: 0
                         NumericFunctions: [1x73 char]
                            ProcedureTerm: 'QUERY'
                                  Schemas: {}
                               SchemaTerm: ''
                       SearchStringEscape: '\'
                              SQLKeywords: [1x255 char]
                          StringFunctions: [1x91 char]
               StoresLowerCaseIdentifiers: 0
         StoresLowerCaseQuotedIdentifiers: 0
               StoresMixedCaseIdentifiers: 0
         StoresMixedCaseQuotedIdentifiers: 1
               StoresUpperCaseIdentifiers: 0
         StoresUpperCaseQuotedIdentifiers: 0
                          SystemFunctions: ''
                               TableTypes: {18x1 cell}
                        TimeDateFunctions: [1x111 char]
                                 TypeInfo: {16x1 cell}
                                      URL: 'jdbc:odbc:tutorial2'
                                 UserName: 'admin'
                    NullPlusNonNullIsNull: 0
```

```
        NullsAreSortedAtEnd: 0
      NullsAreSortedAtStart: 0
         NullsAreSortedHigh: 0
          NullsAreSortedLow: 1
      UsesLocalFilePerTable: 0
              UsesLocalFiles: 1
```

Display the contents of the `Catalogs` property of `v`.

```
v.Catalogs
```

```
ans =
     'D:\matlab\toolbox\database\dbdemos\db1'
     'D:\matlab\toolbox\database\dbdemos\origtutorial'
     'D:\matlab\toolbox\database\dbdemos\tutorial'
     'D:\matlab\toolbox\database\dbdemos\tutorial1'
```

Close the connection.

```
close(conn)
```

Get the AutoCommit Flag Status

Retrieve the `'AutoCommit'` property of the database connection object.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Check the status of the `'AutoCommit'` property for the database connection `conn`.

```
v = get(conn,'AutoCommit')
```

```
v =
 on
```

Close the connection.

```
close(conn)
```

Input Arguments

`object` — Database Toolbox object

database connection object | cursor object | driver object | ...

Database Toolbox object, specified as the following allowable objects:

- Database connection object, which is created using `database`
- Cursor object, which is created using `exec` or `fetch`
- Driver object, which is created using `driver`
- Database metadata object, which is created using `dmd`
- Drivermanager object, which is created using `drivermanager`
- Resultset object, which is created using `resultset`
- Resultset metadata object, which is created using `rsmd`

For a list of properties for each object, see “Retrieving Object Properties Using the get Function” on page 5-76.

`property` — Property of Database Toolbox object

string

Property of the Database Toolbox object, specified as a string.

Data Types: `char`

Output Arguments

s — Object properties

structure

Object properties, returned as a structure that contains the object and its corresponding properties.

v — Object property value

string | numeric | cell array | object

Object property value, returned as a string, numeric value, cell array, or object.

More About

- “Retrieving Object Properties Using the get Function” on page 5-76

See Also

`columns` | `database` | `dmd` | `driver` | `drivermanager` | `exec` | `fetch` | `getdatasources` | `resultset` | `rows` | `rsmd` | `set`

getdatasources

Return names of ODBC and JDBC data sources on system

Syntax

```
d = getdatasources
```

Description

`d = getdatasources` returns the names of valid ODBC and JDBC data sources on the system as a cell array `d` of strings. The function gets the names of ODBC data sources from the `ODBC.INI` file located in the folder returned by running:

```
myODBCdir = getenv('WINDIR')
```

`d` is empty when the `ODBC.INI` file is valid, but no data sources are defined. `d` equals `-1` when the `ODBC.INI` file cannot be opened.

The function also retrieves the names of data sources that are in the system registry but not in the `ODBC.INI` file.

If you do not have write access to `myODBCdir`, the results of `getdatasources` may not include data sources that you recently added. In this case, specify a temporary, writable, output folder via the preference `TempDirForRegistryOutput`. For details about this preference, see `setdbprefs`.

`getdatasources` gets the names of JDBC data sources from the file that you define using `setdbprefs` or the Define JDBC data sources dialog box.

Examples

Get the names of databases on your system.

```
d = getdatasources
d =
    'MS Access Database'  'dbtoolboxdemo'
```

See Also

`database` | `get` | `setdbprefs`

importedkeys

Return information about imported foreign keys

Syntax

```
i = importedkeys(dbmeta, 'cata', 'sch')
i = importedkeys(dbmeta, 'cata', 'sch', 'tab')
```

Description

`i = importedkeys(dbmeta, 'cata', 'sch')` returns foreign imported key information, that is, information about fields that reference primary keys in other tables, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`i = importedkeys(dbmeta, 'cata', 'sch', 'tab')` returns foreign imported key information in the table `tab`. In turn, fields in `tab` reference primary keys in other tables in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get foreign key information for the schema `SCOTT` in the catalog `orcl`, for `dbmeta`.

```
i = importedkeys(dbmeta,'orcl','SCOTT')
i =
  Columns 1 through 7
    'orcl'   'SCOTT'   'DEPT'   'DEPTNO'    'orcl'...
    'SCOTT'    'EMP'
  Columns 8 through 13
    'DEPTNO'    '1'    'null'    '1'    'FK_DEPTNO'...
    'PK_DEPT'
```

The results show foreign imported key information as described in the following table.

Column	Description	Value
1	Catalog containing primary key, referenced by foreign imported key	`orcl`
2	Schema containing primary key, referenced by foreign imported key	`SCOTT`
3	Table containing primary key, referenced by foreign imported key	`DEPT`
4	Column name of primary key, referenced by foreign imported key	`DEPTNO`
5	Catalog that has foreign imported key	`orcl`
6	Schema that has foreign imported key	`SCOTT`
7	Table that has foreign imported key	`EMP`
8	Foreign key column name, that is the column name that references the primary key in another table	`DEPTNO`
9	Sequence number within foreign key	`1`
10	Update rule, that is, what happens to the foreign key when the primary key updates	`null`
11	Delete rule, that is, what happens to the foreign key when the primary key is deleted	`1`
12	Foreign imported key name	`FK_DEPTNO`
13	Primary key name in referenced table	`PK_DEPT`

In the schema `SCOTT`, there is only one foreign imported key. The table `EMP` contains a field, `DEPTNO`, that references the primary key in the `DEPT` table, the `DEPTNO` field.

`EMP` is the referencing table and `DEPT` is the referenced table.

`DEPTNO` is a foreign imported key in the `EMP` table. Reciprocally, the `DEPTNO` field in the table `DEPT` is an exported foreign key and the primary key.

For a description of the codes for update and delete rules, see the `getImportedKeys` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

crossreference | get | dmd | exportedkeys | primarykeys

indexinfo

Return indices and statistics for database tables

Syntax

```
x = indexinfo(dbmeta, 'cata', 'sch', 'tab')
```

Description

`x = indexinfo(dbmeta, 'cata', 'sch', 'tab')` returns indices and statistics for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get index and statistics information for the table `DEPT` in the schema `SCOTT` of the catalog `orcl`, for `dbmeta`.

```
x = indexinfo(dbmeta,'','SCOTT','DEPT')
x =
 Columns 1 through 8
 'orcl'  'SCOTT'  'DEPT'  '0'  'null'  'null'    '0'  '0'
 'orcl'  'SCOTT'  'DEPT'  '0'  'null'  'PK_DEPT' '1'  '1'

  Columns 9 through 13
  'null'    'null'  '4'  '1'  'null'
  'DEPTNO'  'null'  '4'  '1'  'null'
```

The results contain two rows, meaning there are two index columns. The statistics for the first index column appear in the following table.

Column	Description	Value
1	Catalog	`orcl`
2	Schema	`SCOTT`
3	Table	`DEPT`

Column	Description	Value
4	Not unique: 0 if index values can be not unique, 1 otherwise	0
5	Index catalog	null
6	Index name	null
7	Index type	0
8	Column sequence number within index	0
9	Column name	null
10	Column sort sequence	null
11	Number of rows in the index table or number of unique values in the index	4
12	Number of pages used for the table or number of pages used for the current index	1
13	Filter condition	null

For details about the index information, see the `getIndexInfo` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

`dmd` | `get` | `tables`

insert

Add MATLAB data to database tables

Syntax

```
insert(conn,tablename,colnames,data)
```

Description

`insert(conn,tablename,colnames,data)` exports records from the MATLAB variable `data` into new rows in an existing database table `tablename` using the connection `conn`.

Tips:

- `insert` supports the native ODBC interface. To insert dates and timestamps with the native ODBC interface, use the format `'YYYY-MM-DD HH:MM:SS.MS'`.
- To insert data into a structure, table, or dataset array, use the following special formatting. Each field or variable in a structure, table, or dataset array must be a cell array or double vector of size m-by-1, where m is the number of rows to be inserted.

Examples

Insert a Table Record Using Native ODBC

Create a connection `conn` using the native ODBC interface and the `dbtoolboxdemo` data source.

```
conn = database.ODBCConnection('dbtoolboxdemo','admin','admin');
```

Select and display the data from the `productTable` table.

```
curs = exec(conn,'select * from productTable');
curs = fetch(curs);
```

```
curs.Data
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    -------------    -----------    --------------    --------    ------------------
     9               125970         1003              13          'Victorian Doll'
     8               212569         1001               5          'Train Set'
     7               389123         1007              16          'Engine Kit'
     2               400314         1002               9          'Painting Set'
     4               400339         1008              21          'Space Cruiser'
     1               400345         1001              14          'Building Blocks'
     5               400455         1005               3          'Tin Soldier'
     6               400876         1004               8          'Sail Boat'
     3               400999         1009              17          'Slinky'
    10               888652         1006              24          'Teddy Bear'
```

Store the column names of `productTable` in a cell array.

```
colnames = {'productNumber','stockNumber','supplierNumber',...
    'unitCost','productDescription'};
```

Store the data for the insert in a cell array, `data`. The data contains `productNumber` equal to 11, `stockNumber` equal to 400565, `supplierNumber` equal to 1010, `unitCost` equal to $10, and `productDescription` equal to `'Rubik''s Cube'`. Then, convert the cell array to a table, `data_table`.

```
data = {11,400565,1010,10,'Rubik''s Cube'};
data_table = cell2table(data,'VariableNames',colnames)
```

```
data_table =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    -------------    -----------    --------------    --------    ------------------
    11               400565         1010              10          'Rubik's Cube'
```

Insert the table data into `productTable`.

```
tablename = 'productTable';
insert(conn,tablename,colnames,data_table)
```

Display the data from `productTable` again.

```
curs = exec(conn,'select * from productTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    productNumber    stockNumber    supplierNumber    unitCost    productDescription
    -------------    -----------    --------------    --------    ------------------
     9               125970         1003              13          'Victorian Doll'
     8               212569         1001               5          'Train Set'
```

```
      7        389123     1007       16      'Engine Kit'
      2        400314     1002        9      'Painting Set'
      4        400339     1008       21      'Space Cruiser'
      1        400345     1001       14      'Building Blocks'
      5        400455     1005        3      'Tin Soldier'
      6        400876     1004        8      'Sail Boat'
      3        400999     1009       17      'Slinky'
     10        888652     1006       24      'Teddy Bear'
     11        400565     1010       10      'Rubik's Cube'
```

A new row appears in `productTable` with the data from `data_table`.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Insert the Contents of a Cell Array

Create a database connection `conn` using the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo','','');
```

Select and display the data from the `yearlySales` table.

```
curs = exec(conn,'select * from yearlySales');
curs = fetch(curs);
curs.Data
```

```
ans =

      Month        salesTotal     Revenue
    ---------      ----------     -------
    'January'      130            1200
    'Feb'           25             250
```

Store the column names of `yearlySales` in a cell array.

```
colnames = {'Month','salesTotal','Revenue'};
```

Store the data for the insert in a cell array, `data`. The data contains `Month` equal to `'March'`, `salesTotal` equal to $50, and `Revenue` equal to $2000.

```
data = {'March',50,2000};
```

Insert the data into `yearlySales`.

```
tablename = 'yearlySales';
insert(conn,tablename,colnames,data)
```

Display the data from `yearlySales` again.

```
curs = exec(conn,'select * from yearlySales');
curs = fetch(curs);
curs.Data
```

```
ans =

      Month       salesTotal    Revenue
    ---------     ----------    -------
    'January'     130           1200
    'Feb'          25            250
    'March'        50           2000
```

A new row appears in `yearlySales` with the data from `data`.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Input Arguments

`conn` — Database connection

connection object

Database connection, specified as a database connection object created using `database`.

`tablename` — Database table name

string

Database table name, specified as a string denoting the name of a table in your database.

Data Types: `char`

`colnames` — Database table column names

cell array of strings

Database table column names, specified as a cell array of one or more strings to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell`

`data` — Insert data

cell array | numeric matrix | table | dataset | structure

Insert data, specified as a cell array, numeric matrix, table, dataset array, or structure. You do not specify the type of data you are exporting; the data is exported in its current MATLAB format. If `data` is a structure, field names in the structure must match `colnames`. If `data` is a table or a dataset array, the variable names in the table or dataset array must match `colnames`.

Data Types: `double` | `struct` | `table` | `cell`

More About

Tips

- When working with a JDBC driver connection or a JDBC/ODBC bridge connection established using the `database` function, `fastinsert` offers improved performance over `insert`. This is because `insert` creates and executes an SQL insert query for each row of data. `fastinsert` creates the insert query only once and then allows for the data values to be plugged in. All rows of data get inserted as a batch resulting in an overall faster performance over `insert`. However, since `fastinsert` relies more on driver functions compared to `insert`, it is possible in some edge case scenarios that the driver functions do not work as expected. In such cases, `insert` might be preferred, especially if the data to be inserted is small. `datainsert` is faster than `fastinsert` but needs data to be formatted in a specific way and accepts cell arrays and numeric matrices as input data.
- When working with a native ODBC connection established using the `database.ODBCConnection` function, `fastinsert` and `insert` are identical. `datainsert` is not supported for native ODBC connections.
- `insert` uses the same syntax as `fastinsert`.

- “Connecting to a Database Using the Native ODBC Interface”

See Also

`commit` | `fastinsert` | `rollback`

isconnection

Determine if database connections are valid

Syntax

```
a = isconnection(conn)
```

Description

`a = isconnection(conn)` returns `1` if the database connection `conn` is valid, or returns `0` otherwise.

Examples

Check if the database connection `conn` is valid.

```
a = isconnection(conn)
a =
     1
```

See Also

`database` | `ping` | `isreadonly`

isdriver

Detect whether driver is valid JDBC driver object

Syntax

```
a = isdriver(d)
```

Description

`a = isdriver(d)` returns `1` if `d` is a valid JDBC driver object. It returns `0` otherwise.

Examples

Check if `d` is a valid JDBC driver object.

```
a = isdriver(d)
a =
     1
```

See Also

`driver` | `isurl` | `get` | `isjdbc`

isjdbc

Detect whether driver is JDBC compliant

Syntax

```
a = isjdbc(d)
```

Description

`a = isjdbc(d)` returns `1` if the driver object `d` is JDBC compliant. It returns `0` otherwise.

Examples

Verify whether the database driver object `d` is JDBC compliant.

```
a = isjdbc(d)
a =
     1
```

See Also

`driver` | `isurl` | `get` | `isdriver`

isnullcolumn

Determine if last record read in resultset is NULL

Syntax

```
a = isnullcolumn(rset)
```

Description

`a = isnullcolumn(rset)` returns `1` if the last record read in the resultset `rset` is `NULL`. It returns `0` otherwise.

Examples

Example 1 — Result Is Not NULL

`isnullcolumn` returns not null.

1 Run:

```
curs = fetch(curs,1);
rset = resultset(curs);
isnullcolumn(rset)
ans =
     0
```

2 Verify this result.

```
curs.Data
ans =
    [1400]
```

Example 2 — Result Is NULL

`isnullcolumn` returns null.

1 Run:

```
curs = fetch(curs,1);
rset = resultset(curs);
isnullcolumn(rset)
ans =
     1
```

2 Verify this result.

```
curs.Data
ans =
    [NaN]
```

See Also

get | resultset

isreadonly

Determine if database connection is read only

Syntax

```
a = isreadonly(conn)
```

Description

`a = isreadonly(conn)` returns `1` if the database connection `conn` is read only. It returns `0` otherwise.

Examples

Check whether `conn` is read only.

```
a = isreadonly(conn)
```

The result indicates that the database connection `conn` is read only:

```
a =
     1
```

Therefore, you cannot run `fastinsert`, `insert`, or `update` functions on this database.

See Also

`database` | `isconnection`

isurl

Detect whether database URL is valid

Syntax

`a = isurl(d, 's')`

Description

`a = isurl(d, 's')` returns `1` if the database URL `s` for the driver object `d` is valid. It returns `0` otherwise.

The URL `s` is of the form `jdbc:odbc:`*`name`* or *`name`*.

Examples

Check whether the database URL `jdbc:odbc:thin:@144.212.123.24:1822:` is valid for driver object `d`.

```
a = isurl(d, 'jdbc:odbc:thin:@144.212.123.24:1822:')
a =
     1
```

This indicates that the database URL is valid for `d`.

See Also

`driver` | `get` | `isdriver` | `isjdbc`

logintimeout

Set or get time allowed to establish database connection

Syntax

```
timeout = logintimeout('driver', time)
timeout = logintimeout(time)
timeout = logintimeout('driver')
timeout = logintimeout
```

Description

`timeout = logintimeout('driver', time)` sets the amount of time, in seconds, for a MATLAB session to connect to a database via a given JDBC `driver`. Use `logintimeout` before running the `database` function. If the MATLAB session cannot connect to the database within the specified time, it stops trying.

`timeout = logintimeout(time)` sets the amount of time, in seconds, allowed for a MATLAB session to try to connect to a database via an ODBC connection. Use `logintimeout` before running the `database` function. If the MATLAB session cannot connect within the allowed time, it stops trying.

`timeout = logintimeout('driver')` returns the `time`, in seconds, that was previously specified for the JDBC `driver`. A returned value of 0 means that the timeout value was not previously set. The MATLAB session stops trying to connect to the database if it is not immediately successful.

`timeout = logintimeout` returns the `time`, in seconds, that you previously specified for an ODBC connection. A returned value of 0 means that the timeout value was not previously set; the MATLAB software session stops trying to make a connection if it is not immediately successful.

Note: If you do not specify a value for `logintimeout` and the MATLAB session cannot establish a database connection, your MATLAB session may freeze.

Note: Apple Mac OS platforms do not support `logintimeout`.

Examples

Example 1 — Get Timeout Value for ODBC Connection

View the current connection timeout value.

```
logintimeout
ans =
    0
```

This indicates that you have not specified a timeout value.

Example 2 — Set Timeout Value for ODBC Connection

Set the timeout value to 5 seconds.

```
logintimeout(5)
ans =
     5
```

Example 3 — Get and Set Timeout Value for JDBC Connection

1 Check the timeout value for a database connection that is established using an Oracle JDBC driver.

```
logintimeout('oracle.jdbc.driver.OracleDriver')
ans =
     0
```

This indicates that the timeout value is currently `0`.

2 Set the timeout to 5 seconds.

```
timeout = ...
logintimeout('oracle.jdbc.driver.OracleDriver', 5)
timeout =
     5
```

3 Verify the timeout value.

```
logintimeout('oracle.jdbc.driver.OracleDriver')
ans =
     5
```

See Also

`database` | `get` | `set`

namecolumn

Map resultset column name to resultset column index

Syntax

```
x = namecolumn(rset, n)
```

Description

`x = namecolumn(rset, n)` maps a resultset column name `n` to its resultset column index. `rset` is the resultset and `n` is a string or cell array of strings containing the column names.

Examples

1. Get the indices for the column names `DNAME` and `LOC` resultset object `rset`.

   ```
   x  =  namecolumn(rset, {'DNAME';'LOC'})
   x =
        2     3
   ```

   The results show that `DNAME` is column `2` and `LOC` is column `3`.

2. Get the index only for the `LOC` column.

   ```
   x  =  namecolumn(rset, 'LOC')
   ```

See Also

`columnnames` | `resultset`

ping

Retrieve status information about database connection

Syntax

```
ping(conn)
```

Description

`ping(conn)` retrieves the status of the database connection `conn`.

Examples

Retrieve Status of an ODBC Connection

Create an Oracle connection using an ODBC driver. For example, the following code assumes you are connecting a data source named `dbname` with user name `username` and password `pwd`.

```
conn = database(dbname,username,pwd);
```

Retrieve the status of the Oracle connection.

```
ping(conn)
```

```
ans = 

       DatabaseProductName: 'Oracle'
    DatabaseProductVersion: '11.02.0010'
            JDBCDriverName: 'JDBC-ODBC Bridge (SQORA32.DLL)'
         JDBCDriverVersion: '2.0001 (11.02.0001)'
    MaxDatabaseConnections: 0
           CurrentUserName: 'username'
               DatabaseURL: 'jdbc:odbc:dbname'
    AutoCommitTransactions: 'True'
```

`ping` returns the database name, database version, JDBC driver name, JDBC driver version, maximum number of database connection allowed, user name for the current connection, and the database URL. The last field denotes if the current database connection allows automatic commit of transactions.

Close the connection.

```
close(conn)
```

Retrieve Status of an JDBC Connection

Create a Microsoft SQL Server connection using a JDBC driver. For example, the following code assumes you are connecting a data source named `dbname` with user name `username`, password `pwd`, database server name `sname`, and port number `123456`.

```
conn = database('dbname','username','pwd',...
                'Vendor','Microsoft SQL Server','Server','sname',...
                'AuthType','Server','portnumber',123456);
```

Retrieve the status of the Microsoft SQL Server connection.

```
ping(conn)
```

```
ans =

       DatabaseProductName: 'Microsoft SQL Server'
    DatabaseProductVersion: '11.00.3000'
            JDBCDriverName: 'Microsoft JDBC Driver 4.0 for SQL Server'
         JDBCDriverVersion: '4.0.2206.100'
    MaxDatabaseConnections: 0
           CurrentUserName: 'username'
               DatabaseURL: 'jdbc:sqlserver:...'
    AutoCommitTransactions: 'True'
```

`ping` returns the database name, database version, JDBC driver name, JDBC driver version, maximum number of database connection allowed, user name for the current connection, and the database URL. The last field denotes if the current database connection allows automatic commit of transactions.

Close the connection.

```
close(conn)
```

Input Arguments

conn — Database connection
connection object

Database connection, specified as a database connection object created using `database`.

More About

Tips

- When you use a connection object that is already closed in the `ping` function, the function returns the following error: Invalid connection. Create another connection to your database and try the `ping` function again.

See Also

`database` | `dmd` | `get` | `isconnection` | `set` | `supports`

primarykeys

Get primary key information for database table or schema

Syntax

```
k = primarykeys(dbmeta, 'cata', 'sch')
k = primarykeys(dbmeta, 'cata', 'sch', 'tab')
```

Description

`k = primarykeys(dbmeta, 'cata', 'sch')` returns primary key information for all tables in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`k = primarykeys(dbmeta, 'cata', 'sch', 'tab')` returns primary key information for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Examples

Get primary key information for the `DEPT` table:

```
k = primarykeys(dbmeta,'orcl','SCOTT','DEPT')
k =
   'orcl'   'SCOTT'   'DEPT'   'DEPTNO'   '1'   'PK_DEPT'
```

The results show the primary key information as described in the following table.

Column	Description	Value
1	Catalog	`orcl`
2	Schema	`SCOTT`
3	Table	`DEPT`
4	Column name of primary key	`DEPTNO`

Column	Description	Value
5	Sequence number within primary key	1
6	Primary key name	PK_DEPT

See Also

crossreference | get | dmd | exportedkeys | importedkeys

procedurecolumns

Get stored procedure parameters and result columns of catalogs

Syntax

```
pc = procedurecolumns(dbmeta, 'cata', 'sch')
pc = procedurecolumns(dbmeta, 'cata')
```

Description

`pc = procedurecolumns(dbmeta, 'cata', 'sch')` returns the stored procedure parameters and result columns for the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

`pc = procedurecolumns(dbmeta, 'cata')` returns stored procedure parameters and result columns for the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Running the stored procedure generates results. One row is returned for each column.

Examples

Get stored procedure parameters for the schema `ORG`, in the catalog `tutorial`, for the database metadata object `dbmeta`:

```
pc = procedurecolumns(dbmeta,'tutorial', 'ORG')
pc =
  Columns 1 through 7
   [1x19 char]   'ORG'   'display'  'Month'   '3'...
   '12'  'TEXT'
   [1x19 char]   'ORG'   'display'  'Day'     '3'...
   '4'  'INTEGER'

  Columns 8 through 13
    '50'    '50'    'null'    'null'    '1'    'null'
    '50'     '4'    'null'    'null'    '1'    'null'
```

The results show stored procedure parameter and result information. Because two rows of data are returned, there are two columns of data in the results. The results show that running the stored procedure `display` returns the `Month` and `Day` columns.

Following is a full description of the `procedurecolumns` results for the first row (`Month`).

Column	Description	Value for First Row
1	Catalog	`'D:\orgdatabase\orcl'`
2	Schema	`'ORG'`
3	Procedure name	`'display'`
4	Column/parameter name	`'MONTH'`
5	Column/parameter type	`'3'`
6	SQL data type	`'12'`
7	SQL data type name	`'TEXT'`
8	Precision	`'50'`
9	Length	`'50'`
10	Scale	`'null'`
11	Radix	`'null'`
12	Nullable	`'1'`
13	Remarks	`'null'`

For details about the `procedurecolumns` results, see the `getProcedureColumns` property on the Oracle Java Web site:

`http://docs.oracle.com/javase/7/docs/api/java/sql/DatabaseMetaData.html`.

See Also

`dmd` | `get` | `procedures`

procedures

Get stored procedures for catalogs

Syntax

```
p = procedures(dbmeta, 'cata')
p = procedures(dbmeta, 'cata', 'sch')
```

Description

`p = procedures(dbmeta, 'cata')` returns stored procedures in the catalog `cata` for the database whose database metadata object is `dbmeta`.

`p = procedures(dbmeta, 'cata', 'sch')` returns the stored procedures in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta`.

Stored procedures are SQL statements that are saved with the database. Use the `exec` function to run a stored procedure. Specify the stored procedure as the `sqlquery` argument instead of explicitly entering the `sqlquery` statement as the argument.

Examples

Get the names of stored procedures for the catalog DBA for the database metadata object `dbmeta`:

```
p = procedures(dbmeta,'DBA')
p =
    'sp_contacts'
    'sp_customer_list'
    'sp_customer_products'
    'sp_product_info'
    'sp_retrieve_contacts'
    'sp_sales_order'
```

Execute the stored procedure `sp_customer_list` for the database connection `conn`, and fetch all data:

```
curs = exec(conn,'sp_customer_list');
curs = fetch(curs)
curs =
     Attributes: []
           Data: {10x2 cell}
 DatabaseObject: [1x1 database]
       RowLimit: 0
       SQLQuery: 'sp_customer_list'
        Message: []
           Type: 'Database Cursor Object'
      ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
         Cursor: ...
   [1x1 com.mathworks.toolbox.database.sqlExec]
      Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
          Fetch: ...
   [1x1 com.mathworks.toolbox.database.fetchTheData]
```

View the results:

```
curs.Data
ans =
    [101]    'The Power Group'
    [102]    'AMF Corp.'
    [103]    'Darling Associates'
    [104]    'P.S.C.'
    [105]    'Amo & Sons'
    [106]    'Ralston Inc.'
    [107]    'The Home Club'
    [108]    'Raleigh Co.'
    [109]    'Newton Ent.'
    [110]    'The Pep Squad'
```

See Also

dmd | exec | get | procedurecolumns

querybuilder

Start Visual Query Builder GUI to import and export data

Compatibility

The `querybuilder` function will be removed in a future release. Use `dexplore` instead.

Syntax

```
querybuilder
```

Description

`querybuilder` starts Visual Query Builder (VQB), which is the Database Toolbox GUI.

Tip To populate the VQB **Schema** and **Catalog** fields, you must associate your user name with schemas or catalogs before starting VQB.

Examples

For details about Visual Query Builder, including examples, see the VQB **Help** menu or "Getting Started with Visual Query Builder" on page 4-2.

querytimeout

Get time specified for SQL queries to succeed

Syntax

```
timeout = querytimeout(curs)
```

Description

`timeout = querytimeout(curs)` returns the amount of time, in seconds, allowed for SQL queries of the open cursor `curs` to succeed. If a given query cannot complete in the specified time, the toolbox stops trying to perform the query.

The database administrator defines timeout values. If the timeout value is zero, queries must complete immediately.

Examples

Get the current database timeout setting for `curs`.

```
querytimeout(curs)
ans =
     10
```

Limitations

- If a given database does not have a database timeout feature, it returns the following:

  ```
  [Driver]Driver not capable
  ```
- ODBC drivers for Microsoft Access and Oracle do not support `querytimeout`.

See Also

`exec`

register

Load database driver

Syntax

```
register(d)
```

Description

`register(d)` loads the database driver object `d`. Use `unregister` to unload the driver.

Although `database` automatically loads a driver, `register` allows you to use `get` to view properties of the driver before connecting to the database. The `register` function also allows you to run `drivermanager` with `set` and `get` on properties for loaded drivers.

Examples

1. `register(d)` loads the database driver object `d`.
2. `get(d)` returns properties of the driver object.

See Also

`driver` | `get` | `set` | `drivermanager` | `unregister`

resultset

Construct resultset object

Syntax

```
rset = resultset(curs)
```

Description

`rset = resultset(curs)` creates a resultset object `rset` for the cursor `curs`. To get properties of `rset`, create a resultset metadata object using `rsmd`, or make calls to `rset` using applications based on Oracle Java.

Run `clearwarnings`, `isnullcolumn`, and `namecolumn` on `rset`. Use `close` to close the resultset, which frees up resources.

Examples

Construct a resultset object `rset`.

```
rset = resultset(curs)
rset =
     Handle: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
```

See Also

`clearwarnings` | `close` | `fetch` | `exec` | `get` | `isnullcolumn` | `namecolumn` | `rsmd`

rollback

Undo database changes

Syntax

`rollback(conn)`

Description

`rollback(conn)` reverses changes made to a database using `fastinsert`, `insert`, or `update` via the database connection `conn`. The rollback function reverses all changes made since the last `commit` or `rollback` operation. To use `rollback`, the `AutoCommit` flag for `conn` must be `off`.

Note: `rollback` does not roll back data in MySQL databases if the database engine is not `InnoDB`.

Examples

1 Ensure that the `AutoCommit` flag for connection `conn` is `off` by running:

```
get(conn,'AutoCommit')
ans =
 off
```

2 Insert data contained in `exdata` into the columns `DEPTNO`, `DNAME`, and `LOC`, in the table `DEPT`, for the data source `conn`.

```
fastinsert(conn, 'DEPT',...
{'DEPTNO';'DNAME';'LOC'}, exdata)
```

3 Roll back the data that you inserted into the database by running:

```
rollback(conn)
```

The data in `exdata` is removed from the database. The database now contains the data it had before you ran the `fastinsert` function.

See Also

`commit` | `exec` | `database` | `fastinsert` | `get` | `insert` | `update`

rows

Return number of rows in fetched data set

Syntax

```
numrows = rows(curs)
```

Description

`numrows = rows(curs)` returns the number of rows in the fetched data set `curs`.

Examples

Return the Number of Rows in the Cursor

After executing an SQL statement, return the number of rows in the database cursor object generated by `fetch`.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Execute a SELECT query on the `productTable` for product numbers 1 through 5 inclusive.

```
curs = exec(conn,['select * from productTable'...
            ' where productNumber >= 1 and productNumber <= 5']);
```

`exec` returns the database cursor object `curs`.

Fetch the data in `curs`.

```
curs = fetch(curs);
```

The `Data` property of `curs` contains the fetched data from the SELECT query.

Return the number of rows in the `Data` property of `curs`.

```
numrows = rows(curs)
```

```
numrows =

     5
```

Display the rows of data in the `Data` property of `curs`.

```
curs.Data
```

```
ans =

    [2]    [400314]    [1002]    [ 9]    'Painting Set'
    [4]    [400339]    [1008]    [21]    'Space Cruiser'
    [1]    [400345]    [1001]    [14]    'Building Blocks'
    [5]    [400455]    [1005]    [ 3]    'Tin Soldier'
    [3]    [400999]    [1009]    [17]    'Slinky'
```

Close the connection.

```
close(conn)
```

Input Arguments

`curs` — Database cursor

database cursor object

Database cursor, specified as an open SQL database cursor object generated using `fetch`.

Output Arguments

`numrows` — Number of rows in database cursor object

scalar

Number of rows in the database cursor object, returned as a scalar.

See Also

`cols` | `exec` | `fetch` | `get` | `rsmd`

rsmd

Construct resultset metadata object

Syntax

`rsmeta = rsmd(rset)`

Description

`rsmeta = rsmd(rset)` creates a resultset metadata object `rsmeta`, for the resultset object `rset`. Get properties of `rsmeta` using `get` or make calls to `rsmeta` using applications that are based on Oracle Java.

Examples

Create a resultset metadata object `rsmeta`.

```
rsmeta=rsmd(rset)
rsmeta =
     Handle: [1x1 sun.jdbc.odbc.JdbcOdbcResultSetMetaData]
```

Use `v = get(rsmeta)` and `v.property` to view properties of the resultset metadata object.

See Also

`exec` | `get` | `resultset`

runsqlscript

Run SQL script on database

Syntax

```
results = runsqlscript(connect,sqlfilename)
results = runsqlscript(connect,sqlfilename,Name,Value)
```

Description

`results = runsqlscript(connect,sqlfilename)` runs the SQL commands in the file `sqlfilename` on the connected database, and returns a cursor array.

`results = runsqlscript(connect,sqlfilename,Name,Value)` uses additional options specified by one or more Name,Value pairs.

Examples

Run SQL Script

Run SQL commands from a file on a connected data source.

To get the file of SQL commands, navigate to `\toolbox\database\dbdemos\compare_sales.sql` in your MATLAB root folder, or copy and paste the path into your current working directory.

Create the connection object to the data source, `dbtoolboxdemo`.

```
conn = database('dbtoolboxdemo','','');
```

User names and passwords are not required for this connection.

Run the SQL script, `compare_sales.sql`.

```
results = runsqlscript(conn,'compare_sales.sql')
```

```
results =
```

```
1x2 array of cursor objects
```

The SQL script has two queries, and returns two results when executed.

Display the results for the second query.

```
results(2)
```

```
ans =

        Attributes: []
              Data: {4x6 cell}
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: [1x309 char]
           Message: ''
              Type: 'Database Cursor Object'
         ResultSet: [1x1 sun.jdbc.odbc.JdbcOdbcResultSet]
            Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

Display the `resultset` returned for the second query.

```
results(2).Data
```

```
ans =

    'Painting Set'    'Terrific Toys'         'London'    [3000]  [2400]  [1800]
    'Victorian Doll'  'Wacky Widgets'         'Adelaide'  [1400]  [1100]  [ 981]
    'Sail Boat'       'Incredible Machines'  'Dublin'    [3000]  [2400]  [1500]
    'Slinky'          'Doll's Galore'         'London'    [3000]  [1500]  [1000]
```

Get the column names for the data returned by the second query.

```
names = columnnames(results(2))
```

```
names =

'productDescription','supplierName','city','Jan_Sales','Feb_Sales','Mar_Sales'
```

Close the cursor array and connection.

```
close(results)
close(conn)
```

Run SQL Script in Row Increments

Run SQL commands from a file on a connected data source in two-row increments.

To get the file of SQL commands, navigate to `\toolbox\database\dbdemos\compare_sales.sql` in your MATLAB root folder, or copy and paste the path into your current working directory.

Create the connection object to the data source, `dbtoolboxdemo`.

```
conn = database('dbtoolboxdemo','','');
```

User names and passwords are not required for this connection.

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

Run the SQL script, `compare_sales.sql`, specifying two-row increments.

```
results = runsqlscript(conn,'compare_sales.sql','rowInc',2)
```

```
results =

1x2 array of cursor objects
```

The SQL script has two queries, and returns two results when executed.

Display the resultset returned for the second query.

```
results(2).Data
```

```
ans =

    'Painting Set'      'Terrific Toys'    'London'      [3000]    [2400]    [1800]
    'Victorian Doll'    'Wacky Widgets'    'Adelaide'    [1400]    [1100]    [ 981]
```

Only the first two rows of the results are returned.

Fetch the next increment of two rows.

```
res2 = fetch(results(2),2);
res2.Data
```

```
ans =

    'Sail Boat'    'Incredible Machines'    'Dublin'    [3000]    [2400]    [1500]
    'Slinky'       'Doll's Galore'          'London'    [3000]    [1500]    [1000]
```

Close the cursor arrays and connection.

```
close(results)
```

```
close(res2)
close(conn)
```

Run SQL Script to Fetch Data in Batches

Run SQL commands from a file on a connected data source with automated batching. Use this method to avoid Java heap memory issues when the SQL script returns a large amount of data.

To get the file of SQL commands, navigate to `\toolbox\database\dbdemos\compare_sales.sql` in your MATLAB root folder, or copy and paste the path into your current working directory.

Create the connection object to the data source, `dbtoolboxdemo`.

```
conn = database('dbtoolboxdemo','','');
```

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see `database`.

Turn on batching for `fetch`.

```
setdbprefs('FetchInBatches', 'yes')
```

Set appropriate batch size depending on the size of the resultset you expect to fetch. For example, if you expect about a 100,000 rows in the output, a batch size of 10,000 is a good starting point. The larger the `FetchBatchSize` value, the fewer trips between Java and MATLAB, and the memory consumption is greater for each batch. The optimal value for `FetchBatchSize` is decided based on several factors like the size per row being retrieved, the Java heap memory value, the driver's default fetch size, and system architecture, and hence, may vary from site to site. For details about estimating a value for `FetchBatchSize`, see "Preference Settings for Large Data Import".

```
setdbprefs('FetchBatchSize', '2')
```

Run the SQL script, `compare_sales.sql`.

```
results = runsqlscript(conn, 'compare_sales.sql')
```

```
results =

1x2 array of cursor objects
```

Batching occurs internally within `fetch`, in that it fetches in increments of two rows at a time. The batching preferences are applied to all the queries in the SQL script.

- “Configuring a Driver and Data Source” on page 2-13

Input Arguments

`connect` — Database connection
connection object

Database connection, specified as a connection object.

`sqlfilename` — File name of SQL commands
string

File name of SQL commands to run, specified as a string. The file must be a text file, and can contain comments along with SQL queries. Single line comments must start with `--`. Multiline comments should be wrapped in `/*...*/`.

Example: `'C:\work\sql_file.sql'`

Name-Value Pair Arguments

Specify optional comma-separated pairs of Name,Value arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside single quotes (`' '`). You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'RowInc',3,'QTimeOut',60` specifies that results be returned in increments of three rows and the query time out in 60 seconds

`'rowInc'` — Row limit
`0` implies all rows (default) | positive scalar

Row limit indicating the number of rows to retrieve at a time, specified as the comma-separated pair consisting of `'rowInc'` and a positive scalar value. Use `rowInc` when importing large amounts of data. Retrieving data in increments helps reduce overall retrieval time.

Example: `'rowInc',5`

Data Types: `double`

`'QTimeOut'` — Query time out
`0` implies unlimited time (default) | positive scalar

Query time out (in seconds), specified as the comma-separated pair consisting of `'QTimeOut'` and a positive scalar value.

Example: `'QTimeOut',180`

Data Types: `double`

Output Arguments

`results` — Query results
cursor array

Query results from executing the SQL commands, returned as a cursor array. The number of elements in `results` is equal to the number of batches in the file sqlfilename.

`results(M)` contains the results from executing the `M`th SQL batch in the SQL script. If the batch returns a `resultset`, it is stored in `results(M).Data`.

Limitations

- Use `runsqlscript` to import data into MATLAB, especially if the data is the result of long and complex SQL queries that are difficult to convert into MATLAB strings. `runsqlscript` is not designed to handle SQL scripts containing continuous PL/SQL blocks with `BEGIN` and `END`, such as stored procedure definitions, trigger definitions, and so on. However, table definitions do work.
- An SQL script containing any of the following can produce unexpected results:
  - Apostrophes that are not escaped (including those in comments). For example, the string `'Here's the code'` should be written as `'Here''s the code'`.
  - Nested comments.
- A SQL script containing more than 25,000 characters causes `runsqlscript` to return an error.

More About

Batch

One or more SQL statements terminated by either a semicolon or the keyword `GO`.

Tips

- Any values assigned to rowInc or QTimeOut apply to all queries in the SQL script. For example, if `rowInc` is set to `5`, then all queries in the script return at most five rows in their respective `resultsets`.
- You can set preferences for the `resultsets` using `setdbprefs`. Preference settings apply to all queries in the SQL script. For example, if the `DataReturnFormat` is set to numeric, all the `resultsets` return as numeric matrices.

- “Preference Settings for Large Data Import”

See Also

`fetch` | `resultset` | `setdbprefs`

runstoredprocedure

Call stored procedure with input and output parameters

Syntax

```
results = runstoredprocedure(conn, sp_name, parms_in, types_out)
```

Description

`results = runstoredprocedure(conn, sp_name, parms_in, types_out)` calls a stored procedure with specified input parameters and returns output parameters, for the database connection handle `conn` . `sp_name` is the stored procedure to run, `parms_in` is a cell array containing the input parameters for the stored procedure, and `types_out` is the list of data types for the output parameters.

Use `runstoredprocedure` to return the value of a variable to a MATLAB variable, which you cannot do when running a stored procedure via `exec`. Running a stored procedure via `exec` returns resultsets but cannot return output parameters.

Examples

These examples illustrate how `runstoredprocedure` differs from running stored procedures via `exec`.

1 Run a stored procedure that has no input or output parameters:

```
x = runstoredprocedure(c,'myprocnoparams')
```

2 Run a stored procedure given input parameters `2500` and `'Jones'` with no output parameters.

```
x = runstoredprocedure(c,'myprocinonly',{2500,'Jones'})
```

3 Run the stored procedure `myproc` given input parameters `2500` and `'Jones'`. Return an output parameter of type `java.sql.Types.NUMERIC`, which could be any numeric Oracle Java data type. The output parameter `x` is the value of a database variable `n`. The stored procedure `myproc` creates this variable, given the

input values `2500` and `'Jones'`. For example, `myproc` computes `n`, the number of days when `Jones` is `2500`. It then returns the value of `n` to `x`.

```
x = runstoredprocedure(c,'myproc',{2500,'Jones'},{java.sql.Types.NUMERIC})
```

See Also

`fetch` | `exec`

set

Set properties for database, cursor, or drivermanager object

Syntax

```
set(object, 'property', value)
set(object)
```

Description

`set(object, 'property', value)` sets the value of *`property`* to `value` for the specified `object`.

`set(object)` displays all properties for `object`.

Allowable values for `object` are:

- "Database Connection Objects" on page 6-191, created using `database`
- "Cursor Objects" on page 6-192, created using `exec` or `fetch`
- "Drivermanager Objects" on page 6-192, created using `drivermanager`

You cannot set all of these properties for all databases. You receive an error message when you try to set a property that the database does not support.

Database Connection Objects

The allowable values for *`property`* and `value` for a database connection object appear in the following table.

Property	Value	Description
`'AutoCommit'`	`'on'`	Database data is written and automatically committed when you run `fastinsert`, `insert`, or `exec`. You

Property	Value	Description
		cannot use `rollback` to reverse this process.
	`'off'`	Database data is not committed automatically when you run `fastinsert`, `insert`, or `update`. Use `rollback` to reverse this process. When you are sure that your data is correct, use the `commit` function to commit it to the database.
`'ReadOnly'`	`0`	Not read only; that is, writable
	`1`	Read only
`'TransactionIsolation'`	positive integer	Current transaction isolation level

Note: For some databases, if you insert data and then close the database connection without committing the data to the database, the data gets committed automatically. Your database administrator can tell you whether your database behaves this way.

Cursor Objects

The allowable *`property`* and `value` for a cursor object appear in the following table.

Property	Value	Description
`'RowLimit'`	positive integer	Sets the `RowLimit` for `fetch`. Specify this property instead of passing `RowLimit` as an argument to the `fetch` function. When you define `RowLimit` for `fetch` by using `set`, `fetch` behaves differently depending on what type of database you are using.

Drivermanager Objects

The allowable *`property`* and `value` for a drivermanager object appear in the following table.

Property	Value	Description
'LoginTimeout'	positive integer	Sets the logintimeout value for all loaded database drivers.

For command-line help on set, use the overloaded methods:

```
help cursor/set
help database/set
help drivermanager/set
```

Examples

Example 1 — Set RowLimit for Cursor

This example does the following:

- Establishes a JDBC connection to a data source.
- Runs fetch to retrieve data from the table EMP.
- Sets RowLimit to 5.

```
conn = database('orcl','scott','tiger',...
 'oracle.jdbc.driver.OracleDriver',...
 'jdbc:oracle:thin:@144.212.123.24:1822:');
curs = exec(conn,'select * from EMP');
set(curs,'RowLimit',5)
curs = fetch(curs)
curs =
     Attributes: []
           Data: {5x8 cell}
 DatabaseObject: [1x1 database]
       RowLimit: 5
       SQLQuery: 'select * from EMP'
        Message: []
           Type: 'Database Cursor Object'
      ResultSet: [1x1 oracle.jdbc.driver.OracleResultSet]
         Cursor: [1x1 com.mathworks.toolbox.database.sqlExec]
      Statement: [1x1 oracle.jdbc.driver.OracleStatement]
          Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

The RowLimit property of curs is 5 and the Data property is 5x8 cell, indicating that fetch returned five rows of data.

In this example, RowLimit limits the maximum number of rows you can retrieve. Therefore, rerunning the fetch function returns no data.

Example 2 — Set the AutoCommit Flag to On

This example shows what happens when you run a database `update` function on a database whose `AutoCommit` flag is set to `on`.

1. Determine the status of the `AutoCommit` flag for the database connection `conn`.

   ```
   get(conn, 'AutoCommit')

   ans =
   off
   ```

   The flag is `off`.

2. Set the flag status to `on` and verify its value.

   ```
   set(conn, 'AutoCommit', 'on');
   get(conn, 'AutoCommit')

   ans =
   on
   ```

3. Insert a cell array `exdata` into column names `colnames` in the table `Growth`.

   ```
   fastinsert(conn, 'Growth', colnames, exdata)
   ```

   The data is inserted and committed to the database.

Example 3 — Set the AutoCommit Flag to Off and Commit Data

This example shows the results of running `fastinsert` and `commit` to insert and commit data into a database whose `AutoCommit` flag is `off`.

1. First set the `AutoCommit` flag to `off` for database connection `conn`.

   ```
   set(conn, 'AutoCommit', 'off');
   ```

2. Insert a cell array `exdata` into the column names `colnames` in the table `Avg_Freight_Cost`.

   ```
   fastinsert(conn, 'Avg_Freight_Cost', colnames, exdata)
   ```

3. Commit the data to the database.

   ```
   commit(conn)
   ```

Example 4 — Set the AutoCommit Flag to Off and Roll Back Data

This example runs `update` to insert data into a database whose `AutoCommit` flag is `off`. It then uses `rollback` to roll back the data.

1 Set the `AutoCommit` flag to `off` for database connection `conn`.

```
set(conn, 'AutoCommit', 'off');
```

2 Update the data in `colnames` in the `Avg_Freight_Weight` table, for the record selected by `whereclause`, with data from the cell array `exdata`.

```
update(conn, 'Avg_Freight_Weight', colnames, exdata,
whereclause)
```

3 Roll back the data.

```
rollback(conn)
```

The data in the table is now as it was before you ran `update`.

Example 5 — Set the LoginTimeout for a Drivermanager Object

1 Create a drivermanager object `dm` and set its `LoginTimeout` value to 3 seconds.

```
dm = drivermanager;
set(dm,'LoginTimeout',3);
```

2 Verify this result.

```
logintimeout
ans =
     3
```

See Also

`fetch` | `database` | `exec` | `drivermanager` | `fastinsert` | `get` | `insert` | `logintimeout` | `ping` | `update`

setdbprefs

Set preferences for retrieval format, errors, NULLs, and more

Syntax

```
setdbprefs
v = setdbprefs
setdbprefs(property)

setdbprefs(property,value)
setdbprefs(s)
```

Description

`setdbprefs` returns current values for database preferences.

`v = setdbprefs` returns current values for database preferences to the structure `v`.

`setdbprefs(property)` returns the current value for the specified `property`.

`setdbprefs(property,value)` sets the specified `property` to `value`.

`setdbprefs(s)` sets preferences specified in the structure `s` to values that you specify.

Examples

Display Current Values

View the current values of all database preferences

Display all database preference properties and their current values.

```
setdbprefs
```

```
           DataReturnFormat: 'cellarray'
              ErrorHandling: 'store'
```

```
             NullNumberRead: '0'
            NullNumberWrite: 'NaN'
             NullStringRead: 'null'
            NullStringWrite: 'null'
         JDBCDataSourceFile: 'C:\hold_x\jdbcConfig_test.mat'
      UseRegistryForSources: 'yes'
   TempDirForRegistryOutput: 'C:\Work'
         DefaultRowPreFetch: '10000'
             FetchInBatches: 'no'
             FetchBatchSize: '1000'
```

For details about what each property and value mean, see "Setting Database Preferences Using the setdbprefs Function" on page 5-81.

Change a Preference

Set a database preference to another value.

Display the current value of the `NullNumberRead` database preference.

```
setdbprefs('NullNumberRead')

    NullNumberRead: 'NaN'
```

Each `NULL` number in the database is read into the MATLAB workspace as `NaN`.

Change the value of this preference to `0`.

```
setdbprefs('NullNumberRead','0')
```

Each `NULL` number in the database is read into the MATLAB workspace as `0`.

Change the DataReturnFormat Preference

Changing the database preference `DataReturnFormat` affects the way data is returned to the MATLAB workspace.

Specify that database data be imported into MATLAB cell arrays.

```
setdbprefs('DataReturnFormat','cellarray')
```

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Alternatively, you can use the native ODBC interface for an ODBC connection. For details, see the `database` function.

Import data into the MATLAB workspace.

```
curs = exec(conn,...
'select productnumber,productdescription from producttable');
curs = fetch(curs,3);
curs.Data

ans =

    [9]    'Victorian Doll'
    [8]    'Train Set'
    [7]    'Engine Kit'
```

Resulting data displays as a cell array.

Change the data return format from `cellarray` to `numeric`.

```
setdbprefs('DataReturnFormat','numeric')
```

Import data into the MATLAB workspace.

```
curs = exec(conn,...
'select productnumber,productdescription from producttable');
curs = fetch(curs,3);
curs.Data

ans =

     9   NaN
     8   NaN
     7   NaN
```

In the database, the values for `productDescription` are character strings, as seen in the previous example when `DataReturnFormat` was set to `cellarray`. Therefore, the `productDescription` values cannot be read when they are imported into the MATLAB workspace using the `numeric` format. Therefore, MATLAB treats them as `NULL` numbers and assigns them the current value for the `NullNumberRead` property of `NaN`.

Change the data return format to `structure`.

```
setdbprefs('DataReturnFormat','structure')
```

Import data into the MATLAB workspace.

```
curs = exec(conn,...
'select productnumber,productdescription from producttable');
curs = fetch(curs,3);
curs.Data
```

```
ans =

         productnumber: [3x1 double]
    productdescription: {3x1 cell}
```

Resulting data displays as a structure.

View the contents of the structure `curs.Data` to see the data.

```
curs.Data.productdescription
curs.Data.productnumber
```

```
ans =

    'Victorian Doll'
    'Train Set'
    'Engine Kit'

ans =

     9
     8
     7
```

Close the connection.

```
close(conn)
```

Change the Write Format for NULL Numbers

Changing the write format for `NULL` numbers allows the insertion of a `NaN` as a `NULL` in the database.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Specify `NaN` for the `NullNumberWrite` format.

```
setdbprefs('NullNumberWrite','NaN')
```

Numbers represented as `NaN` in the MATLAB workspace are exported to databases as `NULL`.

The variable `ex_data` contains a `NaN`.

```
ex_data = {24,NaN,30.00};
```

Insert `ex_data` into the database using `fastinsert` with column names `productNumber`, `Quantity` and `Price`.

```
colnames = {'productNumber','Quantity','Price'};
fastinsert(conn,'inventoryTable',colnames,ex_data)
```

The `NaN` data is exported into the database as `NULL`.

Close the connection.

```
close(conn)
```

Specify Error Handling Settings

Changing the error handling database preferences affects the display of errors in MATLAB.

Specify the `store` format for the `ErrorHandling` preference.

```
setdbprefs('ErrorHandling','store')
```

With the `ErrorHandling` property set to `store`, errors generated by running `database` or `exec` are stored in the `Message` field of the returned connection or cursor object.

Establish connection `conn` to a MySQL database with user name `username` and password `pwd`.

```
conn = database('MySQL','username','pwd');
```

Fetch data from a closed cursor.

```
curs = exec(conn,'select productdescription from producttable');
close(curs)
curs = fetch(curs,3)
```

```
curs =
```

```
        Attributes: []
              Data: 0
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select productdescription from producttable'
           Message: 'Invalid fetch cursor.'
              Type: 'Database Cursor Object'
         ResultSet: 0
            Cursor: 0
         Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
             Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]
```

The error generated by this operation appears in the `Message` field.

Specify the `report` format for the `ErrorHandling` preference.

```
setdbprefs('ErrorHandling','report')
```

With the `ErrorHandling` property set to `report`, errors generated by running `database` or `exec` appear immediately in the Command Window.

Fetch data from a closed cursor.

```
curs = exec(conn,'select productdescription from producttable');
close(curs)
curs = fetch(curs,3);
```

```
Error using cursor/fetch>errorhandling (line 491)
Invalid fetch cursor.

Error in cursor/fetch (line 460)
            errorhandling(outCursor.Message);
```

The error generated by this operation appears immediately in the Command Window.

Specify the `empty` format for the `ErrorHandling` preference.

```
setdbprefs('ErrorHandling','empty')
```

With the `ErrorHandling` property set to `empty`, errors generated while running `database` or `exec` are stored in the `Message` field of the returned connection or cursor object. In addition, objects that cannot be created are returned as empty handles, `[]`.

Fetch data from a cursor from an invalid table `invalidTable`.

```
curs = exec(conn, 'select * from invalidTable')
curs = fetch(curs)

curs =

        Attributes: []
              Data: []
    DatabaseObject: [1x1 database]
          RowLimit: 0
          SQLQuery: 'select * from invalidTable'
           Message: [1x102 char]
              Type: 'Database Cursor Object'
         ResultSet: 0
            Cursor: 0
         Statement: 0
             Fetch: 0
```

The error appears in the cursor object `Message` field. Furthermore, the `Data` field contains empty handles because no attributes could be created. If the `ErrorHandling` property is set to `store`, the `Data` field contains `0`.

Close the connection.

```
close(conn)
```

Change Multiple Settings

Change multiple database preference simultaneously using `setdbprefs`.

Specify that `NULL` strings are read from the database into a MATLAB matrix of doubles as `'NaN'`.

```
setdbprefs({'NullStringRead';'DataReturnFormat'},...
{'NaN';'numeric'})
```

For details about another way to change multiple settings, see “Assign Values to a Structure” on page 6-202.

Assign Values to a Structure

Assign values for specific preferences in a structure to let you change multiple database preferences simultaneously.

Assign values for preferences to fields in the structure `s`.

```
s.DataReturnFormat = 'numeric';
s.NullNumberRead = '0';
s.TempDirForRegistryOutput = 'C:\Work'

s =
            DataReturnFormat: 'numeric'
              NullNumberRead: '0'
    TempDirForRegistryOutput: 'C:\Work'
```

Set preferences using the values in `s`.

```
setdbprefs(s)
```

Run `setdbprefs` to check your preferences settings.

```
setdbprefs

            DataReturnFormat: 'numeric'
               ErrorHandling: 'store'
              NullNumberRead: '0'
             NullNumberWrite: 'NaN'
              NullStringRead: 'null'
             NullStringWrite: 'null'
          JDBCDataSourceFile: ''
       UseRegistryForSources: 'yes'
    TempDirForRegistryOutput: 'C:\Work'
          DefaultRowPreFetch: '10000'
              FetchInBatches: 'no'
              FetchBatchSize: '1000'
```

Return Values to a Structure

Capture all preferences and their values in a structure.

Assign values for all preferences to `s`.

```
s = setdbprefs

s =

            DataReturnFormat: 'cellarray'
               ErrorHandling: 'store'
              NullNumberRead: 'NaN'
             NullNumberWrite: 'NaN'
              NullStringRead: 'null'
```

```
         NullStringWrite: 'null'
       JDBCDataSourceFile: ''
     UseRegistryForSources: 'yes'
   TempDirForRegistryOutput: 'C:\Work'
       DefaultRowPreFetch: '10000'
           FetchInBatches: 'no'
            FetchBatchSize: '1000'
```

Use the MATLAB tab completion feature when obtaining the value for a preference.

```
s.U
```

Press the **Tab** key, and then **Enter**. MATLAB completes the field and displays the value.

```
s.UseRegistryForSources
```

```
ans =

    yes
```

Save Preferences

You can save your preferences to a MAT-file to use them in future MATLAB sessions.

For example, say that you need to reuse preferences that you set for fetching large data. Assign the preferences to the variable `FetchLargeData` and save them to a MAT-file `FetchLargeDataPrefs` in your current folder.

```
FetchLargeData = setdbprefs;
save FetchLargeDataPrefs.mat FetchLargeData
```

Later, load the data and restore the preferences.

```
load FetchLargeDataPrefs.mat
setdbprefs(FetchLargeData)
```

- “Preference Settings for Large Data Import”
- “Working with Preferences”

Input Arguments

`property` — Database preference

string | cell array

Database preference, specified as a string to denote a preference associated with data return formatting, error handling, null data handling, or other properties. To set multiple database preferences, enter the preference strings in a cell array and match the order with the corresponding values in the `value` argument. For the complete list of properties, see "Setting Database Preferences Using the setdbprefs Function" on page 5-81.

Example: `'DataReturnFormat'`

Example: `{'DataReturnFormat';'NullStringRead'}`

Data Types: `char`

`value` — Database preference value

string | cell array

Database preference value, specified as a string to denote a value for a particular database preference property. To set multiple database preferences, enter the preference values in a cell array and match the order with the corresponding preferences in the `property` argument. For the complete list of allowable values, see "Setting Database Preferences Using the setdbprefs Function" on page 5-81.

Example: `'NaN'`

Example: `{'numeric';'NaN'}`

Data Types: `char`

`s` — Database preferences

structure

Database preferences, specified as a structure to include all the database preferences you specify.

Data Types: `struct`

Output Arguments

`v` — Database preferences

structure

Database preferences, returned as a structure containing the database preference properties and the property values.

More About

- "Setting Database Preferences Using the setdbprefs Function" on page 5-81

See Also

`clear` | `database` | `exec` | `fastinsert` | `fetch` | `getdatasources`

sql2native

Convert JDBC SQL grammar to SQL grammar native to system

Syntax

```
n = sql2native(conn, 'sqlquery')
```

Description

`n = sql2native(conn, 'sqlquery')` converts the SQL statement string `sqlquery` from JDBC SQL grammar into the database system's native SQL grammar for the connection `conn`. The native SQL statement is assigned to `n`.

supports

Detect whether property is supported by database metadata object

Syntax

```
a = supports(dbmeta)
a = supports(dbmeta, 'property')
```

Description

`a = supports(dbmeta)` returns a structure that contains the properties of `dbmeta` and its property values, `1` or `0`. A value of `1` indicates that the property is supported, and `0` indicates that the property is not supported.

`a = supports(dbmeta, 'property')` returns `1` or `0` for the `property` field of `dbmeta`. A value of `1` indicates that the property is supported, and `0` indicates that the property is not supported.

Examples

1 Check if `dbmeta` supports group-by clauses.

```
a = supports(dbmeta, 'GroupBy')
a =
     1
```

2 View the value of all properties of `dbmeta`.

```
a = supports(dbmeta)
```

The returned result is a list of properties and their values.

3 After creating `a` using the `supports` function, you can access the value of any property in `a`. Display the `GroupBy` property by running:

```
a.GroupBy
a =
     1
```

See Also

`database` | `dmd` | `get` | `ping`

tableprivileges

Return database table privileges

Syntax

```
tp = tableprivileges(dbmeta, 'cata')
tp = tableprivileges(dbmeta, 'cata', 'sch')
tp = tableprivileges(dbmeta, 'cata', 'sch', 'tab')
```

Description

`tp = tableprivileges(dbmeta, 'cata')` returns a list of table privileges for all tables in the catalog `cata` for the database whose database metadata object is `dbmeta` resulting from a database connection object.

`tp = tableprivileges(dbmeta, 'cata', 'sch')` returns a list of table privileges for all tables in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta` resulting from a database connection object.

`tp = tableprivileges(dbmeta, 'cata', 'sch', 'tab')` returns a list of privileges for the table `tab`, in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta` resulting from a database connection object.

Examples

Get table privileges for the `builds` table in the schema `geck` for the catalog `msdb`, for the database metadata object `dbmeta`.

```
tp = tableprivileges(dbmeta,'msdb','geck', 'builds')
tp =
      'DELETE'    'INSERT'    'REFERENCES'...
      'SELECT'    'UPDATE'
```

See Also

`dmd` | `get` | `tables`

tables

Return database table names

Syntax

```
t = tables(dbmeta, 'cata')
t = tables(dbmeta, 'cata', 'sch')
```

Description

`t = tables(dbmeta, 'cata')` returns a list of tables and table types in the catalog `cata` for the database whose database metadata object is `dbmeta` resulting from a database connection object.

`t = tables(dbmeta, 'cata', 'sch')` returns a list of tables and table types in the schema `sch`, of the catalog `cata`, for the database whose database metadata object is `dbmeta` resulting from a database connection object.

Tip For command-line help on `tables`, use the overloaded method:

```
help dmd/tables
```

Examples

Get the table names and types for the schema `SCOTT` in the catalog `orcl`, for the database metadata object `dbmeta`.

```
t = tables(dbmeta,'orcl', 'SCOTT')
t =
    'BONUS'        'TABLE'
    'DEPT'         'TABLE'
    'EMP'          'TABLE'
    'SALGRADE'     'TABLE'
    'TRIAL'        'TABLE'
```

See Also

`attr` | `bestrowid` | `dmd` | `get` | `indexinfo` | `tableprivileges`

unregister

Unload database driver

Syntax

```
unregister(d)
```

Description

`unregister(d)` unloads the database driver object `d`, freeing up system resources. If you do not unload a registered driver, it automatically unloads when you end your MATLAB session.

Examples

`unregister(d)` unloads the database driver object `d`.

See Also

`register`

update

Replace data in database table with MATLAB data

Syntax

`update(conn,tablename,colnames,data,whereclause)`

Description

`update(conn,tablename,colnames,data,whereclause)` exports the MATLAB variable `data` in its current format into the database table `tablename` using the database connection `conn`. Existing records in the database table are replaced as specified by the SQL `whereclause` command.

Examples

Update an Existing Record

Create a database connection `conn` using the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo','','');
```

Working with the `dbtoolboxdemo` data source, use `fetch` to import all data from the `inventoryTable`. Store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
```

View the contents of the `Data` element in the cursor object.

```
curs.Data
```

```
ans =

    [ 1]    [2700]    [14.500000000000000]
    [ 2]    [1700]    [                 9]
    [ 3]    [ 356]    [                17]
```

```
    [ 4]    [2580]    [                  21]
    [ 5]    [9000]    [                   3]
    [ 6]    [4540]    [                   8]
    [ 7]    [6034]    [                  16]
    [ 8]    [8350]    [                   5]
    [ 9]    [2339]    [                  13]
    [10]    [ 723]    [                  24]
    [11]    [ 567]    [                   0]
    [12]    [1278]    [                   0]
    [13]    [1700]    [14.500000000000000]
    [25]    [ 439]    [                  60]
    [25]    [ 439]    [                  60]
```

`Data` contains the `inventoryTable` data.

Define a cell array containing the column name that you are updating called `Quantity`.

```
colnames = {'Quantity'};
```

Define a cell array containing the new data `2000`.

```
data = {2000};
```

Update the column `Quantity` in the `inventoryTable` for the product with `productNumber` equal to `1`.

```
tablename = 'inventoryTable';
whereclause = 'where productNumber = 1';

update(conn,tablename,colnames,data,whereclause)
```

Fetch the data again and view the updated contents in the `inventoryTable`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [ 1]    [2000]    [14.500000000000000]
    [ 2]    [1700]    [                   9]
    [ 3]    [ 356]    [                  17]
    [ 4]    [2580]    [                  21]
    [ 5]    [9000]    [                   3]
    [ 6]    [4540]    [                   8]
```

```
    [ 7]    [6034]    [                16]
    [ 8]    [8350]    [                 5]
    [ 9]    [2339]    [                13]
    [10]    [ 723]    [                24]
    [11]    [ 567]    [                 0]
    [12]    [1278]    [                 0]
    [13]    [1700]    [14.500000000000000]
    [25]    [ 439]    [                60]
    [25]    [ 439]    [                60]
```

In the `inventoryTable` data, the product with the product number equal to `1` has an updated quantity of `2000` units.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Update Multiple Records with Multiple Conditions

Create a database connection `conn` using the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo','','');
```

Working with the `dbtoolboxdemo` data source, use `fetch` to import all data from the `inventoryTable`. Store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
```

View the contents of the `Data` element in the cursor object.

```
curs.Data
```

```
ans =

    [ 1]    [2700]    [14.500000000000000]
    [ 2]    [1700]    [                 9]
    [ 3]    [ 356]    [                17]
    [ 4]    [2580]    [                21]
    [ 5]    [9000]    [                 3]
    [ 6]    [4540]    [                 8]
```

```
    [ 7]    [6034]    [                16]
    [ 8]    [8350]    [                 5]
    [ 9]    [2339]    [                13]
    [10]    [ 723]    [                24]
    [11]    [ 567]    [                 0]
    [12]    [1278]    [                 0]
    [13]    [1700]    [14.500000000000000]
    [25]    [ 439]    [                60]
    [25]    [ 439]    [                60]
```

`Data` contains the `inventoryTable` data.

Define a cell array containing the column name that you are updating called `Quantity`.

```
colnames = {'Quantity'};
```

Define a cell array containing the new data.

```
A = 10000;    % new quantity for product number 5
B = 5000;     % new quantity for product number 8

data = {A;B}; % cell array with the new quantities
```

Update the column `Quantity` in the `inventoryTable` for the products with product numbers equal to `5` and `8`. Create a cell array `whereclause` that contains two WHERE clauses for both products.

```
tablename = 'inventoryTable';
whereclause = {'where productNumber = 5';'where productNumber = 8'};

update(conn,tablename,colnames,data,whereclause)
```

Fetch the data again and view the updated contents in `inventoryTable`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [ 1]    [ 2700]    [14.500000000000000]
    [ 2]    [ 1700]    [                 9]
    [ 3]    [  356]    [                17]
    [ 4]    [ 2580]    [                21]
    [ 5]    [10000]    [                 3]
```

```
    [ 6]    [ 4540]    [                8]
    [ 7]    [ 6034]    [               16]
    [ 8]    [ 5000]    [                5]
    [ 9]    [ 2339]    [               13]
    [10]    [  723]    [               24]
    [11]    [  567]    [                0]
    [12]    [ 1278]    [                0]
    [13]    [ 1700]    [14.500000000000000]
    [25]    [  439]    [               60]
    [25]    [  439]    [               60]
```

In the `inventoryTable` data, the product with the product number equal to `5` has an updated quantity of `10000` units and the product with the product number equal to `8` has an updated quantity of `5000` units.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Update Multiple Columns with Multiple Conditions

Create a database connection `conn` using the `dbtoolboxdemo` data source.

```
conn = database('dbtoolboxdemo','','');
```

Working with the `dbtoolboxdemo` data source, use `fetch` to import all data from `inventoryTable`. Store the data in a cell array contained in the cursor object field `curs.Data`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
```

View the contents of the `Data` element in the cursor object.

```
curs.Data
```

```
ans =

    [ 1]    [2700]    [14.500000000000000]
    [ 2]    [1700]    [                 9]
    [ 3]    [ 356]    [                17]
```

```
    [ 4]    [2580]    [                21]
    [ 5]    [9000]    [                 3]
    [ 6]    [4540]    [                 8]
    [ 7]    [6034]    [                16]
    [ 8]    [8350]    [                 5]
    [ 9]    [2339]    [                13]
    [10]    [ 723]    [                24]
    [11]    [ 567]    [                 0]
    [12]    [1278]    [                 0]
    [13]    [1700]    [14.500000000000000]
    [25]    [ 439]    [                60]
    [25]    [ 439]    [                60]
```

`Data` contains the `inventoryTable` data.

Define a cell array containing the column names that you are updating called `Quantity` and `Price`.

```
colnames = {'Quantity','Price'};
```

Define a cell array containing the new data.

```
% new quantities and prices for product numbers 5 and 8
% are separated by a semicolon in the cell array
data = {10000,5.5;9000,10};
```

Update the columns `Quantity` and `Price` in the `inventoryTable` for the products with product numbers equal to `5` and `8`. Create a cell array `whereclause` that contains two WHERE clauses for both products.

```
tablename = 'inventoryTable';
whereclause = {'where productNumber = 5';'where productNumber = 8'};

update(conn,tablename,colnames,data,whereclause)
```

Fetch the data again and view the updated contents in the `inventoryTable`.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data
```

```
ans =

    [ 1]    [ 2700]    [14.500000000000000]
    [ 2]    [ 1700]    [                 9]
```

```
    [ 3]    [  356]    [                17]
    [ 4]    [ 2580]    [                21]
    [ 5]    [10000]    [ 5.500000000000000]
    [ 6]    [ 4540]    [                 8]
    [ 7]    [ 6034]    [                16]
    [ 8]    [ 9000]    [                10]
    [ 9]    [ 2339]    [                13]
    [10]    [  723]    [                24]
    [11]    [  567]    [                 0]
    [12]    [ 1278]    [                 0]
    [13]    [ 1700]    [14.500000000000000]
    [25]    [  439]    [                60]
    [25]    [  439]    [                60]
```

In the inventoryTable data, the product with the product number equal to 5 has an updated quantity of 10000 units and price equal to 5.50. The product with the product number equal to 8 has an updated quantity of 9000 units and price equal to 10.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Roll Back Data After Updating a Record

Create a database connection conn. For example, the following code uses the database toy_store, user name username, password pwd, server name sname, and port number 123456 to connect to a Microsoft SQL Server database.

```
conn = database('toy_store','username','pwd',...
                'Vendor','Microsoft SQL Server',...
                'Server','sname',...
                'portnumber',123456);
```

Set the AutoCommit flag to off. Any updates you make after turning off this flag will not commit to the database automatically.

```
set(conn,'AutoCommit','off')
```

Display the data in the inventoryTable table before making updates.

```
curs = exec(conn,'select * from inventoryTable');
```

```
curs = fetch(curs);
curs.Data

ans =

    [    1.00]    [ 1700.00]    [ 14.50]
    [    2.00]    [ 1200.00]    [  9.30]
    [    3.00]    [  356.00]    [ 17.20]
    ...
```

Define a cell array for the new price of the first product.

```
data(1,1) = {30.00};
```

Define the WHERE clause for the first product.

```
whereclause = 'where productNumber = 1';
```

Update the `Price` column in the `inventoryTable` for the first product.

```
tablename = 'inventoryTable';
colname = {'Price'};

update(conn,tablename,colname,data,whereclause)
```

Display the data in the `inventoryTable` table after making the update.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [    1.00]    [ 1700.00]    [ 30.00]
    [    2.00]    [ 1200.00]    [  9.30]
    [    3.00]    [  356.00]    [ 17.20]
    ...
```

The first product has an updated price of `30.00`. Though the data is updated, the change has not committed to the database.

Roll back the update.

```
rollback(conn)
```

Display the data in the `inventoryTable` table after rolling back the update.

```
curs = exec(conn,'select * from inventoryTable');
curs = fetch(curs);
curs.Data

ans =

    [   1.00]    [ 1700.00]    [ 14.50]
    [   2.00]    [ 1200.00]    [  9.30]
    [   3.00]    [  356.00]    [ 17.20]
    ...
```

The first product has the old price of `14.50`.

After finishing with the cursor object, close it.

```
close(curs)
```

Close the database connection.

```
close(conn)
```

Input Arguments

`conn` — Database connection

connection object

Database connection, specified as a database connection object created using `database`.

`tablename` — Database table name

string

Database table name, specified as a string denoting the name of a table in your database.

Data Types: `char`

`colnames` — Database table column names

cell array of strings

Database table column names, specified as a cell array of one or more strings to denote the columns in the existing database table `tablename`.

Example: `{'col1','col2','col3'}`

Data Types: `cell`

`data` — Update data

cell array | numeric matrix | structure

Update data, specified as a MATLAB variable with cell array, numeric matrix, or structure format. If `data` is a structure, field names in the structure must match field names in `colnames`.

Data Types: `double` | `struct` | `cell`

`whereclause` — SQL WHERE clause

string | cell array

SQL WHERE clause, specified as a string for one condition or a cell array of strings for multiple conditions.

Example: `'WHERE productTable.productNumber = 1'`

Data Types: `char`

More About

Tips

- The status of the `AutoCommit` flag determines whether `update` automatically commits the data to the database. View the `AutoCommit` flag status for the connection using `get` and change it using `set`. Commit the data by running `commit` or an SQL commit statement using the `exec` function. Roll back the data by running `rollback` or an SQL rollback statement using the `exec` function.
- To add new rows instead of replacing existing data, use `fastinsert`.
- To update multiple records, the number of SQL WHERE clauses in `whereclause` must match the number of records in `data`.
- The order of records in your database is not constant. Use values of column names to identify records.
- An error like the following might appear if your database table is open in edit mode.

  ```
  [Vendor][ODBC Product Driver] The database engine could
  not lock table 'TableName' because it is already in use
  by another person or process.
  ```

  In this case, close the table and rerun the `update` function.

- An error like the following might appear if you try to run an update operation that matches the one that you just ran.

```
??? Error using ==> database.update
Error:Commit/Rollback Problems
```

See Also

commit | database | fastinsert | get | rollback | set

versioncolumns

Automatically update table columns

Syntax

```
vl = versioncolumns(dbmeta, 'cata')
vl = versioncolumns(dbmeta, 'cata', 'sch')
vl = versioncolumns(dbmeta, 'cata', 'sch', 'tab')
```

Description

`vl = versioncolumns(dbmeta, 'cata')` returns a list of columns that automatically update when a row value updates in the catalog `cata`, in the database whose database metadata object is `dbmeta` resulting from a database connection object.

`vl = versioncolumns(dbmeta, 'cata', 'sch')` returns a list of all columns that automatically update when a row value updates in the schema `sch`, in the catalog `cata`, for the database whose database metadata object is `dbmeta` resulting from a database connection object.

`vl = versioncolumns(dbmeta, 'cata', 'sch', 'tab')` returns a list of columns that automatically update when a row value updates in the table `tab`, the schema `sch`, in the catalog `cata`, for the database whose database metadata object is `dbmeta` resulting from a database connection object.

Examples

Get a list of which columns automatically update when a row in the table `BONUS` updates, in the schema `SCOTT`, in the catalog `orcl`, for the database metadata object `dbmeta`.

```
vl = versioncolumns(dbmeta,'orcl','SCOTT','BONUS')
vl =
     {}
```

The results are an empty set, indicating that no columns in the database automatically update when a row value updates.

See Also

`columns` | `dmd` | `get`

width

Return field size of column in fetched data set

Syntax

```
colsize = width(cursor, colnum)
```

Description

`colsize = width(cursor, colnum)` returns the field size of the specified column number `colnum` in the fetched data set `curs`.

Examples

Get the width of the first column of the fetched data set, `curs`:

```
colsize = width(curs, 1)

colsize =

    11
```

The field size of column one is 11 characters (bytes).

See Also

`attr` | `cols` | `columnnames` | `fetch` | `get`