Crystal Reports 2008 SP3 User's Guide

Crystal Reports 2008

windows

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Introduction to Crystal Reports 2008

chapter 1

About Crystal Reports

Crystal Reports is designed to work with your database to help you analyze and interpret important information. Crystal Reports makes it easy to create simple reports, and, it also has the comprehensive tools you need to produce complex or specialized reports.

Create any report you can imagine

Crystal Reports is designed to produce the report you want from virtually any data source. Built-in report experts guide you step by step through building reports and completing common reporting tasks. Formulas, cross-tabs, subreports, and conditional formatting help make sense of data and uncover important relationships that might otherwise be hidden. Geographic maps and graphs communicate information visually when words and numbers are simply not enough.

Extend reporting to the Web

The flexibility of Crystal Reports doesn't end with creating reports — your reports can be published in a variety of formats including Microsoft Word and Excel, E-mail and even over the Web. Advanced Web reporting lets other members of your workgroup view and update shared reports inside their web browser.

Incorporate reports into applications

Application and web developers can save time and meet their users needs by integrating the report processing power of Crystal Reports into their database applications. Support for most popular development languages makes it easy to add reporting to any application.

Whether it's the web master in IT, the promotion manager in marketing, the database administrator in finance or the CEO, Crystal Reports is a powerful tool designed to help everyone analyze and interpret the information that's important to them.

About the Crystal Reports documentation

The Crystal Reports documentation includes procedures for typical reporting tasks such as placing fields, formatting reports, and sorting records. It also contains information on more specific areas of interest such as advanced formula creation and accessing different types of data. Use the documentation as a reference for your basic reporting needs as well as an introduction to new concepts in report creation.

Locate information quickly

- Access online help from the Crystal Reports help menu.

  Use the Contents tab to view all major sections in the online help and drill down to specific headings within each section, the Index tab to view topics in alphabetical order, and the Search tab to enter a keyword to view all the sections that relate to the keyword.
- Access a PDF version of the Crystal Reports documentation online at *http://support.businessobjects.com/documentation*.

  The PDF version contains a subset of the topics found in the online help, along with additional sections—such as a Quick Start—that can help you learn Crystal Reports.

Sample Reports

Many topics in the Crystal Reports documentation include a list of related sample reports. Use these reports to illustrate concepts the topic describes. The sample reports can be adapted to your own needs.

Sample reports are located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

What's New in Crystal Reports 2008 SP3

chapter 2

Introduction

This section provides a high-level overview of the components, features, and benefits that are provided by the latest release of Crystal Reports.

The following is an overview of the new features in Crystal Reports 2008 SP1.

- *Flash printing*
- *Unicode-supported interface*
- *Enhanced publishing interface*
- *XML and Web Services Database Driver*
- *Viewer Accessibility*

Flash printing

Crystal Reports 2008 allows you to print SWF objects in your report without the need to first export the report to PDF.

The printing option can print SWF objects that have data binding as well as SWF objects that do not have data binding.

Unicode-supported interface

Crystal Reports 2008 now has a Unicode-capable interface that allows you to use User Function Libraries (UFLs) for multilingual information processing.

For example, in a multilingual report, you can use the UFLs to access and translate the multilingual text.

Enhanced publishing interface

The Crystal Reports 2008 Publishing page now allows you to set parameter values for all recipients from the Personalization page. Other improved usability functions include selecting destinations, PDF merging, and a better shared publishing workflow.

XML and Web Services Database Driver

Web services created with SOAP 1.2 are now accessible to Crystal Reports XML and Web Services driver. This includes new architectures such as .NET 3.0 (Windows Communication Foundation).

Also, the Crystal Reports XML Web Services driver recognizes a Web Service that returns an ADO.NET DataSet.

Viewer Accessibility

The Webform (DHTML) viewer is now accessible. The enhanced cross-tab objects can now be navigated by a screen reader.

Option to distinguish between empty and non empty rows for SAP NetWeaver BW Data

When you want your report to show all SAP NetWeaver BW data records, including the empty ones, you can use the new “Show Empty Data” option. This option has been added to the SAP NetWeaver BW MDX driver to allow empty data records to be displayed.

The “Show Empty Data” option can be selected when you create the connecetion (on SAP System Login).

When the “Show Empty Data” option is selected, empty data rows will be displayed in the report as valid data.

Note:
Setting “Show Empty data” to true will downgrade the data retrieval performance, so the default value for the option is False. This also applies when opening a report created with previous versions of this product.

HTML interpretation tag “<a>” is now supported

When you add a hyperlink to your report, you can now use the “<a> ” tag to display text instead of the hyperlink.

Example:

SAP.COM

Note:
Only the “href” linking property is supported; other HTML 4.01 linking properties are not supported.

Installing Crystal Reports 2008 SP3

chapter 3

Installation overview

The Crystal Reports Installation Wizard works with Microsoft Windows Installer to guide you through the installation process. The Installation Wizard automatically recognizes your computer's operating system and updates files as required.

Note:
Data-Direct ODBC driver installers are not included as part of the Crystal Reports installer. Instead, you must download and run these installers separately.

Installing Crystal Reports 2008 SP3

This section provides step-by-step instructions for installing Crystal Reports and shows how to customize your installation. The main topics are:

- *Installation requirements*
- *Installing Crystal Reports on a local machine*
- *Creating an installation point and installing from a network server*
- *Customizing your installation*
- *Running a silent installation*
- *Setting custom banners*
- *Upgrading Crystal Reports components*

As one of the final steps in the installation process, you'll be asked if you want to register the product. Follow the on-screen instructions to complete this process.

Installation requirements

Minimum installation requirements

Operating Systems	Windows Vista and Vista SP1 Windows XP Professional SP2 Windows 2003 Server Windows 2008 server
Computer/Processor	450 MHz or higher Pentium-compatible CPU
Memory	At least 128 megabytes (MB) of RAM. 256 MB recommended. 4 gigabytes (GB) maximum
Disk space	1.0 gigabyte minimum. 1.5 gigabytes recommended
Drive	CD-ROM or DVD drive

Note:
The Java components require a J2EE 1.6 compatible runtime, which is automatically installed at the same time as Crystal Reports.

Installing Crystal Reports on a local machine

If you are installing Crystal Reports on a computer running any of the supported operating systems (see *Minimum installation requirements* above), you must have Administrator privileges. The installation process creates

registry entries and may update some system files that require Administrator rights.

Close all currently running programs and stop as many services as possible when installing Crystal Reports.

If you want to limit the features you install, see *Customizing your installation*.

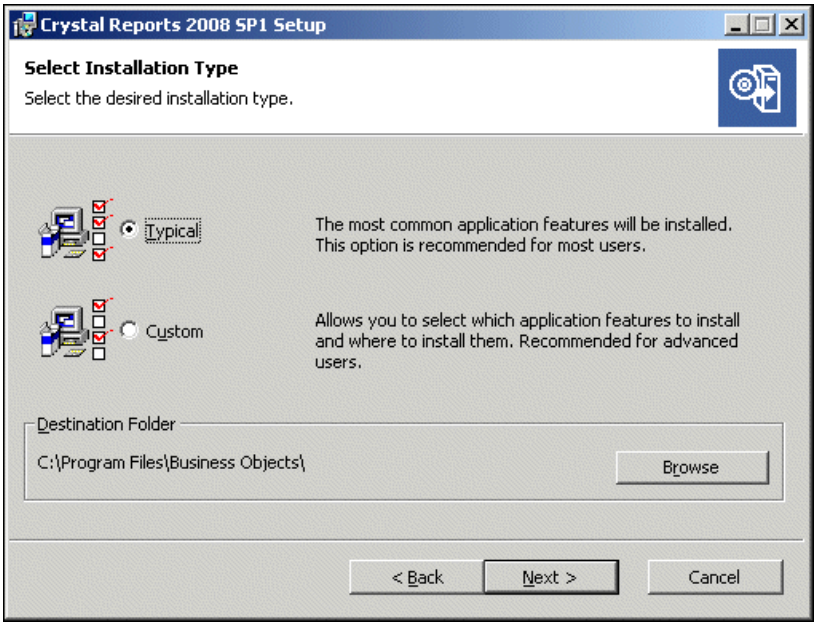
To install on a local machine

1. Unless Autoplay is enabled for your CD-ROM drive, run **Setup.exe** from the `win32_x86` directory of your product distribution.

   Note:
   Depending on the configuration of your current system, you may receive a dialog box informing you to update existing files. If this happens, click Yes and restart your machine. The Installation Wizard updates the required files.

2. Choose the language in which you want to install Crystal Reports.
3. Indicate whether or not you want to create a log file during installation (it is enabled by default).
4. Click **OK**.
5. When the Welcome dialog box appears, click **Next**.
6. Read and accept the License Agreement to proceed with the installation.
7. In the User Information dialog box, type your name, organization, and the product activation keycode.
8. Click **Next**.
9. In the Choose Language Packs dialog box, select the languages that you want to install.
10. Click **Next**.

    The Select Installation Type dialog box appears.



11. Choose the type of installation that you want to perform:
    - **Typical** installs the most common application features.
    - **Custom** enables you to choose the features that you want installed, to specify where they will be installed, and to check the disk space required by each feature. For details, see *Customizing your installation* .

12. Click **Browse** if you want to install Crystal Reports to a directory different from the default location.

    The default location for Crystal Reports is `C:\Program Files\Business Objects\`

13. Click **Next**.

    The Start Installation dialog box appears.

    Note:
    If you install Crystal Reports in Custom Installation Mode on a machine with an Internet connection, you can choose to disable the automatic Web Update Service feature. This features lets you check for updates and

service packs each time you open Crystal Reports; if you disable it, you cannot activate it later.

14. Click **Next** to begin copying files to your local drive.

Creating an installation point and installing from a network server

Installing Crystal Reports from a central network location involves two steps:

1. Make a copy of your Crystal Reports product distribution on a server machine on the network (this copy becomes your installation point). See *Creating an installation point for Crystal Reports*.
2. Access the server machine from a workstation, and run Setup.exe to install Crystal Reports on the workstation. See *Installing Crystal Reports from a network*.

Creating an installation point for Crystal Reports

This procedure must be performed by a network administrator who has write access and network privileges. When this procedure is complete, end users will be able to access Setup.exe from the network to install Crystal Reports onto their local machines.

Note:
If users do not have the Microsoft Windows Installer configured on their machines, the setup process detects the workstation's operating system and installs the appropriate Microsoft Windows Installer package.

To create an installation point

1. Create a folder on your network, and share this folder for the users who need to run the Setup.exe.
2. Copy the entire contents of your Crystal Reports product distribution to the folder that you created in step 1.
3. Assign rights to the users who need to install Crystal Reports from this folder.

Note:
Restricting access to this folder lets you stay within your license limit.

Installing Crystal Reports from a network

If your network administrator has copied Crystal Reports to the network, make sure you have read privileges to that network before beginning this process.

If you are installing Crystal Reports on a computer running any of the supported operating systems (see *Minimum installation requirements*), you must have Administrator privileges on the computer. The installation process creates registry entries and may update some system files that require Administrator rights.

Close all currently running programs and stop as many services as possible when installing Crystal Reports.

To install Crystal Reports from a network

1. Access the folder on the network that contains the Crystal Reports installation files.
2. Double-click **Setup.exe**.

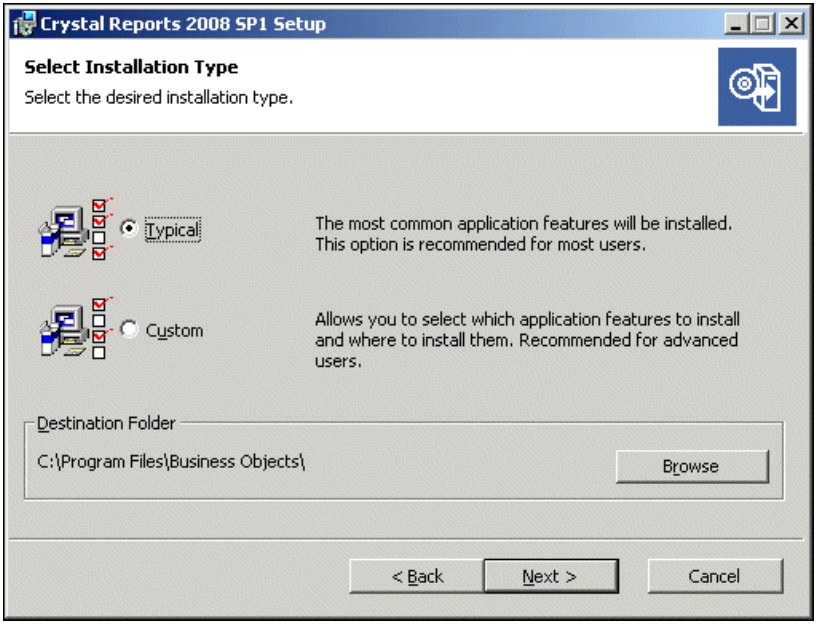
   Note:
   Depending on the configuration of your current system, you may receive a dialog box informing you to update existing files. If this happens, click Yes and restart your machine. The Installation Wizard updates the required files.

3. Choose the language in which you want to install Crystal Reports.
4. Indicate whether or not you want to create a log file during installation (it is enabled by default).
5. Click **OK**.
6. When the Welcome dialog box appears, click **Next**.
7. Read and accept the License Agreement to proceed with the installation, then click **Next**.
8. In the User Information dialog box, type your name, organization, and the product activation keycode.

Tip:
You may need to contact your Administrator for the product activation keycode.

9. Click **Next**.
10. In the Choose Language Packs dialog box, select the languages that you want to install.
11. Click **Next**.

    The Select Installation Type dialog box appears.



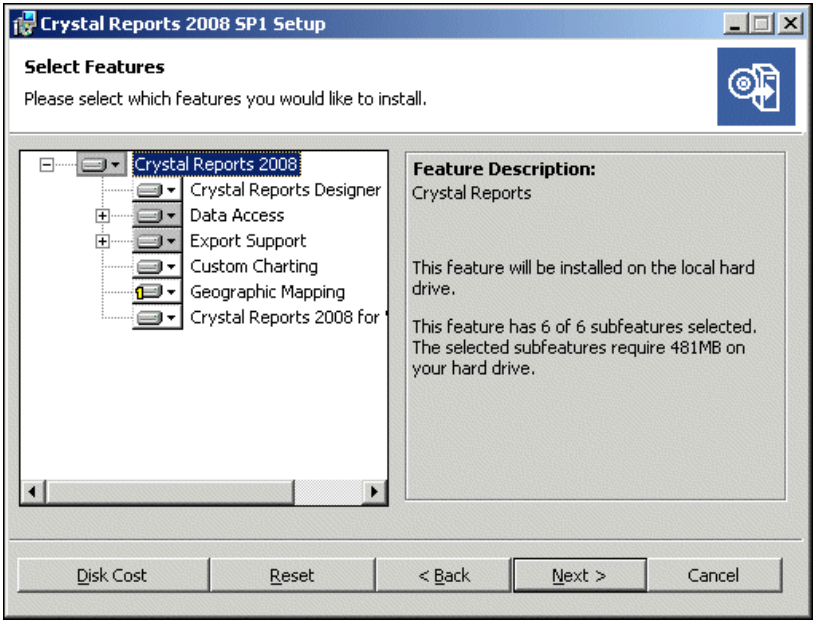
12. Choose the type of installation that you want to perform:
    - **Typical** installs the most common application features.
    - **Custom** enables you to choose the features that you want installed, to specify where they will be installed, and to check the disk space required by each feature. For details, see *Customizing your installation* .
13. Click **Browse** if you want to install Crystal Reports to a directory different from the default location.

The default location for Crystal Reports is `C:\Program Files\Business Objects\`

14. Click **Next** to begin copying files to your local drive.

Customizing your installation

Selecting the Custom installation option invokes the Select Features dialog box, which allows you to install specific features, to change the default location of various features, and to check the amount of disk space required by each feature.



The icons in the feature tree indicate whether the feature and its subfeatures will be installed or not:

- A white icon means that the feature and all its subfeatures will be installed.
- A shaded icon means that the feature and some of its subfeatures will be installed.
- A yellow 1 means that the feature will be installed when required (installed on demand).

- A red X means that the feature or subfeature is either unavailable or will not be installed.

Crystal Reports uses an "install on-demand" technology for some of its features. As a result, the very first time a particular feature is used after being installed, there may be an extra wait for the "install on-demand" to complete. This behavior will affect new installations only once and will not occur when features are restarted.

To select the configuration and location of a feature or subfeature, click its icon.

Note:
Each feature or subfeature can have its own configuration and location.

Use the following table to determine your installation options for each feature or subfeature:

Type of feature installation	Description of what is installed
Will be installed on local hard drive	• Installs the feature on the local hard drive. • Uses the Typical install settings to install some of the feature's subfeatures to the local hard drive.
Entire feature will be installed on local hard drive	• Installs the feature and all of its subfeatures on the local hard drive.
Feature will be installed when required	• Installs the feature or subfeature from the product distribution/network when first used.
Entire feature will be unavailable	• Neither the feature nor its subfeatures are installed.

Note:
Subfeatures are listed below each feature. A subfeature can have a different type of installation than its parent feature.

Running a silent installation

A silent installation is one that you can run either from the command line or by use of a response file to automatically install Crystal Reports on any machine in your system, without the installation program prompting for information during the installation.

The silent Crystal Reports installation is particularly useful when you need to perform multiple installations and do not want to interrupt people who are working on machines in your system. You can also use the silent installation command in your own scripts. For example, if your organization uses scripts to install software on machines, you can add the silent Crystal Reports installation command to your scripts.

Note:

- The silent installation is not available from the Crystal Reports Setup program and is intended only for experienced administrators of Crystal Reports.
- When you perform a silent installation, you accept the Crystal Reports end-user license agreement by default. You can find a copy of the license agreement in the `Docs` folder of your product distribution.
- Silent installations are intended for new installations; do not use them for upgrades.

Command line silent installation

The silent installation command consists of the command `setup.exe`, followed by a number of parameters that provide information about the installation. The following example creates a sub-directory `/Crystal Reports` and installs Crystal Reports into it:

```
setup.exe ADDLOCAL=ALL CLIENTLANGUAGE=<%langcode%>  IN
STALL.LP.<%langcode%>.SELECTED="1" REBOOT=ReallySuppress
 PIDKEY=<%keycode>% INSTALLDIR="C:\Program Files\Business
 Objects" /qn
```

- *<%langcode%>* Replace this variable with a valid language code from the following table.

- *<%keycode%>* Replace this variable with a valid product activation keycode.

The example uses the most common parameters. You can choose any number of valid parameters, but it is good practice to keep the silent installation as simple as possible.

The following table lists the most common parameters used in a command-line silent installation. To use a parameter, place it on the command line after the `setup.exe` command.

Note:
Parameters that are not listed in this table may be available, but they have not been tested. Untested parameters are not supported.

Installation parameter	Description
CLIENTLANGUAGE=	Use this to specify the language version code for the install. • For English, enter EN. • For French, enter FR. • For German, enter DE. • For Spanish, enter ES. • For Japanese enter JA. • For Simplified Chinese, enter zh_CN • For Traditional Chinese, enter zh_TW. • For Italian, enter IT. • For Korean, enter KO. • For Dutch, enter NL. • For Portuguese (Brazilian), enter PT. • For Swedish, enter SV. **Note:** If you don't enter this parameter, the regular language-selection screen appears at the beginning of your install, even if you specified the parameters for a no-prompt installation.

Installation parameter	Description
INSTALLDIR="filepath"	Specifies the machine and directory where you want to create the Crystal Reports sub-directory, `Crystal Reports` and install Crystal Reports into. Replace filepath with the path where to create the installation sub-directory. For example, setting filepath to, `C:\Program Files\Business Objects` would create the path, `C:\Program Files\Business Objects\Crystal Reports\` and install the files there.
PIDKEY=00000-0000000-0000000-0000	Specifies your product activation keycode.
REBOOT=ReallySuppress	Prevents Crystal Reports from prompting the user to reboot the machine.
/qn+	Performs the installation silently, but prompts the user when the installation is complete.
/qn	Performs the installation silently, without prompting the user.

Installation parameter	Description
ADDLOCAL	Specifies a list of features, delimited by commas, that you want to install. For example, ADDLOCAL=ALL **Note:** When using any of the EXCLUDE parameters in this table, you must also use ADDLOCAL. For example, ADDLOCAL=ALL EXCLUDEJAVAFILES =1
EXCLUDEDOTNETFILES	Specifies whether the .NET developer components should be installed. For example, EXCLUDEDOTNETFILES=1 The default value is 0, which indicates that the .NET developer components should be installed. The value 1 indicates these components should not be installed.
INSTALL.LP.<%langcode%>.SELECTED="1"	Specifies a particular language pack to install.

A silent install log file is created in the *%TEMP%* folder to capture all placeholder DLL errors. If the installation is successful, it is copied to the logging folder. If the installation fails for any reason, the installation log file remains in the *%TEMP%* folder.

Response file silent installation

During an installation, you can optionally indicate that you want the installer to create an INI file to act as a response file during subsequent installs. The

installer then records the installation options you select as you install Crystal Reports, and saves the file to disk.

The created INI file can be read by the installer to silently install Crystal Reports with the same options specified during the creation of the file. This is helpful for quickly producing a Silent Installation of Crystal Reports without having to figure out complicated command-line parameters.

Once created during an installation, the INI response file must be included with the set of Crystal Reports installation files.

The following table lists the parameters used to create and use an INI response file for silent installation. To use a parameter, place it on the command line after the `setup.exe` command.

Installation parameter	Description
-w "filepath"	Creates an INI response file at the path specified by filepath. **Note:** You can follow all the steps of the installation up to the final dialog in the sequence, then cancel the installation. This creates the INI response file without installing Crystal Reports.
-r "filepath"	Reads the INI response file at the path specified by filepath, and installs Crystal Reports based on the settings in the file. **Note:** In the INI response file, there is a section "others". Set the key to /qb to perform an install with a progress meter. Set the key to /qa to perform a completely silent install.

Installation parameter	Description
`-l "filepath"`	To be used with the -r parameter. Creates a silent install log file at the path specified by *filepath*. If this parameter is not set, the default location for the creation of the silent install log file is the *%TEMP%* folder. This log captures all the placeholder DLL errors.

Setting custom banners

The installer can be configured to display customized or re-branded banners along the top and as the background of the Crystal Reports installer. Typically, this functionality is intended only for partners who have signed agreements with Business Objects.

In order to use custom banners, find the directory where the MSI installer is located. Create a sub-directory called `res` and copy your banner images to it:

Image filename	Description
`top.bmp`	Banner that is shown along the top of the installation window. Size: 500 x 59 pixels
`full.bmp`	Banner that is shown as the backdrop for the installation window. Size: 1024 x 768 pixels

Image filename	Description
`splash.bmp`	The Crystal Reports splash screen that is shown after installation. This must be placed in the win32x86 folder.

The images must be in Windows bitmap format.

Upgrading Crystal Reports components

If you have purchased an upgrade product activation keycode, you will find that the installation program does not remove your previous version of Crystal Reports. In general, upgrading Crystal Reports components provides you with a side-by-side installation (that is, an installation in which you can run either your old or new version of Crystal Reports).

Note:
Crystal Reports 2008 SP1 side-by-side installation is supported when upgrading from Crystal Reports XI R2 , Crystal Reports XI,Crystal Reports 10, or Crystal Reports 9.

This side-by-side behavior applies to Crystal Reports and the various Software Development Kits (SDKs). Crystal Reports 2008 for Visual Studio .NET can be used in side-by-side mode at runtime (that is, applications written using Crystal Reports XI R2 or Crystal Reports 10 for Visual Studio .NET will continue to run with Crystal Reports XI R2 or Crystal Reports 10 for Visual Studio .NET assemblies). However, Visual Studio integration is not side by side; only one version of Crystal Reports can be integrated into the Visual Studio .NET IDE at any given time.

Note:
For further information that may pertain to your reporting environment, consult the Release Notes included with your product distribution (`release_en.pdf`).

Quick Start

chapter 4

Learning how to use Crystal Reports

You can teach yourself how to use Crystal Reports by choosing from the methods available in this section:

- You can study the sample reports and sample database included with Crystal Reports.

  You will find the sample reports and sample database for Crystal Reports at the Business Objects Technical Support web site:

  http://support.businessobjects.com/samples/

- You can use the detailed descriptions and instructions in the *Quick start for new users*.
- You can use the summaries and topic cross-references in the *Quick start for advanced users*—especially useful if you're already familiar with reporting concepts.

Each method is a helpful way to learn and understand Crystal Reports and, although any one might be enough to get you up and running, you can always come back to this section and consult the other methods as you need them.

Sample data - Xtreme.mdb

A sample database, Xtreme.mdb, is available for you to use while you are learning Crystal Reports. Xtreme.mdb is a Microsoft Access database and all of the necessary drivers are included. You should be able to open the database directly and begin designing reports. Virtually all of the examples in this manual are based on Xtreme.mdb data.

Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

Xtreme.mdb is a database that contains data for Xtreme Mountain Bikes, a fictitious manufacturer of mountain bikes and accessories.

Note:
The sample data has been designed to illustrate various reporting concepts in a training environment, not to teach database design. While there are

alternative ways of designing a database, this design was selected to keep the tutorials and examples focused on reporting, not on data manipulation.

Report Creation Wizards

The tutorials in this section show you how to build a report from scratch. As a complement or an alternative, however, you may want to use the Report Creation Wizards available on the Start Page. There are four Report Creation Wizards:

- *Standard*
- *Cross-Tab*
- *Mailing Label*
- *OLAP*

Each wizard guides you through the creation of a report by providing a series of screens. Many of the wizards have screens unique to a specific type of report. For example, the Mailing Labels Report Creation Wizard has a screen that allows you to specify the type of mailing label you want to use.

Note:
After you've clicked the Finish button in a Report Creation Wizard, you can click the Stop button on the Navigation Tools toolbar if you don't want the program to gather all the data from your data source. This is useful if you want to make adjustments to the report layout that the wizard created.

Standard

The Standard Report Creation Wizard is the most generic of the wizards. It guides you through choosing a data source and linking database tables. It also helps you add fields and specify the grouping, summarization (totals), and sorting criteria you want to use. Finally, the Standard Report Creation Wizard leads you through chart creation and record selection.

The Templates screen contains predefined layouts for you to apply to your report to give it more impact.

Cross-Tab

The Cross-Tab Report Creation Wizard guides you through the creation of a report in which your data is displayed as a cross-tab object. Two special screens (Cross-Tab and Grid Style) help you create and format the cross-tab itself.

Mailing Label

The Mailing Labels Report Creation Wizard lets you create a report that is formatted to print on any size mailing label. You can use the Label screen to select a commercial label type, or you can define your own layout of rows and columns for any multi-column style report.

OLAP

The OLAP Report Creation Wizard lets you create a report in which your OLAP data is displayed as a grid object. Although similar to the Cross-Tab Report Creation Wizard in several ways, the OLAP Report Creation Wizard appears to be different due to the requirements of working with OLAP data sources. You first specify the location of your OLAP data, and then you choose the dimensions you want to include in the grid. Next you filter the report data and choose the style of the grid object, which you can also customize. Finally, you can define labels for your grid and insert a chart, if you wish.

Quick start for new users

The following tutorial has been designed to give you confidence when creating your first report.

In this tutorial, you will get an introduction to the program as you create a Customer List report. The Customer List is one of the most basic business reports and typically has information such as Customer Name, City, Region, and Contact Name.

You begin by learning the basic concepts: selecting a database, placing some fields on the report, and then selecting specific records to be included. You will then learn how to:

- Insert and move database fields.
- Add and format a title.
- Display a report in the Preview tab so you can fine-tune your work.
- Use the Select Expert to ensure the report includes only the data you need.
- Move objects.
- Group and sort data.
- Insert pictures.
- Print a report.

Before you begin

This tutorial assumes you are familiar with Microsoft Windows and uses conventional terms and procedures common to the Windows environment. If you are not familiar with Windows, please refer to the documentation that came with Microsoft Windows for further explanation.

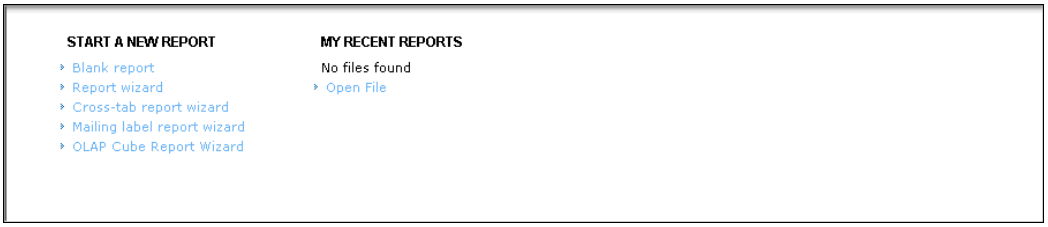
The default font for all report sections in the program is set to Arial, 10 point. If you have changed the default font, or if your printer does not support this font, the field size, field spacing, and screen shots will look different than those included in this tutorial.

This tutorial has been designed using Microsoft Windows 2000. Screen shots may vary slightly if you are using a different platform.

If you are not familiar with the Crystal Reports environment, review *Formatting*, which describes working with the grid, using guidelines, and formatting activities.

Creating the report

1. Click the **Start Page** tab if the Start Page is not already visible in Crystal Reports.



The New Reports area of the Start Page contains a number of wizards to guide you through the creation of specific types of reports. Since you will be learning reporting concepts here, you can skip the wizards and build your report from scratch. After you have completed this tutorial, you may want to build some reports using the wizards to decide which method of report construction you are most comfortable with.

2. In the New Reports area, click **Blank Report**.

   The Database Expert dialog box appears.

   Note:
   You can create reports based on database files, SQL/ODBC data sources, Business Views, and a variety of other data sources.

Selecting a database to use

The next step in creating a report is to select a database. Use the Xtreme.mdb sample database for this tutorial.

The Xtreme.mdb file is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

Copy Xtreme.mdb to a location on your machine that you can access for the tutorial.

To select a database

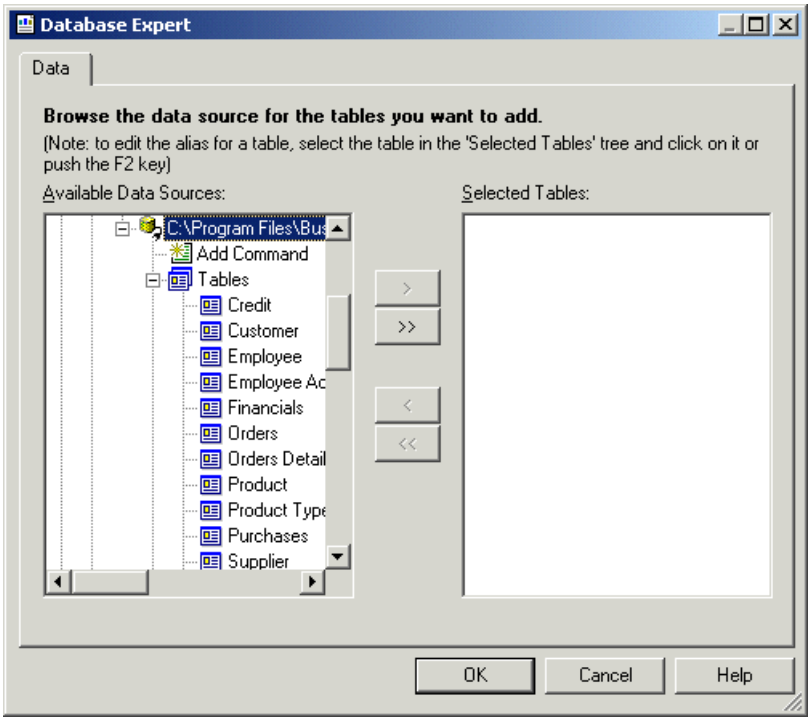
1. In the Database Expert dialog box, expand the **Create New Connection** folder and then expand the **Database Files** folder; then search for the **Xtreme.mdb** sample database.

   Note:

   - You have to use the Open dialog box to find the Xtreme database.

- If you wish to see database and server properties after you have selected a database, right-click the database node in the Database Expert and select Properties from the shortcut menu.

2. Expand the **Tables** node of the **Xtreme.mdb** connection to see a list of tables.



Because you are dealing only with customers in this tutorial, you will select the Customer table.

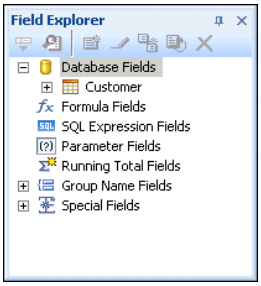
3. Select Customer and click the > arrow to add it to the Selected Tables list, and then click **OK**.

   The Design tab of the Report Designer appears.

4. Click **Field Explorer** on the Standard toolbar.

   The Field Explorer dialog box appears.

Note:
Depending on how it appeared when you last used Crystal Reports, the Field Explorer dialog box might be docked or in floating mode. For more information about docking explorers, see *Opening and docking explorers*.



Report sections

The Design tab is divided into five sections: Report Header (RH), Page Header (PH), Details (D), Report Footer (RF), and Page Footer (PF). If at any time you are unsure of the report section in which you are working, simply look at the shaded area to the left of the report which always displays either the section names or the initials that designate the names. See *Design tab*.

If the Short Section Names check box is selected in the Design View area of the Options dialog box, then the Report Header, Page Header, Details, Report Footer and Page Footer section names will appear as RH, PH, D, RF and PF respectively. If this check box is not selected, follow these steps:

To show short section names

1. On the **File** menu, click **Options**.

   The Options dialog box appears with the Layout tab active.

2. In the Design View area, select the **Short Section Names** check box.
3. Click **OK** to return to the report.

Inserting a field

You'll use the Field Explorer dialog box to insert database fields when you create a new report.

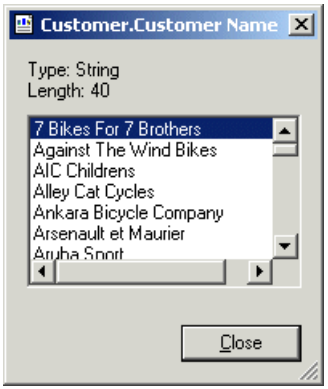
This dialog box is set to remain on-screen until you close it. All the tables available for use are listed in this box.

You will now start placing objects on the report by inserting the Customer Name field.

To insert a field

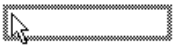
1. Expand the **Database Fields** node in the Field Explorer dialog box and expand a table.
2. Highlight a field name by clicking the name once.

   When you highlight a field name, you can review a subset of the values for that field as well as the field type and size by right-clicking the field and selecting Browse Data from the shortcut menu.



3. Click the **Customer Name** field and drag it into the **Details** section of the report.

   An object frame appears with the Arrow cursor as you drag the field onto the report:

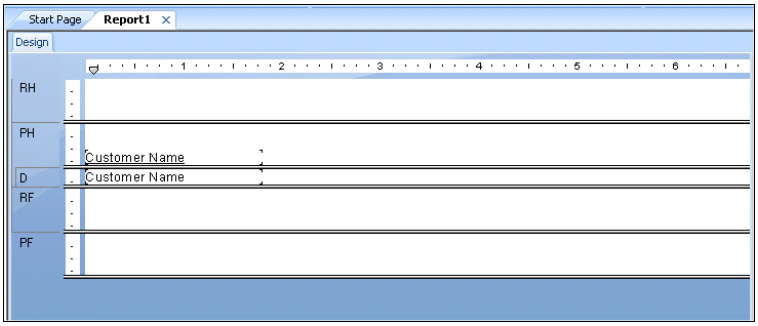


   - The object frame represents the object you have just selected for placement.
   - The size of the object frame approximates the size of the data in the field selected.

4. Move the object frame as far to the left as you can in the Details section.

If you move the field too far to the left, the Arrow cursor turns into a Stop cursor, indicating that you cannot drag the field that far. Keep in mind that you cannot place any objects outside the page margin.

The Design tab should look similar to this:



Understanding fields

Before going any further, take a look at the field you just placed in the Details section:

- First of all, the object frame indicates that when the report is printed, a field value will appear where the box is positioned.
- If you haven't selected the Show Field Names check box on the Layout tab of the Options dialog box, the object frame contains Xs to indicate that the database field contains a text string. Other data types have different character representations. For example, a currency data type is represented by $55,555.56.
- If your report is not showing field names, the number of Xs in the object frame is the data width, the maximum number of characters in the field as defined by the database. Whether or not your report shows field names, the width of the object frame is the field width (the amount of space allocated to the field for printing). Initially it is set to the width needed to display the maximum number of characters in the field (using the font selected for the field). You can change this width by resizing the field.
- The size of the characters or Xs indicates the point size selected for the characters in the field.

- The font and style (Bold, Underline, and so on) used in displaying the characters or Xs indicate the font and style selected for the characters in the field. Later in this tutorial you will learn how to make changes to these properties.
- The line spacing is adjusted to the point size selected for the characters in the field.

Adding additional fields

Next, you will insert two additional fields in the report. This time, however, you will use the **Ctrl-click** combination to add them at the same time.

To add additional fields

1. Highlight the **City** field in the Field Explorer dialog box, press the **Ctrl** key on your keyboard, and then highlight the **Country** field. Release the **Ctrl** key.

   If you scroll through the field list, you will notice that both fields remain selected.

   Note:
   Using the Ctrl-click combination allows you to select a non-continuous range of fields. The Shift-click combination can be used to select several fields from the list that are contiguous.

2. Drag the fields to place them.

   As the cursor is moved over the report, an object frame appears along with the Arrow cursor.

3. Place the fields to the right of the **Customer Name** field.

   Both fields appear in the Details section of the report in the same order in which they are listed in the Field Explorer dialog box.

Selecting fields

When a field is selected, the object frame appears with a handle (box) on its right, left, top, and bottom edge. These handles indicate that the field is selected, and therefore active. To do anything with a field (change the font, move it, and so on), you first have to select it:

- Position the cursor inside the object frame and click once. The handles appear, indicating the object is selected.
- Move the cursor away from the object frame and click in an empty part of the window. The handles disappear.

That's all it takes to select and deselect objects.

Resizing fields

To resize the field, follow these steps:

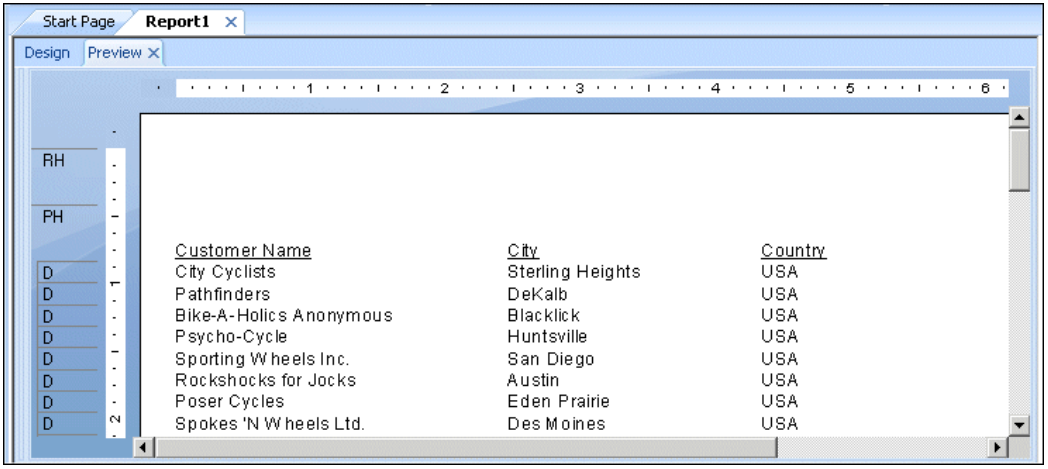
1. Click the **Customer Name** field in the Details section to select it.
2. Press the **Ctrl** key and click the field heading to select both objects.
3. Move the cursor over the resizing handle on the right edge of the fields until the cursor turns into a Resizing cursor.
4. Resize the fields to the right until they are approximately two inches in length.

Reviewing your work

Now let's see how the report looks with three fields placed and positioned.

1. Click **Print Preview** on the Standard toolbar to activate the **Preview** tab.

   The screen should look similar to this:



Note:
The first time you preview a report, you must click Print Preview on the Standard toolbar to activate the Preview tab. The Preview tab appears to the right of the Design tab. You can then switch between designing and previewing the report by clicking the corresponding tab.

You have the beginnings of a customer list report, but you still have several fields to add.

2. When you are finished reviewing the report, return to the **Design** tab by clicking it.

Displaying field names

Field pictures (object frames containing character representations) have been discussed, but there may be times when you want to see the field names in the Design tab.

To display field names

1. On the **File** menu, click **Options**.

   The Options dialog box appears with the Layout tab active.

2. Select the **Show Field Names** check box and click **OK**.

   Now in the Design tab you will see the actual field names instead of character representations (X, $, #, and so on).

Combining database fields in a text object

Instead of adding the Contact First Name and Contact Last Name fields as separate objects, you can insert both fields in a text object. This allows you to control the formatting of both fields by making changes to only one object. When you insert fields in a text object, the fields are automatically trimmed (they do not have any extra white space on either side). This is important because a field is a fixed size but the data in the fields can vary in size, leaving various amounts of unwanted white space.

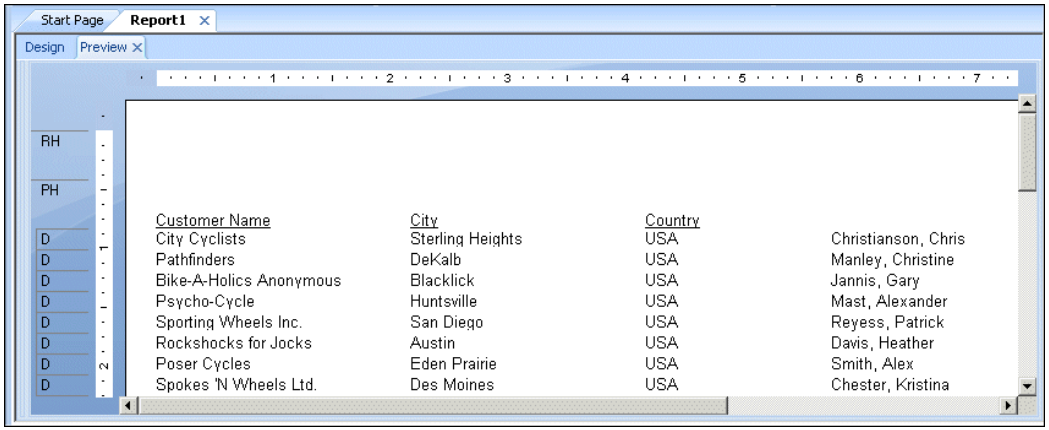
To combine fields in a text object

1. Click **Insert Text Object** on the Insert Tools toolbar. As you move the cursor over the report, an object frame appears next to it.
2. Insert the field to the right of the fields in the **Details** section.

   As you drag the field, the Design tab automatically scrolls to the right, if necessary. When you click to place the object, a text object appears and the horizontal ruler of the Design tab changes to a ruler/tab selector that is used for editing the text object. If you click an empty area of the report or a field object, the standard Design tab ruler appears.
3. Click once on the border of the text object to select it for resizing. Handles appear on all sides of the object.
4. Move the cursor over the right sizing handle of the text object and increase the width by about 1 inch. You may need to scroll to the right and continue resizing.
5. Double-click inside the text object to select it for editing. Notice the insertion point is now flashing within the text object.
6. Select the **Contact Last Name** field in the Field Explorer dialog box. Remember, you can move the Field Explorer dialog box by dragging and dropping it by its title bar.
7. Drag the field to the text object.
8. Move the cursor over the text object until the cursor becomes a Drag and Drop cursor.
9. Release the mouse button to place the field in the text object. The cursor now appears after the **Contact Last Name** field, within the text object.
10. Type a comma and a space after **Contact Last Name**.
11. In the Field Explorer dialog box, highlight the **Contact First Name** field.

12. Drag the field to the text object.
13. Move the cursor over the text object until the cursor becomes a Drag and Drop cursor. Move the cursor to the right of the comma and space you just typed, and release the mouse button. The field will be inserted to the right of the comma and space.
14. Click the **Preview** tab to look at the fields you just placed.

The report should now look similar to this:



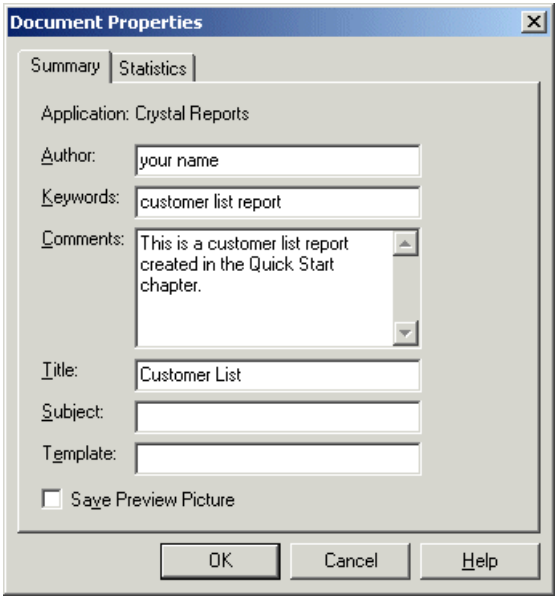
Adding summary information

The next step is to add summary information to your report. Adding summary information allows you to specify the author, title, and subject of the report, as well as any keywords or comments related to the report. When you add summary information, users can find information related to the report quickly.

To add summary information

1. On the **File** menu, click **Summary Info**.

   The Document Properties dialog box appears with the Summary tab active.



2. Enter information about your report in the text boxes provided. Be sure to enter the title "Customer List" in the **Title** text box. This information will be used in the next section of the tutorial.
3. Click **OK** when finished.

Adding a title

As you can see, the report looks incomplete without a title. Although you can add a title using a text object, you can also tell the program to take the title information directly from the Title text box in the Document Properties dialog box.

To add a title

1. Click the **Design** tab.
2. In the Field Explorer, scroll down to **Special Fields** and expand it.
3. Choose **Report Title**.
4. Drag the cursor over the report. An object frame appears.

5. Position the object frame in the upper left-hand corner of the Page Header (PH) section of the report and release the mouse button to place the object.
6. Click the **Preview** tab or **Refresh** to review your changes.

The report title object now displays the title that you entered in the Title text box of the Document Properties dialog box.

Formatting objects

Now you can format the report title. This time, however, you will remain in the Preview tab to do the work. This will make it easier to see your work while you are formatting the title.

To format an object

1. To center the title, you will first need to expand the **Title** field so that it's about the same width as the data in your report. To do this, select the object by clicking it.
2. Position the cursor on the right edge of the object until the cursor turns into a Resizing cursor. Drag the right edge of the field box until it is even with the right edge of the data in the **Contact Name** field object.

   You have created a large field that extends from the left edge to the right edge of the report.

3. With the report title object still selected, click **Align Center** on the Formatting toolbar. The title is centered within the object.
4. Right-click the object and choose **Format Field** from the shortcut menu.
5. When the Format Editor appears, click the **Font** tab.
6. Set the report title to a larger, bolder version of the active font by selecting **Bold** from the **Style** list and **16** (or a point size suitable to the font you are using) from the **Size** list.
7. Change the color of the text by selecting **Maroon** from the **Color** palette. Notice that the Sample box shows an example of how the text will look.
8. Click **OK** when finished.
9. Resize the report title object vertically to accommodate the increased size of the title.

The title is now formatted to stand out on the report.

Adding a field heading

As you can see, the Contact Name field is the only field without a heading. In this section you will create a heading.

To add a field heading

1. Click **Insert Text Object** on the Insert Tools toolbar.
2. Insert the text object in the **Page Header** section directly above the Contact Name field.
3. Click **Underline** on the Formatting toolbar, and then type **Contact Name** into the text object.
4. Click your cursor outside the text object.

The Contact Name field now has a heading that looks just like the other field titles.

Saving the report

1. Click **Save** on the Standard toolbar to save your work.

   Since this is the first time you are saving the report, the Save As dialog box appears displaying the default directory where the file will be saved.

Notice that a default file name, based on the report title you defined earlier, is also displayed.

2. Type Custlist.rpt in the **File name** box and click **Save**.

   Your report is saved to the default directory or another directory you chose.

3. Click the **Preview** tab to view the report.

The report should now look similar to the following:

Congratulations! You have just created a basic listing report. You will continue to refine this report throughout the rest of this tutorial.

Record Selection

Crystal Reports allows you to limit or restrict the records that are to be included in a report. In this section you will learn how to:

- Select the records you want included in the report.
- Save a report, including the selection criteria.

For example, it may be useful to have a customer list that only lists customers from the USA. The sample data contains records from the United States and International customers. It is easy to restrict lists like this using the Select Expert.

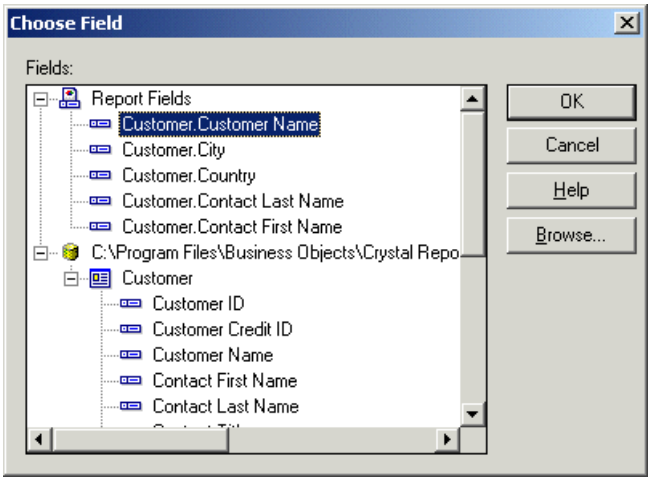
Entering the selection criteria

When you scroll through the report, you will see that it contains information for customers from many different countries. In this step, you will limit the number of countries displayed to the USA.

To enter selection criteria

1. To begin, click the **Design** tab to return to design mode.
2. Click an empty area of the report to make sure all fields are deselected.
3. Click **Select Expert** on the Expert Tools toolbar.

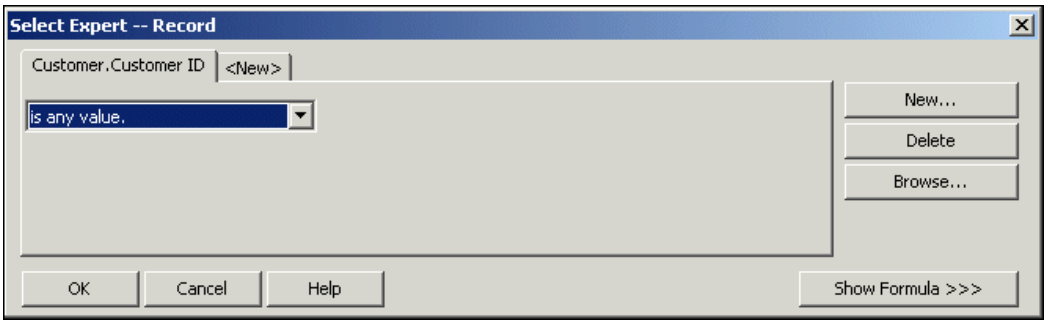
   The Choose Field dialog box appears.



   This dialog box lists all the fields currently in the report in the Report Fields section and then lists all fields that are available from each table in the database fields section.

4. Since you are going to base record selection on the country field, select Country in the **Fields** list and click **OK**.

   The Select Expert appears.



Imagine that you are completing the following sentence:

```
Select all records where a customer's country is
```

You complete the sentence with the condition you want the program to use when selecting records for your report. Right now the condition is any value, which implies there is no restriction on the record selection.

5. Click the arrow on the operators box to see what other options you have. Since you want only those records where the Country is USA, select the **is equal to** condition.

   A new box appears on the right. The dialog box sentence now reads:

   ```
   Select all records where a customer's country is equal
    to
   ```

   All that you need to complete the sentence is the value USA.

6. Click the arrow on the empty list. A list of all the country values appears. Select **USA** from the list.

   The sentence now reads:

   ```
   Select all records where a customer's country is equal
    to USA
   ```

7. Click **OK** to return to the **Design** tab.
8. Click the **Preview** tab to review the results of your work.

   The Change In Record Selection Formula dialog box appears.

9. Click **Refresh Data**.

10. Save this version of the report without overwriting the original report by choosing **Save As** from the File menu and giving the new report the name USA.rpt.

Congratulations! You have started formatting your report and have added selection criteria to it. More than that, you have learned how to manipulate your data. By now, you have a good idea of the powerful kinds of reports you can prepare.

Deleting a field

Now that the report contains only records from the USA, displaying the Country field in the body of the report is not necessary. You can delete this field before continuing.

To delete a field

1. Select the **Country** field and the **Country** column heading using the **Ctrl-click** combination.
2. Press **Delete** on your keyboard.

That is all it takes to delete fields from the report.

The report should now look similar to this:

Balancing field spacing

Now that the Country field has been deleted, there is a large amount of white space between the City and Contact Name fields. You might be satisfied with the spacing as it stands, but it might be more readable if the columns were better balanced across the page.

To balance field spacing

1. Return to the **Design** tab. Select the **Contact Name** field and its field heading by using the **Ctrl-click** combination.
2. Place the cursor over one of the two highlighted text objects and drag them to the left, closer to the **City** field.
3. Click the **Preview** tab and review your work again.

   The report should look similar to this:

   The spacing between the fields is much better, but it looks as if the report title is off-center.

4. Click the report title object to select it.
5. Position the cursor on the right handle of the object until the cursor turns into a Resizing cursor. Drag the right edge of the object frame until it is even with the right edge of the data in the **Contact Name** field object.

   The report title automatically centers itself based on the size of the object.

Grouping and sorting

Data in reports can be grouped and sorted in a variety of ways. Sorting and grouping tools provide a great deal of flexibility for customizing reports.

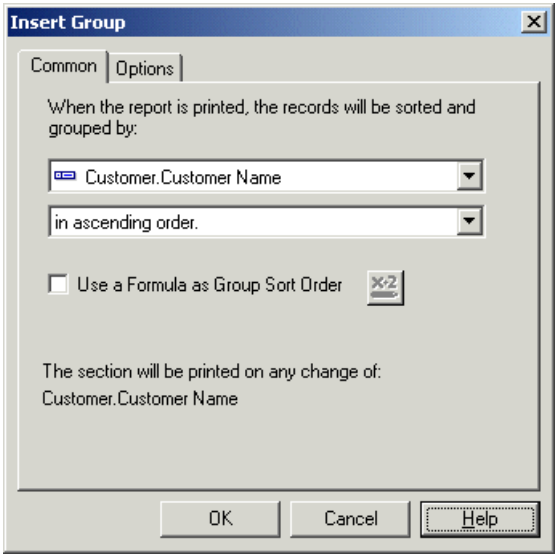
Grouping the report

In many reports you need to break the data into groups in order to make it easier to read and to understand. Crystal Reports lets you do this easily. For this customer list, you will group the customers by region and then sort the customers alphabetically within each group.

To group a report

1. While on the **Design** tab, click **Insert Group** on the Insert Tools toolbar.

   The Insert Group dialog box appears.



2. Select Region from the Customer table in the first drop-down list.

The program takes all records with the same value in the region field and places them together in a group on the report.

3. Select **in ascending order** from the second drop-down list.

   The region grouping will be displayed on the report in alphabetic ascending order.

4. Click **OK**.

   Notice that two new sections now appear in the Design tab: GH1 (Group Header #1) and GF1 (Group Footer #1). This is how the program shows that the report has been grouped.

5. Click the **Preview** tab to see what the report looks like.

6. If the group tree is not visible, select **Toggle Group Tree** on the Standard toolbar to see the groups included in the report.

You can view the group of interest by clicking on the group name in the Group Tree. For example, to see the Texas customer group, click TX in the Group Tree. The program jumps to the Texas group, displaying that group in the Preview tab. The Group Tree allows you to quickly jump to a specific group of interest instead of scrolling through the report looking for the group. For more information on the group tree, see *Group Tree*.

Note:
For many reports, you will want to insert summaries, subtotals and grand totals. For example, when creating a sales report rather than a customer list, you would want to calculate the total sales amount for each region. See *Sorting, Grouping, and Totaling*.

Understanding "live" group headers

When a group is inserted, a group name field is automatically inserted in the Group Header section of the report. The group name field displays the current group's name. For example, if you group by region, and preview the report, the group header for the CA (California) group shows "CA."

The group field name is automatically formatted to stand out from the records in the group.

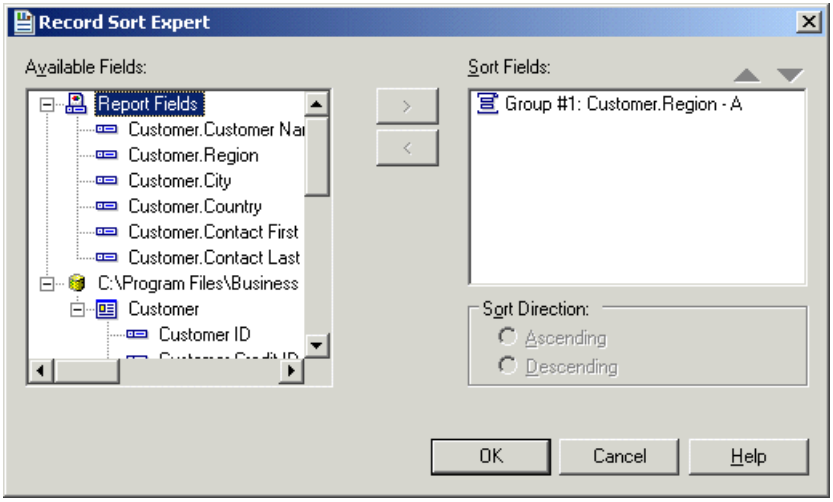
Sorting records

In a typical customer list report, customer names are listed alphabetically. In this example, you will sort the customer names alphabetically within each region.

To sort records

1. While on the **Preview** tab, click **Record Sort Expert** on the Expert Tools toolbar.

   The Record Sort Expert appears.



The Available Fields list box displays all fields currently on your report and all the fields in the data source. You can choose to sort based on any of these fields.

The Sort Fields list box displays the fields that are already sorted in the report. Since the region field has already been sorted, the sorting you are about to do will be within each region, and not for the entire report.

2. Highlight the **Customer Name** field and click the > arrow button to add it to the Sort Fields list.
3. Select **Ascending** for the Sort Direction and click **OK**. The report should now look similar to the following:

Notice that the records within each group are in alphabetic order.

Completing the report

You have just one step left to complete the report. A company logo needs to be added to the first page of the report.

Inserting a company logo

In this section, you will place a company logo at the top of the first page of the report.

To insert a company logo

1. While on the **Design** tab, click **Insert Picture** on the Insert Tools toolbar.

   The Open dialog box appears.

2. Choose a bitmap logo (.bmp) file and click **Open**.

   An object frame appears as you move the cursor over the report. The object frame represents the logo you will place.

3. Position the object frame in the upper left-hand corner of the Report Header (RH) section of the report and click once to place it.

   Placing the logo in the Report Header (RH) section ensures that the logo is printed only on the first page of the report.

   Note:
   Although there does not appear to be enough room in the Report Header (RH) section when you place the graphic, the section will automatically expand to accommodate the picture.

4. Click the **Preview** tab to view the report.

   The final report should look something like this (with the logo that you chose in step 2):

5. Save the report by clicking **Save** on the Standard toolbar.

You have just completed your first report.

For more information

- For information about distributing reports (printing, exporting, and so on) see the printing topics in *Formatting* and *Printing, Exporting, and Viewing Reports*.

Quick start for advanced users

If you are an experienced Windows user who wants to get right into the program, follow these steps to set up a report for the first time.

If you're not an experienced user, check the *Quick start for new users*.

Choosing a report type and data source

1. In Windows, click **Start** > **Programs** > **BusinessObjects XI Release 3** > **Crystal Reports**, and then select **Crystal Reports 2008**.
2. Click **Blank Report** to open the Database Expert dialog box.

   As an alternative to creating a blank report, you can choose one of four Report Creation Wizards.

   After choosing a wizard, you can build your report on a variety of data sources.
3. Browse through the contents of the Database Expert to find the data source you want to use for your report.
4. Select a table you want to use in your report and click the > arrow to add it to the Selected Tables list.
5. After you have added all the tables you want to work with, click **OK** on the Database Expert.

   Note:
   If you select more than one table in the Database Expert dialog box, the Links tab appears. For more information on linking, see *Linking multiple tables*.

   The Design tab appears with Report Header, Page Header, Details, Page Footer, and Report Footer areas. A report is created by inserting and formatting items in each of these areas.

Note:

To use additional database tables for a report and match them up on a record-by-record basis, click Database Expert on the Expert Tools toolbar, select the table(s), and then set up the links on the Links tab when it appears.

Working with report elements on the Design tab

1. Each of the default report areas contains a single section. To add additional sections, click **Section Expert** on the Expert Tools toolbar and use the Section Expert to add the desired sections.

   Once you have added sections to an area, you can move, merge, and delete them in the Section Expert. See *Designing with guidelines* .

2. To turn the grid on or off, choose the **Options** command from the **File** menu and select or clear the Grid check box in the Design View area of the Layout tab when the Options dialog box appears. See *Using the grid*.
3. If you are working with the grid off and you want to use snap-to guidelines for positioning objects, click the top or left ruler wherever you want guidelines to appear.

   Some further ways you can use guidelines:

   - Drag a field to a guideline until it snaps to the guideline.
   - Drag the guideline arrow to move the guideline (and any objects that are snapped to it).
   - Drag the guideline arrow away from the ruler to remove the guideline. See *Designing with guidelines* .

4. If the Field Explorer dialog box is not visible, click **Field Explorer** on the Standard toolbar.

   Expand the Database Fields node to display a list of fields. To speed the entry of multiple fields, this box will remain on-screen until you close it. This dialog box can be moved to a new location or resized, if you wish. See *Placing data on the report* .

5. Select the field(s) you want to appear on the report.

   You can select and place them one at a time, or use the Shift-click combination to select a number of contiguous fields, or the Ctrl-click combination to select fields from the list at random. Drag and drop is also active. Place the fields in the Details section where you want them to appear.

When you place multiple fields, they appear in the same order that they appear in the Field Explorer dialog box. The program marks the position of each field with a rectangular frame. The characters in the frame indicate whether the field is text (XXX...), number (555...), currency ($555...), date (12/31/99), time (00:00:00), DateTime (12/31/99 00:00:00), or Boolean (T/F).

Note:

- The field names and field types can be viewed by selecting the Show Field Names check box on in the Options dialog box (Layout tab).
- The program automatically places field titles in the Page Header section unless the Insert Detail Field Headings check box is not selected in the Options dialog box (Layout tab).
- If additional Details sections are added to the report, field titles will only be placed in the Page Header section for fields in the Details A (the original) section of your report.

6. Once the objects are in place, you may want to adjust the report sections. To do this, right-click the shaded area to the left of the section ruler and use the shortcut menu that appears:
   - To expand a section to accommodate an additional line, choose the Insert Line command.
   - To have the program automatically align the objects in the section horizontally, choose the Arrange Lines command.
   - To reduce the size of a section to eliminate unnecessary white space above and below objects, choose the Fit Section command. See *Using white space between rows* .
7. To generate a report title, you must first enter the title in the Document Properties dialog box. On the **File** menu, click **Summary Info**. Enter a title in the **Title** text box of the Document Properties dialog box. Click **OK**.
8. Choose **Report Title** from the Special Fields list in the Field Explorer. A rectangular placement frame appears when you move the cursor over your report. Click once in the Report Header (RH) section to place the report title. The report title field contains the text that you typed in the **Title** text box of the Document Properties dialog box. See *Adding a title page to the report* .
9. To see how the results will print, click **Print Preview** on the Standard toolbar.

To speed processing time while building a report, you can preview the report using only a small subset of the available data. To do this, go to the File menu, point to Print and then click Preview Sample. See *Preview tab*.

In either case, the program takes you to the Preview tab. You can fine-tune a report in the Preview tab while viewing the results as actual report data. You can also close the Preview tab and continue working on the report in the Design tab.

Using other reporting features

1. If you want to format a field, change the placement or width of a field, or insert a summary, click the field to select it. Handles appear on the top, bottom, and sides of each selected field:
   - To change the placement of the field(s), use the mouse to drag the field placement frame to its new position.
   - To change the width of the field, use the mouse to drag the right or left handle.
   - Right-click the field to format or to summarize it. A shortcut menu appears listing commands for formatting and summarizing the field.

   Tip:
   Many font and formatting options are available on the formatting toolbar.

   Note:
   To apply formatting only under certain conditions, click Conditional Formula next to the formatting property in the Format Editor, and create a formula that defines those conditions. See *Working with conditional formatting*.

2. To create a formula that makes data calculations or comparisons, select **Formula Fields** in the Field Explorer.

   Note:
   You can also click Formula Workshop on the Expert Tools toolbar to work with formulas, custom functions, SQL expressions, and so on.

3. Click **New**. The Formula Name dialog box appears. Enter a name for the formula and click **OK**. The Formula Workshop appears with the Formula Editor active.
4. Enter the formula in the Formula Editor. Enter fields, operators, and functions by selecting them from their respective lists or by typing them in. You can check the formula syntax by clicking **Check**.
5. When you are finished editing, click **Save and close** to return to the Field Explorer dialog box.
6. Click **Insert to Report** to place the formula just like you would a database field. See *Using Formulas*.
7. To insert a subreport (a report within a report), click **Insert Subreport** on the Insert Tools toolbar and choose an existing report to import as a subreport or use the Report Creation Wizard to create a new subreport. See *Inserting subreports*.

   If you want the records in a subreport to match up with the records in a primary report, click the Link tab of the Insert Subreport dialog box and specify the link when the tab appears.

8. To insert a cross-tab object in a report, click **Insert Cross-Tab** on the Insert Tools toolbar and set up the cross-tab in the Cross-Tab Expert when it appears. See *Cross-Tab Objects*.
9. To create a parameter field (a field that prompts you for a value whenever you retrieve data for a report), click **Field Explorer** on the Standard toolbar, then select Parameter Fields in the Field Explorer dialog box when it appears. Click **New** to set up a parameter field. Once created, you can insert the parameter field in a report like a database field or select it from the **Fields** list in the Formula Workshop.

   Parameter fields can be used in reports (as title or label prompts), in selection formulas (as selection criteria prompts), and in formulas (for a variety of purposes including specifying sort fields). See *Parameter Fields and Prompts*.

10. To add a chart, click **Insert Chart** on the Insert Tools toolbar. See *Charting*.

11. To add a map, click **Insert Map** on the Insert Tools toolbar. See *Mapping*.
12. To insert a spreadsheet, picture, or other OLE object that you can edit from within the Report Designer using the tools from the object's native application, choose **OLE Object** from the Insert menu. See *OLE*, and *Working with static OLE objects*.
13. To change the record sort order, click **Record Sort Expert** on the Expert Tools toolbar. The Record Sort Expert appears. Highlight the field(s) you want to use for sorting the report data and the sort direction. See *Sorting single and multiple fields*.
14. To limit the report to specific records (for example, the records of California customers who have year-to-date sales greater than $10,000), click the first field on which you want your selection to be based and then click **Select Expert** on the Expert Tools toolbar. When the Select Expert appears, set up the record selection criteria.
15. To print the report, click **Print** on the Standard toolbar.

That's it! It is that easy to build a report.

Report Design Concepts

chapter 5

Basic report design

The purpose of this section is to suggest a structured approach to preparing a Crystal report. This approach includes the following elements:

- Deciding on the content of the report.
- Developing a prototype on paper.

This section has been designed to provide a conceptual understanding of the reporting process.

Deciding on the content of the report

Before you do anything else, you should outline the information you want the report to provide. The following sections provide a guide to making that outline.

Stating the purpose

What is the overall purpose of the report?

Reports are management tools. Their purpose is to help you quickly grasp the essential elements and relationships found in raw data, to help you make effective decisions. For a report to be effective, it has to present the correct data in a logical way. If it presents the wrong data, or if it presents the right data in a haphazard manner, the report may slow the decision-making process or may even encourage incorrect decisions.

A good starting place in the development of a report is to write out the purpose of the report in a sentence or two. The purpose statement helps you focus on your primary needs, and it gives the report both a starting point and a goal.

Here are some examples of purpose statements.

- The purpose of this report is to show monthly and year-to-date sales by sales representatives, compare this year's numbers to last year's, and flag representatives whose sales figures do not meet company standards.

- The purpose of this report is to show sales activity for each item in inventory, and to suggest reorder quantities based on that activity.
- The purpose of this report is to calculate bowling averages and handicaps for each member of the bowling league.

Defining the purpose of the report before you start is a critical step in the overall process.

Who is going to read the report?

A single report is often used by many individuals. A detailed, company-wide sales report, for example, may be used by sales representatives, the regional sales manager, the national sales manager, and the Chief Operating Officer (COO).

These individuals will be interested in different aspects of the report:

- A sales representative will use the report to evaluate individual sales performance and compare this performance to that of other representatives in the region.
- The regional sales manager will use the report to evaluate regional representatives and compare the region's performance to that of other regions.
- The national sales manager will use the report to evaluate the performance of regional managers and compare overall sales to the current sales forecasts.
- The COO will use the report to evaluate the performance of the Vice-President of Marketing and the sales department as a whole, and to project such things as manufacturing needs and warehouse locations.

Since each user of the report has different interests, it is important to plan the report so it includes the information each user is looking for.

Determining the layout of the report

What is the report title going to be?

Write out a working title for the report. You may decide to change it later, but at least you will have a title to use when creating the prototype report.

What identifying information is needed in the header and footer?

You may wish to include the print date, information on who prepared the report, a block of text to describe the purpose of the report, the range of data covered, or something similar. If you are going to include such information, write it down so you can use it in preparing your prototype.

The information can come from a variety of sources, depending on the kind of information you plan to use.

- Information on who prepared the report might be drawn from individual data fields in the database table(s) used. If it is to be drawn from a database table, what table? Or, what combination of tables?
- A block of text can be created as a text object and placed anywhere on the report.
- Crystal Reports can generate information such as the print date or page numbers.

Finding the data

What data do you want to use in the report?

Do you know the type of database you are reporting from? Will you be reporting off a data file, SQL/ODBC, or another data source?

If you do not know, ask the database administrator in your organization for help in setting up the database type and location of the data. For more information, see Accessing Data Sources in the *Crystal Reports Online Help*.

Are you familiar enough with the data to find the necessary information? When looking for a Customer Contact name, can the field be found in a database table?

If not, your MIS professional, database administrator, or co-workers will have to help you become familiar with the data.

What specific data should appear in the body of the report?

The body should contain all the data needed to fulfill the statement of purpose you wrote for the report. It should also contain all of the data needed by the various users that you have identified.

This step requires you to look at the available database table(s). Crystal Reports allows you to combine data from different databases when you create reports, so you have a great deal of flexibility in your work.

- Much of the data in a typical report is taken directly from data fields. Which data fields will be used, and where are they located?
- Other data will be calculated based on data fields. Which data fields will be used in the calculations?
- Still other data will be placed directly into the report using text objects (headings, notes, labels, and so on).

Does the data exist or does it need to be calculated?

Some report information can be drawn directly from data fields (sales information, for example); other information will have to be calculated based on data field values (for example, sales commission, based on the relationship of sales to quota). In your planning, it can be helpful to segregate or flag data that needs to be calculated from that which can be used directly. See *Specifying formulas*.

What types of fields contain data?

You should take the time to get to know the data type for data fields that will be used in your calculations. Since formula functions and operators work with specific kinds of data, it is important to recognize the data type you are

working with, before you start any calculations. For example, some functions require numeric data, while others work with only string fields. For more information on specific functions and operators, search for "Functions" and "Operators," or for the function or operator by name in the *Crystal Reports Online Help*.

Manipulating the data

Do you want the data organized into groups?

How? By customer? By date? By hierarchy? Or by other criteria? Crystal Reports provides several options for grouping data in a report. See *Grouping data*.

Do you want the data sorted based on record or group values?

Crystal Reports gives you both alternatives. See *Understanding sort options*.

Do you want the report to contain only specific records or groups?

Crystal Reports gives you the opportunity to base a report on all records in a given database, or on a limited set of records from the database. Crystal Reports can be used to select records based on simple date ranges or comparisons, or to create complex formulas to identify the records to be included. Take a few minutes to determine the records needed for the report and list the criteria to be used for selecting those records. See *Selecting records*.

Do you want to summarize the data?

Do you want to total, average, count, or determine the maximum or minimum value included in all the values in any column on the report?

Crystal Reports allows you to do this, and it also allows the grand total (or the grand total average, grand total count, and so on) to be placed at the

bottom of the selected column. See *Calculating a percentage* and *Selecting top or bottom N groups or percentages* .

What information should be flagged on the report?

You may want to call attention to some data by flagging it on the report. For example, non-moving inventory items are often flagged on inventory reports so they can be given special attention. You might want to flag each item that has shown no activity during the last month, during the last three months, or during some other defined period. To flag information, identify it and any conditions that will trigger the flagging.

How do you want information flagged?

You may want to flag items with an asterisk or some other symbol, or you may want a word to appear as a flag. In any case, you should write out flagging instructions so they are handy.

Crystal Reports gives you the opportunity to underline report elements, and change the font type, size, or color used for specific report items. It allows you to put borders around items and to draw lines and boxes (to break the report into sections), set off headings, and so on. All of these formatting tools can be used to highlight key data on a report. See *Formatting*.

Determining printing area characteristics

Each report area has its own printing characteristics. It is important to understand these characteristics because they affect when and how often different report objects get printed.

In what order will the areas print on the report?

Areas print in the order they appear on the Design tab (top to bottom). If there is more than one section in an area, the sections print in the order they appear. For example, if you have three Report Header sections, all three of those sections will print, in order, before the section(s) in the Page Header area begin to print.

How often do report objects print?

The way objects print will determine how you design your report. This will help you decide where to place charts, Cross-Tabs, and formulas to get specific results.

Report Header

Objects placed in the Report Header area print once, at the beginning of the report.

- Charts and Cross-Tabs placed in this area contain data for the entire report.

  Note:
  Both charts and Cross-Tabs can filter report data by using a Group Sort; in such cases, the data shown in the chart or Cross-Tab is a subset of the data for the entire report.

- Formulas placed in this area are evaluated once, at the beginning of the report.

Page Header

Objects placed in the Page Header area print at the beginning of each new page.

- Charts or Cross-Tabs cannot be placed in this section.
- Formulas placed in this area are evaluated once per page, at the beginning of each new page.

Group Header

Objects placed in the Group Header area print at the beginning of each new group.

- Charts and Cross-Tabs placed in this area contain data just for the group.
- Formulas placed in this area are evaluated once for each group, at the beginning of the group.

Details area

Objects placed in the Details area print with each new record.

- Charts or Cross-Tabs cannot be placed in this area.
- Formulas placed in this area are evaluated once for each record.

Group Footer

Objects placed in the Group Footer area print at the end of each group.

- Charts and Cross-Tabs placed in this area contain data just for the group.
- Formulas placed in this area are evaluated once for each group, at the end of the group.

Report Footer

Objects placed in the Report Footer area print once at the end of the report.

- Charts and Cross-Tabs placed in this area contain data for the entire report.

  Note:
  Both charts and Cross-Tabs can filter report data by using a Group Sort; in such cases, the data shown in the chart or Cross-Tab is a subset of the data for the entire report.

- Formulas placed in this area are evaluated once, at the end of the report.

Page Footer

Objects placed in the Page Footer area print at the bottom of each page.

- Charts and Cross-Tabs cannot be placed in this area.
- Formulas placed in this area are evaluated once per page, at the end of each new page.

Developing a prototype on paper

While a paper prototype is useful regardless of your level of expertise with Crystal Reports, it is particularly valuable when you are first learning the program. With the paper prototype in hand, you can put your full effort into

learning and using the commands, rather than into trying to design and learn at the same time.

To design a paper prototype

1. Get the same size paper you will be using for the finished report.
2. Position the title and other descriptive header information, using boxes or lines to represent report elements.
3. Position the footer information.
4. Review the page layout for balance.
5. Look at the information you intend to include in the body of the report:
   - Count the number of fields being used and estimate the appropriate spacing between fields.
   - Use rectangles to pencil in the fields within the estimated spacing.
   - Change the spacing if you need to.
   - Decide on a logical sequence for presenting the data in the body of the report.
   - Label the fields to indicate that sequence.
6. Use small boxes to indicate group values and totals.
7. Place random flags in the column where you want flags to appear.
8. Darken any elements you want highlighted to make them stand out from the rest of the prototype.
9. Review the finished product for layout and balance, and make changes as needed.

Introduction to Reporting

chapter 6

Report creation options

Each time you create a new report, you have three options:

- Use a Report Creation Wizard.
- Use another report as a model.
- Create a report from scratch.

You will probably use each option at some time.

Report Creation Wizards

The Report Creation Wizards help create reports as quickly as possible and many new users and developers alike prefer to create the majority of their reports using them. All you have to do is choose the wizard that most closely matches your report type. The wizard walks you through the process of creating reports step-by-step.

Another report

To build a new report based on one that already exists, another report can be used as a model. Open the report you want to use in this way by selecting the Open File option and save it to a new file using Save As (found on the File menu). This method is useful to:

- Create a new report with a different grouping or different record selection than that of an existing report.
- Reconstruct a report based on an earlier time period using the same report structure used today.
- Create an entirely new report based on a set of databases that are linked in another report. You can create a report and delete the fields without disturbing the underlying links. Then, without relinking, you can build all your new reports based on this report.

Crystal Reports also lets you format a report by applying a template. See *Using a template* for more information.

New report

The Blank Report option is used to create a report from scratch. This is useful when you want the full flexibility and control of building a report from the ground up, or when a report type is different from the many report types available in the wizards.

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Choosing data sources and database fields

Crystal Reports makes it simple to select data sources and database fields by providing easy-to-use functionality in the Database Expert dialog box and the Field Explorer dialog box. Each of these dialog boxes uses the familiar Windows tree structure to allow you to navigate through the possible choices.

The Database Expert

The Database Expert provides an integrated tree view of all data sources you can use with Crystal Reports. In the Database Expert, you can select from the following as a data source for your report:

- A currently connected data source.
- An SQL command that has been saved to the BusinessObjects Enterprise Repository.
- A data source that has been added to your Favorites folder.
- A recently accessed data source (the Database Expert automatically maintains a list of such data sources for you).
- An existing data source (for example, a data file residing locally, or an ODBC data source that has already been set up).

In the Database Expert, you can also specify links between database tables when you have selected more than one table for your report.

The Database Expert is made up of two tabs: the Data tab and the Links tab.

Data tab

Tree View

The Data tab of the Database Expert shows a tree view of possible data sources you can select when creating a report. The tree—in the Available Data Sources list—is made up of folders for:

- My Connections
- Create New Connection

The Create New Connection folder contains subfolders for many popular data sources. Among these, you'll find:

- Access/Excel (DAO)
- Database Files
- ODBC (RDO)
- OLAP
- OLE DB (ADO)

Note:
The data source options available in the Create New Connection folder depend on the data access components selected during installation.

For a brief description of each of these folders and subfolders, see *Selecting the data source*.

Shortcut Menu

You can right-click any item in the Available Data Sources list of the Database Expert to see a shortcut menu with the following options:

- **Add to Report**

  Use this option to add a table or stored procedure to your new report. This option is also available by clicking the > arrow on the Database Expert.

- **Add Command to Report**

Use this option to add a Table object that has been created using an SQL command.

- **Make New Connection**

  Use this option to create a new connection.

- **Remove from Report**

  Use this option to remove a table or stored procedure from your report. This option is also available by clicking the < arrow on the Database Expert.

- **Properties**

  Use this option to obtain detailed information on the selected item.

- **Rename Connection**

  Use this option to rename a data source connection.

- **Delete Connection**

  Use this option to remove a data source connection.

  Note:
  Database connections which have been connected to or referenced in an open report cannot be deleted.

- **Remove from repository**

  Use this option to delete an existing SQL command from the BusinessObjects Enterprise Repository.

- **Rename repository object**

  Use this option to rename an existing SQL command in the BusinessObjects Enterprise Repository.

- **Options**

  Use this option to set the global options that appear on the Database tab of the Options dialog box.

- **Refresh**

  Use this option to refresh the list of available data sources in the Database Expert.

Links tab

Database tables are linked so records from one database match related records from another. For example, if you activate a Suppliers table and a Product table, the databases are linked so that each product (from the Product table) can be matched up with the supplier (from the Supplier table) that made the product.

The majority of reports will probably require data from two or more tables, so linking will be necessary. The process of linking is made easy by using the Links tab of the Database Expert. See *Linking tables*.

The Field Explorer

Use the Field Explorer dialog box to insert, modify or delete fields on the Design and Preview tabs of Crystal Reports. To see the Field Explorer, select the Field Explorer command from the View menu.

Tree View

The Field Explorer shows a tree view of database fields and special fields that you can add to your report. It also shows formula fields, SQL expression fields, parameter fields, running total fields, and group name fields that you have defined for use in your report.

Fields that have already been added to the report, or fields that have been used by other fields (such as formula fields, groups, running total fields, summaries, and so on) have a green check mark next to them.

Toolbar and Shortcut Menu

The Field Explorer's toolbar provides buttons with tool tips and hot-key combinations. You can right-click any item in the tree view to bring up a shortcut menu.

The toolbar offers these functions:

- **Insert to Report**

Use this option to add a field to the report. You can insert more than one field at a time by selecting multiple fields, right-clicking, and choosing Insert to Report.

Alternatively, to insert a field, you can drag and drop it in the Design or Preview tabs.

- **Browse**

  Use this option to browse data for a database field, formula field or SQL expression field.

  Note:
  On the shortcut menu, this option is called Browse Data.

- **New**

  Use this option to create a formula field, SQL expression field, parameter field or running total field.

- **Edit**

  Use this option to modify an existing formula field, SQL expression field, parameter field or running total field.

- **Duplicate**

  Use this option to make a copy of the formula that you have selected in the Field Explorer. When the copy is created, you can rename it and edit it.

- **Rename**

  Use this option to modify the name of an existing formula field, SQL expression field, parameter field or running total field.

- **Delete**

  Use this option to remove a formula field, SQL expression field, parameter field or running total field. You can also select multiple fields, right-click, and choose Delete to remove them all at once.

The shortcut menus for the fields in the Field Explorer offer additional functions that are not on the toolbar, including the following options:

- **Find in Formulas**

Use this option to find occurrences of the selected item throughout all of the formulas in your report.

- **Set Prompt Order**

  Use this option to open the Set Prompt Order dialog box, in which you can change the prompt order of your parameter fields.

- **Show Field Type**

  Use this option to see the field type (string, number, and so on) when you're looking at a list of database fields. The length of string fields is included in brackets at the end of their names.

- **Sort Fields Alphabetically**

  Use this option to display table fields in alphabetical order (instead of the order they appear in the table).

- **Sort Tables Alphabetically**

  Use this option to display database tables in alphabetical order (instead of the order they appear in the database).

- **Refresh**

  Use this option to refresh the list of available fields in the Field Explorer.

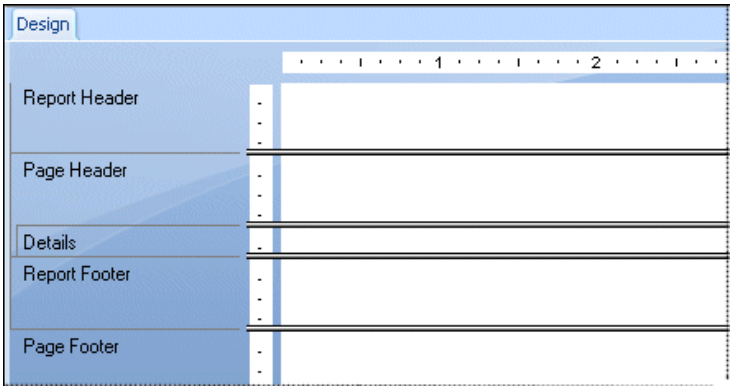
Group Name Fields

You can insert an existing Group Name field shown in the Field Explorer by right-clicking it and selecting Insert to Report. Unlike a formula field, parameter field or running total field, however, you cannot create a Group Name field through the Field Explorer. (A Group Name field is created when you insert a group.)

About the report design environment

Design tab

When working with Crystal Reports, you will probably use the Design tab more than any other part of the program.



The Design tab is the place you do most of the initial work when creating a report. It designates and labels the various sections of the report. You can do the initial formatting, place objects in the sections where you want them to appear, specify sorting, grouping, and totaling needs, and so forth.

The Design tab provides a very efficient environment for designing a report because you work in the tab with data representations, not with data itself. When a field is placed on the report, the program uses a frame to identify the field on the tab; it does not retrieve the data. Thus, you can add and delete fields and other objects, move them around, set up complex formulas, and more, without tying up the computer or network resources needed to gather the data.

The report created in the Design tab is a kind of virtual report; it has the structure and instructions for creating the final report, but it is not the report itself. To turn the Design tab report into a final report or into a report that you can fine-tune, you "just add data." You do this whenever you preview the report, print it, or output it in any other way. The actual data will now appear in the report.

Design tab areas

When you first begin creating a report, Crystal Reports automatically creates five areas in the Design tab.

- **Report Header**

  This section is generally used for the report title and other information you want to appear at the beginning of the report. It can also be used for charts and cross-tabs that include data for the entire report.

- **Page Header**

  This section is generally used for information that you want to appear at the top of each page. This can include such things as chapter names, the name of the document, and other similar information. This section can also be used to display field titles above the fields on a report.

- **Details**

  This section is used for the body of the report, and is printed once per record. The bulk of the report data generally appears in this section.

- **Report Footer**

  This section is used for information you want to appear only once at the end of the report (such as grand totals) and for charts and cross-tabs that include data for the entire report.

- **Page Footer**

  This section usually contains the page number and any other information you want to appear on the bottom of each page.

If a group, summary, or subtotal is added to the report, the program creates two additional sections:

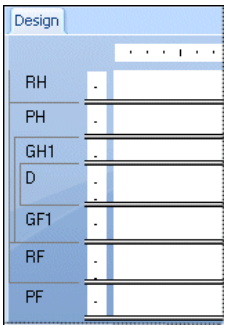
- **Group Header**

  This section typically holds the group name field, and can be used to display charts or cross-tabs that include data specific to the group. It is printed once at the beginning of a group.

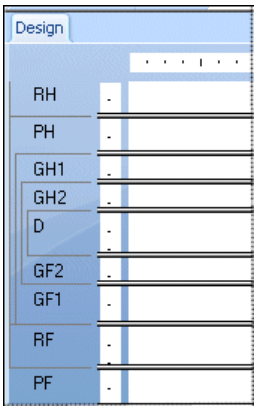
- **Group Footer**

This section generally holds the summary value, if any, and can be used to display charts or cross-tabs. It is printed once at the end of a group.

When a group, summary, or subtotal is added, the Group Header area appears directly above the Details area and the Group Footer area appears directly below the Details area.



If you set up additional groups, the program creates new group areas between the Details area and the existing Group Header and Group Footer area(s).



Like the original areas, each of these newly added areas can contain one or more sections. By default, they each contain a single section.

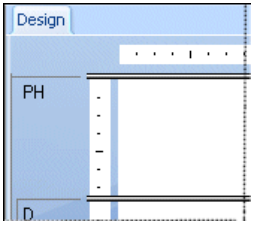
Identifying and working with areas and sections

By default, each area contains only a single section. The name for that section appears directly to the left of the section. If you have multiple sections in an area, the sections are designated as a, b, c, and so forth.

Note:

- Initials, such as RH, PH, D, PF, RF, and so on, are used to identify each section if you have selected the Short Section Names check box in the Design View area of the Options dialog box.
- If you right-click the shaded area containing a section name, a shortcut menu appears with section-specific options.

If you have selected the Show Rulers options on the Layout tab of the Options dialog box, the program displays a section ruler immediately to the left of each section. The section ruler is used to add, remove, and move guidelines, and to provide a visual reference when you are placing objects. See *Designing with guidelines* .



Whenever a new section is added, the program creates a ruler for that section. See *Using multiple sections in reports* .

Other Design tab capabilities

There are several other capabilities built into the Design tab. With the Design tab, you can:

- Resize a section by dragging its boundary. See *Resizing a section*.
- Split a section (create two sections from one) by clicking its left boundary. See *Splitting a section*.

- Add horizontal and vertical guidelines by clicking the rulers. See *Designing with guidelines* .
- Zoom in and out on a report at any magnification from 25% to 400% of the original size. See *Using the zoom feature*.

Preview tab

To preview a report before printing it, click Print Preview on the Standard toolbar.

The program gathers the data, makes the necessary calculations, and displays the report in the Preview tab. With the data in place, you can review the spacing and formatting of your report and see the actual results of all your summaries, formula calculations, and record and group selections.

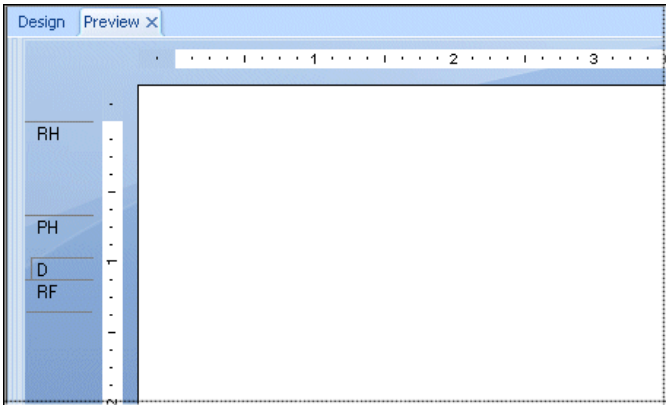
In true WYSIWYG (What You See Is What You Get) fashion, you can work directly on this live data, fine-tuning it until the report has the exact look you want.

The program works with data in the following manner:

- The first time the Preview tab is used, it retrieves data from your underlying data source(s) and saves it with the report (unless you have set up the program not to save data).

- From that point on, the program uses the saved data whenever you preview the report unless you specifically refresh it or add a field that requires the program to retrieve new data.

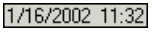
Standard view



In standard view, the report is displayed a page at a time. Using the navigation buttons in the Preview tab, you can move to the beginning or end of the report, or you can move backward and forward through the report one page at a time. For shorter reports or reports in which you're primarily interested in seeing the "bottom line" totals, the standard view provides all of the functionality you need.

The Data Age indicator

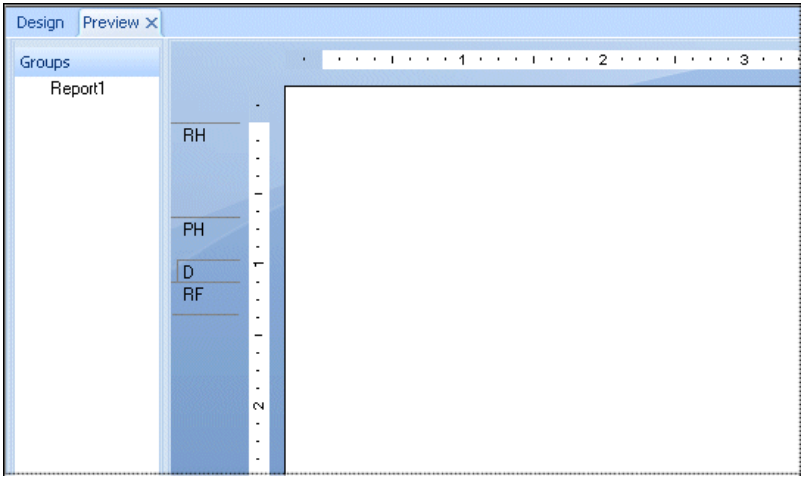
The Data Age indicator indicates the date the data was last refreshed or initially retrieved, whichever is the most recent. If the data was initially retrieved or refreshed today, it indicates the time it happened.



Preview Panel

The **Preview Panel** houses the **Group Tree**, the **Parameter Panel**, and a **Find** tab.

Group Tree



The **Group Tree** can be shown or hidden using the **Toggle Preview Panel** button on the **Standard toolbar**.

The **Group Tree** presents a split screen:

- The right pane displays the report.
- The left pane displays a high level outline of the report, showing the hierarchy of groups and subgroups in a familiar tree format.

The **Group Tree** normally displays the names of the groups and subgroups you created in your report. You can, however, customize these names using the **Options** tab of the **Insert Group** or **Change Group Options** dialog box. For more information on customizing group names in the **Group Tree**, see *Grouping data*.

When you click the tree node for the group that interests you, the program jumps immediately to the part of the report that contains the information for that group. For longer reports or reports in which you wish to jump back and

forth between different groups, the smart navigation features of the **Group Tree** make your work extremely efficient.

The Parameter Panel

The **Parameter Panel** lets users interactively format and filter report data by changing parameter values. It is located within the **Preview Panel**.

In the **Create New Parameter** and **Edit Parameter** dialog boxes, you can specify parameters to display on the Parameter Panel via the **Show on (Viewer) Panel** option. You can choose one of several settings:

- **Do not show**

  The parameter is not visible on the panel. Users must refresh the report to change the parameter values.

- **Editable**

  Users can view and change the parameter values on the panel.

- **Read only**

  Users can view the parameter values on the panel, but cannot change them.

Note:
Do not show is the default setting for a new parameter.

The **Parameter Panel** displays all parameters that have been set to **Editable** or **Read only**. Depending on the type of parameter, users can add, delete, or modify parameter values either by using the dropdown menus and applying their changes or by clicking the **Advanced Dialog** button.

The following are some of the more commonly used types of parameters that must be modified by clicking the **Advanced Dialog** button:

- Parameters with ranged values.
- Dynamic parameters that use cascading prompts.

On the panel, data parameters are differentiated from non-data parameters with a database icon. When a user modifies the value of a data parameter, the report refreshes and accesses the database to make the corresponding changes. When a user modifies the value of a non-data parameter, the report is formatted or filtered based on saved data within the report. It does not access the database.

Comparisons with the Design tab

You have the same formatting capabilities in the Preview tab as you do in the Design tab. Menus (both menu bar and shortcut menus) and toolbars remain active, providing essentially the same functionality you have when working with a report in the Design tab. However, when you are making numerous changes, it is quicker to make the changes in the Design tab. Some additional things to consider are:

- The Design tab and Preview tab are tied together internally. Any changes made in one are reflected in the other.
- The Preview tab has a single vertical ruler at the left of the tab rather than the individual section rulers seen in the Design tab. The functionality of the ruler is the same.
- The Preview tab identifies report sections in the shaded area to the left of the data. With a quick look you can tell which report section the data is printing from. While section names appear only once in the Design tab, they print each time a section prints in the Preview tab.
- The Record counter, the Data Age indicator (see *The Data Age indicator*), and the Page Forward/Page Back controls (see *Preview tab*), are all active in the Preview tab.
- The Preview tab highlights every value when you select a field; whereas, only the field frame is highlighted in the Design tab.

Working in the Preview tab has a different feel from working in the Design tab.

Each field in a database contains dozens, hundreds, or even thousands of values, depending on the number of records in the database. When you place a field in the Design tab, a single field frame represents all those values. When you highlight the field, sizing handles appear on the frame and the frame changes color.

In the Preview tab, however, you are working with the actual data. Instead of a field frame representing many field values, the values themselves appear. Some additional things to consider are:

- When you highlight a field or formula field value, you are actually selecting every value in the field:

- The program places a sizing frame around the specific value you select.
- It highlights every other value in the field.

- Likewise, when you select a summary value, you are actually selecting all the related summary values:
  - The program places a sizing frame around the specific value you select.
  - It highlights all the related summary values.

Aside from the differences in appearance, the process of building and modifying a report is the same in both the Design tab and the Preview tab. You should find it easy to work with your reports in both places.

HTML Preview tab

To see an HTML rendering of your Crystal report as it will appear when published to the web, click HTML Preview on the Standard toolbar.

When you need to make sure that your report design is appropriate and correct over the web in a zero-client environment, the HTML Preview option lets you see an instant rendering of your report to HTML without leaving the Crystal Reports design environment. Unlike the Preview tab, which shows the true report format, the HTML Preview tab shows a converted format. By switching between the two tabs, you can make adjustments in your report design to yield the best results on the web.

In the case of reports that are published to BusinessObjects Enterprise (managed reports), you don't have do any special configuration to make the HTML Preview feature work.

Note:
The guest account in BusinessObjects Enterprise must be enabled before you can use the HTML Preview feature.

For stand-alone reports (unmanaged reports), the program must use the Report Application Sever (RAS) to generate the preview. In this case, you need to configure the HTML Preview feature. Do this in the Smart Tag & HTML Preview tab of the Options dialog box in Crystal Reports.

For information about how to configure the HTML Preview Options, search the Crystal Reports online help for "Smart Tag & HTML Preview tab (Options dialog box)."

Creating a new report

Selecting the data source

After deciding which option you want to use for creating your report (see *Report creation options*), the next step is to select a data source to use.

Most data sources can be chosen through the Database Expert dialog box. The Database Expert appears when you create a report from scratch using Blank Report, or when you choose Database Expert from the Database menu.

Note:
You also select a data source in the Report Creation Wizards. The Data screen in all of the Report Creation Wizards, except the OLAP Report Creation Wizard, is much like the Database Expert dialog box.

To select a data source

1. Choose **Database Expert** from the **Database** menu.

   The Database Expert dialog box appears.

2. Use the tree view in the Available Data Sources list of the Data screen to select your data source:
   - **My Connections**

     This folder shows a list of data sources you are currently connected to.
   - **Create New Connection**

     This folder shows subfolders for various data sources you can connect to.

   Some popular choices in the Create New Connection folder are described here:

- **Access/Excel (DAO)**

  This option lets you connect to a supported database type (Access, dBASE, Excel, Lotus, and so on). You can create a new connection using the Make New Connection option.

- **Database Files**

  This option shows a list of standard PC databases that reside locally. You can use Find Database File to browse for a PC database using the Open dialog box.

- **ODBC (RDO)**

  This option shows a list of ODBC data sources you have already configured for use.

- **OLAP**

  This option opens the OLAP Connection Browser so you can choose an OLAP cube as a data source.

- **OLE DB (ADO)**

  This option shows a list of OLE DB providers you have already configured for use. You can also specify a Microsoft Data Link file to use.

- **Repository**

  This folder shows you the contents of your repository through the BusinessObjects Enterprise Explorer.

Note:
The data source options available in the Create New Connections folder depend on the data access components selected during installation.

Adding tables

After selecting the data source, you can add one or more tables to base your report on.

To add a table

1. Choose **Database Expert** from the **Database** menu.

   The Database Expert dialog box appears.

2. On the **Data** tab, search for the database you want to use in your report. See *Selecting the data source*.
3. In the Available Data Sources list, select the table you want to add to your report and click the > arrow to add it to the Selected Tables list.

   You can insert more than one table at a time by selecting multiple tables, right-clicking, and choosing Add to Report. You can also drag and drop tables to the Selected Tables list.

Linking multiple tables

If the report contains data from two or more database tables, they need to be linked at this point when creating reports.

Note:
It isn't necessary to link tables in reports created from a query or command because any links required by the data have already been processed.

To add and link multiple tables

1. Choose **Database Expert** from the **Database** menu.

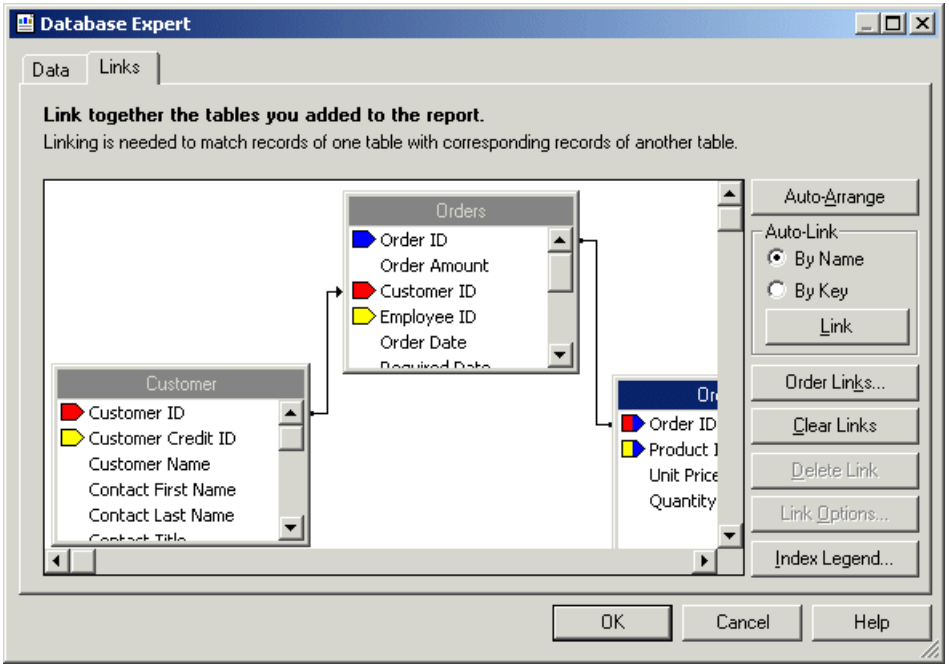
   The Database Expert dialog box appears.

2. On the Data tab, select the tables you want to add to your report. See *Adding tables*.

   The Links tab appears in the Database Expert.

3. Click the **Links** tab to display the databases currently available for linking.

   Crystal Reports automatically links tables by name or key when possible.



4. To create links manually, drag a field from one table to a field in another table. If successful, a link line is created. If unsuccessful, a message is issued.

   Note:
   You can link tables by table name or by foreign key information.

5. If you've deleted links and you want to recreate them automatically, click **Link**.
6. Click **OK** when finished.

   Note:
   When manually creating links, the field you are linking "to" must be of the same data type as the field you are linking from. When a native connection is used, the field you are linking "to" does not have to be indexed. For more information, see *Indexed tables*.

   The Database Expert closes, and you are returned to your report. The linked databases are now available for use in your report. If you are not

satisfied with the link, you can modify it using the Links tab of the Database Expert.

Related Topics

- *Understanding Databases*
- *Linking options*

Placing data on the report

Placing data on a report is a very important task. You need to know what type of data should be placed on the report and where on the report it should be placed.

Database fields

Much of the data placed on a report are database fields, displaying data as it is stored in the database. Normally, database fields will be placed in the Detail section, but under certain circumstances, they will be placed in other sections of the report.

To insert a database field

1. On the Standard toolbar, click **Field Explorer**.

   The Field Explorer dialog box appears. To speed the report building process, this dialog box remains on-screen until you close it. You can move this dialog box wherever you wish.

2. Expand the **Database Fields** folder to see all the tables chosen from the database(s).
3. Expand the individual tables to see all the fields they contain.
4. Select the field you want to appear in the report.
5. Click **Browse** to review the values in the selected field.
6. Click **Insert to Report** to place it in the report.

Formula fields

To display data that is a calculated value, you need to create a formula field and place that formula field on the report. For example, if the database only stores the order dates and ship dates for orders but you need to display the number of days it takes to ship the order, you must create a formula field that will calculate the number of days between ordering and shipping. This is just one example of the use of formula fields. See *Using Formulas*, for an introduction to formulas.

SQL Expression fields

SQL expressions are like formulas, but they are written in Structured Query Language (SQL), not in the Crystal Reports formula language. An SQL expression can be used to query the database for specific sets of data. You can sort, group, and select based on SQL expression fields.

To create an SQL Expression field

1. On the Standard toolbar, click **Field Explorer**.

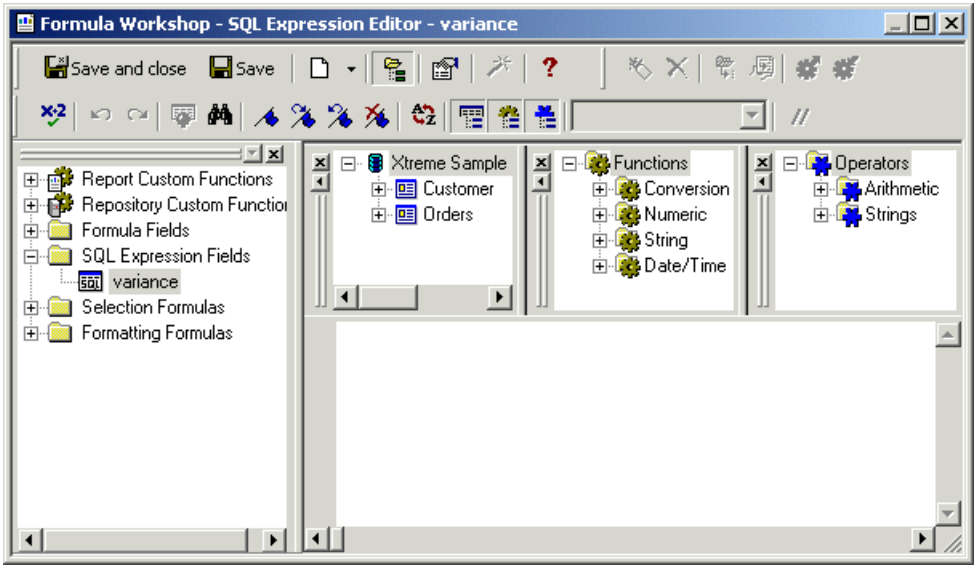
   The Field Explorer dialog box appears.

2. Scroll down to **SQL Expression Fields** and highlight it. Click **New**.

   The SQL Expression Name dialog box appears.

3. Enter a name in the **Name** box, and then click **OK**.

   The Formula Workshop appears with the SQL Expression Editor active.



4. Type the expression in the SQL Expression Editor.

   Note:
   For an overview of the formula language, see *Formula components and syntax*.

5. Click **Save**.

Parameter fields

To prompt the user of a report to enter information, create a parameter field. Think of a parameter as a question that the user needs to answer before the report is generated. The information users enter, or the way they respond, determines what appears in the report. For example, in a report used by salespeople, there might be a parameter that asks the user to choose a region. The report would return the results for the specific region, instead of returning the results for all of the regions. See *Parameter Fields and Prompts* for an introduction to parameter fields.

Running total fields

To display a total that evaluates each record and provides a running sum of all the values in a field (or all the values in a certain set of values), a running total field needs to be created and placed in the report. If the first three values in a field were 2, 4, and 6, a running total would print 2, and then 6 (the sum of 2 + 4), and then 12 (the sum of 2 + 4 + 6). See *Running Totals*, for an introduction to running totals.

Special fields

To display information such as Page Numbers, Print Date, and Report Comments use the commands in the Special Fields tree view of the Field Explorer dialog box.

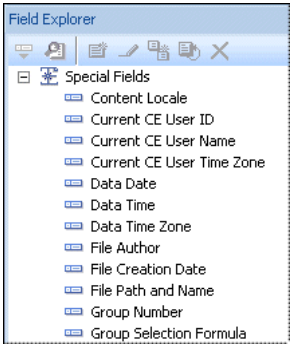
To insert a special field

Crystal Reports allows you to easily insert Page Number, Record Number, Group Number, Print Date, and Total Page Count fields, among others, into your report.

1. On the Standard toolbar, click **Field Explorer.**

   The Field Explorer dialog box appears.

2. Scroll down to **Special Fields** and expand it by clicking.



3. Choose a command from the Special Fields list to insert in the report.

Each special field is inserted into the report as an object. An object frame appears. You can now place it on the report.

Note:

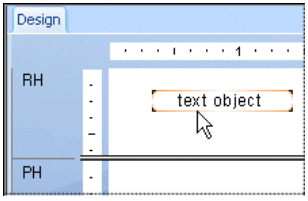
To change the formatting of an inserted object, click the object to select it and click Format on the Expert Tools toolbar. The Format Editor appears where you can make the desired changes. See *Formatting*.

Text objects

Text objects are used in reports for a multitude of purposes. They are a powerful way of inserting titles; labeling summaries and other data on your report; and of easily combining database fields.

To insert a text object

1. On the Insert Tools toolbar, click **Insert Text Object**. A cursor appears.
2. Position the cursor where you want the text object to appear in the report.



Click once on the border of the text object to select it for resizing and moving.

Double-click inside the text object to select it for editing. The Design tab ruler changes to a text object ruler sized to the length of the selected object. To the left, a tab indicator appears. By clicking the tab indicator, you can cycle through the four tab options available. Once you have chosen the desired tab, click the position on the ruler where you want to insert it.

The ruler allows you to add indents and align text within the text object.

Note:
When you first insert the text object into the report, the object is automatically selected for editing.

Picture fields

When designing reports, there will be times when you want to include a picture. For example, you may wish to put a company logo in the report header.

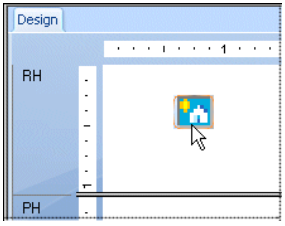
To insert a picture

1. On the Insert Tools toolbar, click **Insert Picture**.

   The Open dialog box appears.

2. Select the desired picture file from the file list and click **Open** to return to the report.

   An object frame appears with the picture inside, ready to be positioned.



3. Position the picture object where you want it to appear in the report and left-click once.

BLOB (Binary Large Object) fields

A BLOB field is a database field whose data consists of Binary Large Objects—such as bitmap graphics, images, OLE objects, metafiles, and so on. Inserting a BLOB field into your report allows you to access these binary objects as you would other data types.

Note:
Crystal Reports can also access BLOB objects by reference (that is, dynamically through a file path), so that you do not need to store the BLOB objects in your database. For more information, see *Making a static OLE object dynamic*.

In general, Crystal Reports allows you to access BLOB fields containing:

- Device-independent bitmaps (DIB).
- JPEG, TIFF, or PNG images.

In addition, if your data resides in a Microsoft Access database, then Crystal Reports enables you to report on BLOB fields containing OLE 1 and 2 objects and metafiles.

You insert BLOB fields as you would any other database field. For details, see *To insert a database field*.

A BLOB field object differs from other database field objects in that it offers options to control cropping, scaling, and sizing—just like an inserted picture or OLE object. To access these options, right-click the BLOB field object, select Format Graphic from the shortcut menu, and click the Picture tab.

Note:
To retain the ability to activate and edit an OLE object with its server application, you should insert the object into your report independently, either by linking or by embedding, rather than inserting it in a BLOB field. For more information about inserting linked and embedded OLE objects, see *Inserting OLE objects into reports*.

Hyperlink fields

You can select a report object on the Design or Preview tab and create a hyperlink to another location.

The hyperlink is saved with your report and is available to other users as a way of viewing additional information.

Note:
Crystal Reports also lets you create hyperlinks with Relative URLs, so your web reports retain independence from their location on any particular server.

To create a hyperlink field

1. Select a report object on the **Design** or **Preview** tab.
2. On the **Format** menu, click **Hyperlink**.

   The Format Editor dialog box appears with the Hyperlink tab active.
3. Click the type of hyperlink you want to create.

   The available types in the upper area are:

   - **No Hyperlink**

     This is the default option. There is no hyperlink associated with the selected report object.
   - **A Website on the Internet**

     Select this option if you want your report object to be linked to a static web address. Use the formula button to create a URL based on a field value. For example, you might enter the following formula if your Customer Name field contained information that would create a series of meaningful URLs:

     "http://www." + {Customer.Customer Name} + ".com"

     Note:
     You can also use this option to connect to Business Objects, Web Intelligence, and OLAP Intelligence documents (this is also known as report linking). Click **Create enterprise Hyperlink** to create these hyperlinks in Crystal Reports.

     Tip:
     Alternatively, you can use the openDocument function in the "Formula Workshop" to create hyperlinks.
   - **Current Website Field Value**

     Select this option if you want the program to create a hyperlink out of the field you selected. The field must be stored as a proper hyperlink in your data source.
   - **An E-mail Address**

     Select this option if you want to create a "mailto" address from the field you selected. Use the formula button to create an address based on a field value.

- **A File**

  Select this option to create a hyperlink to a file on a specific computer or networked computer. Use the formula button to create a file path based on a field value.

  You can also use a hyperlink of this type to run an EXE with a command-line parameter. Enter the path and application name, and follow it by the parameter for the command.

- **Current E-mail Field Value**

  Select this option if you want the program to create an email hyperlink out of the field you selected. The field must be stored as a proper email address in your data source.

The available types in the DHTML Viewer Only area are:

- **Report Part Drilldown**

  For information about how to use this option, see *The Report Part Drilldown option*.

- **Another Report Object**

  For information about how to use this option, see *The Another Report Object option*.

Note:
Not all hyperlink types are available at all times. The object you select and its location on the report determine which types are available.

4. After you have chosen a hyperlink type, enter the appropriate hyperlink information (the URL of a web site, for example).
5. Click **OK** when you are finished.

The hyperlink is inserted as appropriate. Click it on the report to go to the web site, to send an e-mail, and so on. For information about how to use the hyperlink types in the DHTML Viewer Only area, see *Setting up navigation*.

Formatting data

At this point in creating a report, you may want to do some basic formatting. Perhaps you would like to change the font size and style of a text object used as a title. Or, if you have a number field, such as a sales figure, you might want to place a dollar sign before the number or change the number of decimal places displayed.

Record selection

Record selection, the task of paring down the data to include only the data required for your report, is a crucial step in report creation. You will rarely want a listing of all the information in a database. Most often you will be interested in only the sales in a given time period or for a certain product, and so on. For example, a sales report may be designed to only include sales from one product line for the last calendar month.

Grouping, sorting, and summarizing data

Once a basic report is created, you will want to organize the data by grouping related information, sorting individual records, summarizing, subtotaling, and grand totaling.

Grouping records

To organize the data, you may want to group related data together. For example, after grouping a customer list by region, you might divide the list into regional groups. That way, a sales manager for one region could quickly locate the appropriate region group and focus exclusively on the customers within that region. See *Grouping data*.

Sorting records

Crystal Reports allows you to specify the order in which you want the records on your report displayed. For example, after grouping by region, you might

sort the records within each region in alphabetic order by Customer Name. Many of your reports will use some type of sorting. Depending on the report, you will sort the records in a list or sort in conjunction with grouping. See *Sorting single and multiple fields*, and *Sorting records within groups*.

Summaries, subtotals, and grand totals

Many reports use some sort of totaling. For example, in a North American sales report grouped by state, you might want to calculate the total dollar amount sold in each state. You do this by creating a subtotal on the sales field. Summaries are also used at the group level, allowing you to calculate averages, counts, and other group (aggregate) values. For example, in a sales report you may want to calculate an average of sales per state (average summary on the sales field) and calculate the number of products sold in the state (distinct count of the product name field).

Using the drill-down option on summarized data

You can drill down on your data, to show the data behind individual groups, using the Drill-down cursor. See *Sorting, Grouping, and Totaling*.

Drill-down cursor

Crystal Reports allows you to drill down on group or summary information in the Preview tab in both the Standard and the Group Tree (See *Standard view* and *Group Tree*). When you position the cursor over any summary value that you can drill down on, the program displays a Drill-down cursor.

Tip:
Group headers appear on the Drill-down tab just as they do in the main report itself.

If you then double-click, the program reveals the details behind that specific summary value. For example, if the Drill-down cursor becomes active over the city summary, you can double-click to see the details behind that summary.

- If you have only a single summary, you can look at the summary or at the data from the individual records that are summarized.

- If you have multiple summaries, you can look at the summaries behind summaries (the city summaries that make up the region summaries, for example), or at the data from the individual records that are summarized.

Using the zoom feature

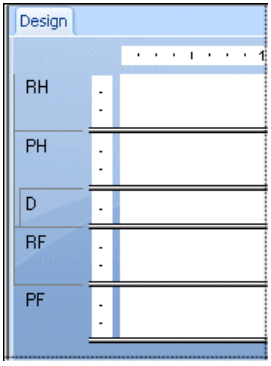
You can easily zoom in on a report. You can choose any magnification from 25% to 400%. This feature is active in both the Design and Preview tabs.

To zoom the report in or out, set the zoom level in the Zoom Control box found on the Standard toolbar.

It is helpful to view reports at low magnifications in order to get an overall picture of the layout of your report. Views at higher magnifications focus attention on the details of the report.

Inserting page headers and footers

You can use page headers and footers by placing the information in the Page Header or Page Footer sections of the Design tab.



- Information to appear only on the first page of the report goes in the Report Header (RH).
- Information to appear only on the last page of the report goes in the Report Footer (RF).

- Information to appear at the top of every page goes in the Page Header (PH).
- Information to appear at the bottom of every page goes in the Page Footer (PF).

Text, fields, or formulas can be used in these sections just as in the Details section.

Related Topics

• *Creating footers after the first page*

Adding a title page to the report

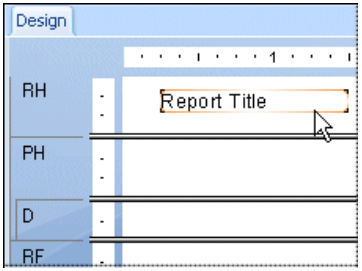
Crystal Reports provides a quick, easy way to add a title page to a report by selecting Report Title from the Special Fields in the Field Explorer dialog box. In order to use this field, you must have a title entered in the Summary tab of the Document Properties dialog box. See *Adding summary information to the report*.

To add a report title

1. On the Standard toolbar, click **Field Explorer.**

   The Field Explorer dialog box appears.

2. Scroll down to **Special Fields** and expand it by clicking.
3. Select **Report Title**, and click **Insert to Report**. An object frame appears when the cursor is moved over the report.



4. Move the object frame to the Report Header section and click once to place the frame.
5. With the report title selected, click **Section Expert** on the Expert Tools toolbar.

   The Section Expert appears.
6. With the Report Header section highlighted, select the **New Page After** check box.

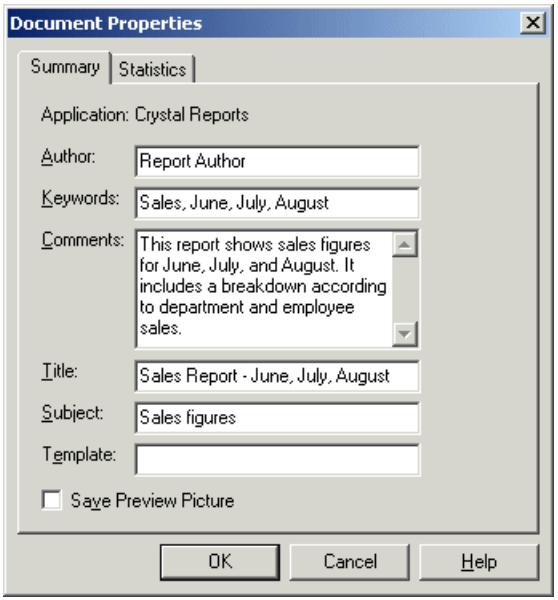
Now the title will appear on the first page and the report will begin on the second page.

Adding summary information to the report

There may be times when you want to include non-printing comments with a report (a personal note to the report recipient, a note to explain more thoroughly the data on which the report is based, a report title, a comment about some particular data on the report, and so on).

Summary Info on the File menu provides a facility for including anything from a short note to hundreds of lines of text with your report. The comments do not print with the report; they remain in the Summary tab of the Document Properties dialog box where they can be reviewed on demand.

When you choose Summary Info, the Document Properties dialog box appears with the Summary tab active.



Enter the desired information and click OK when finished to return to your report.

Exploring reports and working with multiple reports

Crystal Reports lets you work with your existing reports through the Report Explorer, the Workbench, and the Dependency Checker.

This section describes these tools and provides some general information about opening and docking each of the explorers that are available in Crystal Reports. For more information, see *Opening and docking explorers*.

The Report Explorer

The content of the Report Explorer represents the content of the report in a tree view. The root node is the report itself, while the first-level nodes represent the report's sections. Within each section, the report's fields and

objects are listed. Any item you select in the tree view will be selected in the report (in either Design or Preview modes).

You can modify report fields and objects by selecting them in the Report Explorer. When you right-click the selected item, you see a menu that contains the actions you can carry out on the item. For example, if you right-click a text object, the menu will contain the options to edit the text, to format its font or color, and so on. Likewise, if you right-click a section node, the menu will contain the options to hide, suppress, format and so on.

Note:
You cannot add additional fields or report objects when using the Report Explorer, but you can delete them.

You can select multiple fields for formatting by using **Shift-click** or **Ctrl-click**.

Toolbar

The Report Explorer's toolbar provides buttons with tool tips. These buttons let you expand or collapse your report's tree view and choose the report items to display by type:

- **Expand**

  Use this option to expand all child nodes of the tree view under the selected node. If you select this option while the root node is highlighted, all remaining nodes are expanded. If you select this option while a child node is highlighted, only the nodes that are part of the child are expanded.

  Note:
  This option has no effect if selected while a report object is highlighted, or if the selected node has no children.

- **Show/Hide Data Fields**

  Use this option to show or hide data fields in your report. Data fields include formula fields, summary fields, and text objects.

- **Show/Hide Graphical Objects**

  Use this option to show or hide graphical objects in your report. Graphical objects include charts, maps, boxes, lines, BLOB fields, and OLE objects.

- **Show/Hide Grids and Subreports**

  Use this option to show or hide cross-tabs, OLAP grids, and subreports in your report.

Note:

- Items connected to a BusinessObjects Enterprise Repository are shown with the repository icon beside them.
- Items with hyperlinks are shown as blue text with a solid underline. Items with Report Part hyperlinks are shown as green text with a dashed underline.

The Workbench

In the Workbench, you can create projects that contain one or more reports. Use the options on the toolbar to add, remove, or rename folders, reports, and object packages. You can reorganize the files in a folder or folders by dragging and dropping them where you want them to appear. You can also drag report files from Windows Explorer and drop them into the folder of your choice in the Workbench.

Toolbar

The toolbar in the Workbench provides the following options:

- **Add Report**

  Use this option to add a new object to the Workbench:

  - **Add Existing Report**

    When you select this option, the Open dialog box appears so that you can search for a Crystal report that you have previously created.

  - **Add Current Report**

    When you select this option, the program creates a root node that is called Untitled Project. It then adds the current active report to that project.

Note:
This option is available only when there is an active report.

- **Add New Project**

  When you select this option, the program adds a new folder under the root node that is called Untitled Project. You can add reports to this folder. Project folders offer a way to organize the reports in the Workbench.

- **Open**

  Use this option to open the report or report package that you have selected in the project folders.

- **Check Dependencies**

  Use this option to initiate the Dependency Checker. The option is available for individual reports or for folders of reports. Crystal Reports begins checking the report(s) immediately and displays the results in the Dependency Checker. For more information, see *The Dependency Checker*.

Shortcut Menus

You can right-click any item in the projects area of the Workbench to see a shortcut menu. Many of the options that are available on the shortcut menu are also available on the toolbar. This section describes only the additional options that are not available on the toolbar.

- **Add Object Package**

  When you select this option, the program prompts you to log on to your BusinessObjects Enterprise system. When you have connected to your system, you can choose an object package to add to the Workbench. For more information about object packages, see the BusinessObjects Enterprise Administrator's Guide.

- **Publish to BusinessObjects Enterprise**

  Use this option to publish a folder of reports to BusinessObjects Enterprise. You can publish your reports individually or as an object package. (Objects packages can be scheduled in BusinessObjects Enterprise as a single

entity.) When you choose this option, the Publish Object dialog box appears.

For information about using this dialog box, search the Crystal Reports online help for "Publish Object dialog box."

- **Remove**

  Use this option to remove a report, report package, or folder from the projects area.

  Note:

  - You cannot undo this option.
  - When you remove a folder, you remove all of the items in it at the same time.

- **Rename**

  Use this option to rename a folder in the projects area.

The Dependency Checker

The Dependency Checker appears when you check a report or project for errors in the Workbench, or when you select the command on the Report menu for a report that you have open in Crystal Reports. The Dependency Checker registers several types of errors:

- Report part hyperlink errors
- Repository object errors
- Formula compilation errors

Errors listed in the Dependency Checker show the following information:

- Error type.

Icon	Meaning
	Success. The Dependency Checker has verified that there are no errors in the file.
	Warning. The Dependency Checker has found something in the file that might be a problem. You can verify the warning, but you don't have to fix it to have the report to run correctly.
	Error. The Dependency Checker has found an error that you should fix so that the report will run correctly.

- Description of the error.
- Location of the file that contains the error.

Double-click an error to open the target report, and go to the report object so that you can fix the problem. If the report object cannot be found (because, for example, you've deleted part of the report since checking for errors), you receive a message that recommends you run the check again.

Shortcut Menu

When you right-click a message in the Dependency Checker, a shortcut menu appears:

- **Go To**

  Use this option to open the report that contains the error and to go to the object that is causing the problem. You can also select a message and press Enter or double-click to open the report.

- **Sort By**

  Use this option to sort the messages by type, number, description, or location.

- **Clear**

  Use this option to remove the selected message.

- **Clear All**

  Use this option to remove all of the messages.

- **Copy**

  Use this option to copy the message to the clipboard so that you can paste it into another application.

- **Options**

  Use this option to open the Dependency Checker tab of the Options dialog box. Use this tab to select the conditions that you want to check for when you run the Dependency Checker.

  For more information about the options, search the Crystal Reports Online Help for the topic "Dependency Checker tab (Options dialog box)."

Opening and docking explorers

Crystal Reports includes these explorers and tools that you can use to see various reports and report objects:

- The Field Explorer
- The Report Explorer
- The Repository Explorer
- The Workbench
- The Dependency Checker

Open any of these explorers by using the commands on the View menu or the buttons on the Standard toolbar. If the explorer is closed, its command or button opens it; if the expert is already open, its command or button sets focus to it.

After installation, each explorer opens in a docked position in the Report Designer. You can dock explorers in any area of the designer by dragging them to a new location.

Double-click an explorer's title bar to change between docked and free-floating mode. In free-floating mode, the explorer can be dragged to any position. When you drag the explorer, a placement frame shows you where it will be placed. You can also resize an explorer by dragging any of its edges with the Resizing cursor.

Note:
When you double-click the title bar of a free-floating explorer, the program docks it where it was when you last used Crystal Reports.

You can create a single, multi-tabbed explorer from the Field Explorer, the Report Explorer, the Repository Explorer, the Workbench, and the Dependency Checker by dragging the explorers on top of each other. This multi-tabbed explorer can be used in docked or free-floating mode.

Click the tabs in the amalgamated explorer to change focus from one explorer type to another; the name in the title bar changes accordingly to show you which explorer you're currently using.

Beyond basic reports

Once you are comfortable with the basics of reporting, you will be ready to investigate the more powerful reporting features of Crystal Reports, including:

- Charts (see *Charting*)
- OLE objects (see *OLE*)

- Form letters (see *Form letters*)
- Subreports (see *Subreports*)
- Cross-tabs (see *Cross-Tab Objects*)
- Multi-section reports (see *Multiple Section Reports*)

BusinessObjects Enterprise Repository

chapter 7

What is the BusinessObjects Enterprise Repository?

The BusinessObjects Enterprise Repository is a database in which you manage shared report objects. You can refresh a report's repository objects with the latest version from your BusinessObjects Enterprise Repository when you publish reports to BusinessObjects Enterprise.

The BusinessObjects Enterprise Repository is hosted by the Central Management Server (CMS) system database in BusinessObjects Enterprise.

The object types that the repository supports include the following items:

- Text objects
- Bitmaps
- Custom functions
- Commands (queries)

Note:
Business Views and list-of-values objects are also stored in the BusinessObjects Enterprise Repository. You can use Business Views in Crystal Reports, but you create them in the Business View Manager. You can create and use lists of values in Crystal Reports, but you add them to the repository through the Business View Manager.

By maintaining a shared repository of report objects, you can modify a particular object and update all reports containing that object as they are opened for use. A central location for report objects also helps with the task of managing your data—an important benefit in maximizing productivity and minimizing costs at your company.

Work flow

Although there are many ways to use the BusinessObjects Enterprise Repository, this sample work flow will acquaint you with some of the things you might want to do:

- Set up subfolders and subcategories for your repository

The Repository Explorer displays the contents of your BusinessObjects Enterprise Repository as a tree with folders, subfolders, categories, and subcategories. Two folders and two categories are supplied through BusinessObjects Enterprise; these are called: Repository Items, Enterprise Items, Categories, and Personal Categories.

You can add subfolders and subcategories. You can rename subfolders and subcategories as you like.

- Add report objects to your repository

  There are different ways to do this depending on the type of object you want to add:

  - Select a text object or bitmap image and drag it to a folder or choose "Add to Repository" from the shortcut menu.
  - Select a Custom Function in the Formula Workshop and click the "Add to Repository" button.
  - Create or modify a command in the Database Expert and, once it appears in the Selected Tables list, right-click it and choose the "Add to Repository" option.

- Add repository objects to a report

  There are different ways to do this, depending on the type of object:

  - Text objects and bitmap images can be dragged to the report from the Repository Explorer.
  - Custom functions can be added through the Formula Workshop.
  - Commands can be added though the Database Expert.
  - Lists of values and prompt groups can be added to parameter fields by selecting them from the appropriate lists in the Create New Parameter or Edit Parameter dialog boxes.

- Update report objects in your repository

  Again, there are different ways to do this, depending on the type of object:

  - Text objects and bitmap images can be dragged back to the original repository object.
  - Custom functions can be updated through its user interface.

- Commands can be updated and added back to the repository through the Database Expert.

Accessing the BusinessObjects Enterprise Repository

The repository supplied by Crystal Reports is set up when you install. You don't have to do anything additional before you use the repository.

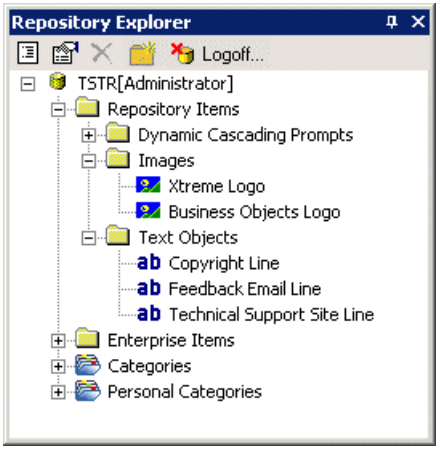
To open the BusinessObjects Enterprise Repository

1. Start **Crystal Reports** and open a report.
2. Click the **Repository Explorer** button on the Standard toolbar.

   Tip:
   Another way to do this is to click the Repository Explorer option under the View menu.
3. Click Logon to connect to BusinessObjects Enterprise.

   For information about how to log on to BusinessObjects Enterprise, see *Working with Enterprise folders* .

   The Repository Explorer appears.



4. Expand nodes to see the repository contents.

The Repository Explorer might appear in a docked position in the Report Designer depending on where it was when you last used Crystal Reports. For more information about docking explorers, see *Opening and docking explorers*.

Hover your mouse's cursor over any object in the Repository Explorer to see a tooltip. Tooltips include Author and Description information for text objects and bitmaps; for commands, tooltips include the complete text of the SQL statement.

Toolbar

The Repository Explorer's toolbar provides buttons with tool tips. These buttons let you add new folders or categories, search for items, and so on:

- **Change view settings**

  Use this option to open the View Settings dialog box. Use this dialog box to limit the type of repository items displayed in the Repository Explorer. You can also select options to sort multiple items by name or by type.

- **Advanced filtering**

  Use this option to display filtering options at the bottom of the Repository Explorer. Use these filters to find specific items by words from the Name or Author fields in the Add Item dialog box. For information about adding or changing an item's name or author, see *Adding items to the repository* and *Modifying objects in the repository*.

  Note:
  Text entered in the filtering fields of this option is not case sensitive.

- **Delete the item/folder**

  Use this option to permanently remove the selected item or folder from the repository. When you delete a folder, you delete all the items it contains. For more information about deleting items from the repository, see *Deleting items from the repository*.

- **Insert a new folder**

Use this option to add a new subfolder to the repository. For information, see *Adding subfolders and subcategories to the repository*.

Note:
This option is called "Insert a new category" when you have selected a category in the repository tree.

- **Logoff Server**

  Use this option to log off the BusinessObjects Enterprise server that you are connected to. When you are logged off, this option is called Logon; use it to reconnect to your BusinessObjects Enterprise server or to connect to a different server.

  For information about how to log on to BusinessObjects Enterprise, see *Working with Enterprise folders* .

Adding subfolders and subcategories to the repository

You can organize the contents of the repository by creating subfolders and subcategories in its tree view.

Folders are objects that you can use to separate content into logical groups. Like folders, categories are objects that you can use to organize documents. You can associate documents with multiple categories, and you can create subcategories within categories.

BusinessObjects Enterprise provides two types of categories:

- Corporate categories are created by the administrator, or other users who have been granted access to these categories. If you have the appropriate rights, you can create corporate categories.
- Personal categories can be created by each user to organize his or her own personal documents.

To add a new subfolder or subcategory

1. In the Repository Explorer, select an existing node, and click **Insert a new folder** or **Insert a new category** on the Repository Explorer's toolbar.

Tip:
The insert button changes automatically from folder to category depending on the type of object that you select.

A new subfolder or subcategory is added to the repository tree. (If your repository items are not sorted, the new subfolder or subcategory is added to the bottom of the selected node. If your repository items are sorted by type, the new subfolder or subcategory is added alphabetically with the default name New Folder.)

2. Name your new subfolder or subcategory and hit the **Enter** key.

Adding items to the repository

You can add text objects and bitmap images to the repository by dragging them from your report to the appropriate repository folder. A dialog box appears so you can add identifying information about the object.

Custom functions are added to the repository through the Formula Workshop and commands are added through the Database Expert.

Once report items are in the repository, they can be shared between many reports. Each person who uses Crystal Reports can connect to the repository and choose items to add to a report.

When you add an object to the repository, that object becomes "connected" to the repository. As long as an object remains connected, you can update any report that uses that object with the latest version in the repository.

Adding a text object or bitmap image

1. Select a text object or bitmap image in your report and drag it to the appropriate folder in the Repository Explorer.
2. In the **Name** field of the Object Information dialog box, create a name for your object or image.

   Note:
   You cannot use these characters in your object's name: # " { } ; /

3. Enter an author and description if you want, and then click **OK**.

Tip:
Author and description information appears in tooltips and can be searched for using the Advanced filtering option.

You'll see that your text object or bitmap image has been added to the appropriate folder.

Adding a text object or bitmap image - another method

You could have added the text object or bitmap image without dragging and dropping it.

1. Select a text object or bitmap image in your report and click **Add to Repository** from the shortcut menu.

   The Add Item dialog box appears.

   Notice that, because you did not drag the object to a specific repository folder, this dialog box contains an area to select a location from.

2. In the **Name** field, create a name for your object or image.

   Note:
   You cannot use these characters in your object's name: # " { } ; /

3. In the Location area, select a repository folder, and then click **OK**.

   You'll see that your text object or bitmap image has been added to the appropriate folder.

If you try to edit any of the objects you added to the repository, you'll see that you can't make changes; the objects are in read-only mode. This is true of any report object that is stored in the repository: as long as it is connected to the repository it can't be changed in the report. If you right-click the object in the report and choose "Disconnect from Repository" from the shortcut menu, the item is disconnected from the repository and becomes editable. If you want other reports to be updated with the edited report object, you must add it back to the repository.

Adding a custom function

1. In the Formula Workshop, expand the **Report Custom Functions** node and select the custom function you want to add to the repository.
2. Click the **Add to Repository** button.

   You'll see that your custom function has been added to the Repository Custom Functions node.

   Tip:

   - You can also add a custom function to the repository by dragging it from the Report Custom Functions node—in the Workshop Tree—and dropping it on a Repository Custom Functions node.
   - The custom function icon in the Report Custom Functions node changes to indicate that the custom function exists in the repository.

Note:
You must add all custom functions to the Repository Custom Functions node that is provided with Crystal Reports.

Adding a command

1. In the Selected Tables area of the Database Expert, select the command you want to add to the repository.
2. Right-click the command and select **Add to Repository**.
3. In the Add Item dialog box, specify a name and repository location for the command.
4. In the Location area, select a repository folder, and then click **OK**.

   You'll find the command in the BusinessObjects Enterprise Explorer, the Repository Explorer, the Database Expert, and the Set Datasource Location dialog box.

Using repository objects in reports

Once you have an object or a collection of objects added to the repository, you can start using them in your Crystal reports. Each type of repository object is added through its own user interface. In the case of text objects and bitmap images, you simply drag them from the Repository Explorer to a report. Custom functions are selected when you work in the Formula Workshop, and commands are selected in the BusinessObjects Enterprise Explorer, the Database Expert, or the Set Datasource Location dialog box. You can select list-of-values objects from within the Create New Parameter or Edit Parameter dialog boxes.

When you add a repository object to a report, it remains connected to the repository and is in read-only mode. To edit the object, you must disconnect it from the repository and unlock its formatting.

Note:

- To reconnect a report object that has been disconnected from its repository, re-add the object or update the repository copy. Objects that remain disconnected from the repository cannot be automatically updated when the report is next opened.
- You can see that a report object is connected to the repository by opening the Report Explorer and looking for it; if the object has an icon in front of it, it is connected to the repository.

This section shows you how to add a bitmap image, a custom function, or a command to a new report. It also shows you how to add a list of values to a parameter.

Adding a text object or a bitmap image to a report

1. Click the **Repository Explorer** button on the Standard toolbar.

   Tip:
   Another way to do this is to click the Repository Explorer option under the View menu.

2. Log on to BusinessObjects Enterprise if you have not done so already.

For information about how to log on to BusinessObjects Enterprise, see *Working with Enterprise folders* .

3. Expand the appropriate folder in the Repository Explorer and drag a text object or bitmap image to your report.

Note:
Folders in your BusinessObjects Enterprise Repository do not have to be named to represent the objects they hold; you can use a name of your choice. See *Adding subfolders and subcategories to the repository* for more information.

Adding a custom function to a report

1. Click the **Formula Workshop** button on the Expert Tools toolbar.

   Tip:
   Another way to do this is to click the Formula Workshop option under the Report menu.

2. In the Formula Workshop, expand the **Repository Custom Functions** node until you find the custom function you want to add.
3. Right-click the custom function and click **Add to Report** from its shortcut menu.

   If the custom function you are adding to your report requires other custom functions from the repository, they can be added at the same time.

You'll see your custom function has been added to the Report Custom Functions node of the Formula Workshop.

Note:
You can also add custom functions to a report while creating formulas in the Formula Workshop. For more information about this method, see *Creating a formula in the Formula Expert* .

Adding a command to a report

1. Click the **Database Expert** button on the Expert Tools toolbar.

Tip:
Another way to do this is to click the Database Expert option under the Database menu.

2. In the Database Expert, expand the **Repository** folder.

   Tip:
   If the BusinessObjects Enterprise Explorer doesn't open immediately, double-click Make New Connection.

3. In the BusinessObjects Enterprise Explorer, expand folders until you find the command you want to add, and then click **Open**.

You'll see your command in the Available Data Sources area of the Database Expert. When the command is in this area, you can added it to your report as you would add any other data source. For more information, see *Selecting the data source*.

Adding a list of values to a parameter

1. In the Field Explorer, select **Parameter Fields** and click **New**.
2. In the List of Values area, click **Dynamic**.
3. Click **Existing** and choose a repository list of values from the tree view that appears.

   Note:
   If the list is empty (you cannot connect to a repository, or your report does not contain an existing list of values), this option is not available.

Modifying objects in the repository

You can modify repository objects by disconnecting them, changing them in a report, and adding them back to the repository. As well, you can rename objects and move them to different folders directly in the repository.

Be aware that when you modify an object and add it back to the repository, your changes affect all those who use that same repository: a renamed object is renamed for all users, and reports that contain the modified object may be updated upon opening them in the Report Designer.

To modify a repository object

Note:
This procedure shows you how to modify and update a text object in the repository. Custom functions and commands are modified and updated in their respective user interfaces; in each case, you must first disconnect the custom function or command from the repository, make the modifications, and then add the custom function or command back to the repository.

1. From the Repository Explorer, drag any text object into a report.
2. Right-click the text object in the report and select **Disconnect from Repository** from the shortcut menu.
3. Double-click the text object and modify its text.
4. Drag the modified text object from the report back its location in the Repository Explorer.

   When you drop the text object, the Add or Update Object dialog box appears.
5. Click **Update**.
6. In the Modify Item dialog box, make any changes you require and click **OK**.
7. Right-click the text object in the repository and click **Properties** from its shortcut menu.

   Notice that the date and time in the Modified area have changed to correspond to the time you added the text object back to the repository.

Updating connected repository objects in reports

Repository objects that are used in a report and are connected to that report's repository can be updated automatically when opening the report in Crystal Reports. This behavior is controlled by an Options setting and is global for all reports.

Note:
Objects that are used in a report but are disconnected from the repository are not automatically updated when the report is opened.

To set the update option

1. On the **File** menu, click **Options**.

   The Options dialog box appears.
2. Click the **Reporting** tab.
3. Select the **Update Connected Repository Objects on Open** check box.
4. Click **OK**.

If you don't want to use this global option, you can also update a report's repository objects by selecting the Update Repository Objects option on the Open dialog box for an individual report.

Note:
When you open a report that contains a command that is stored in the repository, and you have specified that you want to Update Connected Repository Objects on Open, only the definition of the command is automatically refreshed; the data that the command returns is not updated until you click the Refresh button in the report.

Deleting items from the repository

Any object you store in the repository can be deleted from that repository without removing it from the reports that use it. Once you remove an object from the repository, it is removed for all users.

Note:

- When you delete an object from the repository, it appears to remain connected in the reports that use it. When you try to update repository objects for those reports, a warning message is shown in the Missing Repository Items dialog box so you can quickly identify the object. Use the Report Explorer dialog box to find the object in the report; then you can disconnect it.
- If you have deleted an object from the repository, creating a new object with the same name and adding it back to the repository does not relink that object to your reports. Each repository object has a unique ID; linking is not done by name.

To delete an object from the repository

1. Click the **Repository Explorer** button on the Standard toolbar.

   Tip:
   Another way to do this is to click the Repository Explorer option under the View menu.

2. In the appropriate folder, select the object you want to remove and press the **Delete** key.

   You are asked to confirm the deletion.

3. Click the **Yes** button.

   The object is removed from the repository.

You can also delete a repository object by right-clicking it and selecting Delete from the shortcut menu.

Using Undo in the repository

You cannot undo any action that updates the repository. You can undo anything that affects only the report and not the repository. For example, you can undo the disconnect activity.

Designing Optimized Web Reports

chapter 8

Overview

Whether you distribute your enterprise reports over a local network, a corporate Intranet, or the Web, you can use Crystal Reports' powerful, built-in performance features to deliver web reporting speed.

Crystal Reports automatically provides these major performance advantages—even if you don't apply any of the strategies set out in this section:

- Page-on-demand technology

  Page-on-demand report access lets users download only the specific report pages they need to see, thus improving response times and reducing web traffic. Further, placeholders and partial page technology allow you to view report pages and data over the Web immediately, without having to wait for the processing of large objects, such as graphics and subreports.

- Optimized, multithreaded Report Engine

  The Crystal Report Engine's multithreading capabilities and thread-safe database drivers allow you to continue working on your important tasks, while many other operations are processed simultaneously in the background. The Report Engine also minimizes the number of passes made through the data, speeds up processing with improved memory management, and handles subreports and parameters as efficiently as possible.

In addition to these built-in features, the *Key strategies for optimizing web reports* discussed in the following sections bring additional performance benefits, which are often substantial. When you design new reports (or improve reports created in older versions of Crystal Reports) in accordance with these strategies, reports run faster and tie up fewer processing resources. Consequently, report users can easily access the data they need—faster than ever.

Tip:
If you're new to web reporting, or to reporting in general, reading this section will prepare you for future reporting tasks—you'll gain important insight into designing faster, better reports.

Note:
Understanding databases and how they work is often important when considering performance. See *Databases overview* for background information.

Key strategies for optimizing web reports

- As your company grows, Crystal Reports and BusinessObjects Enterprise can grow along with you. For details, see *Scale with BusinessObjects Enterprise*.
- For tips and considerations on how to create fast, interactive reports, see *Making the right design choices*.
- For information about getting the most out of your existing database, see *Streamlining your reporting environment*.
- To minimize data transfer and enhance report performance, see *Using enhanced record selection formulas* .
- To decrease the processing and data transfer times of grouped, sorted, or totalled reports, see *Improving grouping, sorting, and totaling* .

In general, report performance issues are similar, no matter how you distribute your reports. By following these strategies, you'll notice significant improvements not only in multi-user web environments, but also in single-user situations.

Scale with BusinessObjects Enterprise

BusinessObjects Enterprise provides a flexible and efficient way to deliver your reports over the web or to integrate them into custom web applications.

The Report Application Server (RAS) provides a rich set of server-based reporting services that let you tightly integrate reporting into your custom web applications. RAS provides a base set of BusinessObjects Enterprise services, focused on report processing, application integration, and run-time report modification.

You can extend your application even further using the advanced services available in other editions of BusinessObjects Enterprise. These include:

- Security

BusinessObjects Enterprise provides granular group, user, and data-level security to help you protect sensitive reports and deliver a more personalized end-user experience.

- Scheduling

  BusinessObjects Enterprise incorporates a flexible time- and event-based scheduling system to allow you to process large reports during off hours and to avoid unnecessary database hits. (The Report Application Server provides on-demand reporting, so every viewing request results in a separate query on your database.)

- Versioning

  Versioning works closely with scheduling to store "instances" of a report. Versioning not only reduces the number of database hits required to serve users, but also allows you to keep an archive of report instances for historical reference.

- Clustering

  BusinessObjects Enterprise incorporates proven clustering and load-balancing technology to help you deliver a highly available, reliable information delivery system.

- Scalability

  BusinessObjects Enterprise is built on a distributed, multi-server architecture, allowing you to scale up on a single machine (by adding processors) or scale out over multiple machines to handle heavier user loads.

- Management

  BusinessObjects Enterprise incorporates extensive administration and management controls that allow you to organize content, set up complex schedules and security, and tune the system for optimal performance.

- External (third-party) authentication

  BusinessObjects Enterprise allows you to leverage your existing security system to manage users and groups. All authentication can be delegated to a third-party NT or LDAP system.

Evaluation times for date functions in BusinessObjects Enterprise

Different date and time functions available in Crystal Reports are evaluated at different stages during report processing. Some are evaluated when a scheduled report is processed, or when a report instance is refreshed: this evaluation time is known as "WhileReadingRecords." Others are evaluated each time a report page is formatted for display in a report viewer or a browser: this evaluation time is known as "WhilePrintingRecords."

If you use BusinessObjects Enterprise to generate report instances and notice that date or time functions are not evaluating to the values that you expect, consider the following:

- The current date and time are always read from the clock that is locally accessible to the Report Engine—that is, from the clock on the computer that processes the report. In BusinessObjects Enterprise, the Job Server processes scheduled reports against the database, and the Page Server processes on-demand reports against the database. The Page Server also formats individual pages of report instances when users view them.
- When a scheduled report is processed, all date and time formulas are evaluated by the Job Server in order to generate the report instance. When you simply view the resultant report instance, none of the formulas is re-evaluated.
- When you view a cached report page, none of the date functions is re-evaluated, because the records have already been read and the page has already been formatted.
- If you use date and/or time functions in a report's selection formula, the report's data is dependent upon the return values of those formulas. Consequently, when you view a report instance at a later date, the function may cause the report data to be updated from the database.
- To ensure that date and time functions return the values that you expect, you can force the evaluation time through the use of the WhileReadingRecords and WhilePrintingRecords functions.

  For more information, see the "Functions" and "Report Processing Model" sections of the Crystal Reports Online Help.

Making the right design choices

This section offers design options and considerations that will help improve the performance of your reports. The topics covered range from basic suggestions, such as updating reports created in older versions of Crystal Reports to the latest file format, to more involved decisions, such as whether to use live or saved data, and how to use subreports efficiently.

When designing your reports, and especially when designing reports for the Web, you should allow report users to drive the data they see. In other words, display summarized information, so each user can navigate the report quickly and then drill down to access additional data. In this way, web traffic and response times are minimized, because only the data requested by the user is transferred from the database server.

These are only a few of the benefits of designing user-driven reports:

- Report users gain interactive control over the type and quantity of information they view over the Web.
- Data transfer and network traffic decrease, because only the information requested by users is returned from the database server.
- When users need real-time reporting of live data over the Web, user-oriented reports respond quickly and communicate efficiently with the database server.
- Reports become more useful, because each user customizes the report's contents, thereby creating a reporting solution specific to his or her particular decision-making problem.

Using faster report formats

The quickest way to help improve the performance of reports created in older versions of Crystal Reports is to save them in the latest Crystal Reports format. Crystal Reports has been enhanced to process reports faster than ever before: update your older reports to take advantage of these enhancements.

To update the format of an older report, just open it in Crystal Reports and select Save from the File menu. The older version of the report will be replaced with a version 2008 report.

Note:
If for some reason you need to keep a report in its original file format, use the Save As command (instead of Save) and enter a new name for the version 2008 report.

Choosing between live and saved data

When reporting over the Web, the choice to use live or saved data is one of the most important decisions you'll make. Whichever choice you make, however, Crystal Reports displays the first page as quickly as possible, so you can see your report while the rest of the data is being processed.

Live data

Live reporting gives users real-time access to live data, straight from the database server. Use live data to keep users up-to-date on constantly changing data, so they can access information that's accurate to the second. For instance, if the managers of a large distribution center need to keep track of inventory shipped on a continual basis, then live reporting is the way to give them the information they need.

Crystal Reports supports live reporting. However, you should first consider whether or not you want all of your users hitting the database server on a continual basis. If the data isn't rapidly or constantly changing, then all those requests to the database do little more than increase network traffic and consume server resources. In such cases, you may prefer to use reports with saved data.

To ensure the efficiency of real-time reporting, read all of the suggestions in this chapter. These topics, however, are of particular importance:

- *Taking advantage of on-demand subreports*
- *Performing grouping on server*
- *Incorporating parameter fields into record selection formulas*

Saved data

Reports with saved data are useful for dealing with data that isn't continually updated. When users navigate through reports with saved data, and drill down for details on columns or charts, they don't access the database server directly; instead, they access the saved data. Consequently, reports with saved data not only minimize data transfer over the network, but also lighten the database server's workload.

You can schedule these reports within BusinessObjects Enterprise, so they automatically refresh from the database on a predetermined basis. For example, if your sales database is only updated once a day, or once a week, then you can run the report on a similar schedule and save it with data. Sales representatives then always have access to current sales data, but they aren't hitting the database every time they open a report. Alternatively, you can refresh reports with saved data on an as-needed basis.

Saved data is discarded and refreshed when you perform any of these tasks in a report:

- Select the Refresh command.
- Change your database logon.
- Change any of the report's data parameters.
- Add a new field that doesn't exist in the saved data.
- Drill down in a report where "Perform Grouping On Server" is selected, and the details section is suppressed.
- Verify the database—if the database structure has changed drastically.
- Change the linking parameter on a subreport (the subreport is refreshed).
- Change the order of groups (only for reports in the Report Application Server).

If you do use reports with saved data, incorporate the other suggestions in this section to make sure your reports are designed for optimum performance.

To save a report with data, first make sure the Save Data with Report option is selected on the File menu; then Save your report.

Designing summary reports

Designing and distributing summary reports is a relatively easy way to ensure that users quickly find the data they need over the Web. A summary report can include as much data as any other report. However, by hiding a summary report's Details section, you avoid overwhelming users with data they may not immediately need.

When the Details section is hidden, users navigate with the Group tree first, to locate the desired data. Then, by drilling down on the report, they can request specific data, which is returned quickly without unnecessary records. This is especially important to improving navigation of long summary reports, which might consist of hundreds, thousands, or even tens of thousands of pages.

To facilitate navigation in this way, you first need to group the data and insert the summary fields you want to include in your report. For detailed information and instructions, see *Grouping data* and *Summarizing grouped data*.

Once you've grouped and summarized your report data, hide the Details section (and any other large report sections) so that users can easily navigate to the data that's important to them.

To hide details in a summary report

1. Open your report in Crystal Reports.

   If you haven't yet created a grouped and summarized report, open Group.rpt from the Feature Examples samples folder.
2. On the **Report** menu, click **Section Expert** to open the Section Expert.
3. In the **Sections** list, click **Details**.
4. On the Section Expert's **Common** tab, select the **Hide (Drill-Down OK)** check box.
5. Click **OK**.

You'll notice the details are now hidden. To view the details, navigate through the report using the Group tree, and then drill down on the appropriate area of the report.

Note:
For details on minimizing data transfer with summary reports, see *Performing grouping on server*.

To hide details in a summary report

1. Open your report in Crystal Reports.

   If you haven't yet created a grouped and summarized report, open Group.rpt from the Feature Examples samples folder.
2. On the **Report** menu, click **Section Expert** to open the Section Expert.
3. In the **Sections** list, click **Details**.
4. On the Section Expert's **Common** tab, select the **Hide (Drill-Down OK)** check box.
5. Click **OK**.

You'll notice the details are now hidden. To view the details, navigate through the report using the Group tree, and then drill down on the appropriate area of the report.

Note:
For details on minimizing data transfer with summary reports, see *Performing grouping on server*.

Using subreports carefully

A subreport is an excellent way to include additional data in a main report. Performance issues relating to subreports vary depending on the type of subreport used.

For general information on subreporting, see *Subreports*.

Taking advantage of on-demand subreports

If your report has a section that handles a large number of records, you can put that section into an on-demand subreport. An on-demand subreport appears as a hyperlink in the primary report. When you open the primary

report, no data is retrieved for the on-demand subreport until you drill down on the hyperlink.

For example, when designing a report that shows each employee's quarterly sales for each product and each product type, you might also want to track each employee's progress by including weekly sales information. This additional data, however, may not be of interest to many users viewing the report. In such a case, extract the weekly sales portion of the report and attach it as an on-demand subreport. Detailed information about weekly sales is retrieved from the database only when a user drills down on the on-demand subreport.

Many report objects—such as large cross-tabs, OLAP grids, advanced charts, and maps—are ideal candidates to include in on-demand subreports, so that the object is not processed until you drill down.

To insert an on-demand subreport, see *Inserting subreports* and *Creating an on-demand subreport*.

Tip:
You could also place such report objects in a hidden Details section of a report that uses the Perform Grouping On Server option. When you do this, the database server performs the majority of the processing, and only a subset of the records is transferred from the server to the local machine (other records are retrieved when you drill down to a hidden section).

Using linked subreports

When a subreport is linked, Crystal Reports coordinates the data in the subreport with the matching records in the primary report. If you need to use regular linked subreports—that is, linked subreports that are not on-demand subreports—you should consider these guidelines:

- If the additional data provided by a regular linked subreport is useful to relatively few users, create a linked on-demand subreport instead. Users who need to see the extra data click a hyperlink to view the subreport; users who don't need to see the extra data won't have to download it from the database server.
- In some cases, placing regular linked subreports in the Details section of a main report may hinder performance—especially when your main report contains many records. (This is because you're creating a separate subreport for each record, and a separate query must be run for each

database record in the main report.) As an alternative, consider using linked on-demand subreports in the Details section of your main report.

Linking tables instead of linking subreports

Whenever possible, coordinate your report data by linking database tables on the Links tab of the Database Expert, rather than by linking regular subreports—that is, subreports that aren't on-demand subreports—to the main report. Since each subreport is run as a separate report, linked tables often have a performance advantage.

For more information

- For further general guidelines, see *Database links vs. subreports in one-to-many situations*.
- For complete details, see *Performance considerations in one-to-many links*.

Using other design elements effectively

Maps

Map rendering is a single-threaded operation that does not scale well. Although maps are supported, you need to be careful in considering the overall effect a map in your report will have on performance.

Report Templates

If you will be applying the same template to multiple reports, it is best to open the report once and cache it, because the template only needs to be read-only.

Including "Page N of M" or "Total Page Count"

If you include the special fields "Page N of M" or "Total Page Count" in your report, the report needs to finish processing before it can calculate this value. Avoid using these special fields in your report unless the report is very small or you absolutely require the value.

Designing reports to maximize data sharing

BusinessObjects Enterprise has data-sharing functionality that improves performance by reducing the number of database calls that are made in a system with multiple users.

Data can be shared between users of a report object only if certain conditions are met. Try to maximize data sharing by designing reports such that the conditions for data sharing are met as often as possible, without compromising different user's need for report information.

When reports are processed by the Page Server, data is shared between users of a report when these conditions are met:

- Users view a report using the same database logon information.
- Users view a report using the same parameters.
- Users view a report using the same page layout options.
- Users view a report using the same locale settings.

Reports viewed using the DHTML viewer, the ActiveX viewer, or the Java viewer are processed using the Page Server. These viewers do not allow users to change the page layout or locale of a report. However, it is possible to develop custom viewer applications that provide this functionality.

When reports are processed by the Report Application Server (RAS), data is shared between users of a report when these conditions are met:

- Users view a report using the same database logon information.
- Users view a report using the same parameters.
- Users view a report using the same locale settings.
- Users do not modify the report.

Reports viewed using the Advanced DHTML viewer (or your own custom application that permits report viewing and modification) are processed using the Report Application Server.

Streamlining your reporting environment

Another step to ensuring that report users receive their information quickly is to assess your reporting environment. What kind of database do you use? How is data organized within the database? How are you connecting to the data you need to report off? How are you linking your database tables? By taking these important considerations into account, you can significantly minimize the amount of data that must physically travel across the network.

Selecting the fastest database and connection

To improve reporting performance, utilize your database to its full potential by having it do the majority of your report processing. Ideally, Structured Query Language (SQL) databases are the most efficient for carrying out this task.

For details on SQL databases, see *Using SQL and SQL databases*.

Using table indexes

You can also improve the way your data is organized within the database. For optimum processing speed, report off indexed fields on your SQL database. Using table indexes is an easy way to increase the speed of data access and to reduce the time it takes for Crystal Reports to evaluate data.

For a complete description of how table indexing works, see *Indexed tables*.

Improving table-linking choices

When you add multiple database tables to your report, you link the tables on a common field so that records from one table match related records from another. (Table linking works best if your database tables are indexed.) Linking your database tables in this way is usually much faster than incorporating linked subreports into your main report.

When you link two or more tables, you want your report to read as few records as possible, while at the same time finding all matching records. The best

ways to adhere to this guideline are to assess your reporting needs and to plan your strategy before creating your report. When you know exactly what you need from your data source, Crystal Reports makes it easy to get that information.

There are many other specific issues to consider when linking tables. These additional considerations, however, are largely contingent upon your reporting environment. In other words, the steps to optimal table-linking performance depend upon your database type, the possibility of indexing tables, and the join type required between tables. You'll find complete descriptions for various reporting scenarios in the section entitled *Linking tables*.

In the majority of reporting scenarios, the following general procedures should ensure that your tables are linked for improved if not optimal performance.

To link tables effectively

1. Ensure that each database table is indexed on the field you are going to use.
2. Add the database tables to your report, and then link from the primary table to the lookup table on a common field. (Do this instead of inserting a linked subreport and binding it to the data in your primary report.)
3. Use a record selection formula that sets range limits on the indexed field in the primary table. This minimizes the number of records in the primary table for which Crystal Reports must find matching records in the lookup table.

For more information

- For complete details on table-linking scenarios, see *Linking tables*.
- For general information on record selection formulas, see *Selecting records*.
- For advanced record selection strategies, see *Using enhanced record selection formulas* .

Using thread-safe database drivers

If you share and refresh reports over the web, open them using thread-safe database drivers whenever possible. The Crystal Report Engine supports multiple threads. Thus, when you make multiple data requests through thread-safe database drivers, the Report Engine can process all of the requests simultaneously. As the result, you'll be able to view your reports sooner.

The following generic database drivers are thread-safe:

- crdb_odbc.dll (ODBC)
- crdb_jdbc.dll (JDBC)
- crdb_ado.dll (OLE DB)

ODBC connections to the following database types assume that the ODBC database driver is also thread-safe and, therefore, operate in a multi-threaded manner:

- Microsoft SQL Server
- Oracle
- DB2
- Teradata
- Sybase

Note:
It is also assumed that the database drivers used with JDBC and OLE DB are always thread-safe and, therefore, always operate in a multi-threaded manner.

The following native database drivers are thread-safe:

- crdb_ado_plus.dll (ADO.NET data provider)
- crdb_com.dll (COM data provider)
- crdb_db2cli.dll (DB2 Unicode)
- crdb_javabean (Java Bean data provider)
- crdb_xml (XML)

- crdb_olap.dll (OLAP)
- crdb_oracle.dll (Oracle)
- crdb_p2ssby10.dll (Sybase)

Note:
Check the Release Notes in the Crystal Reports product distribution for updates to these lists; more database drivers may be added if they are found to be thread-safe during testing.

Using stored procedures for faster processing

A stored procedure is a compiled SQL program, consisting of one or more SQL statements, which resides and runs on your SQL server. Although stored procedures can take time to set up properly, they can be incredibly powerful.

The advantages of using stored procedures are most noticeable when reporting off large sets of data, or when running reports that demand long, complex calculations. In such cases, you should ideally use a predefined stored procedure that performs the complex work for you on the database server.

Because stored procedures reside on your SQL server, you may need to ask your Administrator about accessing or setting up a stored procedure.

For more information

- For more information on stored procedures, see *Stored procedures*.
- To select a stored procedure as a data source, see "SQL stored procedures" in the online help.

Using enhanced record selection formulas

The most important thing you can do to speed up report processing is to limit the amount of data that is returned from the database. Your primary tool for doing this is the record selection formula.

Crystal Reports analyzes your record selection formula and generates an SQL query from it. This SQL query is then processed by the database, which sends the resulting records back to Crystal Reports. Crystal Reports then evaluates the record selection formula locally for each of the records retrieved from the database, thereby calculating the set of records used to generate the report.

Unnecessary records are eliminated at two stages: at the database with the SQL query and within Crystal Reports by the record selection formula. For speed, you want as many records as possible to be eliminated in the first stage. By designing your record selection formula effectively, you can off-load much of the processing to the database server, thus eliminating unnecessary records before returning them to Crystal Reports. This is commonly called "pushing record selection down to the database server."

This section offers several tips to ensure that your record selection formulas can be pushed down to the database server.

Pushing down record selection—an example

This example demonstrates the benefits of writing record selection formulas that can be pushed down to the database server.

In the Orders table of the Xtreme sample database, there are 2192 records, of which 181 have order dates prior to 2001. Suppose you want to report on only those records. On the one hand, you could use this record selection formula:

```
Year ({Orders.Order Date}) < 2001
```

The SQL query generated will send all 2192 records to Crystal Reports, and then the record selection formula will reduce this to 181. To see this, click Show SQL Query on the Database menu and notice that the SQL query has no WHERE clause. This is because Crystal Reports is not able to push down the Year ( ) function in the WHERE clause.

On the other hand, this record selection formula generates the same report:

```
{Orders.Order Date} < #Jan 1, 2001#
```

This second formula, however, can be performed on the database server, so it is pushed down. The SQL query generated will send only 181 records to Crystal Reports. So, when the record selection formula is evaluated by

Crystal Reports, no further records need to be eliminated. Click Show SQL Query on the Database menu and notice that the resulting SQL query has a WHERE clause.

As this example shows, your report's processing speed improves when you enhance your record selection formula. In this case, both formulas generate the same report, but the second takes advantages of the power and optimizations that the database server can use when handling its own data.

Tip:
See the next section for additional information and limitations when setting up record selection requests.

Note:
If you are new to record selection formulas, you may prefer to begin with the Select Expert or the sample record selection formula templates. For further details, along with an introduction to record selection, see *Selecting records*.

Record selection performance tips

Consider the following performance-related items when setting up record selection requests:

General

- To push down record selection, you must select "Use Indexes or Server for Speed" in the Report Options dialog box (available on the File menu).
- In record selection formulas, avoid data type conversions on fields that are not parameter fields.

  For example, avoid using ToText( ) to convert a numeric database field to a string database field.
- You are able to push down some record selection formulas that use constant expressions.

PC Databases

- You can only push down record selection on indexed fields.

- You can only push down AND clauses (not OR).

SQL Databases

- You can push down record selection on indexed or non-indexed fields.
- Your SQL server will respond faster if you use indexed fields.
- You can push down AND and OR clauses.
- Record selection formulas containing some types of embedded formulas can be pushed down.
- You should incorporate SQL Expression fields to push down formula calculations necessary for the record selection.
- On the Database menu, click Show SQL Query to view the SQL that will be sent to the database server.

Strategies for writing efficient record selection formulas

Note:
This section assumes that you are familiar with the Select Expert and that you are reporting off of a SQL database.

Consider the following points when creating a record selection formula:

Consideration 1

Any record selection formula that you generate completely with the Select Expert, without writing pieces of the formula yourself, can be pushed down.

This case actually follows from the points below. However, you can write more types of record selection formulas using the tips below than is possible with the Select Expert. To do this, you need to edit the record selection formula directly with the Formula Workshop or from within the text area that appears when you click Show Formula in the Select Expert.

To open the Formula Workshop to modify record selection, click the Report menu, point to Selection Formulas, and then select Record from the submenu.

Consideration 2

Any selection formula that is of the form: `DataBaseField SupportedOperator ConstantOrParameterExpression` can be pushed down.

Of course `DataBaseField` is just a database field. `SupportedOperator` is any of =, <>, <, <=, >, >=, StartsWith, Like or In.

`ConstantOrParameterExpression` is any expression that involves constant values, operators, functions, and parameter fields. It cannot involve variables, control structures, or fields other than parameter fields. By their very definition, constant and parameter expressions can be evaluated without accessing the database.

Note:
A constant or parameter expression can evaluate to a simple value, a range value, an array value, or an array of range values. Here are some examples of such expressions:

```
{?number parameter} - 3
Year ({?run date})
CurrentDate + 5
DateDiff ("q", CurrentDate, CDate("Jan 1, 1996"))
Month (Maximum ({?date range parameter}) + 15)
["Canada", "Mexico", "USA", {?enter a country}]
1000 To 5000
[5000 To 10000, 20000 To 30000, 50000 To 60000]
```

A complete example:

```
{Orders.Order Date} >= CurrentDate - 3
```

The program can also push down an expression that just contains a Boolean field (without the operator and constant parts).

```
{Orders.Shipped}
Not {Orders.Shipped}
```

Consideration 3

IsNull (*`DataBaseField`*) can be pushed down.

Consideration 4

SqlExpression SupportedOperator ConstantOrParameterExpression can be pushed down.

For example, the selection formula `{@ExtendedPrice} > 1000` cannot be pushed down if `{@ExtendedPrice} = (Quantity * Price)`. However, if the formula `@ExtendedPrice` is replaced with the equivalent SQL Expression, then your record selection formula will be pushed down.

Consideration 5

When using multiple expressions that follow the above considerations, separate them with AND and OR operators—you can also use NOT. You can have several of each, and you can use parentheses to give priority. For example:

```
{Orders.Order ID} < Minimum({?number range}) Or
{Orders.Order Amount} >= 1000
(IsNull({Customer.Region}) Or
{Customer.Region} = "BC") And
{Customer.Last Year's Sales} > 2000
```

For more information

- If your record selection formula does not respond as expected, see *Troubleshooting record selection formulas* .

Incorporating parameter fields into record selection formulas

Instead of displaying all of a report's data every time the report is opened, you can create parameter fields that prompt users to specify the data they want to see. To decrease the amount of data transferred from the database server, incorporate these parameter fields right into your record selection formula.

In general, parameter fields provide interactivity for users, who respond to the parameter prompts in order to specify the data they want to see. However, by incorporating your parameter fields right into your record selection formula, you not only provide interactivity, but you also decrease data transfer and increase performance.

You can add a parameter field to your record selection formula by using the Select Expert or the Record Selection Formula Workshop. When using the Record Selection Formula Workshop, you treat the parameter field as you would any other field.

In the following example, you will create a parameter field and then add it to the record selection formula with the Select Expert. For further details on designing and creating parameter fields, see *Parameter Fields and Prompts*.

To add a parameter field to your record selection formula

1. Open the sample report **Group By Intervals.rpt**.

   Take a moment to navigate the Group tree and see how the data is organized; notice also, in the bottom right of the Crystal Reports window, that 269 records were returned for this report.

   Note:
   You'll see this number only if you have the Status Bar option selected on the View menu.

   Now click the Design tab.

2. On the **View** menu, click **Field Explorer**.
3. In the Field Explorer, right-click **Parameter Fields** and select **New** from the shortcut menu.

   The Create New Parameter dialog box appears.

4. For the **Name** of the parameter, type SalesQuota .
5. Click the **Type** list and select **Number**.
6. In the Options area, go to the **Prompt Text** option and type What was last year's sales quota?
7. In the Options area, make sure that the **Allow discrete values** option is **True**, and then click **OK**.

Note:
You've now created the parameter field. The rest of these procedures describe how to add the parameter field to the record selection formula with the Select Expert.

8. On the **Report** menu, click **Select Expert**.

   The Choose Field dialog box appears.

9. Select the **Customer.Last Year's Sales** field, and then click **OK**.

   The Select Expert appears.

10. On the **Customer.Last Year's Sales** tab, click the drop-down list and select **is greater than**.

    A new drop-down list appears.

11. Click this second list and select **{?SalesQuota}**.

    Tip:
    Click the Show Formula button to view the new record selection formula, which appears as: {Customer.Last Year's Sales} > {?SalesQuota}. Instead of using the Select Expert, you could have created this formula yourself in the Record Selection Formula Editor. (To see the editor, open the Formula Workshop and select Record Selection from the Selection Formulas folder.)

12. Click **OK** in the Select Expert.

You've now added your parameter field to the record selection formula. When you switch to Preview mode, or click the Refresh button, you will be prompted for new parameter values. You can then enter a numeric value representing last year's sales quota. The resulting report will display only those customers whose Last Year's Sales exceeds the numeric value you specify.

For instance, if you respond to the parameter by entering 40000, then the report will display only those customers whose sales exceeded $40,000 last year. Notice also, in the bottom right of the Crystal Reports window, that only 58 records are returned for your report, instead of the 270 records that were returned before you put the parameter field into a record selection formula.

By enhancing this report, you've retrieved all the information you needed and, at the same time, you've ensured that the fewest number of records is transferred from the database server.

For more information

- To create enhanced parameters, see *Advanced parameter features*.
- For general information about parameter fields, see *Parameter and prompt overview* .
- For general details regarding record selection formulas, see *Record Selection*.

Using SQL expressions where appropriate

SQL expressions are like formulas, but they are written in Structured Query Language (SQL). They are useful in optimizing report performance because the tasks they execute are normally performed on the database server (as opposed to a regular formula, which is sometimes executed on the local machine).

Don't use SQL expressions exclusively, because Crystal Reports includes its own formula language, which is much more powerful than standard SQL. Both Crystal Syntax and Basic Syntax allow you to enhance and hone your formulas in ways that are either difficult or impossible with SQL. In certain circumstances, however, creating and using SQL Expression fields can speed up the processing of your reports.

Key uses of SQL Expression fields

To maintain optimum report processing speeds, avoid using formulas (whether Crystal or Basic syntax) within record selection formulas. Instead, replace the original formula with an equivalent SQL Expression field, and then incorporate the SQL Expression field into your record selection formula. Doing so will greatly improve the chances of your record selection being pushed down to the server.

In addition, avoid sorting, grouping, or totaling on a formula field (whether Crystal or Basic syntax). Instead, replace the original formula field with an equivalent SQL Expression field, and then sort, group, or total on the SQL Expression Field. Again, this will greatly improve the chances of the processing being done on the server.

Finally, if your database supports Case Logic, and your report needs to summarize an If-Then-Else formula calculation, replace the formula with an SQL Expression field. In such cases, SQL Expression fields enable Crystal Reports to perform the report's grouping on the server. For more information, see *Using SQL Expressions for Case Logic*.

For more information

- For an introduction to SQL, see *What is SQL?* and *The SQL language*.
- For instructions on creating an SQL Expression field, see *SQL Expression fields*.
- For further tips on enhancing your record selection formula, see *Using enhanced record selection formulas* .
- For general record selection procedures, see *Record Selection*.

Improving grouping, sorting, and totaling

Performing grouping on server

If you're reporting in real-time off live data over the Web, reduce the amount of data transferred from the database server by using the Perform Grouping on Server option. With this option, much data processing is off-loaded to the database server and only a subset of data is read initially. Detail data is returned from the database only when you drill down in a report.

Note:
Server-side processing works only for sorted and grouped reports that are based on SQL data sources.

To enable server-side processing

1. On the **File** menu, click **Report Options**.
2. Select **Perform Grouping on Server** on the Report Options dialog box.

   This check box is inactive if Use Indexes or Server for Speed is not selected.

Tip:
When Use Indexes or Server for Speed is selected, you can quickly enable Perform Grouping On Server from the Database menu.

3. Click **OK**.

Benefits of grouping on server—an example

The following example describes a typical reporting scenario wherein grouping on server can significantly reduce the amount of unnecessary data transferred from the database server.

To decrease data transfer by grouping on server

1. Open the sample report **Group.rpt**.

   Look in the bottom right corner of the Crystal Reports window and notice that 269 records are returned for this report.

   Note:
   You'll see this number only if you have the Status Bar option selected on the View menu.

2. On the **Report** menu, click **Section Expert** to access the Section Expert.
3. In the **Sections** list, select **Details**.
4. On the **Common** tab, select **Hide (Drill-Down OK)**. This hides the report's Details section, so that only group header displays in the report. (In this case, the report is grouped by Country.)
5. Click **OK** in the Section Expert. The Details records will disappear from the report.
6. Press **F5** to refresh the report data (or click the **Refresh** button on the toolbar).

   Notice that 269 records are still returned for the report, even though the Detail records are hidden from view.

7. On the **Database** menu, click **Perform Grouping on Server**.

   Now notice that only 71 records are returned for the report. The grouping (by Country) has been performed on the database server, and fewer records have been transferred to the report.

8. Drill down on a country by double-clicking the report.

   Tip:
   When drill down is available, your cursor turns into a magnifying glass.

   Crystal Reports retrieves the appropriate Detail records as you need them.

   For instance, if you drill down on Australia, Crystal Reports quickly retrieves the seven records that make up the group.

By hiding the Details section of this report, you've created a summary report that's easy for users to navigate. Each user can first locate the Country with which he or she is concerned, and can then drill down to retrieve valuable details.

Moreover, by enabling the Perform Grouping on Server option, you've ensured that the initial processing is completed on the database server. Consequently, only the necessary records are transferred to the report.

For more information on server-side processing, see *Server-side processing*.

Using SQL Expressions for groups, sorts, and totals

For reports using Perform Grouping on Server, avoid sorting, grouping, or totaling on a formula field (whether Crystal or Basic syntax). Instead, replace the original formula field with an equivalent SQL Expression Field, and then sort, group, or total on the SQL Expression field. This will greatly improve the chances of the processing being done on the server.

For details on when else to use SQL Expressions, see *Using SQL expressions where appropriate*.

Using SQL Expressions for Case Logic

If your database supports Case Logic, and your report needs to summarize an If-Then-Else formula calculation, replace the formula with an SQL Expression field. In such cases, SQL Expression fields enable Crystal Reports to perform the report's grouping on the server.

For instance, suppose that you're reporting off of an MS SQL Server 7 database, which supports Case Logic. You need to include an If-Then-Else calculation in your report, and you need to summarize that calculation for each group in the report. By performing the calculation with an SQL Expression field of the following form, you use your database's ability to process Case Logic:

```
CASE DatabaseTable. "DatabaseField "
WHEN 'SpecifiedValue' THEN Calculation1
ELSE Calculation2
END
```

If a record's *DatabaseField* value is equal to *SpecifiedValue*, then *Calculation1* is performed; for all other records, *Calculation2* is performed. By incorporating the SQL Expression field, you take advantage of your database server's ability to process Case Logic. Your report's grouping consequently takes place on the server, even when you summarize the SQL Expression field elsewhere in the report.

Note:
The SQL syntax in this example is specific to MS SQL Server 7. You may need to refer to your database documentation or consult with your Administrator in order to determine the syntax appropriate to your database.

Inserting summary and running total fields where possible

Where possible, avoid creating formulas with global variables to calculate summaries or running totals.

Instead, create summaries by clicking the Insert menu and then selecting the appropriate command (Subtotal, Grand Total, or Summary). Create running total fields by opening the Field Explorer, right-clicking Running Total Fields, and then selecting New from the shortcut menu.

For general details on summarizing data, see *Sorting, Grouping, and Totaling* and *Running Totals*.

Record Selection

chapter 9

Selecting records

When a field is selected to appear on a report, field values from every record in the active table(s) are printed by default. In many cases, you may not want to include all the values, but only a subset of those values. For example, you may want to include:

- Records only for a specific group of customers.
- Records for a specific range of account numbers out of the total number of records in the database.
- Values from only those records that fall within a particular date range.

Options for selecting records

Crystal Reports includes a very sophisticated formula language that you can use to specify virtually any type of record selection. However, you may not always need the flexibility in record selection that the formula language provides. The Select Expert is designed for such instances.

You can select records in one of two ways:

- *Using the Select Expert*
- *Using formulas*

Once you are familiar with the Select Expert and formulas, you can use your record selection techniques to improve the performance of your reports.

For additional performance tips and advanced record selection strategies, see *Using enhanced record selection formulas* .

Determining which field(s) to use

When you select records, you are basing your report only on those records that meet some conditions that you have set. You base those conditions on the kind of information you want in the finished report.

Assume, for example, that you want a report that only shows data from California. The challenge is to find the best way to identify those records that come from California.

- If the table used in a report has a State or Region field, you can specify in your request that the program use only those records in which the value in the state field is equal to California (Region is equal to CA).
- If the table does not have a State field and you still want to report only on California data, there may be another way to identify that data.
  - If the table has a Postal Code field, you could base your record selection on the range of ZIP codes that apply to California (Postal Code is between `n` and `N`).
  - If the table has an Area Code field, you could base your record selection on California Area Codes (Area Code is one of x, y,....z).

Note:

- If the Area Code is stored in the telephone number field, you will not be able to do this same record selection using the Select Expert based on the Area Code. You will have to create a record selection formula using the formula language to extract the Area Code part of the phone number and then do record selection based on that.
- As a general rule, if you can base your record selection on a number of fields (as in this example), you should select an indexed field instead of a field that is not indexed for better performance.

Using the Select Expert

The Select Expert makes it easy to specify the records you want included in your report. When you work with the Select Expert, you select the field to which you want to apply selection conditions and then you specify those conditions.

The Select Expert can be used to set up simple record selection requests. For example:

- Customers from Arizona.
- Orders in the first quarter.
- Sales over $10,000.

The Select Expert can also be used to set up some sophisticated requests:

- Customers whose names start with "A", "M", or "S."
- Customers from California or Florida who ordered in July.

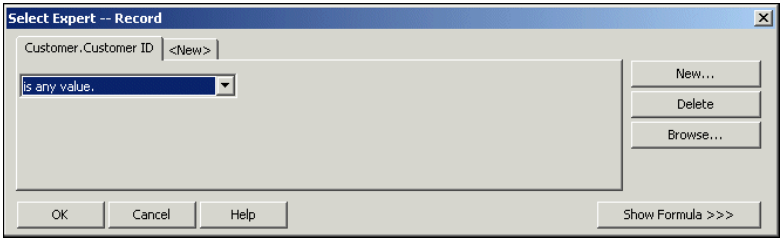
These are all range limit requests. One or more constants define the range. The program compares the field value in each record to the constant(s) and rejects records with values outside the range. The report is limited to values within the range. You can set up all of these types of record selection requests without any previous knowledge of the formula language.

Note:
The Select Expert can be used to set up both record selection and group selection requests. When a group name or summary field is selected, the program knows that the selection criteria set up is intended for group selection. In all other cases, the program knows that you are setting up record selection.

To set up record selection using the Select Expert

1. On the Expert Tools toolbar, click **Select Expert**.

   The Select Expert dialog box appears.



   Note:
   If you click the Select Expert button without first highlighting a field in your report, the Choose Field dialog box appears. Highlight the field on which you want to base record selection and click OK. The Select Expert appears.

2. Use the drop-down lists to enter your selection criteria for the indicated field.
3. Click **OK** when finished.

Tip:
To base record selection on more than one field, click the New tab. Select the next field from the Choose Field dialog box.

A selection formula is generated based on your specifications, limiting the report to the records you indicated.

Note:
To view the selection formula, click the Show Formula button. The Select Expert expands to show the formula. You can modify the formula in the area that appears, or you can click the Formula Editor button to modify it in the Formula Editor.

Using formulas

To set up record selection using a formula

1. On the **Report** menu, point to **Selection Formulas** and click **Record**.
2. In the Record Selection Formula Editor, enter the formula by typing in the components or selecting them from the component trees.

   Note:
   The resulting formula must be Boolean; that is, it must return either a True or False value.

3. Click **Check** to identify any errors in the formula.
4. Fix any syntax errors the Formula Checker identifies.
5. When the formula has the correct syntax, click **Save**.

Further information about formulas

- For sample record and group selection templates, see *Using formula templates*.
- For complete instructions on creating formulas, see *Using Formulas*.
- For advanced record selection strategies and performance tips, see *Using enhanced record selection formulas* .

Interaction of the Select Expert and the Formula Editor

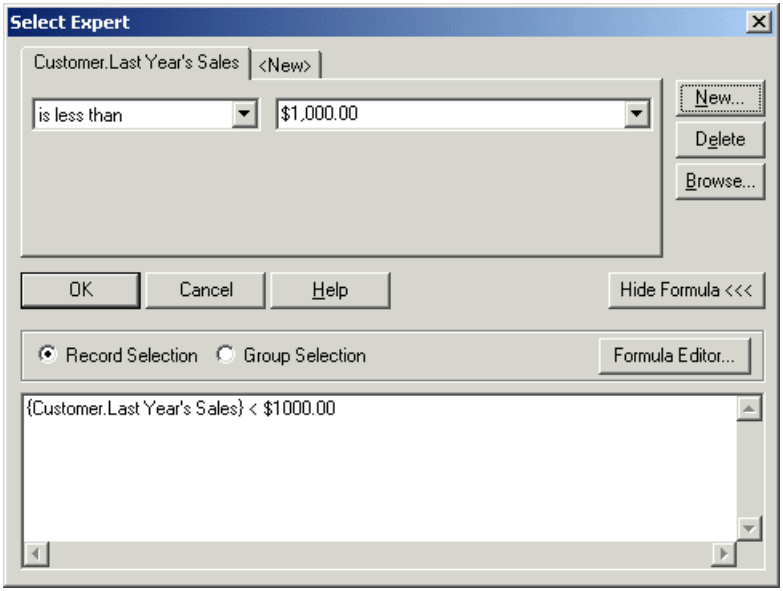
The Select Expert and the Record/Group Selection Formula Editor are interactive. That is, record selection criteria you enter via the Select Expert automatically generates a record selection formula which can be reviewed and modified. Likewise, record selection formulas and modifications to existing record selection formulas automatically update the selection criteria in the Select Expert.

Because of this interactivity, you can use the two tools together as a tutorial for learning the formula language.

To view the Select Expert formula

1. Right-click the field on which you want to view record selection.
2. Click **Select Expert**.
3. Click the **Show Formula** button.

   The Select Expert expands so you can review the formula the program generated based on your selection criteria.



4. Click the **Hide Formula** button when you are done with your review.
5. Use the Select Expert to change your selection formula.
6. Review the updated formula by clicking the **Show Formula** button again.
7. To make changes to the formula, click the **Formula Editor** button in the expanded Select Expert and use the tools in the Formula Workshop to make your formula changes.

Note:
Selection formula components that do not fit any of the fixed criteria in the Select Expert will not be translated. For example, if part of your record selection formula extracts the last four characters in a customer number, the section of the formula code that performs that extraction will not be converted to Select Expert selection criteria.

To view the Select Expert formula

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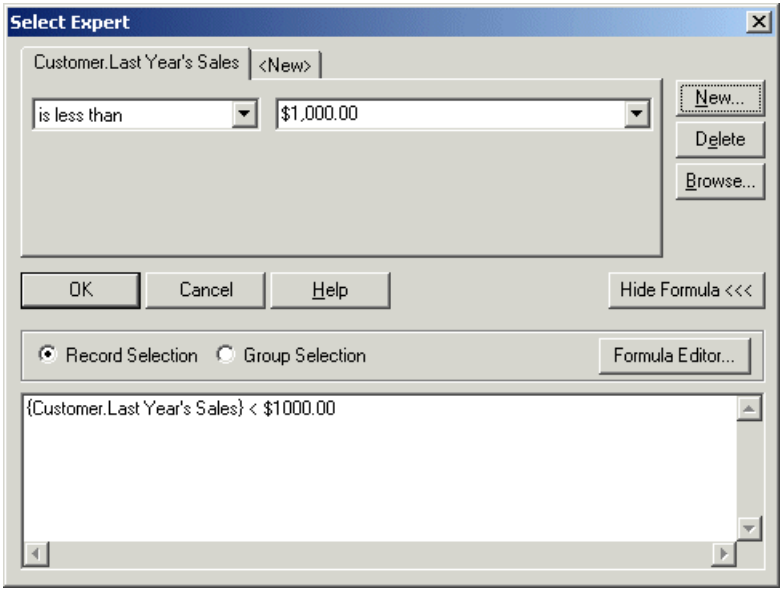
2. Click **Select Expert**.
3. Click the **Show Formula** button.

The Select Expert expands so you can review the formula the program generated based on your selection criteria.



4. Click the **Hide Formula** button when you are done with your review.
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6. Review the updated formula by clicking the **Show Formula** button again.
7. To make changes to the formula, click the **Formula Editor** button in the expanded Select Expert and use the tools in the Formula Workshop to make your formula changes.

Note:
Selection formula components that do not fit any of the fixed criteria in the Select Expert will not be translated. For example, if part of your record selection formula extracts the last four characters in a customer number, the section of the formula code that performs that extraction will not be converted to Select Expert selection criteria.

Saved data selection formulas

Saved data selection formulas filter report data after the records have been stored in the report. Like record selection formulas, they can be created using both the **Select Expert** and formulas.

Unlike record selection formulas, any change to a saved data selection formula does not cause a refresh to the database. Instead, the report's saved data is used for all subsequent filtering. Saved data selection formulas are used with parameters to create interactive report filters that you can customize.

Optional parameters

You can combine saved data selection formulas and optional parameters. For more information on optional parameters, see *Optional parameters*.

Using formula templates

Record selection formula templates

The following sample formulas can be used as templates to help you create your own selection formulas using the Formula Workshop. These examples illustrate different selections that you could do, not necessarily the best selections.

Selecting records using character strings

```
{file.FIELD} startswith "C"
```

Selects those records in which the value in the {file.FIELD} field begins with the character "C" (includes values like CyclePath, Corp. and Cyclist's Trail Co.; excludes values like Bob's Bikes Ltd. and Feel Great Bikes, Inc.).

```
not ({file.FIELD} startswith "C")
```

Selects those records in which the value in the {file.FIELD} field does not begin with the character "C" (includes values like Bob's Bikes Ltd. and Feel Great Bikes, Inc.; excludes values like CyclePath, Corp. and Cyclist's Trail Co.).

```
"999" in {file.FIELD}[3 to 5]
```

Selects those records in which the 3rd through 5th digits of the {file.FIELD} field is equal to "999" (includes values like 10999, 70999, and 00999; excludes values like 99901 and 19990).

```
"Cycle" in {file.FIELD}
```

Selects those records in which the value in the {file.FIELD} field contains the string "Cycle" (includes values such as CyclePath Corp. and CycleSporin, Inc.; excludes values like Cyclist's Trail Co. and Feel Great Bikes, Inc.).

Selecting records using numbers

Single values

```
{file.FIELD} > 99999
```

Selects those records in which the value in the {file.FIELD} field is greater than 99999.

```
{file.FIELD} < 99999
```

Selects those records in which the value in the {file.FIELD} field is less than 99999.

Range of values

```
{file.FIELD} > 11111 and {file.FIELD} < 99999
```

Selects those records in which the value in the {file.FIELD} field is greater than 11111 but less than 99999 (neither 11111 or 99999 is included in the range of values).

```
{file.FIELD} >= 11111 and {file.FIELD} <= 99999
```

Selects those records in which the value in the {file.FIELD} field is greater than 11111 but less than 99999 (both 11111 and 99999 are included in the range of values).

Selecting records using dates

The Month, Day, and Year functions can all be used in examples like the following:

```
Year ({file.DATE}) < 1999
```

Selects those records in which the year found in the {file.DATE} field is earlier than 1999.

```
Year ({file.DATE}) > 1992 and Year ({file.DATE}) < 1996
```

Selects those records in which the year found in the {file.DATE} field falls between 1992 and 1996 (1992 and 1996 not included).

```
Year({file.DATE}) >= 1992 and Year({file.DATE}) <= 1996
```

Selects those records in which the year found in the {file.DATE} field falls between 1992 and 1996 (1992 and 1996 are included).

```
Month({file.DATE}) in 1 to 4
```

Selects those records in which the month found in the {file.DATE} field is one of the first four months of the year (includes January, February, March, and April).

```
Month({file.DATE}) in [1,4]
```

Selects those records in which the month found in the {file.DATE} field is the first or fourth month of the year (includes January and April, excludes February and March).

Selecting records using preset date ranges

The preset date ranges can be used to create selection formulas similar to these:

```
{file.DATE} in LastFullMonth
```

Selects those records in which the date found in the {file.DATE} field falls within the last full month. (If the month is May, this selects all records with an April date.)

```
not({file.DATE} in LastFullMonth)
```

Selects all records except those in which the date found in the {file.DATE} field falls within the last full month (if the month is May, this selects all records except those with an April date).

Selecting records using date/number/character combinations

These formulas simply "mix and match" formulas from the categories above.

```
"C" in {file.FIELD}[1] and Month({file.DATE}) in [1,4]
```

Selects those records in which the value in the {file.FIELD} field begins with "C" and the month is either January or April. For example, if this kind of formula was used with an order database, you could be asking for a report showing all customers whose names begin with "C" and who placed orders in January or in April.

```
"AOK" in {file.HISTORY}[3 to 5] and {file.OPENCRED} >=
5000
```

Selects those records in which the {file.HISTORY} field shows the characters "AOK" as the 3, 4, and 5 characters and the {file.OPENCRED} field (the amount of available credit) is at least 5000.

These templates can be used as they are (with your own data), or they can be combined to create complex formulas.

Pushing down record selection to the database server

The drivers provided with Crystal Reports for SQL data sources allow "pushing down" record selection to the database server. When you specify a record selection formula in a report based on an SQL data source, Crystal Reports analyzes it, generates a SQL query from it and passes the SQL query to the database server. Record selection is then carried out in two stages:

- The first stage of record selection takes place when the database server processes the SQL query and returns a set of records to Crystal Reports.
- In the second stage, Crystal Reports further evaluates locally the record selection formula for the set of records returned from the database server.

Since database servers are usually faster machines than workstations, it is to your advantage to specify record selection formulas that can be processed by the server in the first stage. Doing so minimizes record selection on the local machine in the second stage. This process is commonly known as "pushing record selection down to the database server." The following kinds of record selections can be pushed down to the server:

- Selections with indexed and non-indexed fields (indexed fields provide faster response).
- SQL queries with AND and OR clauses.
- SQL expression fields that carry out formula calculations for record selection. (For the types of SQL expressions supported by your SQL server, consult the documentation provided with the server.)
- For complete details on pushing your record selection formulas down to the database server, see *Using enhanced record selection formulas* .

Troubleshooting record selection formulas

To troubleshoot your selection formula, you should first begin by making sure that all of the fields referenced in the selection formula are placed on your report. Then delete the selection formula and test it as you rebuild it, step by step.

To troubleshoot record selection formulas

1. Write down the record selection formula on paper. You will use this written copy to help you reconstruct the selection formula one step at a time.
2. Remove the record selection formula from your report by deleting the formula from the Record/Group Selection Formula Editor in the Formula Workshop.
3. Click **Close** when finished in the Formula Workshop.

4. Make certain that all fields referenced in the record selection formula (the selectors) are on the report physically and are not hidden.

   For example, if one of the selectors is:

   ```
   {customer.POSTAL CODE} > "80000"
   ```

   but the {customer.POSTAL CODE} field is not used on your report (as in the case of a sales report that uses the postal code to define territories but does not include the postal code in the report data), then insert the {customer.POSTAL CODE} field into the report.

   Or, if one of the fields referenced in the selection formula is on the report but is hidden, unhide it by deselecting the Suppress option in the Format Editor for that field.

5. Print the report and verify that the data in those fields which are referenced in the selection formula print satisfactorily. Make certain that all the data prints. For example, if there are x total records in the database you should have x records printing for each of the referenced fields. This establishes a baseline against which you can compare the results of printing with the selection formula.
6. When you are sure that you are getting satisfactory results without using the selection formula, you can enter the selection formula using only one of the selectors.

   For example, to use this as the final selection formula:

   ```
   {customer.POSTAL CODE} > "80000" and {customer.CONTACT
    LAST NAME}[1] = "C" and {customer.LAST YEAR'S SALES}
    >= 5000
   ```

   this formula will select all of those records that show a Postal code greater than 80000, a value in the {customer.CONTACT LAST NAME} field beginning with "C", and a value in the {customer.LAST YEAR'S SALES} field greater than or equal to 5000.

   You might start with this as the first test selection formula:

   ```
   {customer.POSTAL CODE} > "80000"
   ```

   Print the report and evaluate the data that prints when you have only one selector activated. Does the {customer.POSTAL CODE} field show only ZIP codes greater than 80000?

- If it does, then you know that this part of the selection formula is working.
- If it does not, then troubleshoot this part of the selection formula.

7. Once the selection formula with one selector activated is working properly, add a second selector. For example, the new selection formula might look like this:

```
{customer.POSTAL CODE} > "80000" and {customer.CONTACT
 LAST NAME}[1] = "C"
```

8. Preview the report and evaluate the data that prints when you have two selectors activated. Evaluate the data in the {customer.CONTACT LAST NAME} field (since you already evaluated {customer.POSTAL CODE} in the last step).

   Does the {customer.CONTACT LAST NAME} field show only text strings beginning with the letter "C"?

   - If it does, then this part of the selection formula is working.
   - If it does not, then troubleshoot this part of the selection formula.

9. Once the selection formula with two selectors activated is working properly, add a third selector, then a fourth, and so on, until you have tested each selector in the selection formula.

Correcting selections that do not generate data

You may encounter a situation in which you create a record selection formula and, while header and footer information prints on your report, no detail information appears. The problem is the selection formula is rejecting all records. This usually occurs because of an error in the creation of the selection formula.

Correcting uppercase/lowercase inconsistency

Record selection formulas are case sensitive. That is, "Bob" matches only with "Bob". It does not match with "bob", "BOB", "BoB", "bOB", "boB", or "BOb". Thus, if your selection formula is set to include only those records with "BOB" in the {customer.CONTACT FIRST NAME} field, but all the entries

in the {customer.CONTACT FIRST NAME} field are mixed case ("Bob", for example), the selection formula will find no matches and thus will not print any details for the report.

You can solve this problem by using the UpperCase (str) or LowerCase (str) functions in your selection formula to convert field data to a consistent case before the program begins its selection. For example, if you were using this formula:

```
{customer.CONTACT FIRST NAME} = "BOB"
```

you can change the formula to this:

```
UpperCase({customer.CONTACT FIRST NAME}) = "BOB"
```

This second formula first converts the value of the {customer.CONTACT FIRST NAME} field to upper case characters and then checks to see if the resulting value in that field is equal to "BOB". Using this formula, any instance of the three letters "b," "o," and "b" will be a match, regardless of case, because the case will be converted to uppercase.

You could use the LowerCase function in a similar manner to match with "bob."

Check your selection formula closely and make sure you have the correct case for any text you are trying to match. If in doubt, use the UpperCase (or LowerCase) function to assure consistency and proper matching.

Another formula which performs much the same functions is the following:

```
"BOB" in UpperCase({customer.CONTACT FIRST NAME})
```

Unwanted spaces appear in selection formula

Spaces are characters, and when you include spaces in the search key of a record selection formula, the formula looks for records with the exact match in the selected field, spaces and all. For example, the following formula:

```
"Mr . " in {customer.TITLE}
```

will not find any matches with the form of address "Mr." because there is an extra space in the search key between the letter "r" and the period. Likewise, "Ph. D" will not match "Ph.D".

Check your selection formula closely, and make sure that the spaces in the selection formula match the spaces in the fields you are trying to match.

Using If statements in selection formulas

When creating record selection formulas that include If statements, always include the Else keyword; otherwise, no records or unexpected records may be returned. For example, a record selection such as `If {parameter field} = "less than 100" then {field} < 100` evaluates as False and returns no records. To correct this problem, complete the formula with `Else True`.

Sorting, Grouping, and Totaling

chapter 10

Sorting data

Sorting means placing data in some kind of order to help you find and evaluate it.

When you first insert a database field into your report, the data within the fields appears in the order in which it was originally entered into the database. Locating information in this kind of report is difficult. It is much easier to review or find information when you can see it sorted in a logical format. For example, you may want to have a customer list sorted alphabetically by name or by country.

Understanding sort options

When you sort, the program asks you to define two things:

- The field you want the sort to be based on (sort field).
- The sort direction.

Sort field

A sort field is the field that determines the order in which data appears on your report. Almost any field can be used as a sort field, including formula fields. A field's data type determines the method in which the data from that field is sorted.

Note:
You cannot sort on memo or BLOB fields.

Field Type	Sort Order
Single-character string fields	blanks punctuation numbers uppercase letter lowercase letters
Multiple character string field	two letters three letters four letters, and so on For example: • "123" comes before "124" • " " (blank) comes before "a" • "aa" comes before "aaa"
Currency fields	numeric order
Number fields	numeric order
Date fields	chronological order
DateTime fields	chronological order same-date values sorted by time
Time fields	chronological order

Field Type	Sort Order
Boolean comparison fields	False values (0) True values (1)
Null values	null values non-null values

Note:
If sorting and grouping are performed on the database server, sort order may vary when Unicode or UTF-8 data is used. The order applied depends on the rules in place for your data source. In certain cases, Unicode data is sorted by its binary value, but it can also be sorted according to a particular locale setting. Refer to the documentation for your data source for details on how Unicode data fields are sorted.

Sort Direction

Direction refers to the order in which the values are displayed, once sorted.

- Ascending

  Ascending order means smallest to largest (1 to 9, A to Z, False to True). The program sorts the records in ascending order based on the values in the sort field you select.

- Descending

  Descending order means largest to smallest (9 to 1, Z to A, True to False). The program sorts the records in descending order based on the values in the sort field you select.

Sorting single and multiple fields

In single field sorting, all the records used in the report are sorted based on the values in a single field. Sorting an inventory report by stock number or sorting a customer list by customer number are examples of single field sorts.

In multiple field sorts, the Report Designer first sorts the records based on the values in the first field selected, putting them in ascending or descending order as specified. When two or more records have the same field value in the first sort field, the program then sorts those records based on the value in the second sort field.

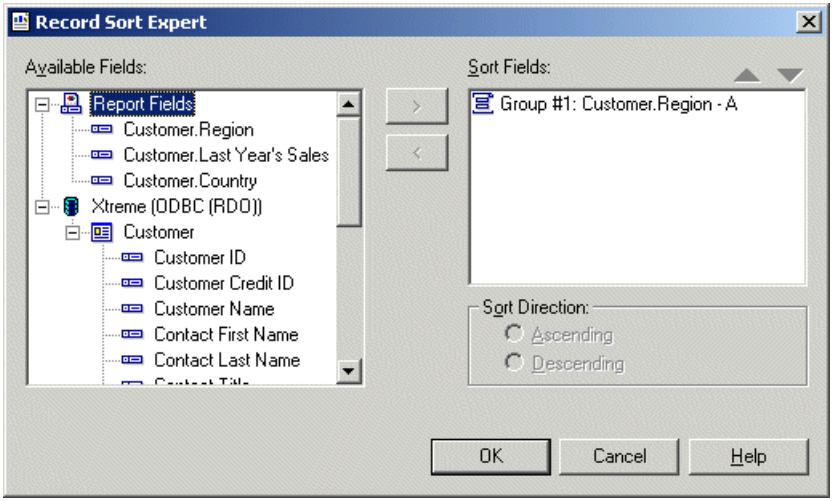
For example, if you choose to sort first by the {customer.COUNTRY} field and then by the {customer.REGION} field, both in ascending order, the report would appear with countries listed in alphabetic order, and regions within each country listed in alphabetic order. Any other fields, such as the postal codes within each region, would remain unsorted.

You create single or multiple field sorts using the same procedure.

To sort your data

1. On the **Report** menu, click **Record Sort Expert**.

   The Record Sort Expert appears.



2. Highlight the field to be sorted from the Available Fields area.
3. Click the > arrow.

   The selected field is added to the Sort Fields list.
4. Specify the sort direction.
5. If sorting by more than one field, highlight the second field you want the data to be sorted by and add it to the Sort Fields list.
6. If you want to change the order of fields in the Sort Fields list, highlight the field you want to move and click the arrow buttons to move it up or down.

   Tip:
   The order of the fields listed in the Sort fields box is the order by which data will be sorted.
7. As you add each field to the Sort Fields list, specify the sort direction.
8. Click **OK** when finished.

   Records are sorted based on the values in the Sort Fields list.

Sort controls

You may want to design your report so that users can modify a sort field or sort direction without refreshing information from the database. You can do this using a "Sort Control".

A "Sort Control" is particularly useful for several reasons:

- It allows users to sort report data for further analysis without leaving the canvas of the report.
- It eliminates processing demand on the database.
- It reduces the time users spend waiting for data to be sorted.
- It allows users to sort fields in the report even if they do not have a connection or rights to access the database at the time of viewing.

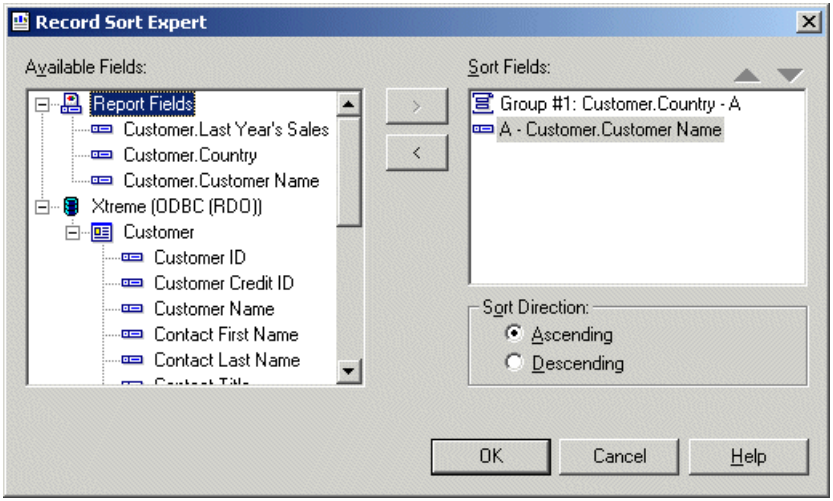
When planning to include a "Sort Control" in your report, it is important to consider the following points:

- Sort controls apply across an entire record set; you cannot sort only one group.
- Sort controls cannot be used in sub-reports.
- Sort controls cannot be created within a cross-tab or an OLAP grid.
- The use of sort controls causes any open drill-down tabs to close (a warning prompt alerts users).

To create a Sort Control

1. Once the data is grouped, on the **Report** menu, click **Record Sort Expert**.

   The "Record Sort Expert" appears.



Note:
Sort fields that begin with "Group" specify that the sort was done automatically when the data was grouped.

2. Highlight the fields that you want to sort by and click the > arrow to add them to the **Sort Fields** list.

   The order of the fields in the **Sort Fields** list is the initial order by which data is sorted.

   Note:
   To enable a **Sort Control** on a field, that field must be included in the **Sort Fields** list.

3. Click **OK** when finished.
4. Create your **Sort Control**:
   - If you want to use an existing text object:
     a. On your report, right-click the text object that you would like to use as a **Sort Control**.
     b. Click **Bind Sort Control**.

        The **Sort Control** dialog box appears.

     c. Select a sort field and click **OK**.
   - If you want to add a new text object:
     a. On the **Insert** menu, click **Sort Control**.

b. Select a sort field and click **OK**.
c. Click and drag your cursor to the report location where you would like to insert the **Sort Control**.
d. Enter a name for the new **Sort Control**, and click outside the text object to complete the process.

5. Repeat Step 4 for any other sort controls you want to create.

Users can sort the fields you have selected by clicking the sort arrows that appear beside the text object. The report promotes the selected field temporarily to the top of the sort order. When a second "Sort Control" is used, the first is returned to its original position in the sort order and the second is promoted to the top sort.

Note:
Grouping hierarchy is not affected by "Sort Control".

To remove a sort control

1. Right-click the text object that contains the existing **Sort Control**.
2. Click **Bind Sort Control**.
   The "Sort Control" dialog box appears.
3. Click **< Not Interactive >**.
4. Click **OK** to return to your report.

The "Sort Control" is removed from the report.

Grouping data

Grouped data is data that is sorted and broken up into meaningful groups. In a customer list, for example, a group might consist of all those customers living in the same Zip Code, or in the same Region. In a sales report, a group might consist of all the orders placed by the same customer, or all of the orders generated by a particular sales representative.

Group and sort direction

When data is grouped, four sort and group direction options are available. Direction refers to the order in which the values are displayed.

- Ascending

  Ascending order means smallest to largest (1 to 9, A to Z, False to True). The program sorts the records in ascending order and then begins a new group whenever the value changes.

- Descending

  Descending order means largest to smallest (9 to 1, Z to A, True to False). The program sorts the records in descending order and then begins a new group whenever the value changes.

- Specified order

  Specified order is a user-defined order. The program places each record into the custom group you specify, leaving the records in each group in original order or it sorts them in ascending or descending order, depending on your instructions. See *Creating custom groups*.

- Original

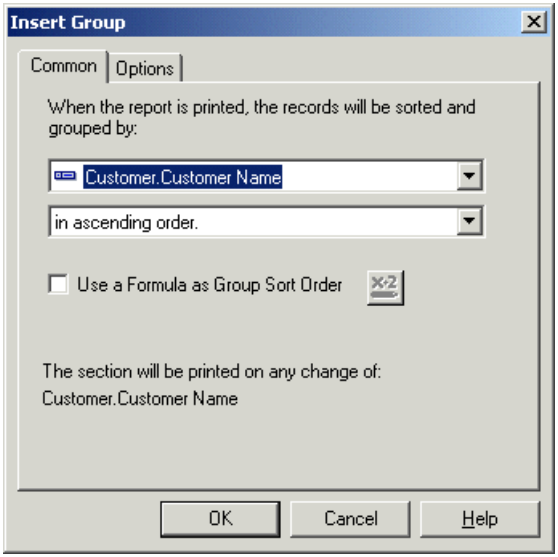
  Original order is the order the data was originally saved in the database. The program leaves the records in the order in which they appear in their originating database table, and begins a new group whenever the value changes in the group field you select.

You can also choose the sort order of your groups based on a condition. For more information, see *Sorting groups conditionally*.

To group data

1. On the **Insert** menu, click **Group**.

   The Insert Group dialog box appears.



2. Select the field you want the data grouped by from the top drop-down list.
3. Select the sort direction from the second drop-down list.

   Note:
   If you want to use a formula for the sort order of your group, see *Sorting groups conditionally*.

4. If you want to show a different value in the group header, click the **Options** tab.

   Note:
   By default, the group header of the report will display the value of the field you are grouping on.

5. Select the **Customize Group Name Field** check box and choose a new group name.

   For example, if you grouped by {Customer.CustomerID}, at each change of a group you will see the corresponding customer ID. If you want to display a different value (customer ID as well as customer name), customize the group name field by choosing an alternate data field, or creating a formula.

Tip:
To hide the group header name, right-click the group header, select Format Field, and click Suppress on the Common tab of the Format Editor.

6. Click **OK**.

   If your records within each group are unsorted, you need to sort the records within each group. See *Sorting records within groups*.

Related Topics

- *Grouping data in intervals*
- *Creating group headers*

Creating custom groups

Usually data is sorted based on the values from a field in the report. Sometimes, however, you may not want to group data based on the values found in one of the fields on your report. For example:

- The field you want to group on does not exist.

  For example, your report may contain a City field and a State field, but no Country field, although you need to group by country.

- The field exists, but you do not want to group on the values in that field.

  For example, you may have a Color field on your report that includes specific color names (Logan Green, Sky Blue, Emerald Green, Navy Blue, and so on) but you want all shades of each color to appear as a single group (Greens, Blues, Reds, and so on). In this case you can build custom groups and manually assign the records you want to be in each group.

- The field exists, but you want to select specific values or ranges of values for each group.

  For example, you might want one group to contain records where gross sales are less than a certain value, a second group where gross sales are greater than a certain value, and a final group where gross sales fall between two values. In this case, you can build your groups using the same range of selection facilities that are available to you for building record selection queries.

Specified order grouping provides a solution to these custom sorting and grouping challenges. It enables you to create both the customized groups that will appear on a report and the records that each group will contain. The only limitation is that a record can be assigned to only one group.

To follow a tutorial where you create custom groups to rank customers by the amount of business they did in the previous year, see *Grouping data in intervals*.

To create a custom group

1. On the **Insert** menu, click **Group**.

   The Insert Group dialog box appears.
2. Select the field you want the data grouped by from the top drop-down list.
3. Select **in specified order** as your sort option from the second drop-down list.
4. On the **Specified Order** tab, enter the name of the group in the **Named Group** field.
5. Click **New**.
6. In the Define Named Group dialog box, use the drop-down lists to select the data to be part of the group.
7. Click the **<New>** tab to add more selection criteria to your specified group, if necessary.
8. Click **OK**.
9. Click **New** to create more custom groups as necessary.
10. Click the **Others** tab to specify how you want to organize the data that is not part of the group(s) you defined.
11. Click **OK**.

Sorting groups conditionally

Although it is often sufficient to choose the sort order for a group in your report when you create the group, there may be times when you want your users to choose their own group sort order.

For example, if you group a sales report by invoice date, you might want your users to choose whether they see that data from earliest invoice date to most recent invoice date (ascending order) or most recent invoice date to earliest invoice date (descending order).

To create a conditional group sort order for this report, you might create a new parameter to prompt for the user's selection, and then pass this selection to a conditional group sorting formula.

To sort a group conditionally

1. Open or create the report that you want to sort conditionally.

   In the case of the example mentioned in this section, open or create a report that contains invoice information.

2. In the Field Explorer, select **Parameter Fields**, and click **New**.
3. Create a string parameter that contains the sorting options that you want your users to see.

   For this example, create a parameter called Sort Order that has two values: Ascending and Descending.

   Tip:
   For information about how to create parameters, see *Creating a parameter with a static prompt*.

4. Click **OK** to save your parameter.
5. On the **Insert** menu, click **Group**.
6. In the Insert Group dialog box, select the field that you want to group on.

   For this example, select your invoice date field.

7. Select **Use a Formula as Group Sort Order**, and click the Conditional Formula button next to it.

   Note:
   This option is not available if you choose "in specified order" as the sort order for your group.

8. In the Formula Workshop, enter your conditional formula text.

For this example, enter this text:

```
If {?Sort Order} = "Ascending" then crAscendingOrder
else crDescendingOrder
```

9. Click **Save and close** to return to your report.
10. Click **OK** to save your group.
11. When you are prompted to select a Sort Order, select the option that you want, and click **OK**.

Your report appears with groups for the field that you selected in the Insert Group dialog box and sorted in the order that you selected in your parameter prompt. To select a different sort order, click the Refresh button and choose "Prompt for new parameter values." The groups in your report are resorted to comply with the new order option that you selected.

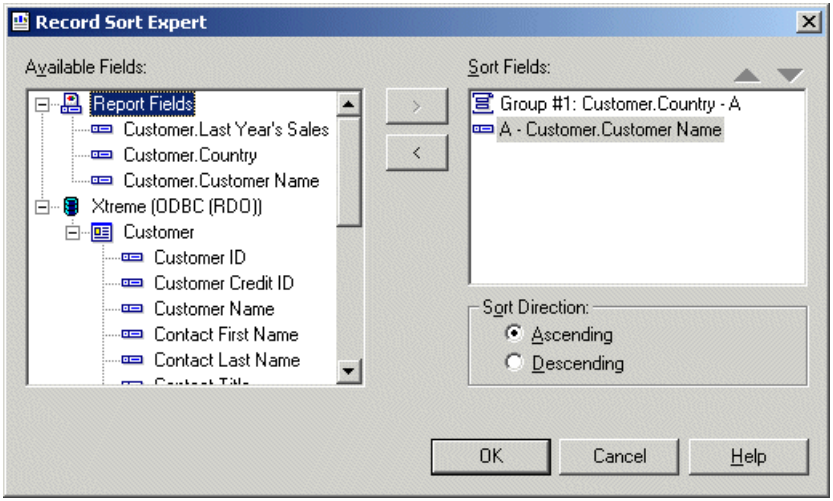
Sorting records within groups

Once you have grouped your data, you can easily sort the records within the groups to further organize the information.

To sort records within groups

1. Once the data is grouped, on the **Report** menu, click **RecordSort Expert**.

   The Record Sort Expert appears.



Note:
Sort fields that begin with "Group" specify that the sort was done automatically when the data was grouped.

2. Highlight the field you want the records within the groups sorted by and click the > arrow to add it to the **Sort Fields** list.

   Note:
   The order of the fields in the Sort Fields box is the order by which data will be sorted.

3. Specify the sort direction.
4. Click **OK** when finished.

Group selection

When you group or summarize data, all the groups in the report are included by default. There may be times, however, when you do not want to include all the groups. For example:

- You might want to see only those groups that have certain group names, or whose summarized values meet a certain condition.

- You might want to see only the groups with the highest summary values, or the lowest.

You can select the groups that appear in the report in two different ways:

- By using the Select Expert.
- By using selection formulas.

Note:
For faster results, limit records through record selection before creating groups. See *Selecting records*.

Using the Select Expert

The Select Expert can be used to select groups of records in the same way that you select individual records.

When you are setting up group selection criteria, instead of basing the selection criteria on standard fields, as you do for record selection, you base the criteria on group name fields or summary fields.

- If you have grouped your data but have not summarized it, you can only set up group selection based on the group name field. For example, you may want to select only those groups whose Region is Massachusetts:

```
GroupName ({Customer.REGION}) = "MA"
```

- If you have summarized your data, you can set up group selection based on either the group name field or the summary field. For example:

```
Sum({Customer.LAST YEAR'S SALES}, {Customer.REGION})
> 10000
```

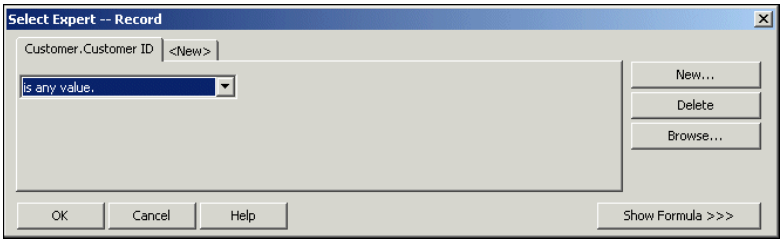
Note:
The Select Expert can be used to set up record selection and group selection requests. When a group name or summary field is selected, the program knows that the selection criteria you set up is intended for group selection. In all other cases, the program knows that you are setting up record selection.

To set up group selection using the Select Expert

1. Right-click the summary field on which you want to base group selection and choose **Select Expert** from the shortcut menu.

The Select Expert dialog box appears.

Note:
If you click the Select Expert button without first highlighting a summary field in your report, the Choose Field dialog box appears.



2. Use the drop-down list to enter your selection criteria for the indicated field.
3. To base the group selection on more than one field, click the **New** tab and choose the next field from the Choose Field dialog box.

Note:
If you have not already previewed the report or refreshed the data, there will not be any data saved with the report. Without the data, the program cannot calculate group values; thus, no values appear when you click the arrow in the right drop-down list. In this situation, you will have to type in the values you want. If you want real values to work with, you will need to preview your report first. This will calculate the actual summary values available for you to work with.

4. When you are finished, click **OK** in the Select Expert to return to the report.

Using selection formulas

With the Group Selection Formula Editor, you can build your group selection request using group fields, group name fields, and other formulas. As with record selection formulas, your only restriction is that the formula you create must be Boolean; that is, it must return either a True or False value.

To create a record or group selection formula

1. On the Report menu, point to **Selection Formulas**.

2. Click **Record** to create a record selection formula.

   - or -

   Click Group to create a group selection formula.

   The Formula Workshop appears.

3. Enter your selection formula in the Group Selection Formula Editor.

   Note:
   The resulting formula must be Boolean; that is, it must return either a True or False value.

4. Click **Check** to identify any errors in the formula.
5. Fix any syntax errors the Formula Checker identifies.
6. When the formula has the correct syntax, click **Save**.

   When the program runs the report, it will include only those records or groups of records that you specified.

Troubleshooting group selection formulas

In some cases, no values will print when using a group selection formula, even though there are values that match the selection criteria. Typically, in these cases:

- The group selection formula references another formula.
- The referenced formula is one that calculates the value of each group as a percentage of the total value of all groups (in other words a subtotal as a percentage of a grand total).

To correct a group selection formula

1. Use Xtreme.mdb to create a report that includes the following fields:

```
{customer.CUSTOMER NAME}
{customer.REGION}
{orders.ORDER ID}
{orders.ORDER AMOUNT}
```

Note:
Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

For each order, the report shows the customer that placed the order, the region in which that customer is located, the order ID number, and the amount of the order.

2. Group the report by the {customer.REGION} field.
3. Insert a summary that subtotals the {orders.ORDER AMOUNT} field for each {customer.REGION} group.

   The program calculates a subtotal in the {orders.ORDER AMOUNT} field every time the region changes. See *Subtotaling data*.
4. Insert a grand total on the {orders.ORDER AMOUNT} field to see the total value of all orders placed.
5. Create a formula named Percent that calculates each subtotal as a percentage of the grand total to see the value of the orders for each region group as a percentage of all orders placed.

```
Sum({orders.ORDER AMOUNT}, {customer.REGION})
     % Sum({orders.ORDER AMOUNT})
```

6. Place the formula in the Group Footer section of the report.
7. Reference the formula (@Percent) in a group selection formula that selects only those groups for which the percentage (of subtotal to grand total) is less than 5% in order to find out which regions individually contributed less than 5% of total sales:

```
{@Percent} < 5
```

When you click Check, you will receive the following error message:

```
This formula cannot be used because it must be evalu
ated later.
```

8. Instead of using the formula name (in this case @Percent) in the group selection formula, enter the formula itself (the formula named @Percent). Thus, instead of using the group selection formula:

```
{@Percent} < 5
```

use the group selection formula:

```
Sum({orders.ORDER AMOUNT}, {customer.REGION})
     % Sum({orders.ORDER AMOUNT}) < 5
```

Now when you print, only the regions that contributed less than 5% will print.

Grouping data in intervals

You may want to group your data into intervals. Age groups, time periods, and sales categories are some of the interval groupings that can be created. In this example, you will rank customers by the amount of business they did in the previous year.

This example uses specified order grouping. This kind of grouping lets you specify the records that will be included in each group. You define the intervals you want and the program will do the rest.

To group data in intervals

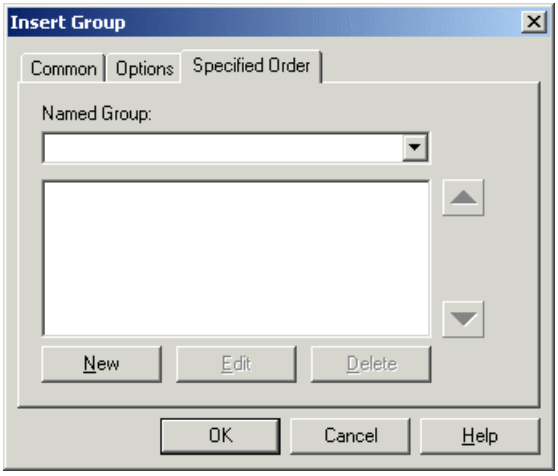
1. Create a report using the sample data, **Xtreme.mdb**, and place the following fields from left to right in the Details section:

   ```
   {customer.CUSTOMER NAME}
   {customer.REGION}
   {customer.POSTAL CODE}
   {customer.COUNTRY}
   {customer.LAST YEAR'S SALES}
   ```

   Note:
   Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

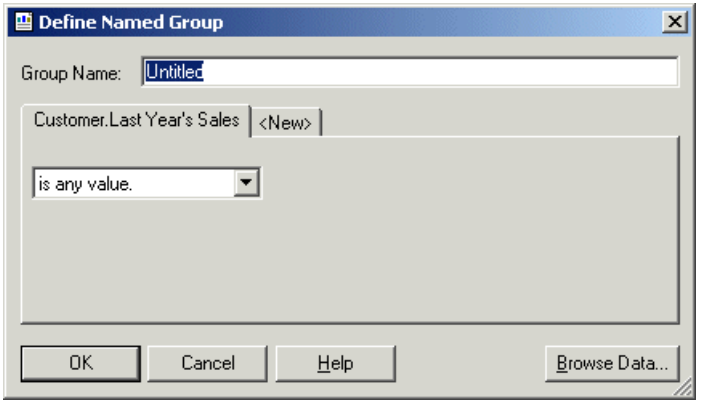
2. On the **Insert** menu, click **Group**.
3. Because you want to set up intervals based on the previous year's sales, select Last Year's Sales as the sort-and-group-by field from the drop-down list on the Insert Group dialog box.
4. Select **in specified order** from the second drop-down list.

   The Specified Order tab appears in the Insert Group dialog box.



5. Click the **New** button.

   The Define Named Group dialog box appears.



6. Type "Less than $10,000" in the **Group Name** field.

   This is the name that will appear as the Group Name field value for the group.

7. Since the first group is to contain only those records that have a Last Year's Sales figure of less than $10,000, set the fields so your condition reads:

   ```
   is less than 10000
   ```

8. Click **OK** to return to the Specified Order Tab.
9. Click **New**.

   The Define Named Group dialog box reappears.

10. Set up a second group that contains values between $10,000 and $25,000.
    - Type "$10,000 to $25,000" in the Group Name field.
    - Set the first field so the condition reads: `is between`.
    - Specify a range of values:
      - Type "10000" in the top field.
      - Type "25000" in the bottom field.

11. Click **OK** to return to the Specified Order tab.
12. Click **New**.

    The Define Named Group dialog box reappears.

13. Set up the final group that contains all values over $25,000.
    - Type "Over $25,000" in the Group Name field.
    - Set the first field so the condition reads: `is greater than`.
    - Type "25000".

14. Click **OK** to return to the Specified Order Tab.
15. Click **OK**.

    The report is grouped by interval in a specified order.

Grouping by the first letter of a company name

You might want to break your data into groups based on the first letter of the company name. For example, in a customer list you might want all the "A"

customers in a group, then all the "B" customers, and so forth. To do this requires the use of a formula.

Do not worry if you are unfamiliar with formulas. This text will show you what formula you need here and how to enter it.

You can learn more about creating and editing formulas in *Formulas overview*.

You are going to create a formula that will extract the first letter of each customer's name. Then you will group the data using that formula field as the sort-and-group-by field. The program will sort the data based on the first letter of each customer name and start a new group whenever that letter changes.

To group data by the first letter of a company name

1. Create a report using the sample data, **Xtreme.mdb**, and place the following fields from left to right in the Details section:

```
{customer.CUSTOMER NAME}
{customer.REGION}
{customer.POSTAL CODE}
{customer.COUNTRY}
```

Note:
Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **View** menu, click **Field Explorer**.

   The Field Explorer dialog box appears.

3. Select **Formula Fields** and click **New**.
4. In the Formula Name dialog box, enter the name you want to identify the formula, for example "First Letter," and then click **OK**.

   The Formula Workshop appears with the Formula Editor active.

5. Type the following formula into the Formula text box:

```
{Customer.Customer Name}[1]
```

6. Click **Save and close** to return to your report.

7. On the Insert menu, click **Group**.

   The Insert Group dialog box appears.

8. Select the formula field as the field you want your data grouped by from the first drop-down list.
9. Select the sort direction from the second drop-down list.
10. Click **OK**.

    You return to your report with the data grouped by the formula field as specified. The data is broken into groups based on the first letter in the customer's name. The formula provides a live header for every group.

    For more information on live headers, see *Live headers*.

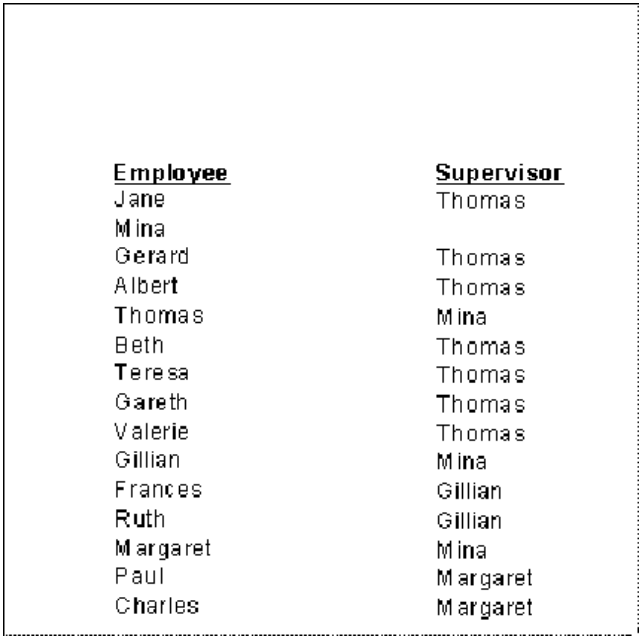
Related Topics

- *Formulas overview*
- *Grouping data*
- *Grouping data in intervals*
- *Creating group headers*

Grouping data hierarchically

To group data hierarchically

1. Create or open a report that contains the data you want to group and sort hierarchically.



Employee	Supervisor
Jane	Thomas
Mina	
Gerard	Thomas
Albert	Thomas
Thomas	Mina
Beth	Thomas
Teresa	Thomas
Gareth	Thomas
Valerie	Thomas
Gillian	Mina
Frances	Gillian
Ruth	Gillian
Margaret	Mina
Paul	Margaret
Charles	Margaret

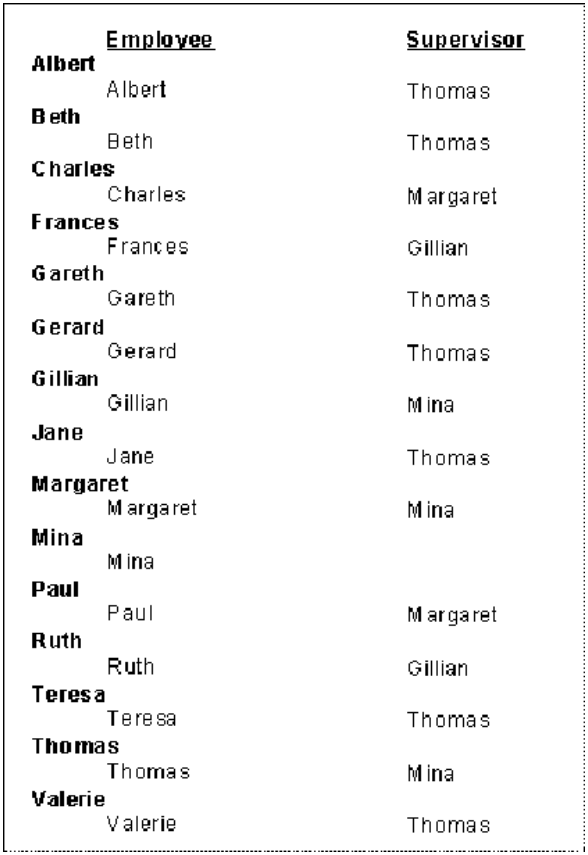
2. On the **Insert** menu, click **Group**.
3. In the Insert Group dialog box, select the field that you want to use as the basis of your hierarchy (the child field).

   For example, if you want to see the hierarchical structure of a company's employees, select the employee field.
4. Select **in ascending order**.

   By default, the group header of the report displays the value of the field you are grouping on.
5. If you want to show a different value in the group header, click the **Options** tab and select the **Customize Group Name Field** check box.

   For example, if you grouped by the employee field, at each change of a group you will see the corresponding employee name. If you want to display a different value (employee ID instead of employee name), customize the group name field by choosing an alternate data field, or by creating a formula.
6. Click **OK**.

   The group you created is added to the report.



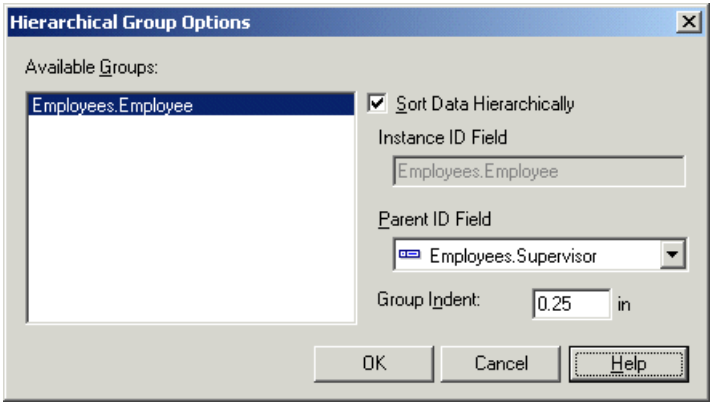
Employee	Supervisor
Albert	
Albert	Thomas
Beth	
Beth	Thomas
Charles	
Charles	Margaret
Frances	
Frances	Gillian
Gareth	
Gareth	Thomas
Gerard	
Gerard	Thomas
Gillian	
Gillian	Mina
Jane	
Jane	Thomas
Margaret	
Margaret	Mina
Mina	
Mina	
Paul	
Paul	Margaret
Ruth	
Ruth	Gillian
Teresa	
Teresa	Thomas
Thomas	
Thomas	Mina
Valerie	
Valerie	Thomas

7. On the **Report** menu, click **Hierarchical Grouping Options**.
8. In the **Available Groups** list of the Hierarchical Options dialog box, select the group you want to organize hierarchically.
9. Select the **Sort Data Hierarchically** check box.
10. In the **Parent ID Field** list, select the field by which you want the Instance ID Field organized.

    For example, for an employee hierarchical report, you might select the data field listing the supervisor to whom the employee reports.

    Note:
    The Instance ID Field and Parent ID Field must be of the same data type. For example, if the Instance ID Field holds string data, then the Parent ID Field must also hold string data.

11. In the **Group Indent** field, enter the amount you want to indent for each subgroup.

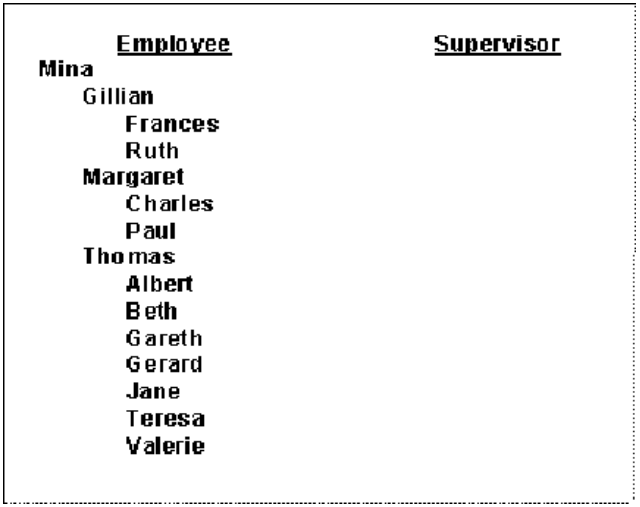


The value that you enter in the Group Indent field affects all other objects that are in the same area as your hierarchical group. For example, if your report contains a salary field on the same line as the name of the employee, the salary field is also indented when you use the employee field to create a hierarchical group. To indent only the hierarchy records and not the other objects, leave this value as 0 (zero) and use the conditional-X-position feature.

12. Click **OK**.

The report data is now grouped hierarchically.

Note:
In this example, the Details section in the report has been hidden to show the hierarchical sorting more clearly.



The report is now grouped by employee name and further sorted to show the supervisor hierarchy. You can see that Mina, whose employee data had no supervisor data associate with it, has been sorted at the top of the list. Under Mina's name is each supervisor who reports to her; and under each of those supervisors is a list of employees who reports to him or her.

Note:
The level at which a name appears in the hierarchy of this report is determined by the number of employees who report to him or her. Those employees with no one reporting to them are at the lowest level in the hierarchy.

If you want to, you can now calculate summary fields across your new hierarchical grouping. When inserting a subtotal, grand total, or summary in the usual manner, select the "Summarize across hierarchy" option. For more information, see *Summarizing grouped data* and *Subtotaling*.

To indent a hierarchy without affecting other fields

Note:
For this procedure to work, you must ensure that the value in the Group Indent field of the Hierarchical Group Options dialog box is set to 0 (zero).

1. Right-click the field that you grouped hierarchically, and select **Size and Position**.

2. Click the Conditional Formula button next to the X position value field.
3. In the Formula Workshop, enter your conditional X position formula text.

   For example, enter formula text such as this:

```
numbervar hLevel := HierarchyLevel (1);
numbervar deltaX := 0;
if (hLevel > 1) then
    deltaX := (hLevel - 1) * 0.4;
deltaX := deltaX * 1440;
```

   Note:

   - There are several ways that you can create this formula; this code is an example of one way.
   - Positions are measured in twips; there are 1440 twips in an inch.

   Search the online help for "HierarchyLevel (GroupingLevel)" to learn more about the function used in this example.

4. Click **Save and close** to return to your report.
5. Click **OK** to save your position setting.

Crystal Reports moves the values in your hierarchical data to new positions based on their level in the hierarchy, but leaves other objects that are on the same lines where you originally placed them.

Characteristics of the data needed for hierarchical grouping

You can group data in a report to show hierarchical relationships. When you group data hierarchically, Crystal Reports sorts information based on the relationship between two fields. A hierarchical relationship must be inherent in the data that you use for the report:

- Parent and child fields must be of the same data type for the program to recognize a relationship between them.
- The data in the parent field must be a subset of the data in the child field.
- For the top level of a hierarchy to appear in a report, the value must appear in the child data, and the corresponding row in the parent data must be empty.

- There cannot be any circular logic in the data (that is, A cannot be related to B, while B is related to C, and C is related back to A).

For example, if you want to show the hierarchical relationship of the people who work in a department, you could group data by employee name (the child field) and specify the hierarchy by using the field that lists whom the employee reports to (the parent field). Your database tables might look like the following example.

Employee (child)	Supervisor (parent)
Jane	Thomas
Mina	
Gerard	Thomas
Albert	Thomas
Thomas	Mina
Beth	Thomas
Teresa	Thomas
Gareth	Thomas
Valerie	Thomas
Gillian	Mina

Employee (child)	Supervisor (parent)
Frances	Gillian
Ruth	Gillian
Margaret	Mina
Paul	Margaret
Charles	Margaret

The Employee and Supervisor fields contain overlapping data that implies a hierarchical relationship. There are 15 unique employee names, with four of these names also appearing as supervisors (Mina, Thomas, Gillian, and Margaret). Three employees report to Mina, seven employees report to Thomas, two employees report to Gillian, and two employees report to Margaret.

Note:
Mina has no corresponding Supervisor. This data implies that Mina is a top-level supervisor who does not report to anyone else in this table.

If you group a Crystal report on the Employee field, you can further sort the data to show the hierarchical relationship between these employees and their supervisors.

Characteristics of a report that you have grouped hierarchically

In addition to a visual representation of the hierarchy inherent in your data, a Crystal report that you have grouped hierarchically has several other characteristics:

- When you drill down on a group in the hierarchy, the drill-down view also shows the records that are lower in the hierarchy.

- The report contains hierarchical group footers that include the records that are lower in the hierarchy of each group. You can summarize data across the hierarchies.
- Use the conditional-X-position feature to ensure that the indenting you set to show hierarchical relationships does not affect other fields in same section of your report.
- Hierarchical levels are supported in the formula language through the use of the GroupingLevel and HierarchyLevel functions.

Note:
You cannot use hierarchical summaries in formulas.

Editing groups

1. On the **Report** menu, click **Group Expert**.
2. In the **Group By** list of the Group Expert dialog box, select the group you want to edit.
3. Click **Options**.
4. In the Change Group Options dialog box, edit the group as necessary.
5. Click **OK** to close the Change Group Options dialog box and again to close the Group Expert dialog box.

   The report reflects the changes you have made to the group.

Summarizing grouped data

One of the primary purposes for breaking data into groups is to run calculations on each group of records instead of on all the records in the report.

When the program summarizes data, it sorts the data, breaks it into groups, and then summarizes the values in each group. It does this all automatically.

The program includes a number of summarizing options. Depending on the data type of the field you plan to summarize, you can:

- Sum the values in each group.
- Count all the values or only those values that are distinct from one another.

- Determine the maximum, minimum, average, or Nth largest value.
- Calculate up to two kinds of standard deviations and variances.

For example:

- Customer list reports: determine the number of customers in each state. The summary would count the distinct customers in each state group.
- Order reports: determine the average order placed each month. The summary would calculate the size of the average order for each month group.
- Sales reports: determine the total sales per sales representative. The summary would sum or subtotal the order amounts for each sales representative group.

Note:
You can also calculate summary fields across hierarchical groupings. To do so, select "Summarize across hierarchy" in the Insert Summary dialog box.

To summarize grouped data

1. On the **Insert** menu, click **Summary**.

   The Insert Summary dialog box appears.
2. Select the desired field to summarize from the **Choose the field to summarize** list.
3. Select a summary operation from the **Calculate this summary** list.
4. Select a location in which to place the summary from the **Summary location** list.

   Tip:

   - You can create a new group for your report by clicking the Insert Group button.
   - You can add your summary to all group levels, or you can add it only once to the level you select as your location.
5. If you want to display your summary value as a percentage of a total, select **Show as a percentage of** from the Options area, and then select a total field from the list.

For more information about percentages, see *Percentages*.

6. If you want to summarize across a hierarchy, select **Summarize across hierarchy**.

   For more information about hierarchies, see *Grouping data hierarchically*.

7. Click **OK** when finished.

Related Topics

- *Subtotaling data*

Ordering groups by summarized values

Groups can be organized in either ascending or descending order by summary value. For example, in an orders report, if you subtotal the order amount by state, you could order the groups:

- From lowest to highest order amount (ascending).
- From highest to lowest order amount (descending).

You order the groups in a report by summary values using the Group Sort Expert command on the Report menu.

To order groups by summary value

1. Click **Group Sort Expert** on the Expert Tools toolbar.

   The Group Sort Expert dialog box appears with a tab for each of the groups in the report that has a summary.

2. Click the tab for the group you want to sort.
3. Select the **All** option from the drop-down list on the left.
4. Choose the summary that you want to base your selection on from the "based on" drop-down list on the right.

   The "based on" drop-down list on the right is for those cases in which you have multiple summaries within a single group section. For example, in an orders report, you might sum and average the orders for each customer and then display both the sum and the average in the same group section.

In such a case, you would select the sum or the average from this drop-down list.

5. Specify the sort direction.
6. To select a second group sort, repeat Steps 2-5.

When you run the report, the program will order the groups based on the summary value(s) specified.

Selecting top or bottom N groups or percentages

At times, you might want to show only the top or bottom groups or percentage values in a report: the fastest selling product lines, the countries that account for the top 25 percent of sales, the states that generate the most orders, and so on. Because this kind of selection is so popular, the program includes the Group Sort Expert for setting it up easily.

There is one other element to consider when setting up top N: what to do with all the records from other groups that do not fit the top N or bottom N criteria you have set. You need to decide whether to eliminate those records from your report entirely or to lump them all together into a single group. The program enables you to choose either option.

Note:

- A report must contain a summary value in order to be able to perform a top N or bottom N selection. See *Summarizing grouped data*.
- It is recommended that you do not use a group that is sorted hierarchically in a top or bottom N selection. The integrity of your hierarchical group sort might be affected by the top or bottom N selection.

To select the top or bottom N groups

Note:
This procedure shows you how to select top or bottom N groups. Top or bottom percentages work the same way except that you define the percentage value instead of the number of groups.

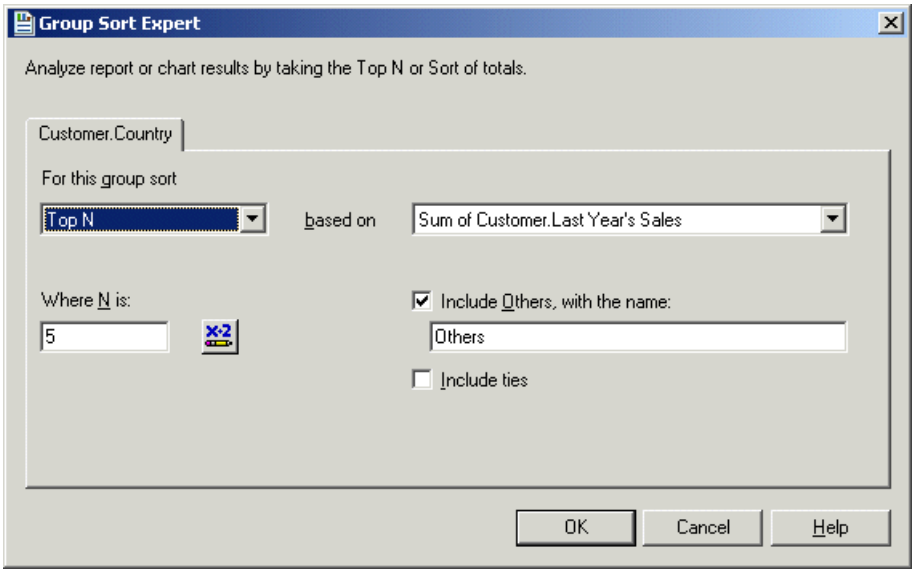
1. Create a report and summarize the data as desired. When you summarize the data, the program breaks the data into groups and summarizes each group.

- With top N groups, you are instructing the program to display those groups that have the highest summary values (Top N).
- With bottom N groups, you are instructing the program to display those groups that have the lowest summary values (Bottom N).

2. Click the **Group Sort Expert** button on Expert Tools toolbar.

   The Group Sort Expert appears with a tab for your group.

   Note:
   If you have multiple groups, the program will display a tab for each of the groups.



3. Choose **Top N** or **Bottom N** from the first drop-down list.
4. Choose the summary that you want to base your selection on from the "based on" drop-down list on the right.

   The "based on" drop-down list on the right is for those cases in which you have multiple summaries within a single group section. For example, in an orders report, you might sum and average the orders for each customer and then display both the sum and the average in the same group section.

In such a case, you would select the sum or the average from this drop-down list.

5. In the **Where N is** text box, enter the number of groups you want to display. For example:
   - To report on the three fastest selling product lines, set N to be equal to three.
   - To report on the five least productive sales regions, set N to be equal to five.
6. Click the **Include Others, with the name** check box and enter a name if you want to group all the other records into a single group.
7. Select **Include ties** to accommodate groups whose summarized values are equal.

   For example, suppose you had the following groups:
   - Order 1 = 100
   - Order 2 = 90
   - Order 3 = 80
   - Order 4 = 80

   If you set your top N to be three, but you do not select "Include ties," your report will show Order 1, Order 2, and Order 3.

   If, in the same scenario, you do select "Include ties," your report will show Order 1, Order 2, Order 3, and Order 4 even though N is set as three. In this way, the program accommodates the equal values of orders 3 and 4.
8. Click **OK** when finished.

   When the program runs the report, it will include only those groups that you specified.

Selecting top or bottom groups or percentages conditionally

If you want your users to choose their own value for a Top N, a Bottom N, or a top or bottom percentage, create a parameter to prompt for the value that Crystal Reports can then pass to a conditional selection formula.

Note:

- For groups, the top or bottom N value must be between 1 and 32,766.
- For percentages, the top or bottom N value must be between 0 and 100.

To select a conditional number of groups or percentage value

1. Open or create the report that you want to use for the conditional value or percentage selection.

   Note:
   This report must contain a group and summary information as described in *Selecting top or bottom N groups or percentages* .

2. In the Field Explorer, select **Parameter Fields**, and click **New**.
3. Create a number parameter.

   Tip:
   For information about how to create parameters, see *Creating a parameter with a static prompt*.

4. Click **OK** to save your parameter.
5. On the **Report** menu, click **Group Sort Expert**.
6. In the Group Sort Expert, select the type of group sort that you want.

   Choose any option except No Sort or All.

7. Click the Conditional Formula button next to the N or Percentage value field.
8. In the Formula Workshop, enter the parameter field that you created in step 3.
9. Click **Save and close** to return to your report.

10. Click **OK** to save your group sort.
11. When you are prompted to enter a number or percentage, enter the value that you want, and click **OK**.

Your report appears with only the number of groups that match the value you entered in your parameter prompt. To enter a different value, click the Refresh button and choose "Prompt for new parameter values." The groups in your report are refreshed to show the new value that you entered.

Subtotaling

A subtotal is a summary that totals or sums numeric values in a group.

Note:
If you are creating a subtotal using database tables that are grouped in a one-to-many linking relationship, you may need to use a running total instead of a subtotal. See *Creating running totals in a one-to-many linking relationship*.

Subtotaling data

In this example you will subtotal Last Year's Sales by Country.

To subtotal data

1. Create a report using the sample data, **Xtreme.mdb**, and place the following fields from left to right in the Details section:

```
{customer.CUSTOMER NAME}
{customer.REGION}
{customer.POSTAL CODE}
{customer.COUNTRY}
{customer.LAST YEAR'S SALES}
```

Note:
Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. Right-click the Last Year's Sales field, point to **Insert** and choose **Summary** from the shortcut menu.

The Insert Summary dialog box appears with the chosen field listed as the field to be summarized.

3. Click **Insert Group**.

   The Insert Group dialog box appears so you can specify the group you want to add to your report.

4. Choose the field you want the data grouped by, specify a sort direction and then click **OK** when finished.
5. On the Insert Summary dialog box, select the group you just created from the **Summary location** list and then click **OK**.

   The values in each group are now subtotaled.

Extending prices and subtotaling the extensions

In an orders report or invoice, you may need to extend the prices for individual line items and then subtotal the extensions. You do this by using a simple formula to extend the prices, and then you subtotal the formula field.

To extend the price and subtotal the extensions

1. Create a report using the sample data, **Xtreme.mdb**, and place the following fields from left to right in the Details section:

```
{Orders.CUSTOMER ID}
{Orders_Detail.PRODUCT ID}
{Orders_Detail.QUANTITY}
{Orders_Detail.UNIT PRICE}
```

   Note:
   Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. To create the formula for extending the prices, go to the **View** menu and select **Field Explorer**.

   The Field Explorer dialog box appears.

3. Select **Formula Fields** and click **New**.

The Formula Name dialog box appears.

4. Enter the name you want to identify the formula, and then click **OK**.

   The Formula Workshop appears with the Formula Editor active.

5. Enter the following formula into the Formula text box:

   ```
   {Orders_Detail.Quantity} * {Orders_Detail.Unit Price}
   ```

6. Click **Save and close** to return to the Field Explorer dialog box.

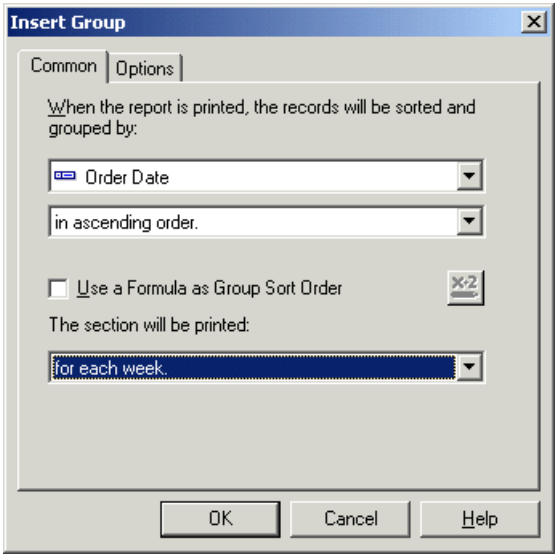
   Your formula is listed in the Formula Fields node.

7. Drag your formula field to the right of the Unit Price field in the Details section of the report.
8. To subtotal your extension formula, right-click the formula field, point to **Insert** and choose **Summary** from the shortcut menu.

   The Insert Summary dialog box appears.

9. Click **Insert Group** and create a group on the {orders.ORDER DATE} field.
10. Choose **for each week** as the group interval.

    Note:
    "The section will be printed" drop-down box will not be activated until you choose the Order Date field.



11. Click **OK** to return to the Insert Summary dialog box.
12. Select the group you just created from the **Summary location** list and then click **OK**.

    Your data will be sorted by date and grouped in one week intervals.

Percentages

Calculating a percentage

You can calculate the percentage of one group within a broader grouping. For example, you can show the percentage of sales in each city based on the total sales for each country. Or, you can see what percentage of the grand total of sales each country contributes.

To calculate a percentage

1. On the **Insert** menu, click **Summary**.

The Insert Summary dialog box appears.

2. Select the field for which you want to calculate the sum.

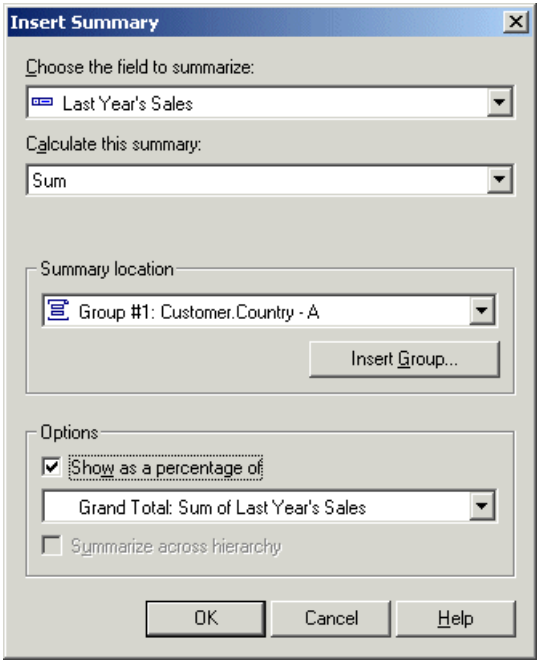
   For example, you may want to insert a field which calculates the sum of last year's sales.

3. Select **Sum** in the **Calculate this summary** list.
4. Select the summary location.

   Note:
   The summary location cannot be Grand Total (Report Footer) when you are calculating a percentage.

5. Click the **Show as a percentage of** check box.
6. Select the group you want the percentage based on.

   You can choose to show a percentage of a group within another group, or show a percentage of the grand total.



7. Click **OK**. The summary percentage field is added to your report.

Group headers

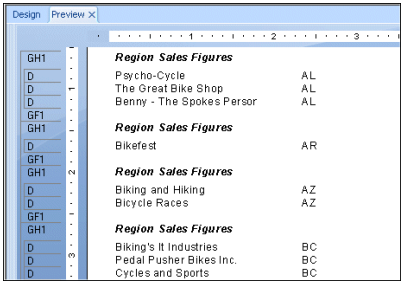
Creating group headers

Whenever you create a group, a subtotal, or a summary, the program creates both a Group Footer (GF) section (where it places any subtotal or summary value), and a Group Header (GH) section (where it automatically places the group name/header). Group Headers are useful, even necessary, if you want your report data to be clear and easily understood. Though the program creates a group header automatically, you may find that you would like to change or modify the header to suit your needs.

In this section, you will learn how to create the most common kinds of group headers.

Standard headers

A standard header is a block of text that is used to identify each group in a rather generic kind of way. "Customer," "State," and "Monthly Orders" are all examples of this kind of header.



While the header is somewhat descriptive ("Region Sales Figures" means it is a regional group), you never know what region is in the group without first looking at the details in the group.

To create a standard header

1. Click the **Insert Text Object** button on the Insert Tools toolbar.

2. When the object pointer appears, move the object frame into the Group Header section.
3. Enter the text you want to use for the header.
4. Click outside the frame when finished to complete the process. Now when you run the report, the same header will appear at the beginning of each group.

Live headers

A live header is a header that changes based on the content of the group. If the data is subtotaled by region, for example, a live header would typically identify the region detailed in each group. Thus, the Arizona group would have a header identifying the group as Arizona data, the California group would have a header identifying the group as California data, and so on.

Note:
When creating a group, the program automatically inserts a group name field in the Group Header section unless you have toggled the option off using the Options command on the File menu. The information that follows details how to manually insert such a section (if you do not have the program insert one automatically) and how to create different kinds of live headers for different needs.

Group name only

The easiest live header to create is one based on identifying the value of the group field.

To create a live header by group name only

1. On the **View** menu, click **Field Explorer**.
2. In the Field Explorer dialog box, expand the **Group Name Fields** folder.
3. Select the Group Name field that matches the group you are working with and drag it into the Group Header section for that group.

   When you run the report, the group field value identifier will appear as the group header for each region group.

Group name with text

A more complex type of live header combines a field value and text. A typical group header of this kind for data broken down by region would be, "Sales for California" or "Customers in Postal Code 60606". Creating these headers involves three steps:

- Insert a text object in the Group Header section.
- Type in the text you want to appear.
- Enter the Group Name field in the text field where you want it to appear in the Group Header.

For example, if you want your header to read "Sales for" and then the name of the region in the current group (Sales for AZ, Sales for CA, and so forth), follow these steps:

To create a live header with group name using text

1. Click the **Insert Text Object** button on the Insert Tools toolbar.
2. Place the object frame into the Group Header section for the group.
3. Type in the desired text with a space after it.
4. Click the **Field Explorer** button on the Standard toolbar.
5. In the Field Explorer dialog box, expand the **Group Name Fields** folder.
6. Select the Group Name field that matches the group you are working with and drag it into the text object, immediately after the text and the space you entered.

   Tip:
   Expand the size of the text box to fit both the text and the group field.

7. Format the text object as you want it to appear.

When you run the report, the program will create a live header (with text) for each of your groups.

Live headers for groups based on a formula

When you create a group and use a formula field as a sort-and-group-by field, the program automatically creates a group name field based on the value returned by the formula.

For example, if you create this formula:

```
{customer.CUSTOMER NAME}[1]
```

and then group on the formula, the program will group your data based on the first letter in the Customer Name field.

To create a live group header for a group based on a formula, simply insert the group name field in the Group Header section.

When you run the report, the "A" group will have the letter "A" as a header, the "B" group will have the letter "B", and so on. For more information, see *Grouping by the first letter of a company name* and *Grouping data in intervals*.

Headers for custom groups

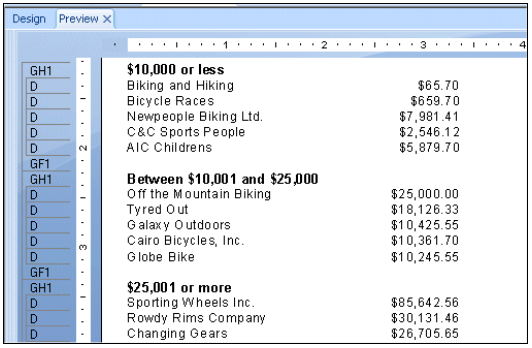
The final type of header is a header for the types of custom groups created when data is grouped in a specified order. When using specified order grouping, both the name for each group and the records that belong in it are specified. As in the other grouping situations, the program creates a group name field for each group based on the group names specified.

To create a header for custom groups

1. On the **View** menu, click **Field Explorer**.
2. In the Field Explorer dialog box, expand the **Group Name Fields** folder.
3. Select the Group Name field for the custom group and drag it into the Group Header section for that group.

The program automatically applies each of the group names you assigned to the appropriate groups.

Note:
Make certain that when you assign the names to the groups using the Define Named Group dialog box, the names you assign are the names you want to appear as group headers.



Suppressing group headers

You have the option to hide group headers in your report.

To suppress group headers

1. Right-click the group header and select **Format Field**.
2. In the Format Editor, on the Common tab, click the **Suppress** check box.
3. Click **OK**.

Tip:
To show the group header again, clear the Suppress check box.

Drilling-down on group headers

To make report viewing easier, you can hide the details of your report and only have the group headers visible. When necessary, you can click on the group header to view the report details.

To drill-down on group headers

1. Right-click the gray Details section to the left of the report.
2. Select **Hide (Drill-Down OK)**.

3. Click **Refresh**.

   When you place the cursor over a group header, the cursor becomes a magnifying glass.

4. Double-click the group header to drill-down to the detail information.

   A drill-down tab appears in the Report Designer. Click the Design or Preview tab to return to that view.

Related Topics

- *Using the drill-down option on summarized data*

Running Totals

chapter 11

Understanding running totals

Running total fields are similar to summary fields but allow more control over how the total is calculated and when it is reset. Running total fields are specifically suited to perform the following totaling functions:

- Show values of a total accumulate as it is calculated record by record.
- Total a value independent of the report's grouping.
- Total a value conditionally.
- Total a value after a group selection formula has been applied.
- Total a value from the driving table in a one-to-many linking relationship.

How running totals work

A running total field is created with the Running Total Expert. The Running Total Expert creates a running total field by asking you to select a field to summarize, the summary operation to use, a condition upon which to base the evaluation, and a condition upon which to reset the evaluation.

Note:
A running total field can be used on database fields and first-pass formulas, but cannot be used on second-pass formulas or formulas that reference other second-pass formulas. For more information see "Multi-pass reporting flow chart".

Placement of running total fields

The calculation of a Running Total field is determined by the settings selected in the Running Total Expert. However, where you place the running total affects the value that appears on the report. For example, if a Running Total field that evaluates every record and never resets (a grand total) in the Report Header, only the value of the first record will appear. Placing the same Running Total field in the Report Footer returns the desired value. The Running Total field is properly calculated in both cases, but it is displayed too soon in the first case.

The following list summarizes the records that are included in the calculation when a running total is placed in various report sections. This list assumes the running total is not reset.

Report section	Records included in the running total calculation
Report Header	The first record in the report
Page Header	All records up to and including the first record on the current page
Group Header	All records up to and including the first record in the current group
Details	All records up to and including the current record
Group Footer	All records up to and including the last record in the current group
Page Footer	All records up to and including the last record on the current page
Report Footer	All records in the report

Creating running totals

Creating running totals in a list

Running totals are totals that can be displayed on a record by record basis. They total all records (in the report, in the group, and so on) up to and including the current record.

The most basic form of a running total is a running total maintained throughout a list. In this tutorial, you will create this kind of report by setting up a running total for a list of order amounts.

Note:
Running total fields are prefixed by the # sign.

To create a running total in a list

1. To get started, create a report using the sample database, **Xtreme.mdb**. Link the Customer and Orders tables, and then place the following fields from left to right in the Details section:

```
{customer.CUSTOMER NAME}
{orders.ORDER ID}
{orders.ORDER AMOUNT}
```

   Note:
   Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **View** menu, click **Field Explorer**.

   The Field Explorer dialog box appears.

3. Select **Running Total Fields** and click **New**.

   The Create Running Total Field dialog box appears.

4. Enter the name "TotalOrders" in the **Running Total Name** box.
5. Highlight Orders.Order Amount in the **Available Tables and Fields** box, and use the first arrow button to move it over to the **Field to summarize** box.

6. Select **sum** from the **Type of summary** list.
7. In the **Evaluate** section of the dialog box, click **On change of field**, and select Orders.Order ID as the **On change of** field.

   The running total will execute each time this field changes.
8. In the **Reset** section of the dialog box, click **Never** (this gives you a running total that never resets; that is, the running total continues throughout the report).
9. Click **OK** to save the running total field.

   The program returns you to the Field Explorer dialog box.
10. Insert the running total field in the Details section of the report, just to the right of Orders.Order Amount.

    On your report, each row in the running total column displays the current record value added to the previous values. This total continues, unbroken, through the report.

Creating running totals for a group

Another common use for running totals is tallying items in a group. The running total starts with the first item in the group and ends with the last. Then it starts all over again for the next group, then the next, and so on.

In this tutorial, you will create a report that:

- Maintains a running total of customer orders.
- Groups customer orders and resets the running total for each group.
- Displays the subtotal for each customer group.

To create a running total for a group

1. To get started, create a report using the sample data, **Xtreme.mdb**.

Link the Customers and Orders tables and place the following fields from left to right in the Details section:

```
{customer.CUSTOMER NAME}
{orders.ORDER ID}
{orders.ORDER AMOUNT}
```

Note:
Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **Insert** menu, click **Group** and group on the Customer.Customer Name field.
3. On the **View** menu, click **Field Explorer**.

   The Field Explorer dialog box appears.

4. Select **Running Total Fields** and click **New**.

   The Create Running Total Field dialog box appears.

5. Enter the name "GroupRunningTotal" in the **Running Total Name** box.
6. Highlight Orders.Order Amount in the **Available Tables and Fields** box, and use the first arrow button to move it over to the **Field to summarize** box.
7. Select **sum** from the **Type of summary** list.
8. In the **Evaluate** section of the dialog box, click **For each record**.
9. In the **Reset** section of the dialog box, click **On change of group** and accept the default group name.
10. Click **OK** to save the running total field.

    You return to the Field Explorer dialog box.

11. Place the running total field in the Details section of your report, just to the right of the Orders.Order Amount field.

    Note:
    If you want to view a grand total of each group, place the running total field in the Group Footer section of your report.

Creating conditional running totals

There may be times when you have a list of values, and you only want to subtotal some of the values in the list. For example:

- You have a list that contains both Canadian and U.S. customers.
- You want to keep customer records sorted alphabetically based on customer name.
- You do not want to break the data into groups based on the country.
- You want a total of the values from just the Canadian records.
- You also want a total of the values from just the U.S. records.

To accomplish this, create two running totals, one to keep a running total of the U.S. records, and one to keep a running total of the Canadian records.

- **USTotal**

  Maintains a running total of the U.S. records.

- **CanadaTotal**

  Maintains a running total of the Canadian records.

To create a conditional running total

1. To get started, create a report using the sample data, **Xtreme.mdb**. Place the following fields from left to right in the Details section:

   ```
   {customer.CUSTOMER NAME}
   {customer.COUNTRY}
   {customer.LAST YEAR'S SALES}
   ```

   Note:
   Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **Report** menu, click **Record Sort Expert**.

Tip:

Another way to do this is to click the Record Sort Expert button on the Expert Tools toolbar.

3. Sort the records based on the Customer.Customer Name field.
4. On the **View** menu, click **Field Explorer**.

   The Field Explorer dialog box appears.

5. Select **Running Total Fields** and click **New**.

   The Create Running Total Field dialog box appears.

6. Enter the name "USTotal" in the **Running Total Name** box.
7. Highlight Customer.Last Year's Sales in the **Available Tables and Fields** box, and use the first arrow button to move it over to the **Field to summarize** box.
8. Select **sum** from the **Type of summary** list.
9. In the **Evaluate** section of the dialog box, click **Use a formula** and then click the **Formula** button.

   The Formula Workshop appears with Running Total Condition Formula active.

10. Enter the following formula in the Formula box:

```
{Customer.Country} = "USA"
```

    This tells the program to evaluate the running total each time it comes to a record where Customer.Country is equal to "USA." The running total will ignore all other records (such as records for Canada).

11. When the formula has the correct syntax, click **Save and close**.

    You return to the Create Running Total Field dialog box.

12. In the **Reset** section of the dialog box, click **Never**.
13. Click **OK** to save the running total field.

    The program returns you to the Field Explorer dialog box.

14. Place the running total field in the Details section of your report.

15. Now create the "CanadaTotal" running total field using the process outlined in steps 5-13. The only difference is that this time you will set the evaluation formula to:

```
{Customer.Country} = "Canada"
```

16. When you are finished, place the **#CanadaTotal** field in the Details section of your report

    Note:
    If you only want to see a grand total of the Canadian and American sales, place the two running total fields you created in the Report Footer section of your report.

Creating running totals in a one-to-many linking relationship

A one-to-many linking relationship occurs in linked tables when a single record in one table can be matched with many records in another table. For example, a one-to-many link might occur when you link a customer table to an orders table. It wouldn't be unusual in such a case for each customer in the primary table to have many orders in the second (lookup) table. In your report, the field values from the primary table are repeated for each new field value in the lookup table.

Creating a subtotal on a field from the primary table provides an incorrect result because the repeated values are included in the calculation. You can avoid this problem by creating a running total.

This concept can be demonstrated with the sample Xtreme database by using the Customer and Orders tables.

To create a running total in a one-to-many linking relationship

1. From the Field Explorer dialog box, place the following fields from left to right in the Details section of your report:

```
{customer.CUSTOMER NAME}
{customer.LAST YEAR'S SALES}
{orders.ORDER ID}
{orders.ORDER AMOUNT}
```

2. On the Insert Tools toolbar, click **Insert Group** and create a group based on the Customer.Customer Name field.
3. Right-click the Customer.Last Year's Sales field and select **Summary** from the **Insert** submenu.
4. Choose **Group #1: Customer.Customer Name - A** as the location for your summary.

   If you look at the subtotals for each group, you will notice they aren't accurate. This is because the Customer.Last Year's Sales field is duplicated for each order in the report. Follow the rest of this procedure to see how a running total produces an accurate result in the same situation.

5. In the Field Explorer dialog box, select **Running Total Fields** and click **New**.

   The Create Running Total Field dialog box appears.

6. Enter the name "LYSrunning" in the **Running Total Name** box.
7. Highlight Customer.Last Year's Sales in the **Available Tables and Fields** box, and use the first arrow button to move it over to the **Field to summarize** box.
8. Select **sum** from the **Type of Summary** list.
9. In the **Evaluate** section of the dialog box, click **On change of field** and add the Customer.Customer Name field from the **Available Tables and Fields** box.
10. In the **Reset** section of the dialog box, click **On change of group** and choose **Group #1: Customer.Customer Name - A**.
11. Click **OK** to save the Running Total field.
12. Place the running total in the **Group Footer** section.

Compare the running total amount with the subtotal amount for each group. You will see the running total is accurate while the subtotal is not.

Creating running totals using a formula

If you have suppressed data, or your data is based on a formula that occurs WhilePrintingRecords, you should create a running total formula rather than using the Create Running Total Field dialog box.

When you create a running total manually, you need to create three formulas:

- A summary formula.
- A reset formula to set a variable to zero.
- A display formula to display the variable.

In the following procedure, you will create a report that performs the following functions:

- Maintains a running total of customer orders.
- Groups customer orders and resets the running total for each group.
- Displays the subtotal for each order (the last running total for that order).

To create running totals using a formula

1. Create a report using the sample data, **Xtreme.mdb**. Link the Customers and Orders tables and place the following fields from left to right in the Details section:

   ```
   {customer.CUSTOMER NAME}
   {orders.ORDER ID}
   {orders.ORDER AMOUNT}
   ```

   Note:
   Xtreme.mdb is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **View** menu, click **Field Explorer.**
3. Select **Formula Fields** in the Field Explorer dialog box and click **New**.
4. Name the formula "RunningTotal" and click **Use Editor**.

   The Formula Workshop appears with Formula Editor active.

5. Enter the following into the Formula box:

   ```
   WhilePrintingRecords;
   CurrencyVar Amount;
   Amount := Amount + {Orders.Order Amount};
   ```

6. Click the **Save and close** button on the Formula Workshop.

7. Place this formula in the Details section of your report, just to the right of the Orders.Order Amount field.

   This formula prints the running total of the values in the Order Amount field.

8. On the **Insert** menu, click **Group** and group the report on the Customer.Customer Name field.
9. In the Formula Workshop, create "AmountReset":

```
WhilePrintingRecords;
CurrencyVar Amount := 0;
```

   This formula says:

   Set the value in the Amount variable to 0.

10. Place this formula in the Group Header #1 section of your report.

    Because the Group Header #1 section appears once for every group, @AmountReset will execute each time the group changes. Thus, the Amount variable is reset to 0 each time a new group begins.

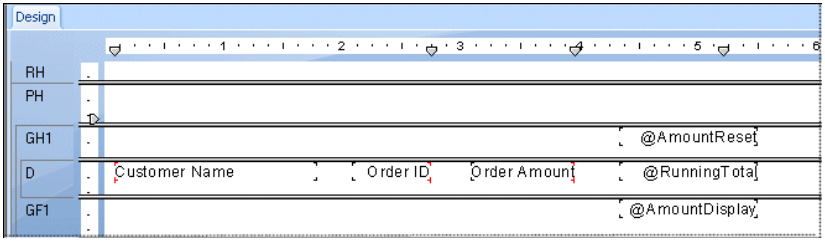
11. Select the @AmountReset formula on the report and use the Format Editor to suppress it so that it will not appear in the final print-out.
12. In the Formula Workshop, create "AmountDisplay":

```
WhilePrintingRecords;
CurrencyVar Amount;
```

    This formula simply displays the current value of the Amount variable at any time.

13. Place this formula in the Group Footer #1 section of your report.

    Because the Group Footer #1 section appears once for every group, @AmountDisplay will execute each time a group ends. Thus, the value stored in the Amount variable will be printed each time the group changes.



Note:
This formula prints the same value that @RunningTotal prints as the running total for the last record in each group. But since it is printing it in the Group Footer section, it acts as a group subtotal, not as a running total.

On your report, each row in the running total column displays the current record value added to the previous values. The running total starts fresh with each new group, and the final running total for each group becomes the subtotal for that group.

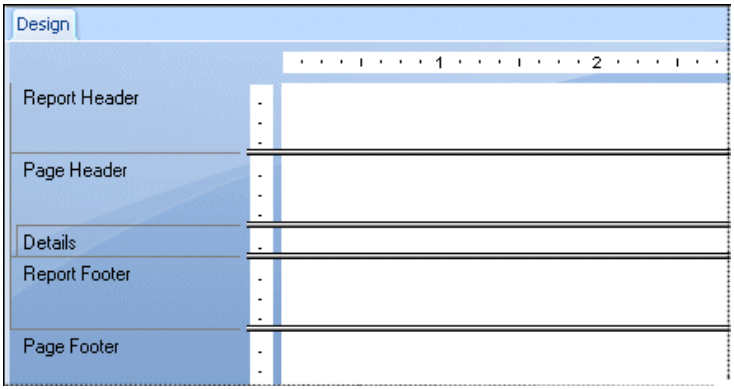
Multiple Section Reports

chapter 12

About sections

Crystal Reports provides five design areas to use when building your report:

- Report Header
- Page Header
- Details
- Report Footer
- Page Footer



Each area contains a single section when you first create a new report. You cannot delete any of these original sections but you can hide them or add to them. Once you have added sections, you can delete them, move them in relation to other similar sections, or merge related sections together.

Working with sections

Many of the procedures in this section show you how to work with sections in the Section Expert. Sections can also be inserted, deleted, and so on by right-clicking the shaded area to the left of the section in the Design or Preview tabs and choosing the appropriate option from the shortcut menu.

Inserting a section

1. Click **Section Expert** on the Expert Tools toolbar.

   The Section Expert appears with a list of all the sections in the report. When there are more than one of any kind of section, the sections are lettered A, B, C, and so on.

   Note:
   The program enables only those options (free form, new page before, and so on) that apply to the highlighted section.

2. Highlight the section you want to insert a section after.

   For example, to add another Details section, highlight the existing Details section.

3. Click **Insert**.

   A new section is inserted immediately below the highlighted section.

Deleting a section

1. Click **Section Expert** on the Expert Tools toolbar.

   The Section Expert appears with a list of all the sections in the report. When there are more than one of any kind of section, the sections are lettered A, B, C, and so on.

   Note:
   The program enables only those options (free form, new page before, and so on) that apply to the highlighted section.

2. Highlight the section you want to delete.
3. Click **Delete**.

   The program removes the highlighted section from the report.

Moving a section

1. Click **Section Expert** on the Expert Tools toolbar.

   The Section Expert appears with a list of all the sections in the report. When there are more than one of any kind of section, the sections are lettered A, B, C, and so on.

   Note:
   The program enables only those options (free form, new page before, and so on) that apply to the highlighted section.

2. Highlight the section you want to move.
3. Click the Up or Down arrow to move the section.

Note:

- You can only move a section up or down within an area.
- The letters that identify the sections describe their relative (as opposed to original) position. Thus, if you move a "C" section up, it becomes a "B" section. It loses its original "C" designation.
- You can also move sections by dragging and dropping them in the Report Designer.

Merging two related sections

There may be times when you have placed objects in two sections (where they print sequentially) and you want to put them all in a single section (where they print simultaneously). You can merge the two sections and then rearrange the objects as needed in the new section.

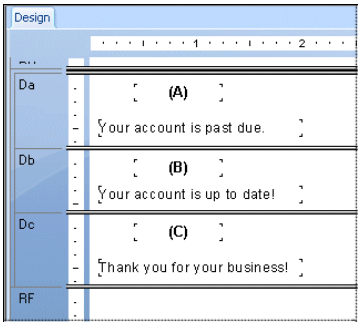
To merge related sections

1. Click **Section Expert** on the Expert Tools toolbar.

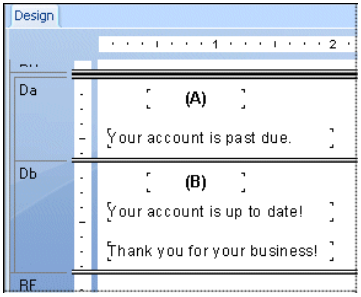
   The Section Expert appears with a list of all the sections in the report. When there are more than one of any kind of section, the sections are lettered A, B, C, and so on.

Note:
The program enables only those options (free form, new page before, and so on) that apply to the highlighted section.

2. Move the sections so the two sections you want to merge follow each other in the list.
3. Highlight the top section.



4. With Section (B) highlighted, click **Merge** and Section (C) will be merged with Section (B) to form one section.



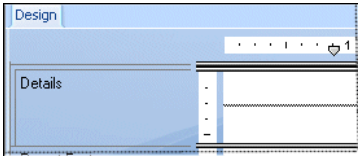
5. Rearrange the objects as needed.

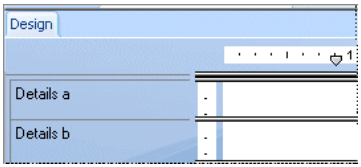
Splitting and resizing sections

A section can be split into two or more sections and/or resized easily in the Design tab.

Splitting a section

1. Move the pointer over the left boundary of the section you want to split.
2. When the pointer becomes a Section Splitting cursor, click the boundary and drag the pointer into the section.
3. When a horizontal line appears, drag it up or down to split the section the way you want it.





Resizing a section

1. Move the pointer over the bottom boundary of the section you want to resize.
2. When the pointer becomes a Resizing cursor, drag the boundary to make the section bigger or smaller as you wish.

Resizing a section to remove white space

If you have one or more objects in a section and you want to resize the section to remove unnecessary white space, right-click in the shaded area to the left of the section in the Design and Preview tabs and choose Fit Section from the shortcut menu. The program automatically resizes the section, moving the bottom boundary of the section to the baseline of the bottom object in the section.

A section automatically expands vertically in two instances:

- When you place an object and the object is bigger (vertically) than the section you place it in.
- When you expand an object (vertically) so it becomes bigger than the section it resides in.

Note:

- You cannot resize a section smaller than the combined height of all the objects in the section.
- You can also remove white space at the bottom of a Page Footer by selecting Clamp Page Footer on the Common tab of the Section Expert.

Using multiple sections in reports

Certain reporting tasks are performed most efficiently by creating multiple sections within an area, such as:

- Keeping variable length objects from overwriting each other (see *Keeping variable length objects from overwriting each other*).
- Eliminating blank lines when fields are empty (see *Eliminating blank lines when fields are empty*).
- Adding blank lines under specific conditions (see *Adding blank lines conditionally*).

Once you understand the power of multiple sections, you will discover even more ways to produce the effects you want.

Related Topics

• *Working with sections*

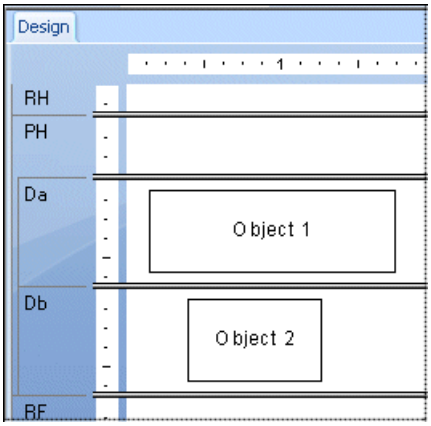
Keeping variable length objects from overwriting each other

When subreports or other variable length objects are placed above other objects in one section of the report while the Can Grow option for the variable

length object is toggled on in the Format Editor, that object may overprint objects positioned directly below it unless you have:

- Expanded the section to fit the maximum size of the object.
- Spaced the objects, allowing enough space for the first object to complete printing before the second one begins.

You can eliminate this overprinting problem by creating multiple sections in an area and placing objects below the variable length object in their own section(s).



Now, when the report runs, the section with the variable length object will finish printing before the section below it prints and you will get the results you want. See *Combining two or more unrelated reports*.

Note:
Many report objects can use the Can Grow option and can, therefore, cause overprinting:

- Text fields
- Formula fields
- Memo fields
- BLOB fields
- Subreports
- Cross-Tabs

- OLAP grids

Eliminating blank lines when fields are empty

It is very common to have two address lines in a customer table, one for street address (Address 1), and one that can be used for a suite number or mail stop (Address 2). Address 1 usually contains a value, but Address 2 is often blank. If you create a customer list using this data and stack the fields on top of one another in mailing label format, those customer records with an empty Address 2 field will print with a blank line. You can eliminate this blank line either by using multiple sections, or by suppressing blank lines.

To eliminate blank lines by using multiple sections

1. Use the Section Expert to create two new Details sections so that you have a total of three. See *Working with sections*.
2. Place the **Address 2** field in the middle section and the other data in the sections above and below it as you want it to appear in the report.
3. In the Section expert, highlight the middle section.
4. On the **Common** tab, select the **Suppress Blank Section** check box.

Now, when the report prints, if the Address 2 section is blank, the program will not print it and you will not get unwanted blank lines in the report.

Note:
If the report section you want to suppress contains a blank subreport, use the Suppress Blank Subreport option, found on the Subreport tab of the Format Editor, as well as the Suppress Blank Section option.

Adding blank lines conditionally

Use multiple sections to print a blank line on your report under specific conditions. For example, you may want to insert a blank line after every fifth record in the report.

To add blank lines conditionally

1. Use the Section Expert to create two Details sections. See *Working with sections*.
2. Place the report detail data in the top section.
3. Leave the second section empty.
4. In the Section expert, highlight the second section.
5. On the **Common** tab, select the **Suppress (No Drill-Down)** check box then click the conditional formatting button to its right.
6. Enter the following formula in the Format Formula Editor:

```
Remainder (RecordNumber,5) <> 0
```

   This formula divides each record number by 5. If the division produces a remainder, it suppresses the blank section. But if the division produces no remainder, a zero (which it will for every fifth record printed), the program prints the second section, thus inserting a blank line.

Note:
To insert a blank line under different conditions, you can modify your formula appropriately. See *Working with conditional formatting*.

Form letters

While form letters themselves are not necessarily multi-section reports, they are often used in multi-section reports to generate custom mailings. The topic *Printing conditional messages in form letters*, explains how to use multiple form letters or multiple versions of the same form letter for custom mailings.

Form letters often use text objects to hold the content of the report. The following sections provide an introduction to text objects and demonstrate how to use them in form letters.

Working with text objects

You will use many of the capabilities of text objects when creating form letters. A brief discussion of text objects should make it easier for you to create the form letter in the next section. Some things to consider are:

- A text object can contain both text and fields; you will use both in this example.
- You can resize text objects; you will be resizing the text object so that it prints as a letter.

Move/Resize mode

When the object is in the move/resize mode, it appears as a solid frame with resizing handles.

In this mode, you can resize the object by dragging any of the resizing handles, or you can move it by placing the cursor inside the object and dragging it to a new location. You can also insert fields in this mode, but you cannot insert text. You put a text object into the move/resize mode by clicking it when it is inactive.

Edit mode

When the object is in the edit mode, it appears as a solid frame without sizing handles, and an in-place ruler appears at the top of the tab (if you have selected the Show Rulers options in the Options dialog box).

When you first place a text object, the program sets it in the edit mode. You can also put a text object into the edit mode by double-clicking it when it's inactive or in the move/resize mode. Finally, you can put a text object in edit mode by right-clicking it and selecting Edit Text from its shortcut menu.

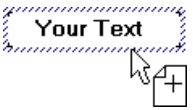
Each text object contains word processor capabilities, including the ability to change the fonts for individual characters and fields, and automatic word

wrap. In the edit mode you can insert text and such non-text objects as database fields and formulas. Whenever the object is in edit mode, it contains an insertion point, a flashing vertical line that indicates the position at which typed text or inserted fields will begin.

The insertion point moves as you type, automatically staying to the right of the last character. It also moves when you insert a field, automatically staying to the right of the field. It moves one character position at a time when you press the space bar. It moves down one line, to the inside left edge of the text object, when you press Enter (this action inserts a carriage return). It moves to the cursor position when you click anywhere within the existing text.

As you work through the tutorials for multiple sections, it is always expected that you will type or place fields at the existing insertion point, unless otherwise indicated.

- To select text within a text object (to delete it, to change a font, and so on), position the cursor over the text and, when the I-beam cursor appears, drag the cursor to highlight the text you want to select.
- To select a field which is inside a text object, position the cursor over the field and, when the I-beam cursor appears, right-click.
- To insert text, type in the desired text and it will appear at the insertion point.



Note:
It is critical that you see the Drag and drop cursor before placing the field. If it does not appear, you might place the field so that it overlays the text object instead of being inserted into it. It may appear to be inside the text object, but if you move the object the field will not move with it.

- The insertion point is tied into the Drag and drop cursor. If you have existing text or fields in the text object, the insertion point moves as you move the Drag and drop cursor, enabling you to pick the exact position where you want to place the field. The program always places the field at the insertion point.

- You can leave edit mode by clicking outside of the text frame. You can also click **Ctrl+Enter**.

Creating a form letter using a text object

The following section shows you how to create a form letter.

You are going to use a text object to create a form letter. The form letter you create will be tied to a database table so that each letter will be customized with company information from a different record.

If you have difficulty performing any of the steps, please see *Working with text objects*.

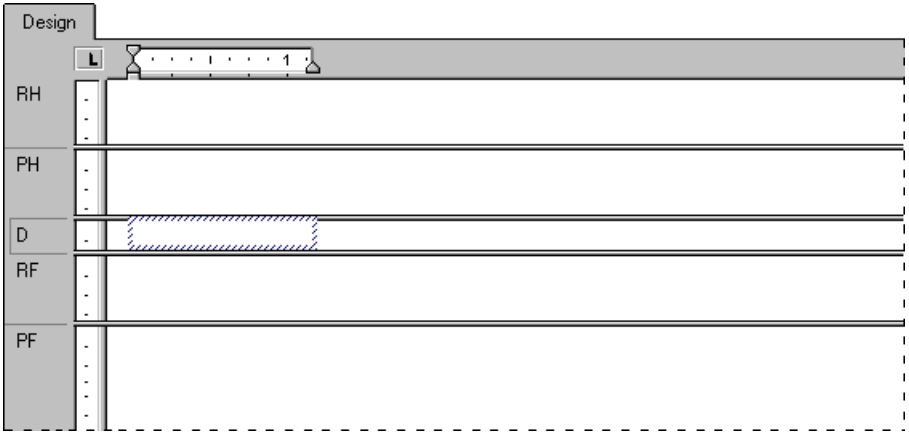
To create a form letter

The letter will consist of a date, an inside address, a salutation, a one paragraph letter body, and a closing section.

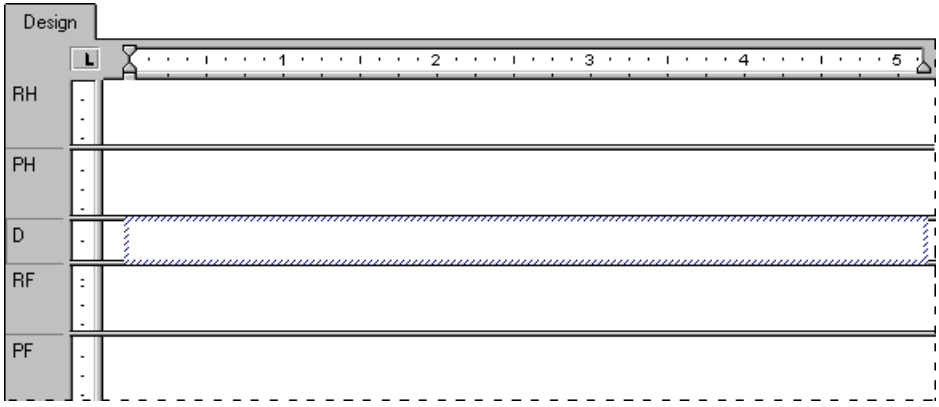
1. Create a blank report. Use the **Customer** table of **Xtreme.mdb**.

   The Design tab appears.

2. Since you do not want field titles to appear above the fields that you insert into the letter, clear the **Insert Detail Field Headings** check box on the **Layout** tab of the Options dialog box.
3. Insert a text object into the **Details** section of the report.
4. Click the text object frame to put the object in move/resize mode.



5. Drag the resizing handle on the right side of the object to the right edge of the **Design** tab. This will make the object about eight inches wide, the approximate width of a page. You may have to stop resizing, scroll the window, and resize some more to accomplish this.



6. Double-click inside the text object to place it in edit mode. It is now ready for you to begin your work. The insertion point appears at the extreme left, inside the object.

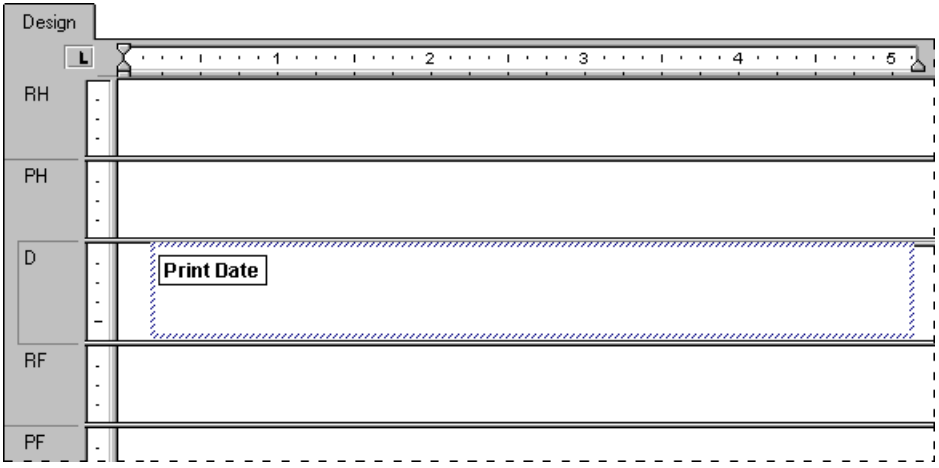
Inserting a date

1. To insert a date into the letter, expand **Special Fields** in the Field Explorer dialog box and scroll until you find **Print Date**.
2. Click **Print Date** and drag the placement frame into the text object and place it at the insertion point.

   Note:
   To change the way the date is formatted in the letter, double-click the text object to select it. Then right-click the Print Date field and choose Format {Print Date} from the shortcut menu. Make your modifications on the Date tab of the Format Editor when it appears.

3. Press Enter twice to insert some white space between the date and the inside address and to move the insertion point down within the text object.

   Tip:
   You might have to resize the Details section and the text object if you have not selected the Can Grow option for the text object in the Format Editor.

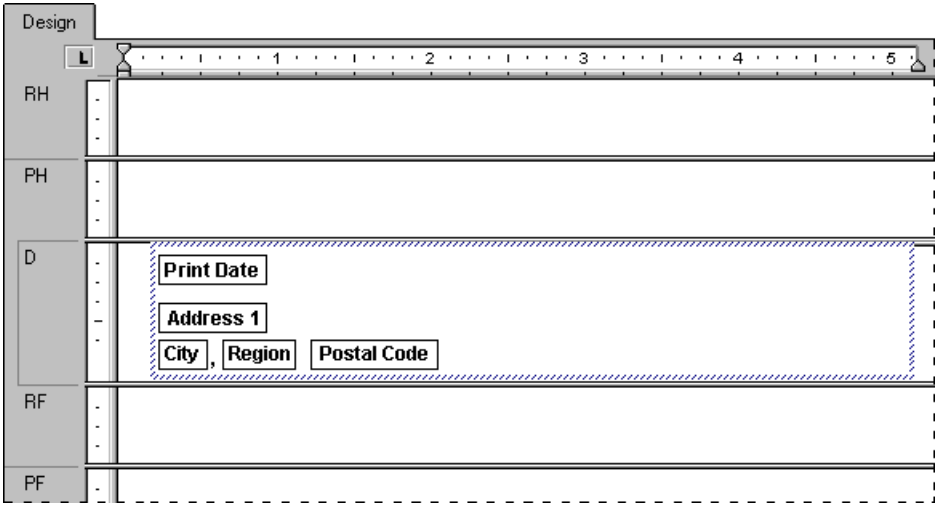


Creating an inside address

1. To create the inside address, drag database fields into the text object from the **Customer** table in the Field Explorer dialog box.

2. Drag in the **Address 1** field and place it at the insertion point, and press **Enter**. The insertion point moves down to the line below.
3. Drag in the **City** field and place it at the insertion point.
4. Type a comma, followed by a space.
5. Drag in the **Region** field and place it at the insertion point.
6. Type in two spaces.
7. Finally, drag in the **Postal Code** field, place it at the insertion point, and press **Enter**. The insertion point moves down to the line below.
8. Press **Enter** one more time to move the insertion point down one more line to the position where the salutation should start. This completes the inside address.

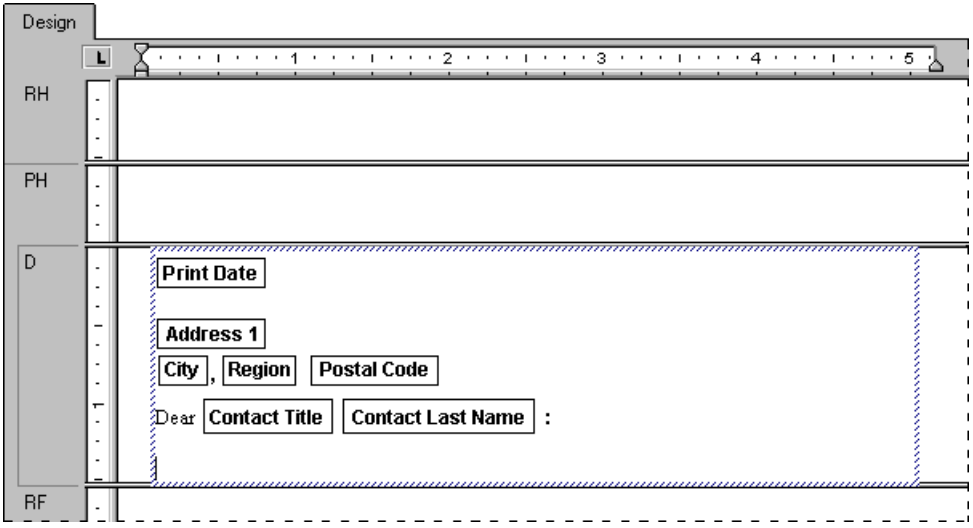
Note:
When a field is placed within a text object, it is automatically trimmed on both the left and right sides, so that it contains no extra white space.



Creating a salutation

1. Press **Enter** four times to move the insertion point down.
2. Type in the word "Dear" and a space (do not include the quotation marks).

3. In the Field Explorer dialog box, highlight the **Contact Title** field from the **Customer** table and drag it into the text object, placing it immediately after the space.
4. Insert a space. The program positions the insertion point immediately after the space.
5. In the Field Explorer dialog box, drag the **Contact Last Name** field into the text object and place it at the insertion point. The insertion point moves to the right of the field.
6. Type a colon ":" at the insertion point (without the quotation marks) and press **Enter** twice to move the insertion point down two lines.



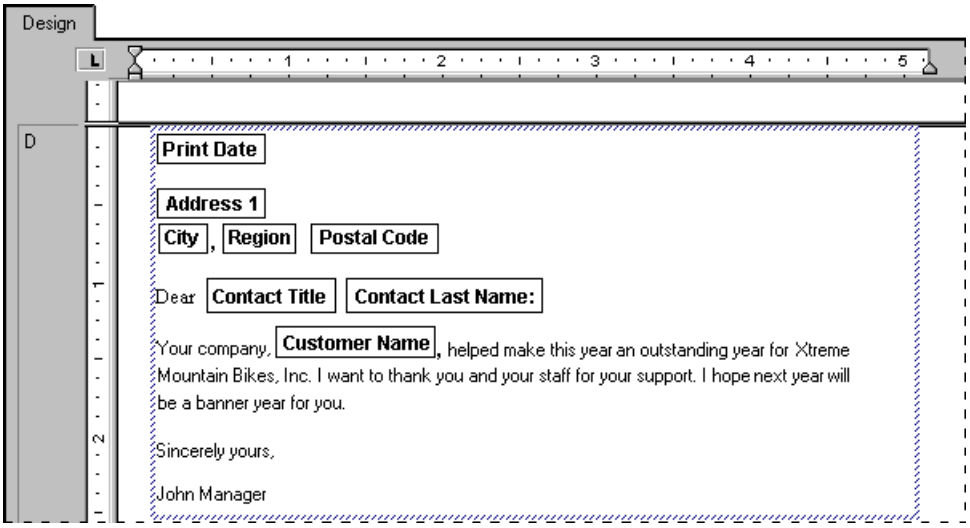
Creating the letter body

1. Now type "Your company" (do not include the quotation marks) and type a comma followed by a space.
2. Drag the **Customer Name** field into the text object and place it at the insertion point, just after the space.
3. Type a comma, followed by a space.
4. Type the following text (do not include the quotation marks): "helped make this year an outstanding year for Xtreme Mountain Bikes, Inc. I want to

thank you and your staff for your support. I hope next year will be a banner year for you."

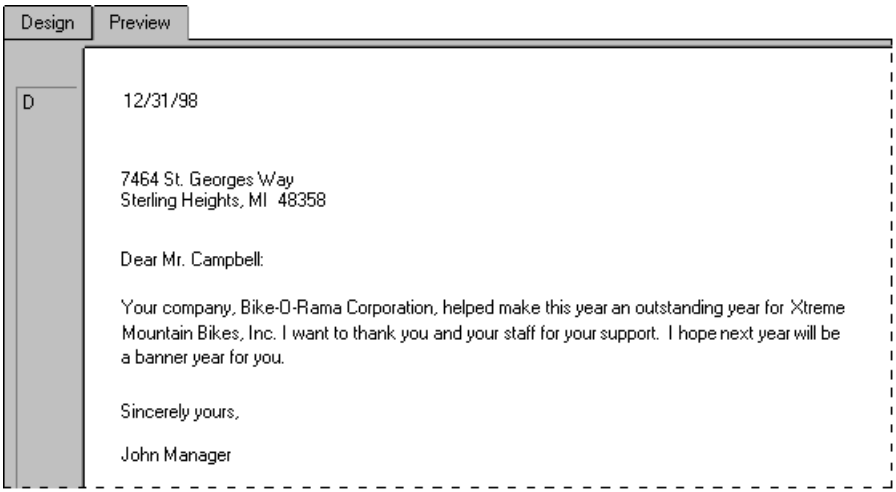
5. Press Enter twice.
6. Type "Sincerely yours" (without the quotation marks), followed by a comma, and then press **Enter** four times.
7. Finally, to complete the form letter, type your name.

   The Design tab should look similar to this:



8. Click **Print Preview** on the Standard toolbar to preview the form letter.

   It should look similar to this:

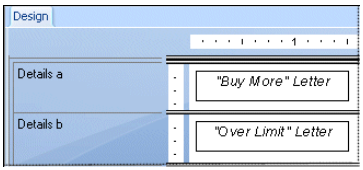


Printing conditional messages in form letters

It is likely that you will want to print conditional messages in form letters. For example, you may want to encourage customers with available credit to buy more and those who are over their credit limit to bring their accounts down below the limit once again. You can create both of these letters within a single report.

To create a conditional message

1. Use the Section Expert to insert a second Details section in the report. See *Working with sections*.
2. Create two form letters. Place a letter that encourages customers to buy more in the Details A section of the report; place a letter that encourages customers to bring their balance down in the Details B section of the report. See *Creating a form letter using a text object*.
3. Use the Section Expert to format the Details sections so that each is suppressed under certain conditions. For example, consider the situation where you want to print one of two letters.



- Format the first section to be suppressed when the balance is less than the credit limit.
- Format the second section to be suppressed when the balance is more than the credit limit.

Now, when a record indicates available credit, the "buy more" letter will print. When the account is over the credit limit, the "over limit" letter will print. And when the customer is right at the credit limit, nothing will print at all.

Related Topics

- *Working with conditional formatting*

Formatting

chapter 13

Formatting concepts

This section explains how to format a report. Formatting refers to changes you can make to the layout and design of a report, as well as the appearance of text, objects, or entire report sections.

You can use formatting to do many things, including:

- Dividing sections of a report.
- Calling attention to certain data.
- Changing the presentation of dates, numbers, Boolean values, currency values, and text strings.
- Hiding unwanted sections.
- Giving the report a professional appearance.

The following topics describe the types of formatting you can do with Crystal Reports, giving step-by-step instructions for performing a variety of formatting tasks.

Note:
There are many date formats you can choose to use on an English report, but if you send the report to a Japanese system, there may be some formatting irregularities. Not all English date formats are viewable on a Japanese system, and the same is true going from Japanese to English. For instance, abbreviated English months do not appear on a Japanese system and Japanese eras in short format do not appear on an English system.

Using a template

A template is an existing report file whose formatting can be added to a new report. At the same time, the formatting of the template report's fields and report objects are applied to the new report. Use templates to give any number of reports a consistent look without having to format each one individually.

For additional information about templates, see *Template considerations*.

Applying a template

When you create a new report in the Standard Report Creation Wizard, you can apply a template as an optional step. You can also apply a template later by using the Template Expert. You can choose from a number of predefined templates, or you can use an existing Crystal report as a template.

To apply a template in the Standard Report Creation Wizard

1. Click **New** on the Standard toolbar.
2. Choose data, fields, grouping fields, and so on, until the wizard displays the Template screen.
3. In the **Available Templates** list, click a predefined template name to see an example of it in the Preview area.

   By default, the sample templates shipped with Crystal Reports are installed at \Program Files\Business Objects\Crystal Reports 11.5\Templates.
4. If you want to apply a template based on an existing Crystal report, click **Browse**.
5. In the Open dialog box, select a Crystal report (.rpt) file and click **Open**.

   The report is added to the list of Available Templates.

   Note:
   If a template name and preview picture were saved (in the Document Properties dialog box) with the report you selected as a template, you will see this information on the Template screen.
6. Click **Finish**.

   Your report appears with its data formatted to match the template you selected.

   Note:
   Formatting is not applied if the report you chose does not meet the requirements for a template.

To apply a template to an existing report

1. On the **Report** menu, click **Template Expert**.

   The Template Expert appears.

   Tip:
   Another way to do this is to click the Template Expert button on the Expert Tools toolbar.

   As was the case with the Template screen, you can choose from a number of predefined templates, or you can click the Browse button to search for an existing report to use as a template.

2. Choose a template and click **OK**.

   Note:
   Any drill-down tabs, alerts, or analyzer views that are open will be closed before the template is applied.

Removing an applied template

Perhaps, after applying a template, you don't like the changes made to your report. As long as you haven't exited Crystal Reports since you applied the template, you can remove it from your report.

To remove an applied template

1. On the **Report** menu, click **Template Expert**.

   Tip:
   Another way to do this is to click the Template Expert button on the Expert Tools toolbar.

2. Choose **Undo the current template** and click **OK**.

   The chosen template's features are removed and your report reverts back to the formatting it had when you first opened it.

Note:
To remove a template, you must use this option; the Undo command is not available from the Edit menu.

Reapplying the last template selected

If you want to reapply the last template you selected during a session of Crystal Reports, you can simply select an option on the Template Expert.

To reapply the last template selected

1. On the **Report** menu, click **Template Expert**.

   Tip:
   Another way to do this is to click the Template Expert button on the Expert Tools toolbar.

2. Choose **Re-apply the last template** and click **OK**.

Using Template Field Objects

You can use Template Field Objects to create more flexible report templates. These report objects do not refer to existing database fields; you simply put them in your template report and format them as you require. When you apply the template to another report, Crystal Reports displays that report's data with the formatting you specified. Therefore, when you design a template, you don't have to know what data might be in the report you'll eventually apply it to—you use Template Field Objects to take care of the possibilities for you.

Note:
Template Field Objects are applied only to result fields: database fields, parameter fields, SQL statements, and formulas. Special Fields are not considered result fields.

To add a Template Field Object to a template report

1. On the **Insert** menu, click **Template Field Object**.

   A placement frame is attached to your cursor.

2. Place the Template Field Object frame on your template report.

   A Template Field Object can be placed in any report section.

3. Right-click the object and click **Format Template Field** from its shortcut menu.

   A list of formatting options appears. You can choose any of the options; when you do, the appropriate tab of the Format Editor appears.

   Tip:
   You can select multiple Template Field Objects and apply your formatting choices to all of the objects.

4. Specify the formatting for your Template Field Object as you require.

   For information about how to apply formatting, see *Working with absolute formatting* .

For each Template Field Object you create, a special formula field is created. You can see this formula field in the Formula Workshop. If you want to use sample data in your report to see how your formatting will look, you can reference database fields in these formulas.

Note:
If you want to apply different formatting to a number of fields within the same report section, you should use a different Template Field Object for each field.

To add sample data to a Template Field Object formula

1. In the Field Explorer, expand the **Formula Fields** node, select a Template Field Object, and click **Edit**.

   Tip:
   In the Formula Fields node of the Field Explorer and the Formula Workshop, Template Field Objects appear as <TemplateFieldn>.

2. In the Formula Editor, replace the `Space(10)` section of the argument with a database field of the type you want to see in your sample, save your change, and close the Formula Workshop.
3. Refresh your report's data.

Template considerations

If an existing report is used as a template, these report objects will be applied to the new report:

- Fields
- Groups
- Group charts
- Summary fields
- Hyperlinks
- Bitmaps
- Lines, boxes, borders
- Static OLE objects

If an existing report is used as a template, these report objects will not be applied to the new report:

- Detail charts
- Subreports
- OLAP grids
- Cross-tabs
- Maps
- Embedded OLE objects
- BLOB fields
- Specified order grouping
- Advanced summaries (such as Top Ns, Percentages, and Running Totals)

The formatting and objects from an existing report used as a template can override choices you made in the Standard Report Creation Wizard. For example, if you had selected "No Chart" on the Chart screen of the wizard, but then applied a template report that includes a chart, the template report will override your selection and the new report will contain a chart.

Further, a chart in a template report overrides the charting summary value selected on the Chart screen of the wizard. The order in which you select your data fields in the wizard generally determines which summary field becomes the default value for your chart. Once the template has been applied, the first summary field in the report becomes the charting summary value even if you selected a different value in the wizard.

If the Template has...	If the target report has...	Result
Group Chart	Group Chart	Overwrite/Apply
Group Chart	No Chart • Group & summary	Overwrite/Apply
No Chart	Group Chart	Chart retained
Advanced Chart • Using group & summary in report	No Chart	Overwrite/Blank section
Advanced Chart • Not using group & summary in report	Advanced Chart	Overwrite/Blank section
Advanced Chart • Using group & summary in report	Advanced Chart	Overwrite/Apply

If the Template has...	If the target report has...	Result
No Chart	Advanced Chart	Chart retained
Cross-Tab/OLAP grid	Cross-Tab/OLAP grid	Cross-Tab/OLAP Grid retained
No Cross-Tab/OLAP grid	Cross-Tab/OLAP grid	Cross-Tab/OLAP Grid retained
Cross-Tab/OLAP grid	No Cross-Tab/OLAP grid	Overwrite/Blank section
Map	Map	Map retained
No Map	Map	Map retained
Map	No Map	Overwrite/Blank section
Subreport	Subreport	Subreport retained
No Subreport	Subreport	Subreport retained
Subreport	No Subreport	Overwrite/Blank section

Using the Report Design Environment

This section describes several things to keep in mind when designing reports that are distributed to different environments.

Section characteristics

A report consists of several sections, including the Report Header, Page Header, Group Header, Details, Group Footer, Page Footer, and Report Footer.

Each report section is made up of a series of lines. When a text-based object is placed in a section, it is placed on a line in such a way that the text is aligned to the baseline. The line's height is then adjusted by the printer driver so that it is high enough to accommodate the object.

- If you place another text-based object on the same line with a font size larger than that of the first object, the line's height extends to accommodate the second object.
- If you place another text-based object on the same line with a font size even larger than the previous two objects, the line's height extends to accommodate the third object.

A line's height is determined by the text-based object with the largest font size on the line.

As you add text-based objects to a report, either in the same section or other sections, the line height adjusts to accommodate the various fonts. Since this vertical spacing is set up by the printer driver, it is difficult to create reports designed for pre-printed forms when they are printed in various environments.

When designing reports, you should do the following:

- Always print a test page.
- Keep all font sizes the same.
- Be sure to print pre-printed forms on the same machine.

Making an object underlay a following section

Using this example, you can make a logo underlay multiple sections. This procedure is similar to the one for inserting a company watermark to serve as a report background.

To make an object underlay a following section, first place the object in the section above the section you want it to underlay. Then select the Underlay Following Sections check box in the Section Expert for the section in which the object is placed.

To create a basic report

1. Create a report using the Customer table in Xtreme.mdb.

   The Xtreme.mdb file is located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. Place {customer.CUSTOMER NAME} and {customer.LAST YEAR'S SALES} side-by-side in the Details section of the report.
3. To remove unnecessary objects from this example, delete the field titles that the program places in the Page Header section of each field.
4. On the **Insert** menu, click **Group** to break the data into regional groups.
5. On the **Common** tab of the Insert Group dialog box, select {customer.REGION}.
6. Click **OK**.

To insert a picture onto the report

1. On the **Insert** menu, click **Picture**.

   Tip:

   Another way to do this is to click the Insert Picture button on the Insert Tools toolbar.

2. Select an image file, and then place it in the Page Header section, to the right of the fields in the report body.

Note:
In this example, the picture is placed to the right of the fields to avoid underlaying the text. When you are working with a watermark, a subdued picture designed to be nearly invisible, place it directly above the text.

3. On the Standard toolbar, click **Print Preview**.

   The picture prints in the Page Header section of each report page.

To make the picture underlay the following section

1. On the **Report** menu, click **Section Expert**.

   The Section Expert dialog box appears.

   Tip:
   Another way to do this is to click the Section Expert button on the Expert Tools toolbar.

2. In the **Sections** list, click **Page Header**, then select the **Underlay Following Sections** check box.
3. Click **OK** to preview the report again.

   The picture now prints in both the first Group Header and the following few Details sections, next to (instead of above) the text in the body of the report.

   Note:
   Using the technique of placing a picture to the right of the body of the report, you can set up a chart or an employee picture to print beside the details pertaining to that chart or employee.

4. Once you are finished previewing the report, return to the **Design** tab.
5. Resize the picture vertically to make it two or three times larger, then preview the report again.

   The bitmap file now underlays more sections.

The area in which the picture underlays depends on the following conditions:

- The size of the picture.
- The section in which the picture was originally placed.

- The position of the picture in the section.

By modifying size and placement of an object, you can create a variety of visual effects, using the underlay feature.

Pre-printed forms

If you print on pre-printed forms, you will be able to:

- Scan a form.
- Place it in the report as a bitmap.
- Use the underlay feature to line up the bitmap and report, as well as move objects anywhere you want them to appear.
- Eliminate the need to print the forms separately by printing the report and the form as a single unit.

Multiple columns

Instead of having your data print straight down the page, you can set up multiple columns and have the data flow from column to column.

To create a multiple-column report

1. Open the report you want to format with multiple columns.
2. On the **Report** menu, click **Section Expert**.

   Tip:

   Another way to do this is to click the Section Expert button on the Expert Tools toolbar.

3. In the Section Expert, highlight **Details**, and then select **Format with Multiple Columns**.

   A Layout tab is added to the Section Expert.

4. Click the **Layout** tab and set the **Width** you want your column to be.

Keep in mind the width of your paper when deciding your column width. For example, if you have three fields in your Details section, and they take up four inches of space, limit the width of the column to under four and a half inches so that all the field information can be seen.

5. Set the **Horizontal** and/or **Vertical** gap you want to maintain between each record in your column.
6. In the Printing Direction area, choose a direction.
7. If the report you're formatting contains grouping, select **Format Groups with multiple column**.
8. Click **OK**.

When you preview the report, you'll see that the field headers appear only for the first column. To have field headers for the second column, insert a text object.

Hiding report sections

Crystal Reports has three properties you can set in the Section Expert to hide report sections.

Hide (Drill-Down OK)

The Hide property hides a section whenever you run the report. For example, in a summary report, the Hide property can be used to display only the summaries, but not the details behind the summaries. When the Hide property is applied to a section, it becomes visible when the Drill-down cursor is used to drill down on the section contents. This property is absolute; it cannot be conditionally applied using a formula.

Suppress (No Drill-Down)

The Suppress property also hides a section when you run the report. Unlike the Hide property, however, you cannot apply the Suppress property, then drill down to reveal the section contents. This property can be applied absolutely, or conditionally using a formula. This is useful for writing form letters. For example, in a form letter, you might create two Details sections:

one to suppress when sales are equal to or over $X and one to suppress when sales are under $X.

Suppress Blank Section

The Suppress Blank Section property hides a section whenever there is nothing in it. If something is placed within the section and it produces a value in your report, then it becomes visible.

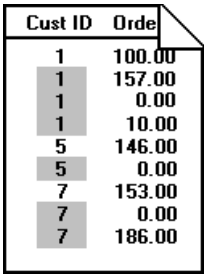
Hiding report objects

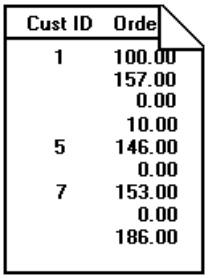
Crystal Reports has three formatting options in the Format Editor for hiding individual objects.

Suppress If Duplicated (Common tab)

The Suppress If Duplicated property prevents a field value from printing if it is identical to a duplicate of the value that comes immediately before it in an iteration of the same section.

The value does not print, but the space in which it would have printed remains.





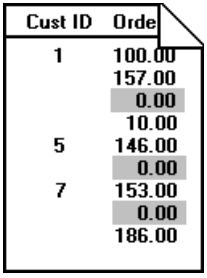
Note:

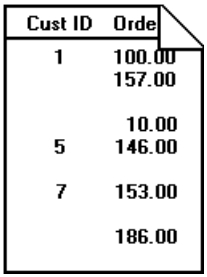
- This option does not work for text fields that contain embedded fields.
- This option compares record values, not formatted field values. The program ignores the option in the first Detail section of a formatted page.

Suppress If Zero (Number tab)

Tip:
To find this option, click the Number tab of the Format Editor, then click the Customize button.

The Suppress If Zero property prevents a value from printing if it is a zero value. The value does not print, but the space in which it would have printed remains. To remove the blank space, select the Suppress Blank Section check box in the Section Expert.

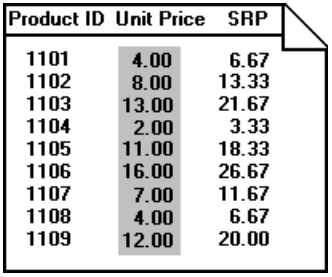


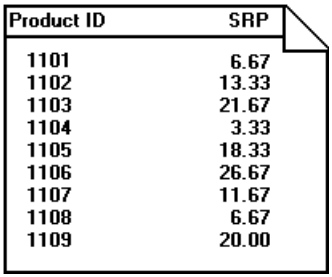


Note:
This will only work if there are no other objects in the section.

Suppress (Common tab)

The Suppress property hides an object when you run the report. For example, it is common to apply this property to formulas that are needed to do some report calculations, but that you do not want to print when you run the report. When you select this property, the selected object does not print.





Product ID	SRP
1101	6.67
1102	13.33
1103	21.67
1104	3.33
1105	18.33
1106	26.67
1107	11.67
1108	6.67
1109	20.00

Note:
You can click the Conditional Formula button for any of these properties and create a formula that will make the setting conditional on some event. See *Working with conditional formatting*.

To set these properties, select the object, then click Format from the Expert Tools toolbar to open the Format Editor dialog box. When the Format Editor appears, set the properties.

Placing text-based objects

When a text-based object is placed on a report, the object is represented by an object frame. The height of the object frame is based on the height of the font. The width, however, is determined differently, depending on the object you are working on.

- For database fields that are not memo fields, the width is initially determined by the width of the field as defined in the database, and by the average character width as provided by the selected font and font size.

  For example, you have a database field called {customer.LAST NAME} and your database defines this field as a text field with a length of 35 characters. When you place this field on your report, the width of the boundary is 35 times the average character width of the font and font size that the database field is formatted to. Remember that this is the initial default boundary width. The width can always be resized to increase or decrease as you see fit.

- For text-based objects, the default width is approximately 19 average character widths wide. Text objects are different from database fields in that their width automatically expands as you enter in text and/or database fields into the object. As with all other text-based objects, the width can be resized by the user.
- For different number fields (double, single, integer, long integer, and byte) the default widths are all different. As with all objects, the width can be resized by the user.

Preventing the truncation of text inside an object

Whether the default widths are accepted or the text-based objects are resized, a problem could arise if the text inside the object prints right to the edge of the object frame. While the report may look fine on the machine it was designed on, when the report is printed using another printer driver that measures the font wider, the length of the text grows, but the object frame remains fixed. The resulting text is cut-off or truncated.

To prevent the truncation of text inside an object

1. Right-click the text object you want to format to bring up the shortcut menu.

   Tip:

   Another way to do this is to click the Format button on the Expert Tools toolbar.

2. On the shortcut menu, click **Format Text**.

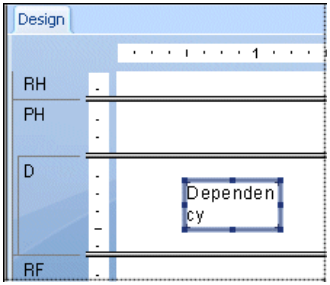
   The Format Editor dialog box appears.

3. On the **Common** tab, select the **Can Grow** check box.
4. Click **OK** to save your changes.

   The object is then formatted to print on multiple lines. If the text prints wider than the object, the text wraps onto additional lines.

Preventing breaks in non-spacing text inside an object

For text strings that do not contain spaces, such as single words, the text string is broken at the edge of the object frame before the line starts to wrap.



To prevent the breaks in non-spacing text inside an object

1. Select the object you want to format.
2. Expand the object frame to make it wider than the widest block of text inside the frame.

There are many times when the actual text in a database field is far less than the maximum amount the field can contain. For example, a {table.LAST NAME} field is designed with a field size of 80 and the longest name in the database is 28 characters. In this case, when you first place the field in your report, the field is 80 times the average character width. Reduce the width of the field, but include enough space to account for growth.

While each of these options offers an effective solution when dealing with a single text-based object in a section, there are still design considerations to take into account when placing more than one object in a section. When sizing an object, consider its placement with regard to other objects in the section.

Avoid designing reports where the space between each object is very tight. Leave room for growth by expanding the width of the object by approximately 5 per cent. Or, if this is not possible, consider reducing the size of the font or placing each object in its own subsection.

Suppressing blank lines in embedded fields

Because you can embed fields in text objects, you might encounter cases where an empty field causes a blank line in a text object. You can suppress blank instances of such embedded fields.

Note:
The suppression of embedded field blank lines is designed to remove blank lines within a text object if the text object contains an entirely blank field alone on a line followed by a carriage return.

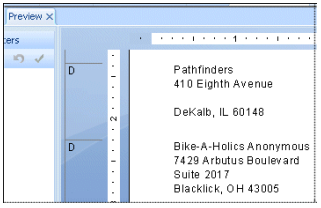
To suppress blank lines in embedded fields

1. Open your report in the **Design** tab, and click the desired text object—that is, the text object that causes blank lines to show for some records.

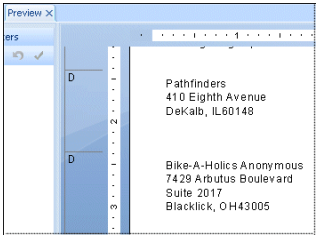
   Tip:
   To ensure that you have clicked a text object, look for the word Text in the status bar at the bottom left corner of the screen.

2. Right-click the text object and, on the shortcut menu, click **Format Text**.
3. Select the **Suppress Embedded Field Blank Lines** option in the Format Editor, and then click **OK**.

Now, when the report prints, unwanted blank lines will no longer appear in place of empty embedded fields. You can confirm your changes in the Preview tab.



Before suppressing blank lines, the Address2 field prints a blank line if it is empty.



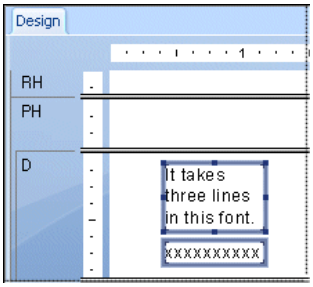
After suppressing blank lines, the Address2 field does not print if it is empty.

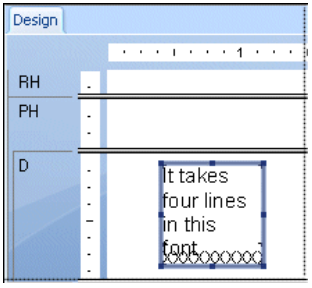
Placing multi-line, text-based objects

While text-based objects that are formatted to print on multiple lines follow the same design rules as other objects, they have one additional characteristic to be considered. If the printer driver expands or contracts the spacing of the text, word wrapping may differ, changing the number of lines necessary to print the object in order to accommodate growth or shrinkage.

When placing multi-line text-based objects, you could encounter problems if other objects in the same section are placed directly below them.

Unlike single-line text-based objects, expanding the object frame of a multi-line text-based object to accommodate growth is not a viable option. When you do this, the line width increases according to the expanded boundaries.





So, when possible, place multi-line text-based objects at the bottom of a section. If they require more lines to print, the section expands downward to accommodate the growth, and they do not endanger other objects.

Importing text-based objects from a file

Using Crystal Reports, you can import a formatted, text-based object from an existing file onto your report.

To import text-based objects from a file

1. Double-click the text-based object you want to format to put it in edit mode, then right-click it to bring up the shortcut menu.
2. On the shortcut menu, click **Insert from file**.
3. In the Open dialog box that appears, select the file in which your text-based object is stored, then click **Open**.

   The object is imported from the file into the text object on your report.

Spacing between text-based objects

Use the grid and guidelines options to help evenly align text-based objects.

You can select the Snap To Grid option, set the grid to a maximum of one inch, and make the grid visible or invisible on the Design tab, Preview tab, or both. For more information on working with grids, see *Using the grid*.

You can also work without a grid, placing objects wherever you want them on a report. You may want to work in a free-form environment while retaining the ability to align objects, or to move or resize them as a group. You can do this using guidelines. See *Designing with guidelines* .

Using the grid

The grid is a series of row and column coordinates. When the grid is selected and the Snap To Grid option is selected on the Layout tab of the Options dialog box, Crystal Reports enables you to place text-based objects only at these coordinates, not between them. You can then space data on your report and align objects as needed. If you attempt to place an object between grid coordinates, the object "snaps" to the grid; that is, the object automatically moves to the nearest set of row and column coordinates.

Each report contains a design grid. You can select the grid on or off, as well as set it to different sizes when required. By default, the grid is not selected. See *Selecting the grid*.

Once set, the grid remains the same size for all sections. It is measured from the upper-left corner of each section and continues down and to the right, until the end of the section. A new grid of the same size then starts from the upper-left corner of the next section, and so on, through the end of the report.

If you select the Snap To Grid option, the following conditions occur:

- The upper-left corner of all newly placed, text-based and OLE objects snap to a grid point.
- Objects placed on a report before the Snap To Grid option is selected do not snap to the nearest grid point. They remain in the same place.
- If you resize an object, the side or sides that you are resizing snap to the nearest grid point.

Selecting the grid

The Design and Preview tabs have an underlying grid structure that you can activate on the Layout tab in the Options dialog box.

To select the grid

1. On the **File** menu, click **Options**.

   The Options dialog box appears.

2. On the **Layout** tab, in the Grid options area, activate the snap to grid feature, or specify the grid size.
3. To show the underlying grid structure on the Design or Preview tab, select Grid in the Design View or Preview areas.
4. Click **OK** to save your changes.

Tip:
Another way to do this is to select the Grid commands from the View menu. You can also right-click an empty space on the Design or Preview tabs and select the command from the shortcut menu.

Designing with guidelines

Crystal Reports provides guidelines to help you align and size report objects with accuracy. Guidelines are non-printing lines that you can place anywhere on the Design and Preview tabs to aid in alignment. They have a snap property that automatically snaps objects to them.

Viewing guidelines

You can view guidelines on the Design and Preview tabs by selecting the view options in the Options dialog box.

To view guidelines

1. On the **File** menu, click **Options**.

   The Options dialog box appears.

2. On the **Layout** tab, in the Design View area, select the **Guidelines** check box and/or the **Guidelines** check box in the Preview area.
3. Click **OK** to save your changes.

Tip:
Another way to do this is to select a Guidelines command from the View menu.

Inserting guidelines

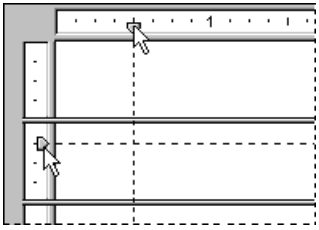
Although you can and should insert manual guidelines whenever necessary, Crystal Reports will automatically insert guidelines in certain situations:

- Whenever you add a field or formula field to a report, the program creates a guideline at the left edge of the field frame and snaps the field and field title to it.
- When a field is summarized, the program snaps the summary to the same guideline to ensure proper alignment.
- When you right-click the shaded areas to the left of a section, then select the Arrange Lines option from the shortcut menu, the program creates one or more horizontal guidelines in the section and snaps the fields to them.

To insert, move, and remove guidelines manually

1. In the Design or Preview tab, click the ruler at the top to activate a vertical guideline; click the ruler on the left to activate a horizontal guideline.

   Notice that each guideline is attached to an arrowhead on its originating ruler.



   Note:
   If guidelines don't appear, ensure that the appropriate Guideline option is selected on the View menu. On the Preview tab, you must select an object to see a guideline.

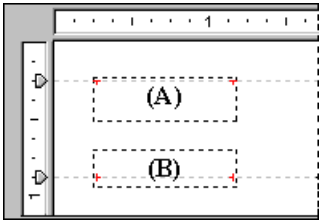
2. To position a guideline, drag its arrowhead along the ruler to the desired location.
3. To delete a guideline, drag its arrowhead away from the ruler.

Note:
If you select the Snap To Grid option, you can only insert or move guidelines in grid increments.

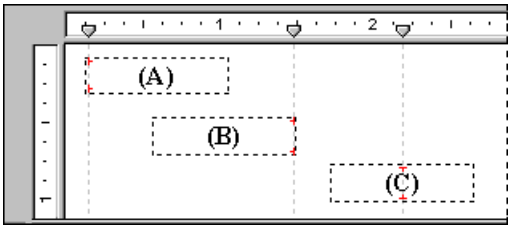
Snapping objects to guidelines

To snap an object to a guideline, drag the report object onto the guideline until the object's edge sits atop the guideline. Snapping enables you not only to align report objects accurately, but also to re-position and re-size multiple objects together. Once several objects are snapped to a guideline, you can move all the objects by moving the guideline.

You can snap either the top or the bottom of an object to a horizontal guideline.



You can snap an object's left side, right side, or vertical midline (the invisible line that bisects an object vertically) to a vertical guideline.

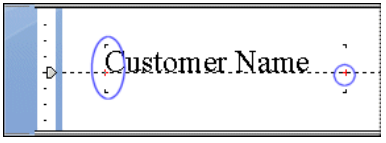


To snap objects to a guideline

1. Insert a guideline by clicking one of the rulers.
2. Drag the report object onto the guideline, so that one of the object's edges is on the guideline.

The snap property of guidelines works differently for text-based objects than for other objects, such as OLE objects. When a single-line text-based object snaps to a guideline, it is the baseline of the text, not the object frame, that snaps to the guideline. When a multi-line text-based object snaps to a guideline, either the baseline of the text or the object frame can be snapped to the guideline.

You can tell if a text-based object is snapped to a horizontal guideline by looking for the special indicators positioned on either side of the object directly at the baseline (as circled in the image below) in Design view. If the object is snapped to a vertical guideline, the special indicators appear along the side of the object.



To place several text objects of different font sizes on one line with their baselines lined up, snap each object's baseline to the same horizontal guideline.

Positioning objects using guidelines

Once you've snapped one or more objects to a guideline, you can move all the objects at once by moving the guideline. To move the guideline, drag its arrowhead along the ruler.

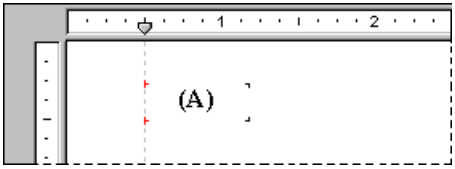
Note:
When a guideline is moved, any object that is snapped to it is moved as well. But, if you move an object that is snapped to a guideline, the guideline does not move.

Resizing objects using guidelines

Use two guidelines to resize two or more objects that are either the same size (height or width) or different sizes. The process for resizing with two guidelines is the same in either case.

To resize objects using guidelines

1. Create a guideline.
2. Snap one side of the object to that guideline.

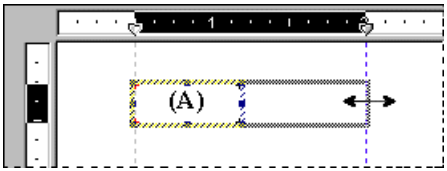


3. Create a second guideline to the right of the object.

   Note:
   The guideline should not be touching the object.

4. Click the object to activate the sizing handles.

5. Drag the resizing handle over to the second guideline so that the object snaps to the guideline.



6. For each additional object you want to snap to both guidelines, repeat Steps 2 through 5.
7. If the objects are not the desired size, drag one or both of the guidelines until the objects are the correct size.

Indenting lines

Using Crystal Reports, you can control line indentation for memo fields, string fields, and text-based objects. For objects, you have the option of indenting lines for a particular paragraph by positioning the cursor at the start of that paragraph. Or, if you select an object in its entirety, you can apply the same indenting specifications to all the paragraphs within that object.

Keep in mind that any line following a carriage return will be considered the first line of a new paragraph.

To indent lines

1. Right-click the field or object you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format text**.

   The Format Editor dialog box appears.

3. Click the **Paragraph** tab.
4. In the Indentations area, you can indent the first line of the paragraph; indent every paragraph line from the left edge of the object; and indent every paragraph line from the right edge of the object.

   Note:

   - Only indentation values within the range of the field or object width are accepted.

- When you select the "Right to Left" reading order, indents are measured from the opposite side of the object. That is, a left indentation is measured from the right side of the object.

5. Click **OK** to save your changes.

Overflow Field Representation

Crystal Reports uses Overflow Field Representation to assist users when working with numeric or currency values in report cells. Normally, if a numeric or currency value is larger than the field containing it, that value is truncated, or "clipped." For example, values like 100,000,000 might appear on the report as 1,000, or as 000 (depending on the properties you have set). This could potentially cause confusion when the report is read.

When the Allow Field Clipping formatting option is cleared, numeric/currency field values that exceed the field size will be represented by number signs (######) in the Preview tab, letting you know immediately when the field is too small.

To allow for overflow field representation

1. Right-click the currency field or number field you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears with the Number tab open.
3. Click the **Customize** button.

   The Custom Style dialog box appears with the Number tab open.
4. To allow overflow field representation, clear the **Allow Field Clipping** check box.

   Note:

   You also have the option to click the Conditional Formatting button to enter a formula in the Format Editor. In the Format Formula Workshop, you can specify that field clipping will be disabled only when certain conditions are met.
5. Click **OK** to save your changes.

To view the results, refresh the report. If you disabled field clipping, any numeric/currency field values that are larger than the field objects containing them will be represented by number signs (######).

Selecting multiple objects

You can select multiple objects, including text, field, chart, map, bitmap, OLAP grid, Cross-Tab and OLE objects, to format them together.

Once you have selected multiple objects, you can move, align, size, cut, and copy and paste them as a group. You can also change their font, color, and paragraph style.

Objects are moved, aligned, and sized based on a "main" object, which is usually the last object you select. You can change the main object to another by right-clicking the desired object.

To select multiple objects

1. Click one object, and **Ctrl+click** the other objects you want to select.

   Note:
   You can also lasso a number of objects by left-clicking and dragging your cursor over an area.

2. Right-click the main object.
3. On the short-cut menu, select the appropriate formatting option.

To select all objects in a section

1. On either the Design or Preview tab, right-click the gray area to the left of the section you want to work with.
2. From the shortcut menu, select **Select All Sections Objects**.

   All report objects in that section are selected.

Vertical placement

On the Common tab of the Format Editor, you can use the text rotation options to vertically align the fields and text-based objects on your report.

When you select a text rotation of 90 degrees, the text shifts 90 degrees in a counter-clockwise direction.

When you select a text rotation of 270 degrees, the text shifts 270 degrees in a counter-clockwise direction.

Note:

- If text rotation is left at 0 degrees, your report is horizontally formatted, left to right.
- For text rotation of text-based objects, the Can Grow option that prevents the truncation of text inside an object is automatically cleared. For more information on the Can Grow option, see *Preventing the truncation of text inside an object*.
- Vertically formatted text that spans over the edge of the page cannot be displayed as part of your report.

Inserting character and line spacing

With Crystal Reports, you can specify the amount of spacing between characters or lines for memo fields, string fields, and text-based objects.

To insert character and line spacing

1. Right-click the field or object you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears.
3. Click the **Font** tab.

   You will use this tab to set up the character spacing values.

4. In the Spacing area, in the **Character spacing exactly** field, specify the value *n* that each character occupies.

   The value n is defined as the distance in number of points measured from the start of one character to the start of the next. When you change the character spacing, you change only the spacing between adjacent characters, not the font size of the characters.

   For example, if you specify a 14-point font with a character spacing of 14 points, each character will remain as a 14-point font size, occupying a space that is 14 points wide.

5. Click the **Paragraph** tab.

   You will use this tab to set up the line spacing values.

6. In the Spacing area, in the **Line spacing** field, specify the line spacing as a multiple of the font size you are using, or as an exact number of points.
7. Click **OK** to save your changes.

Setting fractional font sizes

On the Font tab of the Format Editor, you can select a fractional font size for database fields and text-based objects on your report.

To set fractional font sizes

1. Right-click the field or object you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears.

3. Click the **Font** tab.
4. In the **Size** list, type the desired fractional font size for the field or object.

   Note:
   The number you type must be between 1 and 1638. Crystal Reports will automatically round all fractional entries to the nearest 0.5. Consequently, in your report, you can use the fractional font sizes 1.5, 2.5, 3.5, and so on, up to 1637.5.

5. Click **OK** to save your changes.

Note:
When setting fractional font sizes for individual database fields and text-based objects that you've already placed on your report, you must make your changes manually—that is, by following these procedures. (This is because the existing font settings of objects in your report will override your default Options.) However, you can use the Fonts tab of the Options dialog box to adjust your default font settings: these default Options will affect the new reports that you create, along with any new objects that you add to an existing report.

Setting page size and page orientation

You can view and print your reports using either portrait or landscape orientation, and in a variety of page sizes.

You may also set different page orientation for each section in your report. This is useful for formatting certain sections to display charts or other graphics.

Specify these options using the **Page Setup** command from the **File** menu.

To set page size and page orientation

1. On the **File** menu, click **Page Setup**.

   The **Page Setup** dialog box appears.
2. In the **Page Size** box, select your page size.
3. In the **Page Orientation** box, select your page orientation.
4. In the **Margins** box, select your margins.

   For information on conditional margins, see *Changing margins conditionally*.

To set page orientation by section

1. On the **Report** menu, click **Section Expert**.

   The **Section Expert** appears.

Tip:

Another way to do this is to click the **Section Expert** button on the **Expert Tools** toolbar.

2. In the **Sections** list, select the section to be modified.
3. On the **Paging** tab, select the desired page orientation.

Note:
This option is not available for the Page Header and Pager Footer.

Setting page margins

Margins are the write spaces on the left, right, top, and bottom of the page. Crystal Reports gives you the option of setting margins to meet your specifications.

To set specific margins

1. On the **File** menu, click **Page Setup**.

   The **Page Setup** dialog box appears.
2. Change the default page margins to fit your needs.
3. Click **OK** to save your changes.

Page margins can also be controlled by use of conditional formulas. See *Changing margins conditionally*.

Note:

- All margins are calculated from the page edge. Thus, a left margin of .25 inches causes the printing to start exactly one quarter inch in from the edge of the page.
- You can select the **Adjust Automatically** check box if you want Crystal Reports to adjust the report's margins automatically the next time you change the page size. If you choose a new page size that is large enough for the current printable area, Crystal Reports increases or decreases the margins by enlarging or reducing the left/right and top/bottom margins by the same factor. If you choose a new page size that is smaller than the current printable area, Crystal Reports fills the entire page by reducing

the margins to 0. If you next choose a bigger page, this (reduced) printable area is kept and the left/right, top/bottom margin ratios become 1:1.

TrueType fonts

Designing your report with printer-specific fonts can lead to problems when using different printers. The fonts may not be supported by the other printers, or if they are supported, the fonts may not be installed on the printers.

During the printing process, if you encounter printer-specific fonts that are unrecognizable to the printer driver, Crystal Reports substitutes the fonts, creating inconsistent results. To avoid this situation, only common TrueType fonts should be used when designing reports.

Printer drivers

Updating printer drivers

In order to maintain performance, Crystal Reports queries the printer driver for each of the font elements (font metrics), such as average character height, character width, height of the ascenders and descenders, internal leading, and so on. A problem may develop if using an older printer driver that does not return the font metrics accurately. If you are experiencing problems when printing (missing fields, incorrect formatting, and so on), it is recommended that you obtain and install the most recently updated drivers for your printer. In many cases, the newer printer drivers provide accurate font metrics and any printing issues are quickly resolved.

Inconsistencies due to printer drivers

Inconsistencies may occur if different printer drivers are used to create and print your reports. These inconsistencies are a result of the various methods that individual printer drivers use to measure text metrics such as font size. When printed, text-based objects may be misaligned, truncated, or overprint each other. Examples of text-based objects include string or character fields, text objects, memo fields, numeric fields, and formula fields.

Problems such as these may arise when you have:

- Two identical printers, but each one is using a different printer driver.
- Two different printers using the same printer driver.
- Two different printers using different printer drivers.
- One printer driver that uses the TrueType font and a second printer driver that maps TrueType fonts to PostScript fonts.
- Two identical printers using the same printer driver, but each one is printing from a different version of Microsoft Windows.
- Two identical printers using the same printer driver, but the printer drivers are different versions.
- Two identical printers, two identical printer drivers, and two identical operating systems, but the resolution of the video drivers is different.

Therefore, while a document using one printer driver may require six full lines to display a block of text:

- Using a second printer driver that measures fonts narrower could result in the same block of text requiring less than six full lines.
- Using a third printer driver that measures fonts wider could require more than six full lines.

The goal of the report distributor is to design reports that accommodate printer driver dependency and still print consistently using different printer drivers. To do this, Crystal Reports provides several design solutions. If taken into account when creating your report, these solutions can ensure proper printing and distribution for your report in almost any environment.

For reports that will be viewed online, you can avoid inconsistencies from printer drivers by disabling the report's reliance on a printer driver. For more information on disabling a printer driver, see *Formatting a report for web viewing*.

Formatting a report for web viewing

If your report will be viewed online, you may choose to format your report for web viewing. You can create custom page sizes and adjust margins for a viewer's screen without being restricted to printer-specific settings. Disabling

reliance on a printer driver also prevents inconsistencies that can occur if your report is viewed with a different printer driver than the one you created it with.

To format a report for web viewing

1. On the **File** menu, click **Page Setup**.

   The Page Setup dialog box appears.

2. In the Printer Options box, select the No Printer check box.
3. Select your desired page size, page orientation, and page margins.

   Note:

   - Reports formatted for web viewing can also be printed. If the custom page size is larger than the printed page size, your report will be scaled down to fit the page. If the custom page size is smaller than the printed page size, a portion of your report will be enlarged to fit the printed page size.
   - Exported reports will retain custom page formatting except for reports exported to XLS format.

Formatting properties

You can set formatting properties using the Format Editor for objects and the Section Expert for report sections. In most cases, you can set one of two types of properties:

- Absolute (always apply the property).
- Conditional (apply the property only if certain criteria are met).

Working with absolute formatting

Absolute formatting is formatting that applies under any condition. This type of formatting property always follows a "select, then apply" procedure. For example, you select what it is that you want to format (object or section), then you apply the formatting to the selection using property settings.

You can use the following dialog boxes to format your reports:

- Format Editor to format field values.
- Section Expert to format entire sections.
- Highlighting Expert to conditionally format all types of fields.

Each of these dialog boxes contains a number of different formatting properties, as well as the tools for turning the properties on or off and specifying attributes.

Adding borders, color, and shading to a field

Crystal Reports allows you to add borders, color, and shading to fields on your report in order to emphasize important data and create professional-looking reports.

To add borders, color, and shading to a field

1. Right-click the field you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears.
3. Click the **Border** tab.
4. Select the line style, color, and background color of the field.
5. Click **OK** to save your changes.

Making a report, section, area, or object read-only

You can make a report, section, area, or object read-only so it can't be formatted. When you set this option, choices in the Format Editor become inactive. The formatting options that are usually available on the toolbars or shortcut menus are also suppressed for the report or object.

Note:
This feature is for your convenience in protecting report formatting; it is not intended to be used as report security.

To make a report read-only

1. On the **File** menu, select **Report Options**.
2. Select **Read-only**.

To make a section or area read-only

1. On the **Report** menu, select **Section Expert**.
2. Select the section or area that you want to make read-only.
3. On the **Common** tab, select **Read-only**.

Note:
When a section is read-only, you can move it, cut it, and delete it, but you cannot make changes within the section. When an area is read-only, all sections in the area are read-only; therefore, you cannot insert another section, nor can you move, cut, or delete an existing section.

To make an object read-only

1. Right-click the object you want to make read-only.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears.
3. On the **Common** tab, select **Read-only**.

Note:

- You can also do this by clicking the Lock Format button on the Formatting toolbar.
- When a report object is read-only, you can move it, copy it, cut it, delete it, browse its data, and select it, but you cannot format it.

Locking an object's size and position

You can lock the position of the selected report object so it can't be moved. When you set this option, you cannot drag the object in the Report Designer and the Size and Position command becomes inactive.

To lock an object's size and position

1. Select the object whose size and position you want to lock.
2. On the Formatting toolbar, click **Lock Size/Position**.

Changing your default field formats

Crystal Reports allows you to display database fields in almost any format on your report. This section describes how to use the Options command to control the default format settings that Crystal Reports uses when you add a field to any report. In the Options dialog box, you can set the default formats for database fields of the following type: String, Number, Currency, Date, Time, Date and Time, and Boolean.

Note:
When you change default field formats, your new settings affect only the objects that you subsequently add to a report. To format fields that you've already added to a report, you must right-click the field in the report and select Format Field from the shortcut menu.

To specify default formats for fields

1. On the **File** menu, click **Options**.
2. In the Options dialog box, click the **Fields** tab.
3. Click the button appropriate to the type of field you want to format (String, Number, Currency, Date, Time, Date and Time, or Boolean).

   The Format Editor appears.
4. Use the Format Editor's tabs to specify the formats you want.
5. Click **OK**.

Setting default formats for Date, Time, and Date and Time fields

The following procedures first describe how to specify standard formats for Date, Time, and Date and Time fields, and then describe how to customize the formats for such fields.

Note:
These default settings will affect only the objects that you subsequently add to a report. To format fields that you've already added to a report, you must right-click the field in the report and select Format Field from the shortcut menu.

To set standard default formats for Date, Time, and Date and Time fields

1. On the **File** menu, click **Options**.
2. In the Options dialog box, click the **Fields** tab.
3. To open the Format Editor, click the button appropriate to the field you want to format (**Date**, **Time**, or **Date and Time**).

   Note:
   If you click the Date and Time button in the Format Editor, then any subsequent changes will affect "Date and Time" fields only. You must click Date or Time to format independent date fields or time fields.

4. In the Format Editor dialog box, click the **Date and Time** tab.
5. Select a predefined format from the list (or click **Customize** to create your preferred format). When you click a new format, you can preview the results in the Sample area of the Format Editor.

   Note:
   From the list of predefined formats, you can choose the System Default settings to ensure that Crystal Reports uses the formats dictated by Windows. You can alter your system's settings in the Regional Settings Properties dialog box, located in the Control Panel.

6. Once you've selected a format, click **OK** in the Format Editor dialog box.
7. Click **OK** in the Options dialog box.

Now, when you add Date, Time, or Date and Time fields to a report, Crystal Reports should use the format you specified.

To customize formats for Date, Time, and Date and Time fields

1. On the **File** menu, click **Options**.
2. In the Options dialog box, click the **Fields** tab.
3. Open the Format Editor by clicking the button appropriate to the field you want to format (**Date**, **Time**, or **Date and Time**).
4. In the Format Editor dialog box, click the **Date and Time** tab.
5. Click **Customize** to open the Custom Style dialog box.

Note:
If you chose to format "Date and Time" fields at Step 3, then you will see three tabs in the Custom Style dialog box (Date and Time, Date, and Time). The formats specified in these tabs apply only to the two elements of "Date and Time" fields, and will not affect the formats specified for independent date fields or time fields.

6. Create your preferred format by adjusting the various options in the Custom Style dialog box.
7. Once you've finished designing your format, click **OK** in the Custom Style dialog box.
8. Click **OK** in the Format Editor dialog box.
9. To format another type of field, click the appropriate button in the Options dialog box. Otherwise, click **OK** to return to Crystal Reports.

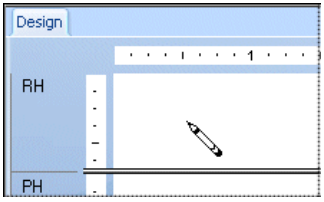
Now, when you add Date, Time, or Date and Time fields to your reports, Crystal Reports should use the customized format that you created.

Adding and editing lines

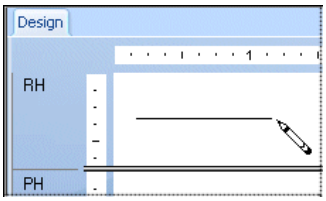
Crystal Reports allows you to add lines to a report to emphasize important data and create professional-looking reports. Lines can run horizontally or vertically. For a vertical line to be broken across several pages, the report section that the line ends in must not be on the same page that it starts on. For example, if a line runs from a group header to the corresponding group footer, the line continues on the top of each subsequent page—just below the page header—until the group footer is encountered.

To add lines to a report

1. On the Insert Tools toolbar, click **Insert Line**.



2. Use the pencil cursor to draw the line where desired.



Note:
You cannot draw diagonal lines.

To edit lines on a report

1. Right-click the line you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Line**.

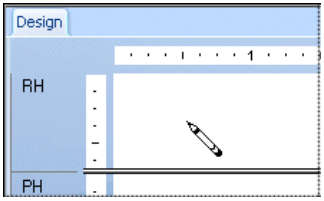
   The Format Editor dialog box appears.
3. On the **Line** tab, make the desired changes to the line.
4. Click **OK** to save your changes.

Adding and editing boxes

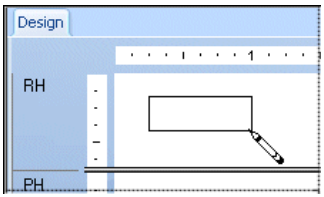
Crystal Reports allows you to add boxes to a report to emphasize important data and create professional-looking reports.

To add boxes to a report

1. On the Insert Tools toolbar, click **Insert Box**.



2. Use the pencil cursor to draw the box where desired.



To edit boxes on a report

1. Right-click the box you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Box**.

   The Format Editor dialog box appears.
3. On the **Box** tab, make the desired changes to the box.
4. Click **OK** to save your changes.

Expected behavior of line and box formatting

This section lists the expected behavior of line and box formatting for some common cases.

Note:
This table uses Short Section Names, for more information about this convention, see *Identifying and working with areas and sections*.

Between these sections	Start	End
• RH to PH • RH to RF • RH to PF • PH to RF • PH to PF • RH to PH	In the top section, or if that section is suppressed, at the top of the next visible section before the bottom section (including the bottom section).	In the bottom section, or if that section is suppressed, at the top of the next visible section.
• RH to GH/D/GF • PH to GH/D/GF	In the top section, or if that section is suppressed, at the top of the next visible header section (RH or PH). If these sections are suppressed, the first visible GH/D/GF section.	In the last instance of the GH/D/GF on a page, or if these sections are suppressed, before the first footer section.
• GH/D/GF to RF • GH/D/GF to PF	In the first instance of a GH/D/GF section on a page, or if these sections are suppressed, at the top of the first visible footer section (RF or PF)—provided that the section is not after the bottom section.	In the bottom section, or if that section is suppressed, at the top of the next visible section.

Between these sections	Start	End
• GH2 to GH3	In every instance of the GH2 section, or if that section is suppressed, at the top of any GH/D/GF section before the end section.	In the first instance of the GH3 section, or if that section is suppressed, at the top of the next visible GH/D/GF section. If these sections are suppressed, at the top of the first RH/PH/RF/PF.
• GH2 to D	In every instance of the GH2 section, or if that section is suppressed, at the top of any GH/D/GF section before the end section.	In the first instance of the D section, or if that section is suppressed, at the top of the next visible GH/D/GF section. If these sections are suppressed, at the top of the first RH/PH/RF/PF.
• GH2 to GF3	In every instance of the GH2 section, or if that section is suppressed, at the top of any GH/D/GF section before the end section.	In the first instance of the GF3 section, or if that section is suppressed, at the top of the next visible GH/D/GF section. If these sections are suppressed, at the top of the first RH/PH/RF/PF.

Between these sections	Start	End
• GH2 to GF2	In every instance of the GH2 section, or if that section is suppressed, at the top of any GH/D/GF section before the end section.	In the GF2 section that corresponds to the GH2 section, or if that section is suppressed, at the top of the next visible GH/D/GF section. If these sections are suppressed, at the top of the first RH/PH/RF/PF.
• GH2 to GF1	In the first instance of the GH2 section in group one, or if that section is suppressed, at the top of any GH/D/GF section before the end section.	In the end section, or if that section is suppressed, at the top of the next visible GH/D/GF section. If these sections are suppressed, at the top of the first RH/PH/RF/PF.
• D to GF2	In the first instance of the D section in group two, or if that section is suppressed, at the top of any GH/D/GF section before the end section.	In the end section, or if that section is suppressed, at the top of the next visible GH/D/GF section. If these sections are suppressed, at the top of the first RH/PH/RF/PF.

Between these sections	Start	End
• GF2 to GF1	In the first instance of the GH2 section in group one, or if that section is suppressed, at the top of any GH/D/GF section before the end section.	In the end section, or if that section is suppressed, at the top of the next visible GH/D/GF section. If these sections are suppressed, at the top of the first RH/PH/RF/PF.

Adding shapes to a report

When designing report formats in Crystal Reports, you can insert a variety of shapes such as circles, ellipses, and boxes with rounded corners, as part of your report. This is especially useful for formatting reports in languages that require these shapes to effectively communicate.

To add shapes to a report

1. Add a box to your report.

   See *Adding and editing boxes*.

2. Right-click the box to bring up the shortcut menu.
3. On the shortcut menu, click **Format Box**.
4. In the Format Editor that appears, click the **Rounding** tab.
5. Select a number between 0 and 100 in the Rounding box, or move the slider to the right to increase the curvature of the box corners.

   The box that you started with gradually changes to an ellipse or circle, depending on how far you move the slider to the right.

   Note:
   If you have specified rounding for a box, you cannot use the Drop Shadow option that is usually available on the Box tab of the Format Editor.

6. Once the appropriate shape is created, click **OK** to save your changes.

Scaling, cropping, and sizing objects

When you create or modify a Crystal report, you can insert a variety of OLE objects. For more information about OLE objects and how to insert them in your report, see *OLE*. Once an OLE object is present in your report, you can scale, crop, or size it.

To scale, crop, or size an object

1. Add a picture or other OLE object to your report.

   See *Inserting OLE objects into reports*.

   Note:
   This procedure also applies to BLOB field objects.

2. Right-click the object and select **Format Graphic** from the shortcut menu.
3. In the Format Editor, click the **Picture** tab.
4. To crop the object, specify the size of the piece that you want to cut from its top, bottom, left, and/or right side.

   Note:
   Cropping begins at the outer edge of the object. Positive numbers cut into the object, while negative numbers add the specified amount of white space between the outer edge of the object and the frame.

5. To Scale the object as a percentage of the original height and width, enter the new scaling percentages.

   For example, if your object is one inch wide, that width is automatically assigned a width scaling value of 100%. To double the width of the object, change Scaling Width to 200% (twice the size of the original). Likewise, to reduce the width of the object to half, change Scaling Width to 50%.

6. To resize the object, enter a new width and height.

   For example, if your object is a one inch square, each of the Size settings will initially be set at one inch. To double the length and width of the object (to make a two inch square), reset the Size settings to two inches each.

To reduce the size of the object to a half inch square, reset the Size settings to a half inch each.

Using conventional accounting formats

As a way of supporting the conventions used in the accounting profession, Crystal Reports lets you decide on how to display the currency symbol, negative values, and zero values on your financial reports. You can also set up your report to reverse the signs for credit and debit amounts.

To use accounting conventions in a report

1. Right-click the currency field or number field you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears with the Number tab open.
3. In the Style area, select how you want the system number format to appear for either positive or negative values.
4. In the Currency Symbol (system default) area, specify how you want the currency symbol to appear with the values on your report.
5. Click **OK** to save your changes.

To customize the accounting conventions for a report

1. Right-click the currency field or number field you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears with the Number tab open.
3. Click the **Customize** button.

   The Custom Style dialog box appears with the Number tab open.
4. Select the **Use Accounting Format** check box.

   Once you select this option, the following conditions occur:

- In the Negatives list, how the negative values appear on your report are determined by the Windows locale settings. The negative values are represented by either a minus sign or brackets.
- In the Show Zero Values as list, the dash symbol is automatically selected to represent zero values on your report.
- On the Currency Symbol tab of the Custom Style dialog box, the currency symbol is positioned on the left-side of the currency and numeric values.

Note:
Changes made to the Windows locale settings are implemented only after you exit and restart Crystal Reports.

5. Select the **Reverse Sign for Display** check box to reverse the signs for debit and credit amounts in your financial reports.
6. Click **OK** to save your changes.
7. Click **OK** again to return to your report.

Repeating report objects on horizontal pages

Some report objects, such as cross-tabs and OLAP grids, can expand horizontally over a number of pages. Crystal Reports lets you designate other report objects that don't expand horizontally, such as text objects, field objects, OLE objects, charts, maps, lines, boxes, and so on, to be repeated on each additional horizontal page that the cross-tab or OLAP grid creates. For example, if your report's page footer includes an image, a text object, and a page number, you can use the Format Editor to make Crystal Reports repeat these objects on each horizontal page.

To repeat objects on horizontal pages

1. Right-click the report object you want to repeat.
2. On the shortcut menu, click **Format Field**, or the appropriate format option.

Note:
Formatting options are not available if the object you select is connected to the BusinessObjects Enterprise Repository. For information about

modifying an object in the repository, see *Modifying objects in the repository*.

3. On the **Common** tab of the Format Editor, select the **Repeat on Horizontal Pages** check box.

   For a line or a box, the Repeat on Horizontal Pages option appears on the Line or Box tab.

4. Click **OK** to save your changes.

Now, if a cross-tab or OLAP grid makes your report expand horizontally, the object you formatted is repeated on each horizontal page.

- The repeated copies of a report object cannot be moved; you must move the original object to move the copies.
- You can format any copy of a repeated report object, but changes you make are applied to all copies.
- Report objects in a section with the Relative Positions option selected in the Section Expert cannot be repeated.

Numbering horizontal pages

A Special Field called Horizontal Page Number lets you number horizontal pages.

To number horizontal pages

1. In the Field Explorer, scroll down to **Special Fields** and expand the node by clicking it.
2. Choose **Horizontal Page Number** from the list and insert it in your report.

Note:
The Repeat on Horizontal Pages option is automatically turned on when you insert the Horizontal Page Number field this way. If you cut and paste a Horizontal Page Number field, or if you insert such a field into another field or text object, the Repeat on Horizontal Pages option is not automatically turned on.

Using white space between rows

The height of a section in relation to the objects within it affects the amount of white space that appears between rows on the report.

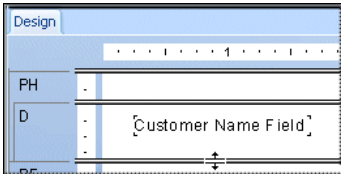
The free-form Design tab lets you add and delete white space in two ways:

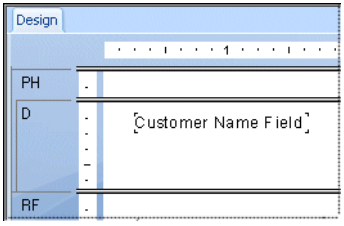
- Using the Resizing cursor to resize the area on the Design tab.
- Changing the option in the Section Expert.

Note:
You can also right-click the shaded area to the left of the section and select Fit Section from the shortcut menu. The program automatically resizes the section so that the bottom boundary is even with the baseline of the bottom object in the section.

Adding white space by resizing

To add extra white space between rows in the report, move the pointer over the lower section boundary line. The pointer changes to a Resizing cursor. When the Resizing cursor appears, drag the section boundary downward to add extra white space.

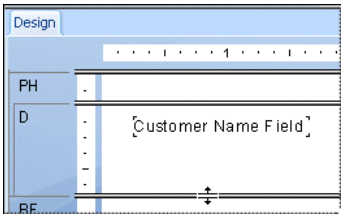


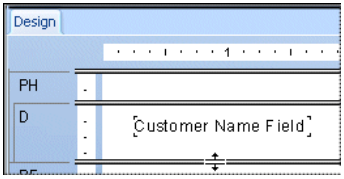


Note:
White space can also be added to a section by right-clicking the shaded area to the left of the section and selecting Insert Line from the shortcut menu. The program resizes the section automatically, adding the amount of space necessary to hold a line of typical database fields.

Deleting white space by resizing

To delete unnecessary white space within a section, move the pointer over the lower section boundary line. The pointer changes to a Resizing cursor. When the Resizing cursor appears, drag the section boundary upward to remove extra white space.





Deleting white space by suppressing a section

If an entire section is blank, you can eliminate the unnecessary white space that the **Page Footer** would occupy by suppressing the section in the **Section Expert**.

If you are not putting anything into the **Page Footer** section of the report, select the **Clamp Page Footer** option in the **Section Expert** to eliminate white space at the bottom of your report pages.

To delete white space by suppressing a section

1. On the **Report** menu, click **Section Expert**.

   The **Section Expert** appears.

   Tip:
   Another way to do this is to click the **Section Expert** button on the **Expert Tools** toolbar.

2. In the **Sections** area, click the section you want to suppress.
3. On the **Common** tab, select the **Suppress** (**No Drill-Down**) check box.
4. Click **OK** to return to your report.

   The blank section will no longer be printed.

To delete white space by clamping the Page Footer

1. On the **Report** menu, click **Section Expert**.

   The **Section Expert** appears.

   Tip:
   Another way to do this is to click the **Section Expert** button on the **Expert Tools** toolbar.

2. In the **Sections** area, click **Page Footer**.
3. Click **Clamp Page Footer**.
4. Click **OK** to return to your report.

The report eliminates white space by placing the **Page Footer** directly beneath the last visible section.

Working with conditional formatting

Conditional formatting is formatting that applies only under certain conditions. For example, in a report you may only want:

- Customer balances printed in red if they are past due.
- The dates to appear in Day, Month, Year format if the customer is Canadian.
- Background color to appear on every other line.

Crystal Reports makes it easy to apply conditional formatting in these and hundreds of other situations.

With absolute formatting, you follow the "select, then apply" procedure. For conditional formatting, you follow the same general procedure, but you go a step further and set up conditions that determine whether or not the formatting will be applied. You specify these conditions using simple formulas.

For more information on creating formulas using Crystal or Basic syntax, see the online help.

When a conditional formatting formula is set up, the formula overrides any fixed settings you have made in the Format Editor. For example, if you select the Suppress option, then set up a conditional formula for the Suppress option, the property will still apply only if the condition in the formula is met.

Crystal Reports enables you to set both on and off properties and set attribute properties conditionally. However, each of these requires a different kind of formula.

Conditional on or off properties

A conditional on or off property tests to see if a condition has been met. It is on if the condition is met, off if the condition is not met. There is no middle ground. Use Boolean formulas for this kind of formatting.

Crystal syntax example

```
condition
```

Basic syntax example

```
formula = condition
```

The program tests each value to see if it meets the condition and it returns a "yes" or "no" answer. It then applies the property to every value that returns a "yes" answer.

Conditional attribute properties

A conditional attribute property tests to see which of two or more conditions is met. The program then applies the formatting appropriate to the condition. For example, assume that you want values under quota printed in red and all other values printed in black. The program tests to see whether the value is under quota or not. If it is under quota, then it applies the red attribute; if it is not, then it applies the black attribute.

Use an If-Then-Else formula for this kind of conditional formatting.

Crystal syntax example

```
If Condition A Then
     crRed
Else
     crBlack
```

Basic syntax example

```
If Condition A Then
     formula = crRed
Else
     formula = crBlack
End If
```

When conditional attribute properties are set up, Crystal Reports loads a selection of attributes into the Functions list in the Formula Workshop. Double-click any of these attributes to add them to a formula. For example, if you are setting horizontal alignment conditionally, the Functions list contains attributes such as DefaultHorAligned, LeftAligned, and Justified. If you are setting borders conditionally, the Functions list contains attributes such as NoLine, SingleLine, and DashedLine.

Note:
Always include the Else keyword in conditional formulas; otherwise, values that don't meet the If condition may not retain their original format. To retain the original format of values that don't meet your If condition, use the DefaultAttribute function.

Crystal syntax example

```
If Condition A Then
     crRed
Else
     DefaultAttribute
```

Basic syntax example

```
If Condition A Then
     formula = crRed
Else
     formula = DefaultAttribute
End If
```

You can take this kind of property one step further. You can specify a list of conditions and a property for each; you are not limited to two conditions. For example, if you have a number field on your report that contains sales figures from countries around the world, you can specify the number attribute(s) that you want to apply to each country. In this case, your conditions would specify that if it is from Country A, the program should apply the Country A attribute; if it is from Country B, the Country B attribute; if it is from Country C, the Country C attribute, and so on.

With more than two alternatives, use this kind of formula:

Crystal syntax example

```
If Condition A Then
     crRed
Else If Condition B Then
     crBlack
Else If Condition C Then
     crGreen
Else
     crBlue
```

Basic syntax example

```
If Condition A Then
     formula = crRed
ElseIf Condition B Then
     formula = crBlack
ElseIf Condition C Then
     formula = crGreen
Else
```

```
     formula = crBlue
End If
```

Use a multi-condition If-Then-Else formula for this kind of conditional formatting.

Changing fonts conditionally

For memo or string fields that are based on conditions such as a parameter value, you can change the font, font style, size, and color for these fields using the Format Editor.

To change fonts conditionally

1. Right-click the field you want to format to bring up the shortcut menu.
2. On the shortcut menu, click **Format Field**.

   The Format Editor dialog box appears.
3. Click the **Font** tab.
4. To change any of the font options, click the appropriate **Formula** button, located on the right side of the dialog box.
5. In the Formula Workshop, you can specify that conditional fonts will change only when certain conditions are met.
6. Click **Save and close**.

   Note:

   - If there is an error in the formula, a message box appears, asking if you want to save anyway. If you click No, a second message box is displayed, detailing the error.
   - If there is no error in the formula, you are returned to the Format Editor. Note that the Formula button has changed. This indicates that a formula has been entered for that property.
7. Click **OK** to return to your report.

Changing margins conditionally

Page margins can be controlled conditionally by use of formula.

Margins based on page number

The following formula checks whether a page number is even or odd and sets the margins accordingly: if the page is an even number, the margin is set to one inch; if the page is an odd number, the margin is set to two inches.

```
If Remainder(pagenumber,2) = 0 then 1440 else 2880
```

Margins based on page orientation

The following formula checks for page orientation and sets the margins accordingly: if the orientation is portrait, the margin is set to one inch; if the orientation is landscape, the margin is set to two inches.

```
If CurrentPageOrientation = crPortrait then 1440 else
2880
```

Note:
Margin position is measured in twips; there are 1440 twips in an inch.

To change margins conditionally

1. On the **File** menu, click **Page Setup**.

   The **Page Setup** dialog box appears.

2. Click the **Conditional Formula** button next to the margin you wish to change.
3. In the **Formula Workshop**, enter your conditional margin formula text.
4. Click **Save and close** to return to your report.
5. Click **OK** to apply your new settings.

Changing X position conditionally

You can change the X position (that is, the horizontal position from the left margin) for an object based on a condition. You might do this when you want objects to appear in different columns when their values meet a certain condition; for example, orders that shipped on time appear in the first column, while orders that shipped late appear in a second column.

Note:
You cannot conditionally change the X position of line or box objects.

To conditionally change the X position of an object

1. Right-click the field that you want to move conditionally, and select **Size and Position**.
2. Click the Conditional Formula button next to the X position value field.
3. In the Formula Workshop, enter your conditional X position formula text.

   For example, to move orders that were shipped late to a second column, enter formula text such as this:

   ```
   If (Orders.Ship Date) < CDateTime (2004, 01, 01, 02,
   10, 11) then 4320
   ```

   Note:
   The number 4320 represents the new position that you want to define as the second column. The position is measured in twips; there are 1440 twips in an inch.

4. Click **Save and close** to return to your report.
5. Click **OK** to save your position setting.

Crystal Reports moves objects that meet your condition to a new position, but leaves those objects that don't meet the condition where you originally placed them.

Creating footers after the first page

You may choose to print a page footer on all pages except the first page. You can do this by formatting the Page Footer section conditionally, using an on or off property.

To create footers after the first page

1. Place the field you want displayed as a page footer in the Page Footer section of the report.

2. On the **Report** menu, click **Section Expert**.

   Tip:

   Another way to do this is to click the Section Expert button on the Expert Tools toolbar.

   The Section Expert dialog box appears.

3. In the Sections area, click **Page Footer**.
4. To open the Formula Workshop, click the **Formula** button, located to the right of the **Suppress** (**No Drill-Down**) check box.
5. Enter the following formula in the Format Formula Editor:

   Crystal syntax example:

   ```
   PageNumber = 1
   ```

   Basic syntax example:

   ```
   formula = PageNumber = 1
   ```

   This formula suppresses the page footer on the first page, but not on any of the other pages.

6. Click **Save and close**.

   Note:

   - If there is an error in the formula, a message box appears, asking if you want to save anyway. If you click No, a second message box is displayed, detailing the error.
   - If there is no error in the formula, you are returned to the Section Expert. Note that the Formula button has changed. This indicates that a formula has been entered for that property.

7. On the Standard toolbar, click **Preview** to preview the report and ensure that the page footer appears on all pages but the first.

Note:

- If you have a multi-line page footer and have inserted the lines into separate Page Footer sections, you will need to suppress each section conditionally, using the formula above.
- To create a page header that appears on all pages but the first, place the header information in the Page Header section and then suppress that

section conditionally, using the same formula that was used for suppressing the Page Footer section.

Using the Highlighting Expert

The Highlighting Expert enables you to apply conditional formatting to all types of report fields (Number, Currency, String, Boolean, Date, Time, and Date and Time fields). With the expert, you format the selected field either by specifying a condition based on that field's value, or by specifying a condition based on the value of a different report field. In other words, the expert enables you create the following formula: If the value of field X meets condition A, then apply the specified formatting to the field selected on the report.

When used for conditional formatting, the Highlighting Expert allows you to:

- Modify several attributes at once, without writing a formula.
- Highlight all field types used in the report.
- Format font style, background color, font color, and border style.
- Format a field based on its own values or the values of another field.
- Highlight a cross-tab or OLAP cell based on row and column heading values.
- Enter values using your locale-specific number format (such as 1,224.23 for North American users).
- Enter dates numerically or textually (January 12, 2001, or Jan 12, 2001).
- Undo highlighting quickly.

When you need to conditionally format report fields, the Highlighting Expert is quicker and easier to use than the Formula Workshop. The Highlighting Expert is most commonly used to highlight field values that are in some way distinguished from other values in the report. You might, for example, highlight your key customers by printing the {Customer.Last Year's Sales} field with a red background whenever the sales value exceeds $50,000. Alternatively, to draw attention to outstanding orders, you might bold the {Product.Product Name} field whenever the {Orders.Shipped} value is False.

The Highlighting Expert, however, is not as flexible as the Formula Workshop. To use the formatting capabilities of Crystal Reports to their full potential,

create your own conditional formatting formulas with the Formula Workshop (accessible through the Format Editor dialog box). For complete details, see *Using Formulas*.

Conditionally formatting fields using the Highlighting Expert

The Highlighting Expert is a quick alternative to the Formula Workshop; it allows you to conditionally format any of your report fields. The Highlighting Expert essentially enables you create the following formula: If the value of field X meets condition A, then apply the specified formatting to the field selected on the report.

The dialog box is divided into two areas: the Item list area displays the formula; the Item editor area allows you to specify the formula. The Item editor area includes a Sample field that displays the formatting specifications being applied.

To conditionally format fields using the Highlighting Expert

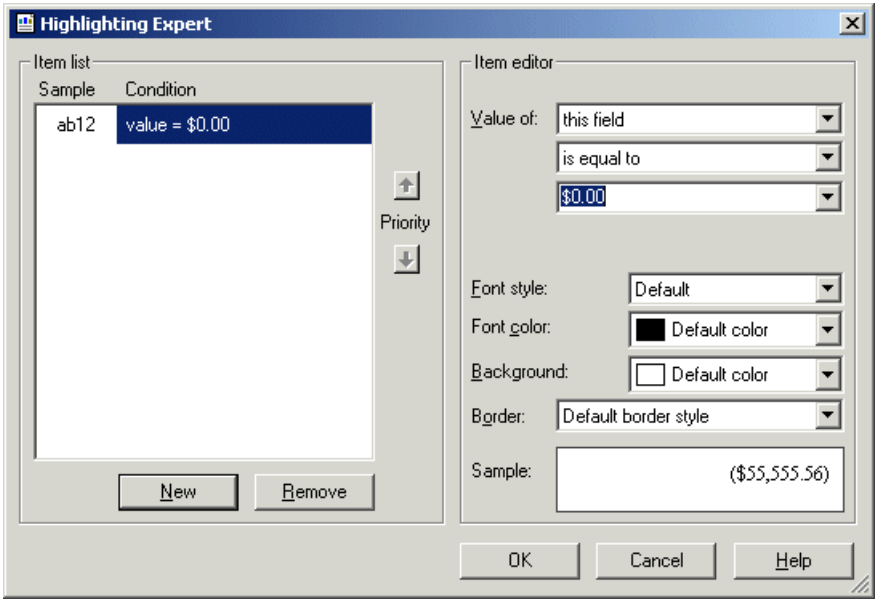
1. To open the Highlighting Expert, right-click the field you want to format and select **Highlighting Expert** from the shortcut menu.

   Tip:

   You can also start the expert by clicking the Highlighting button on the Expert Tools toolbar, or by clicking Highlighting Expert on the Format menu.

   When opened, the expert is set to format the field that is currently selected on the report.

2. In the Highlighting Expert, click **New** to create a new conditional formula with default settings.



3. In the **Item editor** area, click the **Value of** list and select the field that you want to base your condition on.

   The field chosen here is the field upon which your condition is based; this field need not be the field that is being formatted. To create a condition based on the values of the field that is being formatted, select "this field" from the list. To base your condition on a different report field, select it from the list of available fields.

   Note:
   The "Value of" list displays only those fields that you have added to the report.

4. Select a comparison from the second list (is equal to, is less than, and so on).

   This comparative statement works as the operator in the conditional formula created by the expert.

5. Complete the condition by entering the desired value in the box.

Note:
If the field selected in the "Value of" list is not numeric, the text box turns into a list of available values, from which you must select one.

6. In the **Font style**, **Font color**, **Background**, and **Border** lists, specify the formatting changes that you want to apply to the selected field when your condition is met.
7. Repeat steps 3 and 4 if you want to apply multiple highlighting conditions to the selected field.

Note:
You can use the expert's Remove button to delete highlighting formulas from the list.

8. Use the **Priority** arrows to specify the order in which you want Crystal Reports to apply your conditions. For details, see *Setting highlighting priorities*.
9. Click **OK** to return to your report.

Setting highlighting priorities

The Priority buttons in the Item list area of the Highlighting Expert allow you to set priorities for your formulas. This is useful when you have two or more formulas that could offer conflicting results in some situations.

For example, suppose that you highlight the Unit Price field on the report. You assign to this field a highlighting formula that shows a yellow background when a unit price is greater than $100. Then, on this same report, you create another highlighting formula that shows a red background when a unit price is greater than $200. Considering that 100 is a subset of 200, you could have Unit Price fields with yellow backgrounds when, in fact, those fields should have red backgrounds. In other words, a unit price of $300 could receive either a red or a yellow background, depending on which formula has been assigned priority.

To set priorities for highlighting formulas

1. On the **Format** menu, click **Highlighting Expert**.
2. In the Item list area, select one of the conditional highlighting formulas that you have created.
3. Click the **Priority** arrows to move the selected formula to a position above or below the other formula(s).

Note:
A formula has priority over another formula when it is higher in the Items list area.

4. Click **OK**.
5. Click the **Preview** tab or refresh the report to see the highlighting changes.

Undo/Redo activities

Crystal Reports includes multiple levels of undo. With multiple levels of undo, you can undo any number of changes to an object, in reverse order, until you have your report in the condition you want it.

The program also has a redo feature that reverses an undo. If you move an object, for example, and do not like its new position, you can click Undo to move it back to its original position. If you then change your mind, you can click Redo to restore the latest change.

The Undo and Redo buttons have lists that allow you to undo or redo a number of changes at one time.

- To undo an action, click **Undo** on the Standard toolbar.

  The first time the button is clicked, it reverses the most recent change made to the report. Each additional time the button is clicked, it reverses the next most recent change.

  To undo several actions at once, click the arrow button to display the list of actions. Select the series of actions you wish to undo.

- To redo a change after you have undone it, click **Redo** on the Standard toolbar.

  The program disables the Undo button and the Undo/Redo commands whenever there is nothing to undo/redo or when you have made a change that cannot be reversed.

  To redo several actions at once, click the arrow button to display the list of actions. Select the series of actions you wish to redo.

Note:
You can only undo or redo actions in order from the most recent backward. You cannot undo an action without undoing more recent actions.

Using the Format Painter

Use the Format Painter to copy absolute or conditional formatting properties from one report object to one or more target objects. The Format Painter button is activated on the Standard toolbar when you select a source object in your report. If you apply formatting to a target field that is not the same as your source field, only the common properties are applied. For example, if your source field is a Boolean field and your target field is a currency field, only the common font and border properties are changed; Boolean properties are not applied and currency properties are not set.

Note:

- The Format Painter does not copy hyperlink information to a target object or field.
- The Format Painter does not copy formatting that is applied through use of the Highlighting Expert.
- The Format Painter does not copy formatting from text/template objects to database fields.
- The Format Painter can use any object (including Repository objects, read-only objects, and objects contained in read-only sections) as a source of formatting (however, formatting cannot be applied to these objects).
- When using a "Date and Time" field as your source, a target field's date or time properties are changed; the reverse is also true (that is, a Date field or a Time field used as your source also affects the date and time properties of a "Date and Time" field).

The following is a list of source report objects and field and the applicable targets you can use with the Format Painter.

Source object or field	Target object or field
Report field (not in a cross-tab)	Report field (not in a cross-tab)

Source object or field	Target object or field
Report field in a cross-tab	Report field in a cross-tab
Template field	Template field
Text object (not in a cross-tab)	Text object (not in a cross-tab)
Text object in a cross-tab	Text object in a cross-tab
Object in an OLAP grid header	Object in an OLAP grid header
Line object	Line object
Box object	Box object
OLE or BLOB field	OLE or BLOB field
Subreport	Subreport
Chart, map, OLAP grid, or cross-tab	Chart, map, OLAP grid, or cross-tab

To copy and apply formatting

1. Select a source object or field in your report and click **Format Painter**.

   Tip:
   You can also select Format Painter from the shortcut menu.

Note:

- The Format Painter button is not available until you select an object or field.
- Click the button a second time, or press ESC, to exit the Format Painter.

2. Click the target object or field you want to apply formatting to.

   When you move your mouse over your report, the cursor changes to a Stop cursor if the object or field cannot be used as a target.

   Note:

   - You cannot apply formatting to read-only objects or fields.
   - Double-click the Format Painter button, or hold the ALT key down if you want to apply formatting to more than one object or field.

Working with barcodes

Barcodes allow companies to use computers to track products and sales. Specially designed scanners read the barcode and the computer translates it into a human-readable form.

The Crystal Reports install includes the formula and fonts necessary for supporting Code39 barcodes. You can add barcodes to your reports to be used for activities such as managing your inventory or creating package labels.

Code39 is a basic barcode format supported by most scanners on the market. For support of additional barcode types, such as UPC, please contact your preferred barcode vendor.

Adding a barcode

You can apply a barcode to an existing field or add a new field to the report specifically for the barcode.

You will need to consider the following information before adding a barcode:

- When a field is converted to a barcode, the default size changes to accommodate 16 characters at 24 pts.

This may cause the new data to overlap existing fields if there is not enough space between fields.

- Barcodes can be applied to number and string fields only.

  The barcode cannot be applied to Currency, DateTime, or other field types.

- To undo changing a field to a barcode, you must use the **Undo** command right after you use **Change to Barcode**.

  If you perform any other actions after you change the field to a barcode, you must either delete the field item or use the Format Field option to reformat the appearance.

Related Topics

- *Changing the appearance of a barcode*
- *Removing a barcode*

To add a barcode

1. In the report, right-click the field to use for the barcode.

   If the desired field is not in the report, use the Field Explorer to add the field to your report.

2. On the shortcut menu, select **Change to Barcode**.

   The Select Barcode Type dialog box appears.

3. Select the barcode type from the list.
4. Click **OK**.

The field is changed to display barcodes instead of characters.

Changing the appearance of a barcode

You can use the Format Field option to change the appearance of a barcode.

There are many reasons to change the appearance of a barcode including the following:

- To change the size so that the barcode is not too large or too small for a scanner to read.

- To display the barcode in a different color.

Related Topics

- *Adding a barcode*
- *Removing a barcode*

To change the appearance of a barcode

1. Right-click the barcode field that you would like to reformat.
2. From the shortcut menu, select **Format Field**.
   The Format Editor appears.
3. Set your desired border, font size and color, or other options.
4. Click **OK**.

Removing a barcode

If you applied the barcode to the wrong field, or you decide that you do not want to have a barcode, you can use Format Field to change the field back to a regular font.

Related Topics

- *Adding a barcode*
- *Changing the appearance of a barcode*

To change a barcode back to a regular font

1. Right-click the barcode field that you would like to reformat.
2. From the shortcut menu, select **Format Field**.
   The Format Editor appears.
3. Select the **Common** tab.
4. In the **Display String** area, click the red formula editor button.
   The Formula Editor appears.
5. Delete the string in the Formula text window and then click **Save and Close**.
6. Select the **Font** tab

7. Change the font and size to the desired size, and then click **OK** .
8. On the report, resize the field to a an appropriate length.

Charting

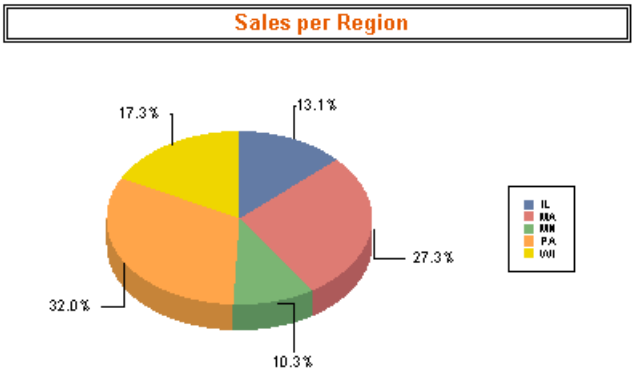
chapter 14

Charting concepts

Charting overview

Crystal Reports enables you to include sophisticated, colorful charts in your reports. You can use charts any time you want to improve the usefulness of a report.

For example, if you have a sales report grouped by Region with a subtotal of Last Year's Sales for each region, you can quickly create a chart that will display Sales per Region.



You can chart on the following:

- Summary and subtotal fields.
- Detail, formula, and Running Total fields.
- Cross-Tab summaries.
- OLAP data.

You will typically chart on summary and subtotal information at the group level. However, depending on the type of data you are working with, you can create an Advanced, Cross-Tab, or OLAP grid chart for your report.

Chart layouts

The Chart Expert provides four layouts that correspond to certain sets of data.

You can create charts with any of the following layouts, and depending on the data you are using, you can change the chart from one layout to another.

Advanced

Use the Advanced layout when you have multiple chart values or when you do not have any group or summary fields in the report.

The Advanced chart layout supports one or two condition fields: with these condition fields, you can create a 2-D, 3-D, or pie chart. Other specific functions with the Advanced layout include:

- Values can be grouped in ascending, descending, or specified order, as well as by Top N or Sort totals.
- Values can be plotted for each record.
- Values can be plotted as a grand total for all records.
- Charts can be based on formula and Running Total fields.

Group

The Group layout is a simplified layout in which you show a summary on change of field for topics such as Country.

Note:
In order to create a chart using the Group layout, you must have at least one group and at least one summary field for that group.

Cross-Tab

Use the Cross-Tab layout to chart on a Cross-Tab object. A Cross-Tab chart uses the fields in the cross-tab for its condition and summary fields.

OLAP

Use the OLAP layout to chart on an OLAP grid. An OLAP chart uses the fields in the OLAP grid for its condition and summary fields.

Note:
Your report must include an OLAP grid before you can create an OLAP chart.

Chart types

Different sets of data are particularly suited to a certain chart type. The following is an overview of the main chart types and their most common uses.

Bar

Most bar charts (also known as a column chart) display or compare several sets of data. Two useful bar charts are the Side-by-Side bar chart and the Stacked bar chart.

- Side-by-Side bar chart

  A Side-by-Side bar chart displays data as a series of vertical bars. This type of chart is best suited for showing data for several sets over a period of time (for example, last year's sales figures for AZ, CA, OR, and WA).

- Stacked bar chart

  A Stacked bar chart displays data as a series of vertical bars. This type of chart is best suited for representing three series of data, each series represented by a color stacked in a single bar (for example, sales for 1997, 1998, and 1999).

Line

A line chart displays data as a series of points connected by a line. This type of chart is best suited for showing data for a large number of groups (for example, total sales over the past several years).

Area

An area chart displays data as areas filled with color or patterns. This type of chart is best suited for showing data for a limited number of groups (for example, percentage of total sales for AZ, CA, OR, and WA).

Pie

A pie chart displays data as a pie, split and filled with color or patterns. Pie charts are typically used for one group of data (for example, the percentage of sales for the entire inventory); however, you have the option to choose multiple pie charts for multiple groups of data.

Doughnut

A doughnut chart is similar to a pie chart, displaying data as sections of a circle or doughnut. If, for example, you charted sales by region on a particular report, you would see the total number of sales (the figure) in the center of the doughnut and the regions as colored sections of the doughnut. As with the pie chart, you have the option to choose multiple doughnut charts for multiple groups of data.

3-D Riser

A 3-D Riser chart displays data in a series of 3-dimensional objects, lined up side-by-side, in a 3-dimensional plane. The 3-D Riser chart shows the extremes in your report data. For example, the differences between sales by customer by country are visually dynamic when presented in this chart.

3-D Surface

3-D Surface charts present a topographic view of multiple sets of data. If, for example, you need a chart to show the number of sales by customer by country, in a visually dynamic and relational format, you might consider using the 3-D Surface chart.

XY Scatter

An XY Scatter chart is a collective of plotted points that represent specific data in a pool of information. The XY Scatter chart allows the user to consider a larger scope of data for the purpose of determining trends. For example, if you input customer information, including sales, products, countries, months, and years, you would have a collective of plotted points that represents the

pool of customer information. Viewing all of this data on an XY Scatter chart would allow you to speculate as to why certain products were selling better than others or why certain regions were purchasing more than others.

Radar

A radar chart positions group data, such as countries or customers, at the perimeter of the radar. The radar chart then places numeric values, increasing in value, from the center of the radar to the perimeter. In this way, the user can determine, at a glance, how specific group data relates to the whole of the group data.

Bubble

A bubble chart (an extension of the XY Scatter chart type) displays data as a series of bubbles, where the size of the bubble is proportional to the amount of data. A bubble chart would be very effective with the number of products sold in a certain region; the larger the bubble, the greater the number of products sold in that region.

Stock

A stock chart presents high and low values for data. It is useful for monitoring financial or sales activities.

Note:
Crystal Reports offers two possible formats for stock charts: High-Low and High-Low-Open-Close. Each of these types requires a series of values in the order specified in its name.

Numeric Axis

A numeric axis chart is a bar, line, or area chart that uses a numeric field or a date/time field as its "On change of" field. Numeric axis charts provide a way of scaling your X-axis values, thus creating a true numeric X-axis or a true date/time X-axis.

Gauge

A gauge chart presents values graphically as points on a gauge. Gauge charts, like pie charts, are typically used for one group of data (for example, the percentage of sales for the entire inventory).

Gantt

A Gantt chart is a horizontal bar chart often used to provide a graphical illustration of a schedule. The horizontal axis shows a time span, while the vertical axis shows a series of tasks or events. Horizontal bars on the chart represent event sequences and time spans for each item on the vertical axis. You should use only date fields when creating a Gantt chart. The field you choose for the data axis should be set to "For Each Record," and the start and end-date fields should be added to the "Show value(s)" area of the Chart Expert's Data tab.

Funnel

Funnel charts are often used to represent stages in a sales process. For example, the amount of potential revenue shown for each stage. This type of chart can also be useful in identifying potential problem areas in an organization's sales processes. A funnel chart is similar to a stacked bar chart in that it represents 100% of the summary values for the groups included in the chart.

Histogram

A histogram is a type of bar chart used to depict how measurements vary from the mean value. It can help to identify the cause of problems in a process by the shape of the distribution as well as the width (deviation) of the distribution. In a histogram, the frequency is represented by the area of a bar rather than the height of the bar.

Where to place a chart

The placement of a chart determines which data is displayed and where it is printed. For example, a chart placed in the Report Header section includes the data for the entire report, while a chart that is placed in a Group Header or in a Group Footer section displays only the group specific data.

Note:

- If your report contains subreports, you can place charts in those subreports as well. See *Subreports*.
- By default, when you insert a chart or chart object frame, it is placed in the Report Header.

Drill-down with charts

Not only is charting a means of presenting data—it is also an analysis tool. Move your cursor over a section of the group chart on the Preview tab, so that the pointer becomes a Drill-down cursor, then double-click to view the underlying details for that section of the chart.

Drill-down with legends

If the chart consists of one or more group fields, you can use the chart legend to drill down on individual groups. Double-click the drill-down cursor on the markers and text in the legend to view the details about that section of the chart.

Creating charts

When you insert a chart in a report, you may see one of the following options:

- A chart object frame in the Report Header.

  Once you have placed the chart frame, the Chart Expert dialog box appears. For more information on where to place a chart in the report, see *Where to place a chart* .

- A chart automatically inserted in the Report Header.

  In some situations, such as when there is at least one group and one summarized field in your report, a chart is automatically added to the Report Header, and the Chart Expert dialog box does not appear. This usually happens when you chart on Cross-Tab summaries or when you chart on an OLAP cube, but it may also happen when you chart on summary or subtotal fields.

Charting on details or formula fields (Advanced layout)

The Advanced layout allows you to create a chart based on specific values. Since charts are a good way to display summarized information, they are often based on a summary field in your report. With an Advanced layout, you can create a chart without the need for a summary field by using values that appear in the Details section of your report.

To create a chart based on the Advanced layout, you must specify two things:

- Conditions (there can be two).

  The condition is used to indicate when to plot the point. For example, a chart showing last year's sales for your customers uses the Customer Name field as the condition. Each time the condition changes (the customer name changes), a point is plotted.

  You also have the option of plotting a point for each record, or plotting one point for all records.

- Values (there can be multiple values).

  The Advanced chart uses the value to indicate what information is plotted as the points on your chart. For example, to create a chart showing last year's sales for your customers, the Last Year's Sales field would be the value.

To chart on a details or formula field

1. On the **Insert** menu, click **Chart**.

   An object frame appears in the Report Header area.

   Tip:

   Another way to create a chart is to click the Insert Chart button on the Insert Tools toolbar.

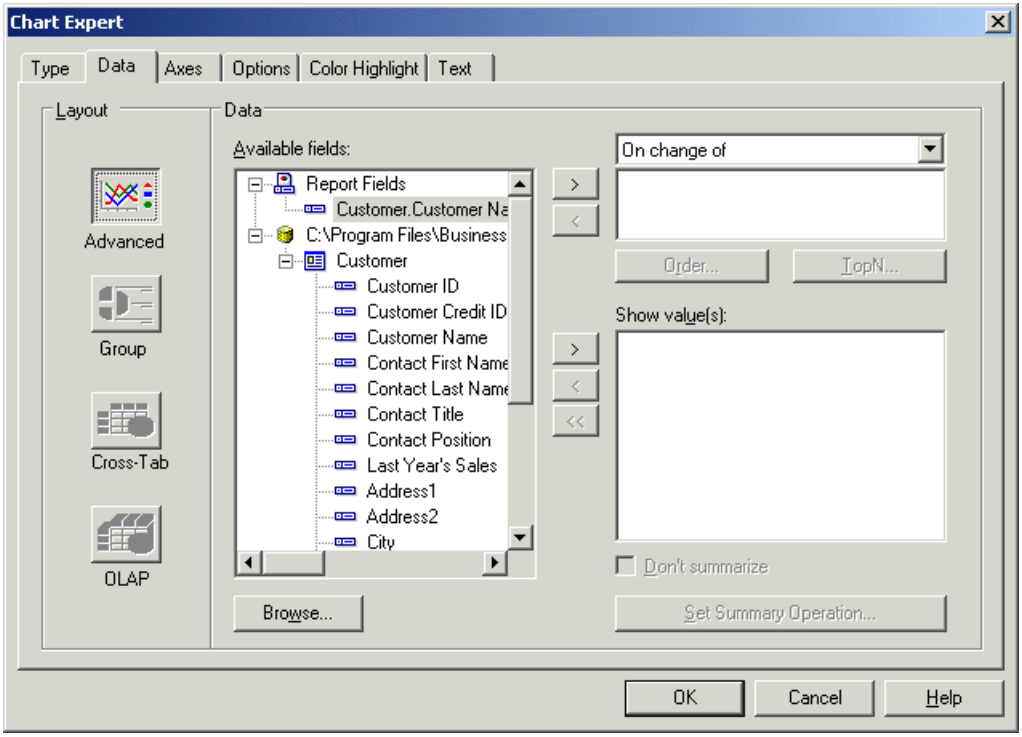
2. Drag the frame to the desired position in the Report Header.

   The Chart Expert dialog box appears.

3. On the **Type** tab, in the **Chart type** list, select a chart type.

   Click the chart subtype that best illustrates your data. See *Chart types*.

4. Click the **Data** tab.



5. In the Layout area, click **Advanced**, if it is not already selected.
6. In the Data area, specify the database fields you want to use as conditions.

   You can select "On change of" from the list, then add up to two database fields in the box underneath the list.

   The arrow buttons on the Chart Expert dialog box allow you to move fields from one list to the other. Single arrows move only the selected field; double arrows move all fields at the same time.

7. Add the database fields you want to use as values to the **Show value(s)** list.

8. If you do not want Crystal Reports to automatically summarize the chart values for a formula field, select the **Don't summarize** check box.
9. If the **Axes** and **Options** tabs appear, you can customize some of the chart's properties, such as the scaling of the axes, the legend, and the data points.
10. Click the **Text** tab.
11. Accept the default title information or add new titles to your chart.
12. Click **OK**.

Note:
When your chart is inserted, it may cover a portion of the report. Move and resize the chart so that it fits properly within the report.

Charting on summary or subtotal fields (Group layout)

Many of the charts you create are based on summary or subtotals within your report. In order to create these charts, you must have a summary or subtotal already inserted into your report in a group header or footer. For more information on inserting summaries and subtotals, see *Summarizing grouped data* and *Subtotaling*.

To chart on a summary or subtotal field

1. On the **Insert** menu, click **Chart**.

   An object frame appears in the Report Header area.

   Tip:
   Another way to create a chart is to click the Insert Chart button on the Insert Tools toolbar.

2. Drag the frame to the desired position in the Report Header, Group Header, or Group Footer.

   The Chart Expert dialog box appears.

   Note:
   You may see a default chart in the Report Header section rather than the Chart Expert dialog box. To select a different chart type, right-click the

default chart, and then click Chart Expert. The Chart Expert dialog box appears.

3. On the **Type** tab, in the **Chart type** list, select a chart type.

   Click the chart subtype that best illustrates your data. See *Chart types*.

4. Click the **Data** tab.
5. In the Layout area, click **Group**, if it is not already selected.
6. In the Data area, in the **On change of** list, click the group field you want to base your chart on; then, in the **Show** list, click the summary field you want to display on your chart.
7. If the **Axes** and **Options** tabs appear, you can customize some of the chart's properties, such as the scaling of the axes, the legend, and the data points.
8. Click the **Text** tab.
9. Accept the default title information or add new titles to your chart.
10. Click **OK**.

Note:
When your chart is inserted, it may cover a portion of the report. Move and resize the chart so that it fits properly within the report.

Charting on Cross-Tab summaries (Cross-Tab layout)

Crystal Reports allows you to include a chart based on summary values in your Cross-Tab report. For example, with a Cross-Tab that shows the amount of a certain product sold in each region of the United States, you may want to include a chart showing the percentage of total sales provided by each region for that product.

To create a Cross-Tab chart, you must first have a Cross-Tab in your report. For more information, see *Cross-Tab Objects*.

To chart on a Cross-Tab summary

1. Select the Cross-Tab on which you want to chart.
2. On the **Insert** menu, click **Chart**.

   An object frame appears in the Report Header area.

Tip:

Another way to create a chart is to click the Insert Chart button on the Insert Tools toolbar.

3. Drag the frame to the desired position in the Report Header.

   The Chart Expert dialog box appears.

   Note:
   You may see a default chart in the Report Header section rather than the Chart Expert dialog box. To select a different chart type, right-click the default chart, and then click Chart Expert. The Chart Expert dialog box appears.

4. On the **Type** tab, in the **Chart type** list, select a chart type.

   Click the chart subtype that best illustrates your data. See *Chart types*.

5. Click the **Data** tab.
6. In the Layout area, click **Cross-Tab**, if it is not already selected.
7. In the Data area, in the **On change of** list, click the group field you want to base your chart on.
8. If necessary, in the **Subdivided by** list, click a secondary row or column you want to base your chart on.
9. In the **Show** list, click the summary field you want to display on your chart.
10. If the **Axes** and **Options** tabs appear, you can customize some of the chart's properties, such as the scaling of the axes, the legend, and the data points.
11. Click the **Text** tab.
12. Accept the default title information or add new titles to your chart.
13. Click **OK**.

Note:
When your chart is inserted, it may cover a portion of the report. Move and resize the chart so that it fits properly within the report.

Charting on an OLAP cube (OLAP layout)

The OLAP layout lets you chart on an OLAP grid. In order to create an OLAP chart, you must first have an OLAP grid in your report. For more information, see *Creating an OLAP report*.

To chart on an OLAP cube

1. Select the OLAP grid on which you want to chart.
2. On the **Insert** menu, click **Chart**.

   An object frame appears in the Report Header area.

   Tip:

   Another way to create a chart is to click the Insert Chart button on the Insert Tools toolbar.

3. Drag the frame to the desired position in the Report Header.

   The Chart Expert dialog box appears.

   Note:
   You may see a default chart in the Report Header section rather than the Chart Expert dialog box. To select a different chart type, right-click the default chart, and then click Chart Expert. The Chart Expert dialog box appears.

4. On the **Type** tab, in the **Chart type** list, select a chart type. Then click the chart subtype that best illustrates your data. See *Chart types*.
5. Click the **Data** tab.
6. In the Layout area, click the **OLAP** button, if it is not already selected.
7. In the Data area, in the **On change of** list, click the field you want to base your chart on.
8. If necessary, in the **Subdivided by** list, click a secondary row or column you want to base your chart on.

   Note:
   Be sure that the chart type selected in Step 3 supports a secondary charting field.

9. If the **Axes** and **Options** tabs appear, you can customize some of the chart's properties, such as the scaling of the axes, the legend, and the data points.
10. Click the **Text** tab.

    Accept the default title information or add new titles to your chart.
11. Click **OK**.

Note:
When your chart is inserted, it may cover a portion of the report. Move and resize the chart so that it fits properly within the report.

Working with charts

Once you have created a chart, you may want to add a new title, headings, or a legend, change fonts, or even change the type of chart. Crystal Reports provides many options for working with your existing charts.

Editing charts using the Chart Expert

Editing charts with the Chart Expert allows you to return to the expert in which you designed your chart. You can modify many of your original choices, such as the type of chart to display, the data on which the chart is based, and so on.

To edit a chart using the Chart Expert

1. Right-click the chart to bring up the shortcut menu.
2. On the shortcut menu, click **Chart Expert**.
3. In the Chart Expert dialog box, make the desired changes.
4. Click **OK**.

Editing charts using the Chart Options menu items

Some of the editing options available in the Chart Expert are also available directly from the Chart Options menu. This menu, which is available when you right-click a chart, also contains many advanced formatting options.

The following procedures show you how to access the various options that are the Chart Options. For more information about how to use these features, click Help in the various dialog boxes to open the Chart Help. The Chart Help (Chart.chm) is installed by default in the `\Program Files\Business Objects\Common\4.0\ChartSupport\Help` directory.

To change chart formatting

1. Right-click your chart, and then select **Chart Options**.
2. Click the appropriate tab to change appearance, titles, data labels, and so on.

To change Numeric Axis Grid options

1. Right-click your chart, and then select **Chart Options**.
2. Click the appropriate tab to change gridlines, axes, and so on.

To change chart titles

1. Right-click your chart, and then select **Chart Options**.
2. Click the Titles tab and make your changes.

Editing charts using other menu items

To apply a new template

1. Right-click your chart and select **Load Template** from the menu.
2. The **Custom** templates dialog box appears.

The options on the Custom tab represent directory locations under `\Program Files\Business Objects\Common\4.0\ChartSupport\Templates` where custom chart files are stored.

Note:
The custom charts are available only if you selected Custom Charting when installing Crystal Reports.

To format a selected chart object

1. Select a line, area, or text object in your chart.
2. Right-click the specified object, and then click **Format** < *object* >.

   For example, you will see Format Pie Slice if you select a pie slice, and Format Series Marker if you select an item within an area chart, bar chart, and so on.
3. Click the appropriate tab to make changes to the format.

To change series options

1. Select a riser item (area, bar, line, marker, pie slice, and so on) or a legend marker.
2. Right-click the specified area, and then select **Series Options**.

   Note:
   The Series option is not available unless you select a riser or marker as outlined in the previous step, and may not be available for some chart types.
3. Click the appropriate tab to change appearance, data labels, and so on.

To format Gridlines

1. Select a gridline in your chart.
2. Right-click the object, and then select **Format Gridlines**.

   You can also select Data (Y) Axis Options from the menu.
3. Click the appropriate tab to change line, scales, layout, and so on.

To choose a viewing angle for a 3D chart

- Right-click your chart, then select **3D Viewing Angle** from the menu.

Using the zooming features with bar and line charts

On the Preview tab, you can find commands for zooming bar charts and line charts within your report. You have the ability to zoom in and out on these chart types at any time, with each time being referred to as instance-specific. If you decide to save the instance of the chart that has been zoomed in or out, you must save the data with the report.

To zoom in and out on a bar or line chart

1. On the **Preview** tab, right-click the bar or line chart to bring up the shortcut menu.
2. On the shortcut menu, click **Zoom In**.
3. Drag the Zoom In cursor around a section of the chart to enclose it within the tracking rectangle.

   The chart zooms in to the section you selected.
4. Repeat the previous step to zoom in further.

   Note:
   To see adjacent areas on a zoomed-in chart view (neighboring bars in a bar chart, for example), use the Pan option on the shortcut menu. Pull the Pan cursor to the left or right to move in that direction.
5. To zoom out on a chart, right-click the chart to bring up the shortcut menu.
6. On the shortcut menu, click **Zoom Out**.
7. With the Zoom Out cursor, click the chart.

   The chart zooms out one level of magnification.
8. Click the chart again to zoom out further.

Auto-arranging charts

If you move or resize chart objects on the Preview tab, select the Auto-Arrange Chart feature to reset the chart.

To auto-arrange a chart

1. On the **Preview** tab, right-click the chart to bring up the shortcut menu.
2. On the shortcut menu, click **Auto-Arrange Chart**.

   Crystal Reports resets the chart to its original size and position.

Formatting charts

Changing the border of a chart

1. On the **Design** or **Preview** tab, right-click the chart to bring up the shortcut menu.
2. On the shortcut menu, click **Format Background**.
3. On the Format Editor dialog box, click the **Border** tab to see its options.
4. Change the line style, color, or thickness.
5. Click **OK** to save your changes.

   Crystal Reports returns you to the report and implements your changes.

Conditionally formatting a chart

1. On the **Design** or **Preview** tab, right-click the chart to bring up the shortcut menu.
2. On the shortcut menu, click **Chart Expert** and select the **Color Highlight** tab.

   For information about the expert, search the online help for Chart Color Format Expert.

Note:

- The option to apply conditional formatting is not available for every chart type.
- An area chart must have two "On change of" values for conditional formatting to appear.
- If your chart type is line, the chart must have data markers before you can see conditional formatting.
- After you apply conditional formatting, you must select "Color by Group" on the Look tab of the Chart Options dialog box before you will be able to see your formatting. To set this option, right-click your chart, point to Chart Options on the shortcut menu, and select General from the submenu. This note applies to line, 3-D Riser, and 3-D Surface charts with one "On change of" field, as well as to bar, numeric axis, 3-D Surface, radar, stock, and charts with two summaries.

3. Click **OK**.

Changing the chart's legend text

1. On the **Preview** tab, click the text in your chart's legend to select it.

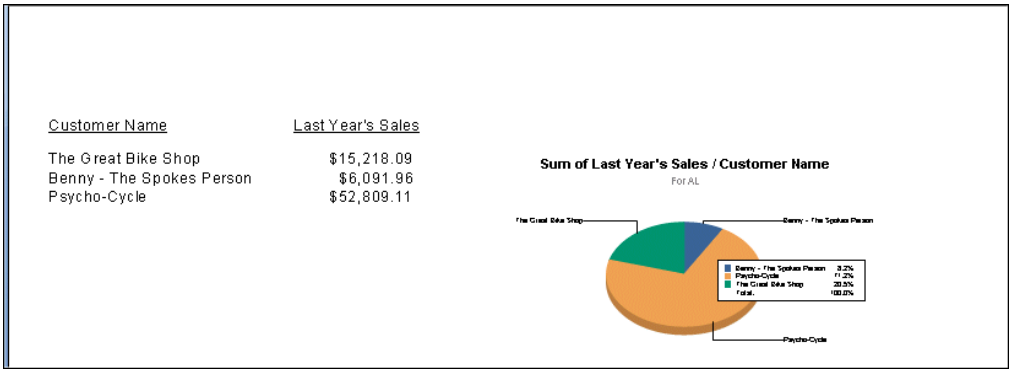
   Tip:
   Be sure to select the text and not the entire legend.

2. Right-click the legend text and select **Edit Axis Label** from the shortcut menu.
3. In the Label Aliasing dialog box, add the text you want to see in the **Displayed Label** field.
4. Click **OK**.

Using the underlay feature with charts

Since charts can print only in certain sections of your report, the underlay feature gives you more control in the overall look of your report. Instead of having a chart print ahead of the data it represents, it can appear next to the data for a more comprehensible report.

This is how your report looks when you underlay a chart with report data.



To underlay a chart

1. Create your chart and place it in the Report Header section. See *Creating charts*.
2. On the **Report** menu, click **Section Expert**.

   Tip:

   Another way to do this is to click the Section Expert button on the Expert Tools toolbar.

   The Section Expert dialog box appears.
3. In the Sections area, click **Report Header**, then select the **Underlay Following Sections** check box.
4. Click **OK**.

   Crystal Reports returns you to the report. Your chart will now underlay the sections below it.
5. If necessary, move or resize the chart.

Mapping

chapter 15

Mapping concepts

Mapping overview

With Crystal Reports, you can include geographic maps in reports. Maps help you analyze report data and identify trends more efficiently. For example, you could create a map that shows sales by region. You would then be able to:

- Use one of the five map types to analyze the data.
- Adjust the appearance and organization of the map (allowing you to better identify trends).
- Drill down on the map regions to view underlying data.

Map layouts

The Map Expert provides four layouts that correspond to certain sets of data.

You can create maps with any of the following layouts, and depending on the data you are using, you can change the map from one layout to another.

Advanced

Use the Advanced layout when using multiple map values or when you do not have any groups or summaries in the report.

Group

The Group layout is a simplified layout in which you show a summary on change of a geographic field (such as Region).

Note:
In order to create a map using the Group layout, you must have at least one group and at least one summary field for that group.

Cross-Tab

Use the Cross-Tab layout when mapping on a Cross-Tab object. A Cross-Tab map does not require groups or summary fields.

OLAP

Use the OLAP layout when mapping on an OLAP grid. An OLAP map does not require groups or summary fields.

Note:
If there is no map associated with the data you specify, then an empty block will appear unless the section that the map is placed in has been formatted to suppress if blank.

Map types

The Map Expert also provides five basic map types, each suitable for a different strategy of data analysis. When deciding which map type best fits your report, you should consider the type of data you want to analyze. For example, if you want the map to display one data item for each geographic division (city, state, country, and so on), then you might use a Ranged, Dot Density, or Graduated map. On the other hand, if you want the map to display more than one value for each new geographic division, then you could use a Pie Chart map or a Bar Chart map. The following is an overview of the main map types and their most common uses.

Ranged

A Ranged map breaks the data into ranges, assigns a specific color to each range, then color codes each geographic area on the map to display the range. For example, you could create a map that displays Last Year's Sales by Region. If you have sales ranging from zero to 100,000, you might give the map five ranges, with equal intervals of 20,000 each. You could use shades of red (going from dark to light red) to color code each region according to those sales figures. Then you could use this map to see where sales are the highest.

With equal intervals, you might end up with all your regions ranging between zero and 20,000, except perhaps one region (for example, California) that might have exceptionally high sales (such as 98,000). This map would be a

very distorted representation of the data. A more useful map would have ranges like 0-5000, 5000-10000, 10000-15000, 15000-20000, and over 20000. It is important to carefully define your ranges.

Note:
The end value for each division is repeated as the start value for the next division; the actual value is included in the group it starts. That is, the ranges in the previous example are actually: 0-4999, 5000-9999, and so on.

There are four different distribution methods for ranged maps.

- Equal count

  This option assigns intervals in such a way that the same number of regions (or as close to the same number of regions as possible) appear in each interval. In other words, this option would assign intervals so that each color on the map is assigned to the same number of regions. The numeric quantity of the summary values in each interval may or may not be equal, depending on the individual regions and their summary values.

- Equal ranges

  This option assigns intervals in such a way that the summary values in each interval are numerically equal. The number of regions in each interval may or may not be equal, depending on the individual regions and their summary values.

- Natural break

  This option assigns intervals using an algorithm that attempts to minimize the difference between the summary values and the average of the summary values for each interval.

- Standard deviation

  This option assigns intervals in such a way that the middle interval breaks at the mean (or average) of the data values, and the intervals above and below the middle range are one standard deviation above or below the mean. Standard deviation is the square root of the variance. It projects how various values in a set of values deviate from the mean for that set.

Dot Density

A Dot Density map displays a dot for each occurrence of a specified item. For example, you might create a United States map that shows one dot for each shipbuilder in the nation. In states like Tennessee, there would be no

dots. However, in some coastal states, such as South Carolina, you might be able to count the dots on the map, since their dispersal would be fairly wide.

The purpose of a Dot Density map is to provide an overall impression of the distribution of the specified item. A Dot Density map is much like a nighttime satellite photo of the United States, where you can see the lights of all the cities. Such a map is not a very accurate means of communicating information (particularly if you have a large number of items), but it is a good way to give an overview of the distribution.

Graduated

A Graduated map is much like a Ranged map; it shows one symbol per instance of a specified item. This symbol is a circle by default, but you can choose a different symbol if you prefer. Each symbol is proportional in size to the value of the item it represents (within a range of three sizes).

A Graduated map communicates the same information as the Ranged map, but you would usually create a Ranged map for a case in which the geographic areas have distinct geographic boundaries (as in the case of Regions), while you would use a Graduated map for displaying data that is linked to points rather than precise areas (as in the case of Cities).

For example, a map of an individual region could use graduated circles to represent the sales for each office. The size of each circle would be proportional to the sales (or to the sales range) of the office it represents. On this map, an office with a sales figure of $70,000 might have a large circle, and an office with a sales figure of $20,000 might have a small circle. So, a Graduated map provides a more efficient representation of point data (e.g. Cities) than a Ranged map does, and it uses sized symbols rather than colors to distinguish variations in the values of the items it represents.

Pie Chart

A Pie Chart map displays a pie chart over each geographic area. The pie charts represent data items that make up a whole. Each slice of the pie represents an individual data item and shows that item's percentage in the whole. For example, you could create a Pie Chart map showing heating fuel types by region. You might have four types of heating fuel (four slices in each pie): electricity, gas, wood, and solar. Each region would then have a pie chart showing the breakdown of heating fuel types within that region. Washington state would probably use a high percentage (a large slice of the

pie) of electricity because of the hydropower in that region, while Idaho would probably use a high percentage (a large slice of the pie) of natural gas.

You can use this map type to compare the distribution of several items within a particular region. You can also specify that the pie charts be sized proportionately so that, as with the symbols in a Graduated map, the pie charts will appear in various sizes, depending on the underlying data values. This will allow you to compare the totals between regions.

Bar Chart

A Bar Chart map works like a Pie Chart map, but may be more useful for certain sets of data. Typically, you would use a Bar Chart map for items that do not total 100%; that is, for data items that do not make a whole, or for data items that are unrelated. For example, you could create a Bar Chart map that displays use of heating fuel by region. You might choose to analyze use of three types of fuel: electricity, gas, and solar. Each bar chart on the map could contain individual bars for each of these types. In this example, the data items (electricity, gas, and solar) do not comprise a whole. There may be other types of fuel used in these regions, such as wood, but this map only focuses on three of them. Also, the purpose of the map is to compare each region's use of each fuel type with that of every other region. In a Pie Chart map, you could show these three fuel types as percentages of the entire fuel use within each region, and though you could compare the percentages for each region, you would probably not be able to compare the actual values for each region because each region would have the same total value (100%).

Where to place a map

When you choose where to place the map, you determine the amount of data that will be included in the map. For example, if you place the map in the Report Header section, the map includes data for the entire report. If you place it in a Group Header or Group Footer section, it displays group-specific data. This choice will also determine whether the map prints once for the entire report, or many times (once for each instance of a given group).

Note:
If your report contains subreports, you can place maps in those subreports as well.

Drill-down with maps

Not only is mapping a means of presenting data—it is also an analysis tool. Move your cursor over a section of the map on the Preview tab, so that the pointer becomes a Drill-down cursor, then double-click to view the underlying details for that section of the map.

Note:
If you drill down on a region that has no data associated with it, you will get a message saying, "There are no detail records for that {Region Name}."

Creating maps

The process for creating a map varies depending on the data you are mapping on. The following sections detail the mapping process for each map layout.

Mapping on details fields (Advanced layout)

The Advanced layout allows you to create a map based on specific values. With an Advanced layout, you can create a map without the need for a summary field by using values that appear in the Details section of your report.

To create a map based on the Advanced layout, you must specify two things:

- Conditions (there can be two).

  The condition is used to indicate where to plot the data on a map. This condition must be a string field. In order for a map to be generated, the field should contain geographic information. For example, a map showing last year's sales for each country uses the Country field as the condition. Each time the condition changes (the country changes), that area on the map is highlighted.

- Value (there must be only one value).

  The Advanced layout uses the value to indicate what information is mapped when the area on the map is highlighted. For example, to create

a map showing last year's sales for the countries, the Last Year's Sales field would be the value.

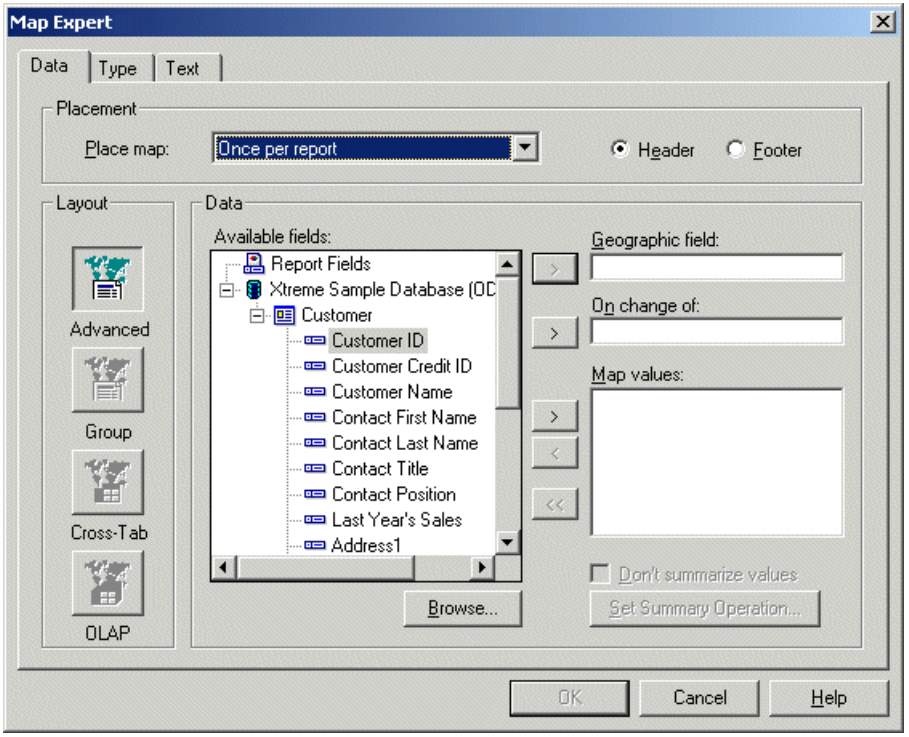
To map on a details field

1. On the **Insert** menu, click **Map**.

   Tip:

   Another way to do this is to click the Insert Map button on the Insert Tools toolbar.

   The Map Expert dialog box appears.



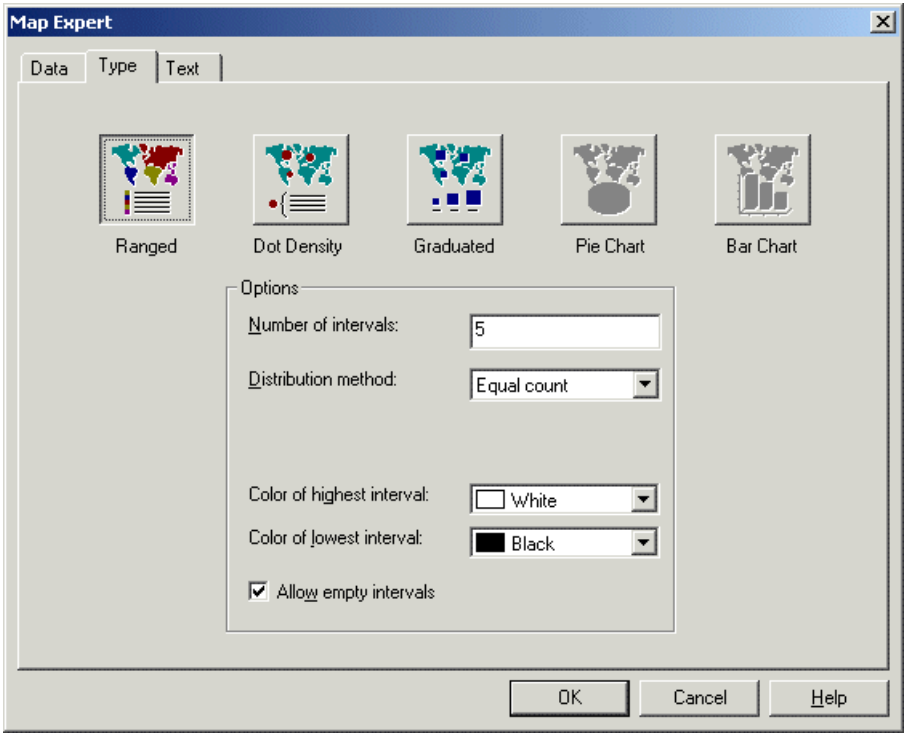
2. On the **Data** tab, in the Layout area, click **Advanced**, if it is not already selected.

3. In the Placement area, in the **Place map** list, specify how often your map appears on the report, then click **Header** or **Footer** to specify where to place your map.
4. In the Data area, add the database field you want to base your map on to the **Geographic field**.

   The arrow buttons on the Map Expert dialog box allow you to move fields from one list to the other. Single arrows move only the selected field; double arrows move all fields at the same time.

   Note:
   You must map on a geographic field, such as City, Region, or Country; otherwise, Crystal Reports cannot generate your map.
5. Add the database field you want to appear with each change to the **On change of** field.
6. Add the database fields you want to use as values to the **Map values** list.
7. If you do not want Crystal Reports to automatically summarize the map values for a formula field, select the **Don't summarize values** check box.
8. Click the **Type** tab and then click the map type that best illustrates your data (Ranged, Dot Density, Graduated, Pie Chart, or Bar Chart).

   For information about map types, see *Map types*.



9. In the Options area, apply formatting options to your map.
10. Click the **Text** tab.
11. In the **Map title** field, enter a title for your map.
12. In the Legend area, you can click one of the following options:
    - **Full legend** to show a detailed legend on your map.
    - **Compact legend** to show a condensed legend on your map.
    - **No legend** to exclude the legend from your map.
13. If you click **Full legend**, click **Made by map** to have Crystal Reports create a legend title based on your map, or click **Specify** to enter your own legend title and subtitle.
14. Click **OK**.

    Your map is placed in the Header or Footer section of the report, depending on your selection in Step 3.

Mapping on group fields (Group layout)

To map on a group, you can use the Group layout, in which you show a summary (such as Last Year's Sales) on change of a geographic field (such as Region). In order to create a map using the Group layout, you must have at least one group and at least one summary field for that group.

To map on a group

1. On the **Insert** menu, click **Map**.

   Tip:

   Another way to do this is to click the Insert Map button on the Insert Tools toolbar.

   The Map Expert dialog box appears.

2. On the **Data** tab, in the Layout area, click **Group**, if it is not already selected.
3. In the Placement area, in the **Place map** list, specify how often your map appears on the report, then click **Header** or **Footer** to specify where to place your map.
4. In the Data area, in the **On change of** list, click the group field you want to base your map on, then in the **Show** list, click the summary field you want to display on your map.
5. Click the **Type** tab.
6. Click the map type that best illustrates your data (Ranged, Dot Density, or Graduated). See *Map types*.
7. In the Options area, apply formatting options to your map.
8. Click the **Text** tab.
9. In the **Map title** field, enter a title for your map.
10. In the Legend area, you can click one of the following options:
    - **Full legend** to show a detailed legend on your map.
    - **Compact legend** to show a condensed legend on your map.
    - **No legend** to exclude the legend from your map.

11. If you click **Full legend**, click **Made by map** to have Crystal Reports create a legend title based on your map, or click **Specify** to enter your own legend title and subtitle.
12. Click **OK**.

    Your map is placed in the Header or Footer section of the report, depending on your selection in Step 3.

Mapping on Cross-Tab summaries (Cross-Tab layout)

With the Cross-Tab layout, you can map on a Cross-Tab summary field. For example, with a Cross-Tab that shows the total number of items of a product sold in each region of the United States, you may want to include a map that shows the percentage of the total sales of the product provided by each region.

In order to create a Cross-Tab map you must first have a Cross-Tab in your report. For more information about Cross-Tabs, see *Cross-Tab Objects*.

To map on a Cross-Tab summary

1. On the **Insert** menu, click **Map**.

   Tip:

   Another way to do this is to click the Insert Map button on the Insert Tools toolbar.

   The Map Expert dialog box appears.
2. On the **Data** tab, in the Layout area, click **Cross-Tab**, if it is not already selected.
3. In the Placement area, click **Header** or **Footer** to specify where to place your map.
4. In the Data area, in the **Geographic field** list, click a geographic field to supply the geographic areas for your map.
5. If necessary, in the **Subdivided by** list, click another field to map on.

   Crystal Reports uses this field to subdivide the pie or bar charts appearing on your map.

6. In the **Map on** list, click a summary field to supply the numeric data for your map.
7. Click the **Type** tab.
8. Click the map type that best illustrates your data. See *Map types*.
   - If you plan to map on only one field, be sure to select None from the "Subdivided by" list, then choose either the Ranged, Dot Density, or Graduated map type.
   - If you plan to map on two fields, be sure to select an additional field from the "Subdivided by" list, then choose either the Pie Chart or Bar Chart map type.
9. In the Options area, apply formatting options to your map.
10. Click the **Text** tab.
11. In the **Map title** field, enter a title for your map.
12. In the Legend area, you can click one of the following options:
    - **Full legend** to show a detailed legend on your map.
    - **Compact legend** to show a condensed legend on your map.
    - **No legend** to exclude the legend from your map.
13. If you click **Full legend**, click **Made by map** to have Crystal Reports create a legend title based on your map, or click **Specify** to enter your own legend title and subtitle.
14. Click **OK**.

    Your map is placed in the Header or Footer section of the report, depending on your selection in Step 3.

Mapping on an OLAP cube (OLAP layout)

Using the OLAP layout, you can map on an OLAP grid. In order to create an OLAP map, you must first have an OLAP grid in your report. For more information about OLAP grids, see *Creating an OLAP report*.

To map on an OLAP cube

1. On the **Insert** menu, click **Map**.

Tip:

Another way to do this is to click the Insert Map button on the Insert Tools toolbar.

The Map Expert dialog box appears.

2. On the **Data** tab, in the Layout area, click **OLAP**, if it is not already selected.
3. In the Placement area, click **Header** or **Footer** to specify where to place your map.
4. In the Data area, click the **On change of** list and select the field on which you want to base your map.

   Note:
   This field should contain geographic information, such as Country.

5. If necessary, click the **Subdivided by** list and select a secondary row or column to incorporate into your map.

   Note:
   Choosing to subdivide by a secondary mapping field, either row or column, will affect the map types available in Step 8.

6. Click the **Type** tab.
7. Click the map type that best illustrates your data. If there is no secondary mapping field, you can choose **Ranged**, **Dot Density**, or **Graduated**; if there is a secondary mapping field, you can choose **Pie Chart** or **Bar Chart**. See *Map types*.
8. In the Options area, apply formatting options to your map.
9. Click the **Text** tab.
10. In the **Map title** field, enter a title for your map.
11. In the Legend area, you can click one of the following options:
    - **Full legend** to show a detailed legend on your map.
    - **Compact legend** to show a condensed legend on your map.
    - **No legend** to exclude the legend from your map.

    Note:
    If you click Full legend, click "Made by map" to have Crystal Reports create a legend title based on your map, or click Specify to enter your own legend title and subtitle.

12. Click **OK**.

    Your map is placed in the Header or Footer section of the report, depending on your selection in Step 3.

Working with maps

Once you have created a map, you may want to add a new title, headings, and a legend, and you may want to change fonts, or even the map type. Crystal Reports provides many options for working with your existing maps.

Editing maps using the Map Expert

Editing maps with the Map Expert allows you to return to the expert in which you designed your map. You can modify many of your original choices, such as the type of map to display, the data on which the map is based, and so on. From either the Design or Preview tab, you can open the Map Expert and make your modifications.

To edit a map using the Map Expert

1. Right-click the map to bring up the shortcut menu.
2. On the shortcut menu, click **Map Expert**.
3. In the Map Expert dialog box, make the desired changes.
4. Click **OK**.

Changing the map title

1. On the **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, choose **Title**.
3. In the Change Map Title dialog box, enter a new title.
4. Click **OK** to save your changes.

   Crystal Reports returns you to the Preview tab and implements your changes.

Changing the map type

You can change the map type and set the properties for that map directly from the menu that appears when you right-click a map on the Preview tab. For example, if you want to see how the data of a Ranged map would look if it were presented in a Dot Density style, you can rearrange the map without having to return to the Map Expert and rework the format.

To change the map type

1. On the **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, choose **Type**.

   The Customize Map dialog box appears.
3. In the **Map type** list, click the new map type.
4. In the Options area, apply formatting options to your new map.

   The properties made available to you vary depending on the map you have selected.
5. Click **OK** to save your changes.

   Crystal Reports returns you to the Preview tab and implements your changes.

Changing map layers

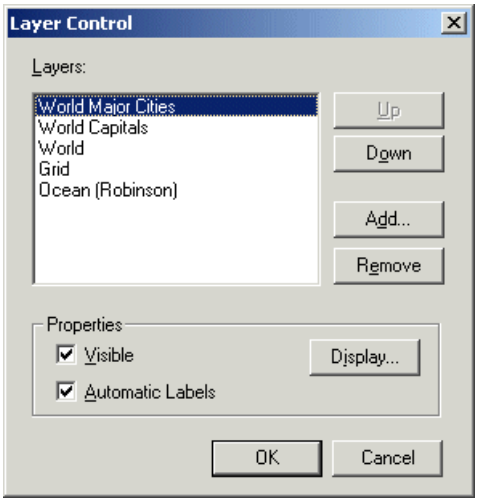
In Crystal Reports, maps are made up of a number of layers. You can stack these layers on top of each other to create a more detailed map. For example, you might want to see the names of major cities in every country; to do this, you could add a layer that contains city names. This layer sits on top of the basic world map to provide further information.

You can specify which of the provided map layers you want to see, and you can rearrange the order of the layers that you have selected.

To change map layers

1. On the **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, and choose **Layers**.

   The Layer Control dialog box appears.



3. In the **Layers** list, click **Up** or **Down** to arrange the order of the map layers.

   Be aware that some map layers contain non-transparent sections that can obscure the detail of other layers. For example, the Ocean layer is mostly non-transparent; if you place it higher in the layers list, it will block many of the other layers (the other layers seem to disappear, but they are merely obscured by the Ocean layer).

4. In the Properties area, set the properties for each map layer, specifying whether the layer is visible and whether it is automatically labeled.

   The Visible option specifies whether the layer appears. The Automatic Labels option specifies whether a predefined label appears (for example, labels for the names of major world cities).

5. If necessary, click **Display** to open the Display Properties dialog box.

Use this dialog box to set the default display mode and zoom range (the minimum and maximum possible magnification) for the layer in question, then click OK to return to the Layer Control dialog box.

6. Click **OK** to save your changes.

   Crystal Reports returns you to the Preview tab and implements your changes.

Resolving data mismatches

Sometimes the map you are working with uses a different geographic name from the one used in the database. For example, a map of Europe may use "United Kingdom" while the database uses the abbreviation "U.K." Until you resolve the data mismatch, the map will not be able to display any information for the selected geographic region.

To resolve data mismatches

1. On the **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, and choose **Resolve Mismatch**.

   The Resolve Map Mismatch dialog box appears.

3. Click the Resolve Mismatch tab to see a listing the geographic names that do not correspond between the database and map.
4. In the **Assign this Field Name** list, click the name you want to resolve.
5. To assign the heading, click a keyword from the **To this Map Name** list.
6. If there is a match, click **Match**.

   The new assignment is displayed in the Matched results part of the Resolve Mismatch tab.

7. Once you are finished resolving the data mismatches, click **OK**.

   The map can now display data for the selected geographic region.

Changing the geographic map

If you prefer to have your data values presented with a different geographic map, specify your changes using the Change Map tab of the Resolve Map Mismatch dialog box.

To change the geographic map

1. On the **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, click **Resolve Mismatch**.

   The Resolve Map Mismatch dialog box appears; the Change Map tab displays the name of the current map you are using, and a list of replacement maps that you can choose from.
3. In the **Available maps** list, click the new map you want to use.
4. Click **OK** to save your changes.

   Crystal Reports returns you to the Preview tab and implements your changes.

Zooming in and out on a map

1. On the **Preview** tab, right-click a map to bring up the shortcut menu.
2. On the shortcut menu, click **Zoom In**.
3. Drag the selection cursor around the map section you want to see.

   The map zooms in one level of magnification.
4. Drag another selection to zoom in further.
5. To zoom out on a map, right-click the map to bring up the shortcut menu.
6. On the shortcut menu, click **Zoom Out**.
7. Click the map.

   The map zooms out a level of magnification.
8. Click the map again to zoom out further.

Note:

- If a map occurs once for each instance of a group, any panning or zooming settings you specify are instance-specific. In other words, if you zoom in on the map in one group header, this setting is only for that group header. None of the headers have been changed. This way you can set each map to different settings.
- If the Save Data with Report option is selected from the File menu, your panning and zooming settings will be saved with the report. If the option is not selected, then only the default map settings will be saved.

Panning a map

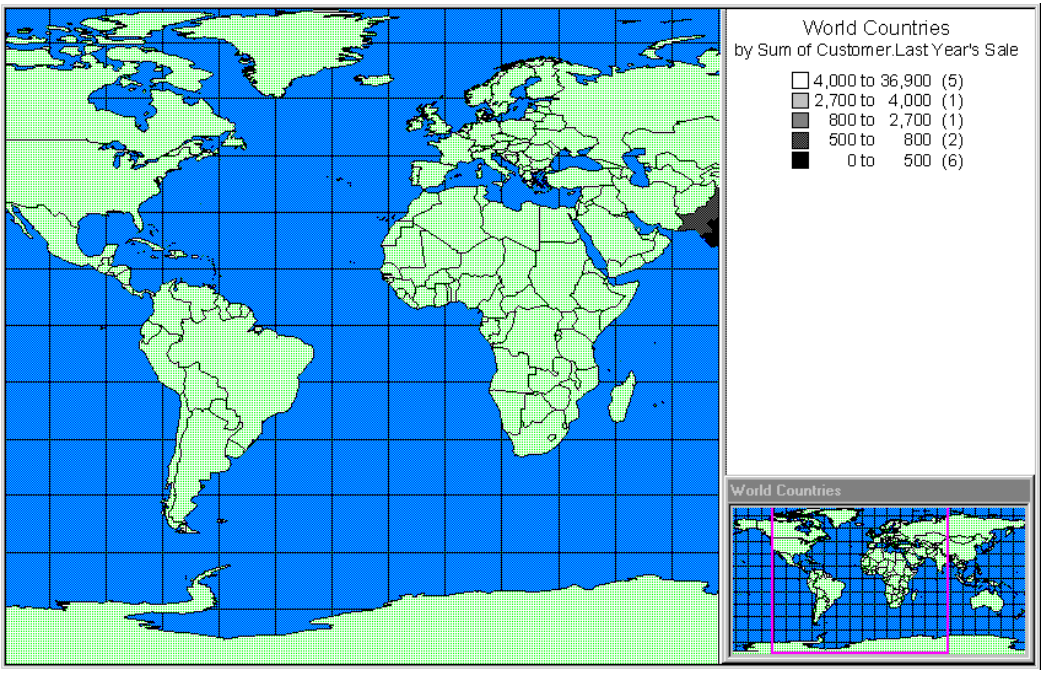
1. On the **Preview** tab, right-click a map to bring up the shortcut menu.
2. On the shortcut menu, click **Pan**.
3. Drag the panning cursor to the desired map section.

Centering a map

1. On the **Preview** tab, right-click a map to bring up the shortcut menu.
2. On the shortcut menu, click **Center Map**.

Hiding and showing the Map Navigator

The Map Navigator provides a small-scale version of the currently displayed map, so that you can select areas you'd like to pan. By panning, you can quickly drag to change the focus of your map as you require. You can then return your map to the center of the display area by using the Center Map command.



You have the option of hiding or showing the Map Navigator.

To hide the Map Navigator

1. On the **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, click **Map Navigator**.

   The Map Navigator is removed from the Preview tab.

To show the Map Navigator

1. On the **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, click **Map Navigator**.

   The Map Navigator is displayed on the Preview tab.

Formatting Maps

Changing the border of a map

1. On the **Design** or **Preview** tab, right-click the map to bring up the shortcut menu.
2. On the shortcut menu, click **Format Map**.
3. On the Format Editor dialog box, click the **Border** tab to see its options.
4. Change the line style, color, background color, and add or remove a drop shadow from the map border.
5. Click **OK** to save your changes.

   Crystal Reports returns you to the report and implements your changes.

Using the underlay feature with maps

Since maps can only print in certain areas and sections of your report, the underlay feature makes mapping even more useful. Instead of having a map print before the data it represents, you can have the map appear alongside the data, thus making the report easier to read and easier to understand.

To underlay a map

1. Create your map and place it in the Report Header section.

   For more information, see *Creating maps*.

2. On the **Report** menu, click **Section Expert**.

   Tip:

   Another way to do this is to click the Section Expert button on the Expert Tools toolbar.

   The Section Expert dialog box appears.

3. In the Sections area, click **Report Header**, then select the **Underlay Following Sections** check box.

4. Click **OK**.

   Crystal Reports returns you to the report. Your map will now underlay the sections below it.

5. If necessary, move or resize the map.

OLE

chapter 16

OLE overview

Object Linking and Embedding (OLE) enables you to insert objects (OLE objects) into a report from other applications (OLE server applications) and then use those applications from within Crystal Reports to edit the objects if necessary.

If you were not using OLE, you would have to exit Crystal Reports, open the original application, change the object, return to Crystal Reports, delete the object originally inserted, and then insert the newly revised object.

Note:
If you intend to use your Crystal report in BusinessObjects Enterprise or through the Report Application Server (RAS), copy the source file to a network folder that is accessible to the network account(s) under which the processing servers (Job Server, Page Server, RAS) are running. Ensure that report designers' accounts also have permission to the network folder. When you insert the linked OLE object in Crystal Reports, use a UNC path.

OLE terminology

Before you work with OLE objects in Crystal Reports, it might be helpful to review some terminology:

- OLE

  OLE is an acronym for Object Linking and Embedding. It refers to the ability to create compound documents; that is, documents that contain elements from other applications that can be edited using the original application.

- OLE Object

  An OLE object is, broadly speaking, a presentation of data that was created in another application and that maintains a relationship with the application that was used to create it. A bitmap created in Paint, an Excel spreadsheet, or a graph from MS Graph may all be OLE objects if they are inserted in the receiving document as OLE objects. If they are not inserted as OLE objects, they retain no relationship with the original application.

- OLE Container Application

An OLE container application is one that can contain and process OLE objects created in other applications (such as Paint or Excel). Crystal Reports is a container application.

- Container Document

  A container document is a document that was created using the container application and that contains one or more OLE objects.

- OLE Server Application

  An OLE server application is an application that allows its documents to be inserted into an OLE container document as OLE objects. Microsoft Word and Excel are examples of applications that are both OLE servers and OLE containers. That is, they can both create new OLE objects and they can contain OLE objects created elsewhere.

- Server Document

  The server document is a file created in the server application that stores the original OLE object.

Types of OLE objects

- Static object

  A static OLE object is a picture of an object that can be displayed and printed, but not edited in place. It does not have a connection to a server application. There are two kinds of static objects: static bitmaps and static metafiles.

- Embedded object

  An embedded object contains a representation of the object, as well as information that defines the content. It does not have a connection to the original object in the server document. As a general rule, use embedded objects when you need to edit the object independently of the original server document.

- Linked object

  A linked object contains a representation of the data and a link to the file where it originated. As a general rule, use linked objects when the data

in the server document is changing and you want the object in your report to be updated when you open the report.

General OLE considerations

There are several points to keep in mind when utilizing OLE functionality.

- When you double-click an embedded OLE object, the object is activated for editing and the Report Designer merges its menus and toolbars with those of the object's server application. If the OLE server application does not support this behavior, the object appears in a separate window. When you are finished editing, click outside the object and the Report Designer toolbars reappear.
- When you double-click a linked OLE object, the program opens the object's server application with the object displayed and ready for editing. You cannot edit a linked object in place in Crystal Reports because you are working on the original object. Since the object could be linked to multiple documents, displaying the original in the server application limits access to one editor at a time.

Inserting OLE objects into reports

There are several ways to insert OLE objects into an application.

- The OLE Object choice on the Insert menu can be used to import an existing object or create a new one. You can place either embedded or linked objects using this method.
- Paste Special on the Edit menu can be used to copy or cut the object from an OLE server application and paste it in a report. If the object can be pasted in multiple formats, you need to decide which format to use. For example, when inserting text from a Microsoft Word document, you can paste the text as Microsoft Word document text (which can be edited in Word), or as a metafile, which is simply a non-editable picture of the text. Use Paste Special to place either embedded or linked objects.

Note:
When inserting selected information (portions of larger files), it is best to use Copy and Paste Special editing. When inserting entire files, click OLE Object from the Insert menu.

To copy and paste OLE objects

This procedure assumes that you have Microsoft Excel or another spreadsheet program on your computer that is an OLE server application.

1. Open both Crystal Reports and Microsoft Excel.
2. Open an existing report in Crystal Reports.
3. Create a spreadsheet in Microsoft Excel by typing the numbers one through ten (1-10) in cells A1 through A10.
4. Select cells A1 through A10, right-click and select **Copy** from the shortcut menu in Excel.
5. Go to Crystal Reports and select **Paste** from the **Edit** menu.
6. Place the cells into the Details section of the report.
7. Right-click the spreadsheet object in the report and observe that it is identified as an OLE object and that the third command from the last identifies it as a Worksheet Object.
8. Double-click the spreadsheet object.

   The menus and toolbars change to a combination of those from the OLE server application and Crystal Reports. You can now edit the object in-place. The object is an embedded object. Any changes you make to the object will not affect the original.

9. Click outside the object when you are finished.

   The menus and toolbars change back to those of Crystal Reports. Any changes you made while editing are saved.

How OLE objects are represented in a report

An OLE object is displayed in a report in any of several different formats depending on how you chose to insert the object.

- If you have chosen to display the object as an icon, the icon will appear in the report. Users can choose to edit the object later by double-clicking the icon.

- If the object was created from an existing file, the data from that file (or an icon) is displayed in the report. This data can be edited by double-clicking the object or its icon.
- If you are creating a new object, the application for the object type that you chose will open, and you can begin designing the object. When you are finished, close or exit the application. The object (or its icon) will be displayed in the report.

Editing OLE objects in reports

In-place editing

In-place editing is the ability to change an OLE object's properties from within an OLE container application (such as Crystal Reports). The container application's menu items change to provide the editing tools from the server application so that you can make changes easily.

When an OLE object is placed in a report, the object becomes part of the report. To edit the object, double-click it and then modify it using the editing tools found in the object's original application or from a similar application that allows in-place editing. You can edit an OLE object only if you have the corresponding server application installed on your computer. You can view and print a report containing an OLE object even if you don't have the server application installed.

Dynamic OLE menu commands

When you have an OLE object selected, there is a submenu on the Edit menu that provides commands for the object. The name of this submenu reflects the type of the OLE object. The commands on the submenu also vary according to the type of object.

The object may be described as a Document object, Bitmap Image object, Picture object, Worksheet object, or something similarly descriptive:

- If the object is embedded, the Edit menu displays those commands that are available to that type of embedded object.

- If the object is linked, the Edit menu displays commands for that type of linked object.

Commands on the context menus change in a similar fashion.

These dynamic commands are provided to give you more control when working with OLE objects.

OLE and the Insert Picture command

When the OLE Object command on the Insert menu is used to place pictures in a report, the picture will be converted to an embedded or linked object associated with Microsoft Paint (or another image editing application).

When the Picture command on the Insert menu is used to place pictures in a report, the Report Designer converts them into static objects.

Static objects cannot be edited. To edit a static object, it has to be converted into an editable type of object using the Convert command on the Edit menu.

Working with static OLE objects

You can insert a number of different types of static OLE objects into your report. Crystal Reports supports these pixel-based image formats:

- Windows Bitmap (BMP)
- TIFF
- JPEG
- PNG

As well, Crystal Reports supports this vector-based image format:

- Windows Metafiles (both WMF and the newer enhanced metafile format).

Note:
Wide static OLE objects can span pages. This functionality may result in two or more horizontal pages in your report. If this do not want this effect, you should resize your static OLE object. As well, it is recommended that you do not use the Repeat on Horizontal Pages option for any static OLE object that will span several pages.

Inserting a static OLE object

1. Open or create a report that you want to insert a static OLE object in.
2. On the **Insert** menu, click **Picture**.

   Tip:

   Another way to do this is to click the picture button on the Insert Tools toolbar.

   The Open dialog box appears.
3. Select a picture (.bmp, .tiff, .jpg, .png, or . wmf) from a directory that you have access to.
4. Click **Open**.
5. When the object frame appears, place the picture in your report.
6. Right-click the picture, and notice that the picture is identified as an OLE object on the shortcut menu.

   When you double-click the object, nothing happens. A static OLE object cannot be edited.

Making a static OLE object dynamic

A dynamic static OLE object is a picture or metafile that you access in Crystal Reports by use of a file path or URL. Typically, you use this option when you have the path to your pictures or metafiles stored as a string field in a database (that is, you do not have the actual objects stored in the database). You can also use this option when you have pictures or metafiles stored on a network share, and you know these objects change occasionally.

The functionality of these dynamic static OLE objects (or dynamic graphics) is created in Crystal Reports through the use of a conditional formatting formula that allows you to link to static OLE objects by reference.

Note:

- This feature is activated when you refresh your report data; therefore, you may not notice a change in the static OLE object until you click the Refresh button in Crystal Reports.

- When you schedule a report that contains a dynamic static OLE object in BusinessObjects Enterprise, the instances that are created contain the version of the static OLE object as it existed in your Crystal report when you scheduled it. BusinessObjects Enterprise does not update the object dynamically for each instance.
- Reports that use an absolute or a relative path for a dynamic static OLE object are not supported in a BusinessObjects Enterprise environment for this release. If you plan to publish reports that contain dynamic static OLE objects to BusinessObjects Enterprise, it is recommend that you use URL links for your OLE objects.

To make a static OLE object dynamic

1. Right-click the static OLE object that you inserted, and choose **Format Graphic** from the shortcut menu.

   Note:
   You begin the process of making a static OLE object dynamic by inserting the object into your report as usual. This object becomes the default object. If Crystal Reports cannot find the dynamic reference to the object, it uses the default object instead.

2. In the Format Editor, click the **Picture** tab, and then click the **Conditional Formula** button adjacent to the **Graphic Location** label.
3. In the Formula Workshop, create the path to your static OLE object.

   For example, if your path is stored in a database field, add that field to the formula.

4. Click **Save and close** to return to the Format Editor.
5. Click **OK** to return to your report.
6. Click **Refresh** to update the reference link to your static OLE object.

Converting a static OLE object to a bitmap image object

1. Right-click the static OLE object that you inserted, and choose **Convert Picture Object** from the shortcut menu.

   The Convert dialog box appears.

2. Select **Paintbrush Picture** in the **Object Type** list, and click **OK**.

   You have just converted a static OLE object to a modifiable OLE object.

   Note:
   This option does not appear if the original file was a metafile.

3. Right-click the object you have just converted.

   The command on the shortcut menu is now Bitmap Image Object.

4. Double-click the object.

   Microsoft Paint, or another graphics application installed on your machine, opens.

Working with embedded vs. linked objects

Since embedded and linked objects each have different properties, it is important for you to consider the capabilities of each when deciding which OLE format to use.

Embedded objects

An embedded object can be created from within Crystal Reports or by using a file that already exists. If you use an existing file, the object is copied to the report.

When changes are made to an embedded object it does not affect the original file and vice versa. The changes are made only to the object within your report.

To insert an embedded OLE object

1. Click the **Design** tab.
2. On the **Insert** menu, click **OLE Object**.

   The Insert Object dialog box appears.

3. Select **Create From File**.

The dialog box changes, allowing you to either type in an object name or browse.

4. Click **Browse** and choose a bitmap file (BMP).
5. Click **Open** to return to the Insert Object dialog box.
6. Click **OK** to return to the report.

   An object frame appears.

7. Place the object in your report.
8. Right-click this picture and observe that it is also identified as an OLE Object on the shortcut menu.

   The third command from the bottom of the shortcut menu identifies it as a Bitmap Image Object. It is an embedded OLE object.

9. Double-click the object.

   You have remained in Crystal Reports but the menus and tools have merged with Microsoft Paint, or those of another graphics package installed on your machine. These tools can be used to edit the bitmap in place. Remember that even though you are working with the tools of the OLE server application, you are not working on the original file; you are working with a copy and nothing you do here will affect the original.

Linked objects

When a linked object is inserted into a report, Windows copies a snapshot of the data (not the data itself) from a file that already exists. The image of the object is added to your report along with a reference to the data used to create it. The actual data remains with the original file.

When the object is activated from within a report, the original file is opened inside the application that was used to create it. Any changes you make directly affect the original file also.

If you want the data in an object to remain available to other applications, and always reflect the most current changes to the data, link the object to the report. An automatic link is refreshed from the source file every time the report is loaded; a manual link is refreshed only when you request it. You can force a refresh, break a link, or redefine the link in the Edit Links dialog box.

When you have a linked object and you break the link using the Links dialog box, all connections to the original data in the server document are broken. A linked object in a container application is merely a representation of that object and a link between the object and the server document. When you break the link you're left with only the representation, with no relationship to the original data or to the editing capabilities of the server application. In this situation, Crystal Reports turns the object into a static object, a stand-alone object that can neither be edited using OLE capabilities nor converted into an editable OLE object.

To link a bitmap image object

1. On the **Insert** menu, click **OLE Object**.

   The Insert Object dialog box appears.

2. Select **Create From File**.

   The dialog box changes, enabling you to enter an object name or browse.

3. Click **Browse** and choose a bitmap file (BMP).
4. Click **Open** to return to the Insert Object dialog box.
5. Select the **Link** check box.
6. Click **OK** to return to the report.

   An object frame appears.

7. Place this object in your report.
8. Right-click this object and observe that this object is identified as an OLE object.

   The third command from the bottom of the shortcut menu identifies this as a Linked Bitmap Image Object.

9. Double-click the object.

   Microsoft Paint or the graphics application you are using opens, displaying the original file. Any changes you make to the original will be reflected in the object that appears in your report.

Integrating Shockwave Flash (SWF) objects

Flash technology is a popular way to add animation to web pages. Flash files can be viewed in a standalone Flash Player, inserted into web pages or inserted into Crystal Reports.

Flash files have a .swf extension. To modify an SWF, you will need the original source file and a Flash authoring tool.

You can either embed an SWF or link to an SWF in any section of a Crystal Reports report.

When you embed the object, you can bind it to the report, but you may be able to bind to only a single variable. You can bind to multiple values in a cross-tab, but you cannot automatically extract the values.

To bind to multiple values, you should use an SWF object that has been created with Xcelsius 2008.

When you link to an object, you will see a static representation of the data. If the SWF object that you link to is updated, you must close and reopen your report to view the changes.

There are restrictions for SWFs created using the Crystal Reports data connection in Xcelsius 2008. Those SWFs can be added to the following sections only:

- Report header
- Group header
- Group footer
- Report footer

Note:

- You must have Adobe Flash Player 9 installed on your machine to test the functionality of the Flash object.
- To view a report that contains a Flash object, you need a viewer that supports Flash rendering such as the .Net Webform or the Java DHTML viewers.
- Reports that are exported or printed will display the default image that you have set instead of the SWF object.

The only format that will display SWF objects in exported reports is PDF. However, if the object contains data binding to the report, the default image is displayed instead of the SWF.

Printing Shockwave Flash (SWF) objects

Crystal Reports 2008 allows you to print SWF objects in your report without the need to first export the report to PDF. The "Print Flash Objects for Current Page" option in the "Print Setup" dialog allows you to print the SWF object that you are currently viewing. The state that you set your SWF object to is the state that it will be printed.

The printing option can print SWF objects that have data binding as well as SWF objects that do not have data binding.

Note:
The Flash printing option only prints SWF objects on the page that you are currently viewing. If you print the entire report, SWF objects on other pages of the report will print as SWF fallback images.

To print Shockwave Flash (SWF) objects

1. Select the page with the SWF object that you want to print.
2. Adjust the SWF to your desired settings.
3. From the "File" menu, select **Print**.
   The "Print Setup" dialog box opens.
4. Ensure that **Print Flash Objects for Current Page** is selected.
5. Click **Print**.

Adding an Xcelsius SWF object to a report

Shockwave Flash (SWF) files cannot be created within Crystal Reports, but they can be displayed.

The "Design" tab displays a placeholder image of the SWF, and the "Preview" tab displays the actual SWF file.

Note:

In the "Design" view, if you choose to insert an SWF that contains an embedded movie or sound, you will hear the sound, but you will not see the movie play. This may cause an echo when you switch to the "Preview" view.

Please consult with your System Administrator to find out how to resolve this issue, or check the Business Objects support site for more information.

To add an Xcelsius SWF object to a report

1. On the **Insert** menu, click **Flash**.

   The Insert Flash Object dialog box appears.

   Note:
   Use one of the following options as an alternative method for inserting a flash object:

   - On the Insert Tools toolbar, click the Insert Flash Object button.
   - Right-click in the report and from the context menu, select Insert Flash Object.

2. Enter the full path for the flash object. If you do not know the exact path, click **Browse** to find the desired file.
3. Select either **embed** or **link**, and then click **OK**.

   The flash object is added to the report.
4. Drag the object frame to the position where you wish to place the flash object.

Using data binding to bind an Xcelsius SWF object to a report

Data can be sent from a report to an SWF, but not from an SWF to a report. The parameters in the SWF are extracted to set the name of the parameter and the format of the data, such as cell, row, or table.

There are three ways to bind data to Flash variables within the SWF object:

- Bind to a cross-tab in the SWF.

A user interface that is like the cross-tab expert allows you to map rows, columns, and summarized fields to Xcelsius variables.

- Bind to an external cross-tab.

  You can bind data to a cross-tab within the report.

- Bind to a single value.

  You can bind data to one detail item in the report. Select fields from the tables to bind to existing variables in the "Flash Data Expert".

  Note:
  If a recurring field is selected, only the first instance is sent.

To bind data to a cross-tab

1. Right-click the SWF object and select **Flash Data Expert**.
   The Flash Data Binding Expert appears.
2. Select a data field and drag it to a row or column of the cross-tab.
3. When you have finished adding data fields to the cross-tab, click **OK**.

To bind data to an external cross-tab

1. Right-click the SWF object and select **Flash Data Expert**.
   The Flash Data Binding Expert appears.
2. Select the**Use Existing Cross-Tab** check box.
3. From the drop-down list, select the cross-tab to use.
4. Click **OK**.

To bind data to a single value

1. Right-click the SWF object and select **Flash Data Expert**.
   The Flash Data Binding Expert appears.
2. For each variable that is listed, select a field or type a value.
3. When finished, click **OK**.

Cross-Tab Objects

chapter 17

What is a Cross-Tab object?

A Cross-Tab object is a grid that returns values based on the criteria you specify. Data is presented in compact rows and columns. This format makes it easy to compare data and identify trends. It is made up of three elements:

- Rows
- Columns
- Summary fields

	USA	MEXICO	CANADA	UK	**TOTAL**
Gloves	4	0	4	0	8
Belts	0	1	1	1	3
Shoes	0	0	0	1	1
TOTAL	4	1	5	2	12

- The rows in a Cross-Tab run horizontally (from side to side). In the example above, "Gloves" is a row.
- The columns in a Cross-Tab run vertically (up and down). In the example above, "USA" is a column.
- The summary fields are found at the intersection of rows and columns. The value found at each intersection represents a summary (sum, count, and so on) of those records that meet the row and the column criteria. In the example above, the value at the intersection of "Gloves" and "USA" is four, the number of gloves sold in the USA.

A Cross-Tab also includes several totals:

	USA	MEXICO	CANADA	UK	**TOTAL**	
Gloves	4	0	4	0	8	← Total of products in row (gloves)
Belts	0	1	1	1	3	
Shoes	0	0	0	1	1	
TOTAL	4	1	5	2	12	← Grand total all products (row) all countries (column)

↑ Total of products in column (USA)

- At the end of each row is a total for that row. In the example above, this total represents a single product sold in all countries. At the end of the "Gloves" row is the value 8, the total number of gloves sold in all countries.

  Note:
  The total column can appear at the beginning of each row.

- At the bottom of each column is a total for that column. In the example above, this total represents all products sold in a single country. The value at the bottom of the "USA" column is four, the total number of products (gloves, belts and shoes) sold in the USA.

  Note:
  The total column can appear at the top of each column.

- At the intersection of the Totals column (totals for the products) and the Totals row (totals for the countries) is a grand total. In the example above, the value at the intersection of the Total Column and Total Row is 12, the total number of all products sold in all countries.

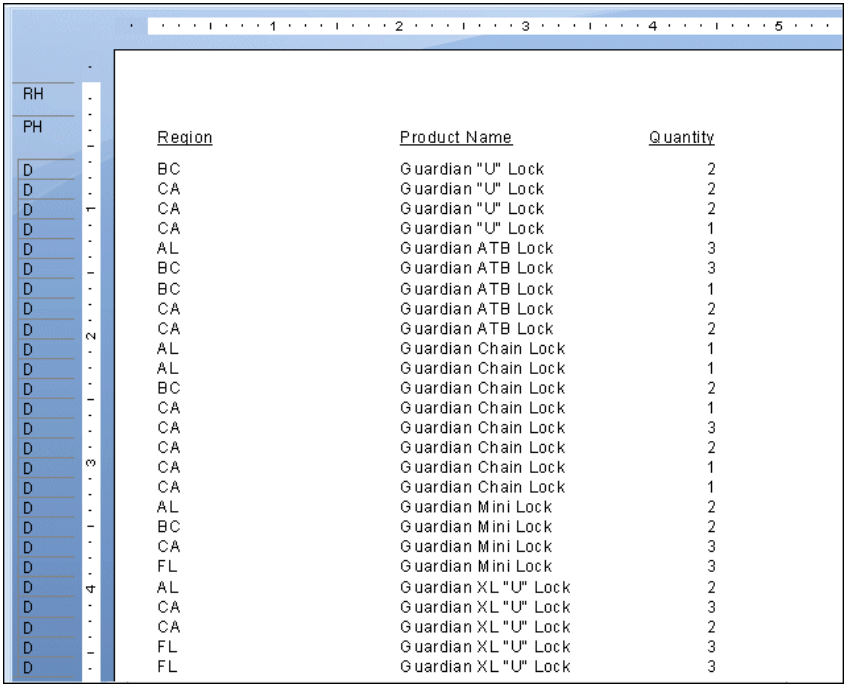
Cross-Tab example

This example demonstrates how you can use a Cross-Tab object to make it easier to understand complex data. The goal of this report is to analyze the unit sales of five different bicycle locks in four different regions (a unit sales of locks by region report). For greater clarity, only the most essential information in these reports has been included:

- The region from which the order came.
- The name of the lock.
- The quantity ordered.

The first way of looking at the data is in the most basic of all reports, a columnar report with no grouping or sorting.

Report of order data - no sorting/grouping



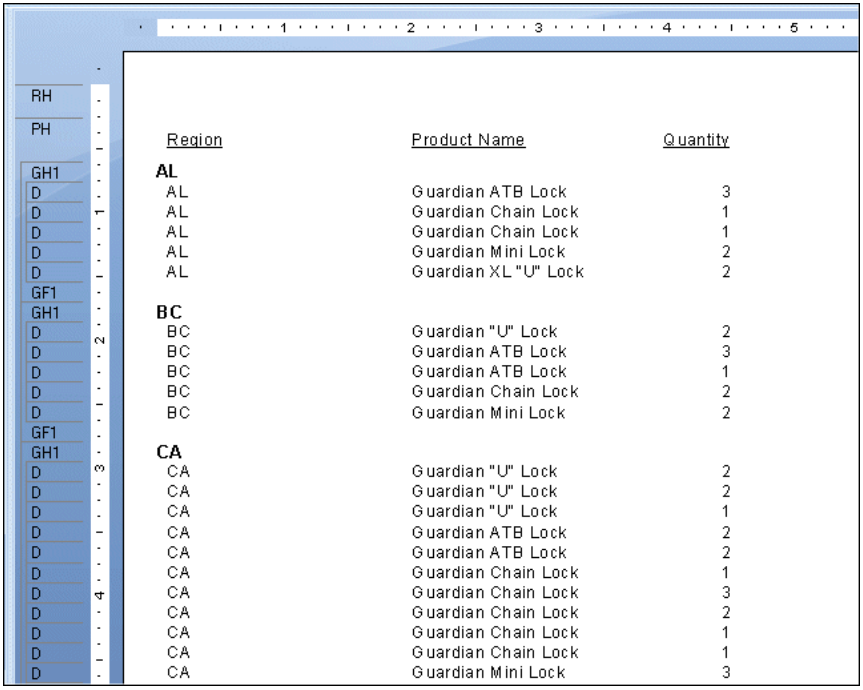
Region	Product Name	Quantity
BC	Guardian "U" Lock	2
CA	Guardian "U" Lock	2
CA	Guardian "U" Lock	2
CA	Guardian "U" Lock	1
AL	Guardian ATB Lock	3
BC	Guardian ATB Lock	3
BC	Guardian ATB Lock	1
CA	Guardian ATB Lock	2
CA	Guardian ATB Lock	2
AL	Guardian Chain Lock	1
AL	Guardian Chain Lock	1
BC	Guardian Chain Lock	2
CA	Guardian Chain Lock	1
CA	Guardian Chain Lock	3
CA	Guardian Chain Lock	2
CA	Guardian Chain Lock	1
CA	Guardian Chain Lock	1
AL	Guardian Mini Lock	2
BC	Guardian Mini Lock	2
CA	Guardian Mini Lock	3
FL	Guardian Mini Lock	3
AL	Guardian XL "U" Lock	2
CA	Guardian XL "U" Lock	3
CA	Guardian XL "U" Lock	2
FL	Guardian XL "U" Lock	3
FL	Guardian XL "U" Lock	3

This report presents details. Each row represents an individual order. There are many orders from each of the regions for different locks. But because there is no summary information, it is nearly impossible to get any useful information out of a report like this.

The next logical step is to group the data in some way. You can group it by region, or by product line. The following section shows a look at both of these options.

Report of order data - grouped by region

This report uses the data seen in the first report, but here the data is grouped by region. All the orders in each region are grouped together, but each regional group contains orders for different types of locks. Because the groups contain different kinds of data, summarizing the Quantity field will determine the total number of locks sold per Region, but not the total of each type.

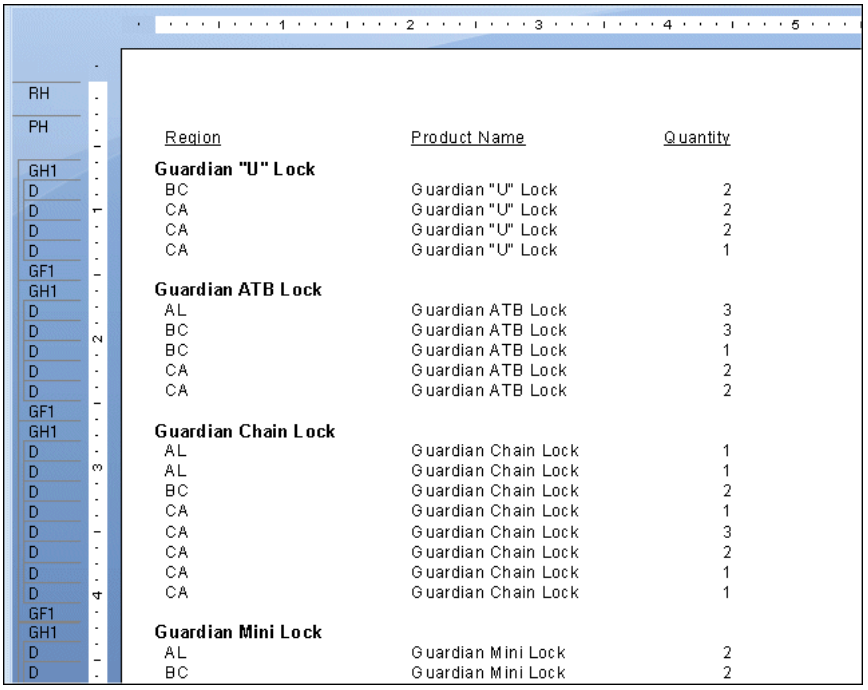


Each region group contains orders for different kinds of locks.

Report of order data - grouped by product

This report groups the data by product. Each group displays all the orders for a specific product. At first it appears that this might be useful, but then it becomes clear that each product group includes orders from several different regions.

The information is helpful, and it brings you closer to your goal, but you are still a long way from having the information you need.



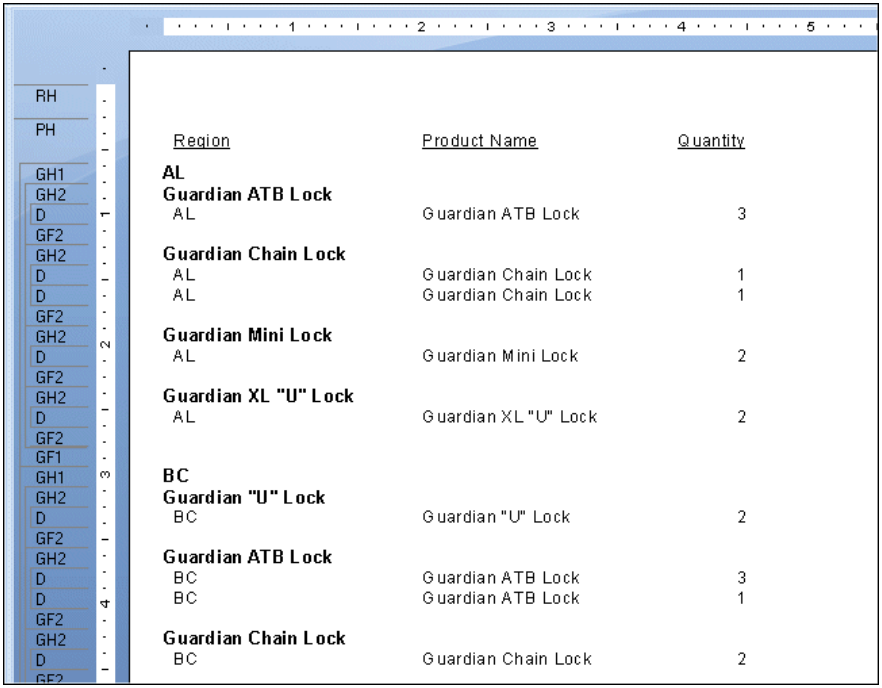
Region	Product Name	Quantity
Guardian "U" Lock		
BC	Guardian "U" Lock	2
CA	Guardian "U" Lock	2
CA	Guardian "U" Lock	2
CA	Guardian "U" Lock	1
Guardian ATB Lock		
AL	Guardian ATB Lock	3
BC	Guardian ATB Lock	3
BC	Guardian ATB Lock	1
CA	Guardian ATB Lock	2
CA	Guardian ATB Lock	2
Guardian Chain Lock		
AL	Guardian Chain Lock	1
AL	Guardian Chain Lock	1
BC	Guardian Chain Lock	2
CA	Guardian Chain Lock	1
CA	Guardian Chain Lock	3
CA	Guardian Chain Lock	2
CA	Guardian Chain Lock	1
CA	Guardian Chain Lock	1
Guardian Mini Lock		
AL	Guardian Mini Lock	2
BC	Guardian Mini Lock	2

Each product group contains orders for many regions.

Report of order data - grouped by region and product

This report is the logical next step. If the By Region report contains multiple products in each region group, and the By Product report contains multiple

regions in each product group, then it seems to make sense to combine the two. Doing that, you group first by Region and then by Product.

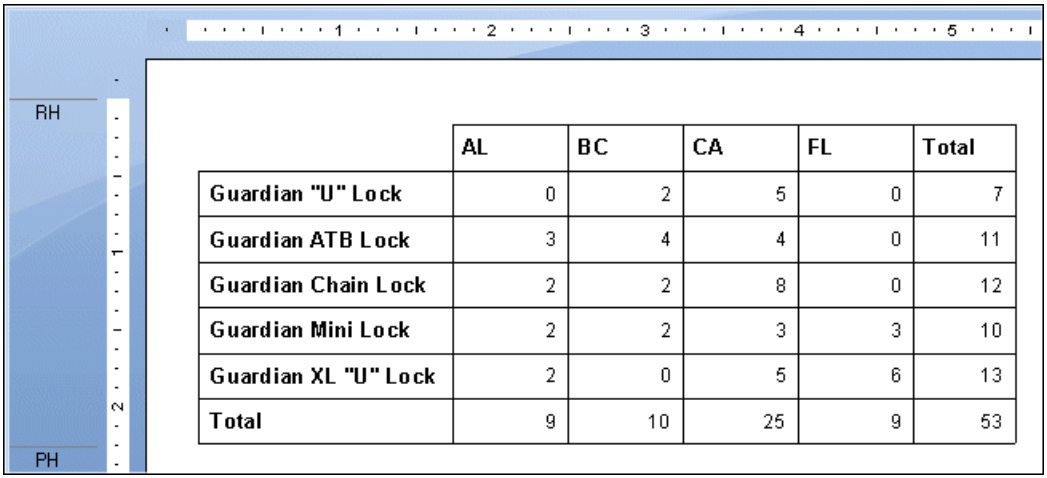


Region	Product Name	Quantity
AL		
Guardian ATB Lock		
AL	Guardian ATB Lock	3
Guardian Chain Lock		
AL	Guardian Chain Lock	1
AL	Guardian Chain Lock	1
Guardian Mini Lock		
AL	Guardian Mini Lock	2
Guardian XL "U" Lock		
AL	Guardian XL "U" Lock	2
BC		
Guardian "U" Lock		
BC	Guardian "U" Lock	2
Guardian ATB Lock		
BC	Guardian ATB Lock	3
BC	Guardian ATB Lock	1
Guardian Chain Lock		
BC	Guardian Chain Lock	2

Each group contains orders for one product for one region. But the data is all spread out and remains difficult to analyze. This information is useful, and with a little work you can use a report like this to get the comparison information you need. However, a Cross-Tab offers a better solution.

Order data in a Cross-Tab object

With Cross-Tabs, all the information you need is provided in a compact format. The report shows the products sold in each region and what the unit sales were. It is easy to see, for example, that Guardian XL "U" Locks are not popular at all in BC but they are the biggest seller in Florida, or that Alabama is being outsold by California in every lock category.



	AL	BC	CA	FL	Total
Guardian "U" Lock	0	2	5	0	7
Guardian ATB Lock	3	4	4	0	11
Guardian Chain Lock	2	2	8	0	12
Guardian Mini Lock	2	2	3	3	10
Guardian XL "U" Lock	2	0	5	6	13
Total	9	10	25	9	53

In this Cross-Tab:

- Product names make up the row headings.
- Regions make up the column headings.
- The value at each row/column intersection is the sum of all the orders for a particular product for a particular region; for example, the total number of Guardian Mini Locks purchased in British Columbia.
- The total at the end of each row is the total of all of the purchases for one product in all regions; for example, the total number of Guardian ATB Locks purchased in Alabama, British Columbia, California, and Florida combined.
- The total at the bottom of each column is the total number of all kinds of locks ordered in one region; for example, the number of locks of all kinds purchased in California.
- The total in the bottom right corner is the grand total showing the total unit sales of all five locks in all four regions.

The report is compact, and enables you to compare your customers' purchasing habits quickly.

Creating a Cross-Tab report

This section provides you with the steps to create a Cross-Tab object in a new report and how to add a Cross-Tab object to an existing report.

Things to keep in mind when using Cross-Tab objects:

- You can drag report fields into or out of Cross-Tab objects.
- You can have multiple rows, columns, and summarized fields.
- You can use print-time formulas as your rows or columns.
- You can use Running Total fields as your summarized field.
- You can include a group sort (top or bottom N) on the rows in your Cross-Tab.

  Note:
  Group sorting cannot be applied to columns.
- You can insert as many Cross-Tab objects in a report as you need.
- You can insert the Cross-Tab into either the Report Header or Footer, or the Group Header or Footer.
- You can place Cross-Tab objects in subreports. This is useful when you want to refer to the results from another report.

To create a new cross-tab report

- On the Start Page, click **Cross-Tab Report Wizard**.

  The Cross-Tab Report Creation Wizard appears.

To add a Cross-Tab to an existing report

1. Open your report.

   This example uses the Group By Intervals.rpt included in the Feature Examples directory.
2. Click the **Design** tab.

3. On the **Insert** menu, click **Cross-Tab**.

   Tip:

   Another way to do this is to click the Insert Cross-Tab button on the Insert Tools toolbar.

   An object frame appears with the Arrow cursor as you drag the Cross-Tab object into the report.

4. Place the object frame in an empty area in the **Group Header #1** and click to release it.

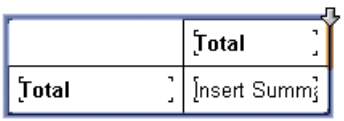
   An empty Cross-Tab object appears in your report. You can drag fields from your report or from the Field Explorer into your Cross-Tab. This example uses Customer Name, Country, and Last Year's Sales from the Customer table.

5. In the Field Explorer, select **Customer Name** and drag it to the Cross-Tab.

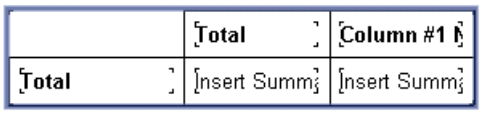
   This field will be your column value.

6. Drag the field to the upper-right-hand corner of the Cross-Tab object.

   You'll see a placement arrow to show you where the field will appear when you drop it.

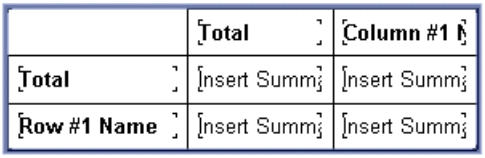
   Once you have clicked to release the field, it appears to the right of the column that you selected.

7. In the Field Explorer, select **Country** and drag it to the Cross-Tab.

   This field will be your row value.

8. Drag the field to the lower-left-hand corner of the Cross-Tab object, and click to release it.



9. Finally, drag **Last Year's Sales** to the **Insert Summary** cells of the Cross-Tab, and click to release it.

   Tip:
   Notice that all of the cells change color when you position the field over them.

10. Click the **Preview** tab to see your Cross-Tab.

Specifying the data source

1. On the Data screen, locate the data source you want to use.

   This example uses the Xtreme Sample Database.

   For information on how to select a data source, see *Selecting the data source*.

2. Select the tables that contain the fields to include in the report.

   Tip:
   Use the Ctrl-click combination to pick a non-continuous range of fields and the Shift-click combination to pick a continuous list of fields.

   This example uses Customer, Orders, Orders Detail and Product.

3. Click the > arrow to add the selected tables.
4. Click **Next**.

   The Link screen appears.

Modifying the links

1. In this example, check to make sure that the Customer table is linked to the Product table via the Orders and Orders Detail tables.

   If you do not like the linking that Crystal Reports has automatically suggested, change it by clicking Clear Links, and then select the fields that you would like to link together.

2. Click **Next**.

   The Cross-Tab screen appears.

Adding a chart

1. Select the kind of chart you want to see in your report:
   - Bar Chart
   - Line Chart
   - Pie Chart

   Note:
   If you don't want to add a chart, leave No Chart selected and skip to *Selecting records*.

2. Change the default charting information to suit your report.

   For more information about creating a group chart, see *Charting on summary or subtotal fields (Group layout)* .

3. Click **Next**.

   The Record Selection screen appears.

Selecting records

Use this screen to apply selection conditions. This limits the results that are returned in your report to only those records that you are interested in.

1. Select the field to apply selection to.

For this example choose Region.

2. Click the > arrow.

   The field is added to the Filter Fields area and the filter types list appears below it.

3. From the filter types list choose a filter method.

   For this example, choose "is one of" as the filter method.

4. In the filter values list that appears, select the value(s) you want to filter on and click **Add**.

   For this example, choose AZ, CA, and OR from the drop-down list.

   The report will provide you with a breakdown and summary of accessory and bicycle sales for Arizona, California, and Oregon.

5. Click **Next**.

   The Grid Style screen appears.

Defining the structure of the Cross-Tab

Add fields from the Available Fields area to the Rows, Columns, and Summary Fields areas.

1. From the **Customer** table, select **Region**; then click the > arrow next to the Rows area.

   The Region field is added to the Rows area.

   Tip:
   You can also add a field to the different Cross-Tab areas by selecting it and dragging it to the Columns, Rows, or Summary Fields areas.

2. From the **Product** table, select **Product Class**; then click the > arrow next to the Columns area.

   The Product Class field is added to the Columns area.

3. From the **Orders** table, select **Order Amount**; then click the > arrow next to the Summary Fields area.

   The Orders Amount is added to the Summary Fields area.

4. Select the summary operation you want to perform on **Order Amount** from the list beneath the Summary Fields area.
5. Click **Next**.

   The Chart screen appears.

Applying a predefined style and finishing the report

1. Select a style.

   For this example choose Original.
2. Click **Finish**.

   The Cross-Tab report appears in the Preview tab.
3. If you do not want the Cross-Tab to appear in the **Report Header**, click the **Design** tab, and move the Cross-Tab to the **Report Footer**.

   Note:

   - You can also place your Cross-Tab in the Group Header or Footer.
   - If you place the Cross-Tab in the Report Footer, unsuppress the footer by right-clicking in the Report Footer's gray area and selecting Don't Suppress.
4. Click the **Preview** tab to view the report.

Adding a Cross-Tab to an existing report using the Cross-Tab Expert

To add a Cross-Tab to an existing report using the Cross-Tab Expert

In this example, a Cross-Tab is added to an existing report to show the sales in North America compared to the rest of the world. However, instead of defining the report by dragging fields into it, you will use the Cross-Tab Expert.

1. Open your report.

This example uses the Group By Intervals.rpt included in the Feature Examples directory.

2. Click the **Design** tab.
3. On the **Insert** menu, click **Cross-Tab**.

   Tip:

   Another way to do this is to click the Insert Cross-Tab button on the Insert Tools toolbar.

   An object frame appears with the Arrow cursor as you drag the Cross-Tab object into the report.

4. Place the object frame in an empty area in the **Report Header** and click to release it.

   An empty Cross-Tab object appears in your report.

5. Right-click the Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears. This dialog box is made up of three tabs: Cross-Tab, Style, and Customize Style.

Defining the structure of the Cross-Tab

Add fields to the Rows, Columns, and Summarized Fields areas.

1. From the **Available Fields** list, select **Country**; then click the > arrow next to the Rows area.

   The Country field is added to the Rows area.

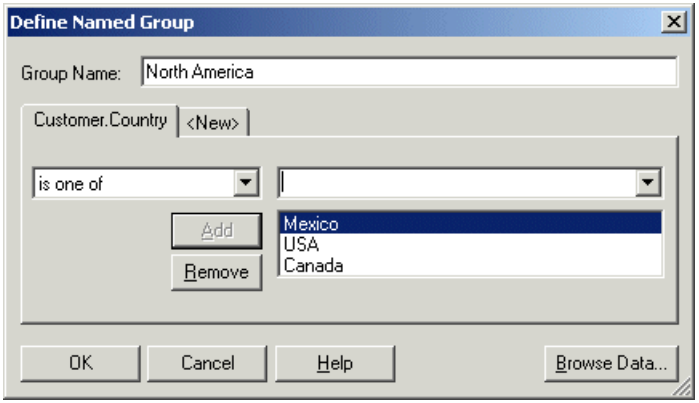
   Tip:
   You can also add a field to the different Cross-Tab areas by selecting it and dragging it to the Columns, Rows, or Summarized Fields areas.

2. From the **Available Fields** list, select **Last Year's Sales**; then click the > arrow next to the Summarized Fields area.

   The Last Year's Sales field is added to the Summarized Fields area.

3. Apply additional structure:
   - Click **Country** in the Rows area.

- Click **Group Options**.
- Select **in specified order** from the drop-down list.
- Type **North America** for the name of the Named Group.
- Click **New**.
- Choose **is one of** from the drop-down list.
- Select **Canada**, **Mexico**, and **USA** from the drop-down list.



- Click **OK** to close the Define Named Group dialog box.
- Click **OK** to close the Cross-Tab Group Options dialog box.

Choosing a predefined style

1. Click the **Style** tab.
2. Select a style.

Applying a custom style

1. Click the **Customize Style** tab.
2. Customize the style as desired.

Finishing the Cross-Tab

1. Click **OK**.
2. On the **Report** menu, click **Refresh Report Data**.

   The updated report appears.

Working with Cross-Tabs

This section describes ways you can work with a Cross-Tab once you've added it to your report.

Showing values as percentages

1. Right-click the blank top-left area of a Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears.
2. On the **Cross-Tab** tab, select a summarized field; then click **Change Summary**.
3. In the Edit Summary dialog box, select the **Show as percentage of** option, and choose the summary field you want to base the percentage on.
4. Choose **Row** or **Column** depending on whether you want your percentage values to be calculated horizontally (row) or vertically (column).
5. Click **OK** to close the Edit Summary dialog box.
6. Click **OK** to return to your Cross-Tab.

   Summarized field values are now displayed as percentages on your Cross-Tab.

Tip:
You can also access the Edit Summary dialog box directly from your Cross-Tab by selecting the summary field and choosing Edit Summary from the shortcut menu.

Abbreviating large summarized fields

Because the values in a Cross-Tab's summarized fields are often very large, Crystal Reports lets you abbreviate such values.

Note:
To complete this procedure, the report you're working with must include the custom function called cdFormatCurrencyUsingScaling. The sample report called `Custom Functions.rpt` includes this function. Sample reports are located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

1. If there is no cross-tab object in the report, insert one in the Report Header. For information on how to insert a cross-tab object, see *Adding a Cross-Tab to an existing report using the Cross-Tab Expert*.

   Use Customer.Country for the Row, and Orders.Order Amount for the summarized field.

2. Right-click the summarized field you want to abbreviate and choose **Format Field** from the shortcut menu.

   The Format Editor appears.

3. On the Common tab, click the conditional formatting button adjacent to **Display String**.
4. In the Functions tree of the Format Formula Editor, select cdFormatCurrencyUsingScaling from the Custom Functions folder.
5. Complete the custom function's arguments as follows:

```
cdFormatCurrencyUsingScaling (CurrentFieldVal
ue,1,"K","M")
```

   - As the first argument, choose CurrentFieldValue from the Formatting Functions folder of the Functions tree. This argument defines the actual value to be summarized.
   - As the second argument, enter the number of decimal places you want to display on your Cross-Tab.
   - As the third and fourth arguments, enter the strings (surrounded by quotation marks) that you want to display as thousands and millions symbols.

6. Click **Check** to identify any errors in the formula.
7. Fix any syntax errors the Formula Checker identifies.
8. When the formula has the correct syntax, click **Save and close** on the Formula Workshop toolbar.

   You return to the Format Editor dialog box.
9. Click **OK** to return to your Cross-Tab.

   Your summarized field values appear abbreviated as defined.

Note:
You can create your own custom function, or you can copy and modify the provided sample to abbreviate a summarized field. In general, using a custom function is not a requirement of working with the Display String feature. You can write any Display String formula you need as long as its return value is a string.

Customizing row/column labels

By default, row and column labels are derived from the data on which you base your Cross-Tab. You can, however, customize row and column labels.

1. Right-click the row or column whose label you want to customize and choose **Format Field** from the shortcut menu.

   The Format Editor appears.
2. On the Common tab, click the conditional formatting button adjacent to **Display String**.
3. In the Format Formula Editor, create formula text that describes the custom names you want to use as well as the conditions under which these names should be applied.

   For more information about how to do this, see *Working with conditional formatting*.
4. Click **Check** to identify any errors in the formula.
5. Fix any syntax errors the Formula Checker identifies.
6. When the formula has the correct syntax, click **Save and close** on the Formula Workshop toolbar.

You return to the Format Editor dialog box.

7. Click **OK** to return to your Cross-Tab.

   Your customized row and column names appear when the conditions you set are matched.

Using running totals in Cross-Tabs

Running Total fields can be useful as summary fields in Cross-Tab objects. Create your Cross-Tab as shown in *Creating a Cross-Tab report*, but choose a running total field as your Summary Field.

Note:
You cannot use Running Total fields as columns or rows in a Cross-Tab.

If you want a running total that totals down the Cross-Tab's columns, you must sort the records in the Cross-Tab by Column and then Row.

To total down columns

1. Right-click the blank top-left area of a Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.
2. On the **Cross-Tab** tab of the Cross-Tab Expert, make sure you have added a Running Total field to the **Summarized Fields** area.
3. Click **OK** to return to the Cross-Tab in your report.
4. Click **Record Sort Expert** and sort your Cross-Tab by the field you designated as a Column in the Cross-Tab Expert.
5. Create a second sort on the field you designated as a Row in the Cross-Tab Expert.

If you want a running total that totals across the Cross-Tab's rows, you must sort the records in the Cross-Tab by Row and then Column.

To total across rows

1. Repeat steps 1 to 3 of the previous procedure.

2. Click **Record Sort Expert** and sort your Cross-Tab by the field you designated as a Row in the Cross-Tab Expert.
3. Create a second sort on the field you designated as a Column in the Cross-Tab Expert.

If you add a Group Sort (top or bottom N sort) based on a Running Total field, the sort is carried out on the running total values as shown in the Cross-Tab's Row/Column Total areas—it is not based on the summary field's totals. Also, in this case, the running total results appear correctly only in the total data and not in the cell data.

Printing Cross-Tabs that span multiple pages

When you create a Cross-Tab that is wider or longer than the specified page size, the program automatically spans the printing across enough pages to accommodate the size of the Cross-Tab. In the Preview tab, a line will appear at each page break. For ease in reading, column headings will be repeated on subsequent pages. Row headings can also be repeated using the Keep Columns Together option.

To repeat row labels

1. Right-click the blank top-left area of the Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears.
2. Click the **Customize Style** tab.
3. Select the **Repeat Row Labels** check box, if desired.

Crystal Reports lets you designate report objects that don't expand horizontally, such as text objects, field objects, OLE objects, charts, maps, lines, boxes, and so on, to be repeated on each additional horizontal page that a Cross-Tab creates. For more information, see *Repeating report objects on horizontal pages* .

Formatting Cross-Tabs

Crystal Reports has powerful formatting capabilities that can be applied to Cross-Tabs. The following sections describe some key procedures.

By applying such formatting as background color, borders, and fonts, you can emphasize important data and create professional-looking, easy-to-understand Cross-Tabs. For more information, see *Formatting properties*.

You can also use the Highlighting Expert to apply conditional formatting to Cross-Tab cells. To access the Highlighting Expert, right-click the cell you want to format and, on the shortcut menu, click Highlighting Expert. For more details, see *Using the Highlighting Expert*.

Changing width, height, and alignment of Cross-Tab cells

1. Click a cell within the Cross-Tab to activate the sizing handles.
2. Click and drag one of the sizing handles to expand the width or height of the cell.
3. Click an alignment option on the Formatting toolbar to change the alignment of the data in the cell.

   You can choose between left, right, center, and justified alignment.

Note:
Changing one cell affects all like cells. For example, changing the width of one summary field cell changes all other summary field cells at the same time.

Formatting background color of entire rows/columns

Use background colors to emphasize rows or columns within your Cross-Tab.

1. Right-click the blank top-left area of the Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears.

2. Click the **Customize Style** tab.
3. Click the row (in the Rows area) or column (in the Columns area), and select a color from the **Background Color** drop-down list.
4. Click **OK** to return to the Cross-Tab.

   The row/column is formatted as specified.

Formatting fields individually

1. Right-click the field you want to format and choose **Format Field** from the shortcut menu.

   The Format Editor appears.
2. In the Format Editor, make font, background, borders, numbering, currency symbols, and printing characteristics choices.
3. Click **OK** to return to the Cross-Tab.

   The field is formatted as specified.

Formatting several fields at one time

1. Use the **Shift**-click method to highlight the desired fields.
2. Right-click any one of them and choose **Format Objects** from the shortcut menu.

   The Format Editor appears.
3. In the Format Editor, make font, background, borders, numbering, currency symbols, and printing characteristics choices.
4. Click **OK** to return to the Cross-Tab.

   The fields are formatted as specified.

Suppressing Cross-Tab data

This section provides you with the steps required to suppress data in your report. You can suppress:

- Empty rows and columns.
- Row and column grand totals.
- Subtotals and their labels.

To suppress empty rows and columns

1. Right-click the blank top-left area of the Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears.
2. Click the **Customize Style** tab.
3. Select either the **Suppress Empty Rows** or **Suppress Empty Columns** check box.
4. Click **OK**.

   Now, when you print the report, empty rows and/or columns will not appear.

To suppress row and column grand totals

1. Right-click the blank top-left area of the Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears.
2. Click the **Customize Style** tab.
3. Select either the **Suppress Row Grand Totals** or **Suppress Column Grand Totals** check boxes.
4. Click **OK**.

To suppress subtotals and their labels

If you have more than two groups in your Cross-Tab you can suppress the subtotal and label for one of them.

1. Right-click the blank top-left area of the Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears.

2. Click the **Customize Style** tab.
3. Click the field whose subtotal you want to suppress.

   The Suppress Subtotal and the Suppress Label check boxes become active.
4. In the Group Options area, select the **Suppress Subtotal** check box.
5. Click the **Suppress Label** check box to suppress the label associated with subtotal.
6. Click **OK**.

Displaying summarized fields horizontally

If you have two or more summarized fields in your Cross-Tab, you can display their values horizontally instead of vertically (the default).

1. Right-click the blank top-left area of the Cross-Tab and select **Cross-Tab Expert** from the shortcut menu.

   The Cross-Tab Expert appears.
2. Click the **Customize Style** tab.
3. In the Summarized Fields area, select **Horizontal**.
4. Click the **Show Labels** check box if you want to display labels for the summarized fields.

   Labels are displayed in the direction you chose for the summarized fields.
5. Click **OK**.

Advanced Cross-Tab features

There are several ways to add even more information to your Cross-Tabs. This section covers several advanced Cross-Tab features.

Related Topics

- *Calculated Members*
- *Embedded Summaries*

Calculated Members

You can add rows or columns to your Cross-Tab by inserting a **Calculated Member**. These rows or columns can contain custom calculations (for example, the difference in sales between two regions) or can be used entirely for formatting purposes (for example, inserting a blank row every three lines to increase readability).

You have complete flexibility in designing your own calculation formulas and can choose whether they appear only once or repeat regularly in the Cross-Tab.

Related Topics

- *Calculation Formulas*
- *Header Formulas*
- *Insertion Formulas*
- *Value Formulas*

To add a Calculated Member to your Cross-Tab

1. In your Cross-Tab, right-click the row or column header you would like to use as the first value of your **Calculated Member**.

   For example, if you wanted to create a **Calculated Member** for the difference between Sales and Sales Returns, the desired formula would be Sales - Sales Returns. In this example, you would right-click the Sales header.

2. On the shortcut menu, point to **Calculated Member**, and select the chosen value as your first value.

   In this example, you would select Sales as your first value.

3. In your Cross-Tab, right-click the row or column header you would like to use as the second value of your **Calculated Member**.

   In this example, you would select Sales Returns as your second value.

4. On the shortcut menu, point to **Calculated Member**, and select the desired calculation.

   In this example, you would select **Difference of "Sales" and "Sales Returns"** as the desired calculation.

A row or column that displays the results of the selected calculation appears in your Cross-Tab .

To add a blank row or column to your Cross-Tab

1. In your Cross-Tab, right-click the header immediately preceding the desired location of your blank row or column.
2. On the shortcut menu, point to **Calculated Member**, and depending on whether you have clicked a row or a column, click either **Insert Row** or **Insert Column**.

A blank row or column appears in your Cross-Tab.

To change the processing order of Calculated Members

If you have multiple **Calculated Members** in your Cross-Tab, the order in which they are calculated can affect your results. You can change the processing order of **Calculated Members** in the **Cross-Tab Calculated Members Expert**.

1. Right-click the top-left corner of your Cross-Tab.
2. On the shortcut menu, point to **Advanced Calculations**, and click **Calculated Member**.

   The **Cross-Tab Calculated Members Expert** appears.
3. In the **Calculated Members** box, use the arrows to change the processing order of the **Calculated Members**.
4. Click OK to save your changes and return to your report.

The Cross-Tab recalculates the values of the **Calculated Members**.

Note:
Changing the processing order of **Calculated Members** does not cause a database refresh.

Calculation Formulas

Calculation Formulas are mathematical formulas that Crystal Reports uses to determine **Calculated Member** cell values. You can choose between several pre-defined formulas or design your own in the **Formula Workshop**.

The pre-defined formulas are as follows:

- Sum of
- Difference of
- Product of
- Quotient of

Crystal Reports is equipped with a variety of functions to help you design your own formulas.

To edit a Calculation Formula

1. In the **Calculated Member** you would like to edit, right-click any cell except for the header.
2. On the shortcut menu, point to **Calculated Member**, and click **Edit Calculation Formula**.

   The **Formula Workshop** appears.
3. In the **Formula Workshop**, enter the desired **Calculation Formula**.
4. Click **Save and close** to return to your report.

The **Calculated Member** displays the results of the new **Calculation Formula**.

Header Formulas

Header Formulas determine the visible row or column header for a **Calculated Member**.

To edit a Header Formula

1. Right-click the header of the **Calculated Member** you would like to edit.
2. On the shortcut menu, point to **Calculated Member**, and click **Edit Header Formula**.

   The **Formula Workshop** appears.
3. In the **Formula Workshop**, enter your desired header name in quotations.

   Note:
   You can also control your header formulaically. A **Header Formula** must return a string.
4. Click **Save and close** to return to your report.

The **Calculated Member** header displays the result of the **Header Formula**.

Value Formulas

If you want to reference a **Calculated Member** in a formula, you must assign a value to it. **Value Formulas** assign values to **Calculated Members** for this purpose.

To edit a Group Value Formula

1. Right-click the header of the **Calculated Member** you would like to edit.
2. On the shortcut menu, point to **Calculated Member**, and depending on whether you have clicked a row or a column, click **Edit Row Value Formula** or **Edit Column Value Formula**.

   The **Formula Workshop** appears.
3. In the **Formula Workshop**, enter your desired value.

   Note:
   You can also control your value formulaically. A **Value Formula** must be of the same type as the row/column grouping field that it is inserted into.
4. Click **Save and close** to return to your report.

The **Calculated Member** retains the result of your **Value Formula**.

Note:
If you have not edited the **Header Formula** for a **Calculated Member**, the visible header displays the result of the **Value Formula**. When you edit the **Header Formula**, it overrides the **Value Formula** as the visible header.

Insertion Formulas

Insertion formulas determine where a **Calculated Member** appears in a Cross-Tab. In most cases, a **Calculated Member** appears only once. However, you can set it to appear in multiple locations or in a repeating pattern.

To edit an Insertion Formula

1. Right-click the header of the **Calculated Member** you would like to edit.
2. On the shortcut menu, point to **Calculated Member**, and click **Edit Insertion Formula**.

   The **Formula Workshop** appears.

3. In the **Formula Workshop**, enter your desired formula.

   For example, the following formula inserts a **Calculated Member** after the country field for Canada:

```
GetColumnGroupIndexOf(CurrentRowIndex) = 1 and
GridRowColumnValue("Customer.Country") = "Canada"
```

4. Click **Save and close** to return to your report.

The **Calculated Member** appears in the locations specified by the **Insertion Formula**.

Embedded Summaries

You can add an additional calculation to your Cross-Tab by inserting an **Embedded Summary**.

Unlike **Calculated Members**, **Embedded Summaries** do not add rows or columns to your Cross-Tab. Instead, they cause additional calculations to appear within each cell of the Cross-Tab.

For example, in a report showing regional sales, you could insert a calculation for each region that shows the percentage of total sales for the country.

To add an Embedded Summary to your Cross-Tab

1. In your Cross-Tab, right-click any cell except for a header.
2. On the shortcut menu, point to **Embedded Summary**, and click **Insert Embedded Summary**.

   A blank **Embedded Summary** appears in the Cross-Tab.
3. In the **Embedded Summary**, right-click the text that says "Edit this formula."
4. Point to **Embedded Summary**, and click **Edit Calculation Formula**.

   The**Formula Workshop** appears.
5. In the **Formula Workshop**, enter the desired **Calculation Formula**
6. Click **Save and close** to return to your report.

The **Embedded Summary** displays the results of the new **Calculation Formula**.

To change the processing order of Embedded Summaries

If you have multiple **Embedded Summaries** in your Cross-Tab, the order in which they are calculated can affect your results. You can change the processing order of **Embedded Summaries** in the **Embedded Summaries dialog box**.

1. Right-click the top-left corner of your Cross-Tab.
2. On the shortcut menu, point to **Advanced Calculations**, and click **Embedded Summary**.

   The **Embedded Summaries dialog box** appears.
3. In the **Summaries** box, use the arrows to change the processing order of the summaries.
4. Click **OK** to save your changes and return to your report.

The Cross-Tab recalculates the values of the **Embedded Summaries** in the new processing order.

Note:
Changing the processing order of **Embedded Summaries** does not cause a refresh from the database.

Building Queries

chapter 18

Connecting to a universe

You access the Business Objects Query Panel in Crystal Reports through the Database Expert. Once you have selected Universes from the Create New Connection node, you are prompted to log onto BusinessObjects Enterprise, after which you can select a universe and design your query.

Crystal Reports can connect to multilingual universes and report off of them, but it cannot take advantage of the multilingual attributes. Crystal Reports will display multilingual field names and other metadata content only in the primary language of the universe.

You can only base new documents and queries on universes for which you have been granted the custom right, **Create / Edit Query**.

Note:
If you are a user of Web Intelligence and you are using the Query Panel in Crystal Reports, you will encounter some differences in behavior from what you might expect in Web Intelligence. These differences are listed in a white paper that you can find on the Business Objects Technical Support site at *http://support.businessobjects.com/*.

To connect to a universe

1. In Crystal Reports, on the **File** menu, click **New**, and then click **Blank Report**.
2. In the Database Expert, double-click **Create New Connection**.
3. Double-click **Universes** to view a list of universes you have the right to base new reports on.
4. Log on to BusinessObjects Enterprise if you have not done so already.

   For information about how to log on to BusinessObjects Enterprise, see *Working with Enterprise folders* .
5. Select the universe that you want to base your query on, and then click **Open**.

   The Business Objects Query Panel appears.

Defining the data selection for a query

You build queries in the Query Panel by using objects in a Business Objects universe. The objects in the universe are a graphical representation of the information available in a database. The objects in the universe are mapped to the table columns and rows in the database.

You can only base new documents and queries on universes for which you have been granted the custom right, **Create / Edit Query**.

The Query Panel is divided into several panes:

- The pane on the left shows a tree view of the objects that your universe contains. You cannot add new objects or edit existing objects in the Query Panel. For information about the types of objects that might appear in this pane, see *Quick reference to objects*.

  Note:
  You can see all available objects in this pane by selecting "All objects." If you want to see how objects relate to each other, select "Hierarchies." This option provides you with a visual representation of the hierarchical structure of objects if such a structure is present in the universe.

- The Result Objects pane is where you place the objects that you want as part of your query.
- The Query Filters pane is where you place the objects that you want to use to filter the data that is returned from your universe. You can define your filter when you add an object to this pane.

To build a simple query

1. In the **Query Name** field, enter a name for your query.

   Note:
   Crystal Reports uses the query name as the name of the SQL Command that it creates for your report. Once you have created your query in the Query Panel, you will see this name in the Available Data Sources and Selected Tables areas of the Database Expert.

2. Select an object in the left-hand pane and double-click it or drag it into the **Result Objects** pane.

Objects that appear in the Result Objects pane become fields that you report on in your Crystal report.

3. Repeat the previous step for each object that you want to include in the query.
4. Select an object in the left-hand pane, or in the **Result Objects** pane, and drag it into the **Query Filters** pane.

   Add filters to the Query Filters pane to restrict the data your query returns based on the object that you selected. Filtering limits the data that a user can see and reduces the runtime of queries. For information about adding filters, see *Creating query filters*.

5. Click **OK**.
6. If your query contains prompts, select your prompt value(s) in the Enter Parameter Values dialog box.

   For information about using the Enter Parameter Values dialog box, search for the dialog box by name in the Crystal Reports Online Help.

7. If your data source is secure, use the connection dialog box to log on to the database that your universe uses.

   For information about using the supported connection dialog boxes, search for "Data source connectivity dialog boxes" in the Crystal Reports Online Help.

You can create a number of queries in the Query Panel that Crystal Reports combines through the use of a Union join.

To create a combined query

- Create a simple query and click **Add a combined query**.

  A new pane is added to the Query Panel under the tree view. You can switch between your query definitions by clicking the nodes in this pane.

  Note:
  The objects in the result panel of the first query are copied into the new query. The program does not copy existing query filters.

Quick reference to objects

An object is a named component that maps to data or a derivation of data in the database. For example, an object may represent a column in a database table, or it may be the summary of the values in a column.

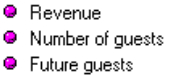
You use objects in a query to retrieve data for your reports. For example, some of the objects in a human resources universe might be Names, Addresses, and Salaries.

Objects can represent different types of information.

Note:

- Object properties are defined in the BusinessObjects Designer, but are not taken into account by the Query Panel in Crystal Reports.
- Objects cannot be defined directly in the Query Panel. Use the BusinessObjects Designer to define objects in a universe.

Object	Examples	Description
Dimension	Resort Country Service Line	This object retrieves the data that provides the basis for analysis in a report. Dimension objects typically retrieve character-type data (for example, customer names, resort names, or dates).

Object	Examples	Description
Detail		This object provides descriptive data about a dimension. A detail is always attached to the dimension for which it provides additional information. For example, Age is a detail object that is associated with the Customer dimension. Address provides additional information on customers.
Measure		This object retrieves numeric data that is the result of calculations on data in the database. For example, Revenue is the calculation of the number of items sold multiplied by item price. Measure objects are often located in a Measures class.

Editing an existing query

You can return to the Query Panel to change an existing query, provided you have been granted the custom right, **Create / Edit Query**. You can add or remove an object, or you can add, edit, or remove a filter.

To edit an existing query

1. In Crystal Reports, open a report created with a universe as a data source, go to the **Database** menu, and click **Query Panel**.
2. Log on to BusinessObjects Enterprise if you have not done so already.

   For information about how to log on to BusinessObjects Enterprise, see *Working with Enterprise folders* .
3. In the Query Panel, edit your query as necessary.
4. When you have finished editing your query, click **OK**.
5. Click **OK** in the Database Expert to return to your report.

   Changes that you made in your query are reflected in Crystal Reports.

   Note:
   If you remove objects from your query that you have used in your Crystal report, you must remove these objects from the report.

Viewing the SQL behind a query

When you build a query, Crystal Reports automatically generates the SQL that corresponds to the query and saves it as a Crystal SQL Command object.

For more information about SQL Command objects, search for "Defining an SQL Command" in the *Crystal Reports Online Help.*

To view the SQL when you create a query

- In the Query Panel, click **View SQL**.

  The SQL dialog box appears; it contains the SQL that constitutes your query. Use this option when you want to check the SQL as you create a query.

To view the SQL after you have created a query

- In Crystal Reports, open a report created with a universe as a data source, go to the **Database** menu, and click **Show SQL Query**.

  You can see the SQL in the Show SQL Query dialog box.

  Or

  In Crystal Reports, open a report created with a universe as a data source, go to the Database menu, and click Database Expert.

  Once you are in the Database Expert, right-click your query in the Selected Tables list and select View Command. You can see the SQL in the View Command dialog box.

Query filters and prompts

Creating query filters

You can use the following types of filters in a query:

- **Predefined filters**

  These filters are created by your administrator.

- **Custom filters**

  You define these filters while you are creating the query.

- **Prompts**

  Prompts are dynamic filters that you define to display a question or a list of values; users can select different filter value(s) each time they refresh the report.

To add a predefined filter to a query

1. Double-click the objects you want to use in your report, or drag them to the **Results Objects** pane.

For step-by-step instructions on selecting objects to build a query, see *Defining the data selection for a query*.

2. Drag a predefined filter to the **Query Filters** pane.

   When you run the query, the data corresponding to the query filters you selected is returned to the report.

Note:
Predefined filters are created and edited by your administrator. As a user of the Query Panel, you cannot view the component parts of predefined filters, neither can you edit them.

To create a custom filter using the Filter Editor

1. Select the object you want to filter and drag it to the **Query Filters** pane.

   The Filter Editor appears. The name of the object you selected is displayed beneath the "Filtered object" text.

2. Select an Operator from the list.

   For a description and example of each operator, see *Quick reference to query filter operators*.

3. Select **Constant** or **Value(s) from list**.
4. Depending on the operator you selected, type a single value or multiple values in the **Type a value** field.
5. Click **OK** to confirm the properties of the custom filter.

   The new filter displays in the Query Filters pane.

Building prompts

A prompt is a dynamic filter that displays a question every time you refresh the data in a report. You respond to prompts by typing or selecting the value(s) you want to view before you refresh the data. Crystal Reports retrieves only the values you specified from the database and returns those values to the report.

Tip:
Prompts allow multiple users view a single report but specify a different sub-set of the database information. Prompts also reduce the time it takes for the data to be retrieved from the database.

To create a prompt

1. Select the object you want to apply a prompt on and drag it to the **Query Filters** pane.

   For example, if you want to allow users to specify the geographical region for the report, drag the Region field to the Query Filters pane.

   The Filter Editor appears. By default, the name of the filter is the name of the filtered object.

2. Select an operator from the list.

   See *Quick reference to query filter operators*.

   Note:
   You cannot use the following operators for prompts: Is null, Is not null, Both, and Except.

3. Under **Operator type**, select **Prompt**.

   The Prompt text field shows the default message.

4. If you want to change the default message, edit it to word a question.

   For example, you might ask "Which region do you want to see data for?"

5. Check **Select only from list** if you want your prompt to display a list of values from which users can select value(s).

   Use this option to prevent users from typing a value that might not exist in the database.

6. Click **OK** to confirm the prompt.

   The prompt appears at each report refresh.

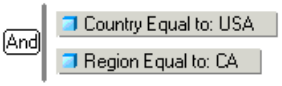
Combining query filters and prompts

You can apply multiple filters and prompts on a single query.

To combine filters and/or prompts

1. Create each query filter and/or prompt.

   For step-by-step information on how to create filters and prompts, see *Creating query filters* or *Building prompts*.

   By default, the Query Panel combines the filters and prompts with the And operator. You can leave the And operator or change the operator to Or. See *Using And or Or to combine query filters*.

2. If necessary, change the operator to **Or** by double-clicking the **And** operator.

   Or now displays as the operator. The prompts appear when you click OK, or when you refresh the report data.

Using And or Or to combine query filters

This table explains the difference between the And and the Or operators.

Retrieve this data	Example	Select
Data true for both filters.	Customers who ordered supplies in Q1 and in Q2 (the data you retrieve will include: customers who placed orders in both Q1 and Q2).	And
Data true for any one of the filters.	Customers who ordered supplies in: Q1 or Q2 (the data you retrieve will include: customers who placed orders in Q1only; customers who placed orders only in Q2, and; customers who placed orders in both Q1 and Q2).	Or

Quick reference to query filter operators

The following table will help you select the operator you need to define a query filter.

Values to retrieve	Example	Select	Filter created
Values equal to a value you specify.	Retrieve data for the US only.	Equal to	<Country> Equal to US

Values to retrieve	Example	Select	Filter created
Values different from a value you specify.	Retrieve data for all quarters except Q4.	Different from	<Quarter> Different from Q4
Values greater than a value you specify.	Retrieve data for customers aged over 60.	Greater than	<Customer Age> Greater than 60
Values greater than or equal to a value you specify.	Retrieve data for revenue starting from $1.5M upward.	Greater than or equal to	<Revenue> Greater than or equal to 1500000
Values lower than a value you specify.	Retrieve data for exam grades below 40.	Less than	<Exam Grade> Less than 40
Values lower than or equal to a value you specify.	Retrieve customers whose age is 30 or less.	Less than or equal to	<Age> Less than or equal to 30
Values between two values you specify that includes those two values.	Retrieve the weeks starting at week 25 and finishing at 36 (including week 25 and week 36).	Between	<Weeks> Between 25 and 36

Values to retrieve	Example	Select	Filter created
Values outside the range of two values you specify.	Retrieve all the weeks of the year, except for weeks 25 through 36 (week 25 and week 36 are not included).	Not between	<Weeks> Not Between 25 and 36
Values that are the same as several values you specify.	Retrieve data for only the following countries: the US, Japan, and the UK.	In list	<Country> In list 'US; Japan; UK'
Values that are different from the multiple values you specify.	Don't retrieve data for the following countries: the US, Japan, and the UK.	Not in list	<Country> Not in list 'US; Japan; UK'
Values for which there is no value entered in the database.	Retrieve customers without children (the children column in the database has no data entry).	Is null	<Children> Is null
Values for which a value was entered in the database.	Retrieve customers with children (the children column in the database has a data entry).	Is not Null	<Children> Is not Null

Values to retrieve	Example	Select	Filter created
Values that includes a specific string.	Retrieve customers whose date of birth is 1972.	Matches pattern	<DOB> Matches pattern, '72'
Values that don't include a specific string.	Retrieve customers whose date of birth is not 1972.	Different from pattern	<DOB> Different from pattern, '72'
Values that correspond to two values you specify.	Retrieve Telco customers who have both a fixed telephone and a mobile phone.	Both	<Account Type> Both "fixed" and "mobile"
Values that correspond to a single value and do not correspond to another value you specify.	Retrieve Telco customers who have a fixed telephone, but don't have a mobile phone.	Except	<Account Type> "fixed" Except "mobile"

Editing and removing query filters

You can edit and remove filters on queries.

To edit a query filter

1. Double-click the filter you want to edit.

The Filter Editor appears.

2. Change the definition of the filter in the Filter Editor.

   For information on how to define filters, see *Creating query filters*.

3. Click **OK** to confirm your changes.

   The modified query appears in the Query Filters pane.

To remove a query filter

- Drag the filter you want to remove and drop it onto the left-hand pane.

  The filter is removed from the query definition and no longer appears on the Query Filters pane.

Filtering data using subqueries and database ranking

This section explains how to work with more advanced types of query filters. It covers the following advanced query filters:

- Subqueries
- Database rankings

Subqueries and database rankings allow you to create filters that are much more powerful than standard query filters.

What is a subquery?

A subquery is a more flexible kind of query filter that allows you to restrict values in more sophisticated ways than with an ordinary query filter.

Subqueries are more powerful than ordinary query filters for the following reasons:

- They allow you to compare the values of the object whose values are used to restrict the query with values from other objects.

- They allow you to restrict the values returned by the subquery with a WHERE clause.

Subqueries allow you to pose complex questions that are difficult or impossible to formulate with simple query filters. For example: what is the list of customers and their associated revenue where the customer purchased a service that had previously been reserved (by any customer) in Q1 of 2003?

Building a subquery

You build a subquery in the Query Filters pane of the Query Panel.

Note:
You can mix subqueries and other types of query filter in the Query Filters pane.

To build a subquery

1. Add the objects that you want to appear in the query to the Result Objects pane.
2. Select the object that you want to filter with a subquery, and then click **Add a subquery**.

   The subquery outline appears in the Query Filters pane. By default the object you selected appears as the FIlter object and Filter By object. For more information on the Filter Object and Filter By object, see *Subquery parameters*.
3. To add a WHERE condition to the subquery, drag a query object to the white area of the subquery outline.

   Note:
   You can use an existing subquery or standard query filter as a WHERE condition in a subquery. To do so, drag and drop the existing filter or subquery to the white area of the subquery outline.
4. Select the operator and values used to filter the object in the WHERE condition.

Note:
For more information on query filter operators and values, see *Query filters and prompts*.

5. Click **Add a subquery** to add an additional subquery to the query filter.

   By default the two subqueries are linked in an AND relationship. Click the AND operator to toggle between AND and OR.

   In addition to linking subqueries in AND or OR relationships, you can nest them (create subqueries within subqueries) by dragging an existing subquery to the white area of the subquery outline. In this case the inner subquery becomes part of the WHERE condition of the outer subquery.

Subquery parameters

A subquery or set of subqueries contains the following parameters:

Parameter	Description
Filter Object(s)	The object whose values are used to filter the result objects. You can include more than one Filter Object. If you do, Crystal Reports concatenates the values of the objects you specify.
Filter By Object(s)	The object that determines which Filter Object values the subquery returns. You can include more than one Filter By object. If you do, Crystal Reports concatenates the values of the objects you specify.

Parameter	Description
Operator	The operator that specifies the relationship between the Filter object and the Filter By object. Because of database restrictions you cannot use certain combinations of operators and Filter By objects together. For example, if you use the Equal To operator with a Filter By object that returns multiple values, the database rejects the SQL because this type of subquery requires the Filter By object to return one value only. In cases where the generated SQL is rejected by the database, you see an error message showing the error description returned by the database.
WHERE condition (optional)	An additional condition that constrains the list of values of the Filter By object. You can use ordinary report objects, predefined conditions or existing query filters (including subqueries) in the WHERE condition.
Relationship operator	If there is more than one subquery, determines the relationship between the subqueries. AND - the conditions in all of the subqueries must be satisfied. OR - the conditions in any one of the subqueries must be satisfied.

What is a database ranking?

Database rankings allow you to answer questions like "what are the top three customers, based on the revenue they generated for each year?" at the query level, without the need to return data that falls outside the ranking to Crystal Reports. You can then filter this data using a ranking.

When you rank data you sort and filter it according to ranking criteria. This process is much like selecting Top or Bottom N values when sorting groups in Crystal Reports. For more information, see *Selecting top or bottom N groups or percentages* .

A database ranking allows you to specify a ranking at the query and database level so that the data returned to Crystal Reports by the query is already ranked. This has the following advantages:

- Ranking data can be processing-intensive. By ranking at the database level you allow the server, which is typically far more powerful than the client machine, to perform this processing.
- Pre-ranking data reduces the amount of data retrieved across the network and stored in Crystal Reports.

Note:

- You can perform a database ranking only if your database supports it. If this is not the case, the "Add a top bottom" button is disabled on the Query Panel toolbar. Databases that support ranking are Oracle, DB2, Terradata and Redbrick.
- Crystal Reports uses the SQL-99 Rank function in ranking SQL.
- SQL is the query language supported by all relational databases (RDBMS), although each database has its own syntax.

Creating a database ranking

You create a database ranking in the Query Filters pane of the Query Panel.

Note:
You can mix database rankings and other types of query filter in the Query Filters pane.

To create a database ranking

1. Add the objects that you want to appear in your query to the Result Objects pane of the Query Panel.
2. Select the object that you want to rank by.
3. Click **Add a database ranking** on the toolbar.

   The ranking outline appears in the Query Filters pane. The object that you selected appears as the ranking dimension, and the first measure in the query appears as the ranking measure in the "Based on" list.

   Note:
   The "Add a database ranking" button is disabled if your database does not support ranking.
4. Select the ranking direction (Top or Bottom).
5. Type the number of records you want the ranking to return in the box next to Top/Bottom.

   Note:
   You can specify a prompt instead of a constant by clicking the arrow next to the number. When you select a prompt, the user must enter the ranking number when they run the query. For more information on prompts, see *Building prompts*.
6. Drag the object that provides the calculation context for the measure to the **For each** box.

   This dimension is optional.

   Note:
   To display the "For each" box, click the arrow to the right of the "Based on" measure.
7. Drag any objects that you want to include in the WHERE restriction to the white area of the ranking outline. For more information on the WHERE restriction, see the explanation under *What is a subquery?*.

Ranking parameters

The following table describes the parameters from left to right in the ranking:

Parameter	Description
Top/Bottom	Ranking order. Top - ranks in descending order. Bottom - ranks in ascending order.
Number of records	The number of records to return in the ranking. For example, the top 10.
Ranking object	The object used in the ranking. For example, if the object is Region and the ranking is Top 10, the ranking returns the top 10 regions.
Based on	The measure by which the ranking object is ranked. For example, if the measure is Revenue and the object is Region, Crystal Reports ranks regions by the amount of revenue they generate.
For Each (optional)	The object that specifies additional calculation context for the ranking. For example, if the ranking object is Region, the measure is Revenue and the For Each dimension is Country, Crystal Reports ranks regions by revenue within each country.

Parameter	Description
WHERE condition (optional)	Additional restriction on the values returned in the ranking that appears below the other parameters. For example, a ranking of regions with a condition that restricts Country to "USA" ranks only those regions in the USA.

Creating and Updating OLAP Reports

chapter 19

OLAP reporting with Crystal Reports

Although relational databases such as SQL servers and PC databases are the most common sources of data, Online Analytical Processing (OLAP) and Multi-Dimensional Data are rapidly becoming the popular data-storage and analysis formats. Crystal Reports provides the same access and reporting features for OLAP data sources that it provides for relational data.

Note:
The term OLAP is used in this topic to refer to all common forms of OLAP and Multi-Dimensional Data storage and access systems.

Crystal Reports supports access to OLAP data through direct connection and Open OLAP gateways. A direct connection requires an installed OLAP client and uses DLLs located on your local machine, whereas the Open OLAP gateway doesn't require either. With an Open OLAP connection, data access is achieved through a Name Server host that communicates with Crystal Reports and your OLAP data source. Set up an Open OLAP connection on the Advanced Settings tab of the Connection Properties dialog box.

For direct connections, Crystal Reports supports many OLAP server types. These types are displayed in the Server Type list of the Connection Properties dialog box. This list is dynamic and will show those server types for which you have an installed client.

Note:
Crystal Reports can open OLAP reports that were created in previous versions. However, while Crystal Reports 9 can open version 10 OLAP reports with saved data, it cannot refresh them.

OLAP grid objects

When you design a report with OLAP data, Crystal Reports creates a primary report containing one or more OLAP grid objects. OLAP grid objects look and act much like Cross-Tab objects, but they are designed specifically for OLAP data.

OLAP grid objects provide true multi-dimensional reporting. Add dimensions to either axis to analyze three, four, or more dimensions in a single OLAP

grid. Or instead of viewing multiple dimensions within one OLAP grid, create multiple OLAP grids within the same report.

Note:
When Crystal Reports displays an OLAP grid, it can do so quickly if the grid is long (down many pages) instead of wide (across many pages). When the grid is long, the program processes it on a page-by-page basis. When the grid is wide, the program must gather all the data before it can display a page. This may require significantly more processing time.

Creating an OLAP report

OLAP reports are created using the OLAP Report Creation Wizard or the OLAP Expert. Before you start creating your report, ensure you have the following information:

- OLAP Type
- Server/Database name
- User ID
- Password
- Parameters (applies only to OLE DB for OLAP)

Tip:
You can return to the OLAP Report Creation Wizard by selecting the OLAP Design Wizard option on the Report menu. Do this if you want to change your page dimensions, or if you want to change parameter values.

To create an OLAP report

- On the Start Page, click **OLAP Cube Report Wizard**.

  The OLAP Report Creation Wizard appears with the OLAP Data screen active.

Specifying the data source

Use the OLAP Data screen to define the OLAP data source.

1. Click **Select Cube**.

   The OLAP Connection Browser appears.

2. Browse your OLAP server for the cube you want to connect to.

   If your server isn't in the list, click Add. In the Connection Properties dialog box, provide the server information; then click OK.

3. Select the desired cube and click **Open**.

   The OLAP Data screen reappears with the supplied data source information.

4. Click **Next**.

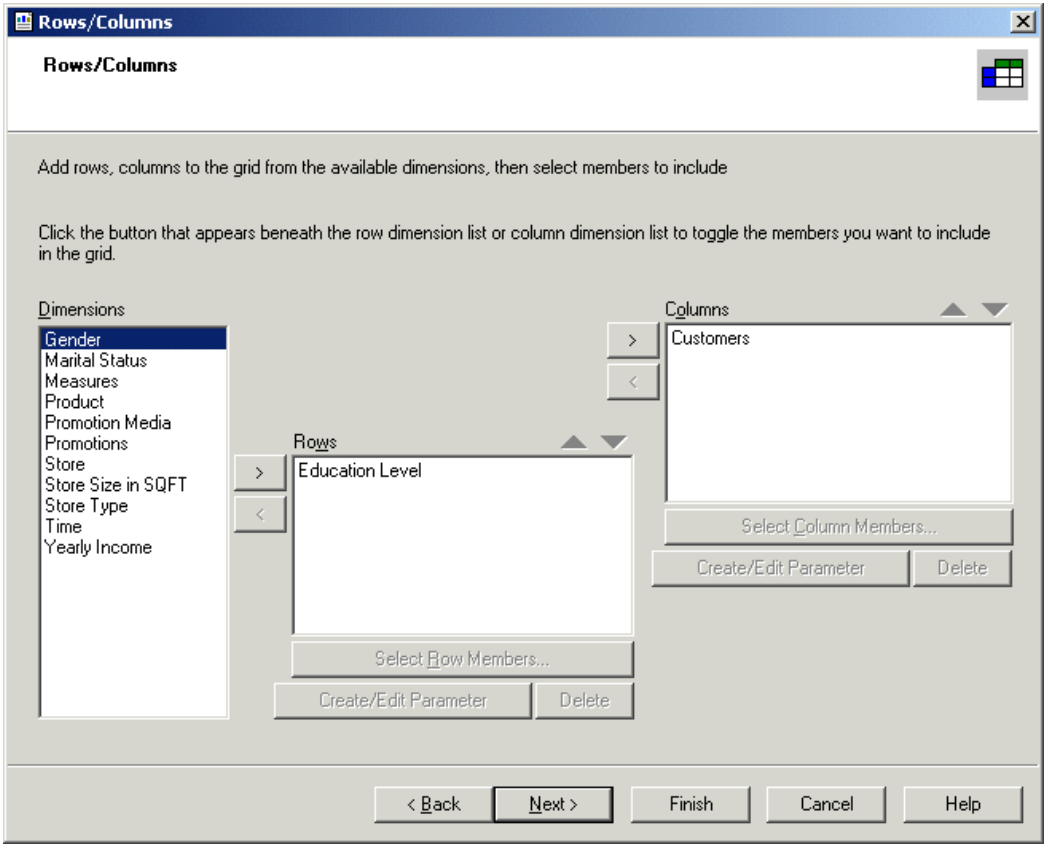
Note:
You can also click "Select CAR File" on the OLAP Data screen. If you choose this option, the Open dialog box appears. Search for a file created in OLAP Intelligence Professional.

Defining the structure of the grid

Use the Rows/Columns screen to define how your data is structured within the grid. You can place the dimensions into either the Columns or Rows areas.

Tip:
It is also possible to drag and drop the dimensions into either the Rows or Columns area.

1. Select a dimension to appear in the report.
2. Click the > arrow adjacent to either the Rows or the Columns areas, depending on where you would like the dimension to be located.
3. Continue adding dimensions to the Rows and Columns areas.



4. Click the **Up** and **Down** arrow buttons associated with the Rows and Columns areas to arrange the order of the dimensions.

   Note:
   If you accidentally add a dimension to either the Rows or Columns area, click the < arrow to return it to the Dimensions list.

5. Select a dimension in either the Rows or the Columns areas and click **Select Row Members** or **Select Column Members** to specify the members to be included in your report.

   The Member Selector dialog box appears.

6. Select the members you would like to include.
7. Click **OK**.

8. Select a dimension in either the Rows or the Columns areas and click **Create/Edit Parameter** to create a parameter for use with the dimension.

   The Create Parameter Field dialog box appears.

9. Select default values, prompting text, and other options, and then click **OK**.

   Note:

   - Once you have created a parameter, access to the Member Selector dialog box is disabled for the dimension until you delete the parameter.
   - If you create a row/column parameter, the View Cube command and the Cube View tab are not available.

10. If you want to delete a parameter, select the appropriate dimension and click **Delete**.

    When you click OK in the Delete Link to Parameter Field dialog box, the program removes the parameter description from the dimension.

11. Click **Next**.

    The Slice/Page screen appears.

Setting sliced dimensions and specifying the number of grids

Use this screen to set sliced dimensions and to specify the number of grids that are required.

The Slice area determines the boundaries that will be placed on your report. For example, if you have a time dimension that is made up of fiscal quarter members, you could specify the report return the results for a specific quarter.

Note:
If all of your members were used in the Rows/Column tab, nothing will appear here.

The Page area enables you to determine the number of grids and the subject of each. For example, if you have a product dimension, you could put this in the page area and specify two different products. This would result in two grids with the same rows, columns, and formatting, but each one would be based on a different product.

To specify a slice

1. To determine the member that is going to be used as the slice, select a dimension in the **Slice** list and click **Select Slice**, or double-click a dimension in the **Slice** list.

   The Member Selector dialog box appears.
2. Select the appropriate member, expanding the structure if necessary.
3. Click **OK**.
4. Click **Next** if you do not want to add a page. The Style screen appears.

To add a page

1. Use the > arrow to add dimension(s) to the **Page** list.

   The Member Selector dialog box appears.
2. Expand the dimension's structure and select the appropriate members.
3. Click **OK**.

To add a parameter

You can create a parameter field to link to any dimension. When you add a parameter to a dimension in your OLAP grid, users are prompted to select a value when refreshing report data.

1. Click the **Create/Edit** button.
2. Select default values, prompting text, and other options, and then click **OK**.
3. Click **Next**.

   The Style screen appears.

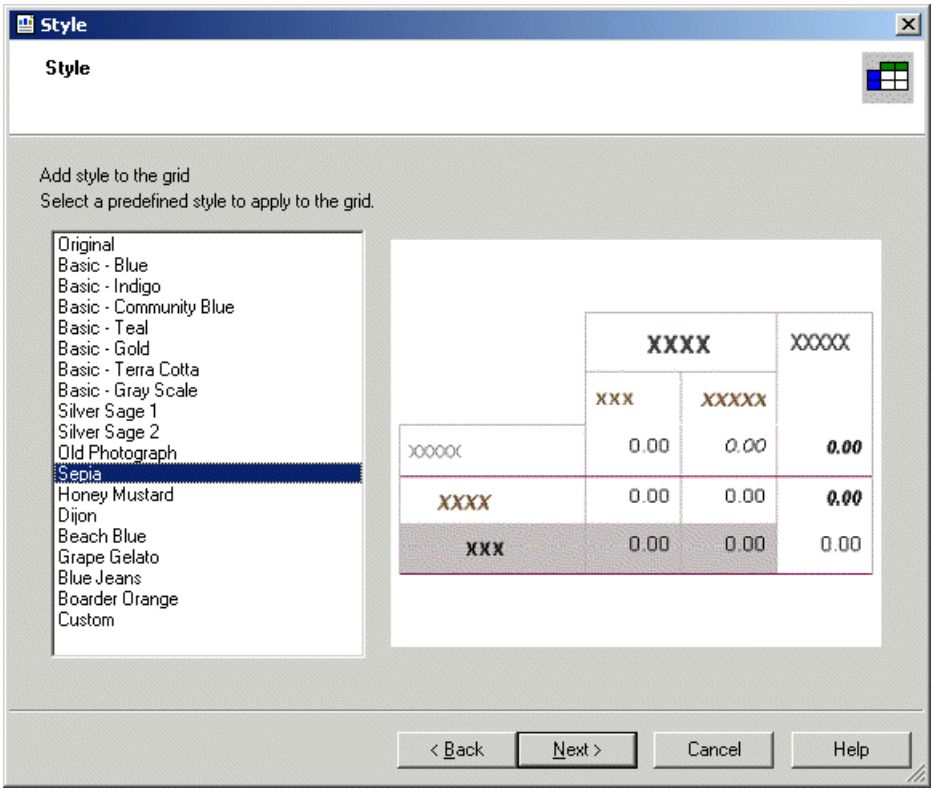
Note:
Once you have created a parameter, access to the Member Selector dialog box is disabled for the dimension until you delete the parameter.

Applying a predefined style

1. Select a predefined style for the grid from the list.

   Tip:
   If you do not want to use a predefined style, click Next.

   A preview of the color scheme you select appears on the right.



   Note:
   The color of the style you select may not appear correctly if your screen resolution is set to 256 colors. Increase the resolution to correct this.

2. Click **Next**.

   The Chart screen appears.

Inserting a chart

1. Select the kind of chart you want to add to your report from the options shown on the Chart screen.

   Tip:
   If you do not want to insert a chart, click Finish.

2. Add a title for your chart.
3. In the **On change of** list, select the dimension you want to base your chart on.
4. If necessary, in the **Subdivided by** list, click a secondary row or column you want to base your chart on.

   Note:
   Be sure that the chart type selected in Step 1 supports a secondary charting field.

5. Click **Other Dimensions** to define field values for any dimensions you've used in your OLAP grid but not in your chart.

   For more information refer to *Charting on an OLAP cube (OLAP layout)* and *Creating charts*.

6. To finalize your report, click **Finish**.

Updating an OLAP report

The location of the OLAP data accessed by your report may change. Some possible scenarios include:

- The location of the OLAP server or database may change due to restructuring of Information System resources.
- Another cube instance may have been successfully processed and reflect more current information.
- New reports may be developed on a smaller database that represents a subset or production version of the primary OLAP database, then ported over to the actual working database to report on real data.

Before updating your report, it is important to ensure that it is compatible with the data. Some things to look for include:

- Removing dimensions contained in the report that are not in the cube.
- Removing fields referred to explicitly in the design of the report, such as a formula.

Note:
If a report contains subreports or grids, and the database used for them has changed name or location, you must update each subreport or grid.

To update a cube location in an OLAP grid object

1. Select the grid by clicking on the border.
2. From the **Database** menu, click **Set OLAP Cube Location**.

   Tip:
   You can also right-click the grid and select Set OLAP Cube Location.

   The Confirm Command dialog box appears.
3. Click **Yes**.

   The Set OLAP Cube Location dialog box appears.
4. Click **Select**.

   The OLAP Connection Browser appears.
5. Browse your OLAP server for the cube you want to connect to.

   If your server isn't in the list, click Add. In the Connection Properties dialog box, provide the server information; then click OK.
6. Select the desired cube and click **Open**.

   The Set OLAP Cube Location dialog box reappears.
7. Click **OK**.

   If your report contains multiple OLAP grids that are based on the same cube, the program prompts you to update the remaining grids to the new location.

Finally, if the location of your report's relational database is the same as the location of your cube, you are prompted to change the location of the relational database to match the new location of the cube. Making sure that the location of the relational database and the OLAP cube match ensures

that your data remains synchronized. The program can change the location automatically, or you can change it manually in the Set Datasource Location dialog box.

Updating the database location

1. In the Set Datasource Location dialog box, expand the **Create New Connection** folder in the "Replace with" area.
2. Expand the **OLAP** folder and search for the new cube location.

   Tip:
   You can double-click the Make New Connection option to search for the cube in the OLAP Connection Browser.

3. Select the data source name, or an individual table, and click **Update**.

   The data source name is changed in the Current Data Source area.

4. Click **Close**.

Formatting data in an OLAP grid

There are several ways to add formatting to rows and columns in an OLAP grid:

- Use the Highlighting Expert to apply conditional formatting to all types of report fields: Number, Currency, String, Boolean, Date, Time, and DateTime fields.

  To access the Highlighting Expert, right-click the field you want to format and, on the shortcut menu, click Highlighting Expert. For more details, see *Using the Highlighting Expert*.

- Use the Format Editor to apply absolute formatting to fields in the grid. Absolute formatting is applied under all conditions, irrespective of the data values in the field.

  To access the Format Editor, right-click the field you want to format; then, on the shortcut menu, click Format Field. For more details, see *Working with absolute formatting* .

- Use the Formula Workshop to write your own conditional formatting formulas with Crystal or Basic syntax. The Formula Workshop gives you maximum control over the formatting of the OLAP grid.

  To access the Formula Workshop, open the Format Editor and click the appropriate Formula button. For more details, see *Working with conditional formatting*.

- Use the OLAP Expert to reformat the entire OLAP grid. This expert provides all of the formatting options that are available in the OLAP Report Creation Wizard.

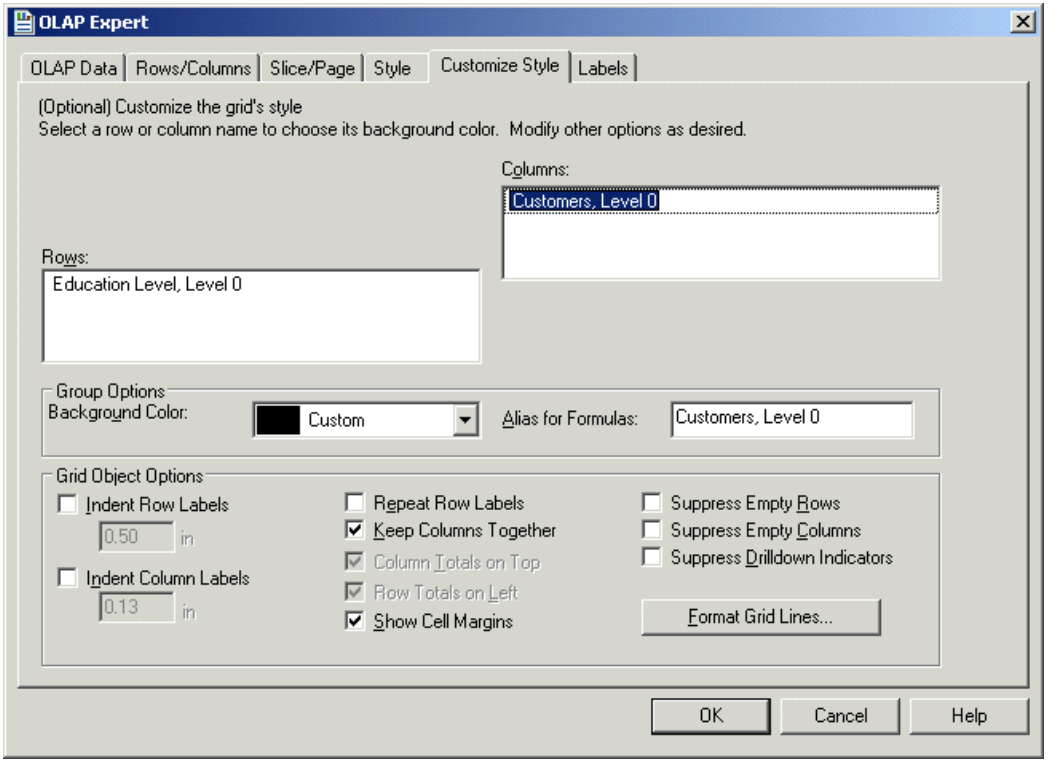
  To access the OLAP Expert, select the entire grid object by clicking one of its borders. Right-click the selected grid and, on the shortcut menu, click OLAP Grid Expert.

  The OLAP Expert has two tabs not found in the OLAP Report Creation Wizard. Use the Customize Style and Labels tabs to format your OLAP grid.

As well as letting you format an OLAP grid's rows and columns, Crystal Reports lets you designate report objects that don't expand horizontally, such as text objects, field objects, OLE objects, charts, maps, lines, boxes, and so on, to be repeated on each additional horizontal page that the OLAP grid creates. For more information, see *Repeating report objects on horizontal pages* .

Changing the background color of a dimension

1. On the Customize Style tab of the OLAP Expert, select a dimension.



2. In the Group Options area, select the color from the **Background Color** list.
3. Click **OK** if you have finished customizing your grid.

Creating an alias for a dimension

You can create aliases to shorten long dimension names. This is useful when you plan on referring to a dimension in a conditional formatting formula (by using the GridRowColumnValue function).

1. On the Customize Style tab of the OLAP Expert, select the dimension.
2. In the Group Options area, enter an alias name in the **Alias for Formulas** field.
3. Click **OK** if you have finished customizing your grid.

Formatting grid lines

In the Format Grid Lines dialog box, you can define whether the lines show or not, as well as the color, style, and width.

1. On the Customize Style tab of the OLAP Expert, click **Format Grid Lines**.

   The Format Grid Lines dialog box appears.
2. From the list, choose the description of the area where you would like the lines to appear, or click the appropriate area in the Format Grid Line diagram.
3. Select the **Draw** check box to have your lines appear in the report.
4. Select the color, style, and width.
5. Click **OK**.
6. Click **OK** if you have finished customizing your grid.

Labelling dimensions

In the Labels tab, you are able to define which dimensions will be labeled and how they will be displayed in the grid. The dimensions available to you are the ones that have been designated as a page or slice.

1. Using the arrow buttons, move the dimensions to the Unlabeled and Labeled areas as required.
2. Make changes to the appearance of the label by using the options available in the Label Position and Label Spacing areas.
3. Click **OK** if you have finished customizing your grid.

Changing the view of OLAP data

When analyzing OLAP data in your report, there are several basic ways to change how the data is displayed in the grid.

Note:
The methods described here let you manipulate your OLAP grid directly from the Preview tab of Crystal Reports. You can also carry out the same and additional, more advanced, functionality on the Cube View tab.

Search the online help for "Using the OLAP Worksheet" to learn more about the functionality available on the Cube View tab.

To show or hide dimension members

1. Right-click the dimension whose members you want to show or hide.
2. On the shortcut menu, click **Expand Member** or **Collapse Member**.

   The dimension expands to show its members, or collapses to hide them.

   Tip:
   You can also double-click parent dimensions to drill down into the hierarchical data displayed in the OLAP grid.

To create asymmetry in an OLAP grid

Using asymmetry, you can display different inner dimension members for any number of outer dimensions.

Note:
You can create asymmetry only on stacked dimensions.

1. Right-click the member that you want to remove.
2. On the shortcut menu, point to **Hide** or **Show** and then select the appropriate option.

   For information about how to use these options, search the online help for "Creating asymmetry" and "Restoring symmetry."

To add totals to an OLAP grid

1. Right-click the dimension you want to see totals for.
2. On the shortcut menu, select **Automatic Totals**.

   A submenu appears with options for the kind of totals you can add.

3. Select the option you want.

A "Total" row or column (or both) is added to your OLAP grid. To remove totals later, select No Totals.

To change the display format for member names

1. Right-click the dimension name.
2. On the shortcut menu, point to **Display Members Using**, and then click one of the display options:
   - Caption
   - Name
   - Caption : Name
   - Unique Name

   For information about names and captions, search the online help for "Changing member captions."

To alter the data displayed in the OLAP grid

1. Drag and drop rows and columns to rearrange the data in the OLAP grid.
2. Drag and drop dimensions to and from the OLAP Labels area to add or remove data from the grid.

   On the Preview tab, the OLAP Labels area is at the upper-left corner of the OLAP grid.

To pivot an OLAP grid

- Right-click the grid border and select **Pivot OLAP Grid** from the shortcut menu.

  This changes the orientation of your OLAP grid by switching the row and column dimensions.

To define the order of fields in the OLAP grid

1. Expand the row or column dimension whose fields you want to reorder.

2. Right-click the dimension and, on the shortcut menu, click **Reorder Displayed Members**.

   Note:
   You cannot reorder members for dimensions that you have created row or column parameters for.

3. In the Reorder Displayed Members dialog box, select fields and click the **Up** and **Down** arrows to rearrange the members that are displayed in the grid.
4. Click **OK** to effect your changes and return to the OLAP grid.

Sorting and filtering OLAP grid data

The sorting capabilities of the OLAP grid enable you to order data by row and column values. If you want to limit the data based on particular field values, add one or more filters to the grid. Filters also allow you to perform top or bottom N analysis (by actual values and by percentage).

Sorting data in an OLAP grid

Use the OLAP grid's sorting capabilities to quickly arrange grid data in a useful manner. You can add, edit, and remove sorts by right-clicking the appropriate row or column member and selecting from the shortcut menu. You can sort data in ascending or descending order, and you can specify whether or not you want to break grid hierarchies.

In the following grid, for instance, an ascending sort has been added to the Budget column.

			Budget
All Products			**2,449,052.00**
	Frozen Goods		**106,392.00**
		Pastry	**395.93**
		Frozen Produce	**97,490.98**
	Bakery		**173,531.50**
		Cakes and Pies	**72,723.45**
		Loaves and Buns	**86,326.31**

In this case, the OLAP grid respects the parent/child relationships between grid members and sorts the data values accordingly. (Frozen Goods precedes Bakery, but Pastry follows Frozen Goods.)

In the next example, the Budget column remains sorted in ascending order; in this case, however, the Break Hierarchies option is selected.

			Budget
All Products	Frozen Goods	Pastry	**395.93**
	Bakery	Cakes and Pies	**72,723.45**
		Loaves and Buns	**86,326.31**
	Frozen Goods	Frozen Produce	**97,490.98**
	Frozen Goods		**106,392.00**
	Bakery		**173,531.50**
All Products			**2,449,052.00**

Now the Report Designer disregards parent/child relationships between grid members and sorts on the basis of data value alone. (Frozen Goods still precedes Bakery, but Pastry precedes all others.)

You can add up to three sorts to grid rows and up to three sorts to grid columns. In each case, the first sort takes precedence, and each subsidiary sort serves to further differentiate between grid data. If you add a fourth sort to a row or to a column, your first three are removed from the grid, and the new sort becomes the single, primary sort.

Tip:
To locate a sorted row or column, move the mouse pointer over the OLAP grid. When you reach a sorted member, the pointer turns into a double-arrow.

To sort data in the OLAP grid

1. Right-click the row or column member that you want to sort by.
2. On the shortcut menu, point to **Add First Sort.**
3. From the submenu, select from the available sort options:
   - Ascending
   - Descending
   - Ascending, Break Hierarchies
   - Descending, Break Hierarchies

Note:
An ascending sort on a grid row orders data values from lowest to highest, left to right. An ascending sort on a column orders data values from lowest to highest, top to bottom.

Search the online help for "Sorting data" in the "Using the OLAP Worksheet" section to learn more about sorting.

Filtering data in an OLAP grid

Use filters to exclude grid data that are not important, or to display only the data that you want to see. You can filter grid data by actual values, or you can choose to exclude or display the top or bottom N, or the top or bottom N%.

To add a filter

1. Right-click the field whose values you want to filter.
2. On the shortcut menu, click **Add Filter**.
3. In the Define Filter dialog box, use the **Filter Type** list to specify how you want to filter the data.

You can filter data by "Actual values," or by selecting "Top/bottom n" or "Top/bottom n%."

4. Use the **Filter Definition** options to specify which rows or columns you want to exclude or display.
5. Click **OK** to add the filter and return to the OLAP grid.

Tip:

- To locate a filtered row or column, move the mouse pointer over the OLAP grid. When you reach a filtered row or column, the pointer turns into an X.
- If you filter all the cells in your OLAP grid, right-click the empty grid and select Remove All Filters from the shortcut menu.

Search the online help for "Filtering data" in the "Using the OLAP Worksheet" section to learn more about filtering.

Adding calculations to OLAP grids

Calculated members enable you to perform specific calculations on OLAP data and to display the results in rows or columns that are added to the OLAP grid. You can create a quick calculation, such as a Variance member calculated by subtracting Budget from Sales. Or you can use functions to perform complex Statistical Analysis or Time Series calculations.

Search the online help for "Adding calculated members" in the "Using the OLAP Worksheet" section to learn more about calculated members.

Printing, Exporting, and Viewing Reports

chapter 20

Distributing reports

Crystal Reports enables you to distribute your report using a variety of methods.

Printing a report

1. On the **File** menu, select **Print**.

   Tip:

   Another way to do this is to click the Print button on the Standard toolbar.

   The Print dialog box appears.

2. Choose the appropriate settings, and then click **OK**.

   The Printing Report dialog box appears showing the progress of your print job.

For information about printers and printer drivers, see these topics:

Related Topics

- *Printer drivers*

Faxing a report

Many fax applications, such as Microsoft Fax and Delrina WinFax, allow you to set up a printer driver that will fax documents over a modem. When using one of these applications, you can fax a report from Crystal Reports.

To fax a report

1. On the **File** menu, click **Print**.

   The Print dialog box appears.

2. In the Print dialog box, click **Find Printer**.

The Find Printers dialog box appears. Use this dialog box to select your fax driver.

3. Click **OK**.

   You are returned to the Print dialog box.

4. Choose the appropriate settings, and then click **OK**.

   Your fax application appears, prompting you to select a cover page and to fill in the appropriate fax information.

Exporting a report

Finished reports can be exported to a number of popular formats, such as spreadsheet, word processor, HTML, ODBC, and common data interchange formats. This makes the distribution of information easier. For example, you may want to use the report data to project trends in a spreadsheet package or to enhance the presentation of data in a desktop publishing package.

Note:
Crystal Reports lets you insert objects anywhere on the report page. When you export to formats such as Microsoft Word, Microsoft Excel, and HTML, however, objects that you placed between lines are moved to the closest line in the output. To alleviate the formatting problems this behavior could cause, it is recommended that you use Guidelines when designing your reports. For more information, see *Designing with guidelines* .

The exporting process requires you to specify a format and a destination. The format determines the file type, and the destination determines where the file is located.

Export format types

The export formats supported by Crystal Reports can be broadly categorized in two groups: page-based formats and record-based formats.

Page-based formats tend to produce a more exact output. The emphasis of these formats is layout representation and formatting. Formatting refers to attributes such as font style, text color, text alignment, background color, and so on. Layout refers to object position, object size, and the relationship

between these attributes and other objects. Depending on the format you choose, it may not be possible for the program to preserve all layout and formatting perfectly, but page-based formats, in general, preserve these properties as closely as possible.

With record-based formats, the emphasis is on data rather than the layout and formatting. However, in some formats—such as Microsoft Excel - Data only—you will notice that some formatting is exported. Some of the record-based formats are only data-exchange formats.

PDF

PDF format is a page-based format. The exported documents are intended for printing and redistribution. PDF format will export both layout and formatting in a manner that is consistent with how the report looks on the Preview tab. PDF format embeds the TrueType fonts that appear in the document. (Non-TrueType fonts are not supported.) This export format does not support Microsoft font-linking technology—which is used to provide support for some extended character sets such as Chinese HKCS. Therefore, the fonts used in the report must contain all of the required glyphs. These URI types are supported for hyperlinks: "http:", "https:" and "mailto:".

Crystal Reports (RPT)

Exporting to Crystal Reports format is much like using the Save As feature with the "Save Data with Report" option selected. This format exports (saves) your report with the current data without modifying the original report.

HTML 3.2 and HTML 4.0

HTML export formats are page based. The HTML 4.0 format preserves the layout and formatting of the report by using DHTML. The HTML 3.2 format, however, cannot maintain all of the layout precisely. The HTML 3.2 format is intended for backward compatibility with older browsers that do not support HTML 4.0. All of the images in your report are saved externally and a hyperlink is inserted in the exported HTML output. Therefore, this export format generates more than one file in the output.

MHTML

MHTML export format can be used to send HTML files in email messages. It can also be used to save a web page with all its pictures, applets, and so on in one single file in MHTML format.

Microsoft Excel (97-2003)

Microsoft Excel format is a page-based format. This format converts your report contents into Excel cells on a page-by-page basis. Contents from multiple pages are exported to the same Excel worksheet. If a worksheet becomes full and there is more data to export, the export program creates multiple worksheets to accommodate the data. If a report object covers more than one cell, the export program merges cells to represent a report object. Microsoft Excel has a limit of 256 columns in a worksheet; therefore, any report object (or part of it) that is added to cells beyond 256 columns is not exported. This export format retains most of the formatting, but it does not export line and box objects from your report.

Microsoft Excel (97-2003) Data-only

Microsoft Excel Data-only, as the name suggests, is a record-based format that concentrates on data. Even so, this format does export most of the formatting, too. Unlike Microsoft Excel format, Microsoft Excel Data-only format does not merge cells—each object is added to only one cell. This format can also export certain kinds of summaries in Crystal Reports as Excel functions. The summaries that are supported are SUM, AVERAGE, COUNT, MIN and MAX.

To get the best output from Excel export formats, you should design your reports in an Excel-friendly way. For more information, refer to the Technical Brief called "Exporting to Microsoft Excel" found on the Business Objects Support site at:

http://support.businessobjects.com/communityCS/TechnicalPapers/scr_exportexcel.pdf.asp

Microsoft Word (97-2003)

Microsoft Word is a page-based, exact format that produces an RTF (Rich Text Format) file. The exported file contains text and drawing objects to represent report objects. Individual objects are placed in text frames. This

format is intended for use in applications such as fill-out forms where the space for entering text is reserved as empty text objects.

Almost all of the formatting is retained in this export format. Text objects cannot, however, be placed outside the left edge of the page. Therefore, if you have text objects in your report that are placed before the left edge of the printable area, they will be pushed right. (This is most noticeable in reports with wide pages.)

Microsoft Word (97-2003) - Editable

The Microsoft Word - Editable format is different from the Microsoft Word format; it is a page-based format, but not all of the layout and formatting are preserved in the output. This format converts all of the report object contents to text lines. Unlike Microsoft Word format, this format does not use text frames. Text formatting is retained, but attributes such as background color, fill pattern, and so on may not be retained. All images in your report are inlined with the textual content and, therefore, the images automatically shift to accommodate text when the document is edited in Microsoft Word. This format does not export line and box objects from your report. As well, the special fields Page Number and Page N of M do not work when exported in this format.

The Microsoft Word - Editable format has an option to insert page breaks at the end of each report page. This option may not correspond to the page breaks created by Microsoft Word; the option is used mainly to separate your report-page contents.

ODBC

ODBC is a record-based, data-exchange format. When you use this format, you can export your report data to any ODBC-compliant database.

Record Style - Columns with spaces and Record Style - Columns without spaces

The record-style formats export report data as text. These formats export data only from Group and Details areas. The output contains one line per record in the database (for the report). The record-style formats are used mainly for data exchange.

Report Definition

The Report Definition format exports your report to a text file that contains a brief description of the report's design view. This format is maintained only for compatibility with Crystal Reports 5.0.

Rich Text Format (RTF)

The Rich Text Format (RTF) format is similar to the Microsoft Word (97-2003) format.

Separated Values (CSV)

The Separated Values format is a record-based, data-exchange format. It exports the report object contents as a set of values separated by separator and delimiter characters that you specify. (When a comma (,) is used to separate fields, the format is known as Comma Separated Values (CSV); this export format is popular among Microsoft Excel users.)

Like record-style formats, the Separated Values format also creates one line of values for each record in your report. A record contains all of the fields in each section of your report as seen in the Design view. That is, fields in the Report Header section are exported first, followed by the Page Header section, the Group Header section, the Details section, the Group Footer section, the Report Footer section, and finally, the Page Footer section.

The Separated Values format cannot be used to export reports with cross-tabs or OLAP grids; nor can it be used to export reports with subreports in Page Header or Page Footer sections.

Tab Separated Text (TTX)

The Tab Separated Text format is similar to the Text format. This format preserves the layout of your report but with some differences. In the Text format, multi-line text objects are exported to multiple lines. In this format, multi-line text objects are exported in a single line; all string values are surrounded by double quotes (""); and the values themselves are separated by tab characters. TTX files can be opened in Microsoft Excel.

Text

Text format is a record-based format. Its output is plain text; therefore formatting is not retained. However, this format can preserve some of your

report's layout. Text format assumes that a font of a constant dimension is used throughout the export. The Characters Per Inch (CPI) option specifies the number of characters that can be fit in a linear inch of horizontal space, and thus determines the dimension of the font.

This format also provides an option for pagination. If you select this option, a page break is inserted in the output after every specified number of lines. Page breaks in this format may not correspond to the pagination of your report.

XML Legacy

XML is used primarily for data exchange. It is a record-based format that uses the Crystal XML Schema.

Destination

The destination determines the export location of your report. Crystal Report enables you to choose one of six destinations. They include:

- Application
- Disk file
- Exchange Folder
- Lotus Domino
- Lotus Domino Mail
- MAPI

Exporting to an application

If you export to an application, the program exports the report to a temporary file in the specified format and then opens the file in the appropriate application.

Note:

- When exporting to an application, the output opens with the program that is associated with its file extension as specified on the File Types tab of your operating system's Folder Options.

- When exporting in ODBC format, Application and Disk file are the same.
- You will need to specify a file path if you are exporting in HTML format.
- The file name of the report and the file name of the temporary file cannot be the same.

The sections below provide instructions on how to export a report to the Microsoft Excel (XLS) format for each of the different destination types.

To export to an application

1. Open the report you would like to export.
2. On the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:

   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.

3. Select the export format type from the **Format** drop-down list.

   In this case, choose Microsoft Excel (XLS).

4. Select **Application** from the **Destination** drop-down list.
5. Click **OK**.

   The Excel Format Options dialog box appears.

   Note:

   - The options in the "Column width" area let you define the width of the Excel cells in your output based on a point width (a constant width) or a width determined by objects in various sections of your Crystal report.
   - Selecting "Whole Report" does not necessarily emulate the layout of your Crystal report. Rather, the Excel cell width is based on objects found in any section of your report. Likewise, for example, selecting "Details" creates cell widths based on the objects found only in the report's Details section.

6. Change the formatting options as needed.
7. Click **OK**.

   The Exporting Records dialog box appears.

   Tip:
   Click Cancel Exporting to cancel the export process.

The program exports the report and opens it in the appropriate application. In this example, Microsoft Excel opens with the exported data.

Exporting to a disk file

If you export to a disk file, the program saves the report to the disk or diskette you have specified.

To export to a disk file

1. Open the report you would like to export.
2. On the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:
   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.
3. Select the export format type from the **Format** drop-down list.

   In this case, choose Microsoft Excel (XLS).
4. Select **Disk file** from the **Destination** drop-down list.
5. Click **OK**.

   The Excel Format Options dialog box appears.

   For more information about this dialog box, see step 5 in *Exporting to an application*.
6. Change the formatting options as needed.
7. Click **OK**.

   The Select Export File dialog box appears.
8. Select the appropriate directory.
9. Enter the File name.
10. Click **Save**.

    Tip:
    Click Cancel Exporting to cancel the export process.

The program exports the report and saves it in the designated directory.

Exporting to a Microsoft Exchange folder

Crystal Reports enables you to export a report file to a Microsoft Exchange folder. You select the folder, and the report is stored there in the format that you specify. A Microsoft Exchange folder can contain standard notes (mail), files, and instances of Microsoft Exchange forms.

To export to a Microsoft Exchange folder

1. Open the report you would like to export.
2. On the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:

   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.
3. Select the export format type from the **Format** drop-down list.

   In this case, choose Microsoft Excel (XLS).
4. Select **Exchange Folder** from the **Destination** drop-down list.
5. Click **OK**.

   The Excel Format Options dialog box appears.

   For more information about this dialog box, see step 5 in *Exporting to an application*.
6. Change the formatting options as needed.
7. Click **OK**.

   The Choose Profile dialog box appears.

   Note:
   You will be prompted by the Microsoft Outlook Setup Expert if Microsoft Exchange, Microsoft Mail, or Internet E-mail is not set up on your machine.
8. Select the desired profile from the **Profile Name** drop-down list.

   If the profile is not listed, click New to create it.
9. Click **OK** when finished.

10. When the Select a Folder dialog box appears, select the folder in the profile in which you want the report to appear, and click **OK**.

The report is exported to the Microsoft Exchange folder you selected. The exported report can now be accessed through the Microsoft Exchange client.

Exporting to Lotus Domino

You must have Version 3.0 or later of the Lotus Domino client. You will also require, at a minimum, depositor access. Crystal Reports will not export to a Lotus Domino OS/2 client.

Note:
Before you export to Lotus Domino, you must create a Form called "Report Form" that includes a Comments field that you can edit, and a View that has two columns: one called "#" (created by default) and another that points to the Comments field.

To export to Lotus Domino

1. Open the report you would like to export.
2. On the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:
   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.

3. Select the export format type from the **Format** drop-down list.

   In this case, choose Microsoft Excel (XLS).

4. Select **Lotus Domino** from the **Destination** drop-down list.
5. Click **OK**.

   The Excel Format Options dialog box appears.

   For more information about this dialog box, see step 5 in *Exporting to an application*.

6. Change the format settings as required.
7. Click **OK**.

The Select Database dialog box appears.

8. Double-click the Lotus Domino server you would like to export your report to.

   The file name defaults.

9. Select the database you would like to export the report to.
10. Click **OK**.

    The Comments dialog box appears.

11. Type in any comments that are to appear when another user selects your report from the Lotus Domino Desktop.
12. Click **OK**.

    The export process begins.

The next time a user logs onto the Lotus Domino database you specified, they will see the report in their desktop. The user can double-click the report file name to display the comments you wrote and then double-click the report icon to view the report.

Exporting to Lotus Domino Mail

1. With the report you want exported active, go to the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:

   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.

2. Select the export format type from the **Format** drop-down list.

   In this case, choose Separated Values (CSV).

3. From the **Destination** drop-down list, select **Lotus Domino Mail**.
4. Click **OK**.

   The Character-Separated Values dialog box appears.

5. Change the default Separator and Delimiter as required, then click **OK**.

The Number and Date Format Settings dialog box appears.

6. Select the check boxes as required, then click **OK**.
7. Enter password information as required, then click **OK**.

   The Send Mail window appears.

8. Complete the fields as required, then click **Send**.

Exporting to MAPI (Microsoft Mail)

Note:
This option works only if you have a mail client installed (Microsoft Outlook, Microsoft Mail, or Exchange). Because the exported report is attached to an email message, you must also have an email account configured properly.

1. Open the report you would like to export.
2. On the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:
   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.

3. Select the export format type from the **Format** drop-down list.

   In this case, choose Microsoft Excel (XLS).

4. Select **Microsoft Mail (MAPI)** from the **Destination** drop-down list.
5. Click **OK**.

   The Excel Format Options dialog box appears.

   For more information about this dialog box, see step 5 in *Exporting to an application*.

6. Change the formatting options as needed.
7. Click **OK**.

   The Send Mail dialog box appears.

8. Enter the address details, then click **Send**.

   The Exporting Records dialog box appears.

Tip:
Click Cancel Exporting to cancel the export process.

Exporting to HTML

By exporting reports in HTML format, Crystal Reports provides you with a new option for rapid, convenient distribution of important company data. Once exported, your reports become accessible with many of the most popular Web browsers, including Netscape and Microsoft Internet Explorer.

To export to HTML

1. With the report you want exported active, go to the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:
   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.

2. From the **Format** drop-down list, select HTML 3.2 or HTML 4.0.
3. Select a destination from the **Destination** drop-down list.

   The rest of this section assumes you select Disk file to store the HTML document in a directory on a web server.

4. Click **OK**.

   The Select Export Files dialog box appears. When exported to HTML format, a report is saved as separate HTML pages. If you prefer, clear the check box to have the entire report saved to one file. Because the report is saved as separate HTML pages by default, the program asks you for the name of a directory for an export destination, and uses default names for the HTML files. The initial HTML page will be saved as Base File Name.html. This is the file you open if you want to view your report through your Web browser.

   Note:
   When you are exporting to a single file (that is, you have cleared the Separate HTML Pages check box) all blank space in headers and footers, as well as top and bottom page margins, is included. If you don't want to see blank spaces in your HTML file, suppress empty header and footer

sections and set the top and bottom page margins to zero in the Page Setup dialog box.

5. Select an existing directory, or create a new directory for your report.
6. To navigate through separate HTML files, click the Page navigator option.
7. Click **OK**.

   The program exports the report to HTML format.

Exporting to an ODBC data source

Crystal Reports allows you to export reports to any ODBC data source. If you have an ODBC data source set up for a database or data format, you can export your report to that data format through ODBC.

For instance, you may have an ODBC data source set up through ODBC Administrator that you normally use to access database tables designed in Microsoft SQL Server. Using the Export dialog box, however, you can select your SQL Server data source and export your report as a new SQL Server database table.

Note:
You must have an ODBC data source set up through ODBC Administrator in order for the program to export to a particular ODBC database format. See How to set up an ODBC data source.

Exporting to an ODBC data source allows you to:

- Change data from a centralized database format into a format compatible with a local DBMS application.
- Change data from a local database format into a format compatible with a centralized database.
- Create a new database table that can be used as a separate data set in future reporting.
- Create a mini data-warehouse.
- Manipulate database data by filtering records, adding formulas, and removing fields to create a new database table that provides the data you need most for your work.

To export to an ODBC data source

1. With the report you want exported active, go to the **File** menu, point to **Export**, and then click **Export Report**.

   Tip:

   Another way to do this is to click the Export button on the Standard toolbar.

   The Export dialog box appears.

2. From the **Format** drop-down list, select **ODBC**.

   Note:
   Destination is ignored when you are exporting a report to an ODBC data source. You do not need to make any changes to the Destination edit box.

3. Click **OK** in the Export dialog box.
4. If your ODBC data source specifies a particular database, the report will be exported to that database. Otherwise, the ODBC Formats dialog box appears. Select the database to which this report will be added as a new table, and then click **OK**.
5. If the ODBC data source you selected requires a Logon ID and password, the Login or SQL Server Login dialog box appears. Enter your ID and Password, and then click **OK**.

   The Enter ODBC Table Name dialog box appears.

6. Enter the name you want to give to the new table in the database, and then click **OK**.

The program exports the report as a new table to the database you specified.

Note:
If your report contains a binary field, a Cross-Tab, or an OLAP grid, you will be unable to export it to an ODBC data source successfully.

Working with Web folders

You have the ability to open and save reports using Web Folders if you:

- Are running Windows 2000 (or higher) or have Office 2000 (or higher) installed.
- Have access to a web server that is configured to support Web Folders.
- Add a Web Folder from this server into your Web Folders folder.

To open your report

1. On the **File** menu, click **Open**.

   The Open dialog box appears.
2. Click **Web Folders**.
3. Open the folder that contains the report.
4. Double-click to open the report.

To save your report

1. On the **File** menu, click **Save As**.

   The Save As dialog box appears.
2. Click **Web Folders**.
3. Locate the folder you would like to save the report to.
4. Enter the file name.
5. Click **Save**.

Note:
After making changes to a report in a Web Folder, you must save the changes to the same file in the same Web Folder.

Working with Enterprise folders

Another way to distribute your reports is through BusinessObjects Enterprise. When you publish a report to BusinessObjects Enterprise, you can deliver it to end users via any web application—intranet, extranet, Internet or corporate portal.

Crystal Reports facilitates the publication of reports through the Enterprise option found in the Open and Save As dialog boxes and through the

Workbench. For more information about publishing through the Workbench, see *The Workbench*.

When you choose the Enterprise option in the Open dialog box, you can select any published report to make changes to it. The same option in the Save As dialog box lets you save a modified report back to its original location, or it lets you save a new report to an Enterprise folder, which, in essence, is the same as publishing the report to BusinessObjects Enterprise.

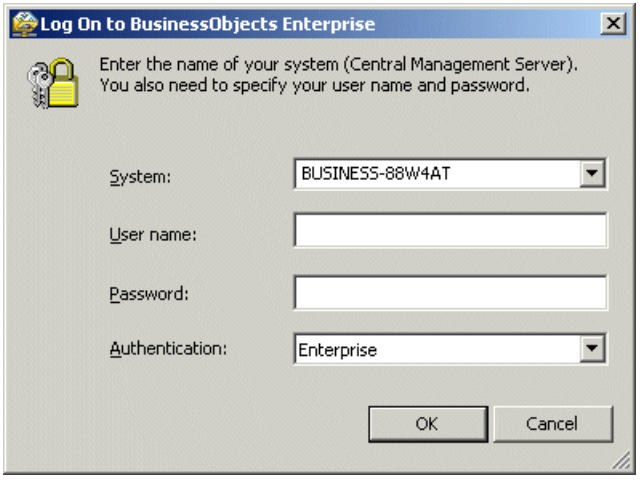
Opening a report in an Enterprise folder

You can open reports from BusinessObjects Enterprise folders in Crystal Reports. Crystal Reports displays the appropriate BusinessObjects Enterprise folders in the Open dialog box.

To open a report in an Enterprise folder

1. On the **File** menu, click **Open**.
2. In the Open dialog box, click **Enterprise**.

   If you have not already logged on to BusinessObjects Enterprise, the Log On to BusinessObjects Enterprise dialog box appears.



3. In the **System** field, enter or select the name of the BusinessObjects Enterprise system that you want to connect to.
4. Enter your user name and password.

5. Click the **Authentication** list to select the appropriate authentication type.

   Enterprise authentication requires a user name and password that is recognized by BusinessObjects Enterprise.

   LDAP authentication requires a user name and password that is recognized by an LDAP directory server.

   Windows Active Directory (AD) authentication requires a user name and password that is recognized by Windows AD.

   Windows NT authentication requires a user name and password that is recognized by Windows NT.

6. Click **OK**.

   The Enterprise folders appear and you can select a report to open in Crystal Reports.

Note:

- To find a specific report, highlight a folder and select Find from its shortcut menu. You can then use the Find dialog box to enter the report's name or a part of its name.
- To limit the risk of expanding a folder than contains many hundreds of reports, use the "batch" options on the folder's shortcut menu:
  - First Batch displays the first 100 objects in the selected folder.
  - Next Batch displays the next 100 objects in the selected folder.
  - Previous Batch displays the previous 100 objects in the selected folder.
  - Last Batch displays the last 100 objects in the selected folder.
- Select the "Update Repository Objects" option to ensure that the report's repository objects are updated when the report is opened in the future. For more information about the BusinessObjects Enterprise Repository, see *BusinessObjects Enterprise Repository*.

Saving a report to an Enterprise folder

You can save Crystal reports to BusinessObjects Enterprise folders. Use the Save As dialog box to save a modified report back to its original location, or use it to save a new report to an Enterprise folder. Saving a report to an

Enterprise folder is the same as publishing the report to BusinessObjects Enterprise.

To save a report to an Enterprise folder

1. On the **File** menu, click **Save As**.
2. In the Save As dialog box, click **Enterprise**.
3. If you have not already logged onto BusinessObjects Enterprise, do so now.

   For information about how to log onto BusinessObjects Enterprise, see *Opening a report in an Enterprise folder*.
4. When the Enterprise folders appear, select a folder to save your report in.
5. Enter a file name for your report.
6. Select **Enable Repository Refresh** if you want your report's repository objects to be updated when the report is opened again in Crystal Reports or scheduled in BusinessObjects Enterprise.

   For more information about the BusinessObjects Enterprise Repository, see *BusinessObjects Enterprise Repository*.
7. Click **Save** to publish your report to BusinessObjects Enterprise.

Viewing reports

You can view Crystal reports using a number of report viewers available through the stand-alone Report Application Server (RAS) or BusinessObjects Enterprise and the BusinessObjects Enterprise Software Development Kit (SDK). For information about the Crystal Report Viewers, see the *Report Application Server Viewer Help* or the viewer online help in the BusinessObjects Enterprise SDK documentation.

In general, the Crystal Report Viewers are page viewers that let you see complete pages of your Crystal reports. However, one viewer—the Report Part Viewer—lets you see specific report objects without viewing the entire page. Report objects displayed in such a way are referred to as Report Parts.

What are Report Parts?

Report objects displayed by themselves in a viewer—without the rest of the report page—are referred to as Report Parts. More precisely, however, Report Parts are objects that use hyperlinks to point from a home report object to a destination object.

Report Parts work with the DHTML viewer subset of the Crystal Report Viewers to expand the navigation possibilities within and between reports. Report Part hyperlinks can link to other objects in the current report or to objects in any other report. This linking lets you create a guided path through your reports that shows only specific information at each stop along the path.

Viewing Report Parts instead of the whole page is a powerful feature that allows you to seamlessly integrate reports into portal and wireless applications.

Report Part Viewer

The Report Part Viewer is a viewer that lets you display Report Parts without the rest of the report page. You can integrate this viewer into web applications so that your users see only specific report objects without having to see the rest of the report.

For the most part, you set up the Report Part hyperlinks in the Report Designer, but you take advantage of their functionality in the report viewers.

What is navigation?

The navigation functionality in Crystal Reports lets you move to other report object(s) in the same report, or to object(s) in another report—with a specified data context. In this last case, the other report must be managed in BusinessObjects Enterprise, or must be part of a stand-alone Report Application Server environment. This navigation is available only in the DHTML viewers (zero-client, server-side viewers). Its advantage is that you can link directly from one object to another; the viewer passes the required data context so you go to the object and data that is relevant.

Report Parts use this navigation functionality when linking between Report Part objects. The key difference between Report Part navigation and regular (page) navigation is that, when navigating with Report Parts (using the Report Part Viewer), you see only the objects identified as Report Parts. In regular navigation (using the page viewers or the Advanced DHTML Viewer), you go to the identified object(s), but you see the entire page.

Setting up navigation

Navigation (page or Report Part) is set up on the Hyperlink tab of the Format Editor dialog box.

In the DHTML Viewer Only area of the Hyperlink tab, you can select one of two options:

- **Report Part Drilldown**

  The Report Part Drilldown option is available for summary fields, group charts and maps, and fields in your report's group header or group footer. This option is relevant only to Report Parts; regular navigation (using the page view) drills down by default. For more information, see *Report Part-specific navigation*.

- **Another Report Object**

  You can use the Another Report Object option for both Report Part and page navigation. This option lets you specify the destination object(s) you want to navigate to and the data context to pass.

When you select the Report Part Drilldown option, the "Hyperlink information" area contains these options:

- **Available Fields**

  The Available Fields area lists, as a tree view, all the sections in your report that contain report objects you can use for Report Part drill down. You select objects from this area and add them to the Fields to Display area.

- **Fields to Display**

  The Fields to Display area lists, as a tree view, the section and objects that you have selected for drilling down on.

See *The Report Part Drilldown option* for information about how to use these options.

When you select the Another Report Object option, the "Hyperlink information" area contains these options:

- **Paste the Report Part link**

  Use the Past Link button to add detailed information about a report object that you previously selected and copied. The pasted information depends, in part, on the option you select from the list associated with the button.

- **Select From**

  After you paste link information, the Select From field contains the path and file name of the report you selected and copied from (it is blank when the current report is referenced). You add information to this field by pasting a report part link; otherwise it is not accessible.

- **Report Title**

  The Report Title field defaults to the title of the report specified in the Select From field (it contains the text <Current Report> when the current report is referenced). If a report title was not defined in the Document Properties dialog box, the field defaults to the report's file name. You add information to this field by pasting a report part link; otherwise it is not accessible.

- **Object Name**

  By adding one or more objects to this field, you are identifying the destination objects for your navigation. In page navigation, this information determines what object you move to in the page. For Report Part navigation, this information determines what object(s) the viewer displays upon navigation (the viewer displays only the identified objects).

  You can select any of the following report object types in the Object Name field (you can select one or more objects from the same report section):

  - Field objects
  - Charts or maps
  - Bitmaps
  - Cross-tabs
  - Text objects

You cannot select the following report object types as destinations:

- Objects inside the Page Header or Page Footer.
- Lines or boxes.
- Subreports or any object inside a subreport.
- Entire sections (you must select the objects inside the section individually).

You can add specific information in one of two ways:

- You can type the object name(s) as they appear in the Report Explorer.
- You can copy report object(s) from the current report or another and paste its information into the object field.

- **Data Context**

  The program normally completes the Data Context field when you paste information for the destination object(s). You can also customize this option by using the Conditional Formula button. For more information, see *Data context formats*.

See *The Another Report Object option* for information about how to use these options.

Note:
Report objects with hyperlinks defined are shown in the Report Explorer as blue text with a solid underline. Objects with Report Part hyperlinks are shown as green text with a dashed underline.

Report Part-specific navigation

Report Parts use the Crystal Reports navigation functionality. However, some special cases apply only to Report Parts:

- The viewer displays only the object identified as the destination object.
- You must specify Initial Report Part Settings for each report that is the first stop on the Report Part navigation path.

The Report Part Drilldown option

The Report Part Drilldown option lets you define a hyperlink so that the Report Part Viewer can emulate the drill-down functionality of Crystal Reports. The Report Part Viewer displays only destination objects; therefore, to make drill down work, you need to define a navigation path from a home object to one or more destination objects. When you have multiple destination objects, they must all reside in the same report section.

The Report Part Drilldown option does not affect the DHTML page viewers since the option emulates the default Crystal Reports behavior for drill down (which the page viewers already support). Page viewers, however, do not limit which objects are displayed—they always show all report objects.

Note:
Use the Report Part Drilldown option only to navigate between objects in the same report.

Because the Report Part Viewer shows only destination objects, you must define Initial Report Part Settings (that is, a default home object) for a report before your Report Part Drilldown hyperlinks can work. A report's Initial Report Part Settings define the object that appears first in the Report Part Viewer. Think of this object as the place you'll begin your path of drill-down hyperlinks from.

To define Initial Report Part Settings

1. Open the report whose default home object you want to define.
2. Right-click the object you want to set as the default home object and select **Copy** from its shortcut menu.
3. On the **File** menu, click **Report Options**.
4. In the Initial Report Part Settings area of the Report Options dialog box, click **Paste Link**.

   The program pastes the name and data context of the report object you selected as your home object into the appropriate fields.

   Tip:
   For more information about data contexts, see *Data context formats*.

Include another object from the same section of the report by entering a semi-colon (;) and typing the name of the object.

5. Click **OK**.

To create a Report Part Drilldown hyperlink

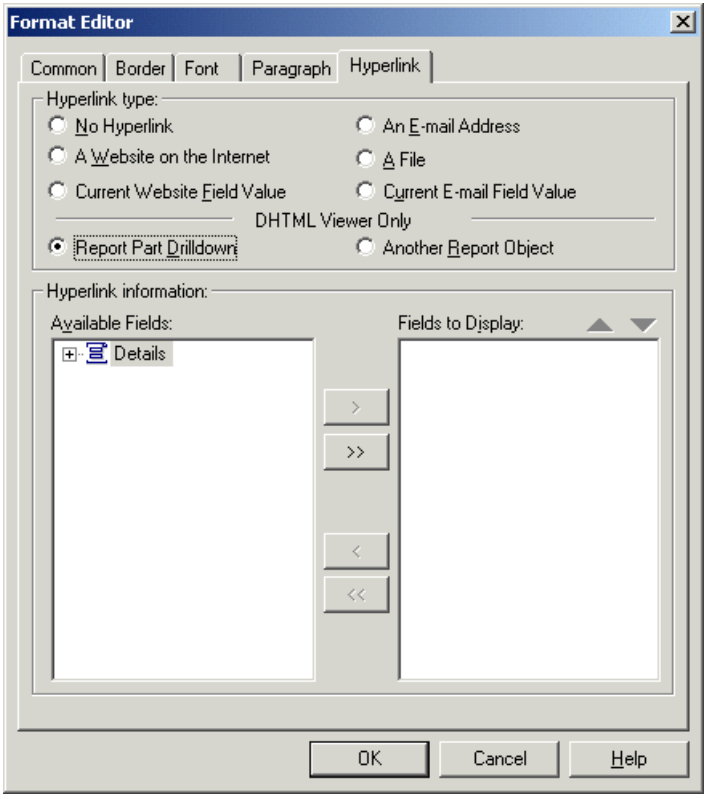
Note:
Before you begin this procedure, be sure to read *Setting up navigation* to acquaint yourself with the limitations of creating this type of hyperlink.

1. Open a report and select the intended destination object; then click the Format button on the Expert Tools toolbar.

   Tip:
   You can also do this by selecting Format Field from the Format menu.

2. In the Format Editor, click the **Hyperlink** tab.
3. In the DHTML Viewer Only area, select **Report Part Drilldown**.

   The "Hyperlink information" area changes to show the fields available for this type of hyperlink.



The Available Fields area shows only the sections and report objects you can select for drill down. In general, these objects include field objects, charts, maps, bitmaps, cross-tabs, and text objects contained in the next section down (that is, for example, objects in group two when the object you selected is in group one).

Note:
The Available Fields area does not show suppressed report objects.

4. In the Available Fields area, select the section or report object(s) you want to use as your drill down destination.

Tip:

Use the Report Explorer to quickly identify the default names assigned to each of your report objects. To open the Report Explorer, click its button on the Standard toolbar.

You can add all the objects in a section by selecting the section node. If you expand the section node, you can select one or more of the objects that it contains.

5. Use the arrow buttons to move the selected section or object(s) to the Fields to Display area.

   For ease of identification, the program creates a section node in the Fields to Display area. This node contains the objects that you selected in the Available Fields area.

6. If you want to add another object to the Fields to Display area, select it in the Available Fields list and drag it into position.

   Note:

   - The position an object has in the Fields to Display area determines how it appears in the Report Part Viewer; top to bottom in the Fields to Display area equates to left to right in the viewer. Use the arrows above the Fields to Display area to change the order of objects. (Note that a programmer can alter this default behavior through the PreserveLayout property of the Report Part Viewer.)
   - The Fields to Display area can contain only one section at a time. If you try to add a second section or an object from a second section, it replaces any existing section in the Fields to Display area.

7. Click **OK**.

You have established a hyperlink from your report's home object to a destination object or objects. In the Report Part Viewer, you will see the home object first, and when you click it for drill down, you will see the destination object(s).

The Another Report Object option

The Another Report Object option lets you define a hyperlink path for linking objects in the same or different reports. If you are defining a hyperlink path to a different report, that report must be managed in BusinessObjects

Enterprise, or it must be part of a stand-alone Report Application Server environment. The Report Part Viewer displays only the objects you specify. Like the Report Part Drilldown option, all destination objects must be from the same report section.

Note:

- When using a stand-alone Report Application Server environment, it is recommended that all reports navigated to and from using the Another Report Object option reside in the default Report Application Server report directory. Placing reports in this directory ensures that the linked reports can be easily migrated to a BusinessObjects Enterprise environment.
- The DHTML page viewer also uses the Another Report Object option for navigation purposes.
- You cannot use the Another Report Object option for an entire cross-tab or OLAP grid object; you can, however, use it for any individual cell in a cross-tab or OLAP grid.

Work flow

Because the Another Report Object option allows you to create hyperlinks between objects in different reports managed in BusinessObjects Enterprise, it requires more set up on the Hyperlink tab. This is an overview of the steps you have to complete to set up your hyperlink successfully.

- Open the report that contains the object you want to be the destination object and copy it.
- Open the report that contains the home object, select it, and open the Format Editor.
- On the Hyperlink tab, paste the information from the destination object into the appropriate fields.

The following procedure shows you how to do all of these steps.

To create an Another Report Object hyperlink

Note:
Before you begin this procedure, be sure to read *Setting up navigation* to acquaint yourself with the limitations of creating this type of hyperlink.

1. Open your source and target reports.

Your source report is the report you copy an object from; the target report is the report you add the hyperlink information to.

When you view your target report in the Report Part Viewer, you first see its home object. When you drill down on that object, you go to the destination object you selected in the source report.

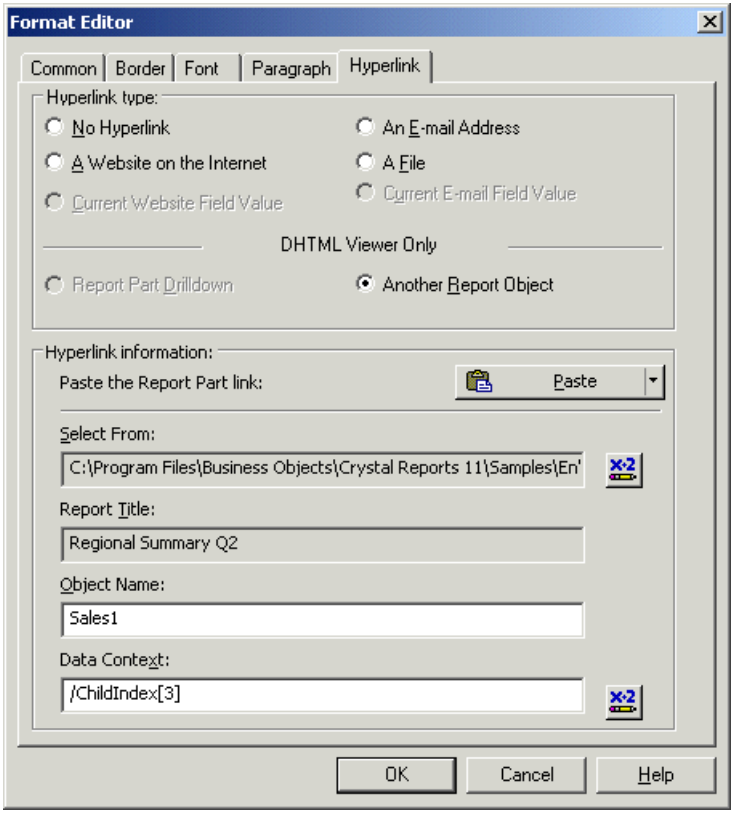
2. In your source report, right-click the intended destination object and select **Copy** from its shortcut menu.
3. In your target report, select the intended home object; then click the **Format** button on the **Expert Tools** toolbar.

   Tip:
   You can also do this by selecting Format Field from the Format menu.

4. In the Format Editor, click the **Hyperlink** tab, and then select the **Another Report Object** option.
5. In the "Hyperlink information" area, click **Paste Link**.

   Note:
   The Paste Link button is unavailable if you have not copied a destination object as shown in step 2.

   The program pastes the identifying information from the destination object you selected in the source report into the appropriate fields.



The Paste Link button includes a list of options that you can use when pasting a link to the destination object. Depending on the type of link you are creating (for example, a link to a specific data context rather than a link to a generic data context), you may see these options:

- **Context Report Part**

  This is the default option; it is selected when you click Paste Link without viewing the other list options. Use this option to paste a link that includes the most complete data context that the program can determine. For more information, see *Context Report Part option scenarios*.

- **Design View Report Part**

Use this option to paste a link that includes a generic data context (that is, a data context that does not point to a specific record). Use this option when you want a broad data context, or when data is not yet present in your source report.

- **Preview Report Part**

  Use this option to paste a link that includes a specific data context (that is, a data context that points to a specific record). Use this option when you want a narrow data context, or when data is present in your source report.

Note:
If you choose the Design View Report Part option (or if you choose the Context Report Part option for an object copied from a report's Design view) and your source and target reports have different data structures, you'll see the Report Part Map Fields dialog box. Each field in the Unmapped Fields area represents a group in your source report. Use this dialog box to map these groups to fields in your target report. When you've mapped all the groups, the OK button is available, and you can proceed.

6. If you want to add other fields from the same section of the source report, click the **Object Name** field and move the cursor to the end of the existing text. Enter a semi-colon (;) and then the name of the field(s).

   Note:
   The order of objects in the Object Name field determines how they appear in the Report Part Viewer; left to right in the Object Name field equates to left to right in the viewer.

7. You can broaden your **Data Context** by using an asterisk (*) to represent all records in a group.

   For example, if your Data Context is /USA/CA/Changing Gears (which will show only that specific detail record), you could change it to /USA/CA/* to show all detail records within that group.

   Tip:

   - You might find it more useful to copy your hyperlink information from the Design view because the data context will be more general (that is, you won't be copying only a specific record as you might on the Preview view).
   - If your report has a group selection formula, check the data context for your destination object to ensure it contains the correct child index.

- For more information, see *Data context formats*.

8. Click **OK**.

You have established a hyperlink from your home object to a destination object or objects. In the Report Part Viewer, you see the home object first, and when you click it for drill down, you see the destination object(s).

Context Report Part option scenarios

When pasting linking information for a Report Part, the Context Report Part option mainly affects the data context of the link; the Select From field (the report URI) and the Object Name field are always the same for any of the choices available in the Paste Link list. This section provides various scenarios and describes how the program creates a data context for each.

Scenario 1

If your source report contains data (that is, if the report is in Preview view), the Context Report Part data context (in the target report) is the source report's Preview data context for all children of the selected field. For example, you might see this in the Data Context field: `/Country[USA]/Region[*]`. Otherwise, the program uses the source report's Design view data context as the Context Report Part data context in the target report.

Scenario 2

If your source and target reports are the same report, and the object you choose as your source is from the Preview view, when the target object you choose to link to is in a higher level than the source object, the data context is left empty. For example, when the source data context is `/Country[Australia]/ChildIndex[5]`, and the target data context is `/Country[Australia]`, the Context Report Part data context is left empty.

Scenario 3

If your source and target reports are the same report, and the object you choose as your source is from the Preview view, when the target object you choose to link to is in a lower level than the source object, the data context pasted is a Design view data context (in the form of a formula). For example, when the source data context is `/Country[Australia]`, and the target

data context is `/Country[Australia]/ChildIndex[5]`, the Context Report Part data context is `"/"+{Customer.Country}`.

Cross-tabs

If the object you copy in your source report is part of a cross-tab, the Context Report Part data context is based on the selected object embedded in the cross-tab. Crystal Reports creates the data context by tracking if the selected object in the cross-tab is a row, column, or cell. Next, the program retrieves row and column names. Then it parses the Design view data context. Finally, it generates the Context Report Part data context by adding the `GridRowColumnValue` function if the group in the data context formula appears in the row or column names retrieved earlier. You might see, for example, a data context such as:

```
"/"+GridRowColumnValue("Customer.Country")+"/"+GridRowColumnValue("Customer.Region")
```

Data context formats

- Normally, a data context formula appears as follows:

  ```
  "/" + {Table.Field} + "/" + {Table.Field}
  ```

- You can also use these formats:
  - XPath-like format:

    ```
    /USA/Bicycle
    ```

  - Strongly-Typed format:

    ```
    /Country[USA]/Product Class[Bicycle]
    ```

  Note:
  You can add detail-level information in 0-based format:

  ```
  /USA/Bicycle/ChildIndex[4]
  ```

  Note:
  You can also use a wildcard to identify all instances:

  ```
  /USA/*
  ```

- For cross-tab objects, you can use navigation on cells, columns, or rows. To define the data context, use the `GridRowColumnValue` formatting function. For example:

```
"/" + GridRowColumnValue ("Supplier.Country") + "/" +
 GridRowColumnValue ("Product.Product Class").
```

Hyperlinks displayed in the viewers

This section summarizes information about the hyperlink options and how they work in the page viewers and the Report Part Viewer.

Differences between the hyperlink options

Another Report Object	Report Part Drilldown
This option allows the selection of one or more report objects.	This option allows the selection of one or more report objects.
Destination objects must be from the same report section.	Destination objects must be from the same report section.
The location of the section that contains the destination objects has no restriction: • The section can be located anywhere in the report. • The section can be in a group level above or below the source object.	The location of the section that contains the destination objects must be in the immediately next, lower-group level from the source object.

Another Report Object	Report Part Drilldown
The object can be in a different report that is managed in BusinessObjects Enterprise or is part of a stand-alone Report Application Server (RAS).	The object must be in the same report.

Differences between how the viewers display hyperlinks

Page viewers	Report Part Viewer
Another Report Object: • Navigates to destination objects and shows contents of the entire page.	Another Report Object: • Navigates to destination objects and shows only the destination objects.
Report Part Drilldown: • Navigates (drills down) to the group and shows the complete contents of the group.	Report Part Drilldown: • Navigates to destination objects and shows only the destination objects.
Default drill down (no hyperlink): • Group drill down from a group header or footer, chart, or map displays the group view. • Subreport drill down displays the subreport view.	Default drill down (no hyperlink): • Not available.

Creating an Enterprise Hyperlink

You can create hyperlinks from a report to enterprise documents such as Crystal Reports, Webi and other documents.

Note:
In order for this feature to work BusinessObjects Enterprise needs to be running.

To create an Enterprise Hyperlink

1. Select a report object on the **Design** or **Preview** tab.
2. On the **Format** menu, click **Hyperlink**.

   The "Format Editor" dialog box appears with the Hyperlink tab active.
3. On the "Hyperlink type" section, select the option **A Website on the Internet**.
4. Click **Create enterprise hyperlink**.
5. Click **Browse**.

   The "Open" dialog box appears.
6. Click **My Connections** to add a new connection to the Enterprise.

   If you already have a connection, click **Enterprise**.
7. Navigate to the enterprise document that you wish to open and click **Open**.

   The "Document ID" and "Document Name" fields are filled out with the CUID and name of the selected document respectively.
8. On the "Hyperlink Settings" section change the different options to create the hyperlink with the specified settings.
9. On the "Parameter Settings" section select the parameter values, if the selected document has parameters.
10. Click **OK**.

Using smart tags

Crystal Reports lets you take advantage of smart tags in Office XP. When you paste a chart, a text object, or a field object into an Office XP application, you can view data from the host report after selecting a smart tag option. This table summarizes the options available to you.

Office XP application	Smart tag option	Crystal Reports object type
Word	View Refresh	Text object Field object Chart
Excel	View Refresh	Text object Field object
Outlook	View Refresh (only when creating a message)	Text object Field object Chart

Before you can use smart tags, web server options must be configured on the Smart Tag tab of the Options dialog box. As well, an .asp or .jsp page must be created for viewing report details. Normally, these tasks should be carried out by your system administrator.

Note:

- The reports you want to use with smart tags must exist on the web server named in the Options dialog box in a directory that mirrors their real location, or the web server must be configured to accept a UNC path.
- The Smart Tag option is only available at design time.

To use smart tags with a Crystal Reports object

1. Open the Crystal report that contains the object you want to copy to an Office XP application.
2. On the **File** menu, click **Options** and ensure that the options in the Smart Tag Web Server Options area on the **Smart Tag & HTML Preview** tab have been configured:
   - Your web server must be named.
   - A virtual directory must be named (a default is provided).
   - A viewing page must be named (a default is provided).
3. On the **Preview** tab of Crystal Reports, right-click the text object, field object, or chart you want to copy and select **Copy Smart Tag** from its shortcut menu.
4. Open the appropriate Office XP application, and paste the report object into a document, worksheet, or email message.

   Note:
   See the table in this section for limitations about which report objects can be pasted into each Office XP application.
5. In your Office XP application, choose the appropriate smart tag from the options for the pasted report object.

   Note:
   See the table in this section for limitations about which smart tags are available in each Office XP application.

   The .asp or .jsp page named in the Options dialog box appears showing the appropriate information from the host Crystal report.

Report Alerts

chapter 21

About Report Alerts

Report Alerts are custom messages created in Crystal Reports that appear when certain conditions are met by data in a report. Report Alerts may indicate action to be taken by the user or information about report data.

Report Alerts are created from formulas that evaluate conditions you specify. If the condition is true, the alert is triggered and its message is displayed. Messages can be text strings or formulas that combine text and report fields.

Once a Report Alert is triggered, it's not evaluated again until you refresh your report's data.

Because Report Alerts are specific to each report, you decide when to use them and when not to. They can be useful to point out important information, such as sales that fall above or below a limit. And the message is created by you, so it can be specific to your data.

Working with Report Alerts

This section focuses on the tasks you'll need to undertake in order to use Report Alerts.

Creating Report Alerts

You must complete three steps when creating a Report Alert:

- Name the alert.
- Define the condition that triggers the alert.
- Create the message you want to appear when the alert is triggered (this step is optional).

To create a Report Alert

1. On the Report menu, point to **Alerts** and then click **Create or Modify Alerts**.

   The Create Alerts dialog box appears.

2. Click **New**.

   The Create Alert dialog box appears.

3. Enter a name for your new alert in the **Name** box.
4. Enter your alert message in the **Message** box.

   The Message box lets you enter a message to be used as a default. If you want the same message to appear every time your alert is triggered, enter it in the Message box.

   If, however, you want to use a formula so the message is customized with data elements, see the next step.

5. If you want to use a formula to create an alert message, click the formula button to the right of **Message**.

   The Formula Workshop appears. For information on how to use the editor, see *Working with the Formula Editor*.

6. Enter your alert message formula.

   For example, if you want to see the message "Country is a star performer" (where Country is the name of a specific country), you might create the following formula:

   ```
   ({Customer.Country}) + " is a star performer"
   ```

   Note:

   - The result of an alert message formula must be a string.
   - The DefaultAttribute function can be used to refer to a message added in the Message box. For example, if the message in your Message box is " is a star performer," your alert message formula might be:

   ```
   ({Customer.Country}) + DefaultAttribute
   ```

   This formula relies on the text you enter in the Message box; that text becomes the DefaultAttribute.

   Note:
   Message condition formulas can be created using either Crystal Syntax or Basic Syntax.

7. Click **Save and close** to return to the Create Alert dialog box.
8. In the Create Alert dialog box, click **Condition**.

The Formula Workshop appears.

9. Enter your alert condition formula.

   Alert formulas can be based on recurring records or on summary fields, but cannot be based on print-time fields, such as running totals or print time formulas. Alert formulas cannot have shared variables.

   If an alert formula is based on a summary field, any recurring fields used must be constant over the summary field. For example, if you are grouping on Country and Region, you might create an alert such as:

   ```
   Sum ({Customer.Last Year's Sales}, {Customer.Region})
    > 10000
   ```

   In this case, your formula can refer to either Country or Region, but not City or Customer Name since these are not constant.

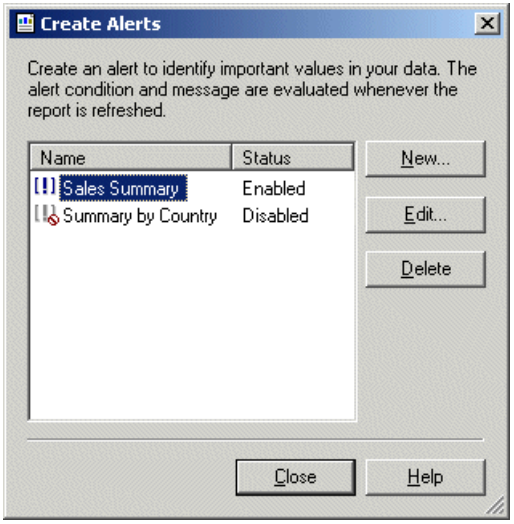
   Note:
   Alert condition formulas can be created using either Crystal Syntax or Basic Syntax.

10. Clear the **Enable** check box if you do not want the alert to be evaluated.

    Otherwise, leave it selected.

11. Click **OK** to save your alert.

    You are returned to the Create Alerts dialog box and your new alert is listed. You can see its name and status (Enabled or Disabled).



Only enabled and disabled alerts appear in the Create Alerts dialog box. If an alert is triggered, it is seen in the Report Alerts dialog box.

Editing Report Alerts

1. On the Report menu, point to **Alerts** and then click **Create or Modify Alerts**.
2. In the Create Alerts dialog box, select the alert you want to edit and click **Edit**.

   Tip:
   Double-clicking an alert also lets you edit it.

3. Make the changes you want in the Edit Alert dialog box.
4. Click **OK** to save your changes.

Note:
If the alert has already been triggered, editing it removes it from the Report Alerts dialog box.

Deleting Report Alerts

1. On the Report menu, point to **Alerts** and then click **Create or Modify Alerts**.
2. In the Create Alerts dialog box, select the alert you want to delete and click **Delete**.

   The selected alert is removed from the Create Alerts dialog box.

Note:
If the alert has already been triggered, deleting it removes it from the Report Alerts dialog box as well.

Viewing Report Alerts

You can view triggered Report Alerts by:

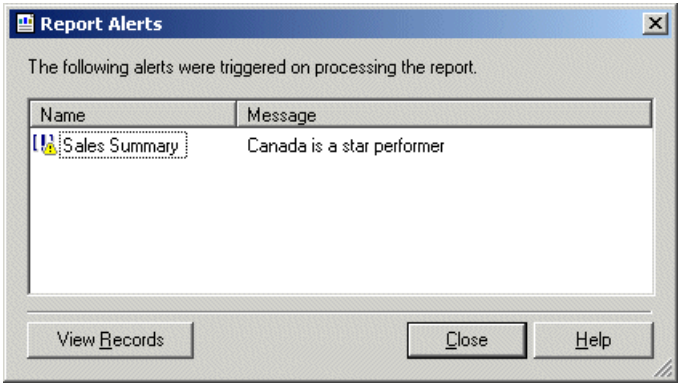
- Refreshing your report's data.
- Selecting Triggered Alerts from the Alerts submenu of the Report menu.

Note:
If you want to view alerts when report data is refreshed, you must select "Display Alerts on Refresh" on the Reporting tab of the Options dialog box (this option is also available on the Report Options dialog box).

To view Report Alerts

1. On the Report menu, point to **Alerts** and then click **Triggered Alerts**.

   The Report Alerts dialog box appears.



2. Select the alert whose records you want to see.
3. Click **View Records**.

   A new report tab is opened showing the report record(s) that triggered the alert. If the record is hidden, the record's group is shown but drill down is not performed.

   Note:
   If you select more than one triggered alert before clicking the View Records button, the results are generated by performing a Boolean AND operation on the selected alerts.

4. To return to the Report Alerts dialog box, click the **Preview** tab.
5. Click **Close** to remove the Report Alerts dialog box.

Referring to Report Alerts in formulas

Alerts can be referred to in formulas. Any formula that references an alert becomes a print time formula.

The following functions are available:

- IsAlertEnabled( )
- IsAlertTriggered( )
- AlertMessage( )

These functions behave the same as alerts created in the Create Alerts dialog box:

- IsAlertTriggered("AlertName") is true only for the records on which the alert is triggered
- AlertMessage("AlertName") displays the message for a record when the alert is true.

Because alerts are not field objects (you cannot drop them into the report), alerts are represented differently from report fields in the Formula Workshop. In the Functions tree, you'll see an Alerts heading where the functions themselves appear. Available alerts are listed by name below that.

Using Formulas

chapter 22

Formulas overview

In many cases, the data needed for a report already exists in database table fields. For example, to prepare an order list you would place the appropriate fields on the report.

Sometimes, however, you need to put data on the report that does not exist in any of the data fields. In such cases, you need to create a formula. For example, to calculate the number of days it takes to process each order, you need a formula that determines the number of days between the order date and the ship date. Crystal Reports makes it easy for you to create such a formula.

Typical uses for formulas

There are many uses for formulas. If you have a need for specialized data manipulation, you can do it with a formula.

Creating calculated fields to add to your report

To calculate a price discounted 15%:

Crystal syntax example:

```
{Orders_Detail.Unit Price}*.85
```

Basic syntax example:

```
formula = {Orders_Detail.Unit Price}*.85
```

Formatting text on a report

To change all the values in the Customer Name field to uppercase:

Crystal syntax example:

```
UpperCase ({Customer.Customer Name})
```

Basic syntax example:

```
formula = UCase ({Customer.Customer Name})
```

Pulling out a portion, or portions, of a text string

To extract the first letter of the customer name:

Crystal syntax example:

```
{Customer.Customer Name} [1]
```

Basic syntax example:

```
formula = {Customer.Customer Name} (1)
```

Extracting parts of a date

To determine what month an order was placed:

Crystal syntax example:

```
Month ({Orders.Order Date})
```

Basic syntax example:

```
formula = Month ({Orders.Order Date})
```

Using a custom function

To convert $500 from U.S. currency to Canadian:

Crystal syntax example:

```
cdConvertUSToCanadian (500)
```

Basic syntax example:

```
formula = cdConvertUSToCanadian (500)
```

Formula components and syntax

Formulas contain two critical parts: the components and the syntax. The components are the pieces that you add to create a formula while the syntax is the rules that you follow to organize the components.

Formula components

Creating a formula in Crystal Reports is like creating one in any spreadsheet application. You can use any of the following components in your formula:

Fields

Example: {customer.CUSTOMER LAST NAME}, {customer.LAST YEAR'S SALES}

Numbers

Example: 1, 2, 3.1416

Text

Example: "Quantity", ":", "your text"

Operators

Example: + (add), / (divide), -x (negate)

Operators are actions you can use in your formulas.

Functions

Example: Round (x), Trim (x)

Functions perform calculations such as average, sum, and count. All functions available are listed with their arguments and are arranged by their use.

Custom functions

Example: cdFirstDayofMonth, cdStatutoryHolidays

Custom functions provide a way to share and reuse formula logic. They can be stored in the BusinessObjects Enterprise Repository and then added to a report. Once in the report, custom functions can be used in the Formula Expert when creating formulas.

Control Structures

Example: "If" and "Select", "For" loops

Group field values

Example: Average (fld, condFld), Sum (fld, condFld, "condition")

Group field values summarize a group. For example, you could use group field values to find the percentage of the grand total contributed by each group.

Other formulas

Example: {@GrossProfit}, {@QUOTA}

Formula syntax

Syntax rules are used to create correct formula. Some basic rules are:

- Enclose text strings in quotation marks.
- Enclose arguments in parentheses (where applicable).
- Referenced formulas are identified with a leading @ sign.

Crystal and Basic syntax

When creating formulas, you have the option of using either Crystal or Basic syntax. Almost any formula written with one syntax can be written with the other. Reports can contain formulas that use Basic syntax as well as formulas that use Crystal syntax.

Crystal syntax is the formula language included in all versions of Crystal Reports.

If you are familiar with Microsoft Visual Basic or other versions of Basic, then Basic syntax may be more familiar to you. In general, Basic syntax is modeled on Visual Basic except that it has specific extensions to handle reporting.

If you are already comfortable with Crystal syntax, you can continue to use it, and benefit from the new functions, operators and control structures inspired by Visual Basic.

Note:

- Record selection and group selection formulas cannot be written in Basic syntax.
- Report processing is not slowed down by using Basic syntax. Reports using Basic syntax formulas can run on any machine that Crystal Reports runs on.
- Using Basic syntax formulas does not require distributing any additional files with your reports.

For more information

- To learn about Basic syntax, see Creating Formulas with Basic syntax in the online help.
- To learn about Crystal syntax, see Creating Formulas with Crystal syntax in the online help.

User Function Libraries in formulas

Crystal Reports lets developers create User Function Libraries (UFLs) that are recognized by the Formula Editor. A UFL is a library of functions that is created by a developer to address a specific need. UFLs can be programmed in a COM or a Java environment.

Crystal Reports lets you see COM UFLs or Java UFLs in the Formula Editor, but not both at the same time. (You can also choose to see no UFLs.)

Note:
Java UFLs are not supported in the Report Application Server (RAS) and the Crystal Page Server, so if a report has a formula in it, and that formula uses a Java UFL, the report may not run in BusinessObjects Enterprise because the formula will fail to compile.

For details about developing Java UFLs and configuring Crystal Reports to use a UFL, see the *Java Reporting Component Developer's Guide*.

Note:
After you have completed the configuration outlined in the Developer's Guide, you must return to Crystal Reports, point to the File menu, and select Options. On the Formula Editor tab, go to UFL Support and select Java UFLs Only.

Specifying formulas

There are several different kinds of formulas in Crystal Reports: report, formatting, selection, search, running total condition, and alert formulas. The majority of formulas in a report are report formulas and conditional formatting formulas.

Report formulas

Report formulas are formulas that you create to stand alone in a report. For example, a formula that calculates the days between the order date and the shipping date is a report formula.

Conditional formatting formulas

Formatting formulas change the layout and design of a report, as well as the appearance of text, database fields, objects, or entire report sections. You format text through the Format Editor. If you need to create a formatting formula, you access the Formula Workshop from the Format Editor. See *Working with conditional formatting*.

Note:
If you open the Formula Workshop from the Format Editor, you cannot create a different type of formula, nor can you modify or delete existing formulas. You can, however, view any formula for reference.

Selection formulas

Selection formulas specify and limit the records and groups that appear in a report. You can either enter these formulas directly or specify the selection using the Select Expert. Crystal Reports then generates the record selection and group selection formula. You have the option to manually edit these formulas, but you must use Crystal syntax. See *Selecting records*.

Search formulas

Search formulas help you locate data in your report. Like selection formulas, you normally do not enter these formulas directly, but instead specify the search criteria using the Search Expert. Crystal Reports generates the formula. You have the option to manually edit these formulas, but you must use Crystal syntax.

Note:
If you already know Basic syntax, you need to know only a small amount of Crystal syntax to modify most selection and search formulas.

Running Total condition formulas

Running Total condition formulas let you define the condition upon which your running total will be evaluated or reset. See *Creating conditional running totals* .

Alerting formulas

Alerting formulas help you define conditions and messages for report alerts. See *About Report Alerts* .

Working with the Formula Workshop

You can create many different kinds of formulas in the Formula Workshop. The workshop consists of a toolbar, a tree that lists the types of formulas you can create or modify, and an area for defining the formula itself.

Note:
Search formulas and Running Total condition formulas are created and maintained through the Search Expert and the Create (or Edit) Running Total Field dialog box. These features open the Formula Workshop so you can work with its familiar user interface, but you cannot add or maintain these kinds of formulas directly from the main Formula Workshop.

Accessing the Formula Workshop

There are many ways to access the Formula Workshop. You see it when you add new Formula Fields, when you define selection formulas, when you work with custom functions, and so on.

You can open the Formula Workshop by itself before you begin adding specific kinds of formulas.

To access the Formula Workshop

1. On the **Report** menu, click **Formula Workshop**.

   Tip:

   Another way to do this is to click the Formula Workshop button on the Expert Tools toolbar.

   The Formula Workshop appears.

2. Click **New** and select the kind of formula you want to create from the list that appears.

   Tip:
   You can also select the appropriate folder in the Workshop Tree, and then click the New button.

   The appropriate editor or dialog box appears.

Workshop Tree

The Workshop Tree contains folders for each type of formula you can create in Crystal Reports. It also contains folders for custom functions and SQL Expressions. If the workshop appears as the result of using a specific command (for example, you've selected the Record command on the Selection Formulas submenu), the appropriate folder in the tree is selected, and the appropriate version of the Formula Editor appears.

Expand any folder in the tree to see the formulas that already exist. New formulas can be added, and existing formulas can be edited or deleted as needed.

Tip:
The Workshop Tree can be docked. By default, it appears docked on the left-hand side of the Formula Workshop, but you can manually dock it on the right-hand side. In free-floating mode, the Workshop Tree can be dragged to any location in the workshop.

Formula Workshop buttons

The main toolbar in the Formula Workshop is made up of three smaller toolbars. Each of these toolbars contains a set of buttons that is relevant to specific actions: working with the Formula Workshop as a whole, working with the Workshop Tree, or working with an editor. Individual buttons are available or unavailable based on the task you are undertaking. Each toolbar can be moved and docked as you require.

The buttons for the General Toolbar of the Formula Workshop perform the following functions:

	Closes the Formula Workshop after prompting you to save changes. If you save changes, your formula is checked for errors.
	Saves the formula, SQL Expression, or custom function.
	Creates a new formula of the type selected from the list. Also used to create a new custom function or SQL Expression.
	Shows or hides the Workshop Tree.
	Toggles display between Custom Function Editor and Custom Function Properties dialog box. Custom functions and formulas (where possible) are displayed in the selected mode until this button is clicked again.

	Opens the Formula Expert. Use the Formula Expert to help you create a formula based on a custom function. **Note:** This button is not available when creating a custom function.
	Opens online help for the Formula Workshop dialog box.

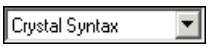
The buttons for the Workshop Tree Toolbar of the Formula Workshop perform the following functions:

	Lets you rename the selected formula, custom function, or SQL Expression.
	Deletes the selected formula, custom function, or SQL Expression.
	Expands the selected node in the Workshop Tree. Also works with multiple node selections.
	Shows or hides report object nodes in the Formatting Formulas folder if the objects do not have formulas associated with them.
	Opens the Add Custom Function to Repository dialog box so you can select the repository to add the custom function to.

	Adds the selected repository custom function to the report.

The buttons for the Expressions Editor Toolbar of the Formula Workshop perform the following functions:

	Tests the syntax of the formula or custom function and identifies syntax errors if they are found.
	Undoes the last action performed.
	Redoes the last action.
	When you select a field from the Report Fields window and click the Browse Data button, a dialog box appears with a list of the values for the selected field. View values for the selected field and select individual values to insert into your formula. **Note:** This button is not available for custom functions.
	Searches the Formula Editor for a specified word, number, or formula string.

	Inserts a bookmark at the beginning of a selected formula line. Click the button again to remove the bookmark.
	Jumps to the next bookmark.
	Jumps to the previous bookmark.
	Deletes all bookmarks in the current formula.
	Arranges all Report Fields, Functions, and Operators trees in alphabetical order.
	Hides or views the Report Fields tree. **Note:** This button is not available for custom functions.
	Hides or views the Functions tree.
	Hides or views the Operators tree.
	Hides or views the result set of a global formula search.
	Allows you to select Crystal syntax or Basic syntax as your formula syntax.

	Allows you to select Exceptions For Null or Default Values For Nulls as a method for dealing with null values in your data.
	Comments out the highlighted selection of a formula. Commented lines are not evaluated as part of the formula.

Working with the Formula Editor

The Formula Editor is a component of the Formula Workshop. Use the Formula Editor to create and modify the content of formulas.

Understanding the sections of the Formula Editor

The Formula Editor contains four main windows.

Window	Description of contents
Report Fields	Report fields contain all database fields accessible for your report. They also contain any formulas or groups already created for the report.

Window	Description of contents
Functions	Functions are prebuilt procedures that return values. They perform calculations such as average, sum, count, sin, trim, and uppercase. Custom functions are also listed in this window.
Operators	Operators are the "action verbs" you use in formulas. They describe an operation or an action to take place between two or more values. Examples of operators: add, subtract, less than, and greater than.
Formula text window	Area where you create a formula.

Choosing the syntax

The Expressions Editor Toolbar of the Formula Workshop contains the drop-down list where you choose either Crystal or Basic syntax for the formula you are creating.

Note:
Changing the syntax from Crystal syntax to Basic syntax or vice versa will change the list of functions in the Functions window as well as the list of operators in the Operators window. The functions and operators differ from syntax to syntax.

The available report fields remain the same since the report fields are available to each syntax.

Setting the default syntax

When you open the Formula Editor, Crystal syntax appears as the syntax default. If you want to change the syntax default, select Options from the File menu, then click the Reporting tab. Choose the preferred syntax from the Formula Language drop-down list and click OK. When you access the Formula Editor, the syntax you selected appears as the default.

Entering formula components

The Report Fields, Functions, and Operators tree at the top of the Formula Editor contain the primary formula components. Double-click any component from these trees to add this component to your formula.

For example, if you set the syntax to Basic syntax and double-click the Operators > Control Structures > Multi-Line If in the Operators tree, the following text is transferred to the Formula text window with the cursor between the If and Then:

```
If | Then
ElseIf Then
Else
End If
```

The above text helps you organize the parts needed to write your formula.

Formula Editor buttons

For a list of the buttons you can use in the Formula Editor, see the Expressions Editor Toolbar section of *Formula Workshop buttons*.

Changing the font size of the Formula Editor

The Options dialog box (File menu) allows you to change the font size and the background/foreground color of text, comments, and keywords in the Formula Editor.

Formula Editor Key Controls

The Formula Editor accepts the following key controls:

Keyboard Combination	Action Performed
Alt+B	Opens Browse dialog box for highlighted field.
Alt+C	Checks formula for errors.
Alt+F	Opens or closes the Shows Field tree.
Alt+M	Comments out or removes comments from current line
Alt+O	Sorts contents of trees.
Alt+P	Opens or closes the Shows Operator tree.
Alt+S	Saves formula without closing Formula Editor.
Alt+U	Opens or closes the Shows Function tree.
Ctrl+A	Selects all.

Keyboard Combination	Action Performed
Ctrl+C	Copies.
Ctrl+End	Goes to the end of the last line of the formula.
Ctrl+F	Opens the Find dialog box (same as clicking the Find or Replace button).
Ctrl+F2	Sets bookmark.
Ctrl+Shift+F2	Clears all bookmarks.
Ctrl+Home	Goes to the beginning of file.
Ctrl+Left Arrow	Goes to the beginning of the left word (+**Shift** key will do the selection).
Ctrl+N	Opens Formula Name dialog box, or another appropriate dialog box, to create a new formula.
Ctrl+S	Saves formula and closes Formula Workshop.
Ctrl+T	Sets focus to the syntax name list box.

Keyboard Combination	Action Performed
Ctrl+Shift+Tab	Changes focus to next control box (reverse order of **Ctrl**-Tab).
Ctrl+Tab	Changes focus to next control box.
Ctrl+V	Pastes.
Ctrl+X	Cuts.
Ctrl+Z	Undoes an action.
Ctrl+Shift+Z	Repeats an action.
Ctrl+Space	Keyword Auto Complete—shows a list of the functions available.
End	Goes to end of line.
Enter	Copies a selected object from a list to the formula text box.
Ctrl+Alt+F2	Goes to next bookmark.
F3	Finds next item as defined in the Find dialog box.
Shift+F2	Goes to previous bookmark.

Creating and modifying formulas

Creating a formula and inserting it into a report

1. On the **View** menu, click **Field Explorer**.
2. In the Field Explorer dialog box, select **Formula Fields** and click **New**.
3. In the Formula Name dialog box, enter the name you want to identify the formula by, and then click **OK**.

   The Formula Workshop appears with the Formula Editor active.
4. On the Expressions Editor Toolbar, choose either Crystal or Basic syntax.

   If you are unsure which syntax to choose see *Formula syntax*.
5. Enter the formula by typing in the components or selecting them from the component trees.

   Tip:

   - Ctrl+Space will bring up a list of the available functions. If you've already started typing it will bring up a list of keywords that are possible matches for what you've already typed.
   - A list of available fields automatically appears when you enter an open brace bracket. Ctrl+Space will bring up the list again if you previously pressed Esc to clear it.
6. Click **Check** to identify any errors in the formula.
7. Fix any syntax errors the Formula Checker identifies.
8. When the formula has the correct syntax, click **Save and close** on the Formula Workshop toolbar.
9. Select the new formula in the Field Explorer dialog box, and drag it to where you want it to appear on your report.

Note:
A formula that is placed on a report is indicated by @ (for example, @ProcessTime) on the Design tab.

Creating a formula in the Formula Expert

The Formula Expert is a component of the Formula Workshop. Use the Formula Expert to create and modify formulas based on custom functions.

Note:
To learn about the Formula Expert's user interface, see Formula Expert in the online help.

To create a formula in the Formula Expert

Note:
Before you begin this procedure, ensure you have a custom function in your report or in the BusinessObjects Enterprise Repository you have access to.

1. On the **Report** menu, click **Formula Workshop**.

   Tip:

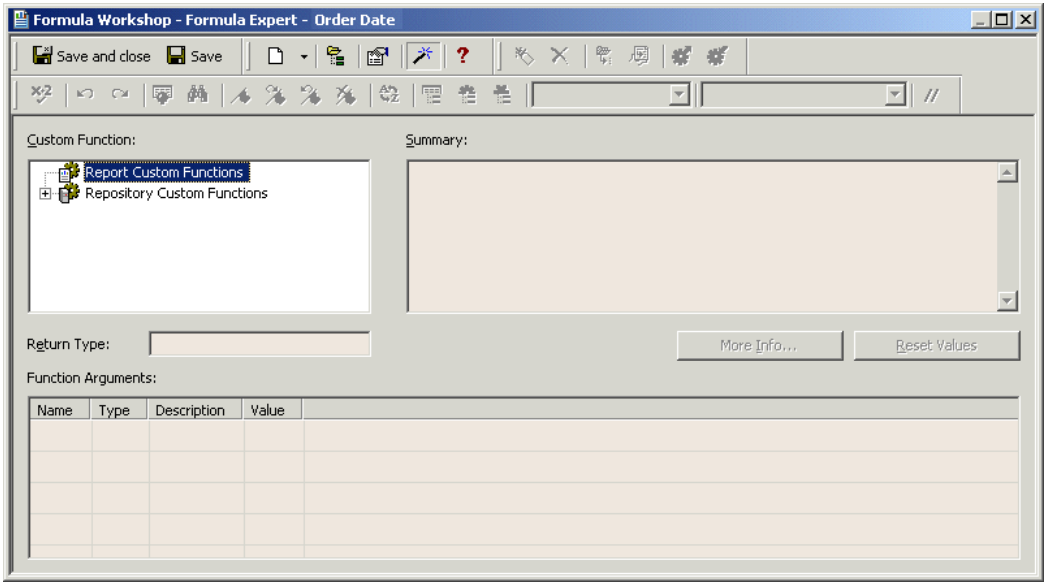
   Another way to do this is to click the Formula Workshop button on the Expert Tools toolbar.

2. Select **Formula Fields** in the Workshop Tree and click **New**.
3. In the Formula Name dialog box, enter the name you want to identify the formula by, and then click **OK**.

   The Formula Expert appears with the Formula Editor active.

4. Click **Use Expert/Editor** on the toolbar.

   The Formula Expert appears.



5. In the Custom Function area, choose the custom function you want to base your formula on.

   You can choose a Report Custom Function (a custom function that exists in the current report) or a Repository Custom Function (a custom function that is stored in the repository).

   Note:
   If you select a Repository Custom Function, that custom function is added to the current report. If that custom function requires other custom functions from the repository, they can be added as well.

6. In the Function Arguments area, specify a value for each argument in the appropriate **Value** field.

   You can enter constant values directly, or you can select predefined values or report fields from the associated list.

7. Click **Save** to save the formula to the Formula Fields folder of the Formula Workshop.

You can now use this formula in your report just as you would use a formula you created in the Formula Editor.

Editing formulas

1. On the **View** menu, click **Field Explorer**.

   The Field Explorer dialog box appears.

2. Right-click the formula you want to edit and choose **Edit**.

   The Formula Workshop appears with the Formula Editor active.

3. In the Formula Editor, edit the formula.
4. Click **Check** to identify any errors in the formula.
5. Fix any syntax errors the Formula Checker identifies.
6. When the formula has the correct syntax, click **Save and close** on the Formula Workshop toolbar.

Searching for formula text

You can use the Find dialog box to carry out a number of different activities:

- Search for text or characters in the Field, Function, or Operator trees.
- Search for text or characters that you want to mark or replace in the formula, Custom Function, or SQL Expression that you have open.
- Search for text or characters across all SQL Expressions in a report.
- Search for text or characters across all formulas and Custom Functions in a report.

When you search for text across all formulas, the results appear in a pane at the bottom of the Formula Workshop. (You can dock the results pane in other locations). When you click an item in the results pane, Crystal Reports opens the appropriate formula and highlights the matching text.

Tip:
You can open the Formula Workshop to search across all formulas from the Field Explorer and from the body of a report. To do this, select a formula field, right-click it, and choose the "Find in Formulas" option.

Copying formulas

To copy an existing formula

Crystal Reports lets you copy an existing formula and then modify it to create a new formula.

1. Choose **View** from the main menu and select **Field Explorer**.

   The Field Explorer dialog box appears.

2. Select an existing formula in the **Formula Fields** list, right-click it, and select **Duplicate** from the shortcut menu.

   Crystal Reports creates a copy of the formula by appending a number to the end of the formula's name.

3. Click **Edit** to modify the formula by changing its definition.

   Note:
   You can also rename the formula in either the Formula Workshop or the Field Explorer.

4. When the formula has the correct syntax, click **Save and close** on the Formula Workshop toolbar.

To copy formulas from online help

Since the formulas you develop using the Formula Editor are text, you can copy useful online formulas directly into the Formula Editor and then modify them to fit your needs.

1. On the **Help** menu, click **Crystal Reports Help**.

   The Crystal Reports online help appears.

2. Click the **Index** tab.
3. Enter formulas in the keyword field and click **Display**.
4. Scroll through the formula topics until you locate the formula you want to copy.
5. Highlight the formula, right-click, and choose **Copy** from the menu.

Windows places a copy of the selected text on the Clipboard.

6. Return to Crystal Reports, choose **View** from the main menu and select **Field Explorer**.

   The Field Explorer dialog box appears.

7. Select **Formula Fields** and click the **New** button.

   The Formula Name dialog box appears.

8. Enter the name you want to identify the formula by, and then click **OK**.

   The Formula Workshop appears with the Formula Editor active.

9. Place the insertion point where you want the text to appear in the **Formula** text box of the Formula Editor and press **Ctrl+V** to paste the text from the Clipboard.
10. Modify the formula by changing the fields, formulas, group fields, conditional statements, and text strings as necessary for use with the data in the new report.
11. When the formula has the correct syntax, click **Save and close** on the Formula Workshop toolbar.

To copy a formula from one report to another

1. Select the formula field you want to copy in the report.
2. On the **Edit** menu, click **Copy**.
3. Open the report you want to copy the formula to.
4. Choose **Paste** from the Edit menu.
5. When the program displays the object frame, drag the formula to the new location.
6. To make changes to the formula, right-click the formula and choose **Edit Formula** from the shortcut menu.

   The Formula Workshop appears with the Formula Editor active.

7. Delete the old values and type in the new values, or select them from the Fields, Functions, and/or Operators tree.
8. Click **Save and close** on the Formula Workshop toolbar when finished.

Key points for editing a copy of a formula

When making changes, use the following points as a guide:

- All fields, formulas, and group fields referenced in the formula copy must actually exist in the new report. This means that any database referenced in the original formula (or a database with the same structure, field names, and alias) must be active in the new report.
- If such a database is not active, you must change the field, formula, and group field references in the formula copy to correspond to elements in your new report.
- If the formula contains conditional elements, make certain that the conditions apply to the data in the new report. For example, if the formula in your old report performed an action when the quantity was greater than 100, make sure that the greater than 100 condition makes sense in the new formula. When modifying a formula, you may find that greater than 10 or greater than 2000 makes more sense with your new data.
- If you are using the formula with new data, and if your report contains statements similar to the following:

```
If {file.FIELD} = "text string"
```

  Make sure that the text strings used in the formula match values that actually exist in the new data.

Deleting formulas

When a formula is created and added to a report, the Report Designer:

- Stores the specification for creating the formula, using the name you assigned to it.
- Places a working copy of that formula at the point you specify in the report. A working copy is any occurrence of the formula in the report.

In order to completely delete formulas, you must delete the specification and all working copies of the formula.

Note:
You cannot delete the specification without deleting all working copies of the formula.

Removing the working formula from your report

1. Right-click the formula you want to delete from the report.
2. Select **Delete**.

Note:
Even after the working copies of a formula have been deleted from the report, the formula specification remains unchanged. The specification is listed in the Field Explorer dialog box. It is available if you wish to enter the formula in the report again.

Deleting the formula specification

1. Choose **View** from the main menu and select **Field Explorer**.

   The Field Explorer dialog box appears.

2. Right-click the formula you want to delete and choose **Delete**.

Note:
A dialog box appears if this formula is currently in use in a report. If you delete this formula, you will delete all references of it in reports. Click Yes to delete.

Debugging formulas

For help on debugging formulas that occur when you save your formula, see the *Debugging tutorial*.

For help on debugging evaluation time errors that invoke the formula editor stack list and assisted debugging, see *Debugging evaluation time errors*.

Debugging evaluation time errors

When the Formula Workshop is being displayed as a result of an evaluation time error, the Workshop Tree will contain a call stack. The root of the tree provides a description of the error which occurred. The nodes in the tree provide the names of the custom functions and/or formulas which were being evaluated when the error occurred. The custom function/formula at the top of the call stack is where the error was detected. The custom function/formula next in the stack has invoked the custom function/formula above it in the stack. If you select a custom function/formula node in the tree, the text of the custom function/formula will be displayed in the editor window and the text of the expression being evaluated when the error occurred will be highlighted. If you expand a custom function/formula node in the tree, the variables being used in the custom function/formula will be shown along with the value they had at the time the error occurred.

Example of an evaluation time error

Using the sample report "Custom Functions.rpt", create a new formula that divides 1 by the result of the @Calendar Days Between function. The function would look like this in Basic syntax:

```
formula = 1/{@Calendar Days Between}
```

It would look like this in Crystal syntax:

```
1/{@Calendar Days Between}
```

Insert this formula into the details section of the report and preview it. You'll get a division by zero error and the formula editor will be invoked with the call stack on the left hand side.

Debugging tutorial

Follow the example below to learn the necessary steps for debugging a formula. After completing this exercise, use the same principles to debug your own formulas.

About this tutorial

- This tutorial uses the Xtreme.mdb sample database.
- This tutorial uses Crystal syntax.
- The following formula is the formula you will test for errors:

```
If ({customer.CUSTOMER NAME} [1 to 2 = "Bi" and
ToText({customer,CUSTOMER ID}) [1] = "6") Or
({customer.CUSTOMER NAME} [1] = 'Ro" and
ToText({customer.CUSTOMER ID}) [1] = "5")
     "PREFERRED CUSTOMER"
Else
     "DOES NOT FIT CRITERIA"
```

If correct, this formula should pick out all customers whose names begin with "Bi" and whose customer IDs begin with "6" as well as those companies whose names begin with "Ro" and whose customer IDs begin with "5". When printing the field, those selections will read "PREFERRED CUSTOMER", while the rest will read "DOES NOT FIT CRITERIA".

You will now break down the formula to check and see that each condition of the formula is working individually.

Formula1

1. To get started, create a report using the Customer table in **Xtreme.mdb** and place the following fields from left to right in the Details section:

   ```
   {customer.CUSTOMER ID}
   {customer.CUSTOMER NAME}
   ```

   To test each portion of the formula, you will place a new formula field next to these two fields in the report.

2. Create a new formula called Formula1.
3. Type the following in the **Formula text** box of the Formula Editor:

   ```
   If {customer.CUSTOMER NAME} [1 to 2 = "Bi" Then
        "TRUE"
   Else
        "FALSE"
   ```

4. Click **Check** to test for errors. You will receive the following error message:

```
The ] is missing.
```

5. Correct the formula by inserting the missing "] " after the 2.
6. Click **Check** again. You will receive the following message:

```
No errors found.
```

7. Click **Save and close** on the Formula Workshop toolbar.
8. Insert the corrected formula field to the right of the two data fields in the Details section of your report.
9. Click **Print Preview** on the Standard toolbar to check the values in the report and compare the fields to see if the field values returned by @Formula1 are correct.

You will find "TRUE" listed next to the customer names that begin with "Bi" and "FALSE" next to all the others. Now you will check the other portions of the formula. Create Formula2, Formula3, and Formula4, by following Steps 1 - 9, using the formulas specified below for each.

Insert each formula field on the same line of the Details section for easy comparison. Check each one for errors, fix as needed, and make sure the values returned are correct before moving on to Formula2.

Formula2

1. Create a new formula called Formula2.
2. Type the following in the **Formula text** box of the Formula Editor:

```
If ToText({customer,CUSTOMER ID}) [1] = "6" Then
     "TRUE"
Else
     "FALSE"
```

3. Click **Check** to test for errors. You will receive the following error message:

```
This field name is not known.
```

4. Correct the formula by replacing the comma (,) in the field name with a period (.).
5. Click **Check** again. The formula should now be error-free.
6. Place the formula to the right of the @Formula1 field.
7. Click **Print Preview** on the Standard toolbar to check the values in the report and compare the fields to see if the field values returned by @Formula2 are correct.

You should see "TRUE" next to all customer numbers that begin with 6 and "FALSE" next to all customer numbers that do not begin with 6.

Formula3

1. Create a new formula called Formula3.
2. Type the following in the **Formula text** box of the Formula Editor:

```
If {customer.CUSTOMER NAME} [1 to 2] = 'Ro" Then
     "TRUE"
Else
     "FALSE"
```

3. Click **Check** to test for errors. You will receive the following error message:

```
The matching ' for this string is missing.
```

4. Correct the formula by changing the single quote (') before Ro to a double quote (").
5. Click **Check** again. The formula should now be error-free.
6. Place the formula to the right of the @Formula2 field.
7. Click **Print Preview** on the Standard toolbar to see the values in the report and compare the fields to check if the field values returned by @Formula3 are correct.

You should see "TRUE" next to all Customer names that begin with "Ro" and "FALSE" next to all Customer names that do not begin with "Ro".

Formula4

1. Create a new formula called Formula4.
2. Type the following in the **Formula text** box of the Formula Editor:

```
If ToText({customer.CUSTOMER ID}) [1] = "5"
     "TRUE"
Else
     "FALSE"
```

3. Click **Check** to test for errors. You will receive the following error message:

```
The word 'then' is missing.
```

4. Correct the formula by typing in the word "Then" at the end of the first line after "5".
5. Click **Check** again. The formula should now be error-free.
6. Place the formula to the right of the @Formula3 field.
7. Click **Print Preview** on the Standard toolbar to see the values in the report and compare the fields to check if the field values returned by @Formula4 are correct.

You should see "TRUE" next to all Customer IDs that begin with 5 and "FALSE" next to all Customer IDs that do not begin with 5.

Now that the formulas are error-free and the field values returned are correct, you will create a formula that links the separate components together. You will begin by linking the first two formulas (@Formula1 and @Formula2) and then you will add @Formula3 and @Formula4 to create the final formula @FinalFormula.

Formula1+2

1. Create a new formula called Formula1+2.
2. Type the following in the **Formula text** box of the Formula Editor:

```
If {customer.CUSTOMER NAME} [1 to 2] = "Bi" and
ToText({customer.CUSTOMER ID}) [1] = "6" Then
     "TRUE"
```

```
Else
     "FALSE"
```

3. Place the formula to the right of the @Formula4 field.

You should see "TRUE" next to each customer whose name begins with Bi and Id begins with 6, and "FALSE" next to all Customer IDs that do not meet this criteria.

If this formula is working correctly, you can create one last formula adding the code from @Formula3 and @Formula4.

FinalFormula

1. Create a new formula called FinalFormula.
2. Type the following in the **Formula text** box of the Formula Editor:

```
If ({customer.CUSTOMER NAME} [1 to 2] = "Bi" and
ToText({customer.CUSTOMER ID}) [1] = "6") or
({customer.CUSTOMER NAME} [1 to 2] = "Ro" and
ToText({customer.CUSTOMER ID}) [1] = "5") Then
     "PREFERRED CUSTOMER"
Else
     "DOESN'T FIT CRITERIA";
```

3. Place the formula where you want it to appear in the Details section of the report. You can now delete all other formula fields from the report. See *Deleting formulas*.

You can use this same process of condition-by-condition testing for any formulas as a means of systematically checking them.

Parameter Fields and Prompts

chapter 23

Parameter and prompt overview

Parameters are Crystal Reports fields that you can use in a Crystal Reports formula. As a formula component, a parameter must have a value before the program can process the report. By using parameters in formulas, selection formulas, and in the report itself, you can create a single report that changes its behavior depending on the values entered by your users. Parameter fields can also be used in subreports.

Prompts are elements that help users set a value for report parameters. Prompts are different from parameters in several ways:

- Prompts are not used directly by a Crystal Reports formula.
- Prompts include user-interface settings that help you determine the appearance of the prompting dialog box that your users see.
- Prompts include an optional list of values that your users can choose from. This list of values can be a static list that is stored in each report, or a dynamic list that is retrieved from a database (this type of prompt includes multi-level cascading lists that are also retrieved from a database).
- Prompts can be set so that the parameter itself is optional.

When your users select values in the prompting dialog box, they are setting values for prompts. The Crystal Reports prompting engine then assigns that value to the corresponding parameter, which is finally used by the report.

When you create and edit a parameter field, you work with one parameter and one or more prompts.

Parameter field considerations

There are a number of things to keep in mind when working with parameter fields:

- Parameter fields support the following data types:
  - Boolean: Requires a yes/no or true/false answer.

    Example: Include planned budget numbers in the summary?
  - Currency: Requires a dollar amount.

Example: Display customers with sales over XXXXX.

- Date: Requires an answer in a date format.

  Example: Enter the start and end dates of the quarter.

- DateTime: Requires both date and time.

  Example: Display statistics for 07/04/1999 between 1:00pm-2:00pm.

- Number: Requires a numeric value.

  Example: Enter the customer identification number.

- String: Requires a text answer.

  Example: Enter the region.

- Time: Requires an answer using a time format

  Example: Display the total number of calls from 1:00pm-2:00pm.

- Parameter field prompting text can be up to four lines long with approximately 60-70 characters per line (depending on character width, up to the 254 character limit). Text over one line in length will automatically word wrap.
- You can create a list of values from which users can choose the parameter value rather than having them enter it manually. Lists of values can be static (embedded in each report), dynamic (refreshed from a database on demand), scheduled (refreshed from a database on a recurring schedule), or partially scheduled (portions of a list of values can be scheduled, while other portions remain on-demand). Scheduled and partially scheduled lists of values are administered through the Business View Manager. For more information, see the *Business Views Administrator's Guide*.
- A parameter field does not have to be placed in a report in order to be used in a record or group selection formula. You create the parameter field and then enter it in your formula as you would any other field.
- A parameter field does not have to be placed in a report in order to be used in a record or group selection formula. You create the parameter field and then enter it in your formula as you would any other field.
- A parameter field can be set to be optional so that users are not forced to enter a value when prompted.

Prompt considerations

There are a number of things to keep in mind when working with prompts:

- Prompts can be static or dynamic. As well, a dynamic prompt can have a cascading list of values. For a description of each option, see these topics:
  - *Creating a parameter with a static prompt*.
  - *Creating a parameter with a dynamic prompt*.
  - *Creating a parameter with a cascading list of values*.
- Dynamic prompts contain lists of values that you can use for a particular report or for many reports. You share a list of values by adding it to the BusinessObjects Enterprise Repository.
- A list of values can be scheduled for automatic updates through the Business View Manager. For more information about scheduling a list of values, see the *Business Views Administrator's Guide*.
- A list of values can form a cascading prompt; that is, you can create a prompt whose final value is determined through a sequence of choices. For example, users might first be prompted to pick a country before the choices for region appear. The users might then need to pick a region before the choices for city appear, and so on.

Data and non-data parameters

Depending on how parameters are used, they are marked as either data parameters or non-data parameters. How these parameters are used within a report will impact whether the report data will refresh upon changing parameter values.

Data parameters are used in:

- Record selection formulas, directly or indirectly (by way of being referenced within a formula)
- Command objects
- Stored procedures
- Universe parameters

Changes made to the value of a data parameter require a report refresh to fetch new data from the database. For example, a report will be refreshed when a data parameter is used to generate a query.

Non-data parameters are used in:

- Saved data selection formulas
- Conditional formulas
- Parameters placed on the report

Changes made to the value of a non-data parameter will filter the saved data of the report and will not require a refresh. This process minimizes the processing demand on the database. For example, a title is a non-data parameter.

Note:
Non-data parameters change the presentation of existing data. It is best to use them only in a way that makes sense for the report. For example, do not filter using a saved data selection formula to display values that are below 100,000 if you have a record selection formula that only selects values above 100,000 from the database. Using selection formulas improperly may provide confusing results, or even blank pages.

Optional parameters

Crystal Reports supports optional parameters. An optional parameter is a prompted value that does not have to be supplied by the user.

Report designers should provide some guidance to the end user that a parameter is optional by adding this information to the prompt text.

Optional parameters are treated by Crystal Reports as optional anywhere within the report that they are used. You cannot set one instance of the parameter to optional and another to mandatory.

Note:

- After you set a parameter to optional, if you use the "Select Expert", the system will automatically add the selection formula for you using the `HasValue()` function.

  The "Formula Workshop Editor" does not automatically add the formula. Only the "Select Expert" automatically adds the formula for you.

- If you change the parameter from optional to mandatory, the `HasValue()` function is not automatically removed from your formula.

Handling a parameter with no value

When the report engine evaluates any formula which references an optional parameter that does not have a value, it generates a runtime error. All formulas that reference an optional parameter should first use the `HasValue()` function to check if that parameter has a value before evaluating it. This includes record selection formulas and saved data formulas.

Note:
The system will not automatically drop a statement from the SQL WHERE clause. It is the report designer's responsibility to decide which statement to leave out based on `HasValue()` testing.

Understanding dynamic prompts

Both dynamic prompts and cascading lists of values are available in Crystal Reports. These features let you populate the lists of values associated with a prompt from a data source outside of your report. (Static lists of values that are stored in your report are also available in Crystal Reports.)

This dynamic capability is available to all Crystal Reports users—whether or not they have the added capabilities of BusinessObjects Enterprise. When Crystal report files are stored in BusinessObjects Enterprise, additional dynamic prompting features are available. The following table shows which features are available with each product.

Note:
In the table, and elsewhere in this section, the term managed report is used to describe reports that are stored in a BusinessObjects Enterprise environment, while unmanaged report is used to describe reports that are stored outside such an environment.

Feature	Available when Crystal reports are stored outside of BusinessObjects Enterprise?	Available when Crystal reports are published to BusinessObjects Enterprise?
Create dynamic prompts and cascading lists of values.	Yes	Yes
Reuse list of value definitions within a single report at design time.	Yes	Yes
Reuse list of value definitions within multiple reports at design time.	No	Yes
Schedule lists of values.	No	Yes
Populate lists of values from command objects.	Yes	No All lists of values that are used by managed reports are based on Business Views; however Business Views can themselves be based on command objects. In this way, lists of values can be indirectly based on command objects.
Populate lists of values from report fields.	Yes	No

Feature	Available when Crystal reports are stored outside of BusinessObjects Enterprise?	Available when Crystal reports are published to BusinessObjects Enterprise?
Populate list of values from Business Views.	No	Yes
Cache lists of values at report run time, and share that list among multiple executing reports.	No	Yes
Schedule lists of values to update themselves on a regular basis.	No	Yes
Schedule portions of lists of values to update themselves on a regular basis, while the remaining portions retrieve their values from the database on demand.	No	Yes

Some components in the Crystal Reports and BusinessObjects Enterprise products support the execution of reports with dynamic prompts and cascading lists of values:

- All viewers except for the Java Applet viewer.

  Note:
  Reports that use dynamic prompts and cascading lists of values run in the Java Applet viewer; they will not, however, have pick lists where dynamic lists of values should appear.

  The supported viewers are as follows:

  - ActiveX
  - .NET Winform
  - .NET Webform
  - Java, COM, and JSF DHTML page viewers
  - Java and COM Advanced DHTML Viewer
- The InfoView and Central Management Console scheduling interfaces in BusinessObjects Enterprise.
- The Report Designer Component (RDC).
- Crystal Reports XI R2 and later.

These components support the design of reports with dynamic prompts and cascading lists of values.

- Crystal Reports XI R2 and later.
- The integrated Visual Studio .NET designer.
- Business View Manager.

Note:
While the dynamic capability is not available with Business Objects Web Intelligence or with full-client products, Crystal reports that are based on universes can use the dynamic prompting capabilities described throughout this section.

Understanding lists of values

List-of-values objects describe how to return a set of values from a data source:

- They provide the values for prompts in the prompting dialog box.
- They can be either static (the values are stored in the report), or dynamic (the values are stored outside the report in a database).
- They are used for both single-level dynamic prompts, and multi-level cascading prompts.

For example, a list of countries could be a dynamic prompt, while a hierarchical list of countries, regions, and cities could be a dynamic prompt with a cascading list of values.

Crystal Reports supports three data sources for list-of-values objects:

- Report fields (only for unmanaged reports).
- Command objects (only for unmanaged reports).
- Business Views (only for managed reports).

A list of values can have one or more levels. If there are multiple levels in the list of values, then each level constrains the next.

You can think of a list of values as the definition of the data needed to populate all levels of a cascading list. In Crystal Reports, a cascading relationship is defined by a single list-of-values object, not by multiple queries that are linked together by a common key. Although the list of values is defined as a single entity, data is not necessarily fetched from the data source in a single query.

Note:

- List-of-values objects are not affected by report record selection or group selection formulas. These formulas affect the report data, not data used for prompt-time lists of values.
- If a data connection is broken or reset, Crystal Reports does not attempt to create or update the dynamic list-of-values object and instead reverts to a static list.

List-of-values types

There are two different types of list-of-values objects:

- Unmanaged lists of values are stored within each report file.

  If you do not have BusinessObjects Enterprise, or if you never publish your reports to BusinessObjects Enterprise, you use an unmanaged list-of-values object. Unmanaged list-of-values objects can use report fields or command objects as a data source.
- Managed lists of values are stored within BusinessObjects Enterprise.

Every report that you store in BusinessObjects Enterprise uses managed list-of-values objects. All managed list-of-values objects are based on a Business View, even if the report itself does not use a Business View. Managed list-of-values objects have a number of features that are not available to unmanaged list-of-values objects.

Feature	Unmanaged list of values		Managed list of values
	Report fields	Command objects	Business Views
Database query per list-of-value level.	Yes The database is queried for each level as the user selects values in the prompting dialog box.	No The database is queried for all values in all levels of the list at one time.	Yes The database is queried for each level as the user selects values in the prompting dialog box (provided the Business View is not based on a command object).
At design time, specify a filter for the list of values.	No All of the values in the report fields that are also in the list of values definition are used.	Yes Any filter that can be represented in SQL can be used.	Yes Business Views support filters.

Feature	Unmanaged list of values		Managed list of values
	Report fields	Command objects	Business Views
At report-view time, prompt for additional information needed by the list of values.	No	Yes If the command object contains parameters, the value(s) are prompted for at report-view time.	Yes If the Business View contains parameters, the value(s) are prompted for a report-view time.
Display different values to different users.	No	No	Yes Because managed lists of values are based on Business Views, they inherit the view-time security capabilities of Business Views.

Feature	Unmanaged list of values		Managed list of values
	Report fields	Command objects	Business Views
Schedule the list of values to update on a recurring schedule.	No	No	Yes The scheduling capability comes from the Business View Manager, not the Central Management Console (CMC) where reports are scheduled.
Partially schedule the list of values to update only certain portions of the list on a recurring schedule.	No	No	Yes

Determining which list-of-values type to use

Different reporting problems require different prompting solutions, depending on the amount of data in the lists of values. This table provides a rough guide to which list-of-values design you should use.

Description	Unmanaged list of values		Managed list of values
	Report fields	Command objects	Business Views
Single-level code tables. (A table that has hundreds of semi-static values in a single level.)	Not well suited. Because report fields cannot be filtered, any filtering of the list that you require must be done outside of Crystal Reports in a database view.	Well suited. You can define filtering within a command object. (That command objects return the data for all levels in the list is not a problem for single-level lists.)	Well suited. You can define filtering within the source Business View.
Multi level-cascading code tables. (A table that has hundreds of semi-static values in multiple levels.)	Well suited. Provided that the data filtering is done outside of Crystal Reports, report fields are well suited to multi-level cascading code tables because they retrieve data one level at a time.	Well suited. Provided that the total data volume for all levels in the list is not too large. If there is too much data, you could encounter performance issues because command-object-based lists of values retrieve data for all levels in one trip to the database.	Well suited. Business-View-based lists of values can support both filtering and level-by-level data retrieval.

Description	Unmanaged list of values		Managed list of values
	Report fields	Command objects	Business Views
Fact tables. (These tables tend to be very large, dynamic tables with millions of values in multiple levels.)	Well suited. Provided that the filtering is done outside of Crystal Reports in a database view, and provided that there is a multi-level hierarchy to the data.	Not well suited. Because command objects retrieve their data in one trip to the database, there could be performance issues when you use them against very large tables.	Well suited. Partially scheduled lists of values excel in this situation, where the semi-static part of the data can be scheduled, and the most dynamic part can be retrieved on-demand.

Lists of values and prompt groups contrasted

Lists of values are the data part of a prompt; the values from your data that your users will see and select from.

Prompt groups, on the other hand, are the presentation part of a prompt. Crystal Reports treats prompt groups as separate objects so that you can share the same list of values with different presentations. For example, you can have a Shipping City prompt, and a Customer City prompt. Perhaps you allow for multiple customer cities, but only a single shipping city in your report. You can design this report so that it uses a single city list of values, but with two different prompt groups (or presentations styles).

For more information about using prompt groups, see *Sharing common lists of values within a report*.

Creating a parameter with a static prompt

A static prompt is one that always contains the same values. For example, if your parameter prompts for a country value, you could create a static prompt because the country list represents a set of values that does not change often.

Use the following steps to create a parameter with a static prompt that lets users see a list of customers that they can select a specific country from.

This procedure is made up of two sets of steps. The first is creating the parameter, and the second is using the Select Expert to incorporate the parameter into the record selection filter.

To create a parameter with a static prompt

1. Open the sample report called **Group.rpt**.

   Sample reports are located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **View** menu, click **Field Explorer**.

   Tip:

   Another way to do this is to click the Field Explorer button on the Standard Toolbar.

   The Field Explorer dialog box appears.

3. Select **Parameter Fields** and click **New**.

   The Create New Parameter dialog box appears.

4. Enter a name for the parameter in the **Name** field (up to 255 alphanumeric characters).

   This example uses Country.

5. Select the appropriate **Type** from the list.

   This example uses String.

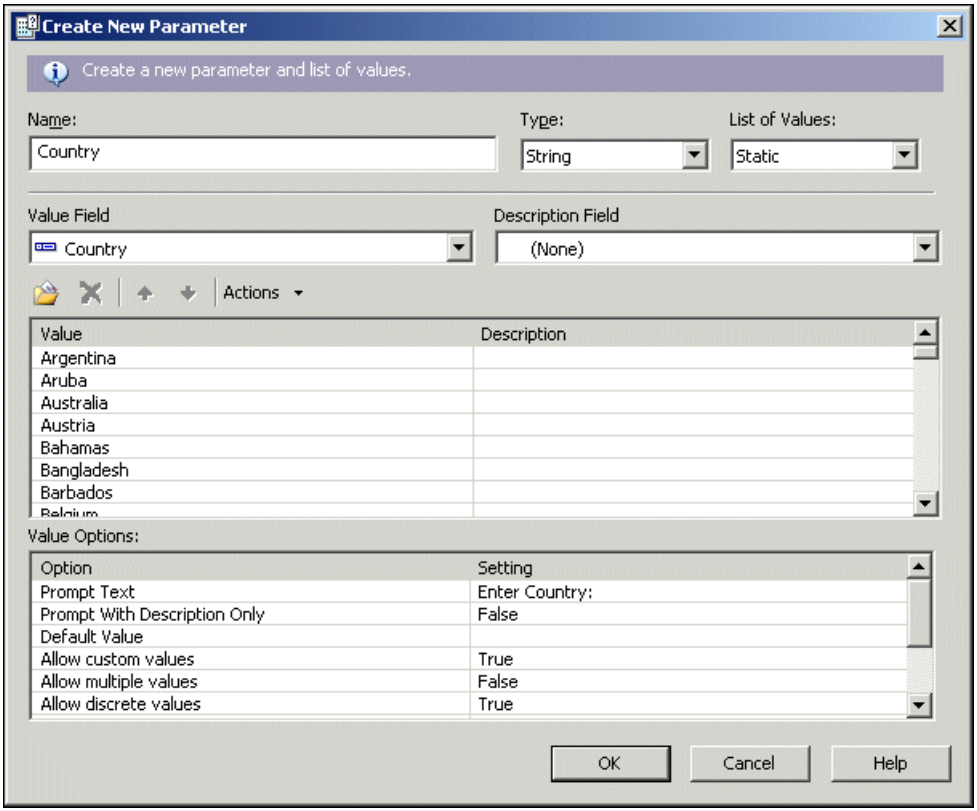
Note:
When creating a parameter whose Type is either Date or DateTime, you can change the date format to suit your needs. For details, see *Changing your default field formats*.

6. From the **Value Field** list, select **Country**.
7. Click **Actions** and select **Append all database values** to move all of the countries in the sample database to the **Values** area.

   This example will enable the user to choose from any of the countries. If you want to limit the selection, manually enter only the countries that you would like the user to choose from.

8. In the Value Options area, enter the desired prompting text in the **Prompt Text** field (up to 255 alphanumeric characters).

   This is the text that appears in the "Enter prompt values" dialog box when the report is refreshed. This example uses the default value.



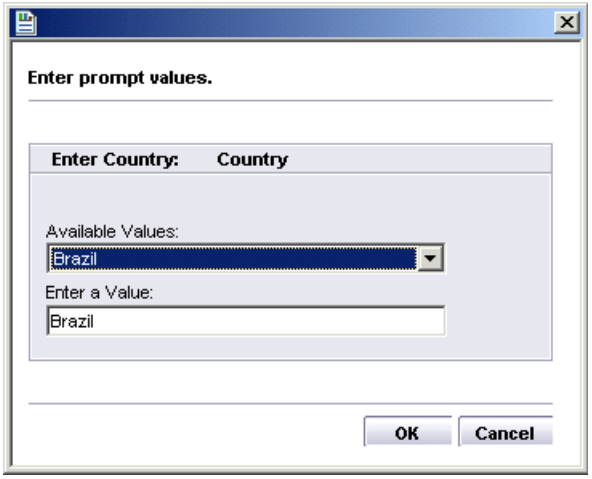
9. Click **OK**.
10. Return to the Field Explorer dialog box, and drag the **Country** parameter into your report.

    The "Enter prompt values" dialog box appears.

    Note:
    If you don't want to see the parameter field you dropped in your report, place it in a section you can suppress, such as a report header or footer.

11. Select the country to base the report on.

    This example uses Brazil.



12. Click **OK**.

To incorporate the parameter into the record selection filter

1. On the **Report** menu, click **Select Expert**.

   Tip:

   Another way to do this is to click the Select Expert button on the Expert Tools toolbar.

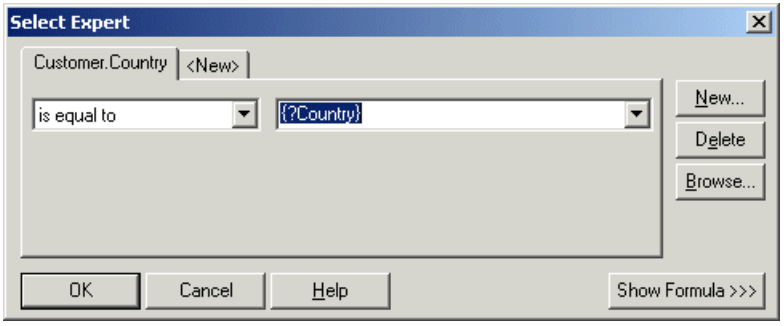
   The Choose Field dialog box appears.

2. Select **Country** from the Customer table, then click **OK**.

   The Select Expert appears.

3. Choose **is equal to** from the drop-down list.
4. Choose the parameter from the adjacent drop-down list.

   This example uses {?Country}.



5. Click **OK**.

   The report appears with the information for Brazil.

With parameter fields, you can create a single report that can be customized quickly to meet a variety of needs.

To incorporate the parameter into a saved data selection formula

1. On the **Report** menu, point to **Select Expert** and then click **Saved Data**.

   The **Choose Field** dialog box appears.
2. Highlight the field on which you want to base record selection and click **OK**.

   The **Select Expert** appears.
3. Use the drop-down lists to enter your selection criteria for the indicated field.
4. Choose the parameter from the adjacent drop-down list and click **OK**.

   If the parameter is being referenced for the first time, the **Enter Values** dialog box appears.
5. Select your initial values and click **OK**.

Crystal Reports immediately filters the report data according to your selection criteria.

Creating a parameter with a dynamic prompt

The values of a dynamic prompt are retrieved from the data source and are not stored within the report. For example, if you are prompting for customer name, you could create a dynamic prompt because the names in your customer database probably change frequently.

Dynamic prompts can be authored in Crystal Reports. You do not need BusinessObjects Enterprise or Crystal Reports Server to author dynamic prompts. When Crystal Reports is installed on the same machine as Microsoft Visual Studio, you can use the embedded Crystal Report designer to author dynamic prompts. When Crystal Reports is used with Crystal Reports Server or BusinessObjects Enterprise, additional features are available. For more information, see *Managed reports*.

Use the following steps to create a parameter that uses a dynamic prompt. As part of the procedure, you will create a list of values.

To create a parameter with a dynamic prompt

1. Open the sample report called **Group.rpt**.

   Sample reports are located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **View** menu, click **Field Explorer**.

   The Field Explorer dialog box appears.

3. Select **Parameter Fields** and click **New**.

   The Create New Parameter dialog box appears.

4. Enter a name for the parameter in the **Name** field (up to 255 alphanumeric characters).

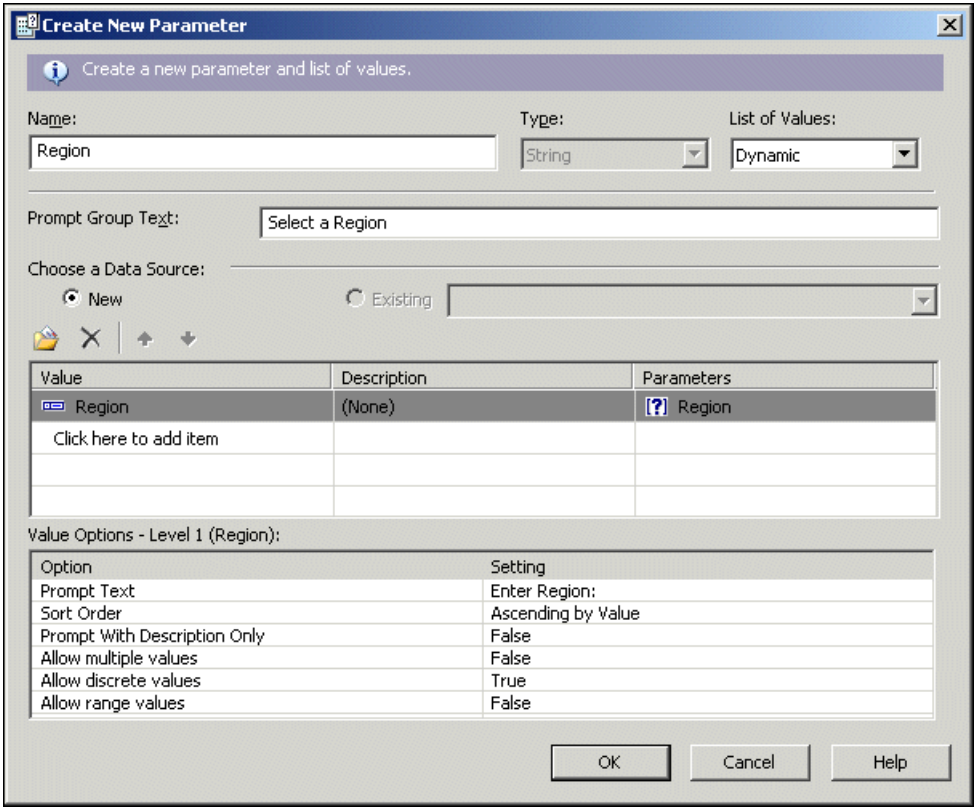
   This example uses Region.

5. In the List of Values area, click **Dynamic**.
6. Ensure that **New** is selected in the Choose a Data Source area.

Note:
If your report already contains a list of values, or if you want to pick a list of values from your repository, you can select Existing and choose an existing list of values from the tree structure.

7. Click **Insert**, and from the **Value** list, select **Region**.
8. In the Value Options area, enter the desired prompting text in the **Prompt Text** field (up to 255 alphanumeric characters).

   This is the text that appears in the "Enter prompt values" dialog box when the report is refreshed. This example uses "Select a Region."



9. Click **OK**.
10. Return to the Field Explorer dialog box, and drag the **Region** parameter into your report.

Note:
If you don't want to see the parameter field you dropped in your report, place it in a section you can suppress, such as a report header or footer.

When you look at your dynamic prompt within Crystal Reports, it does not seem to be much different from a static prompt. In the background, however, Crystal Reports stores the information about the list of values that you created for this prompt. When the report engine requires a parameter that has a dynamic prompt, it will access the data source and populate the list of values automatically. This will be displayed on the end user prompt page. If you choose to publish the report to BusinessObjects Enterprise or Crystal Reports Server, the list of values becomes a separate entity that you can optionally schedule in Business Views Manager.

Creating a parameter with a cascading list of values

A dynamic prompt can include a cascading list of values, which adds additional levels of selection for your users. For example, if you are prompting for a city value, but you also need to know which country and region that city comes from, you could create a dynamic and cascading prompt. In this case, you first prompt for a country, and when that value has been selected, the program prompts for a region by showing only the regions that apply to the selected country. Finally, when a region value has been selected, the program prompts for a city by showing only the cities that apply to the selected region. In this way, you can be sure that your user picks the correct city (for instance, Vancouver, Washington, USA rather than Vancouver, British Columbia, Canada).

As with a dynamic prompt that has only one value, you are able to create or specify a cascading list of values that you can schedule for updates as often as you like through the Business View Manager. For more information about scheduling a list of values, see the *Business Views Administrator's Guide*.

Use the following steps to create a parameter that uses a dynamic prompt and a cascading list of values.

To create a parameter with a cascading list of values

1. Open the sample report called **Group.rpt**.

   Sample reports are located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. On the **View** menu, click **Field Explorer.**

   The Field Explorer dialog box appears.

3. Select **Parameter Fields** and click **New**.

   The Create New Parameter dialog box appears.

4. Enter a name for the parameter in the **Name** field (up to 255 alphanumeric characters).

   This example uses Supplier City.

5. In the List of Values area, click **Dynamic**.
6. Enter prompting text for your prompt group in the **Prompt Group Text** field.

   This example uses "Choose the City that your supplier is located in."

   Note:
   Prompt groups let you use cascading list of values for other cascading prompts. For example, if you set up such a list of values for an address prompt, you might want to use the list for both shipping and billing addresses. In this case, you could create two prompt groups for the same list of values; you might call one prompt group Shipping Address and the other Billing Address.

7. Ensure that **New** is selected in the Choose a Data Source area.

   Note:
   If your report already contains a list of values, or if you want to pick a list of values from your repository, you can select Existing and choose an existing list of values from the tree structure.

8. Click **Insert**.

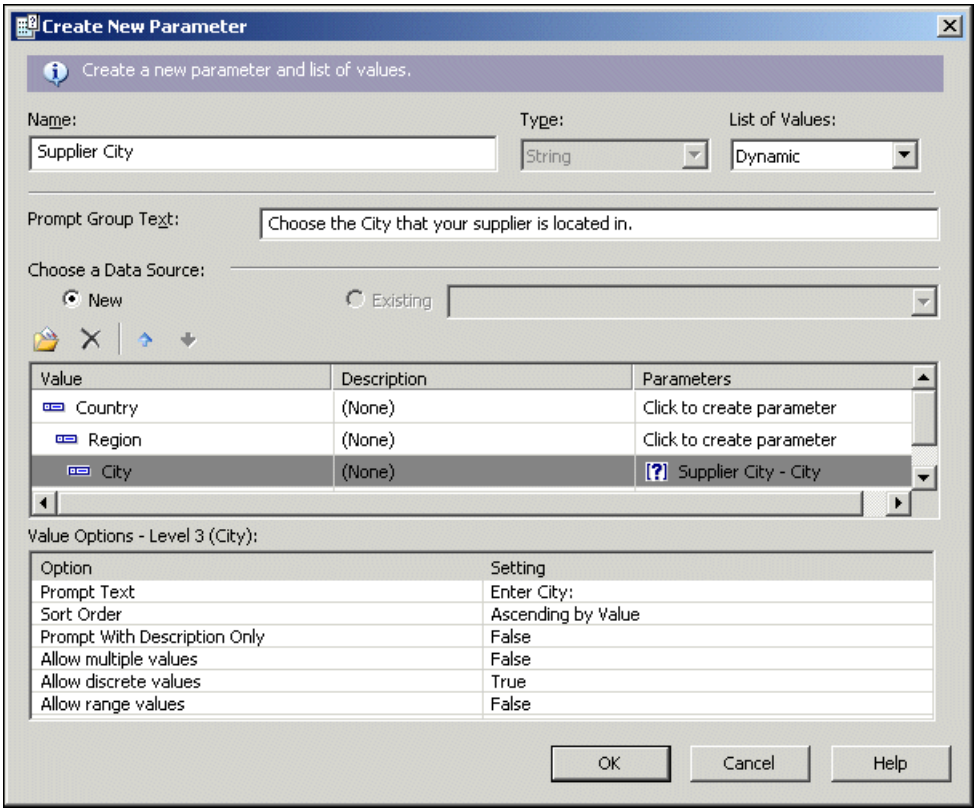
The program automatically expands the Value list. You use this area to define the fields that make up your cascading list of values. This example uses a cascade of Country, Region, and City.

9. From the **Value** list, select **Country**.
10. Click the blank field under **Country** and select **Region**.
11. Click the blank field under **Region** and select **City**.
12. In the Parameters area, click **City** to bind the field that contains the City value to the parameter.

    In this step, you are choosing the field in your cascading hierarchy that should be bound to the parameter field that you are creating. Because this particular parameter is intended to provide Crystal Reports with a city value, you bind the parameter to City.

13. In the **Prompt Text** field (in the Value Options area), enter additional prompting text for each of the fields in your cascading list of values.

    This is the text that appears in the "Enter prompt values" dialog box when the report is refreshed.



14. Click **OK**.
15. Return to the Field Explorer dialog box, and drag the **Supplier City** parameter into your report.

    Note:
    If you don't want to see the parameter field you dropped in your report, place it in a section you can suppress, such as a report header or footer.

The Parameter Panel

The **Parameter Panel** lets users interactively format and filter report data by changing parameter values. It is located within the **Preview Panel**.

In the **Create New Parameter** and **Edit Parameter** dialog boxes, you can specify parameters to display on the Parameter Panel via the **Show on (Viewer) Panel** option. You can choose one of several settings:

- **Do not show**

  The parameter is not visible on the panel. Users must refresh the report to change the parameter values.

- **Editable**

  Users can view and change the parameter values on the panel.

- **Read only**

  Users can view the parameter values on the panel, but cannot change them.

Note:
Do not show is the default setting for a new parameter.

The **Parameter Panel** displays all parameters that have been set to **Editable** or **Read only**. Depending on the type of parameter, users can add, delete, or modify parameter values either by using the dropdown menus and applying their changes or by clicking the **Advanced Dialog** button.

The following are some of the more commonly used types of parameters that must be modified by clicking the **Advanced Dialog** button:

- Parameters with ranged values.
- Dynamic parameters that use cascading prompts.

On the panel, data parameters are differentiated from non-data parameters with a database icon. When a user modifies the value of a data parameter, the report refreshes and accesses the database to make the corresponding changes. When a user modifies the value of a non-data parameter, the report is formatted or filtered based on saved data within the report. It does not access the database.

Working with lists of values

Dynamic prompts use lists of values. You can create a list of values in either Crystal Reports or in the Business View Manager. Crystal Reports refreshes the data in a list of values when you open a report that contains a dynamic prompt; however, you can also refresh the data in a list of values by

scheduling it in the Business View Manager. For more information, see the *Business Views Administrator's Guide*.

You can add lists of values to BusinessObjects Enterprise or Crystal Reports Server in several ways:

- You can create a list of values when you design a report, and then you can save the report to an Enterprise folder. For more information, see *Saving a report to an Enterprise folder*.
- You can create a list of values in the Business View Manager. For more information, see the *Business Views Administrator's Guide*.
- You can create a list of values when you design a report, and then you can add it to BusinessObjects Enterprise through the Central Management Console (CMC) or the Publishing Wizard. For more information, see the *SAP BusinessObjects Enterprise Administrator's Guide*.
- You can migrate lists of values from one environment to another by using the Publishing Wizard, the Import Wizard, or the Business Views Manager Import/Export facility. For more information, see the *SAP BusinessObjects Enterprise Administrator's Guide*.

Sharing common lists of values within a report

You can use a single list-of-values object for many unrelated prompts within a single report. For example, in a report that shows shipments from suppliers to customers, shipments can go from a supplier in one city to a customer in another city. You would want your report to prompt for both supplier city and customer city; both have the same set of values. Because there are many hundreds of cities in the database, you can break up this long list of values into countries, regions, and cities. In that way, your users can navigate through hundreds of values by selecting from three shorter lists.

To share a common list of values within a report

1. Create a report that contains fields for **Country**, **Region**, and **City**.
2. In the Field Explorer, select **Parameter Fields** and click **New**.

   The Create New Parameter dialog box appears.
3. Enter a name for the parameter in the **Name** field.

This example uses SupplierCity.

4. In the List of Values area, click **Dynamic**.
5. Enter prompting text for your prompt group in the **Prompt Group Text** field.

   This example uses "Choose the City that your supplier is located in."

6. Click **Insert**, and from the **Value** list, select **Country**.
7. Click the blank field under **Country** and select **Region**, and then click the blank field under **Region** and select **City**.
8. In the Parameter Binding area, ensure that only the **City** value is bound.
9. Click **OK**.
10. Return to the Field Explorer dialog box, select **Parameter Fields**, and click **New**.
11. Enter a name for the second parameter in the **Name** field.

    This example uses CustomerCity.

12. In the List of Values area, click **Dynamic**.
13. Enter prompting text for your new prompt group in the **Prompt Group Text** field.

    This example uses "Choose the City that your customer is located in."

14. Select **Existing**, and select the list of values that you created in steps 6 through 9.
15. Click **OK**.

You have created two prompts: a Country, Region, City hierarchy for the {?SupplierCity} parameter, and a second Country, Region, City hierarchy for the {?CustomerCity} parameter. By reusing the list-of-values object, you saved time and improved performance time in Crystal Reports.

Note:
You can also use an existing list of values if you have another parameter field that should have a country value. For example, if you add a {?DivisionCountry} parameter to indicate the corporate division that you want to report on, you could use the same list-of-values object in your report. You would bind this parameter to the top-level value in your hierarchy—that is, the Country level of the Country, Region, City hierarchy.

Using separate value and description fields

It is common in relational databases to make use of code fields that represent values. These codes are often numeric or text strings that cannot be read by your users. For such cases, you can create separate value and description fields in your list of values definition. You set the value field to the parameter; the description field appears in the prompting dialog box. How the description field appears in the prompting dialog box is controlled by the prompt option "Prompt with Description Only." When set to True, only the descriptions are visible; when set to False, both the values and descriptions are visible.

To set separate value and description fields

1. Open the sample report called **Group.rpt**.

   Sample reports are located on the Business Objects Technical Support web site *http://support.businessobjects.com/samples/*.

2. In the Field Explorer, select **Parameter Fields** and click **New**.

   The Create New Parameter dialog box appears.

3. Enter a name for the parameter in the **Name** field.

   This example uses Customer Name.

4. In the List of Values area, click **Dynamic**.

5. Click **Insert** and, in the **Value** field, select **Customer ID**.

6. In the **Description** field, select **Customer Name**.

7. In the Value Options area, set the **Prompt with Description Only** option to **True**.

8. Click **OK**.

When your users see this prompt in the prompting dialog box, they do not see values from the Customer ID field (the field on which the parameter is based), but rather, they see a list of customer names.

Using command objects as list-of-values data sources

Crystal Reports supports command objects as data sources for unmanaged lists of values. To use this feature, you first create a command object using the Database Expert to return the values that you want in your list-of-values object.

For more information see "Defining an SQL Command" in the online help.

The query you create should return at least one database field per level in the new list-of-values object. For example, if you want to build a Country, Region, City list-of-values object, your query should return at least three columns from your database: Country, Region, and City. You need to return all three values in a single select statement. There is no need for an order by clause, because the prompting engine sorts the values according to your specifications.

Note:
It is not necessary to link your command object to your report fields. In general, command objects that you use only to populate lists of values do not need to be linked to your report. However, if you want to use a column from this command object in your report, you need to link the command object to the report.

All the command objects defined in your report appear in the value fields drop-down list, and in the description fields drop-down list in the Create New Parameter dialog box. You can then associate your list of values with the command object.

Null handling

Null values in the data returned by the list of values are displayed as "null" in the drop-down list for that prompt. Your users can select these values, and any parameters associated with that prompt receive the null value. You can test for this functionality in the Crystal Reports formula language with the IsNull function.

For more information, see "IsNull (fld)" in the online help.

Long lists of values

Because the number of items in a list of values (LOV) can be very large, numbering in the hundreds or thousands, Crystal Reports handles these long LOVs by retrieving smaller batches of values at a time.

Crystal Reports displays a single batch of LOVs, and provides two options to the user to control the list: the batch number and a simple text filter for limiting the number of items in the list.

The default number of items per batch retrieved in a long LOV is 200; however, you can change this default number.

Changing the number of items in a long LOV

There are two methods for changing the number of items in a long LOVs.

When prompting the user, Crystal Reports retrieves the long LOV batch size from this Windows registry location:

`HKEY_CURRENT_USER\Software\Business Objects\Suite 12.0\Crystal Reports\ReportView`

If it does not already exist, create the DWord value called `PromptingLOV BatchSize`, and set the value to the number of items in a batch.

Note:
Be careful to select **Decimal** as the base value before entering the batch size.

You can create or change a parameter in the Tomcat configuration file to set the batch size for long LOVs. Open the following file:

`{`*`CR_install_folder`*`}/Tomcat/webapps/CrystalReports/WEB-INF/web.xml`

If it does not already exist, create this parameter:

```
<context-param>
  <param-name>crystal_max_number_list_of_values</param-name>
  <param-value>{number}</param-value>
</context-param>
```

Where `{number}` in the above example is the number of items in the batch.

Best practices for prompting

Unmanaged reports

Unmanaged reports are reports that you store outside of BusinessObjects Enterprise. These reports can use lists of values that you define within the report, or lists of values that you have stored in the BusinessObjects Enterprise Repository. (You create report lists of values in Crystal Reports when you use the Create New Parameter dialog box. You create repository lists of values in the Business Views Manager.)

Lists of values defined within a report have the following properties:

- They can be based on command objects or report fields.
- They are always stored within the .rpt file.
- They cannot be shared between reports.

If your unmanaged report also uses a repository-based list of values, the report will prompt you to log on to the repository whenever it is opened. This process is required so that Crystal Reports can locate the list-of-values object.

To maximize performance and scalability of unmanaged reports, you should reuse list-of-value objects within a single report wherever possible. For information about how to do this, see *Sharing common lists of values within a report*.

Managed reports

Managed reports are reports that you store within BusinessObjects Enterprise.

Lists of values used in managed reports have the following properties:

- They are always stored in the repository.
- They can be shared between reports.
- They are based on Business Views.

To maximize performance and manageability of your managed reports, the following practices are recommended:

- Define your list-of-values objects in Business View Manager, not Crystal Reports.
- Build a separate Business View to provide lists of values for all of your reports. The only fields that you need in this Business View are those that you use for prompting. See the *Business Views Administrator's Guide* for information about how to create a Business View.
- Create managed list-of-values objects for each dynamic prompt that you intend to use in your report. These objects are visible to Crystal Reports users when they design parameters and prompts. If you need a list of values for a Country > Region > City hierarchy, and a Country pick list, you can satisfy both needs with a single list-of-values object.

Defining your list-of-values objects in Business View Manager has the following benefits:

- You have control over the metadata that is used to define the prompting list of values.
- You can apply row-level security (if desired) to the Business View that is used for prompting.
- You can separate metadata design from report design. A metadata designer can be responsible for authoring the list-of-values definitions, and the report designer can be responsible for authoring the report.
- This method minimizes the number of metadata objects you need to create to support prompting.

Converting unmanaged reports to managed reports

You can convert an unmanaged report to a managed report in the following ways:

- Publish one or more reports with the Publishing Wizard.
- Save the report to BusinessObjects Enterprise using the Crystal Reports Save As command.
- Create a new report object from within the InfoView portal.

- Create a new report object from within the Central Management Console portal.

In all of these cases, these actions are carried out on the prompt object in your unmanaged report:

- List-of-values objects that are defined in the report are converted to repository lists of values. A Business View, Business Element, Data Foundation, and Data Connection object is created.
- If the same list-of-values object already exists in the repository, no duplicate object is created. Instead, your report references the existing list-of-values object.
- List-of-values objects that are repository-based are unchanged.
- Prompt groups that are defined in the report are converted to repository prompt groups.
- Prompt groups that are repository-based are unchanged.
- All of the new repository-based Business View objects, list-of-values objects, and prompt-group objects are created in the repository folder called Dynamic Cascading Prompts.

Deploying managed reports with dynamic prompts

Repository-based lists of values and prompt groups are repository objects like any other. When managed reports are migrated from one repository to another using the Import Wizard, the list-of-values and prompt-group objects are imported as well. This functionality makes it easy to migrate reports from system to system. BusinessObjects Enterprise tracks the objects that a report depends on, and imports these objects to the destination system if needed.

Business Views Manager has been enhanced to support the import and export of lists of values and prompt groups. For more information, see the *Business Views Administrator's Guide*.

Deleting parameter fields

There are several methods for deleting parameters within a report. The type of parameter you are deleting determines the method you can use.

To delete a parameter that is not used in a formula

1. On the **View** menu, click **Field Explorer**.

   The Field Explorer appears.
2. Expand the **Parameter Fields** folder and click the parameter you want to delete.
3. Click **Delete**.

   If the parameter is used in your report, a Crystal Reports dialog box appears confirming whether you want to delete the parameter.
4. Click **Yes**.

   This parameter is removed from the Parameter Fields folder and from your report.

To delete a parameter used with the Select Expert

1. On the **Report** menu, click **Select Expert**.

   Tip:
   Another way to do this is to click the Select Expert button on the Expert Tools toolbar.

   The Select Expert dialog box appears.
2. Choose the tab whose selection criteria uses the parameter you want to delete.
3. Click **Delete**.
4. Click **OK** to close the Select Expert.
5. On the **View** menu, click **Field Explorer**.
6. Expand the **Parameter Fields** folder and click the parameter you want to delete.
7. Click **Delete**.

To delete a parameter that is used in a formula

1. On the **View** menu, click **Field Explorer**.

   The Field Explorer appears.
2. In the **Formula Fields** folder, select the formula that contains the parameter you want to delete.
3. Click **Edit** and delete the parameter field from the formula.

   Note:
   If the parameter is used in more than one formula, it must be deleted from each formula.
4. Close the Formula Workshop.
5. Expand the **Parameter Fields** folder and click the parameter you want to delete.
6. Click **Delete**.

Responding to parameter field prompts

Previewing a report for the first time

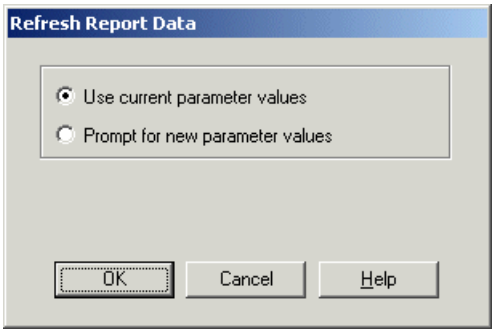
When you preview a report for the first time, the Enter Prompt Values dialog box appears, prompting you for a value.

- If you specified a default value when you created the parameter field, the program will use that value unless you specify a new one.
- If you did not specify a default value, the program will not refresh the data until you supply a new value.

Note:
If the parameter is a string value type, without a default value, and the "Allow discrete values" field is True, an empty string appears.

Refreshing report data

When you refresh data from the Preview tab, the Refresh Report Data dialog box appears.



Select the "Use current parameter values" option to use the current parameter value.

Select the "Prompt for new parameter values" option to enter a new parameter value. When you select this option and click OK, the Enter Prompt Values dialog box appears.

- Enter String values exactly as they will appear in the field. If the parameter field allows multiple values, you can enter additional parameter values using the Add button.
- Enter Boolean values using the following format: TRUE or FALSE.
- Enter Number values exactly as they will appear in the field.
- Enter Currency values exactly as they will appear in the field.
- Enter Date values to match the format used on-screen. If the format is unspecified, enter as Date (Year, Month, Day). For example, Date (1997, 5, 21). To access the calendar, click the drop-down arrow beside the date.
- Enter Time values to match the format used on-screen. If the format is unspecified, enter as Time (Hour, Minutes, Seconds AM/PM). For example, Time (4:32:12 PM). You can also select the unit of time and then use the up and down arrows to scroll through the numbers.

- Enter DateTime values using the following format: Date (Year, Month, Day), Time (Hour, Minutes, Seconds AM/PM). For example, Date (1997, 5, 21), Time (4:32:12 PM). You can also enter DateTime values by using the associated drop-down arrow to access the calendar, and the up and down arrows to scroll through the time.

  Note:
  The drop-down arrow to access the calendar for dates and the up and down arrows to scroll for times will only be available if you have the correct version (4.70 or later) of comctl32.dll.

To use the current value displayed, click OK, or, to use a different value from the one displayed, type a new value in the text box, and click OK.

- If the parameter field is range limited, then you can only enter values within a certain range. The range limit is specified in the Set Default Value dialog box when creating or editing a parameter.
- If the parameter is a string value type, you can limit the values the user is able to enter by using the length limit option or by using an edit mask to restrict the format.

The program now runs the report using the new value(s) you specified.

Advanced parameter features

There are a variety of ways that parameters can be used within a report. This section covers some of the advanced methods of using parameters.

Creating a parameter with multiple prompting values

1. On the **View** menu, click **Field Explorer**.
2. Select **Parameter Fields** and click **New**.
3. Enter a Name for your parameter.
4. Select a value type from the Type list.
5. From the **Value Field** list, select the table and field that you want to use to obtain your prompting values.

6. Add the values from the field you selected by clicking **Actions** and choosing **Append all database values**.

   You can also import values, or you can create your own in the Value area under the Options button.

7. In the Value Options area, select the **Allow multiple values** option and set its value to **True** to enable your uses to enter more than one prompting value for this parameter.

   Both discrete and range type values are allowed individually or in combination.

   Note:
   For details on single or range values, see *Specifying single or ranges of values*.

8. Click **OK**.

Applying conditional formatting using parameter fields

Parameter fields can be used to create conditional formatting formulas. You can customize these formulas whenever you refresh the report data. A conditional formatting formula could be used for color-flagging data that meets certain conditions. For example:

- Sales representatives who sell more than 10% over quota.
- Customers who have not ordered in the last quarter.
- Inventory items that have not had any movement in the last month.

If the conditions under which you flag these items never change, you do not need to use parameter fields. You can just use formulas (for text flags) or conditional formatting (for border flags). However, to change the conditions from report to report, you need to use parameter fields in formulas and conditional formatting formulas.

To apply conditional formatting using parameter fields

1. Create the parameter field of the data type you need for the formula.

2. Create the formula and use the parameter field in place of the fixed value you would normally use.

   For example, to be prompted for all the customers whose last year's sales were over a certain value, and to print their names in red, select the Last Year's Sales field and click Format from the Expert Tools toolbar.

   The Format Editor appears.

3. Click the Conditional formula button next to the Color property on the **Font** tab, and format the field using a conditional formatting formula like this:

```
If {customer.LAST YEAR'S SALES} > {?SalesTarget} Then

     Red
Else
     Black
```

Now, when you refresh the data, the program will prompt you for the value that triggers the color flag (known as the threshold value). It then runs the report and flags all the customers that had sales last year above the threshold figure. You can change the figure each time you run the report and the program will flag a different set of Customer Names.

For more information see "Conditional formatting functions" in the online help.

Creating a report title using parameter fields

Crystal Reports allows you to use parameter fields to create a report title that can be changed each time the report is refreshed.

To create a report title using parameter fields

1. On the **View** menu, click **Field Explorer**.

   The Field Explorer appears.

2. Select **Parameter Fields** and click **New**.

The Create New Parameter dialog box appears.

3. Type a name for the parameter field in the **Name** field.
4. Select String from the **Type** list.
5. To specify a default title, click **Click here to add item** in the Value area and type the desired text.

   Continue adding titles as required.

6. Click **OK**.
7. Return to the Field Explorer, and then place the parameter field in the Page Header section of the report to have the title appear on every page, or in the Report Header section if you want the title to appear on only the first page of the report.

Now, when you refresh the data, the program will prompt you for a report title. If you wish, you can change the title each time you run the report.

Specifying single or ranges of values

You can create parameters that require users to enter a single (discrete) value, or a range of values. If you then include these parameters in your report's record selection, you can help users find specific information. For example, in the case of a record selection parameter than uses a discrete value, a user might enter a single country name to see sales figures for only that country. In the case of a record selection parameter that uses a range of values, a user might enter a range of countries (for example, Canada and France) to see sales figures for all the countries in the range (in this case, Chili, China, Denmark, England, and so on).

To specify single or range values

1. Select the **Allow discrete values** option or the **Allow range values** option to specify whether the parameter field will accept a range of values.
   - If you select "Allow discrete values," the parameter field will accept single values (rather than ranges of values).
   - If you select "Allow range values," then when you are prompted for parameter values, you can enter a start value and an end value. For example, if you enter the values "5" and "10", the range is 5-10, and

a report that uses this parameter for record selection will display all records with values between 5 and 10. This also works for string parameter fields. With a start value of "A" and an end value of "E", a report that uses this parameter for record selection will display all records within an alphabetical range of A-E.

Note:
If the "Allow multiple values" and the "Allow discrete values" options are selected, the parameter field will accept multiple single values. In this case, you can enter more than one value, but these values will be evaluated individually and will not be interpreted as a range. If the "Allow multiple values" and "Allow range values" options are selected, the parameter field will accept multiple ranges.

2. If applicable, select the **Min Length** and/or **Max Length** options to designate the length of the field.
   - For a Currency or Number parameter field, options for entering the "Min Value" and "Max Value" appear.
   - For a Date, DateTime, or Time parameter field, options for entering the "Start" and "End" values appear.

Incorporating a parameter into a formula

1. On the **View** menu, click **Field Explorer**.

   The Field Explorer appears.

2. Select **Parameter Fields** and click **New**.

   The Create New Parameter dialog box appears.

3. Create a parameter field and save it.
4. Select **Formula Fields** and click **New**.

   The Formula Name dialog box appears.

5. Enter the name of the formula, and then click **OK**.

6. Create a formula using the parameter field as you would any constant value. For example, rather than creating a formula that hard-codes the country name:

   ```
   {customer.COUNTRY} = "USA"
   ```

   Use a parameter field instead of "USA".

   ```
   {customer.COUNTRY} = {?Country}
   ```

   To do this double-click the database field, press =, then double-click the parameter.

   Tip:
   Identify parameter fields easily by looking for (?).

7. Click **Save and Close** on the Formula Workshop.

   The Field Explorer dialog box appears. The name of the formula you have just created is highlighted in the Formula list box.

8. Drag and drop the formula into the report.
9. Click **Refresh** to generate the report.

   A dialog box appears, prompting you for values.

Defining sort order using parameter fields

To set the sort order using parameter fields, you need to first create a formula that includes a parameter field and then sort based on that formula. For example, assume that you have a customer list report based on the Customer table. For each customer, you show the Customer Name, City, Region, Country, and Phone Number. You want to be able to sort the report by Country, by Region, or by City, depending on your needs at the time.

1. Create a parameter field and call it **SortField**.
2. Select **String** from the **Type** list.

   You may want to limit the number of characters the user can type to one.

3. To do this, type the numeral 1 into the **Min Length** and **Max Length** text boxes and click **OK**.

Now the parameter field will only accept single-character values. The field will accept "C" as a value, but not "City."

4. In the **Prompting Text** field, enter a prompt similar to this:

```
Type R to sort by Region or C to sort by City; other
wise, data will be sorted by Country.
```

5. Create a formula similar to this and call it **Sort**:

```
If {?SortField} = "C" Then {customer.CITY}
Else
     If {?SortField} = "R" Then {customer.REGION}
     Else
          {customer.COUNTRY}
```

This formula prompts for a value for the parameter field {?SortField}. If you enter "C", the formula will sort by the City field. If you enter "R" it will sort by the Region field. If you enter anything else, or do not enter anything at all, the formula will sort by the Country field.

For more information see "If statements" in the online help.

6. Place the formula in the Report Header section of the report and select **Suppress (No Drill-Down)** in the Section Expert so that it does not print.
7. Click **Sort Records**.
8. Choose your formula and click **Add**.
9. Click **OK**.

Now when you run the report, the program will prompt you for a sort field, the formula will return a value based on your selection, and the sort facility will use that value as your sort field.

Defining entry type and format using the Edit Mask

1. On the **View** menu, click **Field Explorer**.
2. Select **Parameter Fields** and click **New**.

   The Create New Parameter dialog box appears.
3. Enter the Name and value Type.

4. For a string parameter field, you can choose to enter an edit mask in the **Edit mask** field, rather than specifying a range.

   An edit mask can be any of a set of masking characters used to restrict the values you can enter as parameter values (the edit mask also limits the values you can enter as default prompting values).

   You can enter any of the following masking characters, or any combination of them:

   - "A" (allows an alphanumeric character and requires the entry of a character in the parameter value).
   - "a" (allows an alphanumeric character and does not require the entry of a character in the parameter value).
   - "0" (allows a digit [0 to 9] and requires the entry of a character in the parameter value).
   - "9" (allows a digit or a space, and does not require the entry of a character in the parameter value).
   - "#" (allows a digit, space, or plus/minus sign, and does not require the entry of a character in the parameter value).
   - "L" (allows a letter [A to Z], and requires the entry of a character in the parameter value).
   - "?" (allows a letter, and does not require the entry of a character in the parameter value).
   - "&" (allows any character or space, and requires the entry of a character in the parameter value).
   - "C" (allows any character or space, and does not require the entry of a character in the parameter value).
   - ". , : ; - /" (separator characters). Inserting separator characters into an edit mask is something like hard coding the formatting for the parameter field. When the field is placed on the report, the separator character will appear in the field object frame, like this: LLLL/0000. This example depicts an edit mask that requires four letters followed by four numbers.
   - "<" (causes subsequent characters to be converted to lowercase).
   - ">" (causes subsequent characters to be converted to uppercase).

- "\" (causes the subsequent character to be displayed as a literal). For example, the edit mask "\A" would display a parameter value of "A." If the edit mask is "00\A00," then a valid parameter value would consist of two digits, the letter "A," and then two additional digits.
- "Password". Allows you to set the edit mask to "Password," you can create conditional formulas specifying that certain sections of the report become visible only when certain user passwords are entered.

Note:
Some of the edit mask characters require that you enter a character in their place (when entering a parameter value), while others allow you to leave a space, if needed. For example, if the edit mask is 000099, you can enter a parameter value with four digits, five digits, or six digits, since the '9' edit mask character does not require the entry of a character. However, since '0' does require such an entry, you could not enter a parameter value with less than four digits.

5. Click **OK**.
6. Return to the Field Explorer, and drag the parameter into the report.

Creating a saved-data record filter using parameter fields

You can design your report so that users can filter fields and records without refreshing information from the database. Saved-data record filters combine the use of saved data selection formulas and the **Parameter Panel**.

This feature is particularly useful for several reasons:

- It allows users to filter and re-filter report data without leaving the canvas of the report.
- It eliminates processing demand on the database.
- It reduces the time users spend waiting for data to be filtered.
- It allows users to filter records in the report even if they do not have a connection or rights to access the database at the time of viewing.

When planning to include a saved-data record filter in your report, it is important to consider the following points:

- To prevent report refreshing to the database, only non-data parameters should be added to the **Parameter Panel**.

- Exported reports retain all recently applied parameter changes.
- Sub-report parameters cannot be shown on the **Parameter Panel**.

To create a saved-data record filter using parameter fields

- Combine the tasks below to create an interactive saved-data record filter.
  a. Create a parameter appearing on the Parameter Panel
  b. Incorporate a parameter into a saved data selection formula

Related Topics

- *To create a parameter appearing on the Parameter Panel*
- *To incorporate the parameter into a saved data selection formula*

To create a parameter appearing on the Parameter Panel

1. On the **View** menu, click **Field Explorer**.

   Tip:

   Another way to do this is to click the **Field Explorer** button on the **Standard Toolbar**.

   The **Field Explorer** dialog box appears.

2. Select **Parameter Fields** and click **New**.

   The **Create New Parameter** dialog box appears.

3. Enter a name for the parameter in the **Name** field (up to 255 alphanumeric characters).
4. Select the appropriate **Type** from the list.

   Note:
   When creating a parameter whose Type is either Date or DateTime, you can change the date format to suit your needs.

5. From the **Value Field** list, select a value.

6. Click **Actions**, and select **Append all database values** to move all of the applicable values to the **Values** area.

   This example will enable the user to choose from any of the values. If you want to limit the selection, manually enter only the values that you would like the user to choose from.

7. Select **Editable** from the **Show on (Viewer) Panel** list.

   This example will enable the user to edit the parameter value on the **Parameter Panel**. If you want to show the parameter on the panel, but do not want to allow the user to edit it, select **Read only** for this option.

8. Click **OK**.
9. Return to the **Field Explorer** dialog box, and drag the parameter onto your report.

   The **Enter prompt values** dialog box appears.

   Note:
   If you don't want to see the parameter field you dropped in your report, place it in a section you can suppress, such as a report header or footer.

   Tip:
   You don't need to drag the parameter onto the report if you plan on referencing it in a conditional formatting formula or a selection formula. If you have set the parameter options to **Editable** or **Read only** on the **Parameter Panel**, using the parameter in a formula will automatically activate it on the panel.

The parameter now appears on the **Parameter Panel**.

To incorporate the parameter into a saved data selection formula

1. On the **Report** menu, point to **Select Expert** and then click **Saved Data**.

   The **Choose Field** dialog box appears.

2. Highlight the field on which you want to base record selection and click **OK**.

   The **Select Expert** appears.

3. Use the drop-down lists to enter your selection criteria for the indicated field.

4. Choose the parameter from the adjacent drop-down list and click **OK**.

   If the parameter is being referenced for the first time, the **Enter Values** dialog box appears.

5. Select your initial values and click **OK**.

Crystal Reports immediately filters the report data according to your selection criteria.

Adding dynamic grouping using parameter fields

You can design your report so that users can change the grouping presentation of the report without refreshing information from the database. For instance, users can move from a customer-focused view of the report to either a region-focused or an order-focused view. Dynamic grouping combines the use of group selection formulas and the **Parameter Panel**.

To add dynamic grouping using parameter fields

1. Create a report using the sample data, Xtreme.mdb, and place the following fields from left to right in the Details section:

```
{Customer.Customer Name}
{Customer.Country}
{Orders.Order ID}
{Orders.Order Date}
{Orders.Order Amount}
```

2. Create a new parameter field and call it **GroupBy**.
3. Select **String** from the **Type** list.
4. Add the following values to your parameter:
   - Customer
   - Country
   - Order
5. Select **Editable** from the Show on (Viewer) Panel list, and click **OK**.
6. Create a new formula field and call it **GroupField**.
7. Type the following formula into the **Formula** text box.

```
 If {?GroupBy} = 'Customer' then
{Customer.Customer Name}
```

```
 Else if {?GroupBy} = 'Country' then
{Customer.Country}
 Else if {?GroupBy} = 'Order' then
ToText({Orders.Order ID})
```

Note:
Crystal Reports formulas do not allow conditions to return different data types. Both the Customer Name and Country fields return strings, so the ToText function must be used to convert the Order ID from a number to a string as well.

8. Save your formula and close the **Formula Workshop**.
9. In the **Group Expert**, select the **GroupField** formula as your group field, and click **OK**.
10. Customize summary fields and section formatting as you like.

Users can now change the grouping presentation of the report by modifying the **GroupBy** parameter value on the **Parameter Panel**.

Note:
Changing parameter values will not cause a database refresh as long as the parameter is a non-data parameter.

Related Topics

- *Data and non-data parameters*

Subreports

chapter 24

What are subreports?

A subreport is a report within a report. The process for creating a subreport is similar to the process of creating a regular report. A subreport can have most of the characteristics of a report, including its own record selection criteria. The only differences between a subreport and a primary report are that a subreport:

- Is inserted as an object into a primary report; it cannot stand on its own (although a subreport can be saved as a primary report).
- Can be placed in any report section and the entire subreport will print in that section.
- Cannot contain another subreport.
- Does not have Page Header or Page Footer sections.

There are four instances in which a subreport would typically be used:

- To combine unrelated reports into a single report. See *Combining unrelated reports by using subreports* .
- To coordinate data that cannot otherwise be linked. See *Using subreports with unlinkable data*.
- To present different views of the same data within a single report. See *Showing different views of the same data in a report*.
- To perform one-to-many lookups from a field that is not indexed on the lookup field.

  For more information, see "One-to-many links" in the online help.

Note:
You can increase the performance of reports containing subreports by using on-demand subreports instead of regular, in-place subreports.

Unlinked vs. linked subreports

Unlinked

Unlinked subreports are free-standing; their data is not in any way coordinated with the data of the primary report.

In unlinked subreports, there is no attempt to match up the records in one report with records in the other. An unlinked subreport does not have to use the same data as the primary report; it can use the same data source or a different data source entirely. In addition, the subreport is not limited to reporting on a single table. An unlinked subreport can be based on a single table or on multiple tables. Regardless of the underlying data sources, the reports are treated as unrelated.

Linked

Linked subreports are just the opposite; their data is coordinated. The program matches up the records in the subreport with records in the primary report. If you create a primary report with customer information and a subreport with order information and link them, the program creates a subreport for each customer and includes in that subreport all the orders for that customer.

Database links vs. subreports in one-to-many situations

When two tables in a report have a one-to-many relationship, the program retrieves the data in different ways depending on:

- Data source.
- Index situation.
- Record selection criteria.
- Whether you are creating a single report based on linked tables or a primary report that contains a subreport.

When you are considering whether to use a subreport or linked tables, you need to understand the ramifications of each. These issues are discussed fully in *Performance considerations in one-to-many links*.

As a general rule, if you have indexed tables, linked indexed fields, or range limiting record selection criteria based on the indexed fields, the program needs to read the same number of records whether you are linking tables in a single report or using subreports. Since each subreport is run as a separate report, linked tables may have a performance advantage. See *Indexed tables*.

How subreport linking works

When you link a subreport to a primary report, the program creates the link by using a parameter field.

When a subreport link field is selected, the program creates:

- A parameter field in the subreport which is then used to retrieve values passed to it by the primary report.
- A record selection formula for the subreport using the parameter field.
- The selection formula limits the subreport to those records in which the link field is equal to the parameter field value.

When the report is run, the program finds the first primary field record it needs and passes the value in the link field to the parameter field in the subreport. The program then creates the subreport with record selection based on the parameter field value. Here is an example:

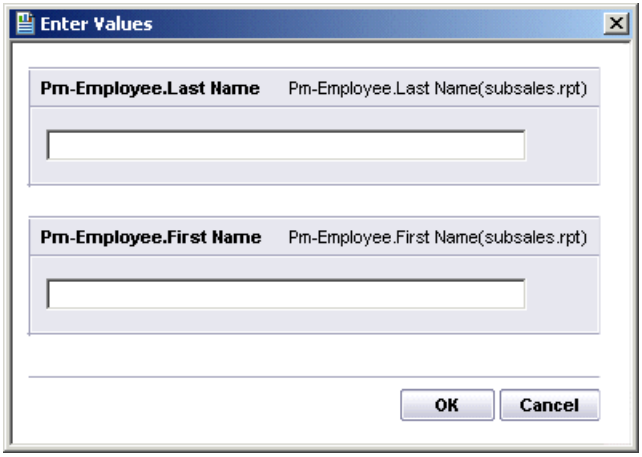
- You create a report that shows customer data and a subreport that shows order data and then you link the two reports using the Customer ID field.
- When you run the report, the program finds the first customer record it needs and passes the Customer ID value from that record to the subreport parameter field.
- The program runs the Orders subreport. Since the subreport selection formula selects only those records in which the Customer ID value is equal to the parameter field value, and since that parameter field value is equal to the Customer ID in the first record in the primary report, the subreport contains only those records that have the same customer ID. Namely, those records that are orders for the first customer.

- When the subreport is finished, the program locates the second record it needs in the primary report, prints the customer data, and then passes this customer's ID number to the parameter field.
- The program then runs a subreport including only those order records for the second customer.
- The process continues until the report is finished.
- All of this parameter field manipulation takes place behind the scenes. You simply pick the fields that will link the primary report with the subreport and the program does the rest. The values are passed without the parameter field prompting you for a value.

Note:

If you have a linked subreport and you click the Print Preview button on the Standard toolbar (from the Subreport Design tab), the program runs the subreport on its own, without waiting to receive a parameter field value from the primary report and without evaluating the tab text formula. In this case, the program displays the Enter Parameter Values dialog box and prompts you for a value.

The value entered in the box is the value the program uses to run the subreport.



Inserting subreports

1. On the **Insert** menu, click **Subreport**.

   Tip:

   Another way to do this is to click the Insert Subreport button on the Insert Tools Toolbar.

   The Insert Subreport dialog box appears.

2. To choose an existing subreport, click **Choose an existing report** and type the name. If you do not know the name, click the **Browse** button and locate it in the dialog box that appears.

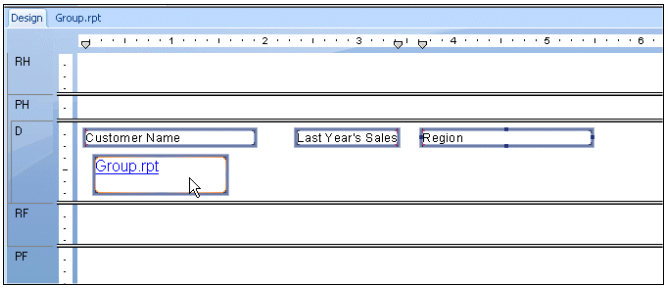
   To create a new subreport, click "Create a subreport with the Report Wizard" and type a name; then click the Report Wizard button. See *Creating a new report* for information about using a wizard to create a report.

3. Choose **On-demand subreport (similar to a hyperlink)** to have the ability to retrieve the data on the subreport when needed. Otherwise, all the subreport data will appear with the report.
4. Click **OK**.

   The program displays an object frame.

5. Move the frame where you want it to appear in the report and click once to place it.

   The program creates a Subreport Design tab, which is labeled with the subreport name. To edit the report, click the design tab and make your modifications.



6. Click the **Preview** tab to see your report.

7. If you chose **On-demand subreport (similar to a hyperlink)**, click the subreport preview tab to see your subreport.

   This tab is labeled with the name of your subreport.

Note:
Using on-demand subreports will increase the performance of reports that contain subreports.

For information about creating a custom caption for the Subreport Preview Tab, see *Adding captions to on-demand subreports*.

Previewing subreports

There may be times when you want to preview a subreport on its own instead of previewing it as a part of the main report. For example, you may want to preview the subreport in order to view and analyze the data for a particular set of parameter values.

To preview a subreport

1. Click the subreport's Design tab.

   This tab is labeled with the name of your subreport.

2. Click **Print Preview** on the Standard toolbar.

   The program displays a preview of the selected subreport.

Saving a subreport as a primary report

You may find it advantageous to save a subreport as a primary report for the sake of distributing the information to a variety of audiences. For example, the primary report containing the subreport may be relevant for a stockholders meeting at the end of the fiscal year; however, the data contained in the subreport may be relevant for everyday use by your managers. In such cases, it is easy to save a subreport as a primary report.

To save a subreport as a primary report

1. In the Design tab, right-click the subreport and click **Save Subreport As** from the shortcut menu.

   The Save As dialog box appears.
2. Search for the appropriate directory in the Save As dialog box.
3. Type a new name for the subreport.
4. Click **Save**.

   The program saves the subreport as a primary report so that you can open it separately when necessary.

Updating subreports

In order to maintain the most up-to-date subreports, you may want to re-import a subreport automatically when opening the main report.

Note:
Re-importing is available only for subreports that were created from a report file.

Re-importing not only updates the data, but updates the formatting, grouping, and structure of the subreport if any changes have been made. If you change the report the subreport was originally based on, you can have these changes reflected in the report containing the subreport.

You can either globally specify that all subreports should be re-imported, or set the automatic re-import for an individual subreport.

To globally update subreports when opening a main report

1. On the **File** menu, click **Options**.
2. In the Options dialog box, click the **Reporting** tab.
3. Click **Re-import Subreport on Open**.
4. Click **OK**.

   Any subreport will be updated when its main report is opened and refreshed.

To update a specific subreport when opening a main report

1. From the **Format** menu, click **Format Subreport**.
2. In the Format Editor dialog box, click the **Subreport** tab.
3. Click **Re-import When Opening**.

   The current subreport will be updated when the main report is opened and refreshed.

Manually updating subreport data

You can update your subreport data at any time.

1. On the **Design** tab, right-click the subreport.
2. Click **Re-import subreport** from the shortcut menu.
3. Click **Yes** to update the subreport data.

Linking a subreport to the data in the primary report

Frequently, the data in a subreport supplements the data in the primary report. You might, for example, have customer data in a primary report and then use subreports to show the orders for each customer.

In such cases, you will need to coordinate the data in the primary report with the data in the subreport so that the orders in each subreport match up with the correct customer.

To do this, you need to specify a field that is common to both the subreport and the primary report. With the Subreport Links dialog box, you create a link between the two common fields. Crystal Reports uses the link to match up records from the primary report to those in the subreport. The link makes certain that the "orders" data in the subreport sits on the same row as the corresponding "customer" data in the primary report.

To link a subreport to the data in the primary report

1. If you are creating a new subreport or importing an existing report as a subreport, from the **Insert** menu, click **Subreport**. Choose or create a report and click the **Link** tab.

   - or -

   If you have already placed a subreport in the primary report, but did not create a link at setup, navigate to the Subreport Links dialog box by choosing Subreport Links from the Edit menu.

   The Subreport Links dialog box appears.

2. Choose the subreport you want to link from the **For subreport** list (if it is not already selected).
3. Select the field you want used as a link field in the primary (containing) report from the **Available Fields** list.
4. Click the > arrow.

   The field is added to the "Field(s) to link to" list box, and is now selected as a link field.

5. Repeat steps 3 and 4 for each additional link, as desired.
6. Use the **Field link** section (which will only appear if you have selected a link field) to set up the link for each link field:
   - Select the field you want linked to the primary report from the "Subreport parameter field to use."
   - Select the "Select data in subreport based on field" check box on and select a field from the adjacent drop-down list to organize the subreport data based on a specific field (this is the quick equivalent of using the Select Expert). If nothing is specified here, the subreport will adopt the organization of the primary report.
7. Click **OK**.

When you run the report, the program will coordinate the data in the primary report with the data in the subreport.

Note:
The field type of the Containing Report field determines which subreport fields are visible. Because the Report Designer reads dates as either strings,

dates, or date/time fields, you must make sure your subreport parameter field type matches the field type set up in Report Options in the main report for the field you want linked.

Linking a subreport to the main report without modifying the selection formula

Crystal Reports uses a parameter field mechanism for linking subreports to main reports.

When linking a main report field that is not a parameter field to a subreport field, the program:

- Automatically creates a parameter field to complete the link.
- Modifies the subreport record selection formula to select those records in which the subreport field is equal to the parameter field value.

The need for a parameter field is implied; it is called an "Implicit Link" situation.

At times, you may wish to use a linked parameter field in a subreport without using it as part of the selection formula for the subreport. For instance, you may want the main report to pass in a summary value that can be used in calculations by the subreport, or you may want the main report to pass in the title of the subreport.

When you link a field in the main report to a parameter field that you have created in the subreport, the program:

- Checks the link you have specified.
- Does not create any additional parameter fields.
- Does not modify the subreport record selection formula.

Specifying a link is called an "Explicit Link" situation.

To link a subreport to a main report without modifying the selection formula

1. Create a parameter field in the subreport.
2. Link a field in the main report to that parameter field.

Combining unrelated reports by using subreports

At times, you may wish to combine unrelated reports into a single report. For example, you may want to create a single report that presents:

- Sales grouped by sales representative.
- Sales grouped by item.

While both reports deal with sales data, there is no real linear relationship between the reports.

Subreports can be used to combine unrelated reports into a single report like this. While the reports could be based on the same data set, they do not have to be. They could each be based on entirely different data sets.

Each of these reports is free-standing; the data in any of the reports is not linked in any way to data in another report. This is the easiest of the subreport options to work with.

Combining two or more unrelated reports

To combine two unrelated reports

1. Create the report you want printed first as the primary report.
2. Import an existing report for use as a subreport or create a new subreport.
3. Place the subreport into the Report Footer and it will print immediately after the primary report.

To combine three or more unrelated reports

1. Create the report you want printed first as the primary report.
2. Import or create each of the other reports you want to use as subreports.
3. Use the Section Expert to insert enough Report Footer sections to match the number of subreports that you are using.

For example, if you want to use three subreports, insert two new Report Footer sections so that you have a total of three Report Footer sections.

4. In Report Footer A, place the subreport you want printed immediately after the primary report. In Report Footer B, place the subreport you want printed next, and so forth.

   The primary report will print first and then the subreports in the order that you placed them in the report.

   Note:
   Subreports can be placed side-by-side in the same Report Footer section. They will print next to each other at the end of the report.

5. Place the subreports into the Report Footer sections and they will print sequentially after the primary report.

Related Topics

• *Working with sections*

Using subreports with unlinkable data

Tables can be linked in a report as long as the following criteria are met:

- The link fields are both database fields.
- The link fields contain similar data.
- The link fields are the same length.
- The link field in the link to (lookup) table is indexed (PC databases only).

Linking tables is rarely a problem. However, there are some circumstances in which you cannot coordinate data from different tables because the data does not meet the linking criteria.

For example, linking to or from a formula field, or linking two unindexed tables cannot be done in a single report. Subreports must be used.

Linking to/from a formula field

There are situations in which you may need to link to or from a formula (calculated) field. For example, an employee ID could be an 11 character value that consists of a two-character department code followed by the employee's nine-character Social Security Number (for example, HR555347487).

The formula language makes it easy to extract the Social Security Number from this field:

```
{employee.EMPLOYEE ID} [-9 to -1]
```

- or -

```
{employee.EMPLOYEE ID} [3 to 12]
```

For the value HR555347487, either formula would return the value 555347487.

While the return value is a valid Social Security Number, the fact that it comes from a formula prevents you from using the field to link to a Social Security Number field in another table. You can report on and coordinate the values in the two tables, however, by using a subreport.

To link to/from a formula field

1. Create the primary report using a table that includes the Social Security Number field.
2. Create (or import) a subreport using the formula that extracts the Social Security Number from the Employee ID field (for this example, {@EXTRACT}).

   See *Inserting subreports*.
3. Place the subreport where you want it to appear in the primary report.
4. Link the subreport to the primary report by linking the Social Security Number field in the primary report ({file.SSN}) to the formula that extracts the number in the subreport ({@EXTRACT}). See *Linking a subreport to the main report without modifying the selection formula*.

Linking unindexed tables

When using PC (not SQL or ODBC) databases, the link field in the lookup database needs to be indexed in order to create a valid link. You cannot link the tables in a single report when two tables contain related data yet neither is indexed on the field which you want to use as a link field, or when the primary table is indexed but the lookup table is not. You must use subreports if you want to coordinate the data in both tables.

Note:
It is important to note that linking unindexed tables or linking from an indexed primary table to an unindexed lookup table may cause inefficient reporting. If your data set is large, this kind of report will take considerable time to run. Use this technique only if you do not have other options.

To link unindexed tables

1. Create the primary report.
2. Create (or import) the subreport and insert it into the primary report.

   See *Inserting subreports*.
3. Use the unindexed fields (or the indexed field in the primary table and the unindexed field in the lookup table) to link the subreport to the primary report. See *Linking a subreport to the data in the primary report*.

Creating an on-demand subreport

On-demand subreports can be especially useful when you want to create a report that contains multiple subreports. In this case, you can choose to have these subreports appear only as hyperlinks.

The actual data is not read from the database until the user drills down on the hyperlink. This way only data for on-demand subreports that are actually viewed will be retrieved from the database. This makes the subreports much more manageable.

Note:
Data for an on-demand subreport is not saved unless the subreport is actually open in a preview window.

To create an on-demand subreport

1. Place an ordinary subreport in your primary report.
2. Click the **Format** button on the Expert Tools toolbar.

   The Format Editor dialog box appears.
3. Click the **Subreport** tab and select the **On-demand subreport** check box.
4. Click **OK**.

Adding captions to on-demand subreports

To further organize a report, captions can be created for the Subreport Preview tab and for the placeholder frame of an on-demand subreport.

Captions are written by using formulas. Both placeholder frame captions and Subreport Preview tab captions can include field names from the main report.

A tab text caption replaces the subreport file name caption on the Subreport Preview tab.

Note:
Placeholder frame captions only apply to on-demand subreports, while tab text captions apply to both on-demand subreports and regular subreports. Since the data from a regular subreport is visible on the Preview tab, there is no need for a frame caption when you format a regular subreport.

To add a caption

1. Select the subreport and click the **Format** button on the Expert Tools toolbar.

   The Format Editor dialog box appears.
2. Click the **Subreport** tab.
3. You can enter either an on-demand subreport caption or a preview tab caption by clicking the appropriate **Formula** button and opening the Formula Workshop.

4. Enter your formula in the **Formula text** box.

   Crystal syntax formula example:

   ```
   "More Information About " + {Customer.Customer Name}
   ```

   Basic syntax formula example:

   ```
   formula = "More Information About" + {Customer.Customer
    Name}
   ```

   Using the Xtreme.mdb sample database, these formulas would give you a caption like "More Information About Pathfinders" or "More Information About Rockshocks for Jocks."

5. Click **Check** to check the formula for errors. If the program finds an error, it will prompt you with a message box detailing the nature of the error.
6. After fixing any errors, click **Save and close**.
7. Click **OK** to return to the report.

Note:
A tab text formula is only evaluated when you drill-down on a subreport. If you preview a subreport separately from the primary report, the formula will not be evaluated.

Showing different views of the same data in a report

Subreports can be used to provide a different view of the data in the primary report. For example, you might want to show summary values at the top of a report and details at the bottom.

This can be done in a variety of ways. The two easiest methods are:

- By creating the summary report as the primary report and the details report as the subreport. In this method, the details subreport would be placed in the Report Footer section.
- By creating the details report as the primary report and the summary report as the subreport. In this method, the summary report would be placed in the Report Header section.

Use the appropriate link fields to link the report and coordinate the data.

Understanding Databases

chapter 25

Databases overview

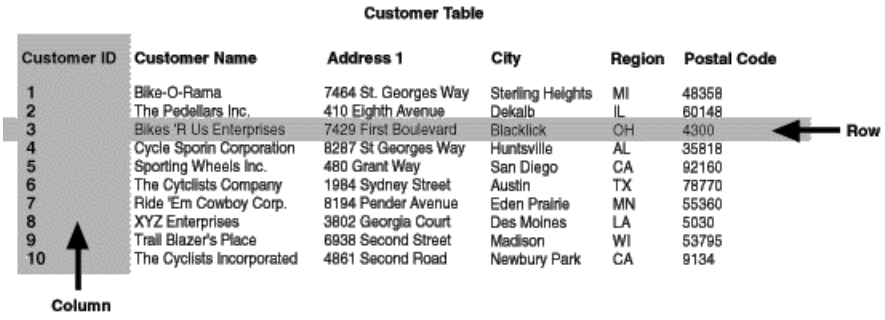
Though there are hundreds of Database Management Systems (DBMS) available, Crystal Reports eliminates many of the differences once it connects to the actual database files. The process of working with database files, tables, fields, and records is much the same, regardless of the actual type of data being accessed.

This section discusses several concepts and tasks common to working with database files. Using database aliases, locating moved or renamed database files, working with indexed tables, and linking tables are subjects common to anyone who designs reports in Crystal Reports. *Using SQL and SQL databases*, is especially important for anyone who accesses data in SQL databases and other database formats that are accessed through ODBC.

Relational database basics

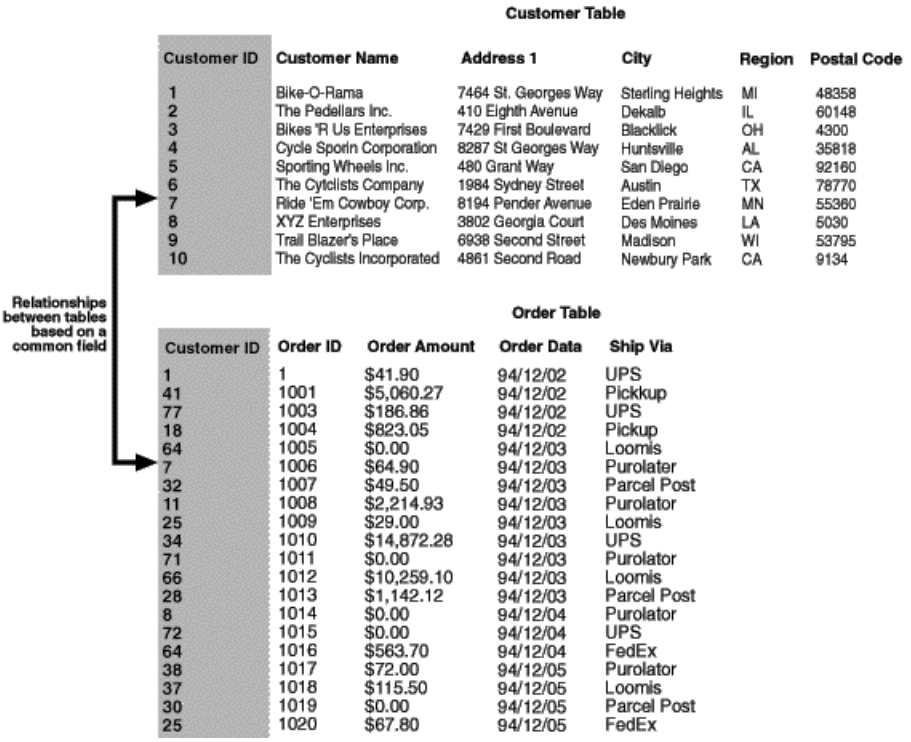
The most popular architecture for database files used in the corporate world is based on the relational model. Applications that allow you to create databases with the relational model are, therefore, often referred to as Relational Database Management Systems (RDBMS).

In a relational database, data is organized in a system of rows and columns. The rows are called records, and the columns are called fields. Each record contains a collection of related data, all information relating to a specific customer, for example. Each field refers to a common type of data that exists in all records, the names of the customers, for example. Records and fields are stored in a database table. The following diagram illustrates the basic relational database model:



Often, data in two different tables can be related by a common field. For example, a Customers table will have a Customer ID for each customer, and an Orders table will have the Customer ID of each customer who placed an order, demonstrating a relationship between tables. The two tables can be linked by a common field see *Linking tables*.

The following diagram displays how two tables can have a relationship:

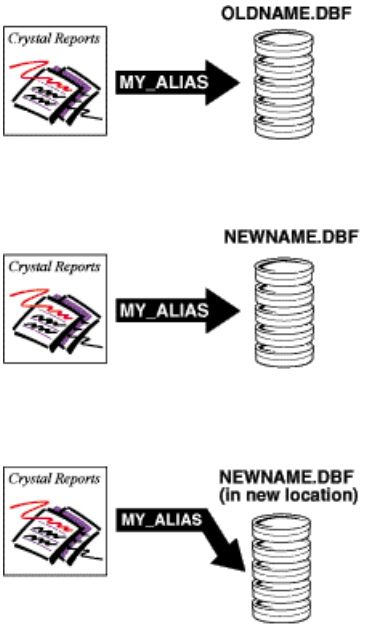


Aliases

For a variety of reasons, database names and locations get changed. If you create a report, then change the name or location of a table or file, the Report Designer must be able to find the new name or location. This is especially important when you create formulas in your report that access a table that has been renamed or moved. To fix the reference for a single field would

not be difficult, but to find every formula that uses that field could be a difficult and time consuming task.

To solve this problem, the Report Designer uses aliases to refer to database tables and files. Aliases are pointers, internal devices that tell the program where it should look for a database field. Now, if you change the name or location of the database, you simply reset the pointer. See *Locating files*. The name of the alias does not change, so your formulas are not affected. The Report Designer looks to the alias for the location and name, goes to the new location for the database field, and executes the formula without a problem.



The Report Designer automatically assigns default alias names to database tables when you first select the table or file. By default, an alias matches the original name of the table. In databases where the database table is a separate file (for instance, dBASE), the name of the database file is used without the file name extension. For example, if you are using the dBASE database file Company.dbf, the program will assign a default alias name of Company to the file. You can accept the default alias or assign a new one to the database table.

You can change an alias at any time using the Database Expert. However, if you have already created formulas in your report using the original alias name, you will need to edit the formulas to use the new alias.

Locating files

When a database file is moved or renamed, Crystal Reports will not be able to find the data the next time the report is printed. On other occasions, a report may be created on one machine where all of the database data is stored in a certain directory, then the report is copied or moved to another machine that stores the same data in a different directory. In any of these events, you need to verify the location of the database files accessed by the report and reset the alias pointers to the new database location or name.

The Verify Database command on the Database menu checks the alias pointers stored in a report file to verify that the database files expected are located in the indicated directories. If the databases are not found in the specified location, the program notifies you of the discrepancies.

Use the Set Datasource Location command on the Database menu to change the alias pointers stored by Crystal Reports. The Set Datasource Location

command provides a simple way to indicate the new name or location of database files. In addition, the Set Datasource Location command automatically converts your database driver to the data source you have chosen. For example, you can automatically convert a direct access data source to an ODBC data source using the Set Datasource Location command.

See "Changing the data source accessed by a report" in the online help.

Indexed tables

Creating indexes for database tables can increase the speed of data access and reduce the time it takes for the program to evaluate data. Some DBMS applications automatically index your database tables, while others require that you create an index yourself. For the best report generation performance, make sure each of your database tables has a corresponding index.

Note:
Some DBMS applications do not support indexed tables. Refer to the documentation for your DBMS to find out if it supports indexes and how to create them. If your DBMS documentation does not mention indexed tables, it may not support them, and you should link tables based on common fields. The Links tab of the Database Expert can also help you determine if your tables include indexes.

Indexes organize the records in a relational database table so that data can be located easier. For example, assume you have a table with the following data:

Order#	Customer	Amount
10444	Allez Distribution	25141.50
10470	BG Mountain Inc.	19164.30
10485	Sierra Mountain	8233.50
10488	Mountain Toad	24580.50

Order#	Customer	Amount
10495	SFB Inc.	7911.80
10501	La Bomba de Bicicleta	1956.20
10511	BG Mountain Inc.	1683.60
10544	Sierra Bicycle Group	19766.20
10568	Mountain Tops Inc.	29759.55
10579	Sierra Bicycle Group	12763.95

The information in this table is organized according to the Order# field. This is fine anytime you want to look up information in the table based on order numbers. However, what if you want to look up information specific to a certain customer?

Say you want to look up all orders made by Sierra Bicycle Group. The database engine must begin by looking at the first order number in the list and checking to see if the customer name matches the request. If not, it goes to the second order number, and checks that customer name. When an order number is reached that contains the correct customer name, the database engine retrieves the information, then continues to the next order number. Using this technique, both the Order# field and the Customer field must be read for every single record in the table. This takes a long time and a large amount of computer processing effort for examining extensive database tables with thousands, or even millions of records.

Instead, you can create an index for the table based on the Customer field. Such an index might look like this:

Customer	Pointer to Order#
Allez Distribution	10444
BG Mountain Inc.	10470
BG Mountain Inc.	10511
La Bomba de Bicicleta	10501
Mountain Toad	10488
Mountain Tops Inc.	10568
SFB Inc.	10495
Sierra Bicycle Group	10544
Sierra Bicycle Group	10579
Sierra Mountain	10485

In this index, information is organized by customers, not order numbers. Also, notice that the second column actually contains pointers to specific order numbers in the original table. By using this index, the database engine can search just the information in the Customer column until it finds the customer you are interested in, Sierra Bicycle Group.

For each correct customer entry the database engine finds in the index, it looks up the matching order in the table according to the pointer in the second column of the index. Only the orders for the correct customer are read. Finally,

since information in the index is organized according to the customer names, the database engine does not need to continue searching through the index or the table as soon as it finds an index entry that does not match the requested customer.

The advantage of this highly organized search through a database table according to an index is speed. Using indexes speeds up data retrieval and report generation, important factors when reporting on large database files.

Linking tables

You link tables so records from one table will match related records from another. For example, if you activate an Orders table and a Customers table, you link the tables so that each order (from the Orders table) can be matched up with the customer (from the Customer table) that made the order.

When you link, you are using a field that is common to both tables. Crystal Reports uses the link to match up records from one table with those from the other. In this example, the link assures that the data in each row of the report refers to the same order.

Link from and link to

When you link two tables, you link from one table to another table. The from table is used as a primary table, while the to table acts as a lookup table where records are looked up by the primary table. In a simple link, the Report Designer examines the first record in the primary table and finds all matching records in the lookup table. Once all matches have been found in the lookup table for the first record in the primary table, all matches in the lookup table for the next record in the primary table are found.

Link relationships

When you link records from one table to another table, the records will typically fall under one of two relationship types: one-to-one or one-to-many.

One-to-one relationships

In a one-to-one relationship between records in two linked tables, for every record in the primary table there is only one matching record in the lookup table (based on the linked fields). For example, in the Xtreme.mdb database, the Employee table can be linked to the Employee Addresses table based on the Employee ID field in each table. The Employee table contains information about employees at the company, the positions they hold, their salaries, hiring information, and so on. The Employee Addresses table contains each employee's home address. There is only one record for each employee in each of these tables. Therefore, if the Employee table is linked to the Employee Addresses table, only one record will be found in the Employee Addresses table for each record in the Employee table. This is a one-to-one relationship.

One-to-many relationships

In a one-to-many relationship between records in two linked tables, for every record in the primary table, there may be more than one matching record in the lookup table, based on the linked fields. In the Xtreme.mdb database, the Customer table can be linked to the Orders table based on the Customer ID field in each table. The Customer table contains information about each customer that has placed an order with the company. The Orders table contains information about orders that customers have placed. Since customers can place more than one order, there may be more than one record in the Orders table for each customer record in the Customers table. This is a one-to-many relationship.

Performance considerations in one-to-many links

The information provided in this section is intended to help you maximize processing speed and minimize network traffic when you are running your reports. You will learn about the best ways to use selection formulas and indexes in one-to-many situations to make your reporting more efficient. If you do not use the information in this section, your reports may end up processing dozens or even thousands more records than necessary.

When a one-to-many situation exists between two database tables and the program matches up records from the tables, there are a number of factors that determine how many records the program reads and evaluates.

The tables that follow show the effects of the different factors on the number of records the program ultimately has to read. The charts are based on these assumptions:

- Table A contains 26 records (one for each letter in the alphabet).
- Table B contains 2600 records (100 matching records for every record in Table A).
- The scenario is to produce a report that finds two specific records in Table A and the 200 records (100+100) in Table B that match those two records in Table A.

  In a best case scenario, the program would only have to read about 200 records to accomplish the task.

  In a worst case scenario the program would have to read about 67,600 records to accomplish the same task.

Note:
The performance considerations for data files are different from the considerations for SQL databases. A data file is any non-SQL database that is accessed directly from Crystal Reports. For the purpose of this discussion, an SQL database is any database capable of accepting SQL commands accessed directly from Crystal Reports or through ODBC as well as any other database types that are accessed through ODBC.

For a better understanding of the difference between direct access databases and ODBC data sources, see Accessing Data Sources in the online help.

Extended descriptions of chart columns

The performance charts use the following columns:

- Linking or Subreport

  Are you creating a report from linked databases or are you inserting a subreport and binding it to the data in your primary report?

- Selection Formula

Does your primary report include a record selection formula that sets range limits on the key (indexed) field in Table A?

- Index A

  Is Table A on the field you are going to use indexed to match up the records?

- Index B

  Is Table B on the field you are going to use indexed to match up the records?

- Reads A

  How many records does the program have to read out of Table A to find the two records it is looking for?

- For each A reads in B

  How many records does the program have to read in Table B to find the 200 records it is looking for?

- Total Records Read

  What is the total number of records the program has to process to complete the task?

PC Data

Linking/Subreport	Selection Formula	Index A	Index B	Reads A	For each A reads in B	Total Records Read
Linking	No	Yes or No	Yes	26	100 (26*100)	2600
Linking	Yes	No	Yes	26	100 (26*100)	2600

Linking/Subreport	Selection Formula	Index A	Index B	Reads A	For each A reads in B	Total Records Read
Linking	Yes	Yes	Yes	2	100 (2*100)	200
Subreport	No	No	No	26	2600 (26*2600)	67,600
Subreport	No	Yes	No	2	2600 (26*2600)	67,600
Subreport	No	Yes	Yes	26	100 (26*100)	2600
Subreport	Yes	No	No	2	2600 (2*2600)	5200
Subreport	Yes	No	Yes	26	100 (26*100)	2600
Subreport	Yes	Yes	Yes	2	100 (2*100)	200

SQL Data

Linking/Sub report	Selection Formula	Reads A	For each A reads in B	Total Records Read
Linking	No	26	100 (26*100)	2600
Linking	Yes	2	100 (2*100)	200
Subreport	No	26	100 (26*100)	2600
Subreport	Yes	2	100 (2*100)	200

Data file considerations

When working with data files, one-to-many links can occur when you link tables in a single report or when you add a subreport to your report.

Linking data files

When retrieving data from linked data files in one-to-many situations, the program uses the following process:

- If there is a selection formula, the program parses the selection formula and passes what it can down to the database DLL. This is generally range limit information. Consider the following record selection formula:

```
{customer.REGION} in "CA" to "IL" AND
Remainder ({customer.CUSTOMER ID},2)=0
```

  In this formula, the part before the "and" operator contains range selection criteria for the Region field. The region must fall alphabetically between "CA" and "IL." The program passes this kind of condition down to either

the database DLL (for PC data) or the server (for SQL data). See *Record Selection*.

The second half of the selection formula, however, requires processing that must be done in the Report Engine. It uses a built-in function to manipulate and evaluate a field value and it cannot be done in the database DLL or the server. The program does not pass this condition to the database DLL.

- If there is an index on Table A, and the range limit selection condition is based on the indexed field ({customer.REGION} in this example), the program goes directly to the record it is seeking in Table A (the first CA record) and reads it.
  - For that record, the program locates the first matching record in Table B, using the Table B index.
  - The program passes this merged record (A+B) back to the Report Designer, which tests the record against the entire selection formula.
  - The program then reads the second matching record and passes the merged record on, and then reads the third matching record, and so on, until it has read all of the matching records.
  - The program then returns to Table A and reads the next record. There is no need to test the record to see if it meets the CA condition; the field is indexed and the records are in alphabetic order. But the program tests the record to see if it goes beyond the "IL" condition (for example, could the next record be from Mississippi or Tennessee?). If the record is still within the specified range, the program begins the matching process again for that record.
  - The program continues the process until it has located all targeted Table A records and the matching Table B records.

    To find two records in Table A and the 100 records in Table B that match the Table A records, the program reads 200 records.
- If there is no index on Table A, or if there is an index but the range limit selection condition is not based on the indexed field, the program reads the first record it finds.
  - For that record, the program uses the Table B index to locate the first matching record in Table B.

- The program passes this merged record (A+B) back to the Report Engine, which tests it against the entire selection formula.
- The program then locates the second matching record in Table B and passes that merged record back, then the third record, and so on, until it has located, merged, and passed back all the records in Table B that match the first record in Table A.
- The program then moves on to the next record in Table A and begins the matching and merging process all over again.

  To find two records in Table A and the 100 records in Table B that match the Table A records, the program reads 2600 records.

Subreports and data files

If your primary report is based on Table A, the subreport is based on Table B, and the records are linked, your primary considerations are as follows:

- The number of subreports that are run by the program is determined by the index and the selection formula situation in the primary report:
  - If Table A is indexed, and if the primary report has a selection formula that passes down range limit conditions for the indexed field, the program runs two subreports.
  - If Table A is not indexed, or if Table A is indexed but the selection formula does not pass down range limit conditions for the indexed field, the program runs 26 subreports.
- The number of records read for each subreport is determined by the index situation on Table B:
  - If you have an index on Table B, the program will read only the matching records (100) when it runs a subreport.
  - If you do not have an index on Table B, the program will always read every record in Table B (2600) when it runs a subreport.

SQL database considerations

Since indexes are not critical with SQL data, the primary concern with both linked tables and subreports is whether or not there is a selection formula in the primary report that puts range limits on Table A. See *Linking data files* .

Linked SQL tables

If there are range limit conditions in the selection formula, the program passes those conditions down to the server.

- If there is a selection formula that puts range limits on Table A, the server locates the records in Table A that satisfy the selection criteria (2), matches them up with the appropriate records in Table B (100), and returns 200 merged records to the Report Engine.
- If there is no selection formula, or if there is a selection formula that does not put range limits on Table A, the server matches up each record in Table A (26) with the appropriate records in Table B (100), and returns 2600 merged records to the Report Engine.

In either case, the Report Engine will then apply the entire selection formula to the merged records.

Subreports and SQL databases

If you are creating a primary report based on Table A and a subreport based on Table B:

- The number of subreports that are run is determined by the selection formula situation in the primary report:
  - If there is a selection formula and it passes down range limits on Table A, the program runs a subreport only for those records that satisfy range limit conditions (2).
  - If there is no selection formula, or if the selection formula does not pass down range limits on Table A, the program runs a subreport for every record in Table A (26).

- The number of records read by each subreport remains the same regardless of whether there was range limit selection on Table A. Each subreport will read only those records in Table B that match each record read in Table A (100).

Performance considerations for all reports

Consideration 1

With both data files and SQL databases, the program parses the entire selection formula and passes down whatever parts of the criteria it is able to translate (pass), wherever they may physically appear in the formula. Thus, if the formula finds criteria it can pass, then criteria that it cannot, then criteria that it can, it passes down the first part, skips the second, and then passes down the third.

- In the case of data files, the program passes down the criteria that it can to the database translation layer.
- In the case of SQL databases, the program passes down to the server the criteria that it can in the form of a WHERE clause.

While there are exceptions, as a general rule the program can pass down any part of the record selection formula that compares a field with a constant. Typically, this means that it can pass down any kind of record selection criteria that can be set up in the Select Expert (equal to, one of, less than, greater than, less than or equal, greater than or equal, between, starting with, or like constant).

There are two special selection formula situations that you need to consider. In these situations, the record selection formula includes multiple conditions, some of which can be passed down while others cannot.

- AND situations

```
{customer.REGION} = "CA" and
{customer.CUSTOMER ID}[3 to 5] = "777")
```

In this situation, the program sees that it can pass down the condition before the And operator but not the condition after. Since the only records that will meet the second condition will have to meet the first as well, the

program passes down the first condition, retrieves the data set that satisfies the condition, and then applies the second condition only to the retrieved data. The rule for AND situations is that the program passes down whatever conditions it can.

Note:
If all of the conditions in an AND situation can be satisfied on the server or in the database DLL, the program passes them all down.

- OR situations

```
{customer.REGION} = "CA" or
{customer.CUSTOMER ID}[3 to 5] = "777")
```

In this situation, the program also sees that it can pass down the condition before the Or operator but not the condition after. Since there are records that can satisfy the second condition without satisfying the first, passing the first condition down does not make any sense because it will retrieve an incomplete data set. In other words, even if it retrieves all the data that satisfies the first condition, it will still have to retrieve all the data in the table(s) before it can apply the second condition in Report Designer. Thus, instead of duplicating parts of the data retrieval, the program passes nothing down. It retrieves all the data and then runs both tests in Report Designer. The rule for OR situations is that the program either passes down all the tests, or none of the tests.

Note:
If all the tests in an OR situation can be performed on the server or in the database DLL, the program passes them all down.

Consideration 2

To make certain the program can use the index on Table A to enhance performance, make certain:

- There is a selection formula.
- There are range limits in the selection formula on the key (indexed) field in Table A.
- Use Indexes is selected in the Options dialog box.

Consideration 3

If the fields you are using from Table A are not indexed, but there is an indexed field that you can use in your record selection request, use that field. For example, assume that you have three products (Product 1, Product 2, and Product 3) and you want to identify all sales of Product 2 in the U.S. There is no index on the Product field but there is an index on the Order Date field. Since you know that Product 2 did not begin shipping until July of 1995, you can improve speed by limiting your report to orders placed in and after July 1995 using the selection formula. In such a case, the program uses the Order Date index to retrieve only those orders from July 1995 and afterward (a small subset of the entire database) and then searches for the occurrences of Product 2 in that subset, not in the entire database.

The Database Expert Links tab

The Database Expert Links tab lets you easily link two or more tables. Choose the Database Expert from the Database menu to display all current tables; then choose the Links tab to display all current links.

The easiest way to link database tables is to select Auto Link in the Database Expert Links tab. Auto Link automatically chooses links for your tables based on common fields in tables or indexed fields (if your database supports indexed fields).

Linking indexed tables

When you are linking direct-access database tables, you link from a primary table to a field in the lookup table. The link field in the primary table can be indexed, but does not have to be. The link field in the lookup table does not have to be indexed, either, unless you aren't using a native driver for your connection.

In addition, the fields used to link two tables must have the same data type. For example, you can link a string field in one table to a string field in another table, or a numeric field in one table to a numeric field in another table, but you cannot link a numeric field in one table to a string field in another table.

- Some DBMS applications allow you to convert the field value to another data type in the index. For instance, the field in the table can be numeric, while the index converts the field value to a string. However, if you choose to use that field to link to another table, you must link to a field of the original data type. You cannot link a string value to a numeric field that has been converted to a string in the index.
- If you are linking tables from two different ODBC data sources, MS SQL Server and Oracle, for example, you can only use string fields to link the tables. String fields are stored in databases in the same manner, regardless of the data source. Other types of values, however, may not be stored the same way in different data sources, so you cannot link different data sources in Crystal Reports using anything other than string values.
- When linking direct-access database tables using native drivers (non-SQL), the only join type available is Left Outer join.

Changing the index used in linking

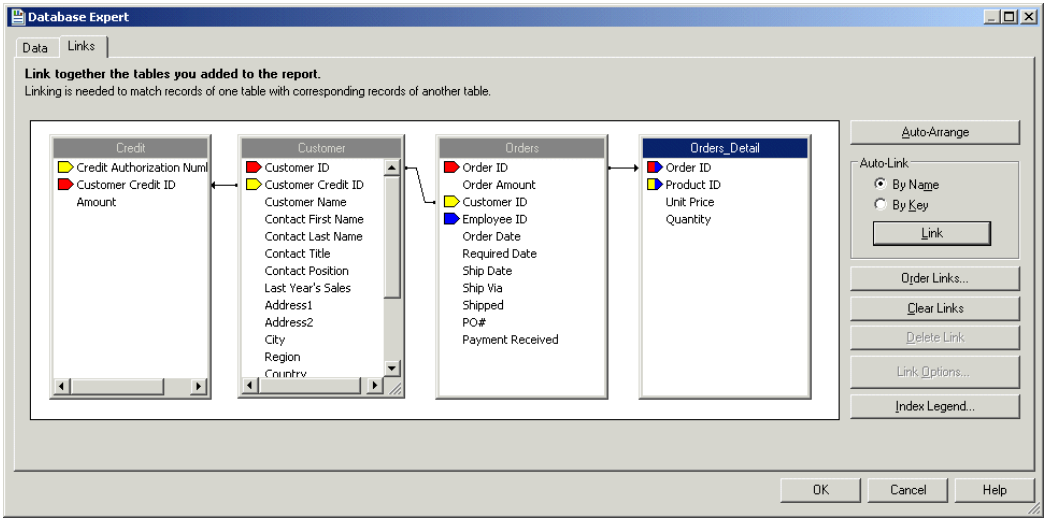
When using the Smart Linking feature to link tables using a field that is a component of multiple indexes (two or more), Crystal Reports selects one of the indexes for the link. That index may or may not be the one you want to use. Delete the link made by the Smart Linking feature and manually link the tables. See *Linking multiple tables* for more information.

Note:
Not all DBMS applications support indexed tables. Verify that your database uses indexes before trying to select an index for linking. Refer to your DBMS documentation to find out if your DBMS can use indexes, and to learn how to create them.

Link processing order

When there is more than one link, Crystal Reports needs to know in what order it should process the links. By default, the processing order matches the order in which the links appear on the Links tab. Use the arrow buttons in the Links Order dialog box to change the default order.

For example, if you have chosen the Credit, Customer, Orders, and Orders Details tables from the Xtreme sample database, the links tab shows the tables linked as follows.



In this case, the links will be processed first between the Credit/Customer tables, then between the Customer/Orders tables, and finally between the Orders/Orders Details tables. The Links Order dialog box shows you this default order and allows you to change the positions in the processing hierarchy as you require.

Note:
Different link orders may result in different data sets returned for use in your report. As well, link order has a significant effect on performance.

Linking options

Crystal Reports enables you to specify the type of join and type of link you want to use when linking tables. You can also enforce the use of tables in your joins. Joins and links indicates how linked fields in two tables are compared when records are read. Join, enforce, and link options can be specified in the Link Options dialog box. Using the various join enforcement options can ensure that linked tables are included in the SQL query, even when none of the fields in the table are used in the report.

Note:
When you link fields using joins, no indexed fields are required.

The join types are:

- Inner join
- Left Outer join
- Right Outer join
- Full Outer join

The enforce join options are:

- Not Enforced
- Enforced From
- Enforced To
- Enforced Both

The link types are:

- Equal [=] link
- Greater Than [>] link
- Greater Than Or Equal [>=] link
- Less Than [<] link
- Less Than Or Equal [<=] link
- Not Equal [!=] link

Inner join

An Inner join is the standard type of join. The result set from an Inner join includes all the records in which the linked field value in both tables is an exact match. For instance, you can use an Inner join to view all customers and the orders they have placed. You will not get a match for any customer who has not placed orders.

Customer Table	Customer Table	Orders Table
Customer ID	**Customer Name**	**Order Amount**
52	Allez Distribution	25141.50

Customer Table	Customer Table	Orders Table
Customer ID	**Customer Name**	**Order Amount**
53	BG Mountain Inc.	19164.30
53	BG Mountain Inc.	1683.60
57	Hansen MTB Inc.	15716.40
58	La Bomba de Bicicleta	1956.20
60	Mountain Toad	24580.50
62	SFB Inc.	7911.80
63	Sierra Bicycle Group	19766.20
63	Sierra Bicycle Group	12763.95
64	Sierra Mountain	8233.50

Left Outer join

The result set from a Left Outer join includes all the records in which the linked field value in both tables is an exact match. It also includes a row for every record in the primary (left) table for which the linked field value has no match in the lookup table. For instance, you can use a Left Outer join to view all customers and the orders they have placed, but you also get a row for

every customer who has not placed any orders. These customers appear at the end of the list with blanks in the fields that would otherwise hold order information:

Customer Table	Customer Table	Orders Table
Customer ID	**Customer Name**	**Order Amount**
52	Allez Distribution	25141.50
53	BG Mountain Inc.	19164.30
53	BG Mountain Inc.	1683.60
57	Hansen MTB Inc.	15716.40
58	La Bomba de Bicicleta	1956.20
60	Mountain Toad	24580.50
62	SFB Inc.	7911.80
63	Sierra Bicycle Group	19766.20
63	Sierra Bicycle Group	12763.95
64	Sierra Mountain	8233.50
54	Bicicletas Aztecas	

Customer Table	Customer Table	Orders Table
Customer ID	**Customer Name**	**Order Amount**
55	Deely MTB Inc.	

Note:
Left Outer and Right Outer joins are handled differently in the SQL language from other join types. If the database is accessed through ODBC, Crystal Reports uses ODBC syntax in the SQL statement. If you are connecting to an SQL database directly (not through ODBC), Crystal Reports uses a syntax native to the database. For more information about what an Outer join looks like in an SQL statement, refer to Microsoft ODBC documentation or to the documentation for your SQL database.

Right Outer join

The result set from a Right Outer join includes all the records in which the linked field value in both tables is an exact match. It also includes a row for every record in the lookup (right) table for which the linked field value has no match in the primary table. If you link the Customer table to the Orders table, you get one row in the table for each order a customer has placed. You also get a row for every order found that cannot be linked to a customer. Theoretically, this should not happen, but if an inexperienced sales person forgot to assign a customer ID to an order, you can quickly locate that order with a Right Outer join. The resulting table leaves a blank in any of the Customer fields for the order without a customer.

Customer Table	Orders Table	Orders Table
Customer ID	**Order ID**	**Order Amount**
52	6	25141.50

Customer Table	Orders Table	Orders Table
Customer ID	**Order ID**	**Order Amount**
53	11	19164.30
53	21	1683.60
57	4	15716.40
58	20	1956.20
60	16	24580.50
62	19	7911.80
63	28	19766.20
63	32	12763.95
64	14	8233.50
	25	10320.87

Note:
Left Outer and Right Outer joins are handled differently in the SQL language from other join types. If the database is accessed through ODBC, Crystal Reports uses ODBC syntax in the SQL statement. If you are connecting to a SQL database directly (not through ODBC), Crystal Reports uses a syntax native to the database. For more information about what an Outer join looks

like in an SQL statement, refer to Microsoft ODBC documentation or to the documentation for your SQL database.

Full Outer join

A Full Outer join is a bidirectional outer join where you can see all records in your linked tables. The result set from a Full Outer join includes all the records in which the linked field value in both tables is an exact match. It also includes a row for every record in the primary (left) table for which the linked field value has no match in the lookup table, and a row for every record in the lookup (right) table for which the linked field value has no match in the primary table. If you link the Customer table to the Orders table, you get one row in the table for each order a customer has placed. You also get a row for every order found that cannot be linked to a customer, and a row for every customer for whom an order cannot be found.

Customer Table	Orders Table	Orders Table
Customer ID	Order ID	Order Amount
52	6	25141.50
53	11	19164.30
53	21	1683.60
57	4	15716.40
58	20	1956.20
60	16	24580.50

Customer Table	Orders Table	Orders Table
Customer ID	**Order ID**	**Order Amount**
62	19	7911.80
63	28	19766.20
63	32	12763.95
64	14	8233.50
65		
66		
	25	10320.87

Not Enforced

When you select this option, the link you've created is used only if it's explicitly required by the Select statement. Your users can create reports based on the selected tables without restriction (that is, without enforcement based on other tables). This is the default option.

Enforced From

When you select this option, if the to table for the link is used, the link is enforced. For example, if you create a link from TableA to TableB using Enforce From and select only a field from TableB, the Select statement will

still include the join to TableA because it is enforced. Conversely, selecting only from TableA with the same join condition will not cause the join to TableB to be enforced.

Note:
For an explanation of from and to tables, see *Link from and link to*.

Enforced To

When you select this option, if the from table for the link is used, the link is enforced. For example, if you create a link from TableA to TableB using Enforce To and select only a field from TableA, the join to TableB will be enforced, and the Select statement that is generated will include both tables.

Note:
For an explanation of from and to tables, see *Link from and link to*.

Enforced Both

When you select this option, if either the from table or the to table for this link is used, the link is enforced.

Equal [=] link

The result set from an Equal link includes all the records where the linked field value in both tables is an exact match. In the following example, the Customer table is linked to the Orders table by the Customer ID field. When the program finds a Customer ID in the Orders table that matches a Customer ID in the Customer table, it displays information for the corresponding records in both tables.

SQL uses the following syntax to describe an Equal link:

```
SELECT Customer.'Customer ID',
     Customer.'Customer Name',
     Orders.'Order Amount'
FROM 'Customer' Customer,
     'Orders' Orders
WHERE Customer.Customer ID =
     Orders.Customer ID
```

This statement produces the following data:

Customer Table	Customer Table	Orders Table
Customer ID	**Customer Name**	**Order Amount**
52	Allez Distribution	25141.50
53	BG Mountain Inc.	19164.30
53	BG Mountain Inc.	1683.60
57	Hansen MTB Inc.	15716.40
58	La Bomba de Bicicleta	1956.20
60	Mountain Toad	24580.50
62	SFB Inc.	7911.80
63	Sierra Bicycle Group	19766.20
63	Sierra Bicycle Group	12763.95
64	Sierra Mountain	8233.50

Greater Than [>] link

The result set from a Greater Than link includes all records in which the linked field value from the primary table is greater than the linked field value in the lookup table. As an example, a company may want to compare the salaries made by all their sales representatives to the salaries made by all their sales managers. The company executives want to make sure no sales representative is making more money than any manager.

With this in mind, you can link the SalesRep table to the Manager table by the Salary field in each table using a Greater Than link:

```
SELECT SalesRep.'Last Name',
     SalesRep.'Salary',
     Manager.'Last Name',
     Manager.'Salary'
FROM 'SalesRep' SalesRep,
     'Manager' Manager
WHERE SalesRep.'Salary' >
     Manager.'Salary'
```

This SQL statement might produce data similar to this:

SalesRep Table	SalesRep Table	Manager Table	Manager Table
Last Name	**Salary**	**Last Name**	**Salary**
Davolio	$35,000.00	Fuller	$32,000.00
Davolio	$35,000.00	Brid	$30,000.00
Davolio	$35,000.00	Buchanan	$29,500.00
Dodsworth	$48,300.00	Hellstern	$45,000.00

SalesRep Table	SalesRep Table	Manager Table	Manager Table
Last Name	**Salary**	**Last Name**	**Salary**
Dodsworth	$48,300.00	Fuller	$32,000.00
Dodsworth	$48,300.00	Brid	$30,000.00
Dodsworth	$48,300.00	Buchanan	$29,500.00
Dodsworth	$48,300.00	Martin	$35,000.00
Patterson	$30,000.00	Buchanan	$29,500.00

In this table, there is no relationship established between sales representatives and sales managers. Since all managers have seniority over all sales representatives, a company might find it necessary to check if any representatives make more money than any managers, evidence of a salary problem that needs to be remedied.

Greater Than Or Equal [>=] link

The result set from a Greater Than Or Equal link includes all records in which the linked field value in the primary table is greater than or equal to the linked field value in the lookup table. The example here is identical to the example for the Greater Than join, except that it uses the Greater Than Or Equal link:

```
SELECT SalesRep.'Last Name',
     SalesRep.'Salary',
     Manager.'Last Name',
     Manager.'Salary'
FROM 'SalesRep' SalesRep,
     'Manager' Manager
```

```
WHERE SalesRep.'Salary' >=
     Manager.'Salary'
```

This statement might produce data such as this:

SalesRep Table	SalesRep Table	Manager Table	Manager Table
Last Name	**Salary**	**Last Name**	**Salary**
Davolio	$35,000.00	Fuller	$32,000.00
Davolio	$35,000.00	Brid	$30,000.00
Davolio	$35,000.00	Buchanan	$29,500.00
Davolio	$35,000.00	Martin	$35,000.00
Dodsworth	$48,300.00	Hellstern	$45,000.00
Dodsworth	$48,300.00	Fuller	$32,000.00
Dodsworth	$48,300.00	Brid	$30,000.00
Dodsworth	$48,300.00	Buchanan	$29,500.00
Dodsworth	$48,300.00	Martin	$35,000.00
Patterson	$30,000.00	Brid	$30,000.00
Patterson	$30,000.00	Buchanan	$29,500.00

Less Than [<] link

The result set from a Less Than link includes all records in which the linked field value in the primary table is less than the linked field value in the lookup table. Using the Less Than link, you can compare sales representative and manager salaries in a different direction. Once again, the Salary field in each table is used as the link field. This time, though, you link from the Manager table to the SalesRep table using a Less Than link on the linked Salary fields:

```
SELECT Manager.'Last Name',
     Manager.'Salary',
     SalesRep.'Last Name',
     SalesRep.'Salary'
FROM 'Manager' Manager,
     'SalesRep' SalesRep
WHERE Manager.'Salary' <
     SalesRep.'Salary'
```

This SQL statement produces a slightly different table than that produced by the Greater Than link:

Manager Table	Manager Table	SalesRep Table	SalesRep Table
Last Name	**Salary**	**Last Name**	**Salary**
Fuller	$32,000.00	Davolio	$35,000.00
Fuller	$32,000.00	Dodsworth	$48,300.00
Brid	$30,000.00	Davolio	$35,000.00
Brid	$30,000.00	Dodsworth	$48,300.00
Buchanan	$29,500.00	Davolio	$35,000.00

Manager Table	Manager Table	SalesRep Table	SalesRep Table
Last Name	Salary	Last Name	Salary
Buchanan	$29,500.00	Dodsworth	$48,300.00
Buchanan	$29,500.00	Patterson	$30,000.00
Martin	$35,000.00	Dodsworth	$48,300.00
Hellstern	$45,000.00	Dodsworth	$48,300.00

Less Than Or Equal [<=] link

The result set from a Less Than Or Equal link includes all records in which the linked field value in the primary table is less than or equal to the linked field value in the lookup table. The example here is identical to the example for the Less Than link, except that it uses the Less Than Or Equal link:

```
SELECT Manager.'Last Name',
     Manager.'Salary',
     SalesRep.'Last Name',
     SalesRep.'Salary'
FROM 'Manager' Manager,
     'SalesRep' SalesRep
WHERE Manager.'Salary' <=
     SalesRep.'Salary'
```

This SQL statement produces data similar to the following:

Manager Table	Manager Table	SalesRep Table	SalesRep Table
Last Name	**Salary**	**Last Name**	**Salary**
Fuller	$32,000.00	Davolio	$35,000.00
Fuller	$32,000.00	Dodsworth	$48,300.00
Brid	$30,000.00	Davolio	$35,000.00
Brid	$30,000.00	Dodsworth	$48,300.00
Brid	$30,000.00	Patterson	$30,000.00
Buchanan	$29,500.00	Davolio	$35,000.00
Buchanan	$29,500.00	Dodsworth	$48,300.00
Buchanan	$29,500.00	Patterson	$30,000.00
Martin	$35,000.00	Davolio	$35,000.00
Martin	$35,000.00	Dodsworth	$48,300.00
Hellstern	$45,000.00	Dodsworth	$48,300.00

Not Equal [!=] link

The result set from a Not Equal link includes all records in which the linked field value in the primary table is not equal to the linked field value in the lookup table. This type of link can be used to find possible combinations of items when a table is joined to itself (a self-join). For example, a company can have a table listing all products they sell. When they decide to hold a sale where their customers buy one item and get the second item half price, they may need a list of all possible two item combinations:

```
SELECT Product1.'Product Name',
     Product2.'Product Name',
FROM 'Product' Product1
     'Product' Product2
WHERE Product1.'Product Name' !=
     Product2.'Product Name'
```

In this SQL statement, the Product table is opened twice. The first time, it is given the alias name Product1. The second time, it is given the alias name Product2. Then the Product Name field is used to link from the Product1 table to the Product2 table. This is the same table, but since it has been opened twice using different aliases, Crystal Reports considers it two separate tables. A Not Equal link is used to link the tables by the Product Name field. As a result, each product is paired with every other product offered, but is not paired with itself:

Product1	Product2
Product Name	Product Name
Xtreme Adult Helmet	Xtreme Mtn Lock
Xtreme Adult Helmet	InFlux Lycra Glove
Xtreme Adult Helmet	Roadster Micro Mtn Saddle

Product1	Product2
Product Name	**Product Name**
Xtreme Mtn Lock	Xtreme Adult Helmet
Xtreme Mtn Lock	InFlux Lycra Glove
Xtreme Mtn Lock	Roadster Micro Mtn Saddle
InFlux Lycra Glove	Xtreme Adult Helmet
InFlux Lycra Glove	Xtreme Mtn Lock
InFlux Lycra Glove	Roadster Micro Mtn Saddle
Roadster Micro Mtn Saddle	Xtreme Adult Helmet
Roadster Micro Mtn Saddle	Xtreme Mtn Lock
Roadster Micro Mtn Saddle	InFlux Lycra Glove

Note:
The symbol != is used to represent a Not Equal link, if the ODBC data source driver for the data being accessed supports this symbol. If not, the default symbol <> is used to represent a Not Equal link.

Using SQL and SQL databases

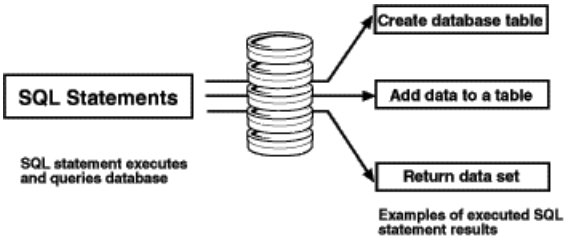
Perhaps the most popular and most powerful database formats are DBMS applications based on the Structured Query Language (SQL). SQL databases usually work over a client/server network architecture, providing an SQL Server to create, store, and manipulate database files, tables, fields and records, and an SQL Client interface allowing workstation users not only to design and work with database files, but also to retrieve useful and meaningful data that will help them in their everyday work.

What is SQL?

SQL is a query language designed for organizing, managing, developing and querying large relational databases over computer networks. SQL is a common language in the Information Science (IS) and Information Management industry. The language has been standardized by the American National Standards Institute (ANSI) and the International Standards Organization (ISO), meaning that there are specific features that must be present in any version of SQL produced by a software company in order for that version to be officially called SQL. Many software vendors add more advanced features to their version of SQL in an effort to improve the language and attract customers, but it must retain the original standards established by ANSI and ISO.

SQL is not a true computer language. It cannot be used to create stand-alone computer applications or operating systems. SQL is often referred to as a sub-language, since it can be used within other languages or applications. Most importantly, the purpose of the SQL language is specific to working with relational databases.

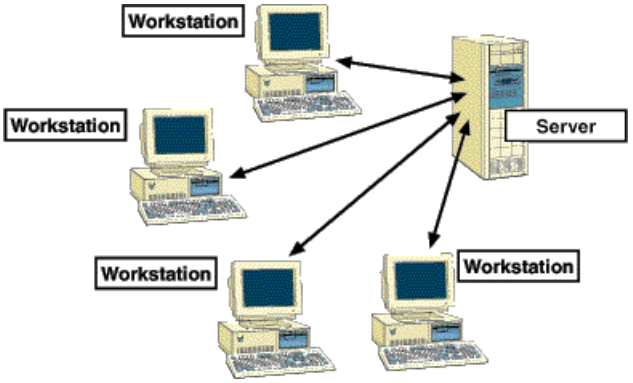
The syntax of the SQL language is built on a system of sending SQL statements to the SQL database server. Each statement is a request to perform a database operation, such as creating a database file, adding tables and fields to a database, adding records to tables, or retrieving data from databases. The SQL server analyzes the SQL statement and performs the required operation. For example, if the statement is a request for data, the server gathers the data and returns it to the client workstation for the user to view.



An SQL query is an SQL statement designed specifically to request data from one or more SQL databases. Some SQL applications require that you type in an SQL query directly using a text editor, while others provide graphical user interfaces that lead you through the process of querying an SQL database. In the latter case, the application must create an SQL statement based on the information you provide. This statement is the actual SQL query, and it is the SQL query that is used to request the data. Crystal Reports falls into both categories of SQL-compliant applications.

Client/server architecture

One of the most powerful features of SQL DBMS applications is their ability to efficiently use the client/server architecture of a network.

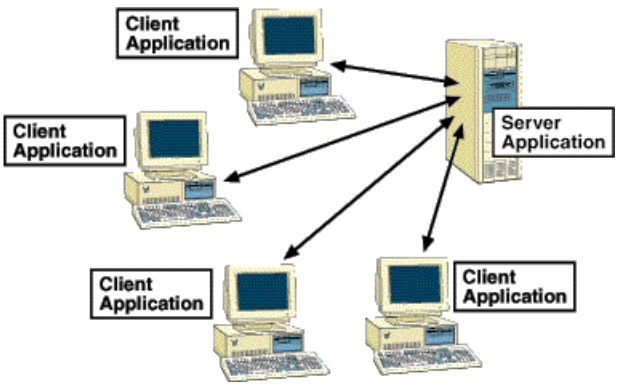


A simple network structure consists of one or more network servers that provide a common location where all users on the network can obtain data and applications. Many network servers also provide network security, automated services such as backing up data, and network resource monitoring to provide the best service possible to all workstations on the

network. Because of the high processing demands required by a network server, the computer used as the server is often a high-powered, fast machine that may contain multiple processors, multiple hard drives, and multiple CD-ROM drives.

A network client is a single computer workstation that is used regularly by one or more company employees. A user works on the client and accesses data and applications from the server over the network. Large processing jobs that require a lot of time and resources are handled by the server, and the finished results are sent back to the client. This provides more efficient time management for users because the local workstation has less processing time and more "up" time available to the user.

Many modern computer applications are based on this client/server architecture. A simple client/server application has two parts: a server-based application that is located on a network server machine, and a client-based application that is located on a user's workstation. The server application handles complex, time-consuming, or power-demanding processes, taking advantage of the network server's power and resources, while the client application provides an easy-to-use user interface designed to help get the work done faster and better than it could otherwise be done.



Often, a client/server application will be available with a certain number of seats, depending on the cost of the application. Each seat represents either a single client workstation, or a single client user (depending on the software vendors' specifications) that can be connected to the client/server software. Software vendors often sell additional seats for their applications, each seat coming with a complete set of client application software.

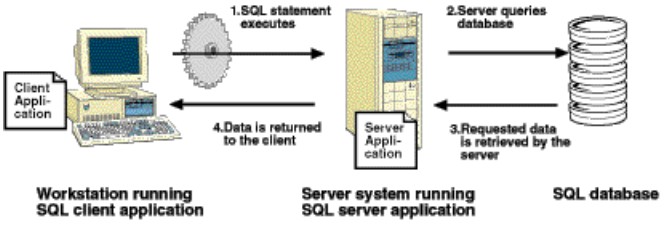
Do not confuse server applications with network server computers. Both are often referred to as servers. However, a server application resides on a network server, taking advantage of the hardware and operating system capabilities of the server machine, while a network server is a physical machine to which network clients are connected by cables or some other connection device.

SQL DBMS

An SQL Database Management System is a common example of a client/server software package. A standard SQL DBMS will include an SQL server application that handles all the actual work of building and working with databases and database data. The DBMS will also include at least one set of SQL client software (one seat) that can connect to the SQL server over your network. SQL client software usually consists of, at the very least, an SQL statement editor that you can use to write and execute SQL statements, and an underlying communications layer that works with the SQL server application over the network.

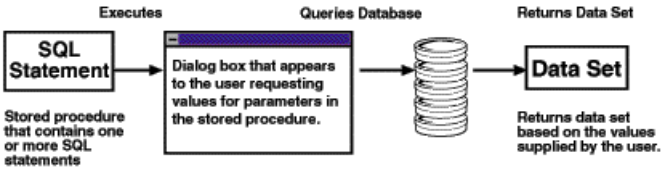
When you execute an SQL statement, the client software passes the statement to the communications layer, which sends the statement over the network to the server software. The SQL server analyzes the statement, performs the requested operation, and returns any data requested to the client software. If the server returns any data, the client software displays the data to the user.

SQL Client communicating with SQL server



Stored procedures

In addition to the common relational database attributes (tables, fields, records, and so on) many SQL DBMS systems support stored procedures. A stored procedure is a compiled SQL program consisting of one or more SQL statements. A stored procedure can be used to define an SQL query that you can use over and over again. Furthermore, variables, conditional expressions, and variable arguments can be defined in the stored procedure so that you are prompted to provide information before the procedure is executed.



Since stored procedures can return a result set, they can provide a specific set of data when executed. In fact, Crystal Reports allows you to execute a stored procedure on an SQL database and use the returned data to design a report. If the stored procedure is designed to prompt a user for information to base its query on, Crystal Reports will prompt you for that information when you select the stored procedure for your report.

How does Crystal Reports use SQL?

When you connect to an SQL database, Crystal Reports acts as an SQL client application, connecting to your SQL server through your network.

When you design a report that accesses SQL data, Crystal Reports builds an SQL query. This query can be seen by choosing Show SQL Query from the Database menu.

This SQL query is a representation of the SQL statement that Crystal Reports sends to the SQL server. By interpreting as much as possible from the report design into an SQL query, Crystal Reports can off-load much of the report processing onto the server machine. Rather than having to sift through an entire database to find the data you requested, Crystal Reports lets the server

do the sifting and gets back a much smaller set of data, thus reducing the time and resources your workstation must use in order to finish the report.

The SQL language

Since Crystal Reports uses the SQL language to access client/server databases through ODBC, you can better understand the report generating process by understanding some of the SQL clauses (commands) used:

SELECT

The SELECT clause indicates specific data items to retrieve from the database tables. The item retrieved may be the values in a database field (column), or it may be the result of a calculation performed while gathering the data. For example:

```
SELECT
     TABLEA.'CUSTNAME',
     TABLEA.'STATE'
```

DISTINCT

The DISTINCT clause forces the query to retrieve only unique (distinct) sets of data. When using the DISTINCT clause, a row of results will be retrieved only once. The previous SELECT statement can be modified to use the DISTINCT clause:

```
SELECT DISTINCT
     TABLEA.'CUSTNAME',
     TABLEA.'STATE'
```

FROM

The FROM clause indicates the sources of the database fields specified in the SELECT clause. FROM lists actual database tables that include the fields and records containing the requested data. The FROM clause generated by Crystal Reports precedes the name of each table with the alias it uses to

identify the table in your report. The following example illustrates the FROM clause used with the SELECT clause:

```
SELECT
     TABLEA.'CUSTNAME',
     TABLEA.'STATE'
FROM
     'TABLEA' TABLEA
```

WHERE

The WHERE clause has two purposes:

- To specify record selection criteria.
- To show how two database tables are joined.

When WHERE is used to specify record selection criteria, it includes a search condition in order to determine which records (rows of data) are to be retrieved. For example:

```
SELECT
     MYTABLE.'SALESPERSON',
     MYTABLE.'SALESTOTAL'
FROM
     'MYTABLE' MYTABLE
WHERE
     MYTABLE.'SALESTOTAL' < 10000.00
```

When WHERE is used to specify how two tables are linked, an SQL join operator sits between the two table names. See *Linking options*.

The following is an example of the WHERE clause joining two tables:

```
SELECT
     CUSTOMER.'CUST_ID',
     CUSTOMER.'CUST_NAME',
     ORDERS.'AMOUNT'
FROM
     'CUSTOMER' CUSTOMER,
     'ORDERS' ORDERS
WHERE
     CUSTOMER.'CUST_ID' = ORDERS.'CUST_ID'
```

ORDER BY

The ORDER BY clause specifies that the database records retrieved be sorted according to the values in a specific field. If you do not use the ORDER BY clause, the program retrieves records in the order in which they appear in the original database. If you specify more than one field after the ORDER BY clause, the program sorts the records according to the values in the first field specified, then, within that sort, the program sorts the records by the values in the second field specified, and so on. The following SQL statement uses the ORDER BY clause:

```
SELECT
     MYTABLE.'COMPANY',
     MYTABLE.'CITY',
     MYTABLE.'STATE'
FROM
     'MYTABLE' MYTABLE
ORDER BY
     MYTABLE.'STATE' ASC,
     MYTABLE.'CITY' ASC
```

Note:
ASC indicates that the values in the field are sorted in ascending order rather than descending order (DESC). Ascending order sorts letters from A to Z and numbers from 0 to 9.

GROUP BY

The GROUP BY clause retrieves a set of summary data. Instead of retrieving the data itself, GROUP BY groups the data and summarizes each group with an SQL aggregate function. The server returns only the summarization information for each group to Crystal Reports.

For example:

```
SELECT
     MYTABLE.'STATE',
     MYTABLE.'ZIPCODE',
     SUM (MYTABLE.'SALES')
FROM
     'MYTABLE' MYTABLE
GROUP BY
```

```
    MYTABLE.'STATE',
    MYTABLE.'ZIPCODE'
```

Server-side processing

Server-side processing allows you to set up a report that performs the majority of its processing on the server and pushes only relevant details to your computer.

Server-side processing provides you with a number of benefits:

- Less time connected to the server.
- Less memory needed to process the report on your computer.
- Lower transfer time from the server to the client.

Here's how server-side processing works: by using SQL pass-through technology to send an SQL statement to the database server and retrieve an initial set of data, Crystal Reports off-loads much of the data retrieval and sorting work onto the server system, thus freeing up local memory and resources for more important tasks. That is why server-side processing works only for reports that have been sorted and grouped; if a report has not been sorted and grouped (for example, if it is a simple list report), then there is no processing to push to the server. You should also note that server-side processing works only for reports based on SQL data sources.

Note:

- This description applies only to off-loading grouping and sorting to the server.
- Large amounts of server resources can be used for the temporary databases required when pushing grouping to the server.

Keep in mind that in order to perform the grouping on the server, your report must conform to the following conditions:

- The Perform Grouping on Server option (in the Options dialog box) is enabled. For more information, see *Enabling server-side processing*.
- The report uses some form of grouping.
- The report is at least partially hidden (at the very least, the Details section must be hidden). Since the server will process those sections that are hidden, the greater the portion of the report that is visible, the greater the

amount of processing that must take place on the client side. If the Details section is shown, server-side processing will not be possible.

- In some cases, formula fields must be processed on the client side. If grouping is based on a formula field, or if a formula is used in a summary field, then all the records must be transferred to the client side before the formula can be evaluated. This will increase the amount of time required to run the report. Therefore, you may want to use SQL expressions as an alternative to formulas.

  Note:
  Formulas used for record selection are an exception and can be pushed down to the server.

- For a report to be processed on the server, any running totals appearing in the report must be based on summary fields (since the data needed for the running totals will be pulled over to the client side).
- For a report to be processed on the server, the report must contain only summary fields of these types: Sum, Maximum, Minimum, Count.
- The report does not contain specified value grouping.

Note:

- When you drill-down on a hidden section of a report, with the processing being done on the server, connection to the server will be automatically initiated. If the client is disconnected from the server (for example, if you download a report onto your laptop and you work on it from a remote location), then drilling-down on data will produce an error since the database is not available.
- If you save a report that has been partially processed on the server using the Save Data with Report option, the program will save only those records that have been transferred to the client side. In other words, if you have drilled-down on a hidden section and there is a tab for that data in Crystal Reports (indicating the data has been transferred), those records will be saved with the report.

How server-side grouping affects the SQL query

When a report pushes most of its processing to the server, this by necessity alters the SQL query. Thus, when the Perform Grouping on Server option is

enabled, individual aspects of server-side processing will modify the SQL statement in different ways.

- If you select Use Indexes Or Server For Speed (in the Report Options dialog box), the program adds an ORDER BY clause to the SQL statement and a WHERE clause for the record selection formula, if possible.
- If you group on a linkable data type in the DBMS, the program adds a GROUP BY clause to the SQL statement. The program uses the GROUP BY clause to perform the grouping on the server.
- If you summarize on a linkable data type, the program adds a summary field to the SELECT clause of the SQL statement.
- If you drill-down on a linkable data type, the program adds a WHERE clause to the SQL statement.
- If you group in descending order on a linkable data type, the program adds an ORDER BY clause to the SQL statement.

The statement also varies between tabs:

- If you are working in the Preview tab, the statement includes the GROUP BY clause, as well as any aggregates that the report is pushing to the server.
- If you are drilling-down, the statement varies depending on the underlying data and the level of drill-down. With each drill-down, the WHERE criteria changes. Also, if you drill-down to the details, the statement will not include a GROUP BY clause (since you no longer have any groups on that drill-down tab).

To view the current SQL statement for the active tab, choose Show SQL Query from the Database menu. The Show SQL Query dialog box appears, displaying the SQL statement.

Note:
You can use the Formula Workshop to edit SQL expressions to be processed on the server.

Enabling server-side processing

1. On the **File** menu, click **Report Options**.
2. Select **Perform Grouping on Server** on the Report Options dialog box.

This check box is inactive if Use Indexes or Server for Speed is not selected.

3. Click **OK**.

Note:
You can also enable or disable this option quickly by selecting or deselecting Perform Grouping on Server on the Database menu as needed. If Use Indexes or Server for Speed is not selected in the Report Options dialog box, this command is inactive.

Mapping database fields

The Map Fields dialog box allows you to link report fields to their corresponding database fields when you have made changes to the structure of the database, or when you have created a report based on one database from a template of another report based on some other database that has the same table and field structure. In this way, the dialog box helps you to make sure your reports print with the current version of the active database.

When you first create a report, the report draws its fields from the database as it exists at the time. If you change the structure of the database after you create the report, the program needs to adapt the report to the new structure.

About the Map Fields dialog box

The Map Fields dialog box contains four boxes:

- The upper-left box displays the names of all unmapped report fields (for which the program detects a change in the active database). The top name is selected by default.
- The upper-right box displays the names of unmapped database fields (in which the program detects a change). Since the Match Type box is selected by default, this box displays only the names of unmapped database fields of the same type as the unmapped report field you selected in the upper-left box. To display all unmapped database fields, regardless of type, clear the Match Type box.
- The lower-left box displays the names of mapped report fields. When you map fields in the upper boxes, they appear in the lower boxes.

- The lower-right box displays the names of mapped database fields. When you map fields in the upper boxes, they appear in the lower boxes.

For each database field that you have changed, highlight the report field and the database field in the upper sections and click Map. The field names move from the upper boxes to the lower boxes.

You do not have to remap every report field. For example, if you delete a database field, it is not necessary to remap its corresponding report field, since you will not need that field in your report. You can click OK to close the dialog box without remapping each field listed in the upper-left box.

On some occasions, you might want to unmap or unlink report and database fields that you have already mapped. For example, you might mistakenly map the wrong fields or want to map a report field to a database field that you have already mapped. In these cases, you can select a report field in the lower boxes (the program then automatically selects the database field) and click Unmap. The field names will move from the lower boxes to the upper boxes.

Note:
Crystal Reports does not automatically refresh the report data when you close the Map Fields dialog box. To refresh your data, click Refresh on the Standard toolbar.

Remapping processes

If you make changes to the active database or universe fields that require you to remap the corresponding report fields, you can display the Map Fields dialog box by choosing any of these commands from the Database menu:

- Verify Database
- Verify on First Refresh
- Set Datasource Location

Note:
There is also a global option called Verify When Database Driver Upgraded (set on Database tab of the Options dialog box) that can make the Map Fields dialog box appear when you first refresh a report's data after updating its database driver.

You can use each of these commands for a specific function; however, any of these commands will open the Map Fields dialog box if the program detects a mismatch between the field names in the report and the field names in the database or universe. In order to detect any possible mismatches, the program checks each field name in the report against the field names in the database or universe. If one of the field names does not match any of the field names in the database or universe, the Map Fields dialog box appears.

Note:
Report fields that are left unmapped are removed from the report.

Using the Verify Database process

When you choose Verify Database from the Database menu, the program checks the active databases or universes, and reports. If it detects changes, the report must be adapted to prevent errors.

The program displays the Map Fields dialog box when it detects either of these types of changes to the database or universe:

- The name of a field that is used in the report has changed.
- The database or universe has been upsized from a PC data source to an SQL data source.

For a tutorial on the Map Fields dialog box, see *Remapping altered database fields*. Crystal Reports automatically adapts the report (and does not display the Map Fields dialog box) if it detects any of these changes:

- Fields have been added to the database or universe.
- Fields that are not used in the report have been deleted from the database or universe.
- Field positions have changed in the database or universe.
- Data types have changed for fields in the database or universe.

Using the Verify on First Refresh process

Verify on First Refresh triggers the Verify Database command the first time you refresh your report data per session:

- If there is a check mark beside Verify on First Refresh, the option is active (the option is active by default for new reports).
- If there is no check mark beside it, the option is inactive.

Using the Set Datasource Location process

When you choose Set Datasource Location from the Database menu and specify a new location for the active database or universe, the program checks the database or universe for changes.

Set Datasource Location displays the Map Fields dialog box when it detects any of the following changes in the database structure:

- A field has been deleted.
- A field has been renamed.
- The database or universe is completely new.

Note:
The program checks for these changes only if the databases or universes have different names or if the name has changed. If the databases or universes have the same name, the Map Fields dialog box does not appear, and you need to verify the database or universe when you have finished setting the location. For more information, see *Using the Verify Database process*.

Remapping altered database fields

Use the Map Fields dialog box to remap existing report fields in the active database or universe if they have been altered.

To remap an altered database field

1. With the report active in the **Design** tab, choose **Verify Database** from the **Database** menu.

   The Verify Database message box appears.

- If the program detects no changes in the active database, the message box displays this message: "The database is up to date." In this case, click OK and return to your work.
- If the program detects a change(s) in the active database, the message box displays this message: "The database file ["table name"] has changed. Proceeding to fix up the report!"

2. Click **OK**.

   If the program detects that a field name has been altered in the active database, the Map Fields dialog box appears.

   Note:
   The program automatically adapts the report to changes in other data within the database (number of fields, field position, data type, and so on). It is not necessary to remap fields in which these changes have been made.

3. Highlight the first report field that you want to remap in the upper-left box.
4. In the upper-right box, highlight the unmapped database field to which you want to remap the selected report field.
5. Click **Map**.

   The highlighted report and database fields no longer appear in the upper boxes. Instead, they appear in the corresponding lower boxes.

6. Repeat Steps 3 through 5 for each unmapped report field you want remapped.

   Note:
   If the names of any report fields remain in the upper-left box when you exit the dialog box, the program removes them from your report.

7. Click **OK**.

   The program remaps the report fields to the altered database fields.

Saved Data Indexes

You can increase the performance of a Crystal report by indexing its saved data. When you create a Saved Data Index on a particular field, Crystal Reports can more efficiently filter on that field. In particular, you will achieve

considerable performance gains—especially in larger reports—by indexing fields that are referred to by record selection formulas.

Note:
The benefits of Saved Data Indexes are largely unnoticeable in reports whose record selection returns fewer than 10,000 records.

Saved Data Indexes are especially useful when you schedule your Crystal reports for viewing through BusinessObjects Enterprise. For example, you want to provide your users with information about yearly sales for North America, so you create a report. You also want sales representatives to see figures for their individual regions, but you don't want them to see figures for other regions, so you create a selection formula to limit the report. After you schedule the report in BusinessObjects Enterprise and sales representatives view its instances, they see only figures for their own regions. If you had also created Saved Data Indexes, the representatives would see their records without having to wait for all records to be loaded.

In other words, the Saved Data Indexes allow a subset of the report's data to be accessed by a user. The indexes are invoked by applying a selection formula in BusinessObjects Enterprise at view time (that is, the selection formula applies a filter to an indexed field). These selection formulas can be applied by setting them in a report viewer, or by setting them through a report processing extension. (For information about report processing extensions, see the *SAP BusinessObjects Enterprise COM SDK Guide*.)

How Report Indexing works

With a non-indexed report, Crystal Reports has to look at every record in order to locate values that meet specified criteria. For instance, when a user requests a particular subset of the saved data, or when a user requests the report but only has rights to access certain records, Crystal Reports filters the saved data by checking each record for the appropriate values.

If you have indexed the saved data by one or more fields, however, Crystal Reports already knows which records contain particular values. Consequently, when a user accesses a particular subset of the saved data from the indexed field, Crystal Reports can locate and format the appropriate records more efficiently.

Once you have created Saved Data Indexes, they work entirely in the background. Users don't know that the saved data is indexed, and the

grouping, sorting, or formatting of the report doesn't change at all. The indexes merely allow Crystal Reports to locate particular records quickly, without passing through the saved data in its entirety.

Considerations for using Saved Data Indexes

There are some things that you should consider before deciding to use Saved Data Indexes:

- Indexes work best in scenarios where a report contains a large set of data, but only small subsets of the data are viewed at one time.
- Large, complex reports can overload the Crystal Reports report engine.

  For example, creating a large report with a selection formula that returns 90% of the report's data will probably take up more memory and disk space than a report file without indexes. In such a case, report processing will be slower.
- Indexes require disk space; this disk space can add up to more than the space required for the data itself. You trade the speed of applying selection formulas for the size of your report files.
- The Crystal Page and RAS servers are limited in how much caching occurs for different users when selection formulas are applied. Therefore, when a user views a report file with a selection formula and the Page Server takes up a certain amount of RAM, adding more users could cause the Page Server to use even more RAM.

Indexing the right field(s)

These guidelines describe the best ways to index saved data and what to avoid when indexing:

- Index fields that users frequently add to their record selection formulas.
- Index fields that are referred to by the report's record selection formula.
- Don't index all of the fields in the report.

  Doing so can result in increased processing times. It is best to index only on the fields that meet the criteria specified above. If all of the fields meet

these criteria, then you should prioritize the fields and index only some of them.

- Don't index fields that contain unique values only.

  For instance, don't index a field such as "Last Year's Sales," whose values are likely to be distinct from one another. If you do so, a separate index is created for each and every value in the field.

To index saved data

1. Open your report in the Crystal Reports.
2. On the **Report** menu, click **Report Bursting Indexes**.
3. In the Saved Data Indexes dialog box, select the fields that you want indexed within the saved data.
4. Click **OK** to return to Crystal Reports.
5. If you want to create the index immediately, refresh and save the report.

Unicode support in Crystal Reports

Crystal Reports supports Unicode by converting data from non-Unicode databases as it accesses it (this data conversion happens within Crystal Reports; the data in your database is not affected). Conversion is done using the identifier of the non-Unicode data and the machine's locale setting (usually found in the Control Panel's Regional Settings). To take advantage of the Unicode support in Crystal Reports, ensure the locale setting is correct on each machine that uses Crystal Reports.

For additional information

This section has only touched on some of the more important aspects of database access, relational databases, and SQL. If you are interested in learning more about database topics, refer to the documentation provided with your DBMS application.

Note:
In addition, there are hundreds of books available on the market that discuss database theory and design in depth. Look for the computer-related section at your local bookstore.

Accessing Data Sources

chapter 26

Introduction

Crystal Reports can access data stored in almost any common database format, as well as many uncommon formats. This section discusses the many different types of data that Crystal Reports can access, and explains the data access layers involved in connecting to the data. If you are not sure what Database Management System (DBMS) your company uses, contact your IT manager or your network administrator.

The principal purpose of Crystal Reports is simply to access data stored in databases and to produce reports on that data. This goal is one of the oldest uses of computers and remains one of the most common and most necessary. Crystal Reports is designed to make that task easier, less time-consuming, and more powerful.

This idea of accessing data remains at the root of every report produced. By understanding how Crystal Reports accesses data, you will gain a better knowledge of the reporting process, as well as a better knowledge of the type of data with which the program can work.

In addition, understanding the data access process will help you troubleshoot problems you may encounter while trying to open a particular database file. This is especially useful for IT managers, or for anyone who provides data access support for a group of users.

Most of the information in this section is designed for experienced Crystal Reports users and IT managers, and covers technical aspects of Database Management Systems (DBMS) and data storage techniques. A familiarity with computers, the Windows operating system, and at least one DBMS application is assumed.

Note:
Business Objects also provides native database drivers for its Solution Kits. These drivers and other integration features are available in Solution Kits for such Enterprise Resource Planning (ERP) products as SAP, Baan, PeopleSoft, and Siebel.

Six types of data

The data that Crystal Reports can access falls into six general categories:

- *Direct access database files*
- *ODBC data sources*
- *OLE DB*
- *Business Views*
- *Crystal SQL Designer files*
- *Crystal Dictionary files*

Each type of data must be accessed using a specific set of Dynamic Link Libraries (DLLs) and other data access-related files. Once you understand the process the program uses to access each type of data, you will have a better understanding of the report creation process and the elements used to create powerful reports with your data.

Note:
When accessing any type of data, Crystal Reports relies on the database drivers to provide field names, field types, and field lengths. This information is provided by either the database engine or the ODBC database driver.

Direct access database files

Crystal Reports can access many of the most common PC database formats directly. In other words, the program has the built-in capabilities needed to directly open database files and tables designed in dBASE, FoxPro, Clipper, Pervasive, Paradox, and Microsoft Access, among others. This functionality exists as soon as you install Crystal Reports. Once the program is installed on your system, you can immediately begin creating reports based on these databases by selecting the appropriate file.

Advantages

Accessing the database directly is the fastest way to read the data. Crystal Reports only needs to talk to a single data access layer that provides contact with the data. Report results can be obtained quickly in almost any system environment.

In addition, data access is simple. Direct access database files are point-and-click data sources. You need only select the required database files, and Crystal Reports will read all the stored data.

Disadvantages

When you access a database directly through Crystal Reports, only that database type can be used by the report. You cannot switch to a different type of database or table without creating a new report.

For example, if you design a report based on Pervasive data, you cannot change the tables accessed by the report to Access data. Crystal Reports communicates with Pervasive data using Pervasive-specific syntax, a syntax that is not compatible with Access data.

If you access data through ODBC, on the other hand, the syntax used is always the SQL language, regardless of the actual database type. See *ODBC data sources* .

Three layers

Direct access of database files from Crystal Reports requires three layers:

- *Crystal Reports*
- *Data translation*
- *Database*

Crystal Reports uses the data translation layer to talk to the database and access its data.

Crystal Reports

Crystal Reports operates as an interface through which you can format, arrange, select, and sort the data stored in database files. It obtains data by communicating with one or more files in the data translation layer that can actually read the database. Since Crystal Reports can work with many forms of data, it must rely on other files in order to work directly with the data.

Crystal Reports can then use a native method of communication to talk to the translation files.

Data translation

Data is translated through a set of DLLs specific to Crystal Reports. The program uses the DLLs specific to a certain data type to understand how data is organized for that type and to present it correctly when your report is printed, previewed, or exported.

Note:
Crystal Reports comes with all the data translation files for each of the direct access database types that it supports.

Database

The database file consists of one or more tables. Different DBMS applications store database information differently. For example, dBASE stores each database table as a separate file. Access, on the other hand, can store several tables, along with queries, macros, and other database elements, all in a single file.

When Crystal Reports accesses a database file directly, it automatically retrieves information about all of the tables and fields in that file. You may not use all of the tables or fields, but the program will make them available to you. In other words, when a dBASE file is opened, only one table in the dBASE file is available. However, when an Access file is opened, every table in that file is available, even if you never use them all.

Note:
Crystal Reports will also open queries in an Access database through the DAO engine or ODBC and will allow you to report on query fields, as with table fields. See *DAO* and *Access*.

Common database formats

Although Crystal Reports uses the same three-tiered system for obtaining data from all direct access database file formats, each format requires a

different set of DLLs. However, some formats expand the basic three-tiered structure.

The following sections cover the systems used by Crystal Reports to access data from some of the most popular database formats.

Microsoft Access

Microsoft Access provides several means for opening its database files. Each method has its advantages and disadvantages, and the technique that you should use may depend on how your data is set up. Below is a description of how to open Access data from Crystal Reports through the DAO engine. Another technique uses Microsoft's Open Database Connectivity (ODBC) standard, and is described in *Access*.

Note:
When you open an Access database using the DAO engine, Crystal Reports opens the entire database and loads information about all tables and queries from the database. To do this, Crystal Reports must reserve a large section of your computer's memory (called a buffer) in advance.

dBASE, FoxPro, Clipper

Crystal Reports has been designed to open dBASE data simply and directly through the xBase engine (inside crdb_p2bxbse.dll). FoxPro and Clipper are dBASE compatible database formats, and Crystal Reports uses the same DLL to access files created by any of these three DBMS applications.

Note:
The crdb_p2bxbse.dll translation layer supports FoxPro files up through version 2.6. See *Visual FoxPro* for versions after 2.6.

The file crdb_p2bxbse.dll handles all translation between Crystal Reports and the dBASE, FoxPro, or Clipper files. Each database file contains only a single database table, but there is no limit to the number of files that can be accessed by a report.

Note:
dBASE data can also be accessed through the Borland Database Engine (BDE) using the translation file crdb_p2bbde.dll. To see how the BDE communicates with database data, see *Paradox*. The BDE, however, does not support FoxPro or Clipper data.

Paradox

Files created with Paradox (.DB) are made available to other applications through the Borland Database Engine (BDE). The BDE does the actual work with the Paradox data, retrieving the requested tables and fields. Since the BDE works so closely with the actual data, it combines with the Paradox database file to create the database layer in the three layer data access model. Crystal Reports accesses the BDE through the crdb_p2bbde.dll translation file.

Note:
Crystal Reports does not install the BDE. It must be installed separately from a third-party application.

DAO

Microsoft's Data Access Object (DAO) Engine for versions of Access 2.0 and later is the part of the Microsoft Access Database Management System that actually handles your database data. As a user, you usually do not work directly with the DAO engine. It acts as a gateway through which Access data is made available to applications. Since the DAO engine is so closely tied to Access data, Crystal Reports considers it a part of the actual database.

DAO uses Microsoft's Object Linking and Embedding (OLE) technology to provide access to Access data through an object-oriented approach.

In addition to Access database tables, Crystal Reports can open and use Access queries through DAO. If you are not familiar with Access queries, refer to your Access documentation. Search also for the topic called "Opening Access queries through DAO" in the *Crystal Reports Online Help*.

Note:

- Access Parameter queries and Cross-tab queries can only be opened through an ODBC connection. Search for the topic called "Opening Access queries through DAO" in the *Crystal Reports Online Help* for more information. Access Action queries are not supported by Crystal Reports.
- When opening Access queries in a report, make sure the Views and Stored Procedures options are toggled on using the Database tab of the Options dialog box in Crystal Reports. This ensures that the queries will be visible when you open the Access database.

To translate information and data to and from DAO, the Report Designer uses the DAO translation file crdb_dao.dll.

Secured Microsoft Access Databases

If you will be using secured Access databases, the SystemDB parameter in the Windows Registry database must be set to point at the path where the System.mdw (Access 95 and later) file is located. On Windows NT, the SystemDB parameter is located in the following Registry key:

- Access 97

  \\HKEY_LOCAL_MACHINE\Software\Microsoft\Office\8.0\Access\Jet\3.5\Engines

- Access 2000

  \\HKEY_LOCAL_MACHINE\Software\Microsoft\Office\9.0\Access\Jet\4.0\Engines

Pervasive

Crystal Reports connects to the Pervasive (formerly Btrieve) engine through the translation files crdb_p2bbtrv.dll, p2bbtrv.dll, and p2ctbtrv.dll.

The Pervasive engine is a complex collection of DLLs and EXEs that are specific to the version of Pervasive you are using. For more information on the different Pervasive engine files, refer to your Pervasive documentation.

Note:

- Pervasive must be configured correctly for Crystal Reports to read Pervasive databases. If Pervasive is already configured correctly on your system, Crystal Reports can use your Pervasive data immediately upon installation. Crystal Reports automatically installs the Pervasive files that it requires to read Pervasive data. Refer to your Pervasive documentation to make sure the Pervasive engine is configured correctly.
- When you open a Pervasive database, Crystal Reports opens the entire database and loads information about all the tables in the database. To do this, Crystal Reports must reserve a large section of your computer's memory, called a buffer, in advance. Computer memory restrictions limit this buffer to 65,536 bytes (64K). This restricts the size of your Pervasive database to about 80 tables, depending on the number of fields in each table.

Pervasive DDF files

Crystal Reports does not determine the definitions of Pervasive data files directly from the data files themselves. It needs a set of Pervasive Data Definition Files (.DDF) that contain file, field, and index information. Crystal Reports uses Wbtrvdef.dll and Sbtrvdef.dll to parse these DDF files. The following are the required DDFs which must all reside in the same directory:

- File.ddf
- Field.ddf
- Index.ddf

A set of DDFs normally contain definitions for multiple Pervasive data files. Once one of the DDFs is selected when creating a new report, Crystal Reports immediately adds all the data files defined in that DDF into the report. Crystal Reports also takes the path defined in the DDFs as the default path of the data files. The DDFs and data files can reside in different locations.

Note:
Be sure to study your Pervasive documentation for more information on Pervasive DDFs and on configuring the Pervasive engine.

Exchange

Exchange is Microsoft's successor to MS Mail. Exchange, however, includes not only e-mail, but also management of group scheduling, electronic forms, groupware, and Internet connectivity. An Exchange folder can contain standard notes (mail), files, and instances of Exchange forms. All of this data is stored in the Exchange Information Store.

Note:
Exchange 2000 can be accessed through ADO.

Crystal Reports can report on data contained in the Exchange Information Store. Exchange data sources available for reporting include:

- Message Tracking Logs
- Address Lists
  - Personal Address Books
  - Global Address Lists

    - Distribution Lists
- Exchange Folder Contents
    - Mail messages
    - Exchange Form applications
    - Properties of OLE documents
- Exchange Administrator
    - Properties of Exchange mailboxes on the Exchange Server
    - Properties of public folders on the Exchange Server
    - Replica list of public folders
    - ACL (Access Control List) of public folders

You can use each Exchange data source like a database table and you can link each Exchange data source to other data sources. For example, you can join the Message Tracking Log to an Address List by using an e-mail address as the link field.

The data translation file used to access the Exchange data source depends on the data source that is being accessed. The following table lists each of the Exchange data translation files and describes their purpose:

File name	Data source
crdb_p2strack.dll	Exchange Server Message Tracking Logs
crdb_p2smapi.dll	Exchange Folders and Address Book
crdb_p2sexsrm.dll	Exchange Server Mailbox Admin
crdb_p2sexsrp.dll	Exchange Server Public Folders Admin

File name	Data source
crdb_p2srepl.dll	Exchange Public Folder Replica
crdb_p2sacl.dll	Public Folders Access Control Lists (ACL)
crdb_p2soutlk.dll p2soutlk.dll	Physical Server DLL for Microsoft Outlook

Exchange translation files work directly with the Microsoft Messaging API (MAPI). MAPI acts as a database engine for Exchange data.

How Crystal Reports treats Exchange data

Crystal Reports treats Exchange Administrator data (Public Folder Admin, Public Folder ACL, Public Folder Replica, and Mailbox Admin server types) as a physical database server. To access this data, you must log on using a SQL/ODBC server and select the appropriate tables from the Choose SQL Table dialog box.

When you log on to any of the Exchange Administrator servers, you must select a profile (or profiles). Each profile represents an Exchange Server.

Note:
Refer to your Microsoft Exchange documentation for more information about how to set up and create Exchange profiles.

Outlook

Microsoft Outlook provides powerful organization and information management tools in the form of e-mail, calendars, task lists and other popular tools.

Crystal Reports lets you report on your Outlook data by providing the translation files crdb_p2soutlk.dll and p2soutlk.dll. Because Outlook data is stored in a flat file system, the translation file accesses it directly.

Note:
You must have Microsoft Outlook installed, or available through UNC (universal naming convention) read-access. UNC is a standard format for paths that include a local area network file server. The basic syntax is:
`\\server\share\path\filename`

ACT!

ACT! contact management software stores information in a relational database format similar to the xBase format. See *dBASE, FoxPro, Clipper*. Crystal Reports can read this data and lets you produce reports based on your contact information.

ACT! databases newer than version 2

Versions of ACT! newer than 2 do not use an intermediate step in the translation layer. The translation files used for all ACT! databases higher than version 2 are crdb_p2bact3.dll, p2bact3.dll, and p2iract3.dll. For more information, search for the topic called "ACT! databases" in the *Crystal Reports Online Help*.

Oracle

Crystal Reports supports direct access to Oracle SQL databases. This accessibility is provided by the crdb_oracle.dll translation file. This file communicate with the Oracle database driver, which works directly with Oracle databases and clients, retrieving the data you need for your report.

Note:

- In order for Crystal Reports to use Oracle SQL databases, the Oracle client software must be installed on your system, and the location of the Oracle client must be in the PATH statement of your Autoexec.bat file.
- When logging on to Oracle using crdb_oracle.dll, the date format is changed to match the default date/time format of Crystal Reports.

Sybase Adaptive Server

Crystal Reports opens SQL data created by Sybase Adaptive Server directly through the crdb_p2ssyb10.dll, installed with Crystal Reports. This translation file works with the Sybase database drivers to read Sybase Adaptive Server data. If your Sybase server is correctly configured, you will be able to read Sybase data as soon as Crystal Reports is installed.

Lotus Domino

Lotus Domino is a powerful groupware application used for communication and information sharing between departments in an organization.

A Lotus Domino database can be read by Crystal Reports using either a native driver or an ODBC driver. For information about the ODBC driver, see *Lotus Domino*.

Choosing Lotus Domino during installation adds the translation file crdb_p2snote.dll.

Note:

- Nextpwd.dll and the Lotus API DLL (Lcppn201.dll) are installed in the Lotus Domino executable directory.
- The following line is added to the Notes.ini file:

```
EXTMGR_ADDINS=extpwd
```

Note:
The Lotus Domino executable and data directories are added to the PATH.

Informix Online Server

The Informix Online Server provides client/server capabilities along with SQL compliance.

Crystal Reports opens SQL data created by Informix through the crdb_p2sifmx.dll, installed with Crystal Reports. This translation file works with the Informix database drivers to read Informix data. You must have the

Informix client installed and configured properly before using this translation file.

DB2 Server

IBM's DB2 Server is an SQL compliant, client/server application that is part of IBM's popular database management suite.

Crystal Reports opens SQL data created by DB2 through the crdb_p2sdb2.dll, installed with Crystal Reports. This translation file works with the DB2 database drivers to read DB2 data. You must have the DB2 client installed and configured properly before using this translation file.

Active Data

Crystal Reports can be used to report off ActiveX data sources, including ActiveX Data Objects (ADO), Remote Data Objects (RDO), and Data Access Objects (DAO). Reports created off these data sources can be used in Visual Basic applications that use these ActiveX data sources. Visual Basic applications, Crystal Reports also supports Crystal Data Objects (CDO), which are sets of relational data created at runtime using Visual Basic arrays.

Crystal Reports also offers the ability to create reports without specifying an actual data source. This is supported through the use of a Data Definition file, which is an ASCII text file with placeholders to represent database fields. By using reports created off a Data Definition File, an application developer has the flexibility of specifying the actual data source at runtime.

Crystal Reports provides these translation files for Active Data reporting:

File	Description
crdb_fielddef.dll	For Microsoft ActiveX Data Objects
crdb_ado.dll	For Microsoft ActiveX Data Objects

File	Description
crdb_cdo.dll cdo32.dll	For Crystal Data Object Crystal Data Object COM DLL
crdb_dao.dll	For Microsoft Data Access Objects
crdb_odbc.dll	For ODBC

These translation files works with a different set of drivers for each data source.

Local file system

You can use Crystal Reports to report on files located on your system or network drives including information such as file name, version number, date, and so on.

The translation file crdb_filesystem.dll is provided by Crystal Reports for reporting on your local file system.

Note:
You must have UNC (universal naming convention) read-access to your local file system. UNC is a standard format for paths that include a local area network file server. The basic syntax is: `\\server\share\path\filename`

NT Event Log

If using Windows NT version 3.51 or later, you can use Crystal Reports to report on the NT Event Log. The Event Log is a database used by network administrators to record and keep track of different types of events that can occur on a Windows NT Workstation or on a Windows NT server.

Crystal Reports provides the translation files crdb_p2sevta.dll (archived log) and crdb_p2sevtc (current log) for working with NT Event Log data. These

files communicate with the Event Logging API in Advapi32.dll, a part of the Windows NT operating system.

Microsoft IIS/Proxy log file

If you use Microsoft Internet Information Server (MS IIS), or Microsoft Proxy, you can use Crystal Reports to report on the log files. These log files keep track of different types of events that occur when using a web server and browser.

The translation file Crystal Reports provides for MS IIS and Proxy log files is crdb_p2smsiis.dll. Because log file data is normally stored in a flat file system, the translation file accesses it directly.

Note:
You must have UNC (universal naming convention) read-access to your local file system. UNC is a standard format for paths that include a local area network file server. The basic syntax is: `\\server\share\path\filename`

Web/IIS log files

You can use Crystal Reports to report on Web log files. These log files keep track of different types of events that occur when using a web server and browser.

The translation file Crystal Reports provides for Web/IIS log files is crdb_p2swblg.dll. Because log file data is normally stored in a flat file system, the translation file accesses it directly.

Note:
You must have UNC (universal naming convention) read-access to your local file system. UNC is a standard format for paths that include a local area network file server. The basic syntax is: `\\server\share\path\file name`.

ODBC data sources

Open Database Connectivity (ODBC) is a standard developed by the Microsoft Corporation through which many different types of data can be

accessed by a single application. An application need only communicate with one set of files (ODBC) to be able to work with any source of data that can be accessed by ODBC.

There are hundreds of Database Management Systems (DBMS) available for personal computers, and thousands of applications that access DBMS data. Normally, a company that designs an application that accesses data, such as Crystal Reports, must develop a means for the application to communicate with each type of data that a customer might want to use. Crystal Reports does this with the databases that it can access directly.

On the other hand, if a DBMS simply provides a means by which ODBC can access its data, the DBMS data becomes an ODBC data source. Any application that can communicate with ODBC (such as Crystal Reports), will instantly have access to any ODBC data source. With ODBC drivers available for most common DBMS products, the range of data types that Crystal Reports can use is almost unlimited.

Advantages

Perhaps the biggest advantage to accessing data through ODBC is the ability to access a wide range of data with just one interface. Since most popular Database Management Systems now offer ODBC drivers, with more appearing every day, Crystal Reports can use any type of data you have.

Because of the extreme flexibility built into ODBC, you can use the same report file with different ODBC data sources. For example, you might design a report using an Oracle data source, and later, if your company switches to Microsoft SQL Server, you can simply change the ODBC data source used by your report. The only requirement is that the new data source must have the same structure (tables and fields) that the original data source had (although table names can be different). For more information, search for the topic called "Changing the data source accessed by a report" in the *Crystal Reports Online Help*.

Experienced SQL (Structured Query Language) programmers also benefit from the ODBC standard. Since Crystal Reports uses SQL to communicate with ODBC, SQL programmers and Database Administrators can view and edit the SQL statements sent to ODBC, controlling exactly how data is retrieved from the data source.

Finally, by using SQL pass-through technology to send an SQL statement to ODBC and retrieve an initial set of data, Crystal Reports off-loads much of the data retrieval and sorting work on to the server system, freeing up local memory and resources for more important tasks. In addition, only the data specified by the SQL statement is returned to Crystal Reports, reducing network traffic and the use of network resources. By working more efficiently with the original data, Crystal Reports saves you time and effort, and lets you concentrate on the design process and other more important work.

Disadvantages

There are many layers involved in passing data through ODBC from a database to an application. First, Crystal Reports must request some data. The request must be translated by the ODBC translation layer into a format that ODBC understands (an SQL statement). ODBC must determine where the requested data exists, and pass the request on to the ODBC data source. For more information, see *DBMS translation (ODBC data source) layer*. The data source must analyze the request and translate it again into a format that can be understood by the DBMS. This complex process can fail at any of several possible levels.

In addition, ODBC data sources must be correctly configured and set up in the Odbc.ini and Odbcinst.ini files before they can be used. If you create a report on one system and try to open it on another system that does not have the same ODBC data source set up, Crystal Reports will not be able to connect to the data.

When working with ODBC, you should also be aware that the SQL language used by ODBC is based on the standards set for the SQL language by the American National Standards Institute (ANSI). Some SQL-based DBMS applications, however, provide additional features to the SQL language that are specific to that DBMS. If your data uses features unique to your DBMS, ODBC will not be able to translate those features (though in many cases it will still retrieve most of the data). See *The SQL language*.

Five layers

The process by which Crystal Reports accesses data from an ODBC data source consists of five layers:

- *Crystal Reports layer*
- *ODBC translation layer*
- *ODBC layer*
- *DBMS translation (ODBC data source) layer*
- *Database layer*

By using the Structured Query Language (SQL), all five layers can conveniently pass data from the database to your report.

Crystal Reports layer

When working with ODBC data, Crystal Reports generates an SQL statement that requests the appropriate data from ODBC. The powerful SQL generator built into Crystal Reports is designed to create an SQL statement that will let the ODBC data source or ODBC itself do as much of the report generation as possible, returning only the data needed to produce the report.

ODBC translation layer

Crystal Reports uses the Dynamic Link Library crdb_odbc.dll to communicate with ODBC. This file is unique to Crystal Reports environment and provides your report with access to any ODBC data source. This is the driver that actually passes data to and from ODBC.

ODBC layer

ODBC is a set of several DLLs and INI files built into the Windows environment that act as a gateway through which database requests and data can pass. Any database file or format that is to be used via ODBC must be set up as an ODBC data source.

Although information regarding data sources is recorded in Odbc.ini and Odbcinst.ini, 32-bit ODBC uses the Windows Registry database to retrieve information about individual data sources.

Note:
For more information on ODBC and the ODBC files, see the Microsoft ODBC documentation.

ODBC uses the SQL language for all transactions between Crystal Reports and ODBC. Even if the database does not normally use SQL to create and work with tables, the ODBC driver provided by the database (the DBMS translation layer) must communicate with ODBC using SQL. For most users, this feature of ODBC is transparent, but more advanced users often take advantage of the features of the SQL language used by ODBC.

DBMS translation (ODBC data source) layer

This layer consists of one or more drivers provided by a DBMS that allow ODBC to communicate with the database. Crystal Reports ships with several ODBC drivers for many of the most common database formats. If you are unsure whether you can use an ODBC driver to access the data in your database, refer to the documentation for your DBMS application. Most DBMS applications that run on a Windows-based platform offer an ODBC driver.

When a DBMS provides an ODBC driver, it must register the driver with ODBC on the machine on which it has been installed. It does this by assigning a name to the driver and recording the filename in the Odbcinst.ini file. Usually, this step is handled automatically when the DBMS application is installed on the system. However, your network system or DBMS application may require that you register the ODBC driver manually with the ODBC Setup application. For more information about registering an ODBC driver with ODBC, refer to the documentation for your DBMS.

Once an ODBC driver is registered, you need to establish an ODBC data source using that driver. The ODBC data source is the object that you connect to when accessing data from Crystal Reports through ODBC. Data sources are recorded in the Odbc.ini file. The data source keeps track of the DBMS translation files (ODBC drivers) and, sometimes, the database itself. An ODBC data source can specify just a database format, such as Oracle, Sybase SQL, or MS SQL Server. Some users, however, prefer to actually specify a particular database. In this case, the ODBC data source extends across both the DBMS translation layer, and the database layer.

If you are using a client/server database, such as an SQL server, the ODBC drivers communicate with the database server through the Database Communication layer, the same layer that your database client uses to communicate with the database server.

Note:
ODBC drivers find their specific DBMS client files on the local machine mainly through key directories that the DBMS client has installed in the search path. The important thing to remember is that a workstation client on a local PC must be able to connect to its server successfully. If you are not sure how to verify this, contact your IT manager.

For Crystal Reports and the ODBC drivers, it does not matter what kind of platform your database server exists on. It is the DBMS client that connects and communicates with the server; Crystal Reports and the drivers need only communicate with the DBMS client. For more information, see *Using SQL and SQL databases*.

Database layer

The database file which the ODBC data source refers to can be located anywhere on a system. Once the ODBC data source is set up, Crystal Reports does not need to know the actual location and format of the data. Thus, the database can have any format and can be located anywhere on a network, as long as ODBC can communicate with it through the ODBC data source.

Installing database clients

Ideally, your database client should be installed and configured before you install Crystal Reports. If, however, you've installed Crystal Reports first, you can ensure the proper configuration of the Crystal Reports ODBC Data Source Name (DSN) by following this procedure.

To ensure correct ODBC DSN configuration

1. On the **Start** menu, select **Settings,** select **Control Panel**, then double-click **Add or Remove Programs**.
2. Select **Crystal Reports** and click **Change**.
3. In the Crystal Reports Setup dialog box, click **Add/Remove**.
4. Expand the **Data Access** folder and select the appropriate data access option.

For example, if you have installed the Informix database client, select Informix from the Data Access folder.

5. Click the selected data access option and choose **Entire feature will be unavailable**.

   An X appears next to the option and the Feature Description area includes a remark that the feature will be completely removed.

6. Click **Next** on this dialog box and the following one.

   The data access option you selected is removed.

7. Repeat steps 2 through 4.
8. Click the selected data access option and choose **Will be installed on local hard drive**.

   The X next to the option is removed and the Feature Description area includes a remark that the feature will be installed.

9. Click **Next** on this dialog box and the following one.

   The data access option you selected is reinstalled and its ODBC DSN is configured properly.

Common ODBC database formats

Access

Although Microsoft Access files can be opened directly by Crystal Reports (see *Microsoft Access*), you may wish to use ODBC for these files instead. When communicating with Access databases, ODBC uses a translation file that communicates with the Microsoft Jet Database Engine through the DAO (see *DAO*). The Jet Database Engine is an example of a DBMS-specific ODBC driver.

The Jet engine is the part of the Access DBMS that does all of the actual work with an Access database. Jet is a required component for working with Access data. Since the Jet engine is an integral part of all Access databases, it is shown here as part of the database layer.

Excel

You can convert Microsoft Excel spreadsheets into databases that can be read by Crystal Reports through ODBC. In Excel 4.0 and earlier, use the Set Database command on the Data menu. In Excel 5.0 and later, use Define on the Name submenu of the Insert menu. Once converted, spreadsheet rows become records, and spreadsheet columns become fields. (For more information on converting your spreadsheets to database format, refer to your Excel documentation). Once the spreadsheet is converted, you can set up an ODBC data source for the file, and then select it from Crystal Reports.

Note:
If you are using Excel 7 or later, you can export your spreadsheets as Access database tables, and read them from Crystal Reports as you would read any other Access tables. For more information, refer to your Excel documentation.

You can set up an ODBC data source for Excel spreadsheets using the DAO engine. The DAO engine is installed on your system when you install Crystal Reports. However, you must set up an ODBC data source manually for your Excel spreadsheet. Search for the topic called "Setting up an ODBC data source" in the *Crystal Reports Online Help*.

Informix

Crystal Reports accesses Informix databases through ODBC. The Informix client should be installed on your machine. Otherwise, Crystal Reports will provide the driver that ODBC uses to communicate with the Informix database engine.

Note:
The Informix ODBC driver is part of the DataDirect drivers download that is available from the Business Objects Download Center at:

http://www.businessobjects.com/products/downloadcenter

SQL databases through DataDirect

There are many different SQL Database Management Systems available on the market, and most of them can be accessed through ODBC. Crystal

Reports provides several DataDirect ODBC drivers through download, allowing you to access many of the most popular SQL databases, including:

- Informix
- Oracle
- Sybase
- Microsoft SQL Server
- DB2

Crystal Reports still communicates with ODBC through the crdb_odbc.dll translation file, but the DataDirect drivers provide ODBC with easy access to the actual databases.

Note:
If you are using an SQL database not accessed by the DataDirect drivers, refer to your DBMS documentation for more information about the required ODBC drivers.

Do not confuse SQL databases with the SQL language. Structured Query Language (SQL) is a specialized computer language used to design, build, and read database files. See *Using SQL and SQL databases*.

SQL databases are any collection of computer applications that depend on the SQL language for database creation and manipulation. SQL DBMS applications are usually designed to run as large client/server applications spread across a network.

To open an SQL database, ODBC uses a set of DataDirect ODBC support drivers (these are the same for every SQL database format), a DataDirect ODBC driver specific to the database format, and the Database Communication layer that actually communicates directly to the database file. The files provided for this DBMS translation layer are all DataDirect drivers.

Note:

- ODBC does not have to use the DataDirect drivers to access the SQL databases shown here. Most SQL DBMS applications provide their own ODBC drivers.
- DataDirect drivers are available as a download from the Business Objects Download Center at:

http://www.businessobjects.com/products/downloadcenter

Visual FoxPro

Microsoft Visual FoxPro data is accessed through ODBC, while FoxPro data from version 2.6 and earlier is accessed directly through the xBase engine. If you are using FoxPro version 2.6 or earlier, see *dBASE, FoxPro, Clipper*.

Lotus Domino

A Lotus Domino database can be read by Crystal Reports through ODBC. For Windows, the Lotus Domino DBMS translation layer consists of three files:

- Nsql32.dll
- Nsqlv32.dll
- Nsqlc32.dll

These files use the drivers installed by the Lotus Notes client to work with the Lotus Domino database. The client component of Lotus Domino must be installed on the local machine.

Note:
The Domino Server can be substituted for the Lotus Notes client in the database layer.

OLE DB

OLE DB is a database connectivity entity from Microsoft similar in conception to ODBC.

Note:

- OLE DB is a connectivity methodology and not a database. Like ODBC, it facilitates the exchange of data created in other database management systems by providing an interface layer.
- OLE DB requires the use of an OLE DB provider, which is the OLE DB equivalent of an ODBC driver.

JDBC data sources

Java Database Connectivity (JDBC) is a Java API developed by Sun Microsystems that acts as an interface between a developer's Java code and a database. JDBC provides a mechanism for the developer to use to connect to a specified database, request information about the database, and then select information from it.

JDBC is similar to Microsoft's Open Database Connectivity (ODBC) and is fast becoming the standard for database-independent connectivity between Java applications and SQL-based databases.

JDBC shares many of the advantages of ODBC, but it has a unique advantage in its ability to provide platform-independent access to any database that has a JDBC driver available to it.

Note:
The Crystal Reports JDBC driver requires version 1.4 of the JDK. You can download the correct version of J2SE at *http://java.sun.com/j2se*.

JNDI

The Java Naming and Directory Interface (JNDI) provides an interface that you can use to seamlessly connect to diverse naming and directory services within your company. Most importantly for reporting purposes, JNDI contains a repository for holding JDBC connection strings; when you provide these predefined connection strings through JNDI, your users will not be called on to provide connection URLs and class names when connecting to a data source.

JNDI can also be used to employ the more advanced connection-pooling type connections to a database. In either case, JNDI returns a valid connection to your database.

Note:
Check the `Platforms.txt` file in the Crystal Reports product distribution for a list of supported JNDI servers.

Five layers

The process by which Crystal Reports accesses data from a JDBC data source consists of five layers.

- *Crystal Reports layer*
- *JDBC translation layer*
- *JDBC layer*
- *DBMS translation (JDBC data source) layer*
- *Database layer*

Crystal Reports layer

The Crystal Reports layer is database-driver independent, but it is used to drive all of the remaining layers.

JDBC translation layer

Crystal Reports uses the Dynamic Link Library `crdb_jdbc.dll` to communicate with JDBC. This file is unique to Crystal Reports environment and provides your report with access to any JDBC data source. This is the driver that actually passes data to and from JDBC.

JDBC layer

JDBC acts as a gateway through which database requests and data can pass.

Note:
For more information on JDBC and the JDBC files, see the Sun Microsystems web site.

JDBC uses the SQL language for all transactions between Crystal Reports and JDBC. Even if the database does not normally use SQL to create and work with tables, the JDBC driver provided by the database (the DBMS translation layer) must communicate with JDBC using SQL. For most users,

this feature of JDBC is transparent, but more advanced users often take advantage of the features of the SQL language used by JDBC.

DBMS translation (JDBC data source) layer

This layer consists of one or more drivers provided by a DBMS that allow JDBC to communicate with the database. If you are unsure whether you can use an JDBC driver to access the data in your database, refer to the documentation for your DBMS application.

Database layer

The database file which the JDBC data source refers to can be located anywhere on a system. Once the JDBC data source is set up, Crystal Reports does not need to know the actual location and format of the data. Thus, the database can have any format and can be located anywhere on a network, as long as JDBC can communicate with it through the JDBC data source.

Supported JDBC database formats

There are many different SQL Database Management Systems available on the market, and many of them can be accessed through JDBC. Crystal Reports communicates with JDBC through the `crdb_jdbc.dll` translation file, which has been designed to work with any fully JDBC-compliant driver. Crystal Reports officially supports third-party JDBC-compliant database drivers provided with:

- IBM DB2
- Oracle
- Microsoft SQL Server
- BEA LiquidData for WebLogic

Note:
Check the Release Notes in the Crystal Reports product distribution for specific version requirements and for updates to this list; more database drivers may be added as testing progresses.

Configuring the Crystal Reports JDBC driver

When you install Crystal Reports, the following Crystal Reports JDBC driver files are added to your system:

- In the `\Program Files\Business Objects\common\3.5\bin` directory:
  - `crdb_jdbc.dll`
  - `crdb_jdbc_res_en.dll`
- In the `\Program Files\Business Objects\common\3.5\java` directory:
  - `CRConfig.xml`
- In the `\Program Files\Business Objects\common\3.5\java\lib` directory:
  - `CRDBJavaServer.jar`

CRConfig.xml configuration for JDBC/JNDI

After installing the Crystal Reports JDBC driver, you must configure the `CR Config.xml` file before the driver will work. See the CRConfig.xml Tag Reference in the *Crystal Reports Online Help* for a complete list of tags. The main tags that you must configure are *`JavaDir, Classpath`*, and *`IOR FileLocation`*.

Business Objects universes

You can create a Crystal report from a Business Objects universe. Crystal Reports lets you select a universe and design a query from it using a tool called the Business Objects Query Panel. This query forms the basis of a SQL statement that is saved as a Crystal SQL Command object. For more information about SQL Command objects, search for the topic called "Defining an SQL Command" in the *Crystal Reports Online Help*.

Note:

- When you report off a universe in Crystal Reports, the query that is produced is based on the structure of the database the universe references as it was when you designed the report. If the universe changes, you must return to the Query Panel to propagate the changes in the report. See *Editing an existing query* for more information.
- If the universe contains security that is created and managed through BusinessObjects Supervisor, the rights applied to the current report are always the rights of the person designing the report.
- When you report off a universe in Crystal Reports, WebI server groups are not supported (PServer, JServer groups are supported).

This version of the Query Panel in Crystal Reports supports ODBC database connections (including Sybase and Informix ODBC) as well as OLE DB, DB2 native, and Oracle native connections.

To learn how to begin reporting off a universe in Crystal Reports, see *Connecting to a universe*.

Business Views

Business Views are collections of components created in Business View Manager—a flexible and reliable multi-tier system. Business View Manager lets companies build detailed and specific Business Views that help report designers and end users access the information they require.

Using Business Views, you can integrate data from disparate sources. You can also bring together data from multiple data collection platforms and application boundaries so that the differences in data resolution, coverage, and structure between collection methods are eliminated.

Business View Manager, a thick-client application, enables administrators to create and modify Data Connections, Dynamic Data Connections, Data Foundations, Business Elements, and Business Views.

Note:
A Business View is defined as the following collection of components:

- Data Connections
- Dynamic Data Connections
- Data Foundations

- Business Elements

Users can access Business Views through products such as Crystal Reports and the Report Application Server.

For detailed information about Business Views and how to create them, see the *Business Views Administrator's Guide*.

Note:

- When you save a report that is based on a Business View, the Save As dialog box contains an option called "Disconnect view security." Selecting this option disconnects the report from the Central Management Server (CMS) so that users are not prompted for logon when they open the report. Once a report is disconnected from the CMS, you cannot reconnect to BusinessObjects Enterprise and its security features, nor can you refresh the report's data. This is a useful option for times when you might want to share data that is normally secured, but you don't want those who receive the report to be able to refresh the data later.
- It is the responsibility of the System Administrator, or the report designer who has Administrator rights, to save reports based on Business Views to a secure location. If the Administrator creates a report based a Business View that has row- or column-level security, saving the report with saved data to a non-secure location and then disconnecting from BusinessObjects Enterprise makes the report and all of its data available to any user.

Crystal SQL Designer files

The Crystal SQL Designer file is a query which is simply a request for a specific set of data from a database. Once the data is gathered, it can be stored as a Crystal SQL Designer file (.qry). The Crystal SQL Designer file can then be used much like a database table. The data it gathers from your SQL databases becomes a new data set that can be added to reports.

Note:

- Crystal SQL Designer files were created by a legacy program in Crystal Reports. While the program is no longer supported, you can still use the resulting QRY files as report data sources.
- Crystal Reports also provides the ability to create SQL Commands; you can define your own SQL statement to create a virtual table to use as a data source for your reports. These commands can be stored in the

BusinessObjects Enterprise Repository and shared between many users. For more information, search for the topic called "Defining an SQL Command" in the *Crystal Reports Online Help*.

A Crystal SQL Designer file gathers data from ODBC data sources (such as SQL servers) by means of SQL (Structured Query Language). The SQL DBMS handles all of the actual data gathering, sorting, and grouping, according to the instructions in the SQL statement. Only the final set of data is stored as a query file.

Note:
If you are not familiar with SQL, see *Linking options*.

First, you refine an SQL statement and create a query file that contains only the data you need. Then you design your reports based on the query file instead of on the original databases. Most of the data gathering process is done on the SQL server when you design the query. When you design your report, the Report Designer only needs to work with a small set of data, saving you time and trouble.

Note:
The file crdb_query.dll must be installed before you can use query files in your reports.

Crystal Dictionary files

A dictionary (.dc5) file is a structured and simplified view of organizational data that you can create for any of the individuals in your organization that are using Crystal Reports. With a dictionary, end users only see the subset of tables and fields they need.

A dictionary is an optional source of data for Crystal Reports. It provides a convenient filter, clarifying and simplifying complex data access techniques for end users, but the user can still access data directly from the database. Dictionaries simply provide all the convenience without the headaches.

Note:
Crystal Dictionary files were created by a legacy program in Crystal Reports. While the program is no longer supported, you can still use the resulting DC5 files as report data sources.

Once created, the dictionary acts as a filter, providing a view of complex data that is clear and easy for any user to understand. The complexity of your data will not stop end users from creating powerful reports.

Note:
The file crdb_dictionary.dll must be installed before you can use dictionary files in your reports.

Crystal Reports reads the dictionary file by using the P2ixbse.dll file. This translation file is based on the xBase engine used to access dBASE, FoxPro and Clipper databases, but it provides all the flexibility needed to read dictionaries. See *dBASE, FoxPro, Clipper*.

Note:
If you upgraded from an earlier version of Crystal Reports that allowed dictionary files, the older dictionary files (.dct) were based on the Pervasive engine. If you convert those older files to new dictionary files, the new files will use the xBase translation layer instead of Pervasive. However, the Pervasive engine installed by the earlier version of Crystal Reports must remain on your system for the new dictionary application to read the older dictionary files.

The Database Access layer is the layer through which the dictionary file actually reads the original database data. Dictionaries must read database data using the same routes that Crystal Reports uses to read the data. The sections on direct access database layers and ODBC data sources describe the files dictionaries need for reading data.

Report Processing Model

Overview

Crystal Reports uses a three-pass reporting method to generate reports. The sections below describe what happens during each step of this process. To see a visual representation, refer to the flow-chart at the end of this section.

What is a "pass"?

A pass is a process that Crystal Reports uses each time the data is read or manipulated. Depending on the complexity of the report Crystal Reports may make 1, 2, or 3 passes over the data. This feature allows for complex reporting and formula manipulation.

Pre-pass 1

When previewing a report, the first elements to be evaluated are "constant" formulas. Constant formulas are those that have a constant value for the entire report. They do not change from record to record. For example, 100* 30 would be a constant formula. Constant formulas are evaluated at the beginning of the print generation process and are never evaluated again. This process is known as "BeforeReadingRecords." If you were to place a constant formula field (i.e., 100*30) in the Details section, the result would be 3000 for each record displayed.

Pass 1

After the "BeforeReadingRecords" process has taken place, Crystal Reports begins reading the database records. During the record reading process, the following will occur:

- Record retrieval. Where possible record selection and sorting are pushed down to the database in this step.
- Evaluation of recurring formulas. These formulas are those that contain database fields but do not contain references to subtotals or summary information. This evaluation time is known as "WhileReadingRecords."

Formulas that contain references to subtotals or summary information are processed in the second pass.

- Application of the record selection locally. If the record selection is too complex to be pushed down to the database, it is applied by Crystal Reports in this step.
- Application of the saved data record selection formulas. When records return to the report, they are further filtered through any existing saved data formulas.
- Sorting, grouping, and totaling. In this step, Crystal Reports sorts the records, separates them into groups, and then calculates the subtotals and summaries needed for each group.
- Cross-Tab, chart, and map generation. Only Cross-Tabs, charts, and maps that are based entirely on database fields and recurring formulas are generated in Pass 1. If these objects include running totals and/or PrintTime formulas, they are generated in Pass 2.
- Storage of saved data. After the totaling process is complete, all of the records and totals are stored in memory and to temporary files. Crystal Reports does not read the database again, but instead uses this saved data during all subsequent processing.

Pre-pass 2

During Pre-Pass 2, Crystal Reports orders the groups in the report for Top/Bottom N or Hierarchical Grouping. The records are not read in this process, instead Crystal Reports only looks at group instances from Pass 1, and takes the Top N as appropriate, or orders the groups based on the Hierarchical Grouping settings specified.

Pass 2

Crystal Reports enters the second pass through the data to format pages. The pages are formatted on demand. This means that Crystal Reports will not format a page until it is requested by the user, or until it is required for the total page count in Pass 3.

During page formatting, Crystal Reports does the following:

- Group selection formulas.
- Running totals.
- Calculation of formulas marked "WhilePrinting Records."

  These are formulas that contain references to subtotals or summary information, also known as "PrintTime" formulas. This evaluation time is known as "WhilePrinting Records."
- Cross-Tabs, charts, and maps.

  Cross-Tabs, charts, and maps that include running totals and/or PrintTime formulas, and charts that are based on Cross-Tabs are generated in Pass 2.
- OLAP grids.
- Subreports.
- Generation of Pages on Demand.

Note:

- Subtotals, grand totals, and summaries may appear to be incorrect if the report has a group selection formula. This occurs because the grand totals and summaries are calculated during Pass 1, but the group selection formula filters the data again in Pass 2. Running total fields can be used instead of summaries to total data in reports with a group selection formula.
- You can use on-demand subreports to ensure that your main report remains a single-pass report. With on-demand subreports, Crystal Reports must still make a second pass through the data; however, this second pass does not begin until you drill down on the subreport. Consequently, you can increase the performance of reports that contain subreports by using on-demand subreports.

Pass 3

In the third, and final pass, the total page count is determined. This applies to reports that use the total page count, or Page N of M special fields.

Crystal Reports Error Messages

appendix B

Drive:\filename.extension

This document could not be opened. It does not appear to be a Crystal Reports document.

Context

Occurs when attempting to open a Crystal report file that does not have an RPT extension.

Reason

This error occurs because the report has become corrupted.

Resolution

A backup copy of the report must be used in place of the corrupted copy.

Drive:\test.rpt

This document could not be opened. It does not appear to be a Crystal Report document.

The document has the expected extension (RPT), but it seems to be corrupted. If this report used to work, try opening it with a different version of Crystal Reports; if that does not work, contact your administrator.

Context

Occurs when attempting to open a Crystal report file that has an RPT extension.

Reason

This error occurs because the report has become corrupted.

Resolution

A backup copy of the report must be used in place of the corrupted copy.

Failed to load database connector

Reason

The database connector is not available on the machine that is processing the report.

The database client software required by the database connector is not available on the machine that is processing the report.

Context

Occurs when refreshing or previewing a Crystal report that does not contain saved data.

Resolution

Ensure that the database connector used by the report is installed on all machines where the report can be run.

Ensure that the necessary database client software required by the database connector is installed and in the PATH environment system variable on all machines where the report can be run.

Failed to open the connection. Details: [Database Vendor Code: <vendor code number>]

Reason

- The data source required by the report is unavailable or improperly configured on the machine that is processing the report.
- The database server required by the report is unavailable.
- The database client is installed but improperly configured on the machine that is processing the report. For example a DB2 database alias, Oracle tnsnames entry or Sybase DSEDIT entry is missing or improperly configured.

Context

Occurs when refreshing or previewing a Crystal report that does not contain saved data.

Resolution

- Ensure that the data source required by the report is available and properly configured on all machines where the report can be run. For example, the ODBC data source or JNDI data source exists and connectivity can be proven from a client test tool.
- Ensure that the database server required by the report is running and that connectivity can be proven from a client test tool on all machines where the report can be run.

Failed to retrieve data from the database. Details: [Database Vendor Code: <vendor code number>]

Context

Occurs when refreshing or previewing a Crystal report that does not contain saved data.

Reason

The report SQL queries that have been sent to the server cannot be executed, because an error was returned by the database server after it processed the queries. For example, a field/table/procedure required by the report is missing, or the queries contain syntax errors.

Resolution

Ensure the report is using the correct connection information. For example, the data source name, server name, database name, and user name are correct.

In a database client test tool, ensure that the fields, tables, and procedures used by the report exist, and that SQL queries can be executed against them.

In the Crystal Reports designer, verify that the SQL query, as shown under the Database menu Show SQL Query option does not contain syntax errors.

If the SQL query shown in Crystal Reports is valid, execute the same SQL query through a database client test tool.

Failed to retrieve data from the database. Details: [Database Vendor Code: <vendor code number>]

Creating Accessible Reports

appendix C

About accessibility

When you create Crystal reports for a large audience across the organization—and around the world—you need to account for the diverse needs of that audience. Report designers often create reports for specific languages, countries, job tasks, or work groups, but it is also important to consider the accessibility requirements of users.

Report users may have physical, sensory, or cognitive limitations that affect their ability to access the Web. They may not be able to see, move, or hear. They may have low vision or limited movement. Some people have dyslexia, color-blindness, or seizure disorders; others have difficulty reading or understanding text. They may have a combination of disabilities, with varying levels of severity.

People with disabilities often use assistive technologies: products or techniques that help people perform tasks they cannot perform otherwise. Assistive technologies include adaptive software programs such as screen readers (which translate text into audible output), screen magnifiers, and speech-recognition software. People with disabilities may also use special browsers that allow only text or voice-based navigation. They may use assistive devices such as refreshable Braille displays, or alternative keyboards that use "sip-and-puff" switches or "eyegaze" technology.

To meet the reporting needs of people with disabilities, your reports should be designed to work with as many assistive technologies as possible.

Despite the wide range of potential accessibility issues, you can use the techniques described in this section to create reports that are useful for everyone.

Benefits of accessible reports

As more business and government leaders adopt new standards for delivering web content to people with disabilities, accessible design is becoming critical to information management and delivery.

Accessible design provides many benefits:

- Accessible reports are easier for everyone to use.

Many accessibility guidelines result in improved usability. An accessible report must provide logical and consistent navigation. Its content must be clearly written and easy to understand.

- Accessible reports are more compatible with a variety of technologies, new and old.

  Accessible content is easier to export to simple formats that are more compatible with mobile phone browsers, personal digital assistants (PDAs), and other devices with low-bandwidth connections.

  Some people may not have a keyboard or a mouse. They may have a text-only screen, a small screen, or a slow Internet connection. Accessible design makes it easier for people with limited technology to access information.

- Accessible content is easier to reuse for other formats.

  In the viewers, accessible reports are more accurately copied or exported to other formats.

- Accessible reports improve server efficiency.

  You may reduce the number of HTTP requests on the server, by providing clear navigation so people can find. what they need faster. Providing text-only alternatives can reduce the number of graphics, which take up valuable bandwidth.

- Recent initiatives indicate a worldwide trend towards providing accessible web content.

  More companies are making accessibility a requirement for their web content, especially in the United States, where the government introduced section 508 of the Rehabilitation Act. Accessibility is quickly becoming an essential part of web content delivery.

- You may be legally required to provide accessible content.

  Each year, more countries introduce anti-discrimination laws that ensure equal opportunities for people with disabilities. Even if you are not legally required to meet accessibility guidelines, you may want to do business with an organization that is required to adhere to them.

- Creating accessible reports is easier than modifying existing reports to make them accessible.

If you build accessible features into your reports now, it will be significantly less expensive than to redesign existing reports later.

About the accessibility guidelines

The most comprehensive accessibility guidelines are the Web Content Accessibility Guidelines (WCAG), developed by the international World Wide Web Consortium (W3C). The WCAG is widely considered the definitive set of recommendations for delivering web content to people with disabilities. The WCAG has influenced the development of similar web content standards around the world.

Organizations and governments worldwide are adopting the accessibility recommendations of the W3C. In Australia, the Disability Discrimination Act includes standards for web site accessibility. Similar guidelines have been introduced in the United Kingdom and throughout Europe. In Canada, all government web content is now developed according to the Common Look and Feel (CLF) initiative, which is largely based on the W3C's Web Content Accessibility Guidelines. Taking web accessibility a step further, the United States government introduced legislation in the form of Section 508 of the Rehabilitation Act, which ensures the right to accessible government web content.

Common to all guidelines is a focus on providing web content that is useful for all people, regardless of disability or impairment. For reports, accessible design is focused on the same key concepts:

- Content must be easy to understand and navigate.
- Text equivalents or alternatives should be provided for non-text objects.
- Objects should be logically organized to clarify relationships between objects.
- Reports must not rely on any one specific type of hardware, such as a mouse, a keyboard, or a color screen.

For more information on specific accessibility guidelines, see *Resources*.

Accessibility and Business Objects products

Business Objects products allow you to design accessible reports and deliver them to your users via the Web. By observing accessibility guidelines, you can use Crystal Reports to create reports that are accessible to users with disabilities. You can then publish these reports to BusinessObjects Enterprise, where people with disabilities can view them on the Web using the BusinessObjects Enterprise web desktop and the DHTML viewers.

The reports in this section were created in Crystal Reports and tested using screen readers (including JAWS 4.5).

However, Crystal Reports does not currently provide complete accessibility for report designers with disabilities.

The BusinessObjects Enterprise management components, including the BusinessObjects Enterprise Central Management Console (CMC) and the Central Configuration Manager (CCM), do not currently provide access for people with disabilities. The ActiveX and Java viewers are also not accessible.

In the BusinessObjects Enterprise web desktop, the main user interface for working with reports through BusinessObjects Enterprise, the ability to log on and view reports is accessible for most users. However, other areas, such as new account sign up and scheduling, may not be accessible.

Note:
Although you can use many of the same design guidelines to improve the accessibility of OLAP Intelligence Professional reports, Worksheets are difficult to format for accessibility. Crystal Reports is the recommended option for delivering reports to people with disabilities.

Improving report accessibility

To begin improving the accessibility of your Crystal reports, start with accessibility guidelines that are quick and easy to implement. A small change in your design conventions or company template may have a significant impact on accessibility.

Simple navigation and clearly-written content are critical for accessibility, but they are easy to implement and useful for all report users.

The following sections provide tips and guidelines on how to design reports with accessibility in mind. Click the appropriate link to jump to that section:

- *Placing objects in reports*
- *Text*
- *Color*
- *Navigation*
- *Parameter fields*

Placing objects in reports

There are a few general guidelines to keep in mind when you place objects on a report.

Organizing objects logically

When you place objects on reports, make sure their placement is clear and logical, especially when you need to imply a relationship between two objects in a report. For example, if you include a text description of a chart, ensure that it is close enough to the chart to make the connection clear.

Many assistive technologies read from left to right and from top to bottom; therefore, if you include a text description and title for a chart, you should decide which one you want the user to read first. This will ensure that the objects in a report are read in the correct order.

Placing objects in order

When you publish a report to BusinessObjects Enterprise, the HTML version organizes the objects in the report according to the consecutive order that you added them in Crystal Reports, not according to where they were positioned on the report. The report appears the same on the screen, but the underlying HTML code lists the reports objects in the order they were inserted. Instead of reading the report from left to right and top to bottom, screen readers and other assistive devices may follow the order specified in the HTML. To make a report accessible, you must add objects to reports in the order that you want a screen reader to read them.

For example, you place Quarter, Year, and Invoice fields in the Details section and then add the report title "Invoices by Quarter" to the Report Header. When you publish the report to BusinessObjects Enterprise, it looks the same as it did in Crystal Reports, but the underlying HTML displays the database field headings first, followed by the title. Instead of reading the report title first, a screen reader reads the headings first: "Quarter, Year, Invoice, Invoices by Quarter."

To avoid this, insert the "Invoices by Quarter" title first. Before you add the data table, you could provide an introductory text object that describes the table. Finally, add the fields to the Details section. The report will now make more sense in a screen reader, which will read "Invoices by Quarter. The following table lists our invoices for each quarter. Quarter, Year, Invoice.", and then read the data. (For details on providing accessible data tables, see *Improving data table accessibility*.)

Therefore, to create accessible reports, you must plan the order of your report before you begin working in Crystal Reports. Plan it on paper. Make sure you know which objects you want to add and where you want them. Include all calculations, images, and charts on your plan. When you create a new report based on your plan, you can start adding objects from the upper left corner and work your way to the bottom right corner of the report. Once the objects are placed, you can make changes to them afterwards without affecting their order.

Note:
If you create a text-only alternative of your report, add it to your report as a subreport and, most importantly, add the subreport before you add any other object to your report. For further details, see *Text*.

After you add all objects to the report, you can test their placement order by tabbing through the objects.

To test the placement order of objects in a report

1. Make sure no objects in the report are selected.
2. Press the Tab key.

   Crystal Reports selects the object that was placed on the report first.
3. Tab through the remaining objects.

   The order that Crystal Reports uses to tab through the objects is the same order adopted by a screen reader that views the published version of the report.

Text

The most common accessibility issue encountered by report designers is also one of the easiest to resolve: providing text-only versions of non-text objects. A non-text object is an object that conveys meaning through a picture or sound. Non-text objects include pictures, charts, graphical buttons, graphical representations of text, sounds, animations, and audio or video clips.

People who use assistive technologies are accustomed to text-only substitutes and, therefore, will respond well to the text-only alternatives you provide.

There are a number of ways you can use text to substantially improve your reports' accessibility:

- Provide text equivalents for objects in reports.
- Provide text alternatives for reports.
- Ensure that text is written and formatted clearly.

Text is a useful tool for creating accessible reports. Most assistive technologies require text input, including screen readers, speech synthesizers, and Braille displays. You can easily resize and format text, and text is the most flexible medium for import and export.

Providing text equivalents

When you create reports, there are many opportunities to use text equivalents to clarify non-text objects.

- Place a descriptive text object next to a non-text object, and be sure to add them to the report in consecutive order (for more details see *Placing objects in order*).

  Whenever possible, a text equivalent should communicate the same information as its corresponding object in the report. If a report displays data in a pie chart, for example, include a text box next to the chart that summarizes its contents.

Describe the purpose of the non-text object. For example, if an image performs an action when you click it, describe the action. For a button that opens your web site, provide a text box labeled "Click to view our web site".

- If a report includes audio links, provide a transcript for significant audio clips.
- If a report links to a multimedia or video presentation, provide a transcript. You may also want to provide captioning for the audio portion and an audio description of the visual portion. Captioning should be synchronized with the audio.

Providing text-only alternatives

If there are too many non-text objects on a report, or if you do not have the resources to integrate accessible design into all of your reports, then you can provide complete text-only alternatives. For reports that represent data using only charts and graphics, for example, you can provide a link to a text-only alternative that provides the same data in data tables and text objects.

Whenever possible, a text-only alternative should provide the same information as the original report. The information conveyed through images in the main report should also be described using text objects on the alternative report.

Note:
If you cannot produce a complete text-only version of the report, you can still improve accessibility by providing a descriptive summary of key information or conclusions illustrated by the report.

It is good practice to provide the text-only alternative on a subreport, linked from the top left corner of the main report, so the user has the opportunity to switch to the text-only version as soon as possible. Add the subreport to the report before any other object to ensure that a screen reader will read it first. If you want the subreport link to appear only for people using screen readers or similar software, you can create a subreport link that is the same color as the background color. The link will appear as a small blank space, but a screen reader will read the text for the link.

To add a text-only alternative to a subreport

1. Create a text-only version of the report and save it.
2. Open a new report.
3. On the **Insert** menu, click **Subreport**.
4. In the Insert Subreport dialog box, select **Choose an existing report** and click **Browse** to locate the report you created in step 1.
5. Click the subreport, then choose **Format Subreport** from the **Format** menu.
6. In the Format Editor, on the **Subreport** tab, select **On-demand Subreport**.
7. To hide the subreport link, on the **Font** tab, choose the color that matches the background color of the report.

   Note:
   Instead of hiding the subreport link, you can conditionally suppress the section that contains the subreport. For details, see *Accessibility and subreports*.

Using punctuation

To improve the logical flow of spoken text, you may need to add extra punctuation to create pauses. Without extra punctuation, screen readers may read several text objects as one continuous sentence, making the content difficult to understand. For example, information in data tables may be read without stop. To prevent this, you can break up information in data tables by inserting periods between fields.

Certain punctuation marks are read aloud, which may be distracting if used too frequently. For example, when a screen reader reads a colon ":", it may read it aloud as "colon" instead of a pause. You can change the amount of spoken punctuation in your screen reader's settings.

To troubleshoot your report's punctuation, it is good practice to read the report using a screen reader. Do objects run together too quickly? Or are there too many pauses? Are any punctuation marks read aloud? Does this improve or deter from the usability of the report?

Formatting text

After you create text equivalents or alternatives for non-text objects, ensure that the text is clearly written and easy to read. Observe the following design guidelines:

- Use a larger font.

  Although people with visual impairments can use the Zoom feature to increase the size of the report, they will not need to magnify the report as much if the font size is larger. For example, chart labels or legends can appear in a small font by default. For general legibility, it is good practice to use a font larger than 8 point. For accessibility, ensure that text is larger than 11 point.

- Use a "sans serif" font.

  Simple fonts such as Arial and Helvetica can be easier to read than serif fonts like Times or Palatino.

- Choose left or justified alignment.

  Left-aligned or justified text is easier to read than centered or right-aligned text.

- Ensure that text follows the guidelines for color usage. For details, see *Color*.

Note:
You can allow users to choose different font settings using a parameter and conditional formatting. For details, see *Accessibility and conditional formatting*.

Finding the right balance between text and non-text objects

Text equivalents are very flexible and often the best solution for accessibility, but they are not always necessary or preferred.

Not all non-text objects require text equivalents. You need to include text alternatives only for non-text objects that provide information or navigation elements that the user cannot do without. Images used for decorative purposes do not need a text description. If a report has a watermark image that acts as a background for the data, you do not need to provide a text

equivalent. Adding text descriptions for decorative objects can produce unnecessary clutter.

Text versions of visual or auditory objects in reports should be used as a complement to the object—not as a replacement. You do not need to remove non-text objects. Visual objects in reports can be very helpful, especially for people with learning disabilities such as attention deficit disorder, or for people who are deaf. People with hearing impairments may be accustomed to visual communication such as sign language, and may find images more useful than text.

No one presentation method can meet the needs of all users. Audio clips can be very useful for people with visual impairments, but people with hearing impairments will be unable to use them. To help both groups, provide a combination of audio and text. Multimedia presentations may provide audio information for people with visual impairments, as well as video information for people who are deaf or hard of hearing. Multimedia presentations are particularly effective for people with attention deficit disorder. However, people with certain mental health disabilities may be distracted by visual or audio objects.

The best approach is to communicate the same information with both text and non-text objects. Add descriptive text to support the images, and add images that support the text.

If text objects begin to overwhelm your report, you may want to provide a complete text-only version in a separate report or a subreport. For details, see *Providing text-only alternatives*.

To learn more strategies on how to choose presentation methods that meet the needs of a variety of audiences, see *Designing for flexibility*.

Color

The colors you choose for objects in reports can have a significant impact on accessibility for people with visual impairments, low vision, or color blindness. Ensure that your reports can be understood when viewed without color.

Contrasting colors

Users with limited vision may be unable to distinguish between colors. To test the color contrast in your report, print or view a black and white copy. You should be able to distinguish between values or fields displayed in different colors (in a pie chart, for example).

If you cannot distinguish between colors on the report, try different colors or use gray shading. If this does not resolve the issue, you can change other characteristics.

For text, use the Format Editor to change the font, size, or style. You can add borders, underlining, or background shading to differentiate text objects from each other.

For charts, use a combination of shading and patterns. You can automatically convert a color chart to a black and white one using the Chart Expert, or you can select values individually and choose your own patterns.

Using color to convey information

Do not use color as the only identifying characteristic for critical information in a report.

For example, a text object may instruct users to "click the green button" to open a subreport. Users with limited vision cannot tell which button is green. The button should be recognizable by another defining characteristic besides its color. For example, you can change the button graphic to a shape that is not used elsewhere on the report, and instruct users to "click the green arrow button". This solution provides color information for people who can distinguish colors, and extra information for people who cannot.

Other common situations where color may be used to provide important information include:

- Highlighting

  To highlight particular values in a table, do not change only the color of the value. If you highlight outstanding invoices in red, for example, they may look the same as the paid invoices to someone with limited vision. In the Highlighting Expert dialog box, change a font characteristic other than color, such as font style.

- Hyperlinks

  Using color as the only method for identifying hyperlinks may also cause problems for color-blind users. When you print your report in black and white, check the hyperlinks to ensure that they are still visible.

- Identifying important areas of the report

  Do not organize a report by using color as a background or as a separator between different sections or areas. Instead of using color to identify sections, establish clear and consistent navigation for the entire report.

Navigation

As with other aspects of accessible design, providing several alternative navigation methods can help you meet the reporting needs of more people. The W3C recommends including several different navigation methods. On the other hand, simplicity is critical for intuitive navigation. Section 508 recommends simple navigation that uses the least number of navigation links possible. Either approach can be effective for your reports, as long as you maintain clarity and consistency.

You may want to use report parts to navigate a report (or to connect several reports). If you provide a series of links in a page header, keep in mind that screen-reading software will reread the navigation information every time the user refreshes the page or views a new page. In this case, simple navigation is preferable.

For a large report, you could provide a list of navigation links as a table of contents in the report header. More extensive navigation can be useful when you have a large volume of data. To allow users to skip the list, you could start with a "Skip the table of contents" link that jumps ahead to the first page header.

In general, report navigation should follow these guidelines:

- Identify the target of each link.
- Provide information at the start of the report that describes the layout and navigation.
- Use navigation consistently.
- Provide the opportunity to skip repetitive navigation links.

Parameter fields

When you include parameter fields in a report, make sure they are clear and simple. Although parameter fields can be a useful tool for providing accessible content, they can also introduce several accessibility concerns. It is important to test all parameter fields for accessibility.

Parameter fields should follow these guidelines:

- Provide a list of default values for the user to choose from.

  Avoid requiring the user to type a value for a parameter. When users provide their own values, they need to make sure the format of the value will be recognized by the parameter field. A list of default values is easier to use, and it ensures that the user chooses from values with valid formats.

- Try to avoid complex parameter fields.

  A complex parameter field may be more accessible when it is broken down into multiple parameters. When you test the accessibility of your parameter fields, pay particular attention to parameters that require a range. It may be easier to understand if you provide two parameter fields that prompt for discrete values for the top and bottom of the range, rather than ask the user to choose both values in the same parameter field.

- For date fields, do not allow users to choose their own values.

  The calendar used to select date values is not currently accessible. Provide a pick-list of default date values. Using a list of default values also helps avoid invalid date formats.

Designing for flexibility

Flexibility is the key to providing accessible reports. Because different users require different levels of accessibility, it is good practice to provide a variety of presentation styles and methods to meet the needs of as many people as possible. For a detailed report, however, you may not be able to provide multiple presentation styles without cluttering the report with extra objects.

To address this problem, plan the degree to which you want to integrate accessible formats into your reports. You can provide accessible formatting for each object, for each section, or as a subreport. You can then allow users

to choose their own accessibility options using a parameter field that prompts them to choose whether or not to display accessible formats.

Using this parameter field, you can conditionally format objects, or conditionally suppress sections that address different access needs. Or you can provide different display options by using subreports.

Accessibility and conditional formatting

Using the accessibility parameter field in simple formulas, you can provide multiple formats for any object in a report. If a user chooses "Yes" when prompted by the parameter, the conditional formulas will ensure that the objects are modified with accessible formatting conventions. If a user chooses "No", then the report appears without accessible formatting, perhaps in the standard company template.

For accessible text formatting, you can follow the guidelines suggested by this section and by the W3C, or you can survey your report users to determine the formats that work best for them. After you determine the formatting options you want to use, you can create conditional formulas that define the options. For example, you can display all database fields in a large Arial font, in white text on a black background, with the Can Grow option enabled.

The following procedure creates a conditional formatting formula based on the ?Access parameter field. The formula increases the font size if the ?Access parameter field is set to "Yes". You can use similar formulas to change colors, add borders, or enable the Can Grow setting. For complete instructions on conditionally formatting fields and using the Format Formula Editor, see the *Crystal Reports Online Help*.

Note:
If text objects are too small to accommodate the enlarged font, you can use a similar conditional formatting formula to enable the Can Grow setting, which appears on the Common tab of the Format Editor.

To apply accessible settings to font size conditionally

1. Open the report in the **Design** tab of Crystal Reports.
2. In the Details section, right-click the field you want to conditionally format, and select **Format Field**.
3. In the Format Editor, click the **Font** tab.

4. Click the **Formula** button that corresponds to the Size list.

   The Format Formula Editor opens a new formula named Font Size.

5. In the Formula text window, type this formula (which uses Crystal Syntax):

```
if {?Access} = "Yes"
 then 20
else 10
```

   This formula ensures that the font size for the currently selected field is increased from 10 point to 20 point when the user chooses to display accessible formatting.

6. Click **Save and close**.
7. Click **OK** in the Format Editor.

Accessibility and suppressing sections

Instead of formatting individual objects conditionally, you can create separate sections for accessible versions of the report content, then use the accessibility parameter field to conditionally suppress sections. The accessible and non-accessible sections can be suppressed or shown, based on the parameter value the user selects.

Creating separate sections for accessible versions of report content may be more time-consuming, but there are a few situations where suppressing sections conditionally can be more practical than formatting on the object level:

- If a report contains many objects, suppressing sections may require fewer conditional formulas.
- Not all settings and features can be formatted conditionally. By suppressing sections, however, you can make any formatting changes you want.
- You may want to provide completely different types of information for people viewing the accessible version of the report. For example, you may want to split visual and audio objects into two different sections and conditionally suppress them based on the parameter value the user chooses.

To suppress an accessible section

1. Right-click the left boundary of the section you want to suppress conditionally, and click **Section Expert**.
2. In the Section Expert, click the **Formula** button that corresponds to the **Suppress (No Drill-Down)** setting.

   The Format Formula Editor opens a new formula named Suppress (No Drill-Down).
3. In the Formula text window, type this formula (which uses Crystal Syntax):

   ```
   if {?Access} = "No" then True
   ```

   This formula selects the Suppress option if the user chooses not to view accessible report content.
4. Click **Save and close**.
5. Click **OK** in the Section Expert.

Accessibility and subreports

Accessible report design may become too cumbersome using conditionally formatted objects and suppressed sections. Two situations in particular may be problematic:

- To make the report accessible, you may need to change the overall organization of the report sections, or you may need to provide different objects.
- If the report contains a large number of objects or sections, it may take too much time to create conditional formulas for all of them.

For example, if a report contains many non-text objects displayed in a complex series of groups and sections, you may want to provide a text-only version that uses different objects and a simplified group structure to meet accessibility guidelines. The easiest way to address this problem is to create a subreport that displays the accessible version of the report and place the subreport at the beginning of the main report. For details on creating a text-only accessible subreport, see *Providing text-only alternatives*.

If you want only screen readers to be able to see the subreport, you can hide it by changing the subreport link to the same color as the background. Alternatively, you can use the ?Access parameter field to allow users to choose whether or not the subreport appears in the report. Place the subreport in its own section and conditionally suppress the section based on the ?Access parameter field. For details, see *Accessibility and suppressing sections*.

Improving data table accessibility

Large tables of data can be difficult to interpret if a person is using a non-visual means of accessing the web, such as a screen reader. People using screen magnifiers or the Zoom feature may also find data tables hard to navigate because they cannot see the table headings at all times. It can easily become difficult to associate the value that a screen reader is reading with the corresponding column and row headings. Users need to be able to understand the data value's position in the table and its relationship to other values.

To improve data table navigation, you can use text objects to provide contextual information with each value. Using conditional formatting or suppression, you can create a report that displays these objects only if the user chooses to view them. Other design guidelines can help make large tables of data easier to understand, such as providing summary paragraphs and expanded column headings.

Note:
This section uses terminology consistent with the W3C accessibility guidelines. In these guidelines, the term data table refers to values arranged in columns and rows. In Crystal Reports, data tables take the form of group or page headings combined with database fields in the Details section. Do not confuse data tables with database tables, which are data sources used by Crystal Reports.

Text objects and data table values

You can make a large table easier to understand and navigate by adding text objects that provide information about each value in the table.

Include whatever information is necessary to establish the meaning and context of the value displayed. When appropriate, include information that describes column headings or neighboring fields. For example, if a report displays employee names and salaries, you can add a text object before the Salary database field that reads "{Last Name}'s salary is ". The user can determine the context and meaning of the value by reading the accompanying text object.

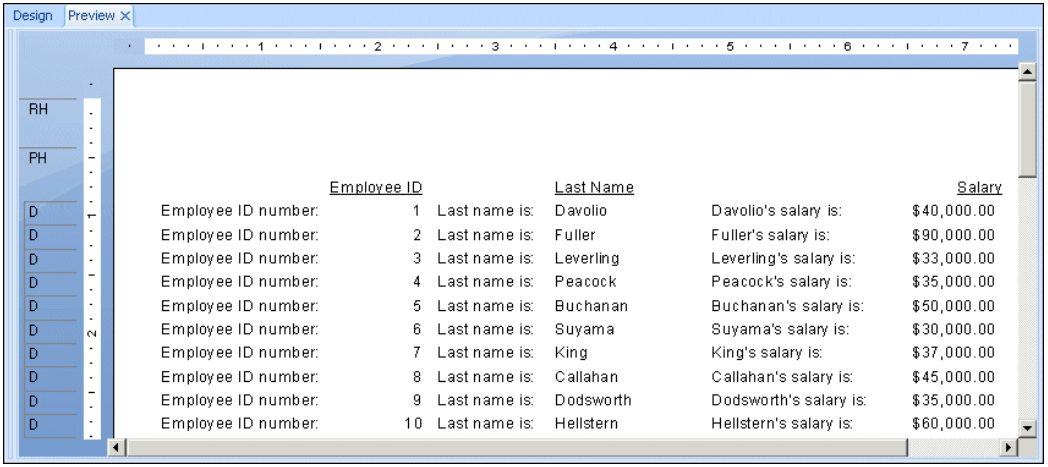
Ensure that your text objects use punctuation that will make the content easier to understand when read aloud by a screen reader. Without accessibility-orientated punctuation, data tables may be read as one long sentence, making navigation and interpretation very difficult. For example, you can add periods after values so a screen reader will pause between columns and rows. For details, see *Using punctuation*.

As with all objects in reports, the order in which you place text objects on the report can affect accessibility. Screen readers read the objects in the order they were originally added. (For details, see *Placing objects in order*.) The correct placement order is critical when you add a text object that identifies the contents of a particular column in a data table. If you add the text objects at the end of the design process, they may be read after the columns that they refer to. When you add text objects that describe values in a report, ensure that you place them on the report in the order that you want them to be read.

Before you can create an accessible data table, you must plan your report in advance, determining which objects and database fields you want to include. Because objects must be placed in the order you want them to be read, planning your content for accessibility is essential. As part of this planning, it is good practice to choose how you will use text objects to identify data table values. You can simply add text objects before each database field. Or you can conditionally suppress text objects or use formulas to combine text objects and values. elephant

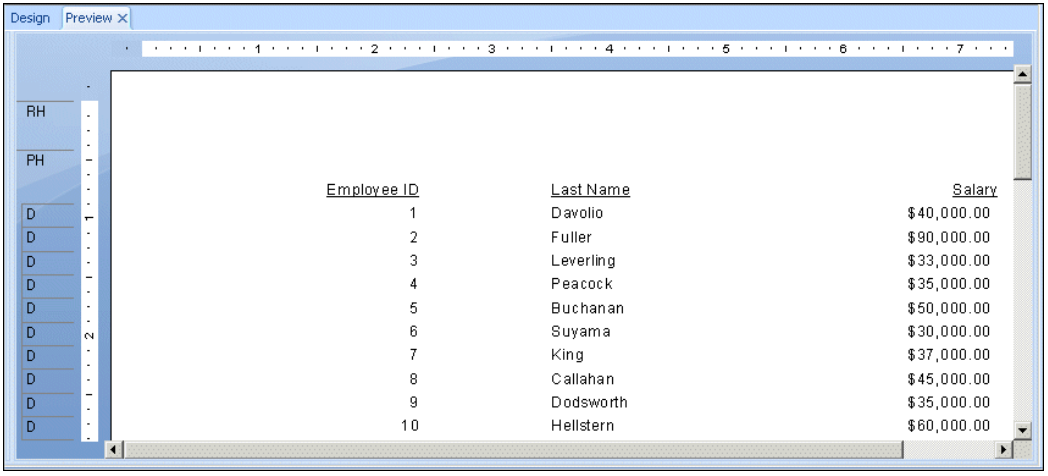
Labelling data tables with text objects

Before each field, add a text object that describes the field's position in the table. In the following example, the text box provides information about the Employee ID number. When the report is read with a screen reader, each number is preceded by the brief explanation in the text box.



	Employee ID		Last Name		Salary
Employee ID number:	1	Last name is:	Davolio	Davolio's salary is:	$40,000.00
Employee ID number:	2	Last name is:	Fuller	Fuller's salary is:	$90,000.00
Employee ID number:	3	Last name is:	Leverling	Leverling's salary is:	$33,000.00
Employee ID number:	4	Last name is:	Peacock	Peacock's salary is:	$35,000.00
Employee ID number:	5	Last name is:	Buchanan	Buchanan's salary is:	$50,000.00
Employee ID number:	6	Last name is:	Suyama	Suyama's salary is:	$30,000.00
Employee ID number:	7	Last name is:	King	King's salary is:	$37,000.00
Employee ID number:	8	Last name is:	Callahan	Callahan's salary is:	$45,000.00
Employee ID number:	9	Last name is:	Dodsworth	Dodsworth's salary is:	$35,000.00
Employee ID number:	10	Last name is:	Hellstern	Hellstern's salary is:	$60,000.00

Providing extra information for each value can make a data table appear cluttered for people without vision impairments, so you may want to hide the extra text objects by changing the font color to the same color as the background. The extra text is invisible, but is still detected and read by screen readers.



Employee ID	Last Name	Salary
1	Davolio	$40,000.00
2	Fuller	$90,000.00
3	Leverling	$33,000.00
4	Peacock	$35,000.00
5	Buchanan	$50,000.00
6	Suyama	$30,000.00
7	King	$37,000.00
8	Callahan	$45,000.00
9	Dodsworth	$35,000.00
10	Hellstern	$60,000.00

Labelling data tables conditionally

Although adding text objects is relatively easy to implement, it does not address all accessibility concerns. Invisible text is read by screen readers, but does not help people with limited vision. You can allow the user to choose whether or not to display text descriptions in the data table by conditionally formatting or suppressing text objects.

Make sure your report includes an accessibility parameter field. For instructions on how to create the ?Access accessibility parameter field, see *Designing for flexibility*.

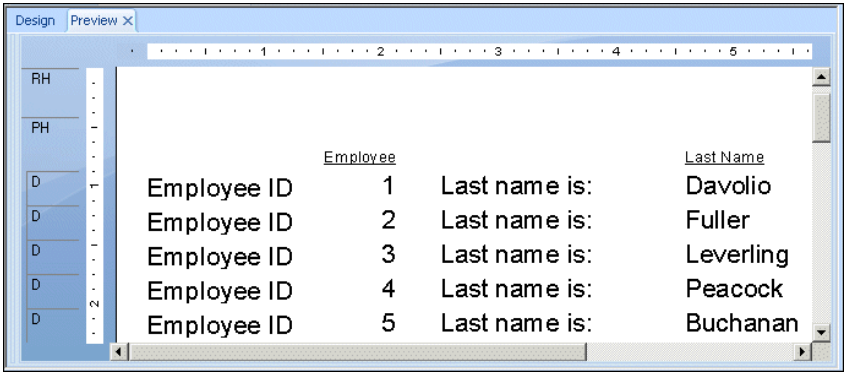
You can use the parameter field to suppress the text objects conditionally. While it has the same effect as changing the font color to the background color, conditionally-suppressed text also allows you to use the parameter field to specify other formatting options such as font size and style.

To display the text objects only when the user chooses Yes for the ?Access parameter field, the following report uses a simple conditional formula to enable the Suppress option on the Common tab of the Format Editor.

```
{?Access}="No"
```

The formula must be added for each text object you want to suppress.

When the user chooses Yes for the ?Access parameter field, the text objects are not suppressed; the data table displays text descriptions.



Note:
The report shown also uses the ?Access parameter field to enable the Can Grow option (also on the Common tab of the Format Editor) and increase the font size for people with visual impairments.

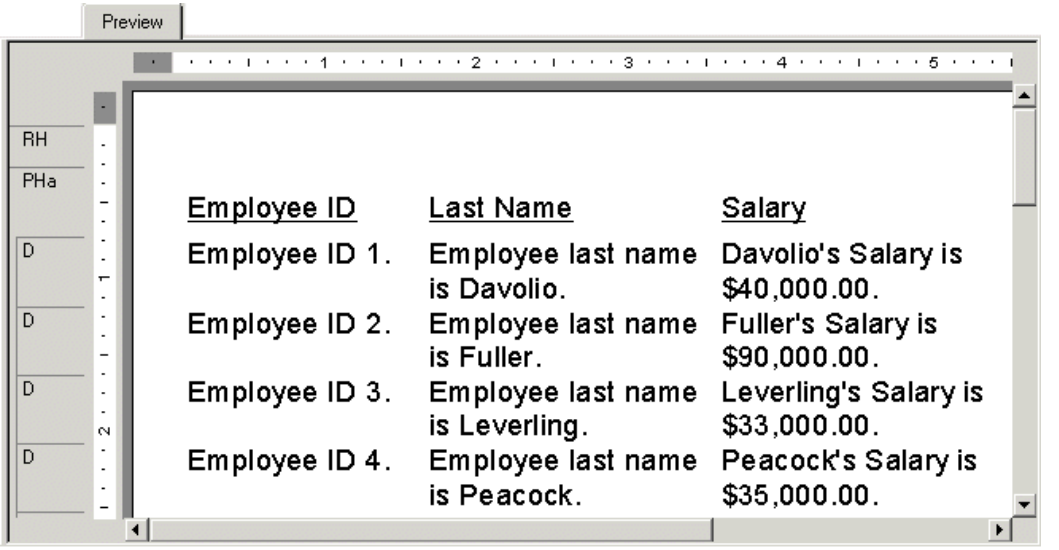
When the user chooses No for the ?Access parameter field, the conditional formula suppresses the text objects, leaving spaces in the report in place of the text objects.

Labelling data tables with formulas

Another method for adding explanatory text to a data table is to create formulas that combine text, database fields, and conditional formatting. By adding the text and the database fields together in a conditional formula based on the ?Access parameter, you can provide optional text for values in a table without leaving blank spaces in the report. Using formulas also reduces the number of objects on the report, making it easier to maintain the proper placement order.

Note:
Do not use this method if the report has summary fields or calculated fields. Although formulas provide the best display of data, they can interfere with calculations because the data is converted to text.

The following report uses formulas placed in the Details section that combine the database fields and the extra text. When the user chooses Yes for the ?Access parameter field, each formula builds a string that includes the description and the value.



This report uses the following formulas:

@Employee ID

```
If {?Access}="Yes" then "Employee ID "
+ ToText({Employee.Employee ID},0) + ". "
else ToText({Employee.Employee ID},0)
```

@Last Name

```
If {?Access}="Yes" then "Employee last name is "
+ {Employee.Last Name} + "."
else {Employee.Last Name}
```

@Salary

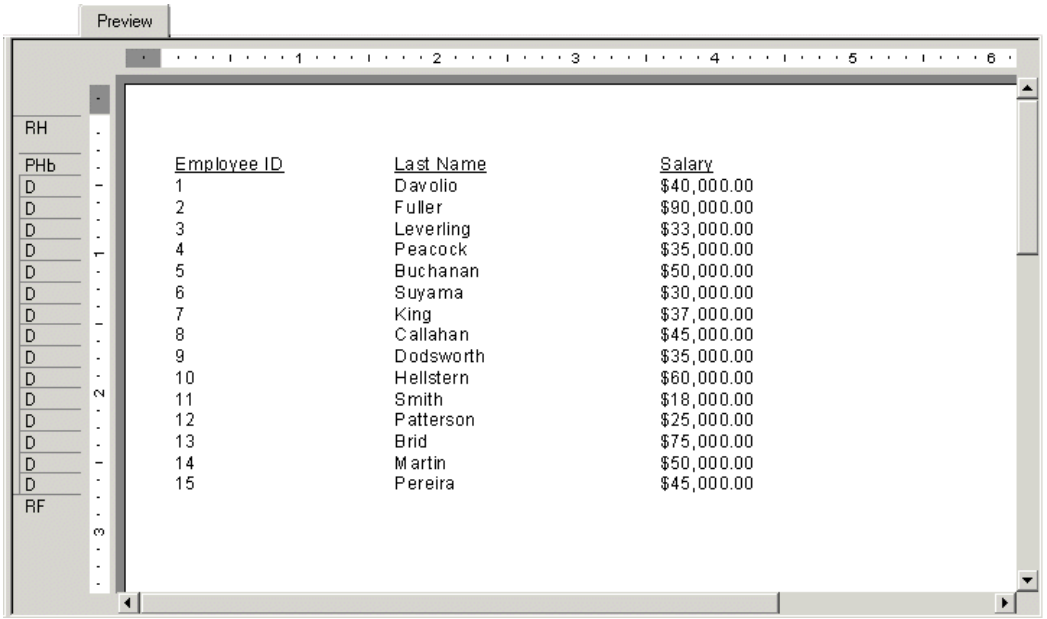
```
If {?Access}="Yes" then {Employee.Last Name} + "'s Salary
 is " + ToText({Employee.Salary}) + "."
else ToText({Employee.Salary})
```

Notice the added punctuation. The periods at the end of each formula improve screen reader legibility by creating a pause between fields.

Note:

- The report also uses the ?Access parameter field to enable the Can Grow option and increase the font size.
- In @Employee ID, ?Access parameter field has been set to "0" to enable the Can Grow option and increase the font size.

When the user chooses No for the ?Access parameter field, the formula returns only the data. The report does not display blank spaces in place of the conditional text objects. Both versions of the report are easy to read.



Employee ID	Last Name	Salary
1	Davolio	$40,000.00
2	Fuller	$90,000.00
3	Leverling	$33,000.00
4	Peacock	$35,000.00
5	Buchanan	$50,000.00
6	Suyama	$30,000.00
7	King	$37,000.00
8	Callahan	$45,000.00
9	Dodsworth	$35,000.00
10	Hellstern	$60,000.00
11	Smith	$18,000.00
12	Patterson	$25,000.00
13	Brid	$75,000.00
14	Martin	$50,000.00
15	Pereira	$45,000.00

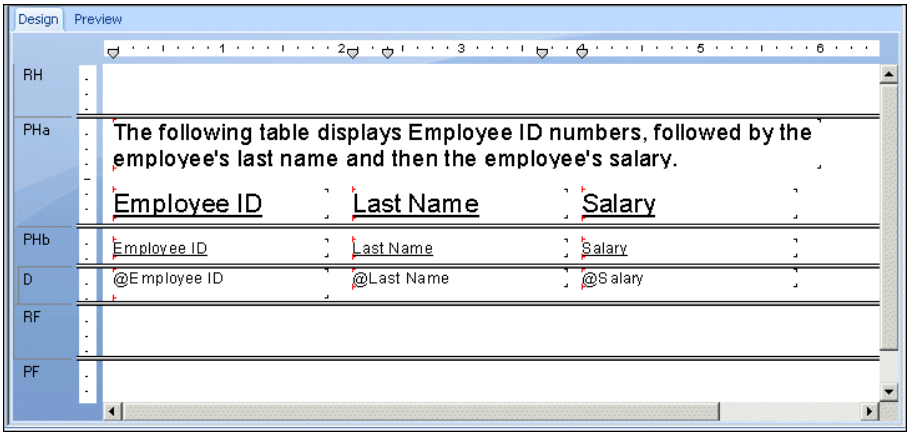
Other data table design considerations

In addition to labelling data values with text objects, other report design techniques can help you create data tables that are easier to understand and navigate.

- Include an introductory paragraph that summarizes the content of the table. The summary should be brief: one or two sentences if possible.

- Ensure that headings provide enough information to clearly identify the values that they label.
- To test a table's accessibility, read its headings and values in a linear fashion from left to right and from top to bottom. For example, if a report displays last and first name fields for each customer, it may read better if it displays first name followed by last name. Whenever possible, test the report using assistive technologies such as screen reading software.

The final accessible report includes a summary of the data table.



To display the table summary conditionally, the report designer divided the Page Header into two sections. The first page header is suppressed when the ?Access parameter field is set to No . The second page header is suppressed if the user chooses Yes . For details, see *Accessibility and suppressing sections*.

Accessibility and BusinessObjects Enterprise

Designing accessible reports is only part of the solution. You need to make sure that you deliver reports through an accessible interface that follows the same design guidelines.

Although the administrative components of BusinessObjects Enterprise and the scheduling functionality in the BusinessObjects Enterprise web desktop

are not currently accessible to everyone, the BusinessObjects Enterprise web desktop and the DHTML viewer allow for accessible access to reports over the Web.

Several enhancements have been made to BusinessObjects Enterprise to account for accessibility issues. Text descriptions are now provided in ALT tags for the toolbar buttons and other images. Descriptions for text boxes are clearer, and shortcut links are provided in the DHTML viewer so you can navigate past the toolbar and group tree.

Setting accessible preferences for BusinessObjects Enterprise

For the best accessibility support in BusinessObjects Enterprise, you need to set certain display preferences.

For the BusinessObjects Enterprise web desktop, display objects in the Action view. The Action view is more accessible because it provides a text list of the available reports and does not use shortcut menus for report commands. Depending on your users' needs, you may also want to reduce the number of reports displayed on each page.

For viewing reports, choose the DHTML viewer as the default viewer in your preferences.

If you administer accounts for other users, you can set their BusinessObjects Enterprise preferences as well. To change another user's preferences, use the BusinessObjects Enterprise web desktop Preferences Manager, which is located in the Administrator Samples area of the BusinessObjects Enterprise Launchpad.

Note:
You must have your own account on the system in order to set preferences.

Accessibility and customization

When you customize Crystal reports or the BusinessObjects Enterprise web desktop, or if you incorporate BusinessObjects Enterprise into an existing web site, ensure that your changes follow the accessibility guidelines set forth by the U.S. Access Board in section 508, or the W3C's Web Accessibility Initiative.

If you customize Crystal reports or the BusinessObjects Enterprise web desktop extensively, you may encounter other accessibility issues. For online resources that provide comprehensive accessibility guidelines, see *Resources*. The following list provides some common accessibility issues that may cause problems when you customize Crystal Reports or BusinessObjects Enterprise content.

- Frames

  Frames should be clearly labelled, for easier identification and navigation. Provide text at the top of the frame that describes its purpose. For example, if a frame provides a list of links to different countries, you can clarify its purpose clear by adding text to the frame, such as a title ("Countries") or short instructions ("Click a country for details").

- Style sheets

  If you have a visual impairment, you can create a style sheet with specific viewing preferences to accommodate the disability. For example, you could create a style sheet that displays all web pages in a large font with white characters on a black background. Users cannot apply personalized style sheets to Crystal reports, but the viewers provide a Zoom button that enables people with visual impairments to increase the magnification to suit their needs. You can also allow users to choose from different formatting options using conditional formatting. For details, see *Accessibility and conditional formatting*.

- Scripts

  If you modify Crystal content to include a script that displays content or an interactive object, ensure that the script is identified by text that conveys the purpose of the script. Make sure that pages with scripts are still usable when the scripts are turned off or unsupported. For more information about scripts and accessibility, see *Resources*.

- Image maps

  Server-side image maps identify active regions using coordinates, which are not meaningful to a screen reader. Client-side image maps provide better accessibility because you can assign a link or URL to each active region within the image map.

- Electronic forms

  Electronic forms can present difficulties for screen readers, and must be set up carefully. When you label a component in a form, ensure the label

is clearly located next to the form component. For example, for a Search box, ensure that the "Search" title appears alongside the appropriate text box.

- Applets and plug-ins

  If a report needs an applet, plug-in, or other application on the client machine in order to interpret page content, the plug-in or applet must follow accessibility guidelines.

  If you attach multimedia or other additional resource files to your report, such as PDF or Real Audio files, provide a link to install the required plug-ins or software, and ensure that the required software also meets accessibility design standards.

- Flickering

  Flickering images can trigger seizures for people with seizure disorders. The W3C recommends to avoid use of images that flicker or flash between four and 59 times per second.

- Search engine placement

  Do not use hidden text to enhance your web site's placement in search engines. Hidden text reduces readability, because it is read by the screen readers. Also, hidden text is actively discouraged by popular search engines such as Google, and thus offers little benefit.

Resources

This section focuses on how you can create and distribute accessible reports with Crystal software. The report design techniques in the section were tested using JAWS 4.5. It is good practice to test all accessible reports using JAWS and other assistive technologies whenever possible.

To make all of your Web communications accessible, consult the detailed guidelines available through the W3C or from your government's web site.

- World Wide Web Consortium's Web Accessibility Initiative:

  http://www.w3.org/WAI/

- the United States Access Board's web site for Section 508:

  http://www.access-board.gov/sec508/guide/

- the Government of Canada Internet Guide:

  http://www.cio-dpi.gc.ca/ig-gi/

More Information

appendix D

Information Resource	Location
SAP BusinessObjects product information	*http://www.sap.com*
SAP Help Portal	Navigate to *http://help.sap.com/businessobjects* and on the "SAP BusinessObjects Overview" side panel click **All Products**. You can access the most up-to-date documentation covering all SAP BusinessObjects products and their deployment at the SAP Help Portal. You can download PDF versions or installable HTML libraries. Certain guides are stored on the SAP Service Marketplace and are not available from the SAP Help Portal. These guides are listed on the Help Portal accompanied by a link to the SAP Service Marketplace. Customers with a maintenance agreement have an authorized user ID to access this site. To obtain an ID, contact your customer support representative.
SAP Service Marketplace	*http://service.sap.com/bosap-support* > Documentation • Installation guides: *https://service.sap.com/bosap-instguides* • Release notes: *http://service.sap.com/releasenotes* The SAP Service Marketplace stores certain installation guides, upgrade and migration guides, deployment guides, release notes and Supported Platforms documents. Customers with a maintenance agreement have an authorized user ID to access this site. Contact your customer support representative to obtain an ID. If you are redirected to the SAP Service Marketplace from the SAP Help Portal, use the menu in the navigation pane on the left to locate the category containing the documentation you want to access.

Information Resource	Location
Docupedia	*https://cw.sdn.sap.com/cw/community/docupedia* Docupedia provides additional documentation resources, a collaborative authoring environment, and an interactive feedback channel.
Developer resources	*https://boc.sdn.sap.com/* *https://www.sdn.sap.com/irj/sdn/businessobjects-sdklibrary*
SAP BusinessObjects articles on the SAP Community Network	*https://www.sdn.sap.com/irj/boc/businessobjects-articles* These articles were formerly known as technical papers.
Notes	*https://service.sap.com/notes* These notes were formerly known as Knowledge Base articles.
Forums on the SAP Community Network	*https://www.sdn.sap.com/irj/scn/forums*
Training	*http://www.sap.com/services/education* From traditional classroom learning to targeted e-learning seminars, we can offer a training package to suit your learning needs and preferred learning style.
Online customer support	*http://service.sap.com/bosap-support* The SAP Support Portal contains information about Customer Support programs and services. It also has links to a wide range of technical information and downloads. Customers with a maintenance agreement have an authorized user ID to access this site. To obtain an ID, contact your customer support representative.

Information Resource	Location
Consulting	*http://www.sap.com/services/bysubject/businessobjectsconsulting* Consultants can accompany you from the initial analysis stage to the delivery of your deployment project. Expertise is available in topics such as relational and multidimensional databases, connectivity, database design tools, and customized embedding technology.

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