

# **“Un-chugging” Crystal Reports for Optimal Performance**

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# Topics

- ▶ **Database issues**
- ▶ **Multi-pass reporting**
- ▶ **Miscellaneous tidbits**

## ▶ Database issues

- Indexed fields
- Table linking
- Grouping on server
- Pushing record selections to the server
- SQL expressions
- SQL commands

## ▶ Multi-pass reporting

## ▶ Miscellaneous tidbits

- ▶ **Table A contains 26 records**
- ▶ **Table B contains 2600 records**
  - 100 matching records for every record in Table A
- ▶ **Find two specific records in Table A and the 200 records (100+100) in Table B**
- ▶ **Crystal Reports should only have to read about 200 records in total**

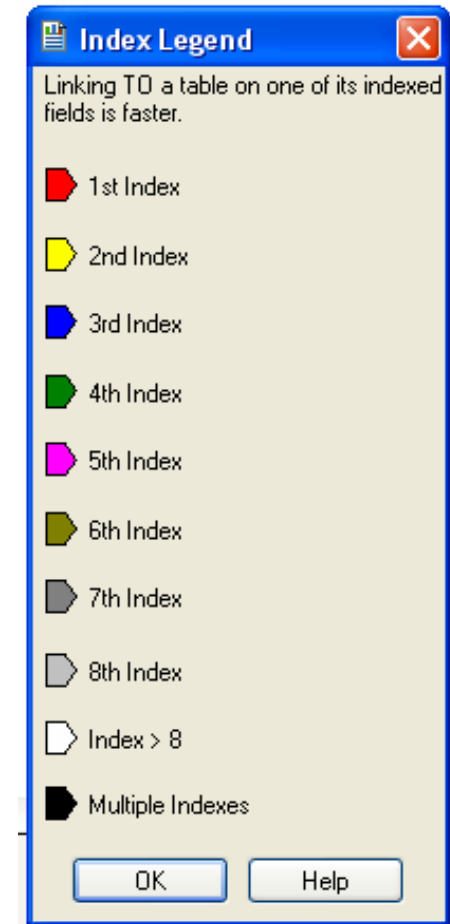
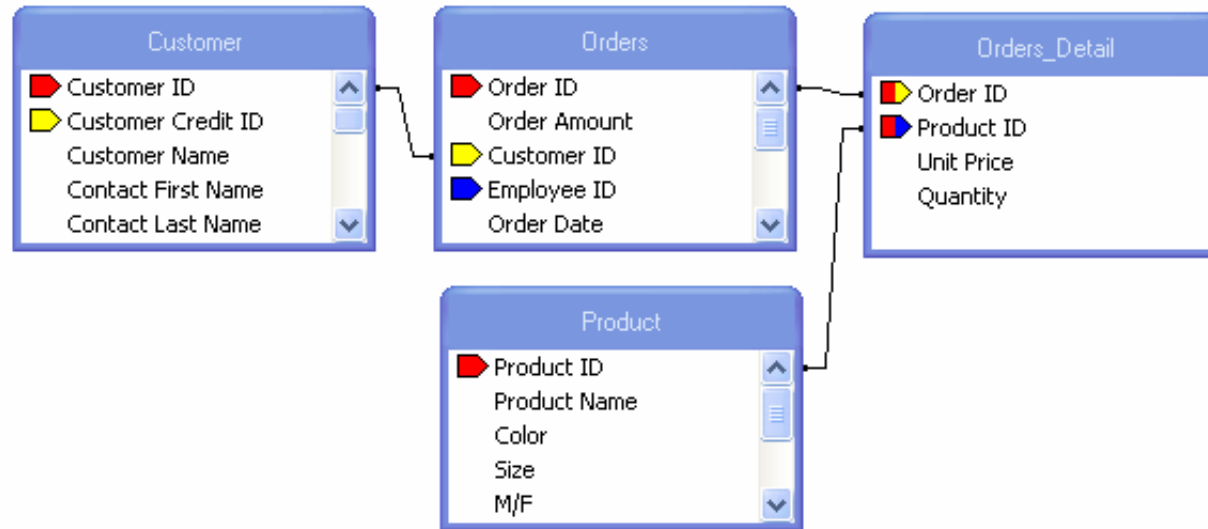
- ▶ Does your primary report include a record selection formula that sets range limits on the key (Indexed) field in Table A?
- ▶ Index A – is Table A field indexed?
- ▶ Index B – is Table B field indexed?
- ▶ How many records does Crystal Reports have to read out of Table A to find the two records in Table B?

*Are your selection formula fields indexed?*

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	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/ Subreport	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

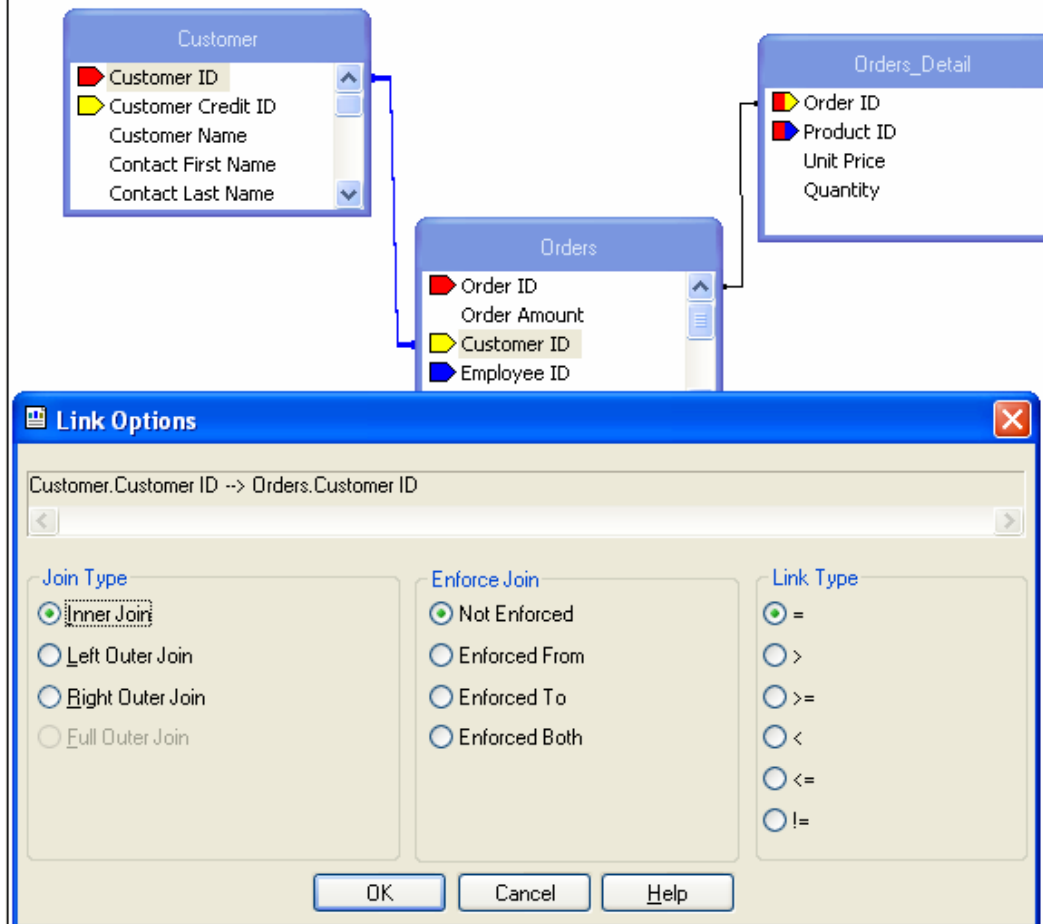
*Are your tables linked on indexed fields?*



# Database Issues – Table Linking

*Ensuring you are using the right join type*

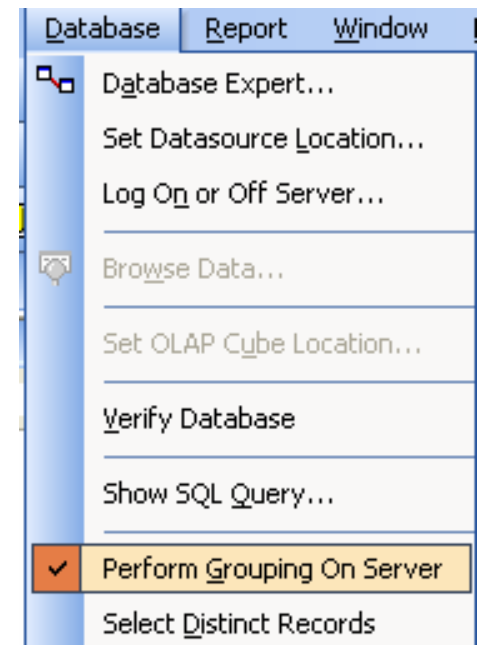
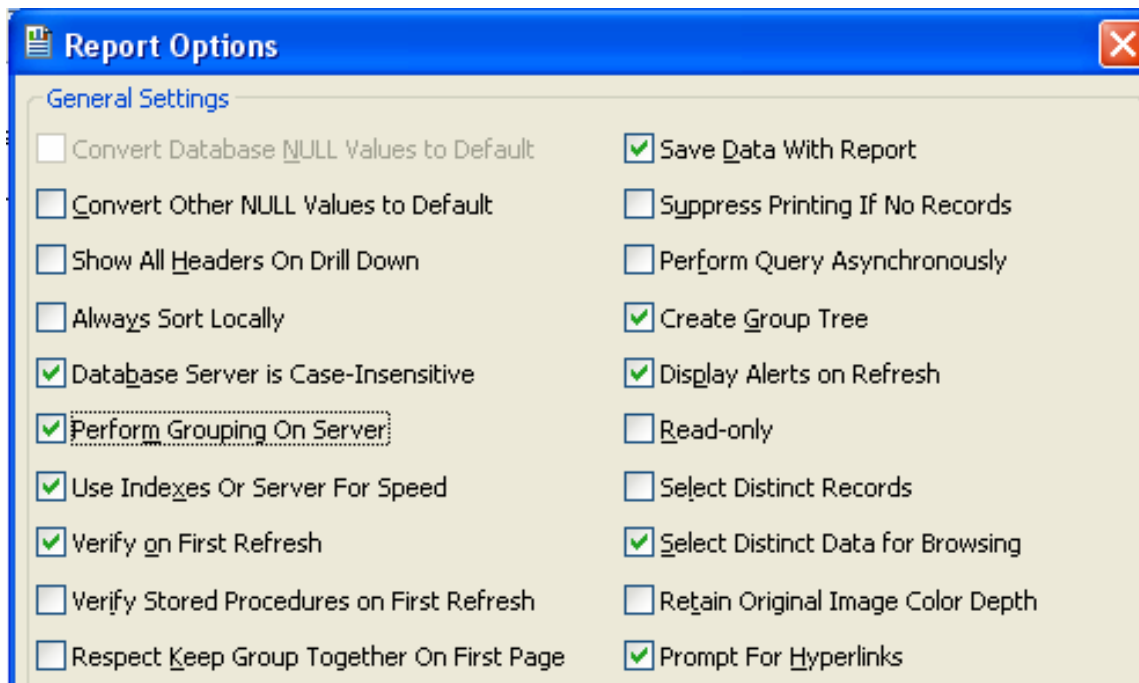
**Using the various join enforcement options can ensure that linked tables are included in the SQL query, even when none of the fields in the table are used in the report. (New in version 10)**





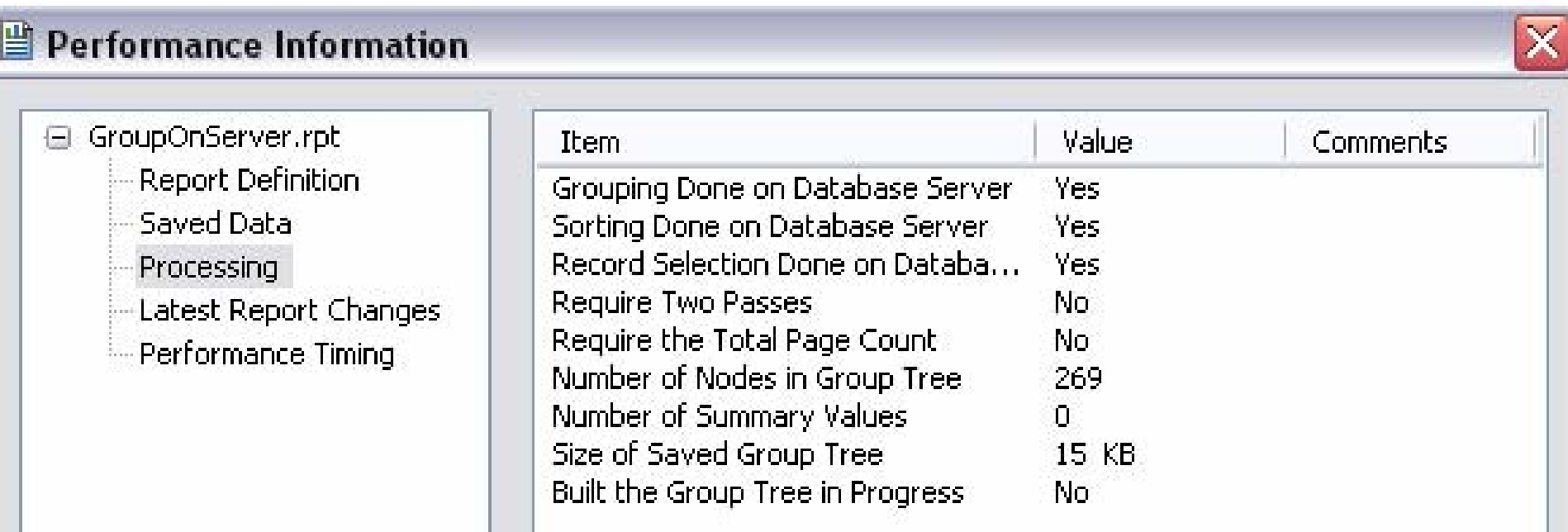
## ► Server-side processing – let the server do the work

- Less time connected to the server
- Less memory needed to process the report on your PC
- Lower transfer time from the server to the client



1. Use SQL data sources
2. “Perform Grouping on Server” option is checked on
3. Use some form of grouping
4. The report is at least partially hidden
  - At minimum, the Details section must be hidden
5. Do not group on a formula field, or use a formula in a summary field
  - Use SQL expressions as an alternative to formulas
6. Running totals must be based on summary fields only
7. No average or distinct count summaries
8. No specified grouping

1. Review the Report Performance Information Dialog Box to confirm Grouping on the Server is working



**Performance Information**

GroupOnServer.rpt

- Report Definition
- Saved Data
- Processing
- Latest Report Changes
- Performance Timing

Item	Value	Comments
Grouping Done on Database Server	Yes	
Sorting Done on Database Server	Yes	
Record Selection Done on Databa...	Yes	
Require Two Passes	No	
Require the Total Page Count	No	
Number of Nodes in Group Tree	269	
Number of Summary Values	0	
Size of Saved Group Tree	15 KB	
Built the Group Tree in Progress	No	

# Database Issues – Pushing Record Selections 1/2

*Be careful when trying to do a record selection on a formula!*

**Select Expert**

Purchases.Order Date <New>

formula: Year({Purchases.Order Date}) > 2000

New...  
Delete  
Browse...

OK Cancel Help Show Formula >>>

## Show SQL Query

```
SELECT `Purchases`.`Order Date`, `Product`.`Product Name`, `Purchases`.`Units  
in Stock`, `Purchases`.`Units on Order`, `Purchases`.`Paid`, `Purchases`.`Product  
ID`  
FROM `Purchases` `Purchases` INNER JOIN `Product` `Product` ON  
`Purchases`.`Product ID`=`Product`.`Product ID`
```

## *Using an absolute value instead of a formula*

Select Expert

Purchases.Order Date <New>

New... Delete

OK Cancel Help Hide Formula <<<

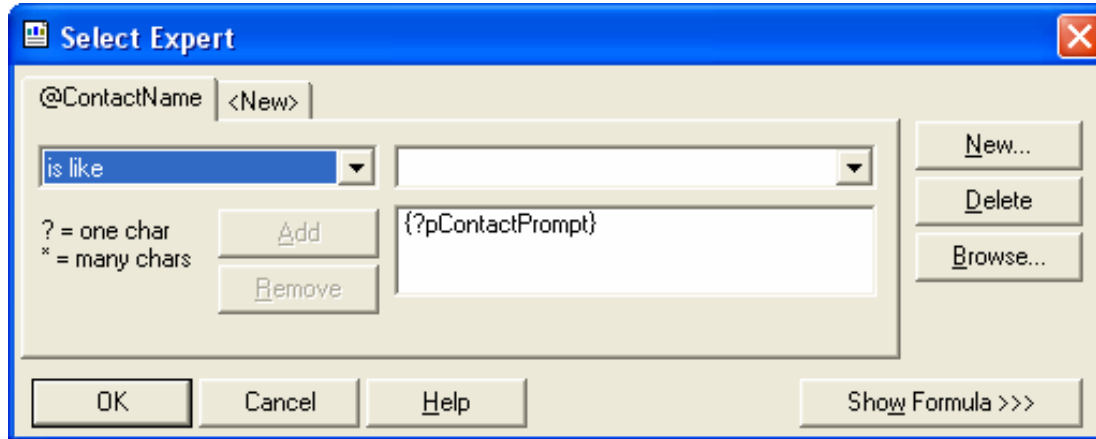
☒ Record Selection ☐ Group Selection Formula Editor...

{Purchases.Order Date} > #01/01/2001#

Show SQL Query

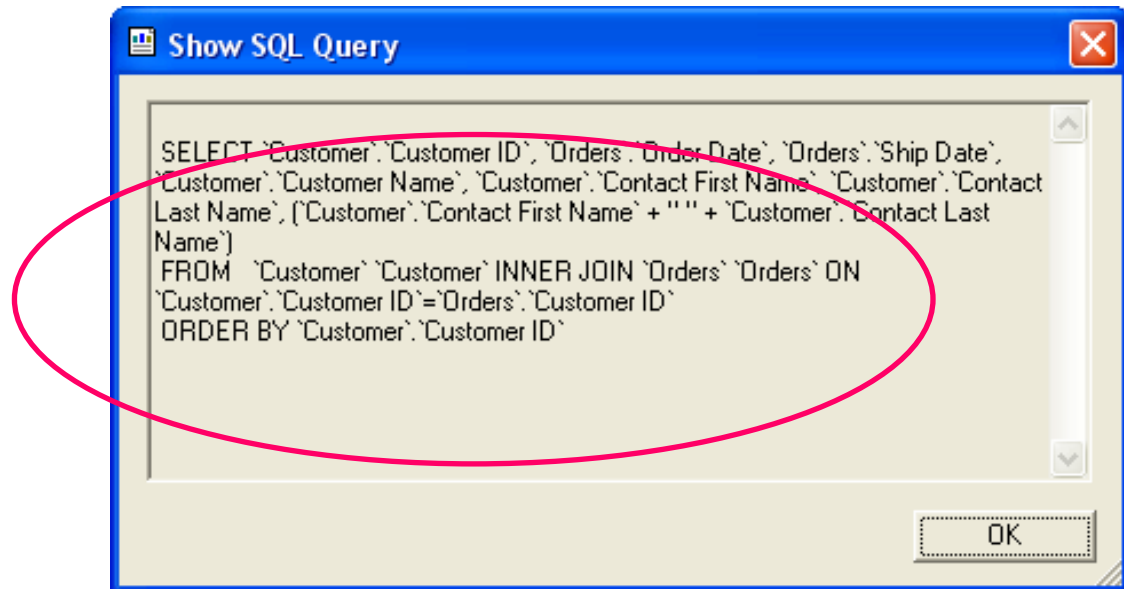
```
SELECT 'Purchases'.Order Date, 'Product'.Product Name, 'Purchases'.Units  
in Stock, 'Purchases'.Units on Order, 'Purchases'.Paid, 'Purchases'.Product  
ID  
FROM 'Purchases' 'Purchases' INNER JOIN 'Product' 'Product' ON  
'Purchases'.Product ID='Product'.Product ID  
WHERE 'Purchases'.Order Date>={ts '2001-01-01 00:00:01'}
```

*Using a formula in your record selection*

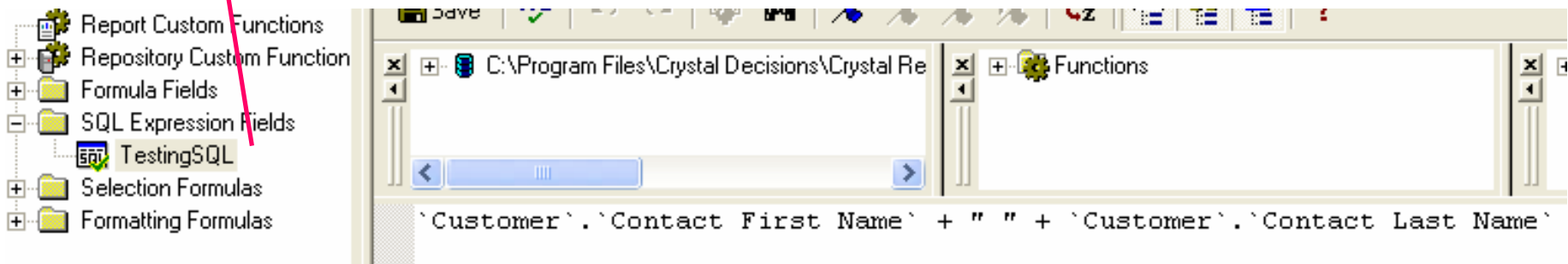
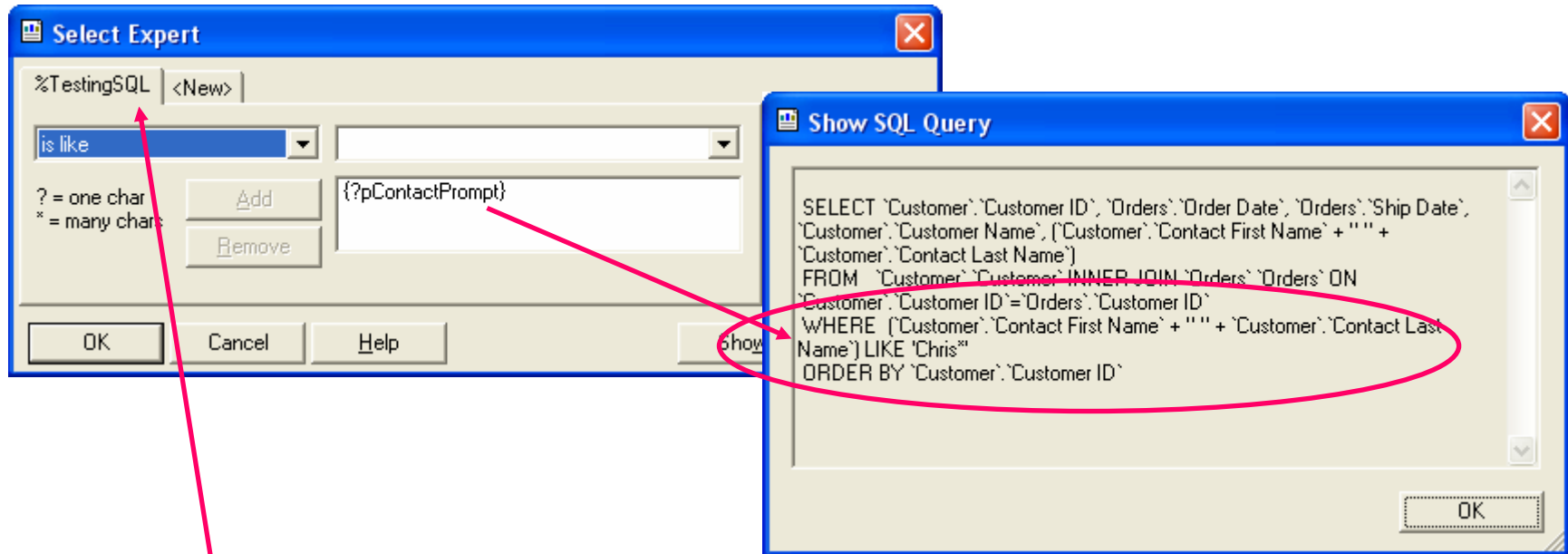


Do **not** base your record selection on a formula! ...

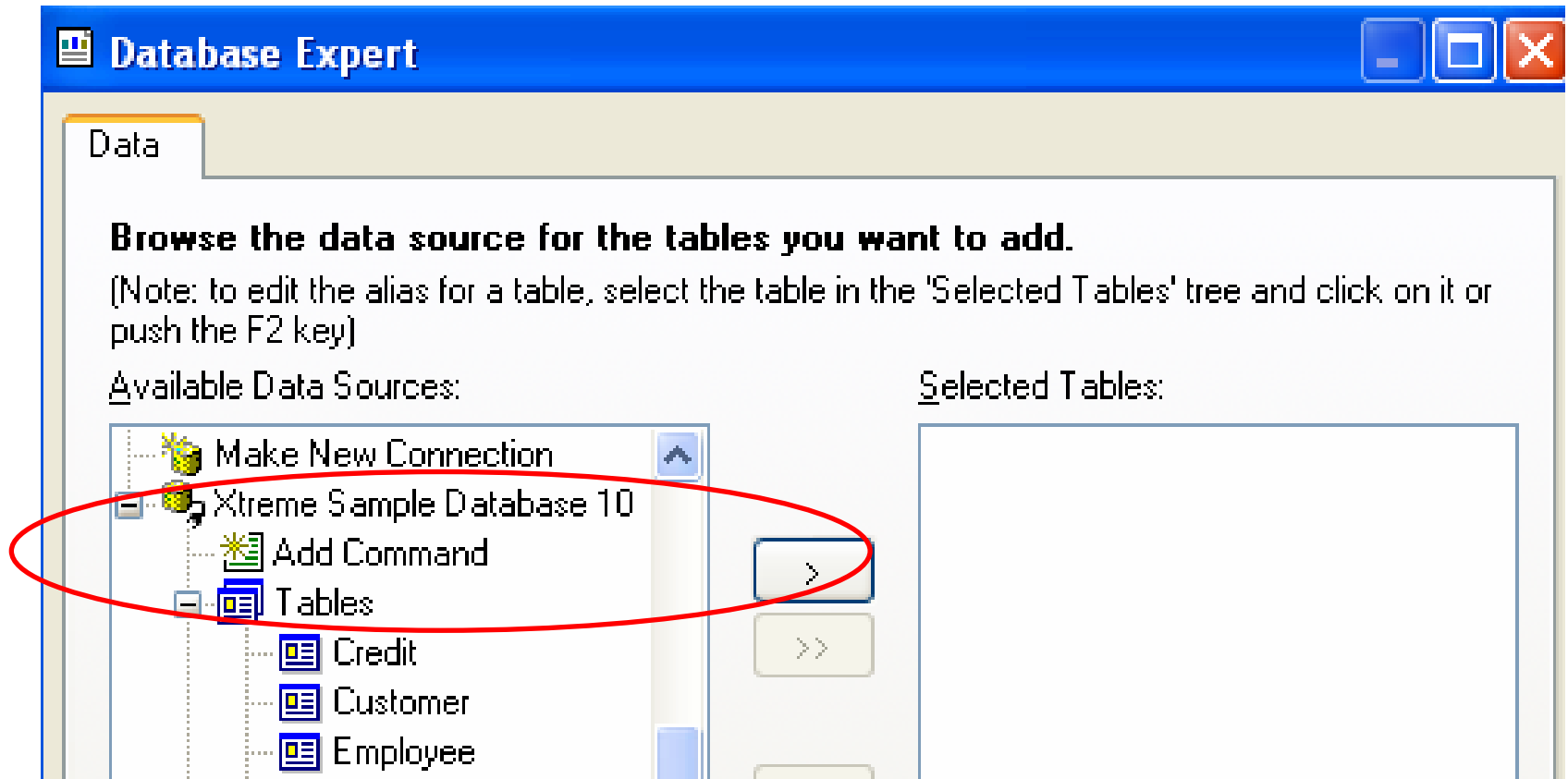
**No WHERE clause therefore the server is not doing the work!**



*Using a SQL expression in your record selection formula*

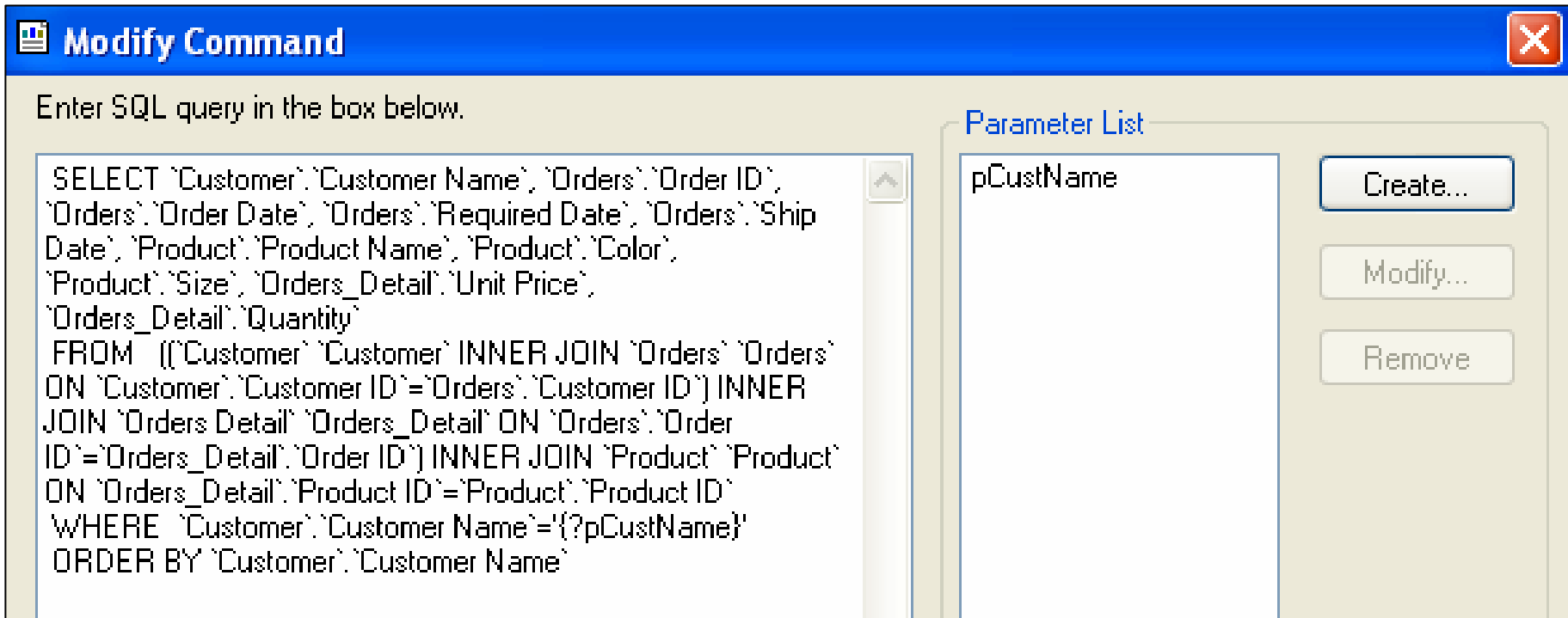


*Pick “Add Command” once you pick your database connection*





## *Sample SQL command including a parameter*



**Modify Command**

Enter SQL query in the box below.

```
SELECT `Customer`.`Customer Name`, `Orders`.`Order ID`,  
`Orders`.`Order Date`, `Orders`.`Required Date`, `Orders`.`Ship  
Date`, `Product`.`Product Name`, `Product`.`Color`,  
`Product`.`Size`, `Orders_Detail`.`Unit Price`,  
`Orders_Detail`.`Quantity`  
FROM ((`Customer` `Customer` INNER JOIN `Orders` `Orders`  
ON `Customer`.`Customer ID`=`Orders`.`Customer ID`) INNER  
JOIN `Orders_Detail` `Orders_Detail` ON `Orders`.`Order  
ID`=`Orders_Detail`.`Order ID`) INNER JOIN `Product` `Product`  
ON `Orders_Detail`.`Product ID`=`Product`.`Product ID`  
WHERE `Customer`.`Customer Name`='{?pCustName}'  
ORDER BY `Customer`.`Customer Name`
```

**Parameter List**

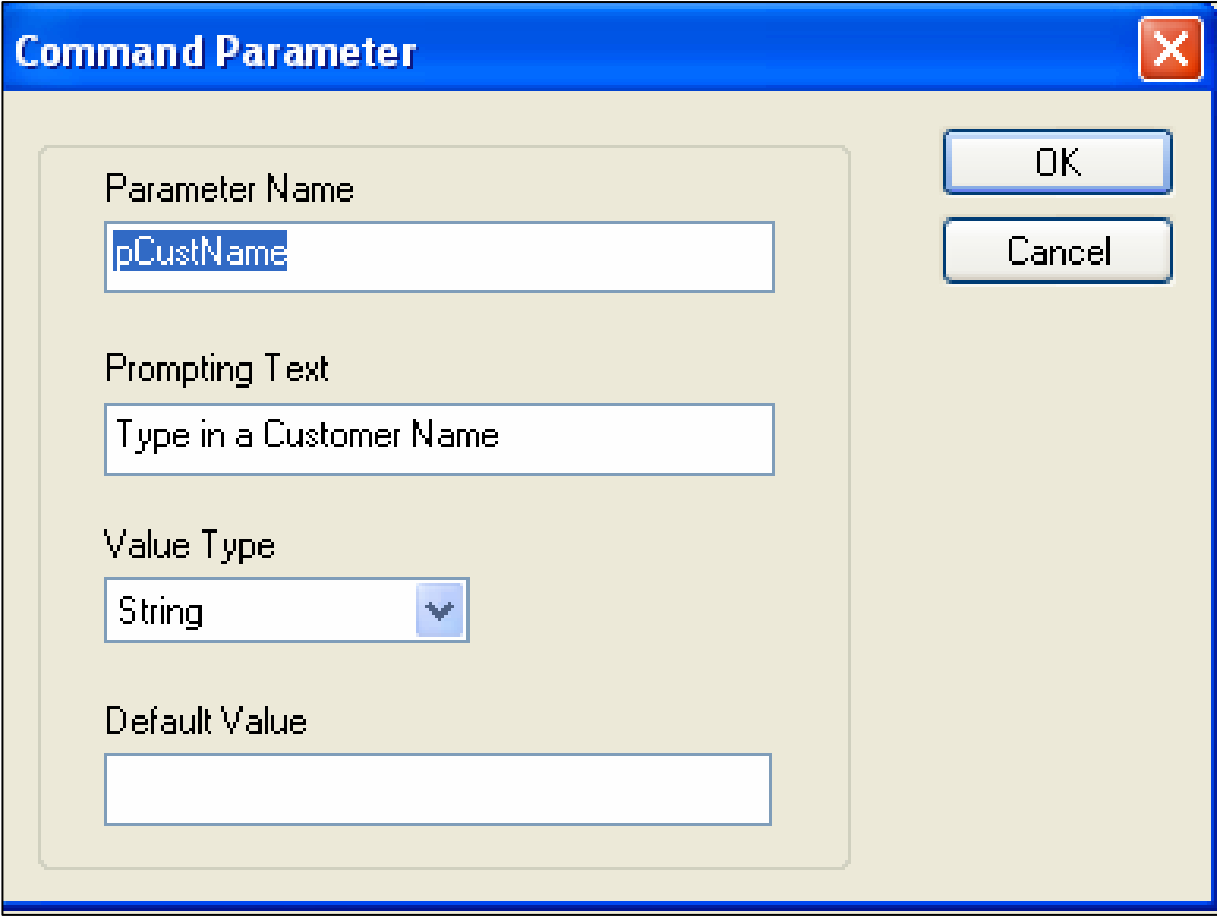
pCustName

Create...

Modify...

Remove

## *Sample SQL command parameter*



**Command Parameter**

Parameter Name  
pCustName

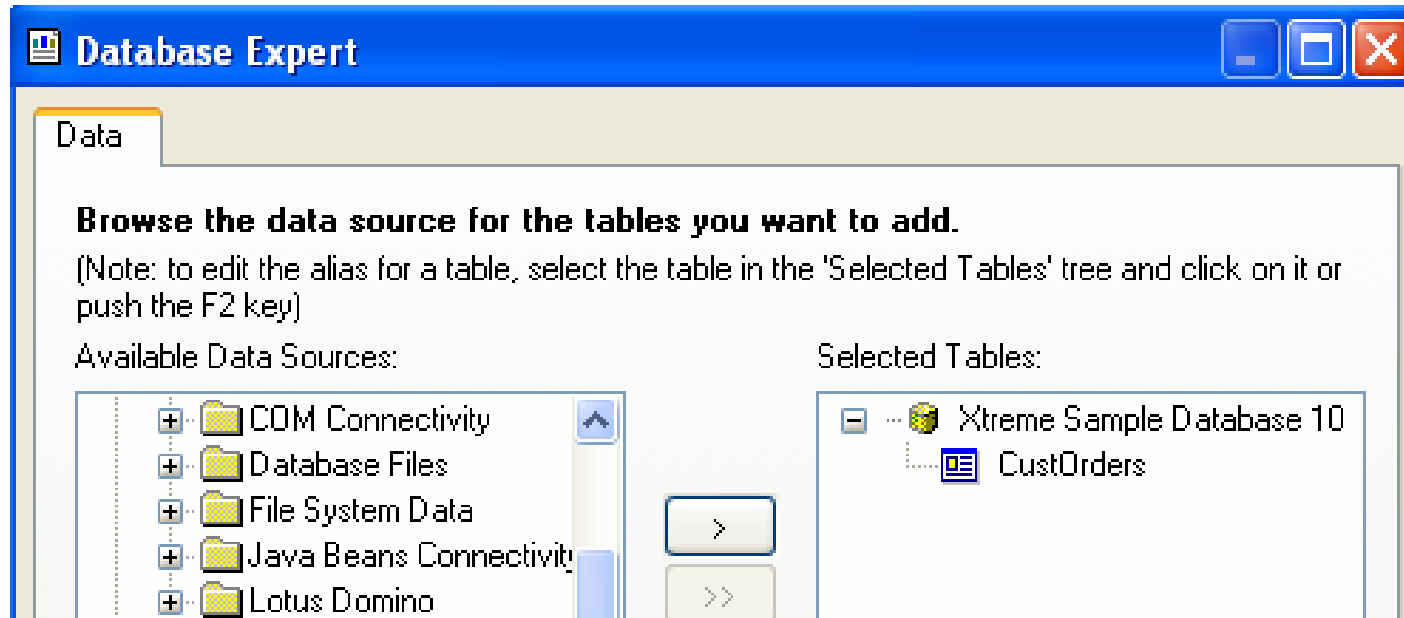
Prompting Text  
Type in a Customer Name

Value Type  
String

Default Value

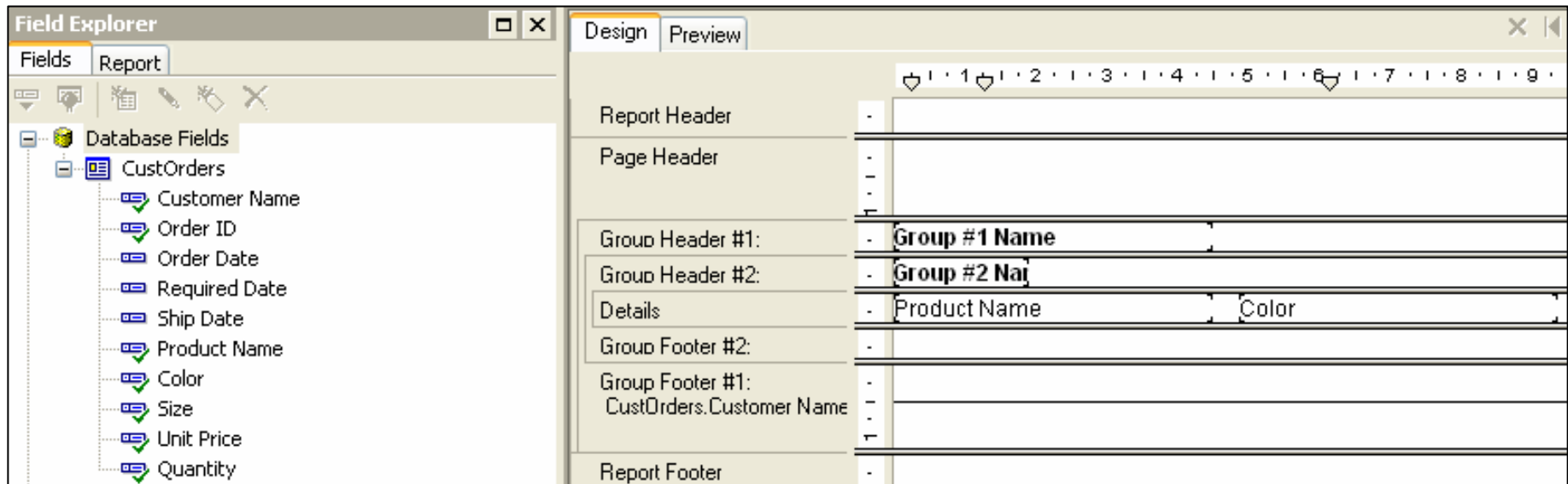
OK  
Cancel

## *Changing the name of a SQL command*



**To change the command name, hold the left mouse button down on the name. Release to change the name.**

## *How the SQL command data shows in Crystal Reports*



## ▶ Database issues

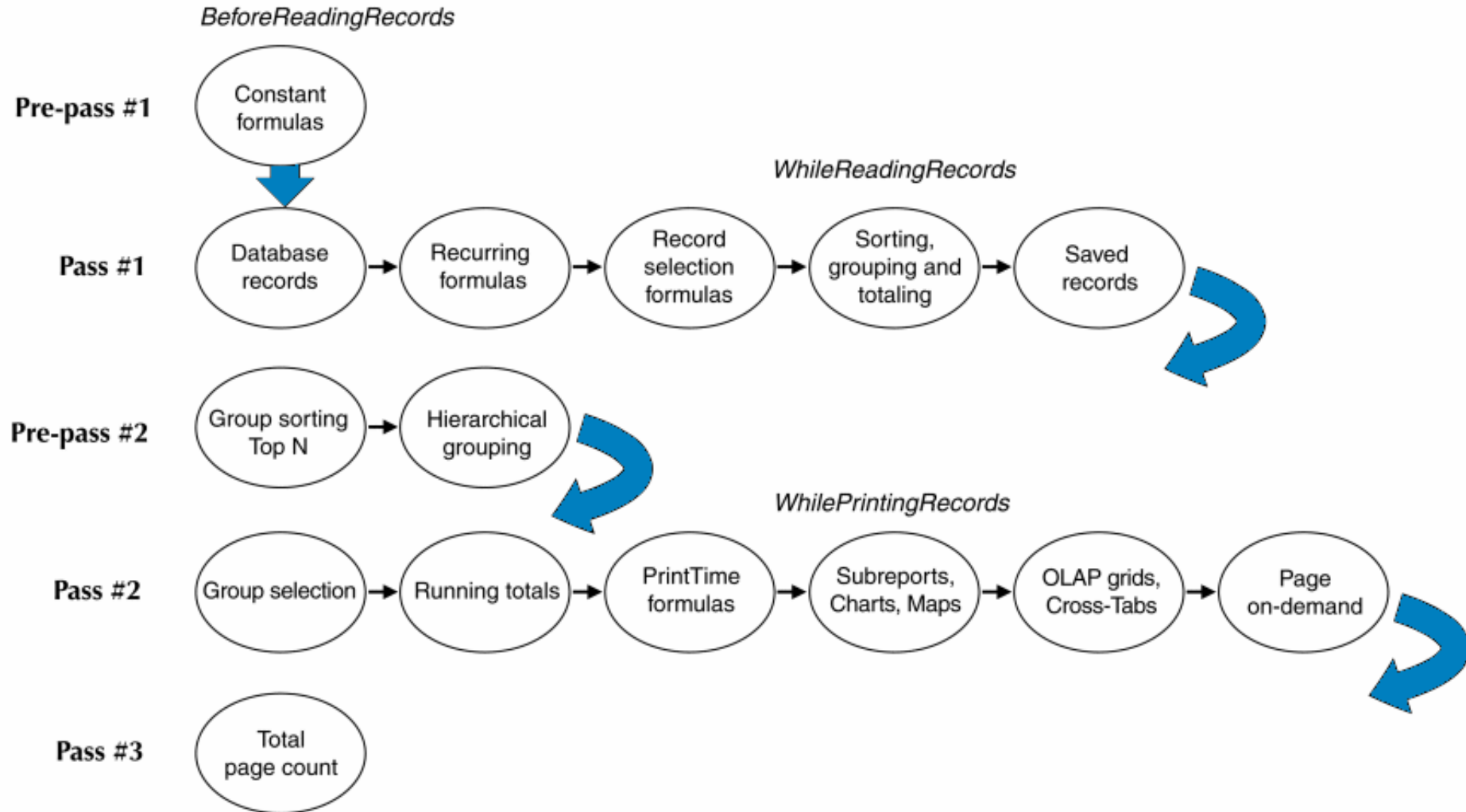
## ▶ Multi-pass reporting flow chart

- Performance consideration goal
- Using arrays instead of sub-reports
- Manual running totals and manual distinct counts
- Page N of M

## ▶ Miscellaneous tidbits

# Multi-Pass Reporting Flow Chart

## *Crystal Reports XI*



# Performance Consideration Goal

*The smaller the number of reporting passes, the faster your report processes*

- ▶ **Do you really need the Page N of M?**
  - Avoid pass 3
- ▶ **Use on-demand sub-reports?**
  - Pass 2 then only runs during drill-down
- ▶ **Can you avoid the subreports altogether?**
  - Sometimes!
- ▶ **Is there another way to process Running Totals?**
  - Yes .. using manual running total formulas
- ▶ **Review what data you are bringing into Crystal Reports**
  - Can calculations be done prior to Crystal Reports?

*Need a list of records from another table?*

*Showing the difference in Speed using  
an Array instead of a Subreport*

Donor: Bob Kochie

Tom Jones  
Candy Smith  
Janet Jones  
Davy Crockett

4/28/2005 \$500.00

*Prospect has potential for long commitment to Foundation. Strong ties to health care.*

**Use an array to pull a  
list of volunteers  
assigned to one  
donor instead of a  
sub-report**



## Array setup, display and reset formulas

```
whileprintingrecords;  
stringvar array volunteers;  
numbervar counter := 0;
```

Page Header

Group Header #1:  
CnBio.CnBio\_SortKey - A

[Donor] [CnBio\_Nar

@Init

Details

@FindVolunteers

@FindGifts

Group Footer #1a:

@DisplayVolunteers

Group Footer #1b:

@DisplayGifts

Group Footer #1c:

Group Footer #1d:

CnBio.CnBio\_SortKey - A

[CnNote\_1\_Actual\_Notes

Group Footer #1e:

### Reference in Speed using

```
whileprintingrecords;  
stringvar array volunteers;  
numbervar counter;  
  
counter := counter + 1;  
redim preserve volunteers[counter];  
volunteers[counter] := (CnRelSol_1.CnRelSol_1_Name);
```

```
whileprintingrecords;  
stringvar array volunteers;  
  
join(Volunteers, chr(13))
```

*Manual running totals to replace Crystal Reports feature 1/2*

**Performance Information**

- runningtotal.rpt
  - Report Definition
  - Saved Data
  - Processing
  - Latest Report Changes
  - Performance Timing**

Item	Value
Open Document	85 ms
Run the Database Query	4 ms
Read Database Records	0 ms
Format First Page	10 ms
Number of pages formatted	2
Average time to format a page	21 ms
Number of page starts generated	3
Average time to generate a page start	8 ms

**Using Crystal's Running Total Fields**

Group #1 Name

Group #2 Name

Product Name

Size

Color

rProductCount

Product Name

Size

Color

#rProductCount

## *Manual running totals to replace Crystal Reports feature 2/2*

**Edit Running Total Field**

Available Tables and Fields:

- Report Fields
  - Product.Supplier ID
  - Supplier.Supplier Name
  - Product\_Type.Product Typ
  - Product.Product Name
  - Product.Color
  - Product.Size
- Xtreme Sample Database 9 (OC)
  - Product
    - Product ID
    - Product Name
    - Color
    - Size
    - M/F
    - Price (SRP)
    - Product Type ID
    - Product Class
    - Supplier ID
  - Product\_Type

Running Total Name: rProductCount

Summary

Field to summarize: Product.Product Name

Type of summary: count

Evaluate

☒ For each record

☐ On change of field

☐ On change of group

☐ Use a formula

Reset

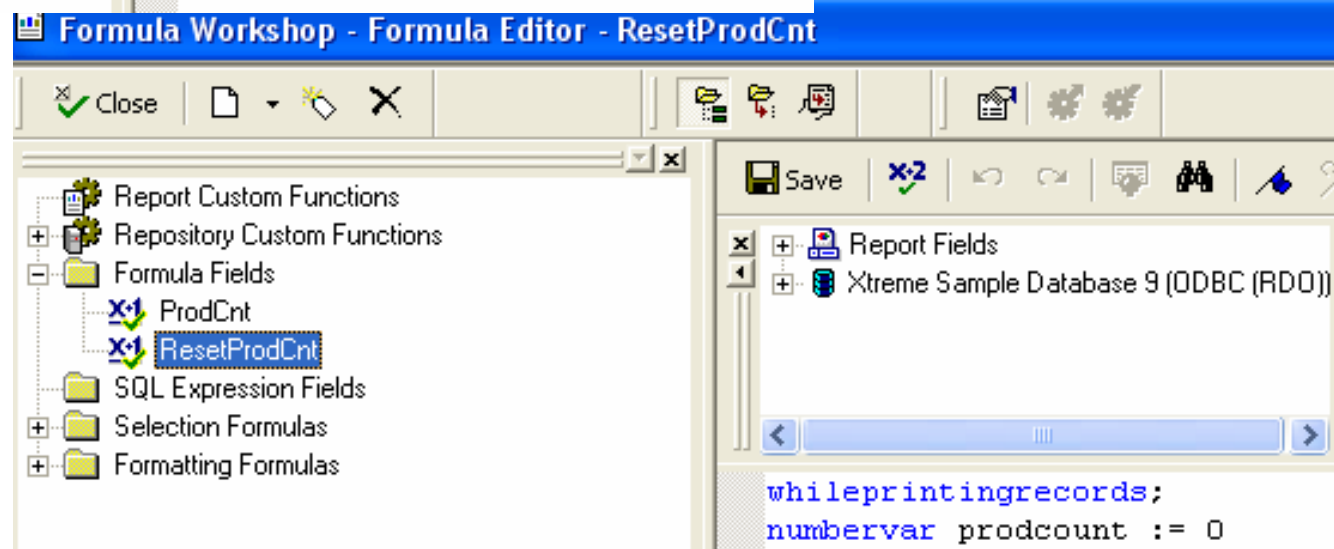
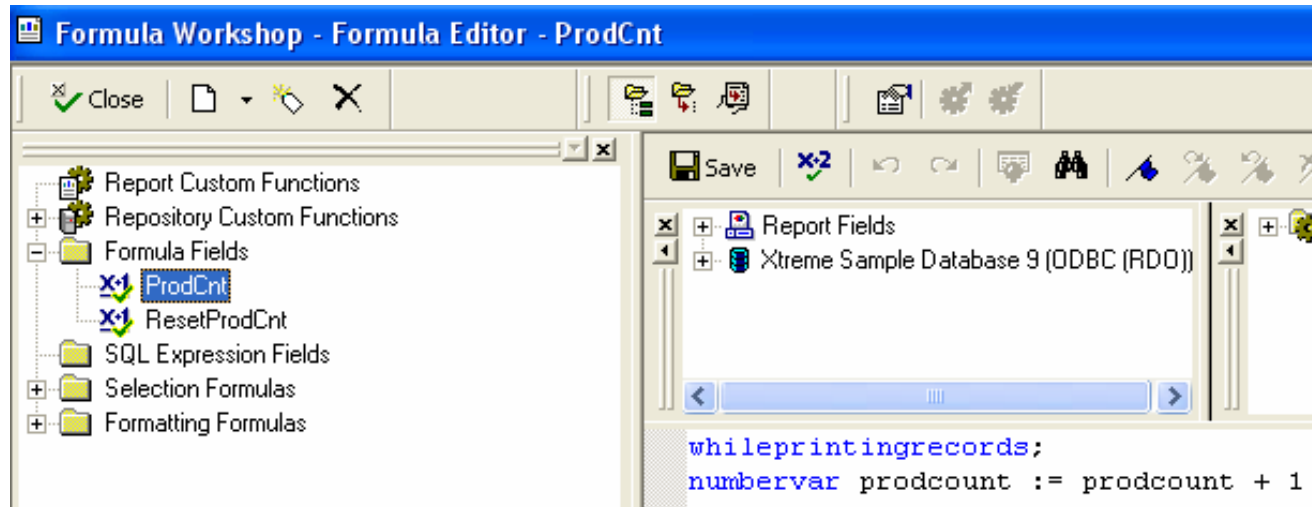
☐ Never

☐ On change of field

☒ On change of group: Group #1: Product.Supplier ID - /

☐ Use a formula

*The actual running total formulas in Crystal Reports syntax*



*Reset in the group header*

**Performance Information**

- runningtotal-formula.rpt
  - Report Definition
  - Saved Data
  - Processing
  - Latest Report Changes
  - Performance Timing**

Item	Value
Open Document	0 ms
Run the Database Query	4 ms
Read Database Records	0 ms
Format First Page	17 ms
Number of pages formatted	2
Average time to format a page	9 ms
Number of page starts generated	3
Average time to generate a page start	3 ms

Running Totals using Formulas

Group #1 Name				setProdCnt
Group #2 Name				
Product Name	Size	Color		ProdCnt
Product Name	Size	Color		@ProdCnt

## *Using Crystal Reports distinct count summary feature*

**Performance Information**

[-] DistinctCount.rpt

- Report Definition
- Saved Data
- Processing
- Latest Report Changes
- Performance Timing**

Item	Value
Open Document	171 ms
Run the Database Query	92 ms
Read Database Records	220 ms
Format First Page	119 ms
Number of pages formatted	2
Average time to format a page	59 ms
Number of page starts generated	60
Average time to generate a page start	1 ms

**Edit Summary**

Choose the field to summarize:  
Orders\_Detail.Product ID

Calculate this summary:  
Distinct count

Options  
☐ Show as a percentage of  
Grand Total: DistinctCount of Product ID

Design Preview

RH

PH

GH1

D

GF1

Group #1 Name
Order ID Order Date Product ID Product Name Size Color
Product ID Distinct Count per Product Type

## *Using a formula instead of the distinct count summary feature*

Performance Information		
DistinctCount-formula.rpt	Item	Value
Report Definition	Open Document	108 ms
Saved Data	Run the Database Query	86 ms
Processing	Read Database Records	212 ms
Latest Report Changes	Format First Page	116 ms
Performance Timing	Number of pages formatted	2
	Average time to format a page	58 ms
	Number of page starts generated	60
	Average time to generate a page start	5 ms

```
whileprintingrecords;
shared stringvar stringRT := "";
shared numbervar distinctCt := 0
```

Design	Preview										
RH	Using Manual Distinct Count Formula										
PH											
GH1	Group #1 Name					etDistinctCt					
D	Order ID	Order Date	Product ID	Product Name	Size	Color	ystalSyntax				
GF1	Formula Distinct Count per Product Type										
	@RunTotalCrystalSyntax (Number)										

```
whileprintingrecords;
shared stringvar stringRT;
shared numbervar distinctCt;

if instr(stringRT, totext({Orders_Detail.Product ID}) + "^") = 0 then
    (stringRT:= stringRT + totext({Orders_Detail.Product ID}) + "^";
    distinctCt:= distinctCT + 1)
```

# Page N of M – Pass 3

*Only use the Page N of M if absolutely necessary!*

Performance Information		
[-] PageNofM.rpt		
Report Definition	Open Document	179 ms
Saved Data	Run the Database Query	109 ms
Processing	Read Database Records	4 ms
Latest Report Changes	Number of pages formatted	1
Performance Timing	Average time to format a page	1 ms
	Number of page starts generated	181
	Average time to generate a page start	2 ms

Performance Information		
[-] use2-formula.rpt		
Report Definition	Open Document	179 ms
Saved Data	Run the Database Query	119 ms
Processing	Read Database Records	5 ms
Latest Report Changes	Format First Page	150 ms
Performance Timing	Number of pages formatted	3
	Average time to format a page	53 ms
	Number of page starts generated	181
	Average time to generate a page start	2 ms

Performance Information		
[-] use2-formula.rpt		
Report Definition	Grouping Done on Database Server	No
Saved Data	Sorting Done on Database Server	Yes
Processing	Record Selection Done on Database...	Yes
Latest Report Changes	Require Two Passes	No
Performance Timing	Require the Total Page Count	Yes
	Number of Nodes in Group Tree	2635
	Number of Summary Values	444
	Size of Saved Group Tree	47 KB
	Built the Group Tree in Progress	No



- ▶ **Database issues**
  - ▶ **Multi-Pass reporting flow chart**
    - Performance consideration goal
    - Using arrays instead of sub-reports
    - Manual running totals and manual distinct counts
    - Page N of M
- ▶ **Miscellaneous tidbits**

## *Text box versus concatenation formula*

Why use a formula for concatenation?  
Report using two Text Box Merges

Performance Information		
<div> <div>TextConcatenation.rpt</div> <ul style="list-style-type: none"> <li>Report Definition</li> <li>Saved Data</li> <li>Processing</li> <li>Latest Report Changes</li> <li>Performance Timing</li> </ul> </div>		
Item	Value	
Open Document	0 ms	
Run the Database Query	123 ms	
Read Database Records	293 ms	
Format First Page	152 ms	
Number of pages formatted	1	
Average time to format a page	152 ms	

Group #1 Name

Group #2      Order Amount      Order Date      {Contact First Name} {Contact Last Name}

Product Name      Unit Price      Quantity      @ExtPrice

if @ExtPrice

Orders for {Group #1 Name} total: if @ExtPrice

## Text box versus concatenation formula

Why use a formula for concatenation? Speed!

```
trim({Customer.Contact First Name}) + " " + trim({Customer.Contact Last Name})
```

Performance Information	
TextConcatenation-formula.rpt	
Report Definition	
Saved Data	
Processing	
Latest Report Changes	
Performance Timing	
Item	Value
Open Document	0 ms
Run the Database Query	104 ms
Read Database Records	252 ms
Format First Page	133 ms
Number of pages formatted	1
Average time to format a page	133 ms

Group #1 Name

Group #2

Order Amount

Order Date

@ContactName

Product Name

Unit Price

Quantity

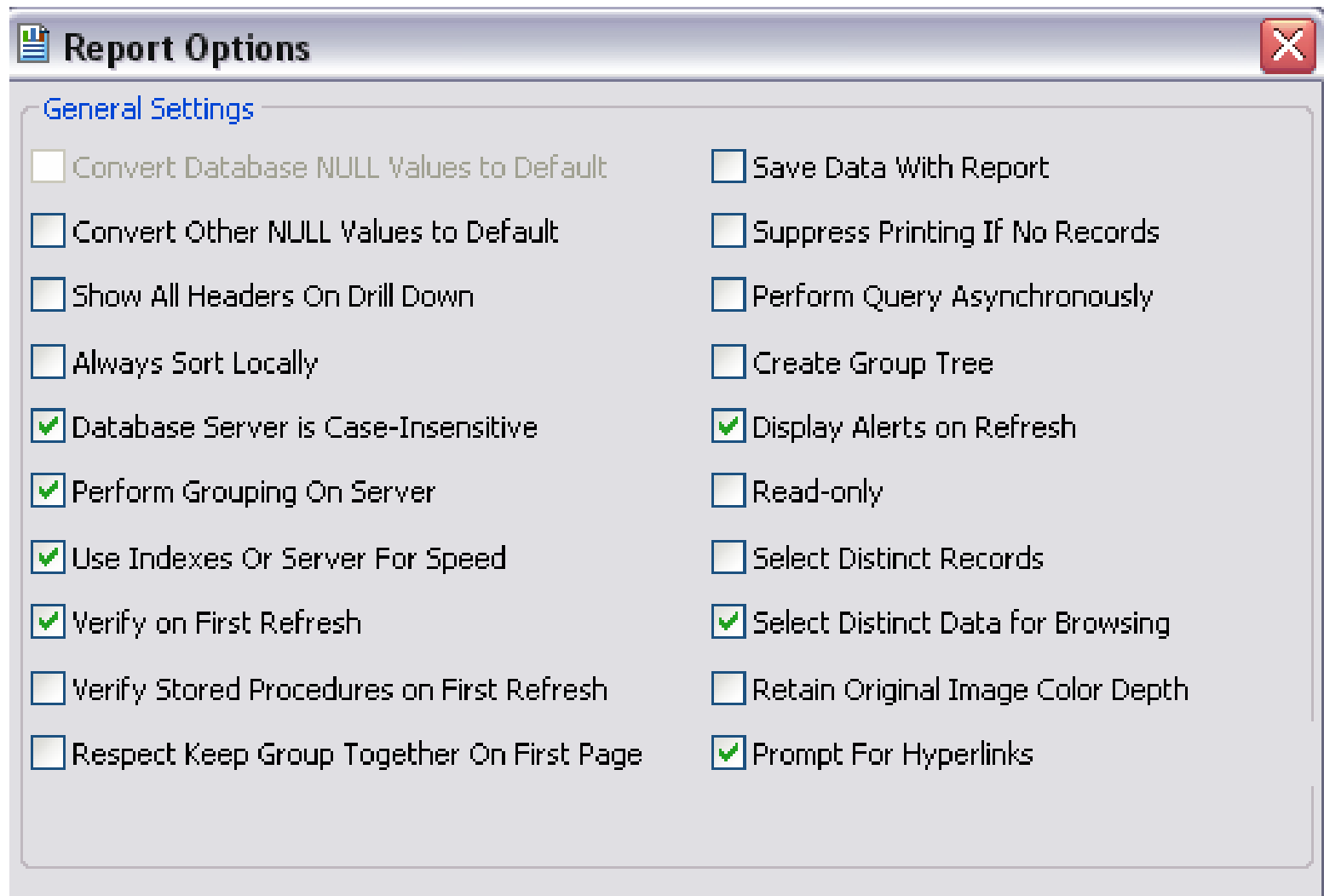
@ExtPrice

if @ExtPrice

@CustNameFooter

if @ExtPrice

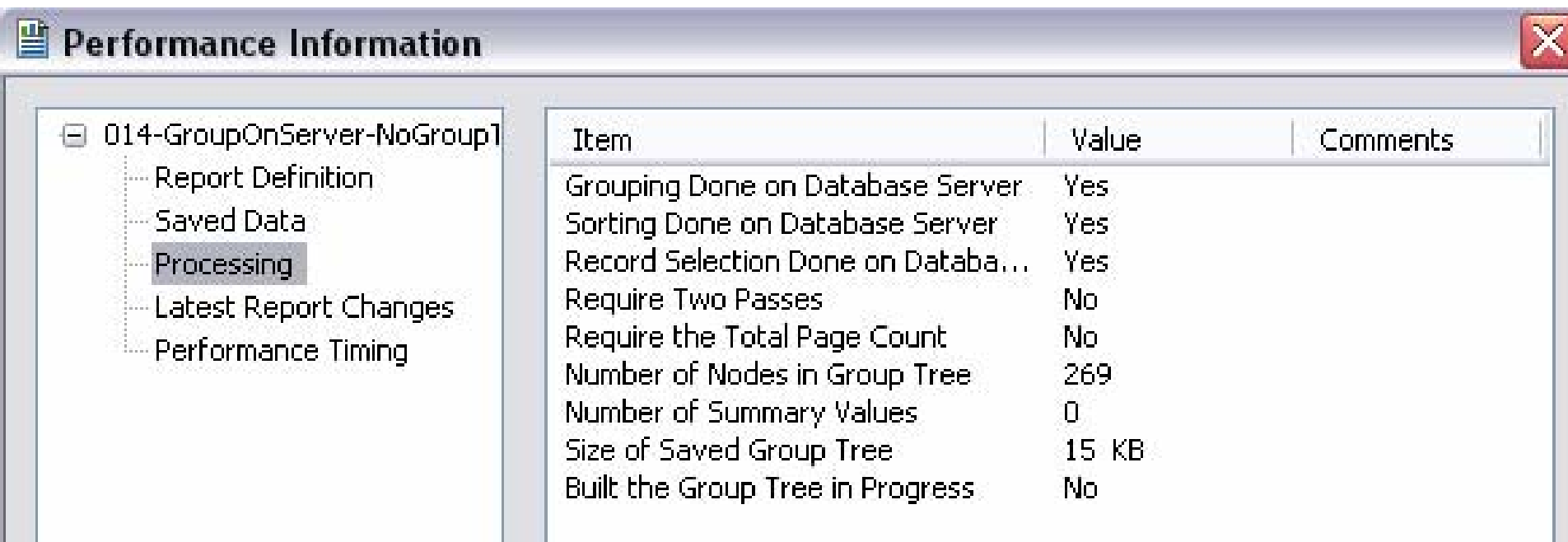
## Create a group tree



The screenshot shows a 'Report Options' dialog box with a 'General Settings' tab. The dialog has a title bar with a close button (X) in the top right corner. The settings are organized into two columns of checkboxes. The 'Create Group Tree' checkbox is highlighted with a blue selection bar.

General Settings	
<input type="checkbox"/> Convert Database NULL Values to Default	<input type="checkbox"/> Save Data With Report
<input type="checkbox"/> Convert Other NULL Values to Default	<input type="checkbox"/> Suppress Printing If No Records
<input type="checkbox"/> Show All Headers On Drill Down	<input type="checkbox"/> Perform Query Asynchronously
<input type="checkbox"/> Always Sort Locally	<input type="checkbox"/> Create Group Tree
<input checked="" type="checkbox"/> Database Server is Case-Insensitive	<input checked="" type="checkbox"/> Display Alerts on Refresh
<input checked="" type="checkbox"/> Perform Grouping On Server	<input type="checkbox"/> Read-only
<input checked="" type="checkbox"/> Use Indexes Or Server For Speed	<input type="checkbox"/> Select Distinct Records
<input checked="" type="checkbox"/> Verify on First Refresh	<input checked="" type="checkbox"/> Select Distinct Data for Browsing
<input type="checkbox"/> Verify Stored Procedures on First Refresh	<input type="checkbox"/> Retain Original Image Color Depth
<input type="checkbox"/> Respect Keep Group Together On First Page	<input checked="" type="checkbox"/> Prompt For Hyperlinks

## *Building a group tree*



The screenshot shows a window titled "Performance Information" with a close button in the top right corner. On the left is a tree view with the following items:

- 014-GroupOnServer-NoGroup1
  - Report Definition
  - Saved Data
  - Processing
  - Latest Report Changes
  - Performance Timing

The "Processing" item is selected. On the right is a table with three columns: "Item", "Value", and "Comments".

Item	Value	Comments
Grouping Done on Database Server	Yes	
Sorting Done on Database Server	Yes	
Record Selection Done on Database Server	Yes	
Require Two Passes	No	
Require the Total Page Count	No	
Number of Nodes in Group Tree	269	
Number of Summary Values	0	
Size of Saved Group Tree	15 KB	
Built the Group Tree in Progress	No	

*What else could cause your report to run slow?*

► **Considerations for when your report is running extremely slow on one computer but not on another**

- Check your ODBC drivers – sometimes they get corrupted
- Options settings (SQL server / database options)
- CPU / RAM – workstation hardware
- Review if other programs are running on that workstation (Task Manager)
- Network traffic
- Other database processes running at the same time
- NIC – network card
- HUB / SWITCH – network infrastructure
- Security issues