

Database Toolbox™

User's Guide

R2011b

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Database Toolbox™ User's Guide

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- “Data Retrieval Restrictions” on page 1-7

Working with Databases

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“Supported Drivers” on page 1-3
“Structured Query Language (SQL)” on page 1-4

Connecting to Databases

Before you can use this toolbox to connect to a database, you must set up data sources. For more information, see “Configuring Your Environment” in the *Database Toolbox™ Getting Started Guide*.

Supported Platforms

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

For more information, 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.)

Supported Databases

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.

Supported Drivers

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 Sun™ Java™ Database Connectivity (JDBC) drivers.

Note If you receive this message:

Invalid string or buffer length.

you may be using the wrong driver.

For nearly all databases, you must use JDBC drivers with 64-bit machines. The only exceptions are 64-bit Access 2010 and 64-bit Oracle 11g Release 2. You can use 64-bit ODBC drivers for 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 Sun JDBC Web site at <http://industry.java.sun.com/products/jdbc/drivers>.

Structured Query Language (SQL)

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

Supported Data Types

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
- TINYINT

Note The Database Toolbox software interprets this data type as `BOOLEAN` and imports it into the MATLAB workspace as logical `true` (1) or `false` (0). For more information about how the Database Toolbox software handles `BOOLEAN` data, see “Importing and Exporting `BOOLEAN` Data” on page 3-48.

- VARCHAR
- NTEXT

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

Data Retrieval Restrictions

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“Reserved Words in Column Names” on page 1-7

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.

Working with Data Sources

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Setting Up ODBC Data Sources

For instructions on setting up ODBC data sources, see “Setting Up ODBC Data Sources” in the *Database Toolbox Getting Started Guide*.

Setting Up JDBC Data Sources

For instructions on setting up JDBC data sources, see “Setting Up JDBC Data Sources” in the *Database Toolbox Getting Started Guide*.

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 2-4.
- 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 2-4.
- 2** Click **Remove**.
- 3** Click **OK** to save your changes and close the Define JDBC data sources dialog box.

Troubleshooting JDBC Driver Problems

This section describes how to address common data source access problems, in which selecting a data source in the Visual Query Builder list produces an error, or the data source is not in the list as expected. There are several potential causes for these issues:

- The database is unavailable, or there are connectivity problems. Try reselecting the data source in VQB. If you are still unable to access the data source, contact your database administrator.
- You ran the `clear all` command in the MATLAB Command Window after you defined a JDBC data source. In this case, redefine the data source by following the instructions in “Setting Up JDBC Data Sources” in the *Database Toolbox Getting Started Guide*.

Using Visual Query Builder

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- “Working with Preferences” on page 3-6
- “Displaying Query Results” on page 3-10
- “Fine-Tuning Queries Using Advanced Query Options” on page 3-22
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Getting Started with Visual Query Builder

In this section...
“What Is Visual Query Builder?” on page 3-2
“Using Queries to Import Data” on page 3-2
“Using Queries to Export Data” on page 3-4

What Is Visual Query Builder?

Visual Query Builder (VQB) is an easy-to-use graphical user interface (GUI) for exchanging data with your database. 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.

12 View query results in table, chart, and report formats.

8 Set preferences for data retrieval.

13 Save, load, and run queries, and generate M-files.

6 Refine query.

7 View SQL statement.

9* Assign variable for results.

11 Double-click to view query results in MATLAB Array Editor. 10* Run query.

The screenshot shows the Visual Query Builder window with the following configuration:

- Data operation:** Select, Insert
- Data source:** MS Access Databases, SampleDB, dBASE Files, dbtoolboxdemo
- Catalog:** <default>
- Schema:** <default>
- Tables:** inventoryTable, productTable, salesVolume, suppliers, Temperatures
- Fields:** StockNumber, January, February, March, April
- Advanced query options:** All, Distinct; Where...: > 400000
- SQL statement:** SELECT ALL StockNumber, March FROM salesVolume WHERE StockNumber > 400000
- MATLAB workspace variable:** A
- Execute** button
- Data table:**

Workspace variable	Size	Memory (bytes)
A	7x2	952

For a step-by-step example of how to use queries to import data into the MATLAB workspace from a database, see “Using Queries to Import Database

Data into the MATLAB Workspace” in the *Database Toolbox Getting Started Guide*.

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.

9 Save, load, and run queries, set preferences for exporting NULLs, and generate M-files.

7 View MATLAB statement.

6* Specify variable containing data to export.

8* Run query.

The screenshot shows the Visual Query Builder window with the following configuration:

- Data operation:** Insert
- Data source:** dBASE Files
- Catalog:** <default>
- Schema:** <default>
- Tables:** Avg_Freight_Cost, Categories, Customers, Employees
- Fields:** Calc_Date, Avg_Cost
- Advanced query options:** All, Distinct
- MATLAB command:** `insert(conn,'Avg_Freight_Cost',{'Calc_Date','Avg_Cost'},export_data)`
- MATLAB workspace variable:** export_data
- Data Table:**

Workspace variable	Size	Memory (bytes)
export_data	1x2	150

For a step-by-step example of how to use queries to export data from the MATLAB workspace to a database, see “Using Queries to Export MATLAB Workspace Data to a Database” in the *Database Toolbox Getting Started Guide*.

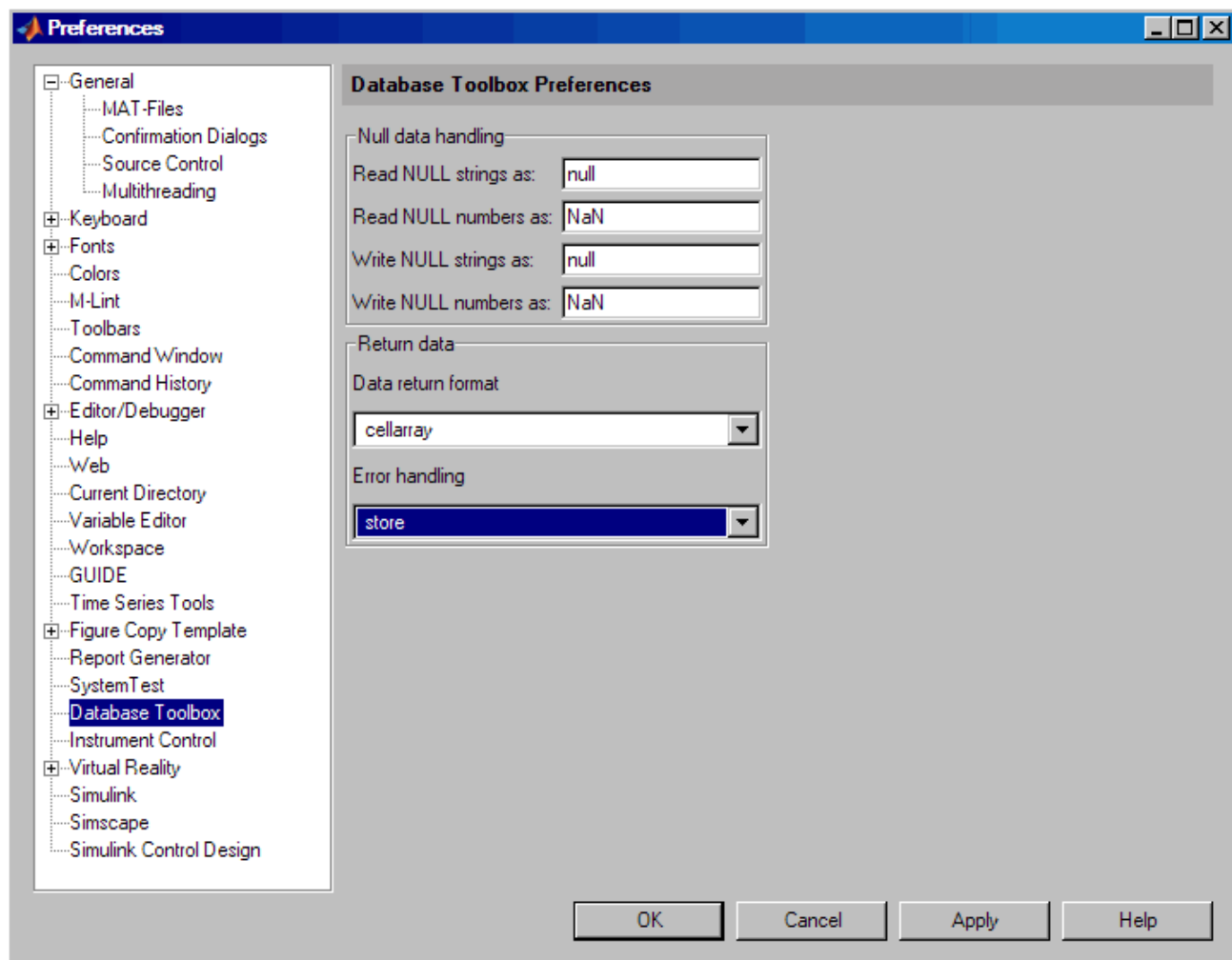
Working with Preferences

Specifying Preferences

This section describes how to set VQB preferences 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

1 Select **Query > Preferences**. The Preferences dialog box appears.



2 Specify the Preferences settings as described in the following table.

Preference	Value	Description
Read NULL numbers as	0	If you accept the default value for this field, NULL data imported from databases into the MATLAB workspace appears as NaN. Setting this field to 0 causes NULL data imported into the MATLAB workspace to appear as 0s.
Data return format	numeric	Select a data format based on the type of data you are importing, memory considerations, and your preferred method of working with retrieved data. Cell arrays and structures support mixed data types, but require more memory and process more slowly than numeric matrices. Select numeric if: <ul style="list-style-type: none"> • The data you are retrieving is numeric, or • You need to convert nonnumeric data to the format specified in the Read NULL numbers as field.
Error handling	report	<ul style="list-style-type: none"> • Set this field to store or empty to direct errors to a dialog box rather than to the MATLAB Command Window. • Set this field to report to display query errors in the MATLAB Command Window.

- 3** Click **OK**.
- 4** Assign the query results to a workspace variable, **A**.
- 5** Click **Execute** to rerun the query.

Information about the retrieved data appears in the **Data** area.

- 6** To see the results, enter **A** in the Command Window.

A =

125970	1400	1100	981
212569	2400	1721	1414
389123	1800	1200	890
400314	3000	2400	1800
400339	4300	0	2600
400345	5000	3500	2800
400455	1200	900	800
400876	3000	2400	1500
400999	3000	1500	1000
888652	0	900	821

NULL values appear as 0s instead of NaNs.

For more information about Preferences, see the `setdbprefs` function reference page.

Displaying Query Results

In this section...

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“Displaying Data Relationally” on page 3-10

“Charting Query Results” on page 3-14

“Displaying Query Results in an HTML Report” on page 3-16

“Using the MATLAB® Report Generator Software to Customize Display of Query Results” on page 3-17

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 Variable 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**.

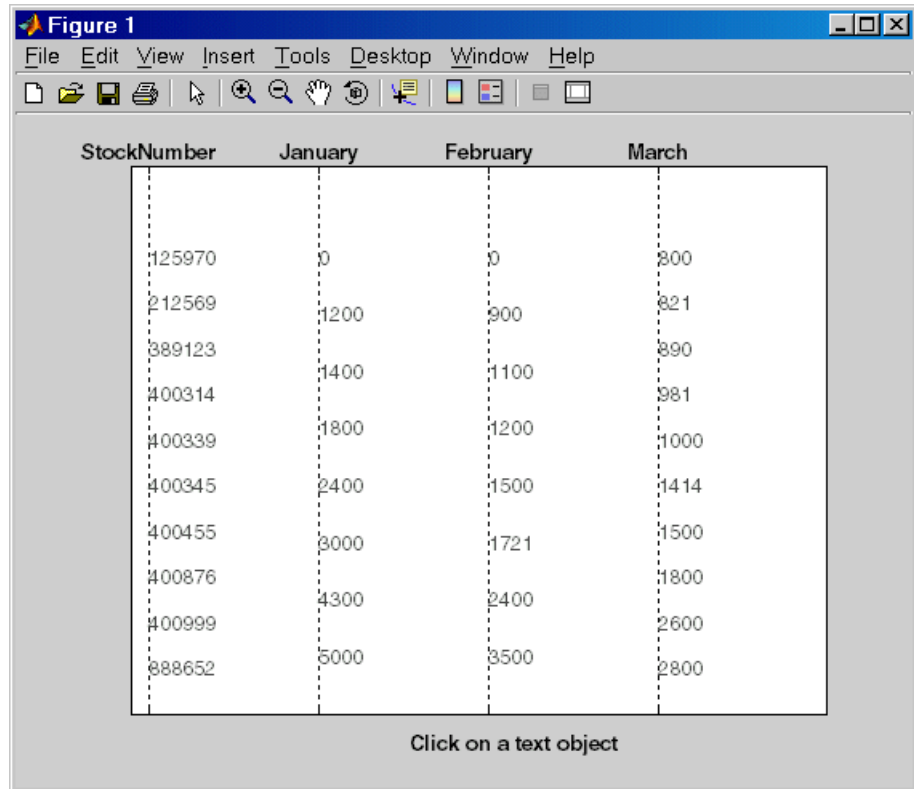
Displaying Data Relationally

To display the results of `basic.qry`:

- 1** Execute `basic.qry`.

2 Select **Display > Data**.

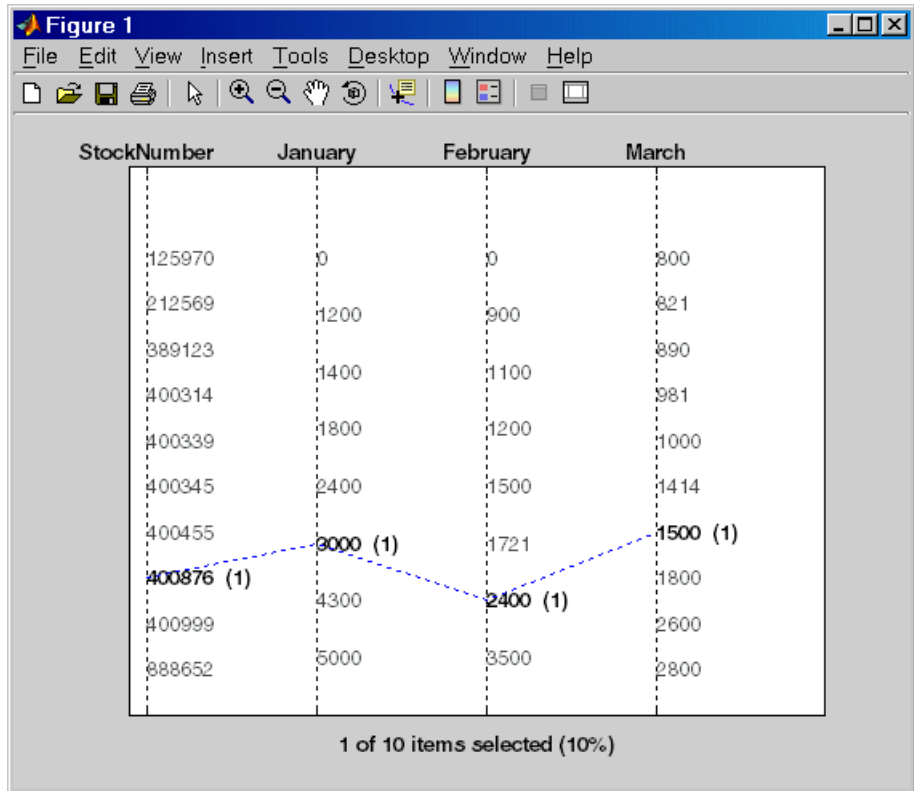
The query results appear in a figure window.



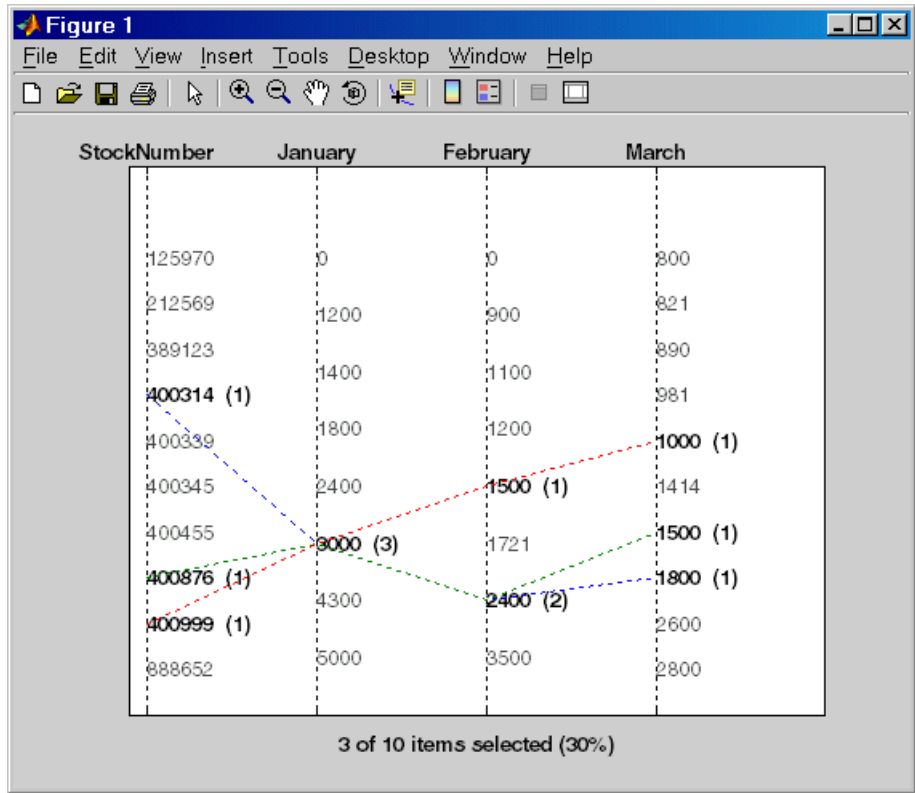
This display shows only unique values for each field, so you should not read each row as a single record. In this example, there are 10 entries for **StockNumber**, 8 entries for **January** and **February**, and 10 entries for **March**. The number of entries in each field corresponds to the number 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.

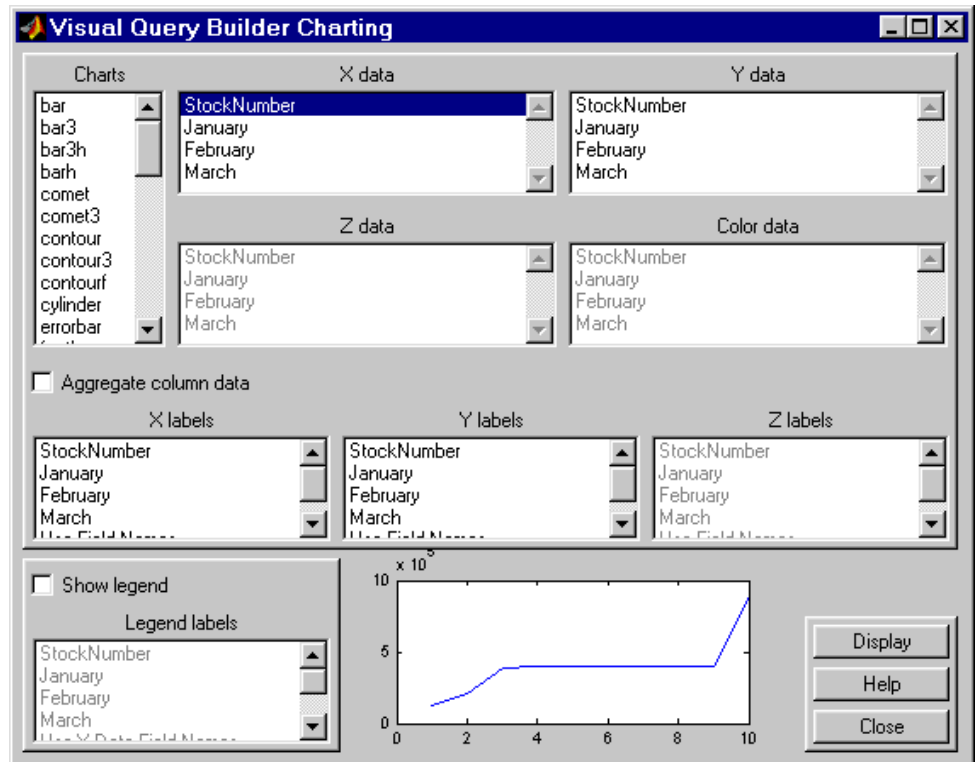


Charting Query Results

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.

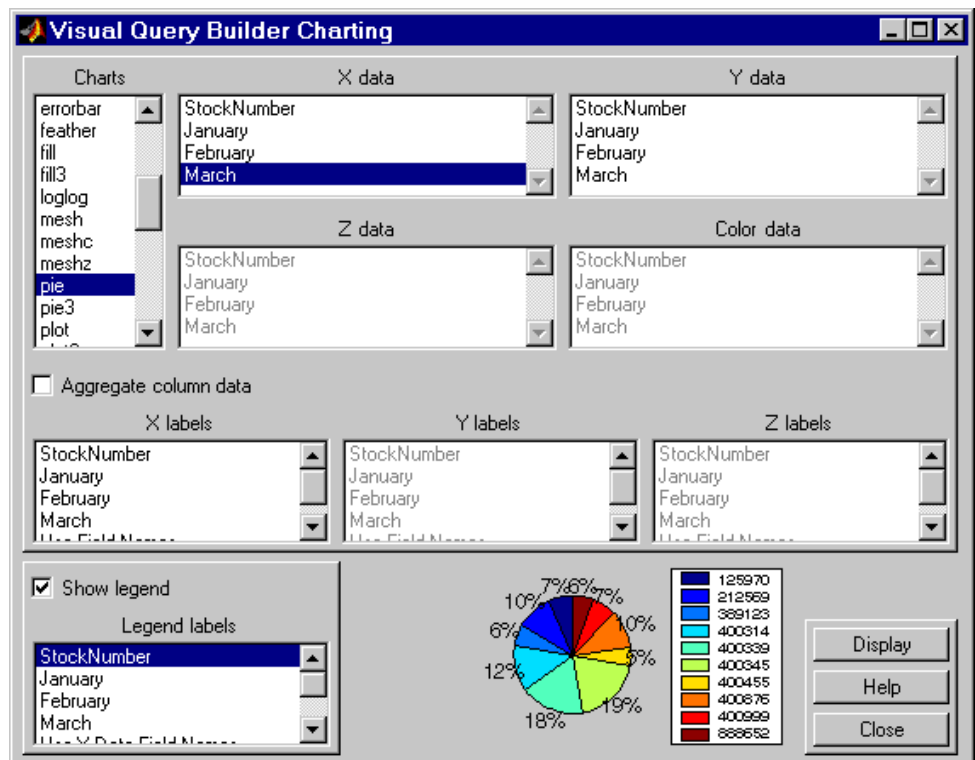
The pie chart preview now shows percentages for March data.

- 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.

The screenshot shows a Netscape browser window with a menu bar (File, Edit, View, Go, Bookmarks, Tools, Window, Help) and a toolbar with navigation buttons and a search box. The main content area displays a table titled "Table 1. Database Toolbox Default Report". The table contains 11 rows of data. Below the table is a link for "The MathWorks Inc". The status bar at the bottom indicates "Document Done (0.121 secs)".

StockNumber	January	February	March
125970	1400	1100	981
212569	2400	1721	1414
389123	1800	1200	890
400314	3000	2400	1800
400339	4300	0	2600
400345	5000	3500	2800
400455	1200	900	800
400876	3000	2400	1500
400999	3000	1500	1000
888652	0	900	821

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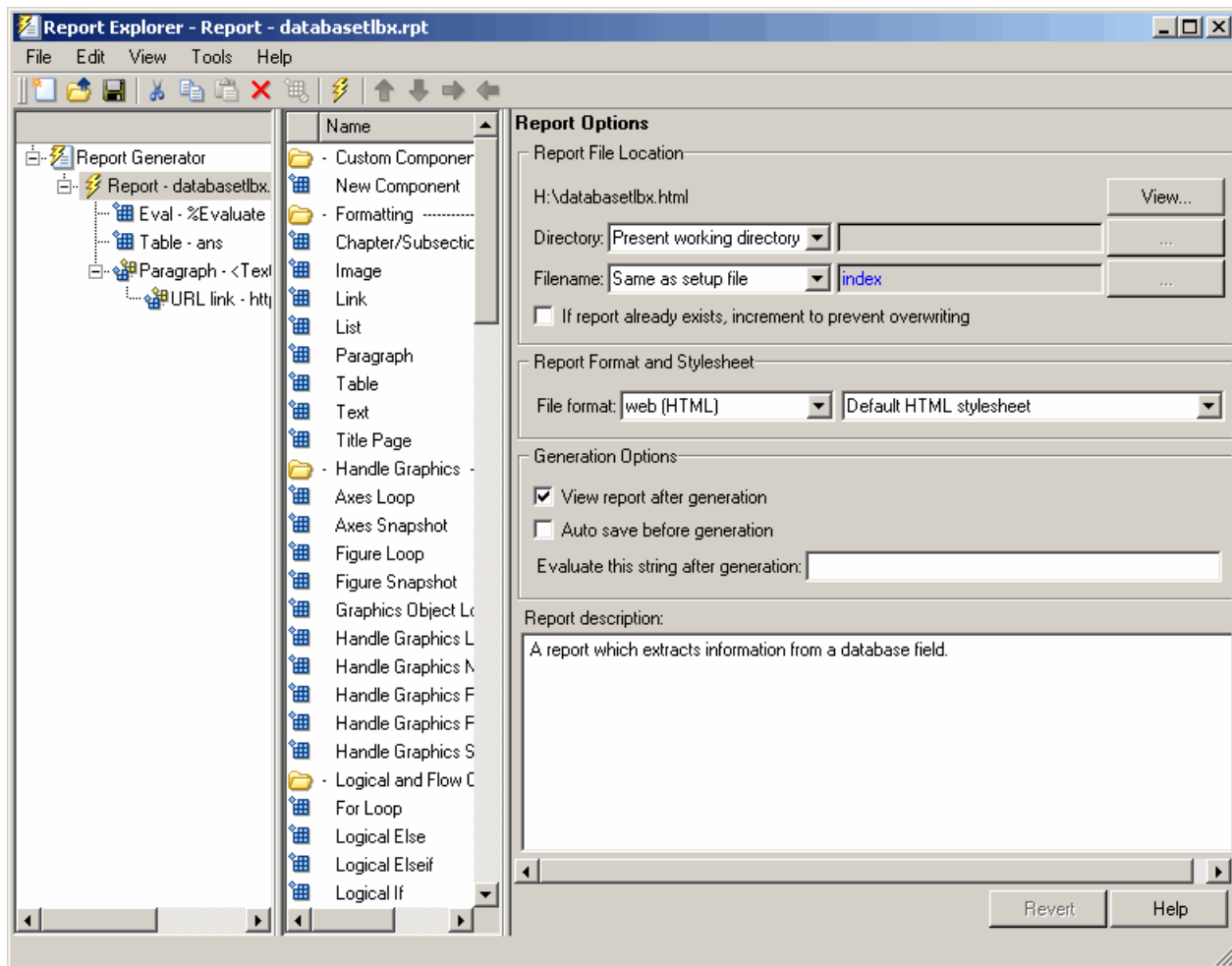
Document Done (0.121 secs)

Tip Because some browsers do not start automatically, you may need to open your Web browser before displaying the query results.

Using the MATLAB Report Generator Software to Customize Display of Query Results

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/databaset1bx.rpt` from the Options pane in the middle of the Report Explorer window.



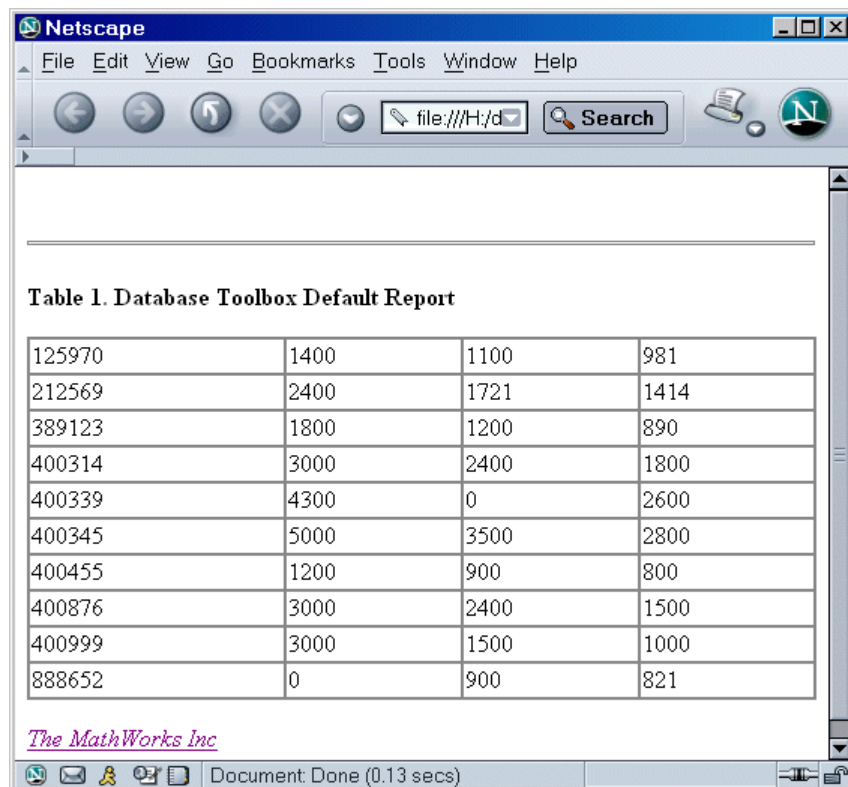
3 Open the report template for editing by clicking **Open a Report file or stylesheet**.

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.



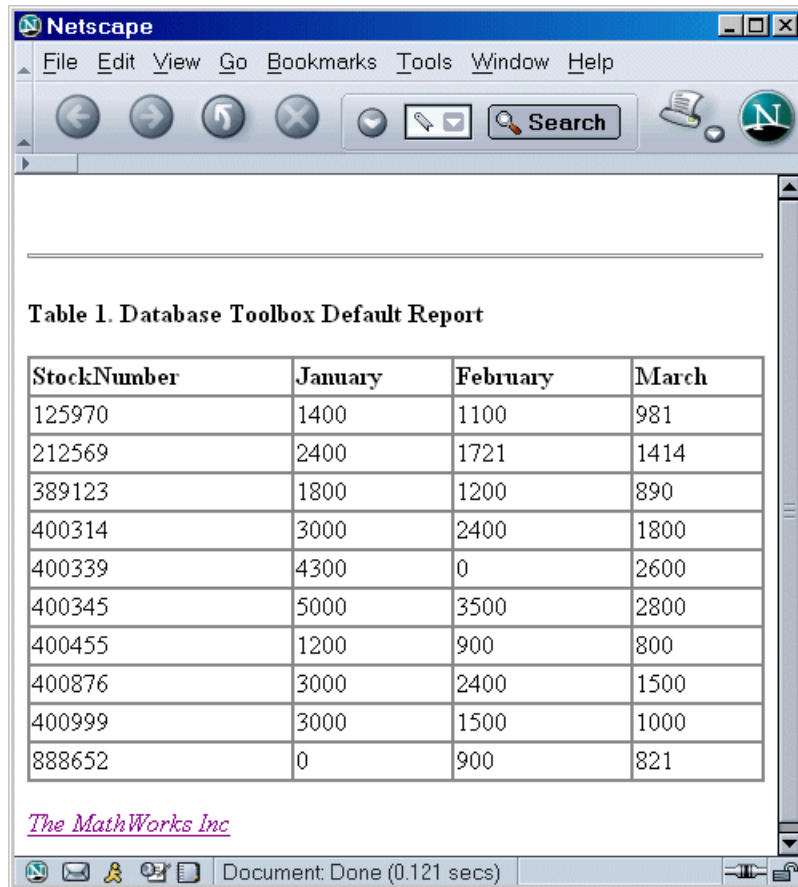
- 5 Field names do not automatically display as column headers in the report. To display the field names:

- 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.



For more information about the MATLAB Report Generator product, click the **Help** button in the Report Explorer or see the MATLAB Report Generator documentation.

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...

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“Retrieving Data That Meets Specified Criteria” on page 3-24

“Grouping Statements” on page 3-27

“Displaying Results in a Specified Order” on page 3-31

“Using Having Clauses to Refine Group by Results” on page 3-34

“Creating Subqueries for Values from Multiple Tables” on page 3-37

“Creating Queries That Include Results from Multiple Tables” on page 3-42

“Additional Advanced Query Options” on page 3-45

Note For more information 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]
```

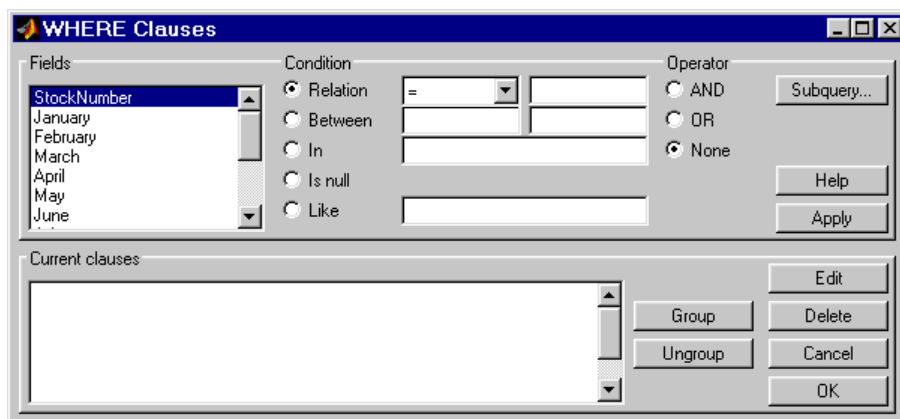
The value 3000 appears three times in All, but appears only once in Distinct.

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:

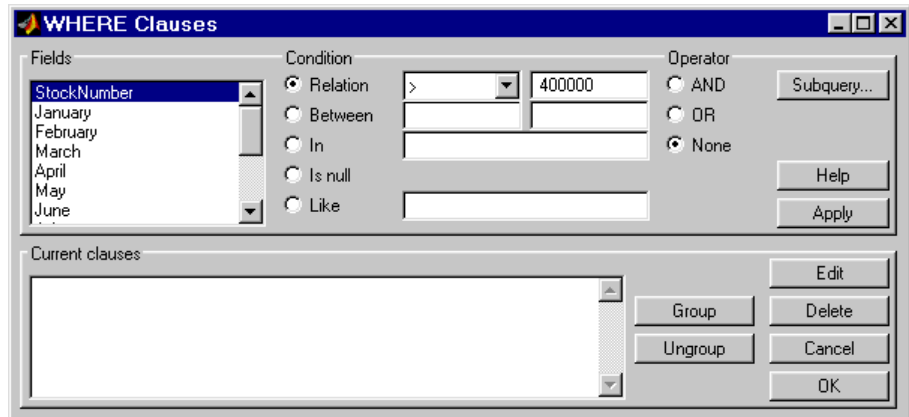
- 1 Load `basic.qry`.
- 2 Set the **Data return format** preference to `cellarray`.
- 3 Set **Read NULL numbers as** to `NaN`.
- 4 In **Advanced query options**, click **Where**.

The WHERE Clauses dialog box appears.



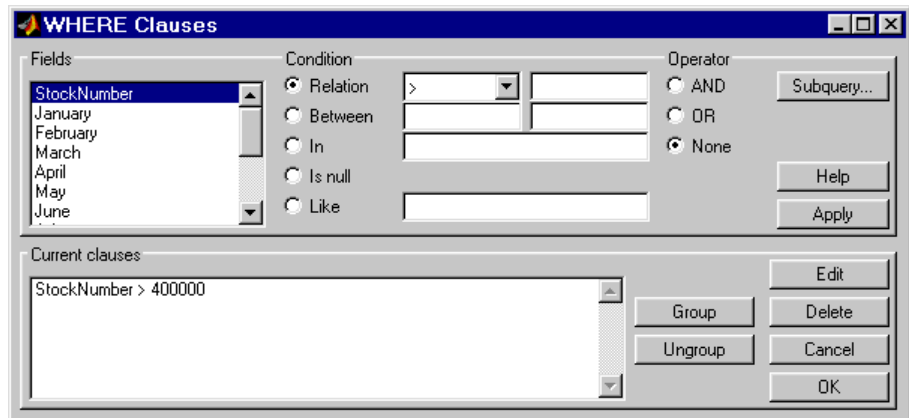
- 5 In **Fields**, select the field whose values you want to restrict, `StockNumber`.
- 6 In **Condition**, specify that `StockNumber` must be greater than 400000.
 - a Select **Relation**.
 - b In the drop-down list to the right of **Relation**, select `>`.
 - c In the field to the right of the drop-down 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]

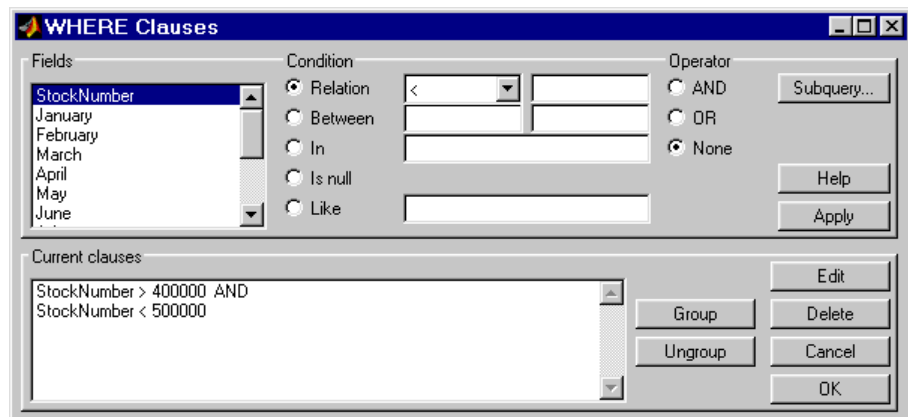
12 Save this query as basic_where.qry.

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:

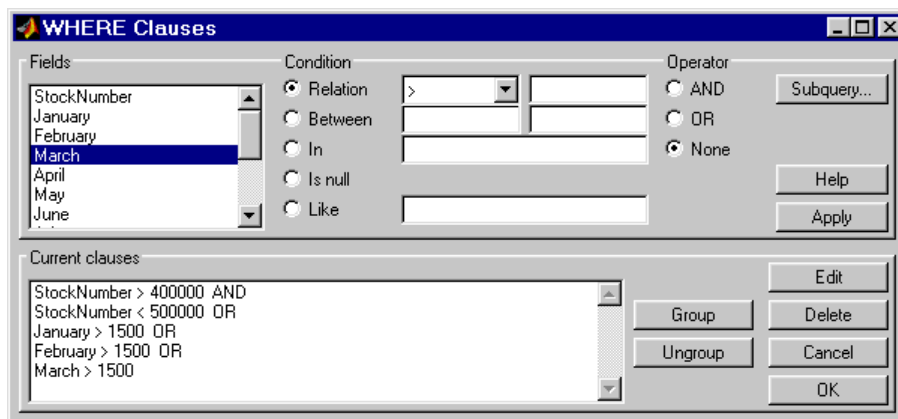
1 Click **Where** in VQB. The WHERE Clauses dialog box appears.



2 Modify the query to retrieve data if sales in January, February, or March exceed 1500 units.

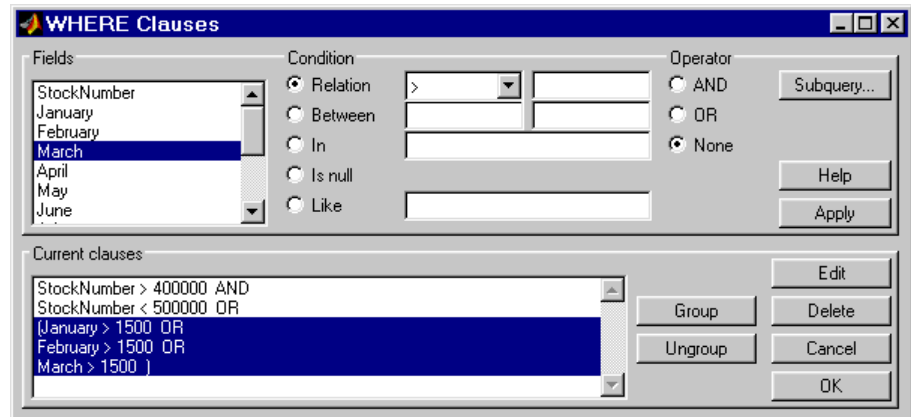
- a** In **Current clauses**, select StockNumber < 500000 and click **Edit**.
- b** For **Operator**, select OR and click **Apply**.
- c** In **Fields**, select January. For **Relation**, select > and enter 1500 in its field. For **Operator**, select OR. Click **Apply**.
- d** Repeat step c twice, specifying February and March in **Fields**.

The WHERE Clauses dialog box now looks as follows.



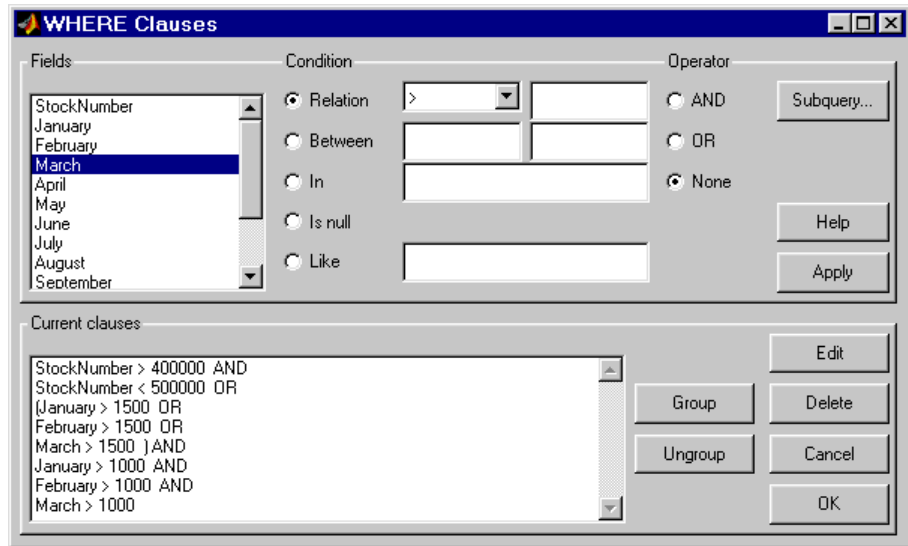
- 3** Group the criteria that require sales in each month to exceed 1500 units.
 - a** In **Current clauses**, select the statement January > 1500 OR. Press **Shift**+click to select February > 1500 OR and March > 1500 also.
 - b** Click **Group**.

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

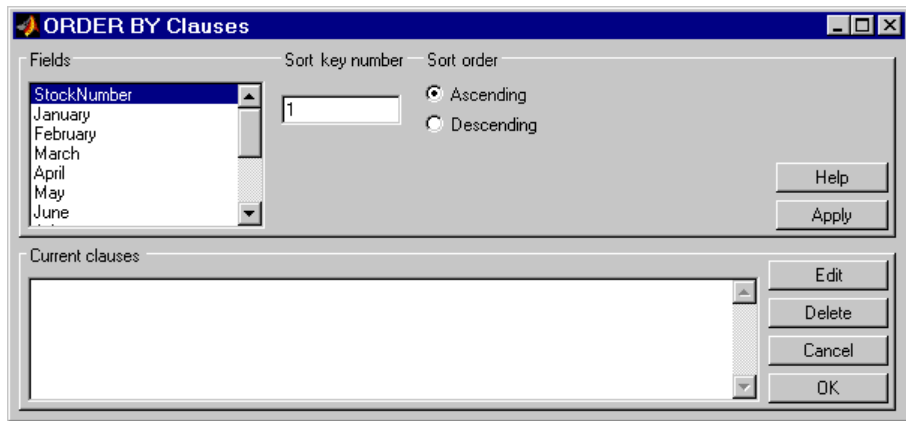
Use **Order by** in **Advanced query options** to specify the order in which query results display.

This example uses the `basic_where.qry` query you created in “Retrieving Data That Meets Specified Criteria” on page 3-24. 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.

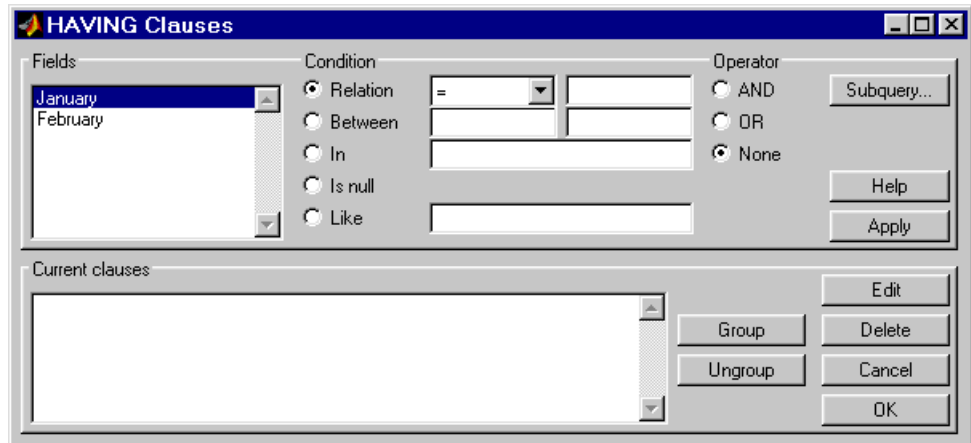
For items 400314 and 400876, **February sales** were 2400, so the third sort key, **March sales**, applies. **March sales** appear in descending order: 1800 and 1500, respectively.

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 3-24.
- 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:

d Select the clauses to group from **Current clauses**. Press **Ctrl+click** or **Shift+click** to select multiple clauses.

e 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 more information, see “Creating Subqueries for Values from Multiple Tables” on page 3-37.

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**.

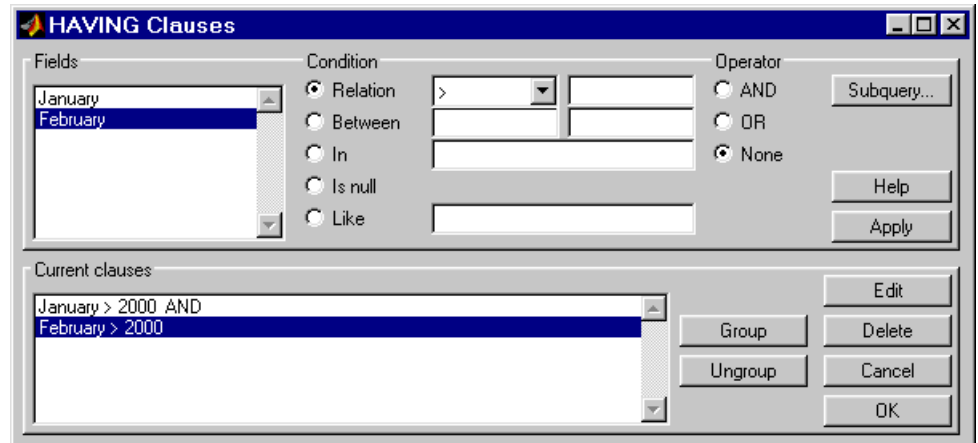
d Click **Apply**.

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 3-31.

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 in “Saving Queries” in the *Database Toolbox Getting Started Guide*.

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

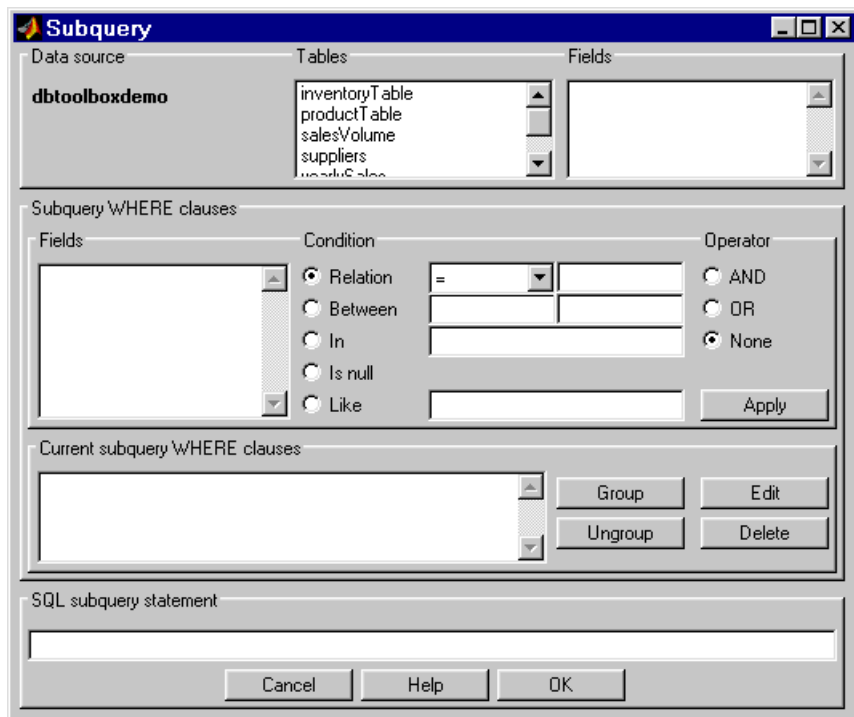
number for the product whose description is **Building Blocks** from the **productTable** table. It then gets the sales volume values for that stock number from the **salesVolume** table.

- 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.

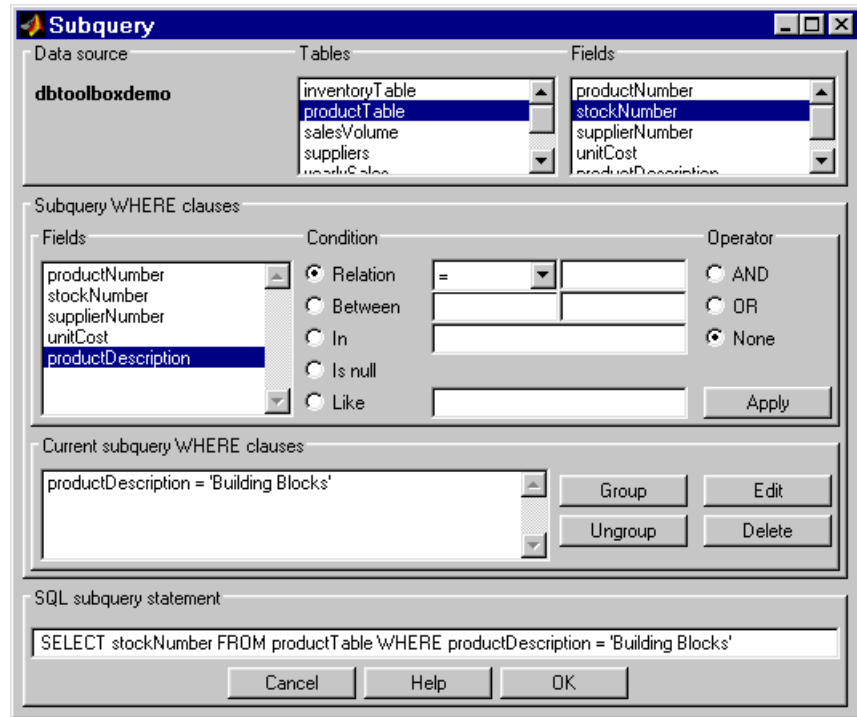


- 5** In **Tables**, select `productTable`, which includes the association between the stock number and the product description. The fields in that table appear.
- 6** In **Fields**, select `stockNumber`, the field that is common to this table and the table from which you are retrieving results.

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**.

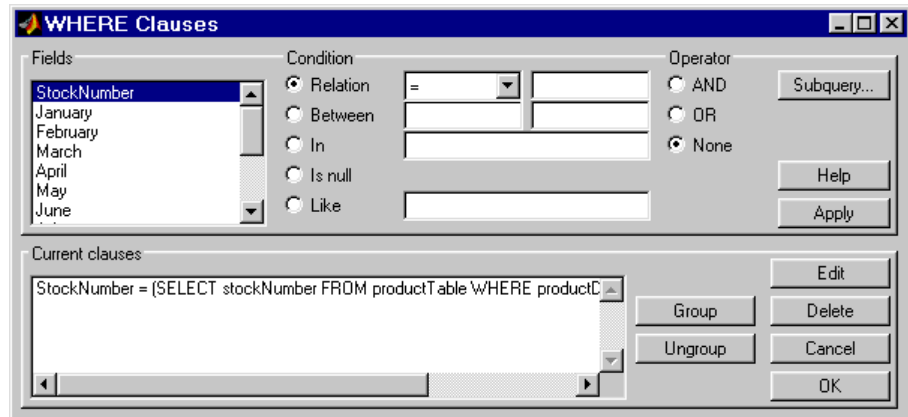
The clause appears in the **Current subquery WHERE clauses** field and is added to the **SQL subquery statement**.



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:
- For **Data source**, select dbtoolboxdemo.
 - In **Tables**, select productTable.
 - In **Fields**, select stockNumber and productDescription.
 - Assign the query results to the **MATLAB workspace variable P**.
 - 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 3-37, 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 `fieldName.tableName`. 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.

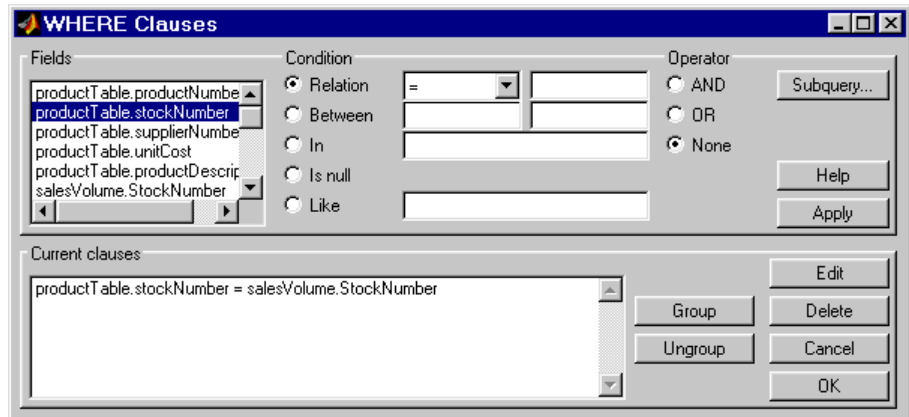
In **Advanced query options**, click **Where** to associate fields from different tables. The **WHERE Clauses** dialog box appears.

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 more information on 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** Sun Java 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 **SampleDB** 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 **SampleDB**.
- 3** In **Tables**, select **Employees**.
- 4** In **Fields**, select **EmployeeID** and **Photo** (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 more information on `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...

“Importing BOOLEAN Data from Databases to the MATLAB Workspace”
on page 3-48

“Exporting BOOLEAN Data from the MATLAB Workspace to Databases”
on page 3-51

Importing BOOLEAN Data from Databases to the MATLAB Workspace

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 `Products` table in the `Nwind` database into the MATLAB workspace.

- 1 Set **Data return format** to `cellarray`.
- 2 For **Data operation**, choose **Select**.
- 3 In **Data source**, select `SampleDB`.
- 4 In **Tables**, select `Products`.
- 5 In **Fields**, select `ProductName` and `Discontinued`.
- 6 Assign the query results to the **MATLAB workspace variable** `D`.
- 7 Click **Execute** to run the query.

VQB retrieves a 77-by-2 array.

- 8 Enter `D` in the MATLAB Command Window. 77 records are returned; only the first five records appear here due to space constraints.

```
D =
    'Chai '           [0]
    'Chang'          [0]
```

```
'Aniseed Syrup'      [0]
                    [1x28 char] [0]
                    [1x22 char] [1]
```

9 Compare these results to the data in Microsoft Access.

Discontinued field is BOOLEAN, where a check means true or Yes.

Product ID	Product Name	Supplier	Category	Quantity	Unit Price	Units In Stock	Units On Order	Reorder Level	Discontinued
1	Chai	Exotic Liquors	Beverages	10 boxes	\$18.00	39	0	10	<input type="checkbox"/>
2	Chang	Exotic Liquors	Beverages	24 - 12 oz	\$19.00	17	40	25	<input type="checkbox"/>
3	Aniseed Syrup	Exotic Liquors	Condiments	12 - 550 ml	\$10.00	13	70	25	<input type="checkbox"/>
4	Chef Anton's Cajun Seasoning	New Orleans Produce	Condiments	48 - 6 oz jar	\$22.00	53	0	0	<input type="checkbox"/>
5	Chef Anton's Gumbo Mix	New Orleans Produce	Condiments	36 boxes	\$21.35	0	0	0	<input checked="" type="checkbox"/>

Design view in Access for the **Discontinued** field shows it is a Yes/No (BOOLEAN) data type.

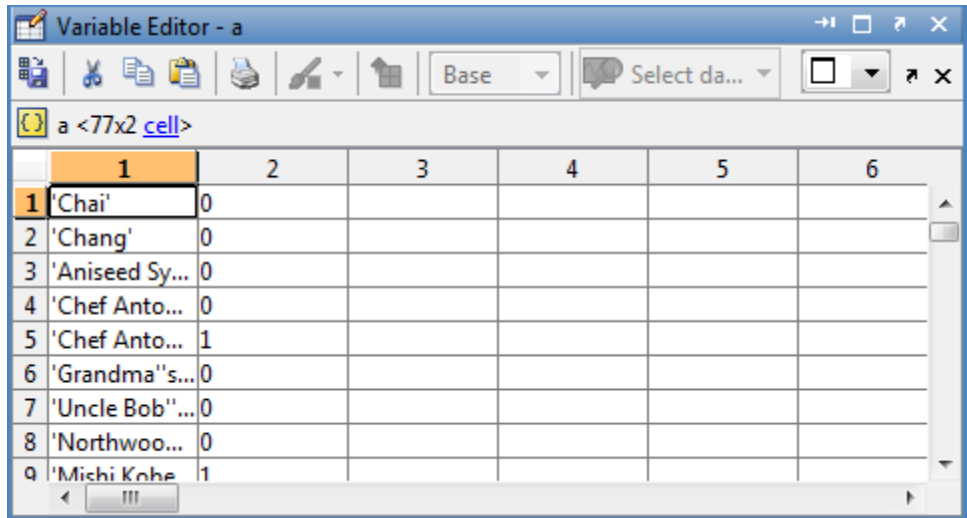
Field Name	Data Type	Description
Discontinued	Yes/No	Yes means item is no longer available.

Field Properties

Format	Yes/No
Caption	
Default Value	=No
Validation Rule	
Validation Text	
Required	No
Indexed	No

The field description is optional. It helps you describe the field and is also displayed in the status bar when you select this field on a form. Press F1 for help on descriptions.

- 10 In the VQB **Data** area, double-click D to view its contents in the Variable Editor.



The screenshot shows the Variable Editor window for variable 'a'. The window title is 'Variable Editor - a'. The toolbar includes icons for copy, paste, undo, redo, and a 'Base' dropdown menu. The main area displays a table with 9 rows and 6 columns. The first column contains names, and the second column contains numerical values. The first row is highlighted in orange.

	1	2	3	4	5	6
1	'Chai'	0				
2	'Chang'	0				
3	'Aniseed Sy...	0				
4	'Chef Anto...	0				
5	'Chef Anto...	1				
6	'Grandma''s...	0				
7	'Uncle Bob''...	0				
8	'Northwoo...	0				
9	'Michi Kabe	1				

For more information about MATLAB logical data types, see Logical Types in the MATLAB Programming Fundamentals documentation.

Exporting BOOLEAN Data from the MATLAB Workspace 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 Products table in the Nwind database.

- 1 In the MATLAB workspace, create P, the structure you want to export.

```
P.ProductName{1,1}='Chocolate Truffles';
P.Discontinued{1,1}=logical(0);
P.ProductName{2,1}='Guatemalan Coffee';
P.Discontinued{2,1}=logical(1);
```

- 2 For **Data operation**, choose **Insert**.

- 3 In **Data source**, select SampleDB.

- 4 In **Tables**, select Products.

- 5 In **Fields**, select ProductName and Discontinued.

- 6 Assign results to the **MATLAB workspace variable P**.

- 7 Click **Execute** to run the query.

VQB inserts two new rows into the Products table.

View the table in Microsoft Access to verify that the data was correctly inserted.

Products : Table										
	Product	Product Name	Supplier	Category	Quantity P	Unit P	Units	Units O	Reorde	Discontinued
+	74	Longlife Tofu	Tokyo Trad	Produc	5 kg pkg.	10.00	4	20	5	<input type="checkbox"/>
+	75	Rhönbräu Klosterbier	Plutzer Leb	Bevera	24 - 0.5 l bc	7.75	125	0	25	<input type="checkbox"/>
+	76	Lakkalikööri	Karkki Oy	Bevera	500 ml	18.00	57	0	20	<input type="checkbox"/>
+	77	Original Frankfurter grü	Plutzer Leb	Condin	12 boxes	13.00	32	0	15	<input type="checkbox"/>
+	78	Chocolate Truffles				10.00	0	0	0	<input type="checkbox"/>
+	79	Guatemalan Coffee				10.00	0	0	0	<input checked="" type="checkbox"/>
*	Number)									

Record: 1 of 79

Saving Queries in Files

In this section...

“About Generated Files” on page 3-52

“VQB Query Elements in Generated Files” on page 3-53

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 = '';
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.

Using Database Toolbox Functions

- “Getting Started with Database Toolbox Functions” on page 4-2
- “Importing Data from Databases into the MATLAB Workspace” on page 4-3
- “Viewing Information About Imported Data” on page 4-5
- “Exporting Data from the MATLAB Workspace to a New Record in a Database” on page 4-7
- “Replacing Existing Data in Databases with Data Exported from the MATLAB Workspace” on page 4-11
- “Exporting Multiple Records from the MATLAB Workspace” on page 4-13
- “Exporting Data Using the Bulk Insert Command” on page 4-17
- “Retrieving BINARY or OTHER Sun Java SQL Data Types” on page 4-24
- “Working with Database Metadata” on page 4-26
- “Using Driver Functions” on page 4-33
- “About Database Toolbox Objects and Methods” on page 4-35

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.

Importing Data from Databases into the MATLAB Workspace

This example demonstrates a sample workflow on a sample database called SampleDB.

- 1 Before you connect to a database, set the maximum time that you want to allow the MATLAB software session to try to connect to a database to 5 seconds.

```
logintimeout(5)
```

Note If you are connecting to a database using a JDBC connection, you need to specify different function syntax in this step. For more information, see the `logintimeout` function reference page.

- 2 Use the `database` function to define a MATLAB variable, `conn`, to represent the returned connection object. Pass the following arguments to this function:
 - The name of the database, which is `SampleDB` for this example
 - The username and password

```
conn = database('SampleDB', 'username', 'password')
```

Enter `conn` at the command prompt to see the data.

Note If you are connecting to a database using a JDBC connection, you need to specify different syntax for the `database` function. For more information, see the `database` reference page.

- 3 Use `ping` to check that the database connection status is successful.
- 4 Use the `exec` function to open a cursor and execute an SQL statement. Pass the following arguments to `exec`:

- `conn`, the name of the connection object
- `select country from customers`, a SQL statement that selects the country column of data from the customers table

```
curs = exec(conn, 'select country from customers')
```

The `exec` function returns the MATLAB variable `curs`.

- 5** The returned data contains strings, so you must convert it to a format that supports strings. Use `setdbprefs` to specify the format `cellarray`:

```
setdbprefs('DataReturnFormat', 'cellarray')
```

- 6** To stop working now and resume working on the next example at a later time, close the cursor and the connection as follows:

```
close(curs)  
close(conn)
```

Viewing Information About Imported Data

This example shows how to view information about imported data and close the connection to the database using the following Database Toolbox functions:

- `attr`
- `close`
- `cols`
- `columnnames`
- `rows`
- `width`

For more information on these functions, see `matlab\toolbox\database\dbdemos\dbinfodemo.m`.

1 Open the cursor and connection if needed:

```
conn = database('SampleDB', '', '');  
curs = exec(conn, 'select country from customers');  
setdbprefs('DataReturnFormat', 'cellarray');  
curs = fetch(curs, 10);
```

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 =
```

```
'country'
```

- 5** Use `width` to return the column width, or size of the field, for the specified column number:

```
colsize = width(curs, 1)
colsize =
    15
```

- 6** Use `attr` to view multiple attributes for a column:

```
attributes = attr(curs)
attributes =
    fieldName: 'country'
    typeName: 'VARCHAR'
    typeValue: 12
    columnWidth: 15
    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)
```

Exporting Data from the MATLAB Workspace to a New Record in a Database

This example does the following:

- 1 Retrieves freight costs from an orders table.
- 2 Calculates the average freight cost and records the date on which the calculation was made.
- 3 Stores this data in a cell array.
- 4 Exports this data to an empty table.

You learn to use the following Database Toolbox functions:

- `get`
- `fastinsert`
- `setdbprefs`

For more information on these functions, see `matlab\toolbox\database\dbdemos\dbinsertdemo.m`.

- 1 Connect to the data source, `SampleDB`, if needed:

```
conn = database('SampleDB', '', '');
```

- 2 Use `setdbprefs` to set the format for retrieved data to numeric:

```
setdbprefs('DataReturnFormat','numeric')
```

- 3 Import three rows of data the freight column of data from the orders table.

```
curs = exec(conn, 'select freight from orders');  
curs = fetch(curs, 3);
```

- 4 Assign the data to the **MATLAB workspace variable** `AA`:

```
AA = curs.Data
```

```
AA =  
    32.3800  
    11.6100  
    65.8300
```

- 5** Calculate average freight cost and assign the number of rows in the array to `numrows`:

```
numrows = rows(curs);
```

- 6** Calculate the average of the data and assign the result to the variable `meanA`:

```
meanA = sum(AA(:))/numrows  
meanA =  
    36.6067
```

- 7** Assign the date on which the calculation was made to the variable `D`:

```
D = '20-Jan-2002';
```

- 8** Assign the date and mean to a cell array to export to a database. Put the date in the first cell of `exdata`:

```
exdata(1,1) = {D}  
exdata =  
    '20-Jan-2002'
```

Put the mean in the second cell of `exdata`:

```
exdata(1,2) = {meanA}  
exdata =  
    '20-Jan-2002'    [36.6067]
```

- 9** Define the names of the columns to which to export data. In this example, the column names are `Calc_Date` and `Avg_Cost`, from the `Avg_Freight_Cost` table in the `SampleDB` database. Assign the cell array containing the column names to the variable `colnames`:

```
colnames = {'Calc_Date', 'Avg_Cost'};
```


- 10** 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.

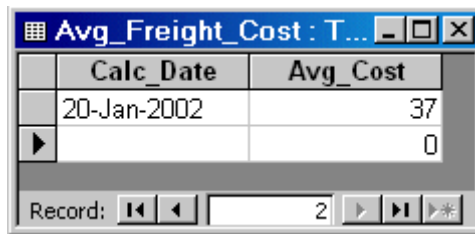
- 11** Use the `fastinsert` function to export the data into the `Avg_Freight_Cost` table. Pass the following arguments to this function:

- `conn`, the connection object for the database
- `Avg_Freight_Cost`, the name of the table to which you are exporting data
- The cell arrays `colnames` and `exdata`

```
fastinsert(conn, 'Avg_Freight_Cost', colnames, exdata)
```

`fastinsert` appends the data as a new record at the end of the `Avg_Freight_Cost` table.

- 12** In Microsoft Access, view the `Avg_Freight_Cost` table to verify the results.



Calc_Date	Avg_Cost
20-Jan-2002	37
	0

The `Avg_Cost` value was rounded to a whole number to match the properties of that field in Access.

- 13** Close the cursor.

```
close(curs)
```

- 14** Continue with the next example. To stop now and resume working with the next example at a later time, close the connection.

```
close(conn)
```

Replacing Existing Data in Databases with Data Exported from the MATLAB Workspace

This example updates the date field that you previously imported into the Avg_Freight_Cost table using the following Database Toolbox functions:

- close
- update

For more information on these functions, see `matlab\toolbox\database\dbdemos\dbupdatedemo.m`.

- 1 If you have completed the previous example, skip this step. Otherwise, enter the following commands:

```
conn = database('SampleDB', '', '');
colnames = {'Calc_Date', 'Avg_Cost'};
D = '20-Jan-2002';
meanA = 36.6067;
exdata = {D, meanA}
exdata =
    '20-Jan-2002'    [36.6067]
```

- 2 Change the date in the Avg_Freight_Cost table from 20-Jan-2002 to 19-Jan-2002:

```
D = '19-Jan-2002'
```

- 3 Assign the new date value to the newdata cell array.

```
newdata(1,1) = {D}
newdata =
    '19-Jan-2002'
```

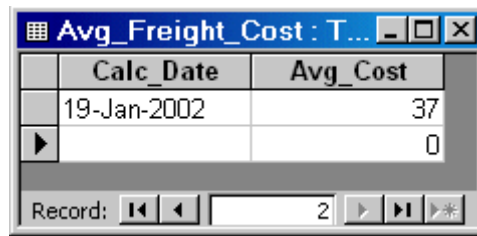
- 4 Specify the record to update in the database by defining a SQL where statement and assigning it to the variable `whereclause`. The record to update is the record whose `Calc_Date` is 20-Jan-2002. Because the date string is within a string, it is embedded within two single quotation marks rather than one.

```
whereclause = 'where Calc_Date = ''20-Jan-2002'' '  
whereclause =  
    where Calc_Date = '20-Jan-2002'
```

- 5** Export the data, replacing the record whose Calc_Date is 20-Jan-2002.

```
update(conn, 'Avg_Freight_Cost', colnames, newdata, whereclause)
```

- 6** In Microsoft Access, view the Avg_Freight_Cost table to verify the results.



Calc_Date	Avg_Cost
19-Jan-2002	37
20-Jan-2002	0

Record: 2

- 7** Close the cursor and 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 tutorial database 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 more information on these functions, see `matlab\toolbox\database\dbdemos\dbinsert2demo.m`.

- 1 Ensure that the tutorial database 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', '', '');
```

- 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
```

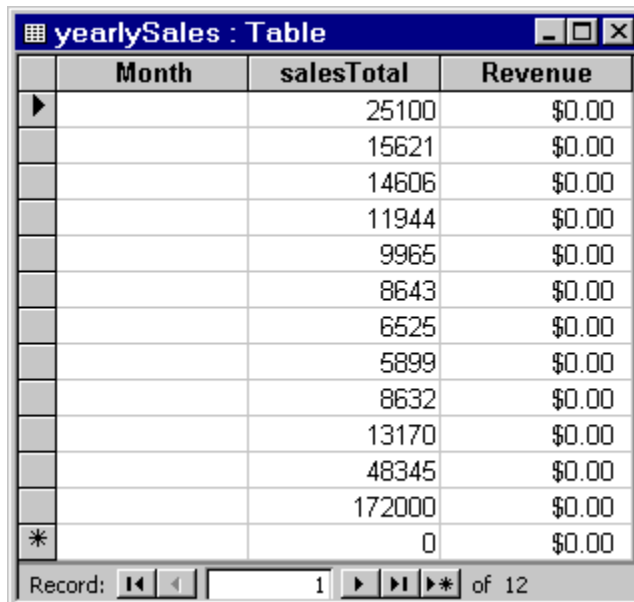
- 9** Create a string array containing the column names into which you want to insert the data, and assign the array to the variable `colnames`.

```
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, view the `yearlySales` table in the tutorial database.



	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 the Bulk Insert Command

In this section...

“Bulk Insert to Oracle” on page 4-17

“Bulk Insert to Microsoft® SQL Server 2005” on page 4-19

“Bulk Insert to MySQL” on page 4-21

Bulk Insert to Oracle

This example demonstrates how to export data to the Oracle server using the bulk insert command. To follow 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 to Microsoft SQL Server 2005

1 Connect to the Microsoft SQL Server. For JDBC driver use, add the jar file to the MATLAB javaclasspath.

```

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
```

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 to MySQL

1 Connect to the MySQL server. For JDBC driver use, add the jar file to the MATLAB javaclasspath.

```

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)
```

Retrieving BINARY or OTHER Sun Java SQL Data Types

This example retrieves images from the SampleDB data source using a sample file that parses image data, *matlabroot/toolbox/database/vqb/parsebinary.m*.

- 1 Connect to the SampleDB data source.

```
conn = database('SampleDB', '', '');
```

- 2 Specify cellarray as the data return format preference.

```
setdbprefs('DataReturnFormat','cellarray');
```

- 3 Import the EmployeeID and Photo columns of data from the Employees table.

```
curs = exec(conn, 'select EmployeeID,Photo from Employees')  
curs = fetch(curs);
```

- 4 View the data you imported.

```
curs.Data  
ans =  
  
[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]
```

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 photo.


```
photo = curs.Data{1,2};
```

- 6 Run `parsebinary`. This program writes the retrieved data to a file, strips ODBC header information from it, and displays `photo` 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(photo, 'BMP');
```

For more information on `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 4-26

“Resultset Metadata Objects” on page 4-32

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'
```

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 more information about the database metadata properties returned by `get`, see the methods of the `DatabaseMetaData` object on the Sun Java Web site:

<http://java.sun.com/j2se/1.4.2/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\Nwind'
'D:\Work\databasetoolboxfiles\Nwind_orig'
'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 more information about properties that the database supports, see the methods of the `DatabaseMetaData` object on the Sun Java Web site at <http://java.sun.com/j2se/1.4.2/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 more information, 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 demo available for this example, 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 more information.

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` (`cursor.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 =  
    Attributes: []  
        Data: {10x1 cell}  
DatabaseObject: [1x1 database]  
    RowLimit: 0  
    SQLQuery: 'select country from customers'  
    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 =  
    'Germany'  
    'Mexico'  
    'Mexico'  
    'UK'  
    'Sweden'  
    'Germany'  
    'France'  
    'Spain'  
    'France'
```

- 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. For more information, see “Methods — Defining Class Operations” in the *Developing MATLAB Classes* documentation.

Function Reference

Utilities (p. 5-2)	Settings for login time, retrieval format, and more
Database Connection (p. 5-2)	Create, test, close, and set parameters for database connection
SQL Cursor (p. 5-3)	Set parameters for and execute query
Data Import (p. 5-3)	Import data from database to MATLAB workspace, and get information about imported data
Database Metadata Object (p. 5-4)	Information about database data
Data Export (p. 5-5)	Export data from MATLAB workspace to database
Driver Object (p. 5-6)	Construct and get information about database driver
Drivermanager Object (p. 5-6)	Construct and get information about database drivermanager
ResultSet Object (p. 5-6)	Construct and get information about resultset
ResultSet Metadata Object (p. 5-7)	Construct and get information about resultset metadata
Visual Query Builder (p. 5-7)	Start query builder GUI and configure JDBC data source

Utilities

<code>logintimeout</code>	Set or get time allowed to establish database connection
<code>setdbprefs</code>	Set preferences for retrieval format, errors, NULLs, and more

Database Connection

<code>close</code>	Close database connection, cursor, or resultset object
<code>database</code>	Connect to database
<code>database.catalogs</code>	Get database catalog names
<code>database.columns</code>	Get database table column names
<code>database.schemas</code>	Get database schema names
<code>database.tables</code>	Get database table names
<code>get</code>	Retrieve object properties
<code>getdatasources</code>	Return names of ODBC and JDBC data sources on system
<code>isconnection</code>	Detect whether database connections are valid
<code>isreadonly</code>	Detect whether database connection is read only
<code>ping</code>	Get status information about database connection
<code>set</code>	Set properties for database, cursor, or drivermanager object

setdbprefs	Set preferences for retrieval format, errors, NULLs, and more
sql2native	Convert JDBC SQL grammar to SQL grammar native to system

SQL Cursor

close	Close database connection, cursor, or resultset object
exec	Execute SQL statement and open cursor
get	Retrieve object properties
querytimeout	Get time specified for SQL queries to succeed
runstoredprocedure	Call stored procedure with input and output parameters
set	Set properties for database, cursor, or drivermanager object

Data Import

attr	Retrieve attributes of columns in fetched data set
cols	Retrieve number of columns in fetched data set
columnnames	Retrieve names of columns in fetched data set

<code>cursor.fetch</code>	Import data into MATLAB workspace from cursor object created by <code>exec</code>
<code>database.fetch</code>	Execute SQL statement to import data into MATLAB workspace
<code>fetch</code>	<code>cursor.fetch</code> or <code>database.fetch</code>
<code>fetchmulti</code>	Import data from multiple resultsets
<code>querybuilder</code>	Start SQL query builder GUI to import and export data
<code>rows</code>	Return number of rows in fetched data set
<code>width</code>	Return field size of column in fetched data set

Database Metadata Object

<code>bestrowid</code>	Unique identifier for row in database table
<code>columnprivileges</code>	List database column privileges
<code>columns</code>	Return database table column names
<code>crossreference</code>	Retrieve information about primary and foreign keys
<code>dmd</code>	Construct database metadata object
<code>exportedkeys</code>	Retrieve information about exported foreign keys
<code>get</code>	Retrieve object properties
<code>importedkeys</code>	Return information about imported foreign keys
<code>indexinfo</code>	Return indices and statistics for database tables

<code>primarykeys</code>	Get primary key information for database table or schema
<code>procedurecolumns</code>	Get stored procedure parameters and result columns of catalogs
<code>procedures</code>	Get stored procedures for catalogs
<code>supports</code>	Detect whether property is supported by database metadata object
<code>tableprivileges</code>	Return database table privileges
<code>tables</code>	Return database table names
<code>versioncolumns</code>	Automatically update table columns

Data Export

<code>commit</code>	Make database changes permanent
<code>datainsert</code>	Export MATLAB data into database table
<code>fastinsert</code>	Add MATLAB data to database table
<code>insert</code>	Add MATLAB data to database tables
<code>querybuilder</code>	Start SQL query builder GUI to import and export data
<code>rollback</code>	Undo database changes
<code>update</code>	Replace data in database table with MATLAB data

Driver Object

<code>driver</code>	Construct database driver object
<code>get</code>	Retrieve object properties
<code>isdriver</code>	Detect whether driver is valid JDBC driver object
<code>isjdbc</code>	Detect whether driver is JDBC compliant
<code>isurl</code>	Detect whether database URL is valid
<code>register</code>	Load database driver
<code>unregister</code>	Unload database driver

Drivermanager Object

<code>drivermanager</code>	Construct database drivermanager object
<code>get</code>	Retrieve object properties
<code>set</code>	Set properties for database, cursor, or drivermanager object

ResultSet Object

<code>clearwarnings</code>	Clear warnings for database connection or resultset
<code>close</code>	Close database connection, cursor, or resultset object
<code>get</code>	Retrieve object properties

<code>isnullcolumn</code>	Detect whether last record read in resultset is NULL
<code>namecolumn</code>	Map resultset column name to resultset column index
<code>resultset</code>	Construct resultset object

Resultset Metadata Object

<code>get</code>	Retrieve object properties
<code>rsmd</code>	Construct resultset metadata object

Visual Query Builder

<code>confds</code>	Configure JDBC data source for Visual Query Builder
<code>querybuilder</code>	Start SQL query builder GUI to import and export data

Functions — Alphabetical List

attr

Purpose Retrieve attributes of columns in fetched data set

Syntax
`attributes = attr(curs, colnum)`
`attributes = attr(curs)`

Description `attributes = attr(curs, colnum)` retrieves attribute information for the column number `colnum` in the fetched data set `curs`.

`attributes = attr(curs)` retrieves attribute information for all columns in the fetched data set `curs` and stores the data in a cell array.

`attributes = attr(colnum)` displays attributes of column `colnum`.

A list of returned attributes appears in the following table.

Attribute	Description
<code>fieldName</code>	Name of the column.
<code>typeName</code>	Data type.
<code>typeValue</code>	Numerical representation of the data type.
<code>columnWidth</code>	Size of the field.
<code>precision</code>	Precision value for floating and double data types; an empty value is returned for strings.
<code>scale</code>	Precision value for real and numeric data types; an empty value is returned for strings.
<code>currency</code>	If <code>true</code> , data format is currency.
<code>readOnly</code>	If <code>true</code> , data cannot be overwritten.
<code>nullable</code>	If <code>true</code> , data can be NULL.
<code>Message</code>	Error message returned by <code>fetch</code> .

Examples **Example 1 – Get Attributes for One Column**

Get column attributes for the fourth column of a fetched data set:

```
attr(curs, 4)
```

```
ans =
  fieldName: 'Age'
  typeName: 'LONG'
  typeValue: 4
  columnWidth: 11
  precision: []
  scale: []
  currency: 'false'
  readOnly: 'false'
  nullable: 'true'
  Message: []
```

Example 2 – Get Attributes for All Columns

- 1 Get column attributes for curs and assign them to attributes.

```
attributes = attr(curs)
```

- 2 View the attributes of column 4.

```
attributes(4)
ans =
  fieldName: 'Age'
  typeName: 'LONG'
  typeValue: 4
  columnWidth: 11
  precision: []
  scale: []
  currency: 'false'
  readOnly: 'false'
  nullable: 'true'
  Message: []
```

See Also

cols | columnnames | columns | cursor.fetch | dmd | get | tables
| width

bestrowid

Purpose 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`

Purpose 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

Purpose Close database connection, cursor, or resultset object

Syntax `close(object)`

Description `close(object)` closes `object`, which frees up resources. Allowable objects for `close` are listed in the following table.

Object	Description	Action Performed by <code>close(object)</code>
<code>conn</code>	Database connection object	Closes <code>conn</code>
<code>curs</code>	Cursor object	Closes <code>curs</code>
<code>rset</code>	Resultset object	Closes <code>rset</code>

Database connections, cursors, and resultsets remain open until you close them using the `close` function. Always close a cursor, connection, or resultset when you finish using it. Close a cursor before closing the connection used for that cursor.

Note The MATLAB session closes open cursors and connections when exiting, but the database might not free up the cursors and connections.

Tip For command-line help on `close`, use the overloaded methods:

```
help database/close
help cursor/close
help resultset/close
```

Examples

Close the cursor `curs` and the connection `conn` .

```
close(curs)
close(conn)
```

See Also

`cursor.fetch` | `database` | `exec` | `resultset`

cols

Purpose 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 three columns in the fetched data set `curs`.

```
numcols = cols(curs)
```

```
numcols =  
3
```

See Also `attr` | `columnnames` | `columnprivileges` | `columns` | `cursor.fetch` | `get` | `rows` | `width`

Purpose

Retrieve names of columns in fetched data set

Syntax

```
FIELDSTRING = columnnames(CURSOR)
FIELDSTRING = columnnames(CURSOR, BCELLARRAY)
```

Description

FIELDSTRING = columnnames(CURSOR) returns the column names of the data selected from a database table. The column names are enclosed in quotes and separated by commas. (The columnnames function is not supported for a cursor object returned by the fetchmulti function.)

FIELDSTRING = columnnames(CURSOR, BCELLARRAY) returns the column names as a cell array of strings when BCELLARRAY is set to true.

Examples

- 1 Run a SQL query to return all columns from the Microsoft Access Northwind database employees table:

```
sql = 'select * from employees'
cursor = exec(connection, sql)
cursor = fetch(cursor)
```

- 2 Use columnnames to retrieve all column names for the selected columns:

```
fieldString = columnnames(cursor)
fieldString =
'EmployeeID', 'LastName', 'FirstName', 'Title',
'TitleOfCourtesy', 'BirthDate', 'HireDate', 'Address',
'City', 'Region', 'PostalCode', 'Country', 'HomePhone',
```

See Also

attr | cols | columnprivileges | columns | cursor.fetch | get
| width

columnprivileges

Purpose 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` | `columnnames` | `dmd` | `get`

Purpose

Return database table column names

Syntax

```
l = columns(dbmeta, 'cata')
l = columns(dbmeta, 'cata', 'sch')
l = columns(dbmeta, 'cata', 'sch', 'tab')
```

Description

`l = columns(dbmeta, 'cata')` returns a list of all column names in the catalog `cata` for the database whose database metadata object is `dbmeta`.

`l = columns(dbmeta, 'cata', 'sch')` returns a list of all column names in the schema `sch`.

`l = columns(dbmeta, 'cata', 'sch', 'tab')` returns a list of columns for the table `tab`.

Examples

1 Run `columns` for the arguments shown:

```
l = columns(dbmeta, 'orcl', 'SCOTT')
l =
    'BONUS'          {1x4 cell}
    'DEPT'           {1x3 cell}
    'EMP'            {1x8 cell}
    'SALGRADE'      {1x3 cell}
    'TRIAL'          {1x3 cell}
```

The results show the names of the five tables in `dbmeta`, and cell arrays containing the column names in each table.

2 View the column names for the `BONUS` table:

```
l{1,2}
ans =
    'ENAME'    'JOB'    'SAL'    'COMM'
```

See Also

`attr` | `bestrowid` | `cols` | `columnnames` | `columnprivileges` | `dmd` | `get` | `versioncolumns`

commit

Purpose 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` | `exec` | `fastinsert` | `get` | `rollback` | `update`

Purpose

Configure JDBC data source for Visual Query Builder

Alternatives

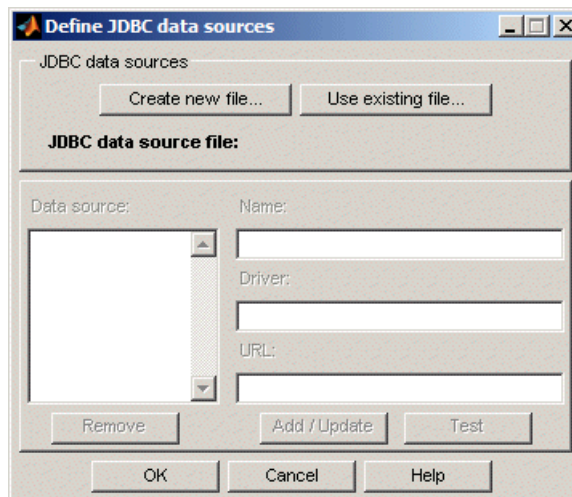
Select **Define JDBC data sources** from the Visual Query Builder **Query** menu.

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 “Setting Up JDBC Data Sources” in the *Database Toolbox Getting Started Guide*.

Tip Use the database function to define JDBC data sources programmatically.

confds

See Also

database | querybuilder

Purpose

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

crossreference

Column	Description	Value
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 Sun Java Web site:

<http://java.sun.com/j2se/1.4.2/docs/api/java/sql/DatabaseMetaData.html>

See Also [dmd](#) | [exportedkeys](#) | [get](#) | [importedkeys](#) | [primarykeys](#)

cursor.fetch

Purpose Import data into MATLAB workspace from cursor object created by `exec`

Alternatives Retrieve data using Visual Query Builder. For more information, see Chapter 3, “Using Visual Query Builder”.

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, 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 do not specify a `RowLimit`, `fetch` imports all remaining rows of data.

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.

Tips This page documents `fetch` for a cursor object. For more information 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`.

Examples **Example 1 – Import All Rows of Data**

- 1 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)
curs =
    Attributes: []
           Data: {91x1 cell}
 DatabaseObject: [1x1 database]
      RowLimit: 0
   SQLQuery: 'select country from customers'
      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]

```

- 2 Display data in `curs.Data`. Due to space constraints, only a portion of the returned data appears here.

```

curs.Data
ans =
    'Germany'
    'Mexico'
    'Mexico'
    'UK'
    'Sweden'
    .
    .
    .
    'USA'
    'Finland'
    'Poland'

```

Example 2 – Import a Specified Number of Rows

- 1 Use the `RowLimit` argument to retrieve only the first three rows of data.

cursor.fetch

```
curs = fetch(curs, 3)
curs =
    Attributes: []
           Data: {3x1 cell}
DatabaseObject: [1x1 database]
      RowLimit: 0
      SQLQuery: 'select country from customers'
      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]
```

2 View the data.

```
curs.Data
ans =
    'Germany'
    'Mexico'
    'Mexico'
```

3 Rerun the fetch function to return the second three rows of data.

```
curs = fetch(curs, 3);
```

4 View the data.

```
curs.Data
ans =
    'UK'
    'Sweden'
    'Germany'
```


Example 3 – Import Rows Iteratively Until You Retrieve All Data

Use the RowLimit argument to retrieve the first 10 rows of data, and then rerun the import using a while loop, retrieving 10 rows at a time. Continue until you have retrieved all data, which occurs when curs.Data is 'No Data'.

```
% Initialize RowLimit (fetchsize)
fetchsize = 10
% Check for more data. Retrieve and display all data.
while ~strcmp(curs.Data, 'No Data')
    curs=fetch(curs,fetchsize);
    curs.Data(:)
end
ans =
    'No Data'
```

Example 4 – Import Numeric Data

Import a column of numeric data, using the setdbprefs function to specify numeric as the format for the retrieved data.

```
conn = database('SampleDB', '', '');
curs=exec(conn, 'select all UnitsInStock from Products');
setdbprefs('DataReturnFormat','numeric')
curs=fetch(curs,3);
curs.Data
ans =
    39
    17
    13
```

Example 5 – Import BOOLEAN Data

- 1 Import data that includes a BOOLEAN field, using the `setdbprefs` function to specify `cellarray` as the format for the retrieved data.

```
conn = database('SampleDB', '', '');
curs=exec(conn, ['select ProductName, '...
'Discontinued from Products']);
setdbprefs('DataReturnFormat','cellarray')
curs=fetch(curs,5);
A=curs.Data
A =
    'Chai'          [0]
    'Chang'         [0]
    'Aniseed Syrup' [0]
           [1x28 char] [0]
           [1x22 char] [1]
```

- 2 View the class of the second column of A:

```
class(A{1,2})
ans =
logical
```

Example 6 – Perform Incremental Fetch

Retrieve data incrementally to avoid Java heap errors:

```
Data = cell(6400*4, 4);
rowLimit = 6400;
startRow = 1;
endRow = rowLimit;
conn = database('dname', '', 'password');
cur = exec(conn, ['select field1, field2, '...
'field3, field4 from fname']);

while true
    e = fetch(e, rowLimit);
```

```

if rows(e)==0
    break
end

dbData = e.Data;
numFetchedRows = size(dbData,1);
if numFetchedRows < 6400
    Data(startRow:endRow-...
        (6400-numFetchedRows), :) = dbData;
else
    Data(startRow:endRow, :) = dbData;
end

startRow = startRow + rowLimit;
endRow = endRow + rowLimit;
end

```

See Also

attr | cols | columnnames | database | database.fetch | exec |
 fetch | fetchmulti | get | logical | rows | resultset | set | width

How To

- “Working with Visual Query Builder”
- “Retrieving BINARY and OTHER Sun Java Data Types” on page 3-46

database

Purpose Connect to database

Alternatives Connect to databases using Visual Query Builder. For more information, see Chapter 3, “Using Visual Query Builder”.

Syntax

```
conn = database('datasourcename', 'username', 'password')
conn = database('databasename', 'username', ...
'password', 'driver', 'databaseurl')
```

Description `conn = database('datasourcename', 'username', 'password')` connects a MATLAB session to a database via an ODBC driver and assigns the returned connection object to `conn`. The arguments passed to this function are the ODBC data source, `datasourcename`, and the username and password required to connect. If a user name or password are not required, specify empty strings for these arguments.

`conn = database('databasename', 'username', ... 'password', 'driver', 'databaseurl')` connects a MATLAB session to a database via a JDBC driver and assigns the returned connection object to `conn`. The arguments passed to this function are the name of the database `databasename` and the username and password required to connect. If a user name or password are not required, specify empty strings for these arguments. `driver` is the name of the JDBC driver and `databaseurl` is a JDBC URL object of the form `jdbc:subprotocol:subname`. `subprotocol` is a database type, such as Oracle. `subname` may contain other information used by `driver`, such as the location of the database and/or a port number. `subname` may take the form `//hostname:port/databasename`.

Note The JDBC driver is sometimes referred to as the *class* that implements the Sun Java SQL driver for your database.

If `database` establishes a database connection, it returns information about the connection object, as shown in the following example:

```

Instance: 'SampleDB'
UserName: ''
Driver: []
URL: []
Constructor: [1x1 com.mathworks.toolbox.database.databaseConnect]
Message: []
Handle: [1x1 sun.jdbc.odbc.JdbcOdbcConnection]
TimeOut: 0
AutoCommit: 'off'
Type: 'Database Object'

```

Examples

Example 1 – Establish an ODBC Connection

Connect to an ODBC data source called Pricing, specifying user name mike, and password bravo:

```
conn = database('Pricing', 'mike', 'bravo');
```

Example 2 – Establish an ODBC Connection Without a User Name and Password

Connect to an ODBC data source SampleDB, where a user name and password are not required to access the database:

```
conn = database('SampleDB', '', '');
```

Example 3 – Establish a Dynamic Database Source Name (DSN) Connection

Connect to a database that is not defined in the Windows ODBC Data Sources pane, in this example Microsoft Access, by following the steps below:

```

% Specify the location of the database on disk.
dbpath = ...
[matlabroot '\toolbox\database\dbdemos\tutorial.mdb']

% Create the connection URL.
conurl = ['jdbc:odbc:Driver={Microsoft Access Driver '...

```

database

```
        '(*.mdb));DBQ='] dbpath]

% Connect to the database.
con = database('','','sun.jdbc.odbc.JdbcOdbcDriver', ...
              conurl)

% Fetch data from the database.
e = exec(con, 'SELECT ALL January FROM salesVolume');
e = fetch(e);
data = e.Data

% Close the connection.
close(con)
```

Example 4 – Establish a JDBC Connection

The JDBC driver name and database 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
Oracle oci7 drivers	JDBC Driver: oracle.jdbc.driver.OracleDriver Database URL: jdbc:oracle:oci7:@rex

Database	JDBC Driver Name and Database URL Example Syntax
Oracle oci8 Drivers	JDBC Driver: oracle.jdbc.driver.OracleDriver Database URL: jdbc:oracle:oci8:@111.222.333.44:1521: 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:
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& <i>The trailing & is required.</i>
Sybase SQL Server and Sybase SQL Anywhere	JDBC Driver: com.sybase.jdbc.SybDriver Database URL: jdbc:sybase:Tds:yourhostname:yourportnumber/

Connect to the Oracle Server

Establish a JDBC connection to the Oracle database:

```
conn = database('oracle','scott','tiger',...
               'oracle.jdbc.driver.OracleDriver','jdbc:oracle:oci7:');
```

Input Argument Descriptions

oracle

The database to which you connect

scott and tiger

The required user name and password

oracle.jdbc.driver.OracleDriver

The oci7 JDBC driver name

jdbc:oracle:oci7

The URL that specifies the location of the database server

Connect to Microsoft SQL Server 2005

Establish a JDBC connection to the Microsoft SQL Server 2005 database:

```
conn = database('dbName', 'user', 'password', ...
               'com.microsoft.sqlserver.jdbc.SQLServerDriver', ...
               'jdbc:sqlserver://servername:portnumber;database=dbName')
```

Input Argument Descriptions

dbName

The database to which you connect

user and password

The required user name and password

com.microsoft.sqlserver.jdbc.SQLServerDriver

The JDBC driver name

jdbc:sqlserver://servername:portnumber;database=dbName

The URL that specifies the location of the database server

Connect to MySQL Server 5.1

Establish a JDBC connection to the MySQL server database:

```
conn = database('dbName', 'user', 'password', ...
               'com.mysql.jdbc.Driver', ...
               'jdbc:mysql://servername:portnumber/dbName');
```


Input Argument Descriptions

dbName	The database to which you connect
user and password	The required user name and password
com.mysql.jdbc.Driver	The JDBC driver name
jdbc:mysql://servername:portnumber/dbName	The URL that specifies the location of the database server

Configure MATLAB to Use JDBC Drivers for Authenticated Database Connection

To connect to a SQL server database with integrated Windows authentication using a JDBC driver, do the following:

- 1 Close MATLAB if it is running.
- 2 Insert the path to the database driver JAR file in the `classpath.txt` file. The `classpath.txt` file is located at:

```
$MATLABROOT\toolbox\local\classpath.txt
```

The updated path entry should now include the full path to the driver. For example:

```
C:\DB_Drivers\sqljdbc_2.0\enu\sqljdbc4.jar
```

- 3 Insert the path to the folder containing `sqljdbc_auth.dll` in the `librarypath.txt` file. The `librarypath.txt` file is located at:

```
$MATLABROOT\toolbox\local\librarypath.txt
```

The path entry should not include the file name `sqljdbc_auth.dll`:

```
C:\DB_Drivers\sqljdbc_2.0\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 directory of the SQL server driver.

If you are running a 32-bit Java Virtual Machine (JVM), use the `sqljdbc_auth.dll` file in the x86 folder, even if the operating system is the x64 version. If you are running a 64-bit JVM on a x64 processor, use the `sqljdbc_auth.dll` file in the x64 folder. If you are running a 64-bit JVM on a IA-64 processor, use the `sqljdbc_auth.dll` file in the IA64 folder.

4 Start MATLAB.

5 Append the string `integratedSecurity=true;` to the database URL:

```
conn = database('dbName','','', ...  
               'com.microsoft.sqlserver.jdbc.SQLServerDriver', ...  
               ['jdbc:sqlserver://servername:portnumber; '...  
               'database=dbName;'] 'integratedSecurity=true;')
```

See Also

`close` | `dmd` | `exec` | `fastinsert` | `get` | `getdatasources` |
`isconnection` | `isreadonly` | `logintimeout` | `ping` | `supports` |
`update`

How To

- Chapter 3, “Using Visual Query Builder”

Purpose 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

Purpose 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`

Purpose	Execute SQL statement to import data into MATLAB workspace
Syntax	<pre>results = fetch(conn, sqlquery) results = fetch(conn, sqlquery, RowInc)</pre>
Description	<p><code>results = fetch(conn, sqlquery)</code> executes the SQL statement <code>sqlquery</code>, imports data for the open connection object <code>conn</code>, and returns the data to <code>results</code>. (For more information on SQL statements, see <code>exec</code>.)</p> <p><code>results = fetch(conn, sqlquery, RowInc)</code> imports <code>RowInc</code> rows of data at a time.</p>
Input Arguments	<p><code>conn</code> A database connection object.</p> <p><code>sqlquery</code> A SQL statement.</p> <p><code>RowInc</code> Specifies the number of rows of data to import at a time. Use <code>RowInc</code> when importing large amounts of data. Retrieving data in increments, as specified by <code>RowInc</code>, helps reduce overall retrieval time.</p>
Output Arguments	<p><code>results</code> A cell array, structure, or numeric matrix, depending on specifications set by <code>setdbprefs</code>.</p>
Tips	<ul style="list-style-type: none">As shown in the syntax section above, you call the <code>database.fetch</code> function with the command <code>fetch</code> rather than <code>database.fetch</code>. You implicitly call <code>database.fetch</code> by passing a database object, <code>conn</code>, to the function <code>fetch</code>. <code>Fetch</code> also works with a cursor object. See <code>cursor.fetch</code>.

- The order of records in your database does not remain constant. Use the SQL `ORDER BY` command in your `sqlquery` statement to sort data.

Examples

This example shows how to import data. (If you experience speed and memory issues, use the `rowinc` argument)

- 1 Import the country column from the `customers` table in the `SampleDB` database.

```
conn = database('SampleDB', '', '');
setdbprefs('DataReturnFormat', 'cellarray')
results = fetch(conn, 'select country from customers')
```

```
results =
```

```
    'Germany'
    'Mexico'
    'Mexico'
    'UK'
    'Sweden'
```

```
...
```

```
    'Finland'
    'Brazil'
    'USA'
    'Finland'
    'Poland'
```

- 2 View the size of the cell array into which the results were returned.

```
size(results)ans =
```

```
    91     1
```

Import two columns of data and view information about the data.

- 1 Import the `ProductName` and `Discontinued` columns from the `SampleDB` database.

```
conn = database('SampleDB', '', '');
setdbprefs('DataReturnFormat','cellarray')
results = fetch(conn, ['select ProductName, '...
    'Discontinued from Products']);
```

- 2 View the size of the cell array into which the results were returned.

```
size(results)
ans =

    77     2
```

- 3 View the results for the first row of data.

```
results(1,:)
ans =
    'Chai'     [0]
```

- 4 View the data type of the second element in the first row of data.

```
class(results{1,2})
ans =
    logical
```

See Also

`cursor.fetch` | `database` | `exec` | `fetch` | `logical`

How To

- “Retrieving BINARY or OTHER Sun Java SQL Data Types” on page 4-24

database.schemas

Purpose 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`

Purpose 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

datainsert

Purpose Export MATLAB data into database table

Syntax `datainsert(connect,tablename,fieldnames,data)`

Description `datainsert(connect,tablename,fieldnames,data)` inserts data from the MATLAB workspace into a database table.

Tips You can also use the `fastinsert` function to export MATLAB data into a database table. The `fastinsert` function allows more flexibility in terms of the date and time string format of input data, but it is slower than `datainsert`.

Input Arguments

`connect`

Database connection object.

`tablename`

Database table.

`fieldnames`

String array of database column names.

`data`

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.FFF`, and timestamps must be strings of the form `yyyy-mm-dd HH:MM:SS.FFF`. null entries must be empty strings and any NaNs in the cell array must be converted to empty strings before calling `datainsert`.

MATLAB date numbers and NaNs are supported for insert when `data` is a numeric array. Date numbers inserted into database date and time columns convert to `java.sql.Date`.

Examples

Export MATLAB cell array data into the field names col1, col2, and col2 in the 'inserttable' database table:

```
datainsert(connect,'inserttable',{'col1','col2','col2'},...  
          {33.5 8.77 '2010-07-04'})
```

Export data from a numeric matrix into a database table:

```
datainsert(connect,'inserttable',{'col1','col2','col2'},...  
          [33.5 8.77 734323])
```

See Also

fastinsert | insert | update

dmd

Purpose 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` | `database` | `get` | `supports` | `tables`

Purpose	Construct database driver object
Syntax	<code>d = driver('s')</code>
Description	<code>d = driver('s')</code> constructs a database driver object <code>d</code> from <code>s</code> , where <code>s</code> is a database URL string of the form <code>jdbc:odbc:name</code> or <code>name</code> . The driver object <code>d</code> is the first driver that recognizes <code>s</code> .
Examples	<code>d = driver('jdbc:odbc:thin:@144.212.123.24:1822:')</code> creates driver object <code>d</code> .
See Also	<code>get</code> <code>isdriver</code> <code>isjdbc</code> <code>isurl</code> <code>register</code>

drivermanager

Purpose 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`

Purpose	Execute SQL statement and open cursor
Alternatives	Query databases using Visual Query Builder. For more information, see Chapter 3, “Using Visual Query Builder”.
Syntax	<code>curs = exec(conn, 'sqlquery')</code>
Description	<p><code>curs = exec(conn, 'sqlquery')</code> executes the SQL statement <code>sqlquery</code> for the database connection <code>conn</code>, and opens a cursor.</p> <p>Running <code>exec</code> returns the cursor object to the variable <code>curs</code> and returns additional information about the cursor object. The <code>sqlquery</code> argument can be a stored procedure for that database connection, of the form <code>{call sp_name (parm1,parm2,...)}</code>.</p>
Tips	<ul style="list-style-type: none">• After opening a cursor, use <code>fetch</code> to import data from the cursor. Use <code>resultset</code>, <code>rsmd</code>, and <code>statement</code> to get properties of the cursor.• Use <code>querytimeout</code> to specify the maximum amount of time for which <code>exec</code> tries to execute the SQL statement.• You can have multiple cursors open at one time.• A cursor stays open until you close it using the <code>close</code> function.• Unless noted in this reference page, the <code>exec</code> function supports all valid SQL statements, such as nested queries.• The order of records in your database is not constant. Use values in column names to identify records. Use the SQL <code>ORDER BY</code> 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 the following MATLAB error: <pre>[Vendor][ODBC Driver] The database engine could not lock table 'TableName' because it is already in use by another person or process.</pre>

- 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$" (or 'Sheet1$')`.
- You may experience issues with text field formats in the Microsoft SQL Server database management system. Workarounds for these issues include:
 - Converting fields of format `NVARCHAR`, `TEXT`, `NTEXT`, and `VARCHAR` to `CHAR` in the database.
 - Using `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. For example:

```
curs = exec(conn, 'select * from mydb where mydate > #03/05/2005#')
```


Examples

Example 1 – Select Data from a Database Table

Select data from the customers table that you access using the database connection `conn`. Assign the returned cursor object to the variable `curs`.

```
curs = exec(conn, 'select * from customers')
curs =
    Attributes: []
           Data: 0
 DatabaseObject: [1x1 database]
           RowLimit: 0
           SQLQuery: 'select * from customers'
           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
```

Example 2 – Select One Column of Data from the Database Table

Select country data from the customers table that you access using the database connection `conn`. Assign the SQL statement to the variable `sqlquery` and assign the returned cursor to the variable `curs`.

```
sqlquery = 'select country from customers';
curs = exec(conn, sqlquery);
```

Example 3 – Use a Variable in a Query

- 1 Select data from the customers table that you access using the database connection `conn`, where `country` is a variable. In this example, you are prompted to specify your country. Your input is assigned to the variable `UserCountry`.

```
UserCountry = input('Enter your country: ', 's')
```

2 You are prompted as follows:

Enter your country:

Enter:

Mexico

3 To perform the query using your input, run:

```
curs = exec(conn, ...
    ['select * from customers where country= ' '''' UserCountry '''''])
curs=fetch(curs)
```

The select statement is created by using square brackets to concatenate the two strings `select * from customers where country = and 'UserCountry'`. The pairs of four quotation marks are needed to create the pair of single quotation marks that appears in the SQL statement around `UserCountry`. 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.

Tip Without using a variable, the function to retrieve the data would be:

```
curs = exec(conn, ['select * from customers where country = '...
    ''Mexico'''])
curs=fetch(curs)
```

Example 4 – Roll Back or Commit Data Exported to the Database Table

Use `exec` to roll back or commit data after running a `fastinsert`, `insert`, or `update` for which the `AutoCommit` flag is off.

- To roll back data for the database connection `conn`.

```
exec(conn, 'rollback')
```

- To commit the data, run:

```
exec(conn, 'commit');
```

Example 5 – Change the Database Connection Catalog

Change the catalog for the database connection `conn` to `intlprice`.

```
curs = exec(conn, 'Use intlprice');
```

Example 6 – Create a Table and Add a New Column

This example creates a table and adds a new column to it.

- 1 Use the SQL `CREATE` command to create the table.

```
mktab = ['CREATE TABLE Person(LastName varchar, ...  
        'FirstName varchar,Address varchar,Age int)'];
```

- 2 Create the table for the database connection object `conn`.

```
exec(conn, mktab);
```

- 3 Use the SQL `ALTER` command to add a new column, `City`, to the table.

```
a = exec(conn, ...  
        'ALTER TABLE Person ADD City varchar(30)');
```

Example 7 – Run a Simple Stored Procedure

- 1 Execute the stored procedure `sp_customer_list` for the database connection `conn`.

```
curs = exec(conn, 'sp_customer_list');
```

- 2 Run a stored procedure with input parameters.

```
curs = exec(conn, '{call sp_name (parm1,parm2,...)}');
```

Example 8 – Return a Cursor Object Using a Stored Procedure

The following example calls a database stored procedure that returns a cursor object.

- 1 Specify data to return as a structure.

```
setdbprefs('DataReturnFormat','structure');
```

- 2 Define a stored procedure.

```
ssql_cmd1 = ['{?= call get_int_by_id(1,1, '...  
            'to_date('07/02/05','MM/DD/YY'),'...  
            'to_date('07/07/05','MM/DD/YY'))}'];
```

- 3 Execute the stored procedure and open a cursor object.

```
curs = exec(conn, ssql_cmd1)  
curs =  
    Attributes: []  
            Data: 0  
DatabaseObject: [1x1 database]  
            RowLimit: 0  
            SQLQuery: [1x97 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: 0
```

4 Import data from the cursor to a MATLAB variable, a.

```
a = fetch(curs);
```

5 View a.Data.

```
a.Data
ans =
    TS_DT: {'2005-07-02 00:00:00.0'}
    INT_VALUE: 1
```

6 Define another stored procedure.

```
sql_cmd2= ['{?= call nrg.ts_get_int_by_id(1,1, '...
    'to_date(''07/02/05'', ''MM/DD/YY''), '...
    'to_date(''07/20/05'', ''MM/DD/YY'')}]'];
```

7 Repeat steps 1 through 5 using this new stored procedure.

```
curs = exec(conn, ssql_cmd2)
curs =
    Attributes: []
    Data: 0
    DatabaseObject: [1x1 database]
    RowLimit: 0
    SQLQuery: [1x97 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: 0

a = fetch(curs)
a =
    Attributes: []
    Data: [1x1 struct]
```

```
DatabaseObject: [1x1 database]
    RowLimit: 0
    SQLQuery: [1x97 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]
a.Data
ans =
    TS_DT: {2x1 cell}
    INT_VALUE: [2x1 double]
```

8 Examine the attributes of a.

```
a.Data.TS_DT
ans =
    '2005-07-02 00:00:00.0'
    '2005-07-10 00:00:00.0'
a.Data.INT_VALUE
ans =
    1
    6
```

See Also

`close` | `cursor.fetch` | `database` | `database.fetch` | `fastinsert` | `fetch` | `procedures` | `querybuilder` | `querytimeout` | `resultset` | `rsmd` | `set` | `update`

How To

- Chapter 3, “Using Visual Query Builder”
- “Data Retrieval Restrictions” on page 1-7

Purpose

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
2	Schema containing primary key that is exported	SCOTT

exportedkeys

Column	Description	Value
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 Sun Java Web site:

<http://java.sun.com/j2se/1.4.2/docs/api/java/sql/DatabaseMetaData.html>

See Also

`crossreference` | `dmd` | `get` | `importedkeys` | `primarykeys`

Purpose	Add MATLAB data to database table
Alternatives	<ul style="list-style-type: none">• Export data using Visual Query Builder with Data operation set to Insert. For more information, see Chapter 3, “Using Visual Query Builder”.• Use the <code>datainsert</code> function. The <code>datainsert</code> function is faster than the <code>fastinsert</code> function, but you must enter dates and times in a specific format.
Syntax	<code>fastinsert(conn, 'tablename', colnames, exdata)</code>
Description	<p><code>fastinsert(conn, 'tablename', colnames, exdata)</code> exports records from the MATLAB variable <code>exdata</code> into new rows in an existing database table <code>tablename</code> via the connection <code>conn</code>. The variable <code>exdata</code> can be a cell array, numeric matrix, or structure. You do not specify the type of data you are exporting; the data is exported in its current MATLAB format. Specify column names for <code>tablename</code> as strings in the MATLAB cell array <code>colnames</code>. If <code>exdata</code> is a structure, field names in the structure must exactly match <code>colnames</code>.</p> <p>The status of the <code>AutoCommit</code> flag determines whether <code>fastinsert</code> automatically commits the data to the database. Use <code>get</code> to view the <code>AutoCommit</code> flag status for the connection and use <code>set</code> to change it. Use <code>commit</code> or issue an SQL commit statement using <code>exec</code> to commit the data to the database. Use <code>rollback</code> or issue an SQL rollback statement using <code>exec</code> to roll back the data.</p> <p>Use <code>update</code> to replace existing data in a database.</p>
Tips	<ul style="list-style-type: none">• The <code>fastinsert</code> function replaces the <code>insert</code> function. The two functions have the same syntax, but <code>fastinsert</code> provides better performance and supports more object types than <code>insert</code>. If <code>fastinsert</code> does not work as expected, try running <code>insert</code>.• The <code>fastinsert</code> function only supports dates in U.S. format; that is, dates in <code>mm/dd/yyyy</code> format.

- 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 may 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.

Examples

Example 1 – Insert a Record

- 1 Insert a record consisting of two columns, `City` and `Avg_Temp`, into the `Temperatures` table. `City` is San Diego and `Avg_Temp` is 88 degrees. The database connection is `conn`. Assign the data to the cell array `exdata`.

```
exdata = {'San Diego', 88}
```

- 2 Create a cell array containing the column names in `Temperatures`.

```
colnames = {'City', 'Avg_Temp'}
```

- 3 Insert the data into the database.

```
fastinsert(conn, 'Temperatures', colnames, exdata)
```

The row of data is added to the `Temperatures` table.

Example 2 – Insert Multiple Records

Insert a cell array, `exdata`, that contains multiple rows of data and three columns, `Date`, `Avg_Length`, and `Avg_Wt`, into the `Growth` table. The database connection is `conn`.

Insert the data.

```
fastinsert(conn, 'Growth', ...
{'Date'; 'Avg_Length'; 'Avg_Wt'}, exdata)
```

The records are inserted into the table.

Example 3 – Import Records, Perform Calculations, and Export Data

Import data from a database into the MATLAB workspace, perform calculations on it, and then export the results to a database.

- 1 Import all data from the products table into a cell array.

```
conn = database('SampleDB', '', '');
curs = exec(conn, 'select * from products');
setdbprefs('DataReturnFormat', 'cellarray')
curs = fetch(curs);
```

- 2 Assign the first column of data to the variable prod_name.

```
prod_name = curs.Data(:,1);
```

- 3 Assign the sixth column of data to the variable price.

```
price = curs.Data(:,6);
```

- 4 Convert the cell array price to a numeric format, and calculate off 25% of the price. Assign the result of the calculation to the variable new_price.

```
new_price = .75*[price{:}]
```

- 5 Export prod_name, price, and new_price to the Sale table. Because prod_name is a character array and price is numeric, you must export the data as a cell array. To do so, convert new_price from a numeric array back to a cell array. To convert the columns of data in new_price to a cell array, run:

```
new_price = num2cell(new_price);
```

- 6 Create an array, `exdata`, that contains the three columns of data to export. Put `prod_name` in column 1, `price` in column 2, and `new_price` in column 3.

```
exdata(:,1) = prod_name(:,1);  
exdata(:,2) = price;  
exdata(:,3) = new_price;
```

- 7 Assign the column names to a string array, `colnames`.

```
colnames={'product_name', 'price', 'sale_price'};
```

- 8 Export the data to the `Sale` table.

```
fastinsert(conn, 'Sale', colnames, exdata)
```

All rows of data are inserted into the `Sale` table.

Example 4 – Insert Numeric Data

Export `tax_rate`, a numeric matrix consisting of two columns, into the `Tax` table.

```
fastinsert(conn, 'Tax', {'rate', 'max_value'}, tax_rate)
```

Example 5 – Insert and Commit Data

- 1 Use the SQL commit function to commit data to a database after it has been inserted. The `AutoCommit` flag is off.

Insert the cell array `exdata` into the column names `colnames` of the `Error_Rate` table.

```
fastinsert(conn, 'Error_Rate', colnames, exdata)
```

- 2 Alternatively, commit the data using a SQL commit statement with the `exec` function.

```
cursor = exec(conn, 'commit');
```

Example 6 – Insert BOOLEAN Data

- 1 Insert BOOLEAN data (which is represented as MATLAB type logical) into a database.

```
conn = database('SampleDB', '', '');  
P.ProductName{1}='Chocolate Truffles';  
P.Discontinued{1}=logical(0);  
fastinsert(conn, 'Products', ...  
    {'ProductName'; 'Discontinued'}, P)
```

- 2 View the new record in the database to verify that the Discontinued field is BOOLEAN. In some databases, the MATLAB logical value 0 is shown as a BOOLEAN false, No, or a cleared check box.

See Also

commit | database | exec | insert | logical | querybuilder |
rollback | set | update

How To

- Chapter 3, “Using Visual Query Builder”

fetch

Purpose `cursor.fetch` or `database.fetch`

**About
fetch,
cursor.fetch,
and
database.fetch**

There are two `fetch` functions in this toolbox, `cursor.fetch` and `database.fetch`. The `fetch` function runs one of these functions, depending on what object you provide to it as an argument. Use the syntax `fetch` with the appropriate object argument rather than explicitly specifying `cursor.fetch` or `database.fetch`.

For example, `cursor.fetch` runs when you pass a cursor object, `curs`, to `fetch` as an argument.

```
conn = database(...)  
curs = exec(conn, sqlquery)  
fetch(curs)
```

The `database.fetch` function runs when you pass a database object, `conn`, to `fetch` as an argument.

```
conn = database(...)  
fetch(conn, sqlquery)
```

In this example, the results are effectively identical. `database.fetch` runs `exec` and returns results to the cursor object. It then runs `cursor.fetch`, returns results, and closes the cursor object. This shows that you can use a single call to the `database.fetch` function to get the same results as if you had called two functions, `exec` and `cursor.fetch`.

`cursor.fetch` returns a cursor object on which you can run many other functions, such as `get` and `rows`. For this reason, `cursor.fetch` is recommended for use in most situations. To import data into the MATLAB workspace without meta information about the data, use `database.fetch` instead of `cursor.fetch`.

Throughout the documentation, references to `fetch` denote `cursor.fetch` unless explicitly stated otherwise.

Explicitly specify `database.fetch` or `cursor.fetch` only when running `help` or `doc`. To get help for `database.fetch`, run `help`

`database.fetch`. Similarly, to view the reference pages for either version of `fetch`, run `doc database.fetch` or `doc cursor.fetch`.

See Also

`cursor.fetch` | `database` | `database.fetch` | `exec`

fetchmulti

Purpose 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]
```


See Also

`cursor.fetch` | `database` | `exec` | `setdbprefs`

get

Purpose

Retrieve object properties

Syntax

```
v = get(object)
v = get(object, 'property')
v.property
```

Description

`v = get(object)` returns a structure that contains `object` and its corresponding properties, and assigns the structure to `v`.

`v = get(object, 'property')` retrieves the value of `property` for `object` and assigns the value to `v`.

`v.property` returns the value of `property` after you have created `v` by running `get`.

Use `set(object)` to view a list of writable properties for `object`.

Allowable objects include:

- “Database Connection Objects” on page 6-64, which are created using `database`
- “Cursor Objects” on page 6-65, which are created using `exec` or `fetch` (`cursor.fetch`)
- “Driver Objects” on page 6-66, which are created using `driver`
- “Database Metadata Objects” on page 6-66, which are created using `dmd`
- “Drivermanager Objects” on page 6-67, which are created using `drivermanager`
- “ResultSet Objects” on page 6-67, which are created using `resultset`
- “ResultSet Metadata Objects” on page 6-68, which are created using `rsmd`

If you call these objects from applications that use Sun Java, you can get more information about object properties from the Java Web site:

[http://java.sun.com/j2se/1.4.2/docs/api/java/sql/
DatabaseMetaData.html](http://java.sun.com/j2se/1.4.2/docs/api/java/sql/DatabaseMetaData.html)

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 may 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 current transaction isolation mode
'Type'	Object type, specifically Database Object
'URL'	For JDBC connections only, the JDBC URL object <code>jdbc:subprotocol:subname</code> , as specified by database
'UserName'	User name required to connect to a given database, as specified by database
'Warnings'	Warnings returned by database

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 <code>attr</code> 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 <code>fetch</code> , as specified by <code>set</code>
'SQLQuery'	SQL statement for a cursor, as specified by <code>exec</code>
'Message'	Error message returned from <code>exec</code> or <code>fetch</code>
'Type'	Object type, specifically Database Cursor Object
'ResultSet'	Resultset object identifier
'Cursor'	Cursor object identifier
'Statement'	Statement object identifier <hr/> Note If you specify a value (in seconds) for the <code>timeout</code> argument, queries time out after the time exceeds the given value. <hr/>
'Fetch'	0 for cursor created using <code>exec</code> ; <code>fetchTheData</code> for cursor created using <code>fetch</code>

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
'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'}
'ColumnTypeName'	{'TEXT' 'LONG'}
'TableName'	{'' ''}
'isNullable'	{{1} [1]}
'isReadOnly'	{{0} [0]}

The empty strings for `CatalogName` and `TableName` indicate that databases do not return these values.

For command-line help on `get`, use the overloaded methods:

```
help cursor/get
help database/get
help dmd/get
help driver/get
help drivermanager/get
help resultset/get
help rsmd/get
```

Examples

Example 1 – Get Connection Property and Data Source Name

Connect to the database `SampleDB`, and then get the name of the data source for the connection and assign it to `v`.

```
conn = database('SampleDB', '', '');
v = get(conn, 'Instance')
```


Example 2 – Get Connection Property and AutoCommit Flag Status

Check the status of the AutoCommit flag for the database connection conn.

```
get(conn, 'AutoCommit')
```

```
ans =  
on
```

Example 3 – Display Data in Cursor

Display data in the cursor object curs by running:

```
get(curs, 'Data')
```

or:

```
curs.Data  
ans =  
    'Germany'  
    'Mexico'  
    'France'  
    'Canada'
```

Example 4 – Get Database Metadata Object Properties

- 1 View the properties of the database metadata object for connection conn. Due to space constraints, only a portion of the returned data appears here.

```
dbmeta = dmd(conn);
v = get(dbmeta)
v =
    AllProceduresAreCallable: 1
    AllTablesAreSelectable: 1
    DataDefinitionCausesTransaction: 1
    DataDefinitionIgnoredInTransact: 0
    DoesMaxRowSizeIncludeBlobs: 0
    Catalogs: {4x1 cell}
    NullPlusNonNullIsNull: 0
    NullsAreSortedAtEnd: 0
    NullsAreSortedAtStart: 0
    NullsAreSortedHigh: 0
    NullsAreSortedLow: 1
    UsesLocalFilePerTable: 0
    UsesLocalFiles: 1
```

- 2 To view names of the catalogs in the database, run:

```
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'
```

See Also

columns | cursor.fetch | database | dmd | driver | drivermanager
| exec | getdatasources | resultset | rows | rsmd | set

Purpose

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 more information 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'    'SampleDB'    'dbtoolboxdemo'
```

See Also

database | get | setdbprefs

importedkeys

Purpose 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

Column	Description	Value
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 Sun Java Web site:

<http://java.sun.com/j2se/1.4.2/docs/api/java/sql/DatabaseMetaData.html>

importedkeys

See Also

[crossreference](#) | [dmd](#) | [exportedkeys](#) | [get](#) | [primarykeys](#)

Purpose 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
4	Nonunique: 0 if index values can be nonunique, 1 otherwise	0
5	Index catalog	null
6	Index name	null
7	Index type	0

indexinfo

Column	Description	Value
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 more information about the index information, see the `getIndexInfo` property on the Sun Java Web site:

<http://java.sun.com/j2se/1.4.2/docs/api/java/sql/DatabaseMetaData.html>

See Also

dmd | get | tables

Purpose Add MATLAB data to database tables

Syntax `insert(conn, 'tab', colnames, exdata)`

Description `insert(conn, 'tab', colnames, exdata)`

The `fastinsert` function has replaced the `insert` function. `fastinsert` offers improved performance and supports more data types than `insert`.

Use `insert` if `fastinsert` does not work as expected, especially if you have used `insert` successfully in the past.

The `insert` function uses the same syntax as `fastinsert`; for details, see `fastinsert`.

See Also `commit` | `fastinsert` | `querybuilder` | `rollback`

isconnection

Purpose Detect whether 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` | `isreadonly` | `ping`

Purpose 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` | `get` | `isjdbc` | `isurl`

isjdbc

Purpose 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` | `get` | `isdriver` | `isurl`

Purpose Detect whether 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.

isnullcolumn

```
curs.Data  
ans =  
  [NaN]
```

See Also

[get | resultset](#)

Purpose Detect whether 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

Purpose Detect whether database URL is valid

Syntax `a = isurl('s', d)`

Description `a = isurl('s', d)` 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('jdbc:odbc:thin:@144.212.123.24:1822:', d)
a =
    1
```

This indicates that the database URL is valid for `d`.

See Also `driver` | `get` | `isdriver` | `isjdbc`

Purpose 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

Purpose 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`

Purpose Get status information about database connection

Syntax ping(conn)

Description ping(conn) returns status information about the database connection conn if the connection is open. It returns an error message otherwise.

Examples **Example 1 – Get Status Information About ODBC Connection**

Check the status of the ODBC connection conn.

```
ping(conn)
ans =
    DatabaseProductName: 'ACCESS'
    DatabaseProductVersion: '03.50.0000'
    JDBCDriverName: 'JDBC-ODBC Bridge (odbcjt32.dll)'
    JDBCDriverVersion: '1.1001 (04.00.4202)'
    MaxDatabaseConnections: 64
    CurrentUserName: 'admin'
    DatabaseURL: 'jdbc:odbc:SampleDB'
    AutoCommitTransactions: 'True'
```

Example 2 – Get Status Information About JDBC Connection

Check the status of the JDBC connection conn.

```
ping(conn)
ans =
    DatabaseProductName: 'Oracle'
    DatabaseProductVersion: [1x166 char]
    JDBCDriverName: 'Oracle JDBC driver'
    JDBCDriverVersion: '7.3.4.0.2'
    MaxDatabaseConnections: 0
    CurrentUserName: 'scott'
    DatabaseURL: 'jdbc:oracle:thin: ...
@144.212.123.24:1822:orcl' AutoCommitTransactions: 'True'
```

Example 3 – Unsuccessful Request for Information About Connection

In this example, the database connection `conn` has been terminated or is not successful.

```
ping(conn)
Cannot Ping the Database Connection
```

See Also

`database` | `dmd` | `get` | `isconnection` | `set` | `supports`

Purpose 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'
```

primarykeys

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
5	Sequence number within primary key	1
6	Primary key name	PK_DEPT

See Also

`crossreference` | `dmd` | `exportedkeys` | `get` | `importedkeys`

Purpose 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.

procedurecolumns

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 more information about the procedurecolumns results, see the `getProcedureColumns` property on the Sun Java Web site:

<http://java.sun.com/j2se/1.4.2/docs/api/java/sql/DatabaseMetaData.html>

See Also

dmd | get | procedures

Purpose

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(conn)  
curs =  
    Attributes: []  
    Data: {10x2 cell}  
    DatabaseObject: [1x1 database]
```

procedures

```
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

Purpose Start SQL query builder GUI to import and export data

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 more information on Visual Query Builder, including examples, see the VQB **Help** menu or Chapter 3, “Using Visual Query Builder”.

querytimeout

Purpose 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`

Purpose 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` | `drivermanager` | `get` | `set` | `unregister`

resultset

Purpose 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 Sun 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` | `cursor.fetch` | `exec` | `get` | `isnullcolumn`
| `namecolumn` | `rsmd`

Purpose 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 The `rollback` function does not roll back data in MySQL databases.

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` | `database` | `exec` | `fastinsert` | `get` | `insert` | `update`

rows

Purpose 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`, where `curs` has been generated by the `cursor.fetch` function.

Examples There are four rows in the fetched data set `curs`.

```
numrows = rows(curs)
```

```
numrows =  
4
```

To see the four rows of data in `curs`, run:

```
curs.Data  
ans =  
    'Germany'  
    'Mexico'  
    'France'  
    'Canada'
```

See Also `cols` | `cursor.fetch` | `get` | `rsmd`

Purpose 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 Sun 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`

runstoredprocedure

Purpose 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 Sun 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 [cursor.fetch](#) | [exec](#)

set

Purpose 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 6-107, created using `database`
- “Cursor Objects” on page 6-108, created using `exec` or `fetch` (`cursor.fetch`)
- “Drivermanager Objects” on page 6-108, 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 <code>fastinsert</code> , <code>insert</code> , or <code>exec</code> . You cannot use <code>rollback</code> to reverse this process.
	'off'	Database data is not committed automatically when you run <code>fastinsert</code> , <code>insert</code> , or <code>update</code> . Use <code>rollback</code> to reverse this process. When you are sure that your data is correct, use the <code>commit</code> 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]
```

As displayed above, 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

[cursor.fetch](#) | [database](#) | [drivermanager](#) | [exec](#) | [fastinsert](#) | [get](#) | [insert](#) | [logintimeout](#) | [ping](#) | [update](#)

Purpose	Set preferences for retrieval format, errors, NULLs, and more
Alternatives	Select Query > Preferences to set database preferences from Visual Query Builder.
Syntax	<pre>setdbprefs s = setdbprefs setdbprefs('property') setdbprefs('property', 'value') setdbprefs({'property1'; ...}, {'value1'; ...}) setdbprefs(s)</pre>
Description	<p>setdbprefs returns current values for database preferences.</p> <p>s = setdbprefs returns current values for database preferences to the structure s.</p> <p>setdbprefs('property') returns the current value for the specified property.</p> <p>setdbprefs('property', 'value') sets the specified property to value.</p> <p>setdbprefs({'property1'; ...}, {'value1'; ...}) sets properties starting with property1 to values starting with value1.</p> <p>setdbprefs(s) sets preferences specified in the structure s to values that you specify.</p> <p>Allowable properties appear in the following tables:</p> <ul style="list-style-type: none">• DataReturnFormat and ErrorHandling Properties and Values for setdbprefs on page 6-114• Null Data Handling Properties and Values for setdbprefs on page 6-115• Other Properties and Values for setdbprefs (Not Accessible via Query > Preferences) on page 6-116

DataReturnFormat and ErrorHandling Properties and Values for setdbprefs

Property	Allowable Values	Description
'DataReturnFormat'	'cellarray' (default), '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)	Imports nonnumeric data into MATLAB cell arrays.
	'dataset'	Imports data into MATLAB dataset objects.
	'numeric'	Imports 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'	Imports data into a MATLAB structure. Use for all data types. Facilitates working with returned columns.
'ErrorHandling'	'store' (default), 'report', or 'empty'	Specifies 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 display immediately in the MATLAB Command Window.

DataReturnFormat and ErrorHandling Properties and Values for setdbprefs (Continued)

Property	Allowable Values	Description
	'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'	User-specified, for example, '0'	Specifies 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'	User-specified, 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.
'NullStringRead'	User-specified, for example, 'NULL' (default)	Specifies how NULL strings appear after being imported from a database into the MATLAB workspace. Set this parameter before running fetch.
'NullStringWrite'	User-specified, for example, 'NULL' (default)	Strings in the specified format, for example, NaN, appear as NULL after being exported from the MATLAB workspace to a database.

setdbprefs

Other Properties and Values for setdbprefs (Not Accessible via Query > Preferences)

Property	Allowable Values	Description
'JDBCDataSourceFile'	User-specified, for example, 'D:/file.mat'	Path to MAT-file containing JDBC data sources. For more information, see "Accessing Existing JDBC Data Sources" on page 2-4.
'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. The following message may appear: Registry editing has been disabled by your administrator. This message is harmless and can safely be ignored.
'TempDirForRegistryOutput'	User-specified, for example, 'D:/work'	Folder where VQB writes ODBC registry settings when you run <code>getdatasources</code> . 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 <code>getenv('temp')</code> . If you specify a folder to which you do not have write access or which does not exist, the following error appears: Cannot export <folder-name>\ODBC.INI: Error opening the file. There may be a disk or file system error.

Tips

Preferences are retained across MATLAB sessions.

Examples**Example 1 – Display Current Values**

Run setdbprefs.

```
setdbprefs
      DataReturnFormat: 'cellarray'
      ErrorHandling: 'store'
      NullNumberRead: 'NaN'
      NullNumberWrite: 'NULL'
      NullStringRead: 'null'
      NullStringWrite: 'null'
      JDBCDataSourceFile: ''
      UseRegistryForSources: 'yes'
      TempDirForRegistryOutput: ''
```

These values show that:

- Data is imported from databases into MATLAB cell arrays.
- Errors that occur during a database connection or SQL query attempt are stored in the `Message` field of the connection or cursor data object.
- Each NULL number in the database is read into the MATLAB workspace as NaN. Each NaN in the MATLAB workspace is exported to the database as NULL. Each NULL string in the database is read into the MATLAB workspace as 'null'. Each 'null' string in the MATLAB workspace is exported to the database as a NULL string.
- A MAT-file that specifies the JDBC source file has not been created.
- Visual Query Builder looks in the Windows system registry for data sources that do not appear in the ODBC.INI file.
- No temporary folder for registry settings has been specified.

Example 2 – Change a Preference

```
1 Run setdbprefs ('NullNumberRead').
```

```
setdbprefs ('NullNumberRead')
NullNumberRead: 'NaN'
```

Each NULL number in the database is read into the MATLAB workspace as NaN.

- 2 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.

Example 3 – Change the DataReturnFormat Preference

- 1 Specify that database data be imported into MATLAB cell arrays.

```
setdbprefs ('DataReturnFormat','cellarray')
```

- 2 Import data into the MATLAB workspace.

```
conn = database('SampleDB', '', '');
curs=exec(conn, ...
    'select all ProductName,UnitsInStock fromProducts');
curs=fetch(curs,3);
curs.Data
ans =
    'Chai'           [39]
    'Chang'          [17]
    'Aniseed Syrup' [13]
```

- 3 Change the data return format from cellarray to numeric.

```
setdbprefs ('DataReturnFormat','numeric')
```

- 4 Perform the same import operation as you ran in the cell array example. Note the format of the returned data.

```
curs.Data
```

```
ans =  
    NaN    39  
    NaN    17  
    NaN    13
```

In the database, the values for `ProductName` are character strings, as seen in the previous example when `DataReturnFormat` was set to `cellarray`. Therefore, the `ProductName` values cannot be read when they are imported into the MATLAB workspace using the numeric format. Therefore, the MATLAB software treats them as NULL numbers and assigns them the current value for the `NullNumberRead` property of `setdbprefs`, NaN.

- 5 Change the data return format to structure.

```
setdbprefs ('DataReturnFormat', 'structure')
```

- 6 Perform the same import operation as you ran in the cell array example.

```
curs.Data  
ans =  
    ProductName: {3x1 cell}  
    UnitsInStock: [3x1 double]
```

- 7 View the contents of the structure to see the data.

```
curs.Data.ProductName  
ans =  
    'Chai'  
    'Chang'  
    'Aniseed Syrup'  
  
curs.Data.UnitsInStock  
ans =  
    39  
    17  
    13
```

Example 4 – Change the Write Format for NULL Numbers

- 1 Specify NaN for the NullNumberWrite format.

```
setdbprefs('NullNumberWrite', 'NaN')
```

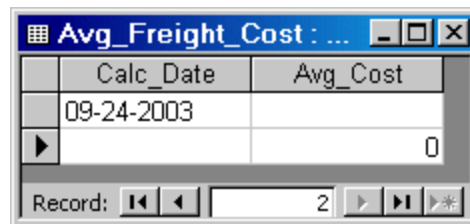
Numbers represented as NaN in the MATLAB workspace are exported to databases as NULL.

For example, the variable `ex_data` contains a NaN.

```
ex_data =  
    '09-24-2003'          NaN
```

- 2 Insert `ex_data` into a database using `fastinsert`. The NaN data is exported into the database as NULL.

```
fastinsert (conn, 'Avg_Freight_Cost', colnames, ex_data)
```



- 3 Change the value of NullNumberWrite to Inf.

```
setdbprefs('NullNumberWrite', 'Inf')
```

- 4 Attempt to insert `ex_data`. A MATLAB error appears because the NaN in `ex_data` cannot be read.

```
fastinsert(conn, 'Avg_Freight_Cost', colnames, ex_data  
??? Error using ==> fastinsert  
[Microsoft][ODBC Microsoft Access Driver]
```

Too few parameters.
Expected 1.

Example 5 – Specify Error Handling Settings

- 1 Specify the store format for the ErrorHandling preference.

```
setdbprefs ('ErrorHandling','store')
```

Errors generated from running database or exec are stored in the Message field of the returned connection or cursor..

- 2 Try to fetch data from a closed cursor..

```
conn=database('SampleDB', '', '');
curs=exec(conn, 'select all ProductName from Products');
close(curs)
curs=fetch(curs,3);
curs=
```

```
Attributes: []
Data: 0
DatabaseObject: [1x1 database]
RowLimit: 0
SQLQuery: 'select all ProductName from Products'
Message: 'Error: Invalid 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.

- 3 To specify the report format for the ErrorHandling preference, run:

```
setdbprefs ('ErrorHandling','report')
```

Errors generated by running database or exec appear immediately in the Command Window.

- 4 Try to fetch data from a closed cursor.

```
conn = database('SampleDB', '', '');
curs=exec(conn, 'select all ProductName from Products');
close(curs)
curs=fetch(curs,3);
??? Error using ==> cursor/fetch (errorhandling)
Invalid Cursor
Error in ==>
    D:\matlab\toolbox\database\database\@cursor\fetch.m
    On line 36 ==>     errorhandling(initialCursor.Message);
```

The error generated by this operation appears immediately in the Command Window.

- 5 Specify the empty format for the ErrorHandling preference.

```
setdbprefs ('ErrorHandling','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, [].

- 6 Try to fetch data from a closed cursor.

```
conn = database('SampleDB', '', '');
curs=exec(conn, 'select all ProductName from Products');
close(curs)
curs=fetch(curs,3);
curs =

    Attributes: []
    Data: []
    DatabaseObject: [1x1 database]
```

```

RowLimit: 0
SQLQuery: 'select all ProductName from Products'
Message: 'Invalid Cursor'
    Type: 'Database Cursor Object'
ResultSet: 0
    Cursor: 0
Statement: [1x1 sun.jdbc.odbc.JdbcOdbcStatement]
Fetch: [1x1 com.mathworks.toolbox.database.fetchTheData]

```

The error appears in the cursor object `Message` field. Furthermore, the `Attributes` field contains empty handles because no attributes could be created.

Example 6 – Change Multiple Settings

Specify that NULL strings are read from the database into a MATLAB matrix of doubles as 'NaN':

```

setdbprefs({'NullStringRead'; 'DataReturnFormat'}, ...
{'NaN'; 'numeric'})

```

See “Example 8 — Assign Values to a Structure” on page 6-123 for more information on another way to change multiple settings.

Example 7 – Specify JDBC Data Sources for Use by VQB

Instruct VQB to connect to the database using the data sources specified in the file `myjdbcdatasources.mat`.

```

setdbprefs('JDBCDataSourceFile', ...
'D:/Work/myjdbcdatasources.mat')

```

Example 8 – Assign Values to a Structure

1 Assign values for preferences to fields in the structure `s`.

```

s.DataReturnFormat = 'numeric';
s.NullNumberRead = '0';
s.TempDirForRegistryOutput = 'C:\Work'

```

setdbprefs

```
s =
    DataReturnFormat: 'numeric'
    NullNumberRead: '0'
    TempDirForRegistryOutput: 'C:\Work'
```

2 Set preferences using the values in s:

```
setdbprefs(s)
```

3 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'
```

Example 9 – Return Values to a Structure

1 Assign values for all preferences to s by running:

```
s = setdbprefs
s =
    DataReturnFormat: 'cellarray'
    ErrorHandling: 'store'
    NullNumberRead: 'NaN'
    NullNumberWrite: 'NaN'
    NullStringRead: 'null'
    NullStringWrite: 'null'
    JDBCDataSourceFile: ''
    UseRegistryForSources: 'yes'
    TempDirForRegistryOutput: ''
```


- 2 Use the MATLAB tab completion feature when obtaining the value for a preference. For example, enter:

```
s.U
```

- 3 Press the **Tab** key, and then **Enter**. MATLAB completes the field and displays the value.

```
s.UseRegistryForSources
```

```
ans =
```

```
yes
```

Example 10 – 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 the Seasonal Smoothing project. Assign the preferences to the variable `SeasonalSmoothing` and save them to a MAT-file `SeasonalSmoothingPrefs` in your current folder:

```
SeasonalSmoothing = setdbprefs;  
save SeasonalSmoothingPrefs.mat SeasonalSmoothing
```

Later, load the data and restore the preferences:

```
load SeasonalSmoothingPrefs.mat  
setdbprefs(SeasonalSmoothing);
```

See Also

`clear` | `cursor.fetch` | `getdatasources`

How To

- “Working with Preferences” on page 3-6

sql2native

Purpose 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`.

Purpose Detect whether property is supported by database metadata object

Syntax

```
a = supports(dbmeta)
a = supports(dbmeta, 'property')
a.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.

`a.property` returns the value of `property` after you have created `a` using the `supports` function.

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 See the value of the `GroupBy` property by running:

```
a.GroupBy
a =
    1
```

See Also `database` | `dmd` | `get` | `ping`

tableprivileges

Purpose 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.

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.

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.

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

Purpose 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`.

`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`.

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

Purpose	Unload database driver
Syntax	<code>unregister(d)</code>
Description	<code>unregister(d)</code> unloads the database driver object <code>d</code> , freeing up system resources. If you do not unload a registered driver, it automatically unloads when you end your MATLAB session.
Examples	<code>unregister(d)</code> unloads the database driver object <code>d</code> .
See Also	<code>register</code>

Purpose

Replace data in database table with MATLAB data

Syntax

```
update(conn, 'tab', colnames, exdata, 'whereclause')
update(conn, 'tab', colnames, ...
{datA,datAA, ...; datB,datBB, ...; datn, datNN}, ...
{'where col1 = val1'; 'where col2 = val2'; ... 'where coln = valn'})
```

Description

`update(conn, 'tab', colnames, exdata, 'whereclause')` exports the MATLAB variable `exdata` in its current format into the database table `tab` using the database connection `conn`. `exdata` can be a cell array, numeric matrix, or structure. Existing records in the database table are replaced as specified by the SQL `whereclause` command.

Specify column names for `tab` as strings in the MATLAB cell array `colnames`. If `exdata` is a structure, field names in the structure must match field names in `colnames`.

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 a SQL commit statement via the `exec` function. Roll back the data by running `rollback` or a SQL rollback statement via the `exec` function.

To add new rows instead of replacing existing data, use `fastinsert`.

`update(conn, 'tab', colnames, {dataA, dataAA, ...; datB, datBB, ...; datn,datNN}, {'where col1 = val1'; 'where col2 = val2'; ... 'where coln = valn'})` exports multiple records for `n` where clauses. The number of records in `exdata` must equal `n`.

Tips

- The order of records in your database is not constant. Use values of column names to identify records.
- An error like the following may 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 repeat the `update` function.

- An error like the following may appear if you try to run an update operation that is identical to one that you just ran:

```
??? Error using ==> database.update
Error:Commit/Rollback Problems
```

Examples

Example 1 – Update an Existing Record

Update the record in the Birthdays table using the database connection `conn`, where `First_Name` is Jean, replacing the current value for `Age` with 40.

- 1 Define a cell array containing the column name that you are updating, `Age`.

```
colnames = {'Age'}
```

- 2 Define a cell array containing the new data, 40.

```
exdata(1,1) = {40}
```

- 3 Run the update.

```
update(conn, 'Birthdays', colnames, exdata, ...
        'where First_Name = ''Jean''')
```


Example 2 – Roll Back Data After Updating a Record

Update the column `Date` in the `Error_Rate` table for the record selected by `whereclause`, using data contained in the cell array `exdata`. The `AutoCommit` flag is `off`. The data is rolled back after the update operation is run.

- 1 Set the `AutoCommit` flag to `off` for database connection `conn`.

```
set(conn, 'AutoCommit', 'off')
```

- 2 Update the `Date` column.

```
update(conn, 'Error_Rate', {'Date'}, exdata, whereclause)
```

- 3 Because the data was not committed, you can roll it back.

```
rollback(conn)
```

The update is reversed; the data in the table is the same as it was before you ran `update`.

Example 3 – Update Multiple Records with Different Constraints

Given the table `TeamLeagues`, where column names are `'Team'`, `'Zip_Code'`, and `'New_League'`:

```
'Team1'    02116
'Team2'    02138
'Team3'    02116
```

Assign teams with a zip code of 02116 to the A league and teams with a zip code of 02138 to the B league:

```
update(conn, 'TeamLeagues', {'League'}, {'A';'B'}, ...
{'where Zip_Code ='02116''';'where Zip_Code ='02138'''})
```

See Also

`commit` | `database` | `fastinsert` | `rollback` | `set`

versioncolumns

Purpose Automatically update table columns

Syntax

```
v1 = versioncolumns(dbmeta, 'cata')
v1 = versioncolumns(dbmeta, 'cata', 'sch')
v1 = versioncolumns(dbmeta, 'cata', 'sch', 'tab')
```

Description `v1 = 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`.

`v1 = 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`.

`v1 = 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`.

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`.

```
v1 = versioncolumns(dbmeta, 'orcl', 'SCOTT', 'BONUS')
v1 =
    {}
```

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`

Purpose 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 `cursor`.

Examples Get the width of the first column of the fetched data set, `cursor`:

```
colsize = width(cursor, 1)
```

```
colsize =
```

```
11
```

The field size of column one is 11 characters (bytes).

See Also `attr` | `cols` | `columnnames` | `cursor.fetch` | `get`

width

Examples

Use this list to find examples in the documentation.

Visual Query Builder GUI: Importing Data

“Working with Preferences” on page 3-6

“Retrieving All Occurrences vs. Unique Occurrences of Data” on page 3-22

“Retrieving Data That Meets Specified Criteria” on page 3-24

“Creating Subqueries for Values from Multiple Tables” on page 3-37

“Creating Queries That Include Results from Multiple Tables” on page 3-42

“Retrieving BINARY and OTHER Sun Java Data Types” on page 3-46

“Importing BOOLEAN Data from Databases to the MATLAB Workspace”
on page 3-48

Visual Query Builder GUI: Displaying Results

“Displaying Data Relationally” on page 3-10

“Charting Query Results” on page 3-14

“Displaying Query Results in an HTML Report” on page 3-16

“Using the MATLAB® Report Generator Software to Customize Display of
Query Results” on page 3-17

“Displaying Results in a Specified Order” on page 3-31

Visual Query Builder GUI: Advanced Query Options

“Example: Using Having Clauses” on page 3-36

Visual Query Builder GUI: Exporting Data

“Exporting BOOLEAN Data from the MATLAB Workspace to Databases”
on page 3-51

Using Database Toolbox Functions

“Importing Data from Databases into the MATLAB Workspace” on page 4-3

- “Viewing Information About Imported Data” on page 4-5
- “Exporting Data from the MATLAB Workspace to a New Record in a Database” on page 4-7
- “Replacing Existing Data in Databases with Data Exported from the MATLAB Workspace” on page 4-11
- “Exporting Multiple Records from the MATLAB Workspace” on page 4-13
- “Exporting Data Using the Bulk Insert Command” on page 4-17
- “Retrieving BINARY or OTHER Sun Java SQL Data Types” on page 4-24
- “Working with Database Metadata” on page 4-26
- “Using Driver Functions” on page 4-33

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