Chapter 4
Accessing Data

The entire purpose of reporting is to make sense of data. Therefore, it is important to know how to access data locked away in the database. In this chapter, you will learn how to pull data from multiple sources.

Crystal Reports has long had a reputation of being able to use just about any data source. If the database has an ODBC driver or an OLE DB Provider, it would almost guarantee that Crystal Reports could extract data for the report.

Crystal Reports 9 made several improvements in data access, all of which make data access easier. The Database Expert is completely redesigned. The Visual Linking Expert has been replaced with an easier to use tool. SQL commands and the Crystal Repository replaced the old Crystal Dictionaries and Crystal.

Using the Database Expert

The Database Expert (see **Figure 1**) is used to select the tables for a report. When you create a new report, the Database Expert displays in the first step. You can also select Database | Database Expert from the menu to display the Database Expert.

The Database Expert lists data in five different categories as follows:

- Current Connections – Lists database objects already used in a report.
- Repository – Lists objects stored in the Repository, discussed later in this chapter.
- Favorites – Lists commonly used database objects.
- History – Lists recently used database objects.
- Create a New Connection – Used to create a connection to a new database object.

A database object is a field, view, cursor, stored procedure, or other object in a database usable as a data source for a report field. To add a database object to a report, move it from the Available Data Sources list to the Selected Tables list. Once you select two tables, the Links tab is added to the Database Expert (see the "Linking Tables" section later in this chapter).

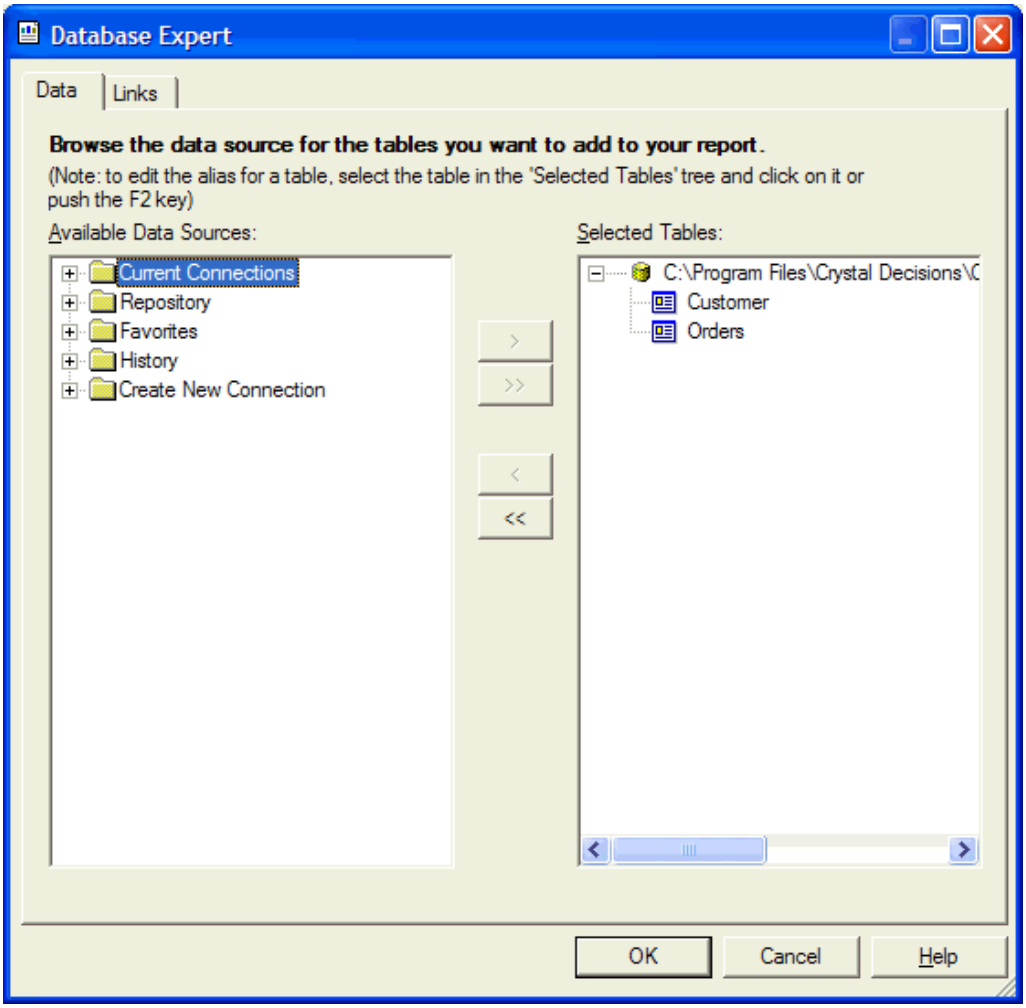

***Figure 1**. Use the Database Expert window to select the tables for a report.*

Creating a new connection

When you add a new connection, you first need to expand the Create New Connection branch under Available Data Sources (see **Figure 2**). The data sources listed depend on which data components you installed with Crystal Reports. The steps to add a connection varies with the data source you select. I explain some of the connection options here. You can find a discussion of COM Connectivity in Chapter 15, "Integrating COM Components," and ADO .NET in Chapter 17, "Crystal Reports .NET."

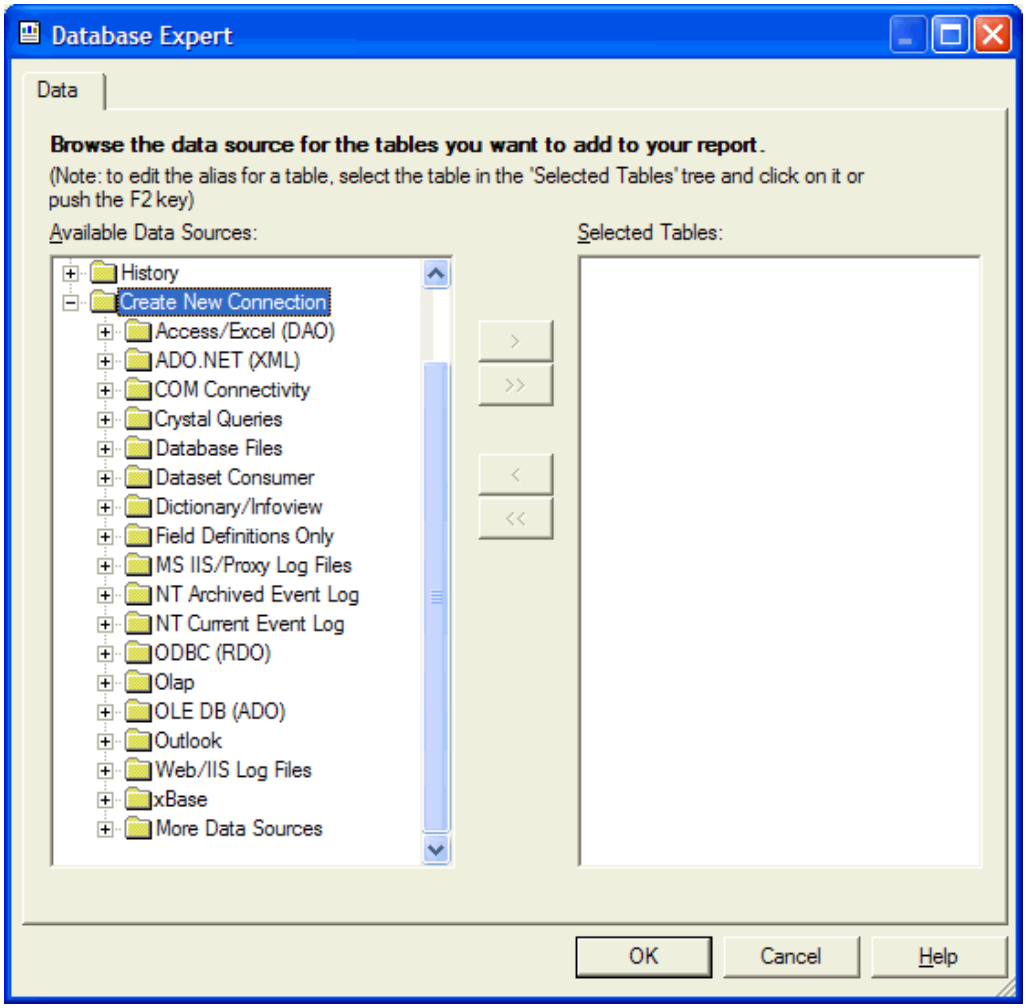

***Figure 2**. You need to expand the Create New Connection branch to add new tables to a report.*

Access/Excel (DAO)

When you select the Access/Excel (DAO) option a dialog box displays that allows you to enter the file information (see **Figure 3**). While called Access/Excel (DAO), this option also lets you connect to data other than Access or Excel files. You can select Access, Dbase, Excel, HTML, Lotus, Paradox, and text files or what Crystal Reports calls “direct access data”. This means Crystal Reports can natively access the data without using any external drivers.

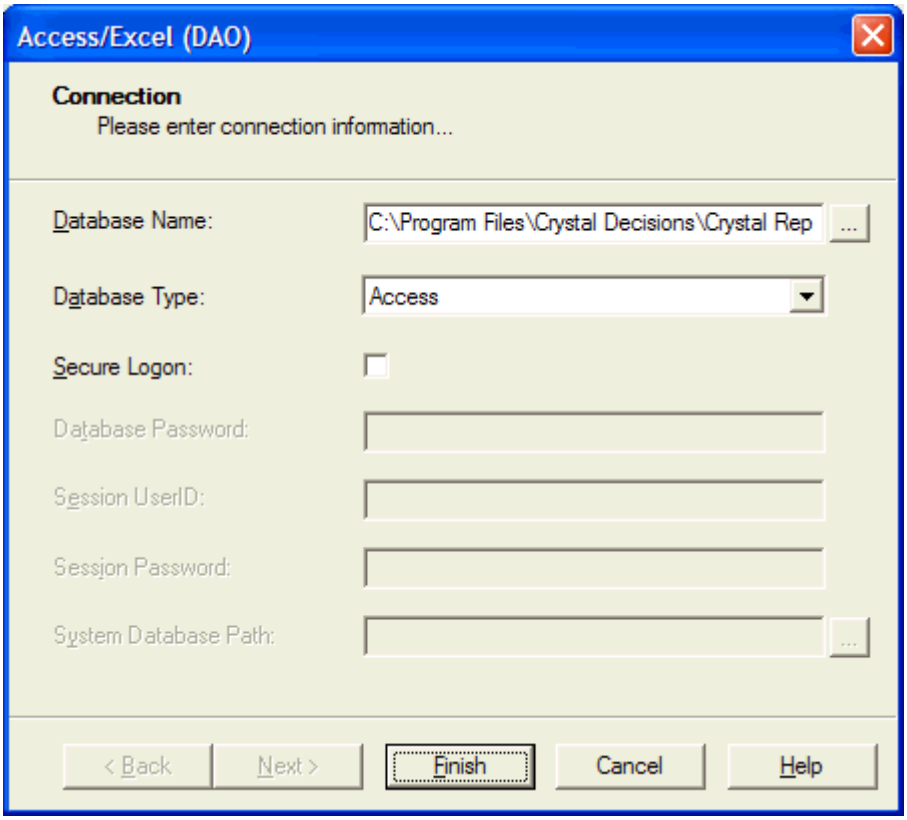

***Figure 3**. Use the Access/Excel (DAO) window to enter information about direct access data sources.*

If the data source is password protected, make sure you select the Secure Logon check box and enter the log on information. Once you populate the necessary fields, click Finish to return to the Database Expert.

ADO .NET (XML)

Crystal Reports supports connecting to XML files, but don't let this option fool you. You do not need ADO .NET (see Chapter 17, "Crystal Reports .NET", for a complete discussion of Crystal Reports .NET) to connect to XML. Select this option to specify the file location (see **Figure 4**).

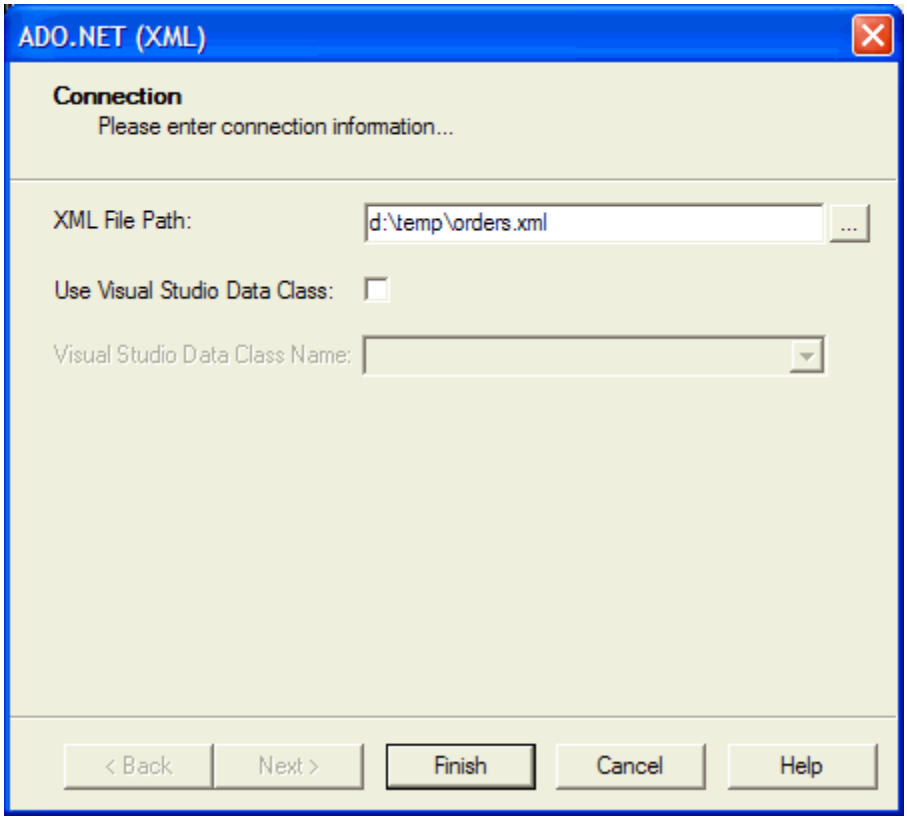

***Figure 4**. Use the ADO.NET (XML) dialog box to specify an XML file for the report data source.*

When you enter the XML File Path, you can use either a file name or a URL. The Visual Studio Data Class fields are explained in Chapter 17, "Crystal Reports .NET."

ODBC (RDO)

Crystal Reports relies on an existing Data Source Name (DSN) to connect to a database using ODBC. When you select ODBC as a data source, Crystal Reports displays the ODBC (RDO) dialog box (see **Figure 5**). You can optionally select a File DSN.

Once you select the DSN, Crystal Reports displays a second dialog box for you to enter the logon information for the database. **Figure 6** shows this dialog box for the Northwind database in Microsoft SQL Server. Some databases, such as Visual FoxPro, do not support logons. The second page of the dialog box still displays. Just leave the fields empty and Crystal Reports connects to the data.

When you enter all the logon information, click Finish to return to the Database Expert.

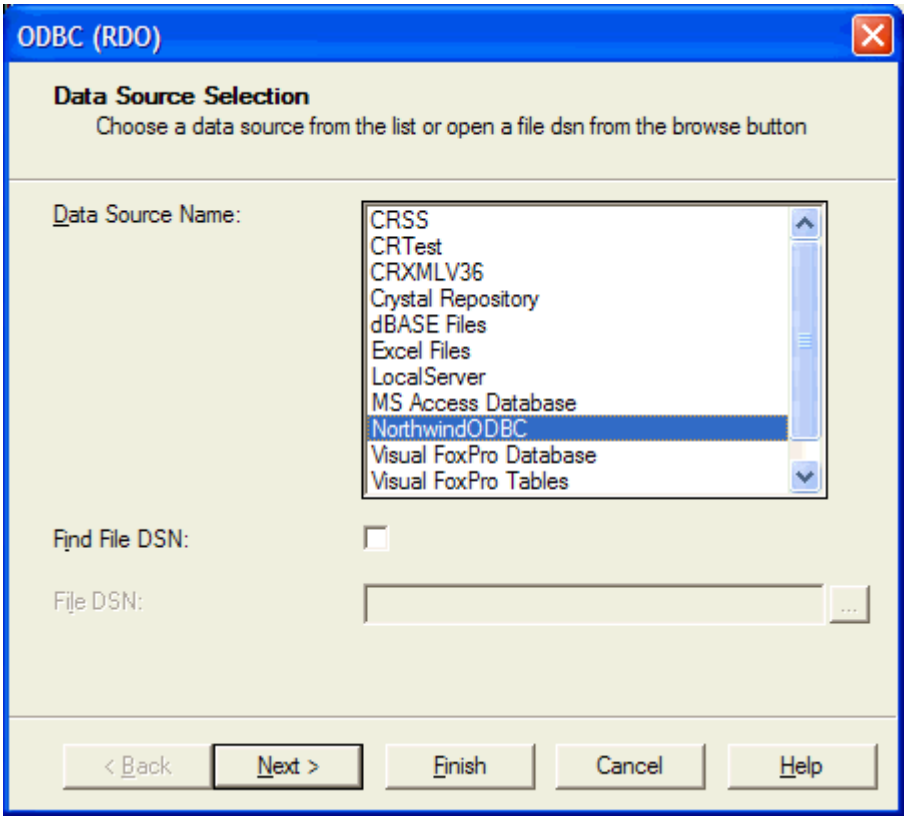

***Figure 5**. Use the Data Source Selection page of the ODBC (RDO) dialog box to select an ODBC data source.*

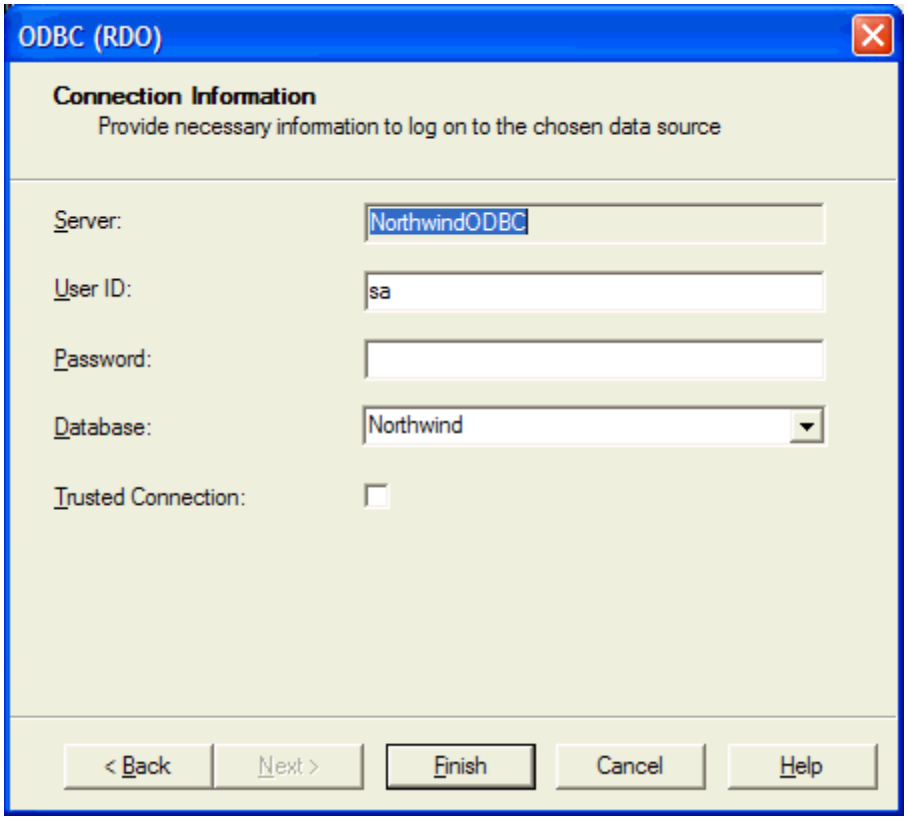

***Figure 6**. The Connection Information page of the ODBC (RDO) dialog box is where you enter logon information for the database.*

OLAP

Crystal Reports can connect to various OLAP servers and databases, including Microsoft SQL Server OLAP Services (Analysis Services), IBM DB2, Hyperion Essbase, and Crystal Analysis.

When you choose to connect to an OLAP server, the Crystal OLAP Connection Browser displays (see **Figure 7**).

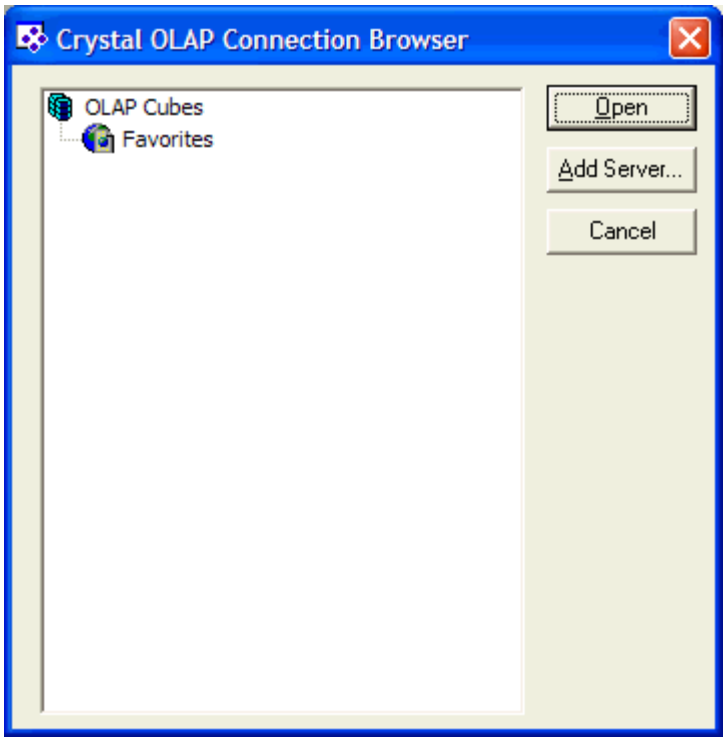

***Figure 7**. You select an existing OLAP server from the Crystal OLAP Connection Browser dialog box.*

Choose an OLAP server from the list or click Add Server to display the New Server dialog box (see **Figure 8**).

You first select the Server Type and enter a Caption to display. The remainder of the dialog box changes depending on the server type you select.

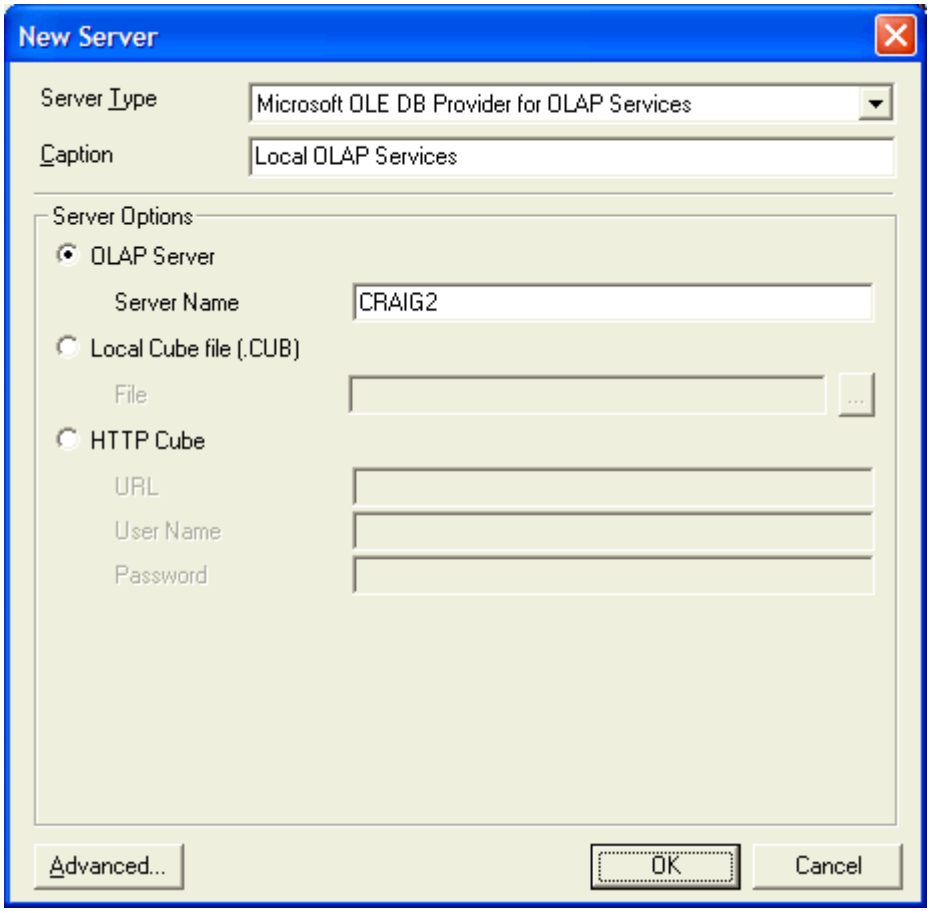

***Figure 8**. Add a new OLAP server in the New Server dialog box.*

OLE DB (ADO)

OLE DB is a fairly new technology developed by Microsoft as a replacement for ODBC. Where ODBC is designed to connect to relational data, OLE DB can connect to any type of data. OLE DB itself is a low level interface only used directly by C++ programmers. ADO is a COM wrapper around OLE DB that makes the data accessible to other development languages such as Visual FoxPro, Visual Basic, Delphi, and others.

When you choose the OLE DB (ADO) source, Crystal Reports displays the OLE DB (ADO) dialog box (see **Figure 9**).

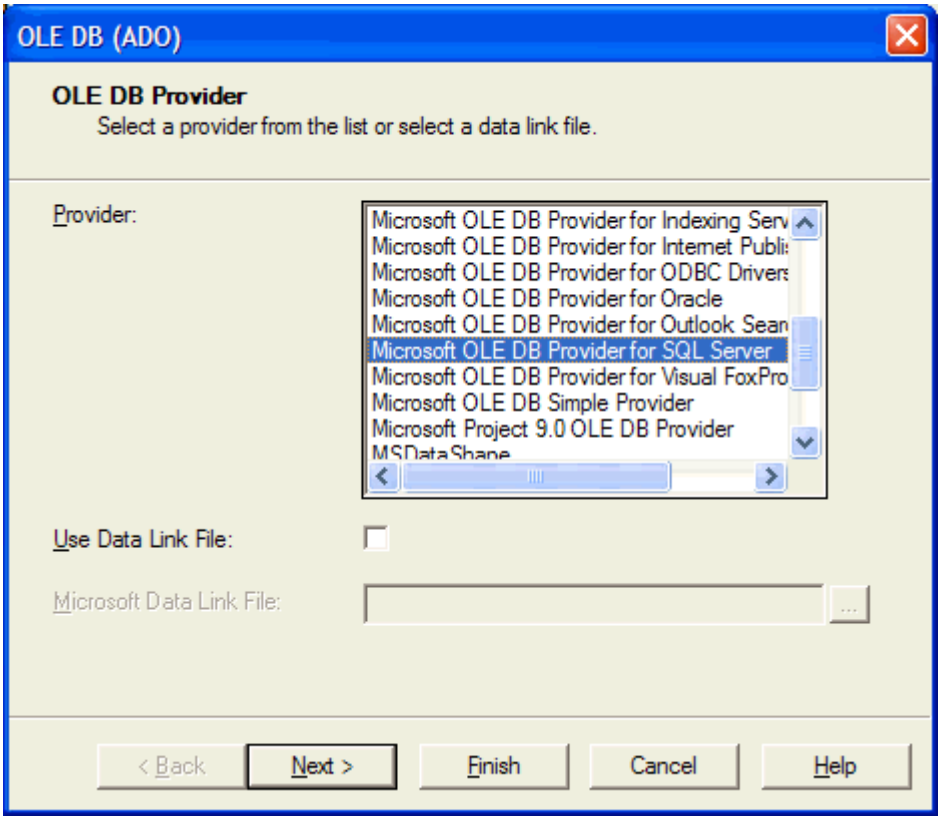

***Figure 9**. The first step in using an OLE DB or ADO connection is choosing the OLE DB provider or data link file.*

In this dialog box, select the OLE DB Provider or data link file to use for connecting to the data. It is possible the data link file contains all the necessary connection information. If it does, click Finish. Otherwise, click Next to go to the next step. The Connection Information panel displays (see **Figure 10**).

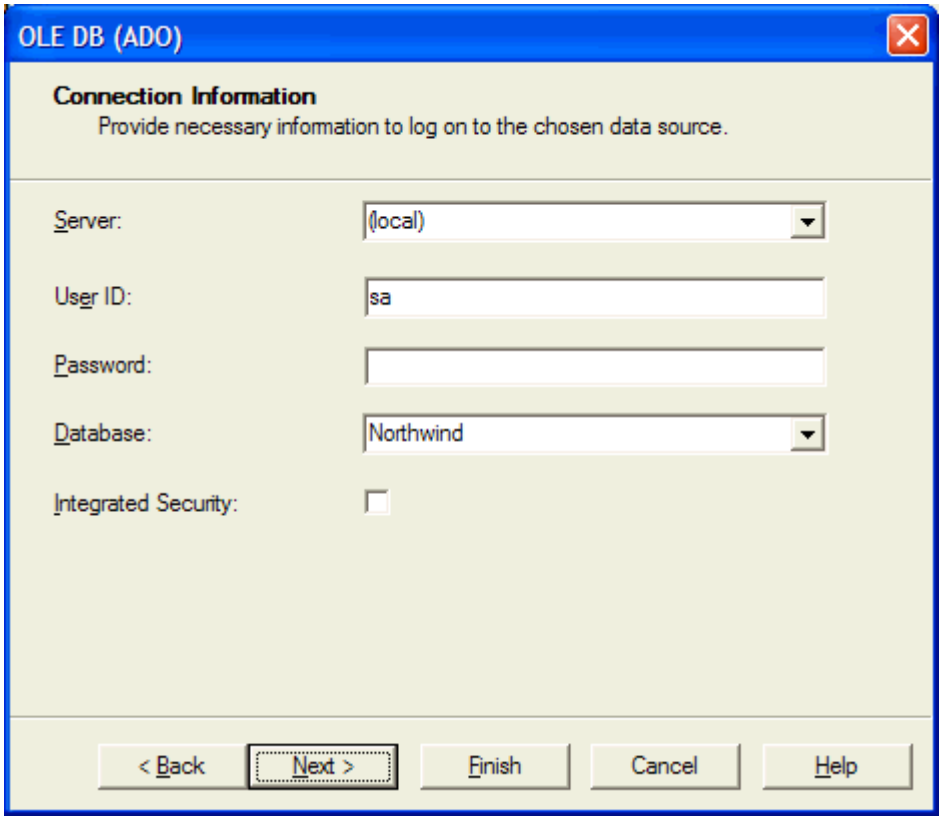

***Figure 10**. Enter server and connection information in the Connection Information dialog box.*

In this dialog box, you enter connection information such as server name, logon username, password, and set the database to use. If you want to use the default values for additional parameters, click Finish. Otherwise, click Next to display the Advanced Information dialog box (see **Figure 11**).

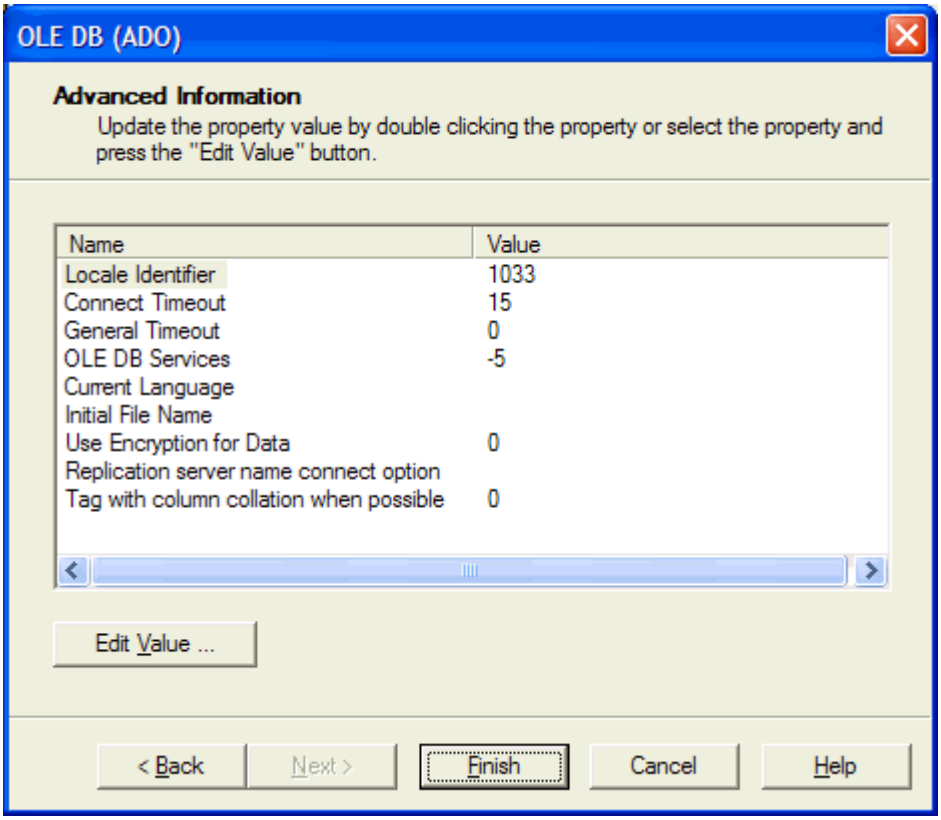

***Figure 11**. You change additional OLE DB parameters in the Advanced Information dialog box.*

To change a particular value, select it in the list, and then click Edit Value. When you have made all the necessary changes, click Finish.

xBase

Crystal Reports can natively connect to dBase II, dBase III and FoxPro 2.x tables. If you have data in Visual FoxPro tables, you need to either copy the data to a FoxPro 2.x table or connect to it using the Visual FoxPro OLE DB Provider.

When you select xBase from the Available Data Sources list in the Database Expert, Crystal Reports displays a File Open dialog box to select the DBF file you want to include. You need to add the tables one at a time until all the necessary tables are added to the Database Expert.

More Data Sources

If the data source you want to use is not listed in the Database Expert, select More Data Sources. This list shows the data sources you did not select when you installed Crystal Reports.

Select the data source you want to use. Crystal Reports may launch the Install on Demand feature of Windows Installer to install the required database drivers.

SQL Commands

Crystal Reports 9.0 introduces the concept of SQL Commands. They are designed to replace the Crystal Query application. SQL Commands are a powerful feature that let you define a SQL Select statement to pull data from a single table or multiple tables. This makes it easy for developers to provide data to users who create their own report. The following steps show you how to add a SQL Command:

1. Add the desired connection in the Database Expert
2. Expand the tree for the connection (see **Figure 12**).

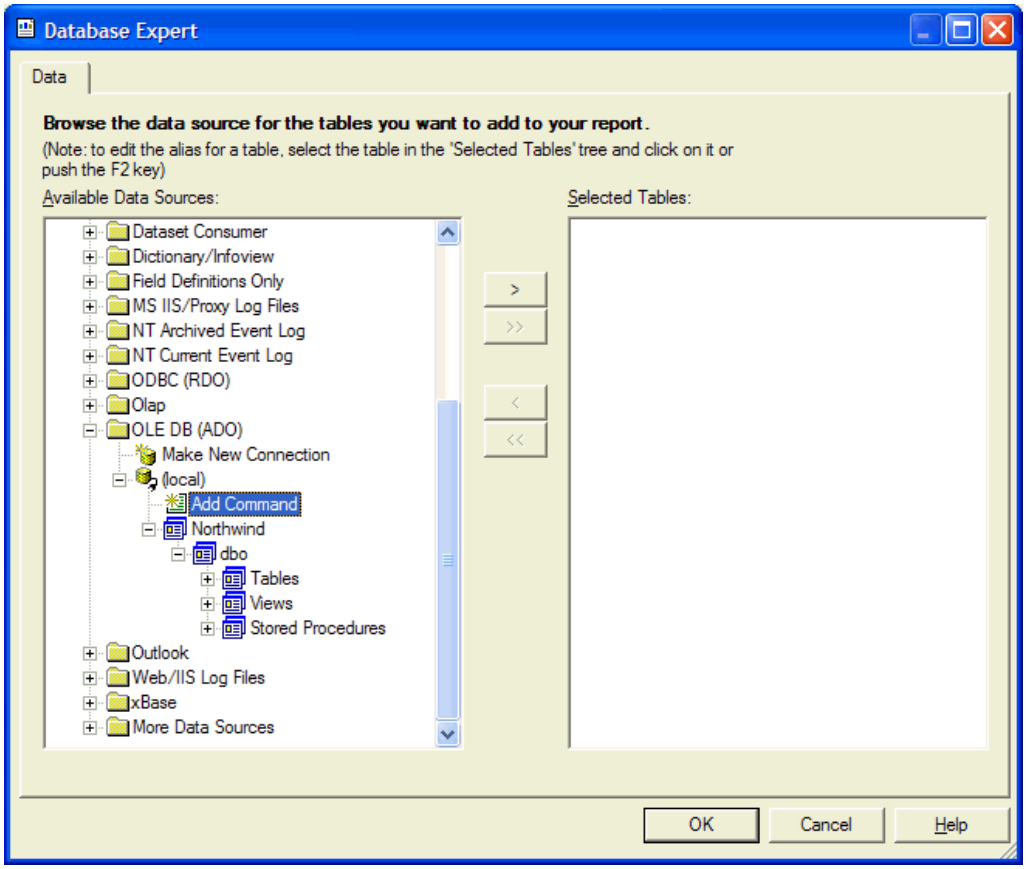

***Figure 12**. To add a SQL Command, expand your selected database in the Database Expert and select Add Command.*

3. Double-click Add Command to display the Modify Command dialog box (see **Figure 13**).

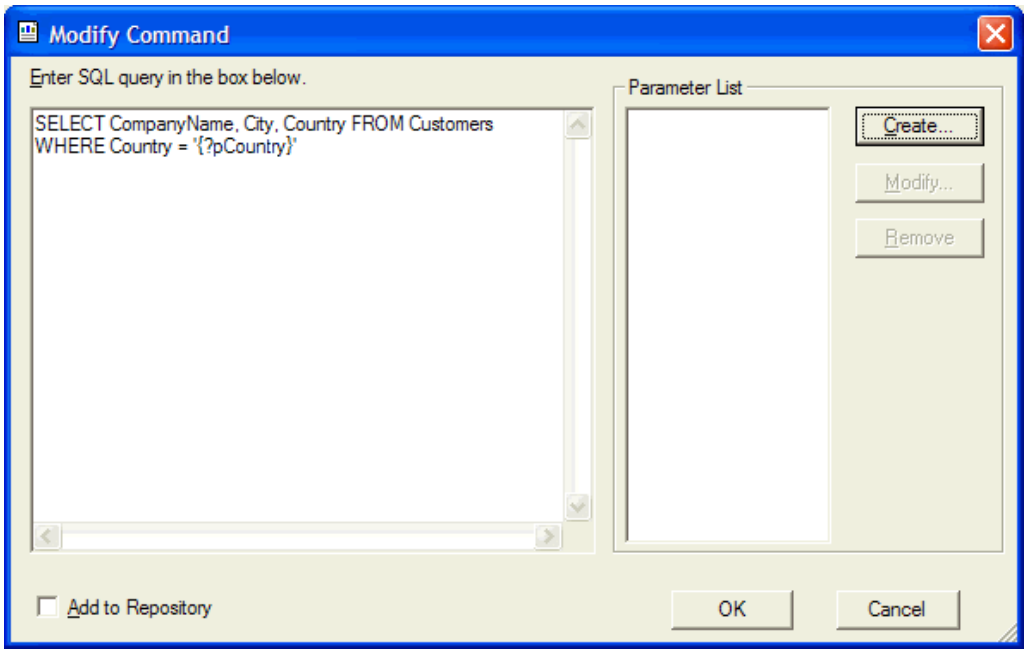

***Figure 13**. Enter the SQL Select statement in the Modify Command dialog box.*

4. Enter the SQL Select statement to create the desired result set. If the statement is complete, proceed to step 12. Otherwise, continue with step 5.
5. If you need to enter a parameter (Figure 13 shows the parameter pCountry), click Create to display the Command Parameter dialog box (see **Figure 14**).
6. Enter the Parameter Name.
7. Enter the Prompting Text.
8. Select the Value Type.
9. Enter the Default Value.
10. Click OK to save the parameter information and return to the Modify Command dialog box.
11. Repeat steps 6 through 10 to enter additional parameters as needed.
12. If desired, select Add to Repository. When you do this, the Add Item dialog box displays. (See "Understanding the Crystal Repository" later in this chapter.)
13. Click OK to close the Modify Command dialog box.

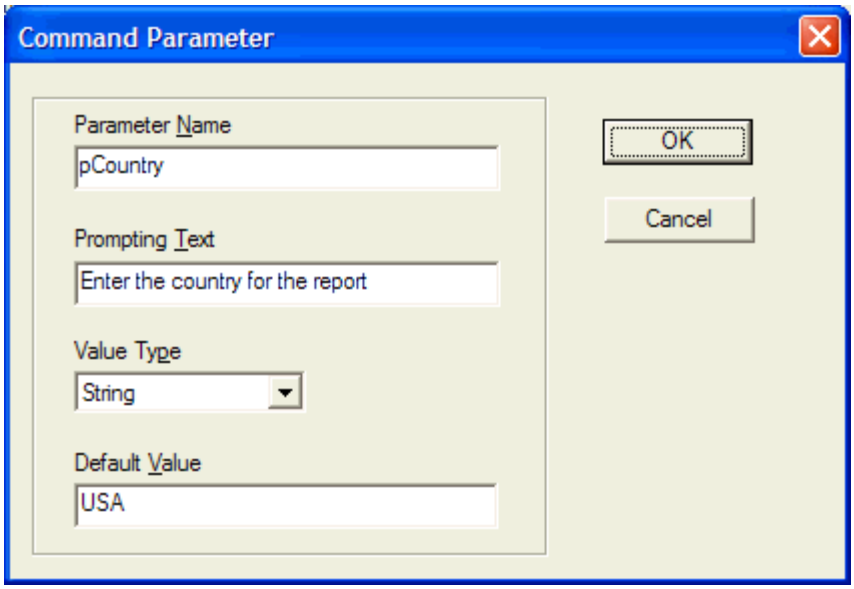

***Figure 14**. Specify the SQL Select parameters in the Command Parameter dialog box.*

There is one important note about command parameters. If the parameter is a character data type, you must surround it by single quotes in the SQL Select statement as shown in Figure 13. This is not required for other data types. Parameters fields, explained in detail in Chapter 6, "Advanced Reporting," are similar to command parameters.

Selecting database objects

Now that you selected the database connections for the report, you need to specify the tables to use. To see the available tables, expand the connection under the connection type or Current Connections in the Available Data Sources list in the Database Expert. Drill down under the appropriate node in the list. By default, Crystal Reports shows the tables, views, and stored procedures of the data source, if they are supported (see **Figure 15**).

To add a table to the report, drill down to the desired table, view, or stored procedure and drag it from the Available Data Sources list to the Selected Tables list. You can also select tables from the Favorites and Repository the same way.

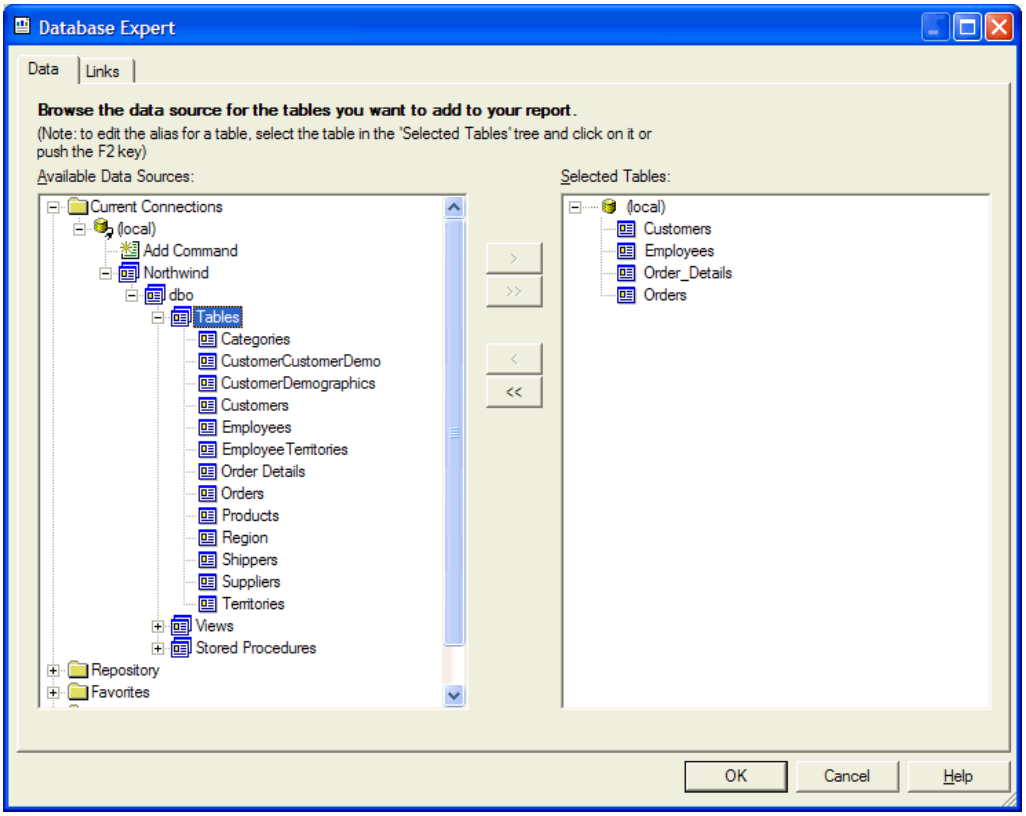

***Figure 15**. Drag the table from the Available Data Sources list to the Selected Tables list in the Database Expert.*

If you select a stored procedure, Crystal Reports will prompt you to enter a value for any required parameters (see **Figure 16**). You do not need to enter the parameters at this time. Crystal Reports will prompt the user to enter the values when the report is run.

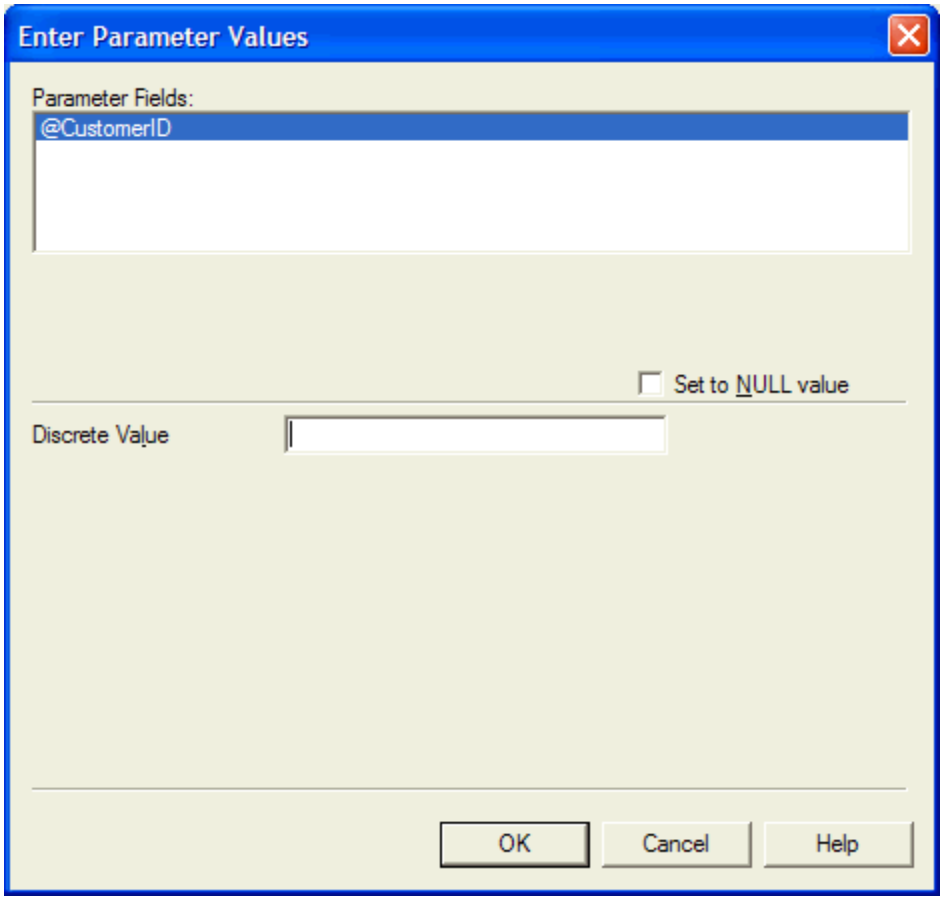

***Figure 16**. Crystal Reports will prompt for required parameters if you select a stored procedure.*

Linking Tables

Once you add tables to the report, you need to tell Crystal Reports how to link them. This is done on the Links page of the Database Expert. **Figure 17** shows four tables being linked. Some fields are indexed, as indicated by the pointers next to the field name. When you look at this in Crystal Reports, the pointers are different colors. Click Index Legend to see definitions of the different colors.

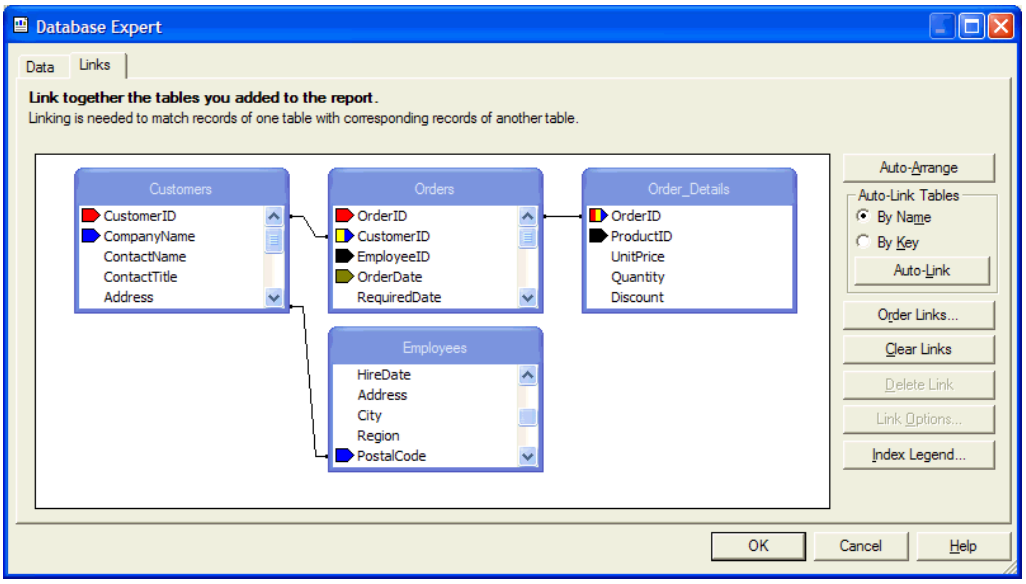

***Figure 17**. Crystal Reports makes its best guess at linking tables.*

When Crystal Reports links the tables, it makes its best guess at which fields to use for linking the tables. It does this by comparing field names in the tables. In Figure 17, Crystal Reports guessed Customers.PostalCode should link to Employees.PostalCode. However, the correct link should be Orders.EmployeeID to Employees.EmployeeID (see **Figure 18**). The following steps show how to make the correct link:

1. Click the line with the incorrect link to select it. The link displays bold.
2. Press the Delete key or right-click and select Delete Link from the shortcut menu.
3. Drag the linking field from the parent table onto the linking field in the child table.

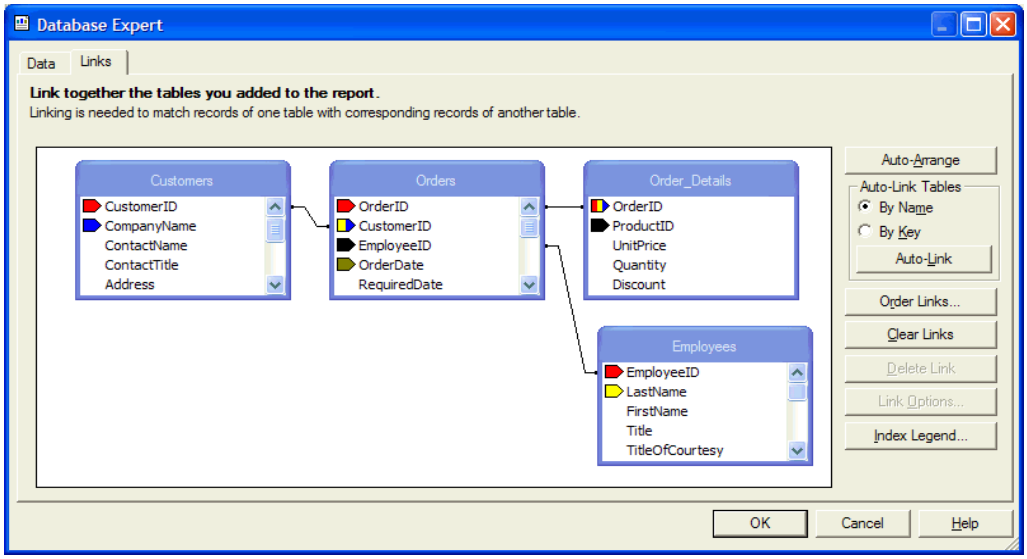

***Figure 18**. A view of the Database Expert Links page after correcting the linking information.*

Crystal Reports assumes the fields to use for linking should be the same value (equal to) and it should perform an inner join. To modify this, right-click the line indicating the link and select Link Options from the shortcut menu. The Link Options dialog box displays (see **Figure 19**). Make your changes, and then click OK to save them.

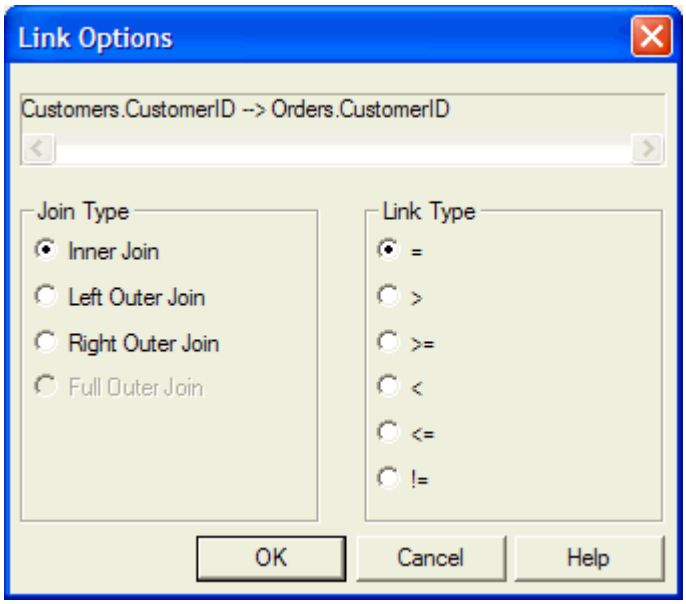

***Figure 19**. Use the Link Options dialog box to modify how tables are linked.*

Field definition files

Normally, data fields in a report are bound to a field in a specific table. However, you can create unbound reports, and then apply the actual data source at runtime using a field definition file. The advantage of a field definition file is it is easy to change the actual data source at report time.

Field definition files are tab separated text files with a TTX extension. Each line of the file represents one column in the data source. You must specify the field, data type (see **Table 1**), and length for string fields.

***Table 1**. Data Types for Field Definition Files.*

Data Type
Blob
Boolean
Byte
Currency
Date
Long
Memo
Number
Short
String

Creating a field definition file

You can create a field definition file using a text editor or you can use the designer in Crystal Reports.

1. In the Database Expert, expand the Create New Connection node and select Field Definitions Only. The Field Definitions Only dialog box (see **Figure 20**) displays.

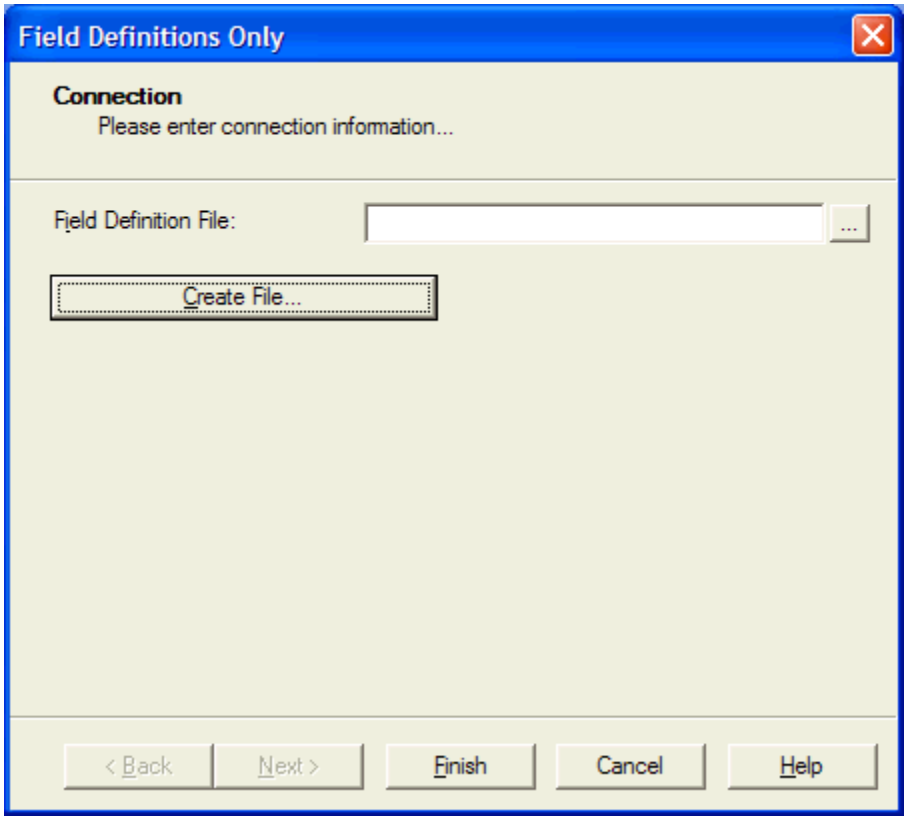

***Figure 20**. Use the Field Definitions Only dialog box to specify the TTX file for unbound reports.*

2. Enter either the name of an existing TTX file or click Create File. If you click Create File, the Database Definition Tool (see **Figure 21**) displays.

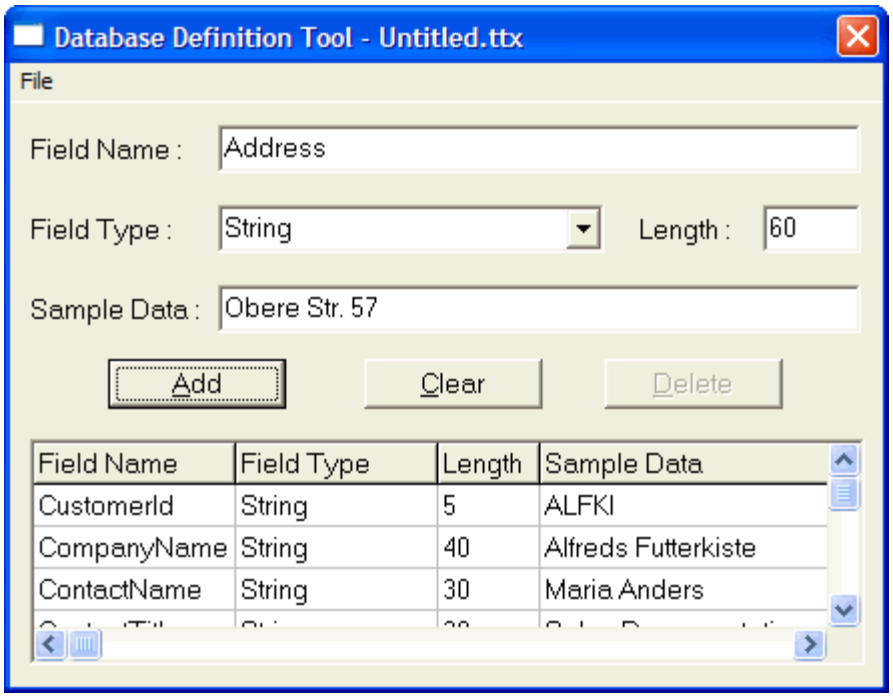

***Figure 21**. Use the Database Definition Tool to specify field information for a TTX file.*

3. Enter the Field Name for the first field in the table.
4. Enter the Field Type for the second field in the table. If you select String, it will prompt you to enter the field Length.
5. Optionally enter Sample Data.
6. Click Add.
7. Repeat steps three through six for each field in the table.
8. When you finish, close the dialog box or select File | Save from the menu. It will prompt you to enter the file name if you created a new file, and then return to the Field Definitions Only dialog box.
9. Click Finish to return to the Database Explorer.

Using a field definition file

Once you create the field definition file, you add it to the report just like any other data source. However, you still need to link the report to the actual data.

1. Open the report. If you preview the report at this time, it uses the sample data you placed in the TTX file.

2. Select Database | Set Datasource Location from the menu. The Set DataSource Location dialog box (see **Figure 22**) displays.

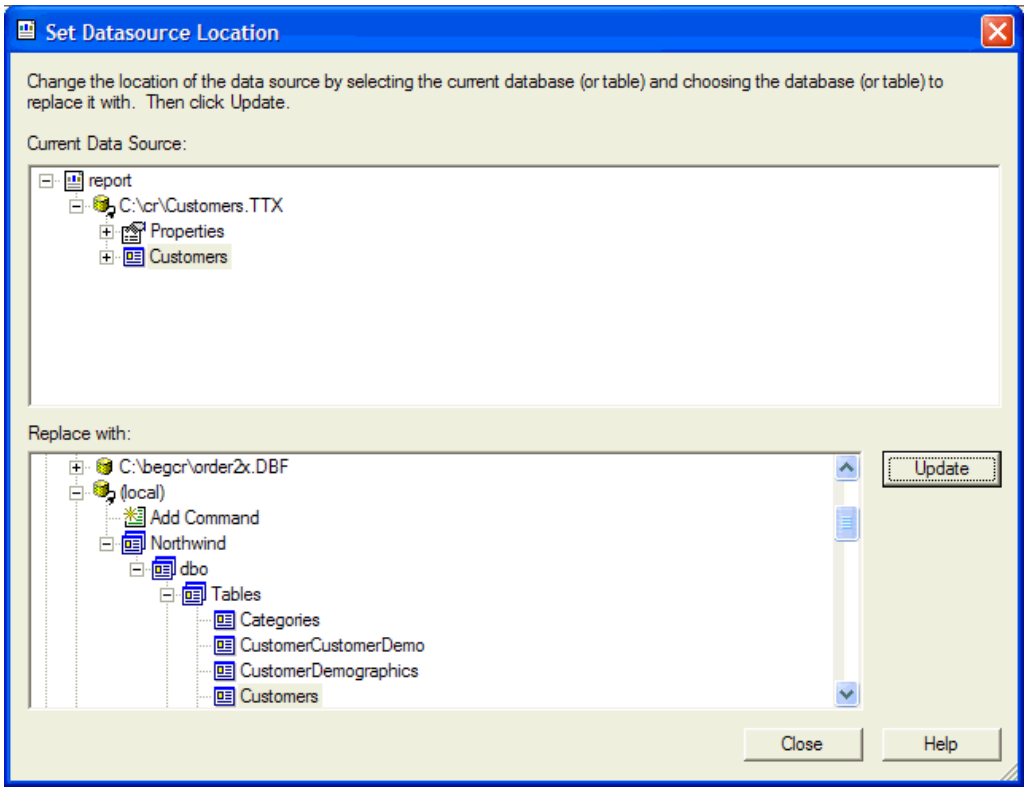

***Figure 22**. You change the location of the database in the Set Datasource Location dialog box.*

3. In the top pane, select the specified table from the TTX file.
4. In the bottom pane, select the actual data source.
5. Click Update.
6. Preview the report to verify it is using the actual data.

Working with Images

I have seen many questions over the past few years asking how to handle images. Putting a single image on a report is easy, but when each detail record needs a different image, it's difficult to make it work.

There are two methodologies to handling images. One is storing the image in a field in the database. The second, and probably more accepted method, is keeping an image file on disk and storing the filename in the database.

Images in the database

Crystal Reports supports Windows Metafiles, Bitmaps (BMP), TIF, JPG, and PNG file formats. It does not support GIF files.

I tested images stored in four different data sources: FoxPro, Visual FoxPro, Access, and SQL Server.

In a FoxPro or Visual FoxPro table, images are stored in a General field. When using native data connections to a FoxPro table, Crystal Reports does not recognize the general field. The image does not print in the report. However, if you use ODBC or the Visual FoxPro OLE DB Provider, the General field is recognized and the image prints in the report.

Access stores images in an OLE Object field. The images print correctly using direct access, ODBC, and ADO.

In SQL Server, you store the pictures in an Image file. Using both ODBC and ADO, the images print correctly.

Using separate image files for each record requires you hook into the formatting events of Crystal Reports. Chapter 15, "Integrating COM Components," discusses Event handling in detail.

Adding a watermark

Watermarks are images or text that prints behind the report data. Use the following steps as a guide to add a watermark under the detail section of a report.

1. Right-click the Page Header, to the left of the design area, and select Insert Section Below from the shortcut menu.
2. Place the graphic or text in the new section.
3. Select Report | Section Expert from the menu or click the Section Expert button on the Expert Tools toolbar to display the Section Expert (see **Figure 23**).

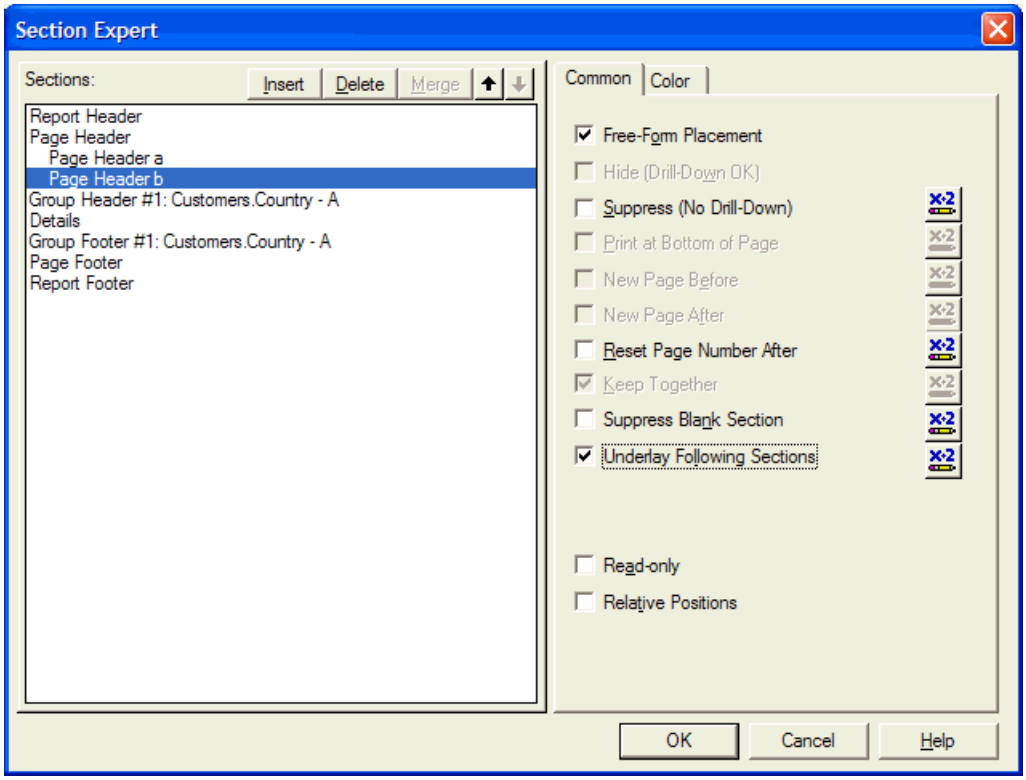

***Figure 23**. Use the Section Expert to set options for each report section.*

4. Select the newly added section in the Sections list box.
5. Select the Underlay Following Sections check box.
6. Click OK to return to the designer.
7. Preview the report.
8. Return to the design tab and stretch the graphic vertically until it is tall enough to underlay they entire Details section.

Limiting records selected

When you apply a record selection criteria, Crystal Reports adds a Where clause to the SQL Select statement sent to the database. You can use the Select Expert or Selection Formulas in the Formula Workshop (see Chapter 8, “Using Formulas”). Either way gives the same results.

The Select Expert

Basically the Select Expert is a wizard that makes it easy to apply a criteria select statement. The following steps walk you through using the Select Expert.

1. Choose Report | Select Expert from the menu or click the Select Expert button on the Expert Tools toolbar.
2. If you don't have any criteria entered, such as the first time you display the Select Expert, the Choose Field dialog box (see **Figure 24**) displays.

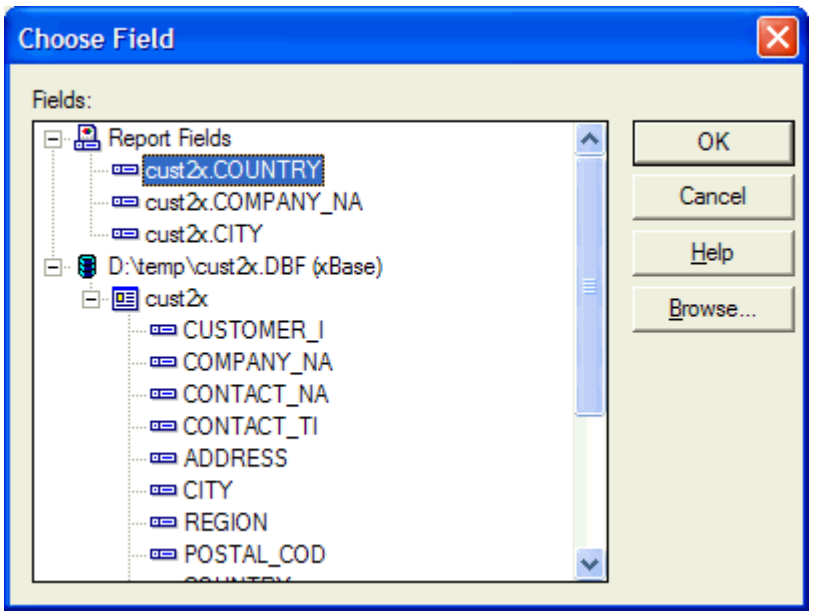

***Figure 24**. Use the Choose Field dialog box to pick the first field for the Select Expert.*

3. Select the field for the criteria and click OK to return to the Select Expert (see **Figure 25**).

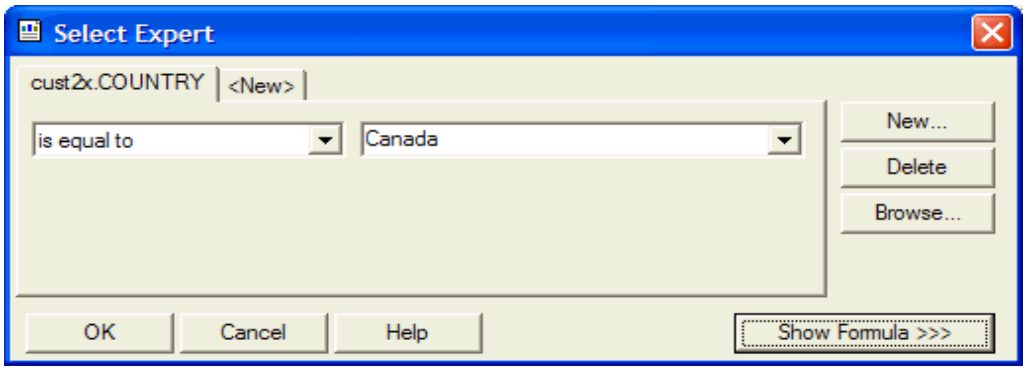

***Figure 25**. Use the Select Expert to limit the data used in the report.*

4. In the first combo box, choose the comparison for the field.
5. In the second combo box, choose the value.
6. Click Show Formula to display the formula Crystal Reports will apply (see **Figure 26**). You can also enter the same formula in the Formula Workshop.

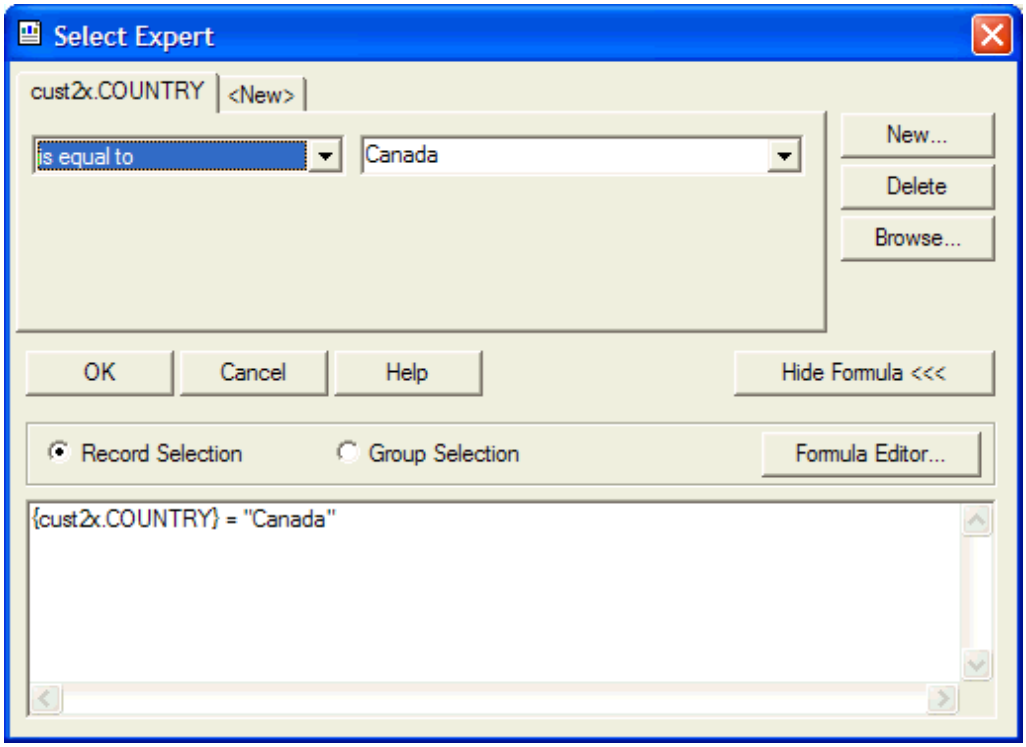

***Figure 26**. The Select Expert expanded to show the selection formula.*

7. To add additional criteria, click New or click OK to save the criteria and close the Select Expert.
8. Preview the report to see the filtered data.

Miscellaneous data functions

Crystal Reports has a few other data related functions you should know about.

Set Database Location

It's common to use a different data set during development than at runtime. This makes it necessary to change the location of the data and maybe even the type of data access. For example, you may develop a report using direct access FoxPro data, but at runtime you need to access data on SQL Server. To change the location of the data:

1. Select Database | Set Database Location from the menu. The Set Datasource Location dialog box (see Figure 22) displays.
2. Choose the table in the Current Data Source list.
3. Select the new data source or create a new connection in the Replace with list.
4. Click Update to change the location and convert the database driver Crystal Reports uses.
5. Click Close to close the Set Datasource Location dialog box.
6. Select Database | Verify Database from the menu to confirm the new database is the same structure as the old database.

LogOn or Off Server

This option does exactly what it says. It logs you on or off a server. If you have a report open, select Database | LogOn or Off Server from the menu. If you do not have a report open, select File | LogOn or Off Server. With either option, the Data Explorer (see **Figure 27**) displays.

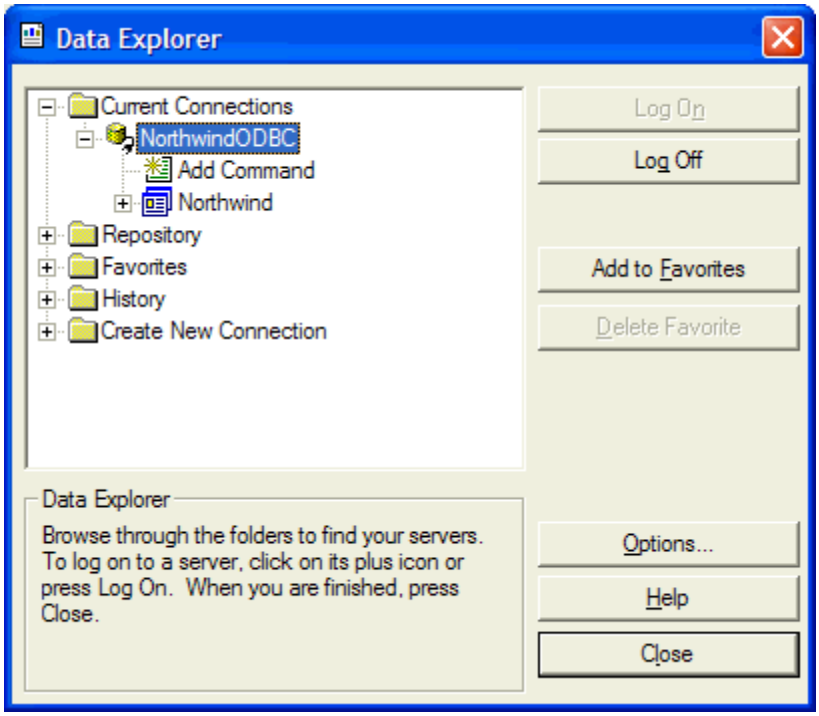

***Figure 27**. Use the Data Explorer to log on or off a database server.*

To log on the server, select the server from the list or create a new connection and click Log On. To log off, select the server and click Log Off.

Show SQL Query

This option displays the Show SQL Query dialog box (see **Figure 28**) showing the SQL Select statement sent to the database. To display the dialog box, select Database | Show SQL Query from the menu.

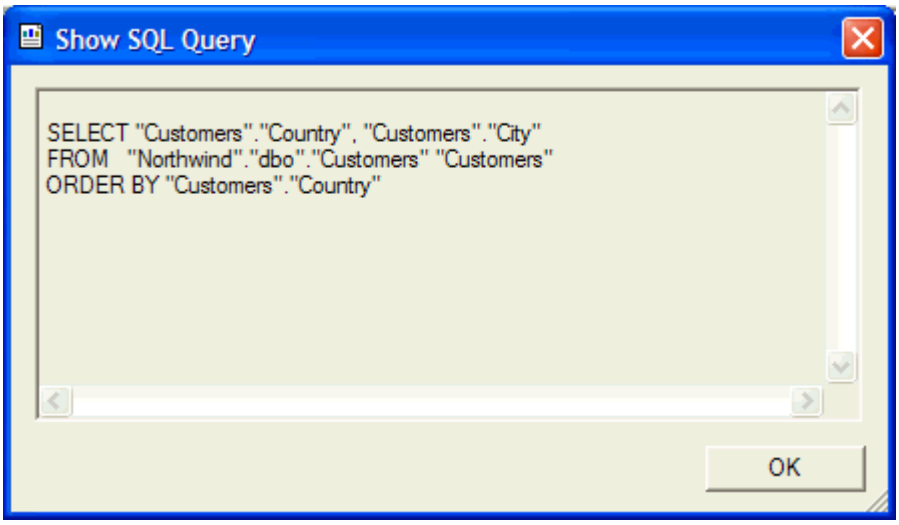

***Figure 28**. The Show SQL Query dialog box displays the SQL Select statement sent to the database.*

Perform Grouping on Server

When selected, this option can provide significant performance increases, particularly when used with client/server databases such as SQL Server and Oracle. If selected, a Group By clause is added to the SQL Select statement sent to the database. To toggle this option, select Database | Perform Grouping on Server from the menu or set this option in either the Options or Report Options dialog box.

Report Bursting Indexes

Sometimes you may want to save the data with the report. When you do this, you can improve the reporting performance by adding indexes to the data. Select Report | Report Bursting Indexes from the menu to display the Saved Data Indexes dialog box (see **Figure 29**).

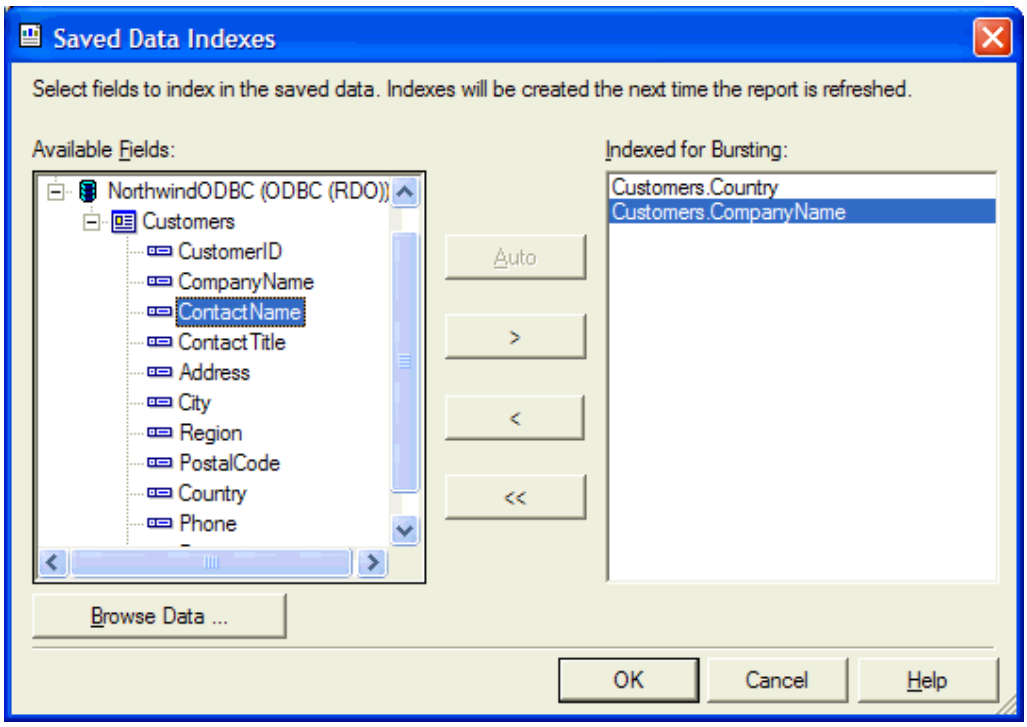

***Figure 29**. Select fields for indexing in the Saved Data Indexes dialog box to increase reporting speed in reports using saved data.*

Select the fields you want indexed in the Available Fields list. When you finish, click OK.

Summary

In this chapter, I showed you how to connect to many commonly used data sources. Crystal Reports can connect to many others, such as NT Event Logs, IIS Logs, Outlook, Lotus Domino servers, and many others. While I didn't explain many of these data sources, you should have no trouble connecting to them.

Updates and corrections to this chapter can be found on Hentzenwerke's web site, **www.hentzenwerke.com**. Click "Catalog" and navigate to the page for this book.