Chapter 3 – Running Totals

Chapter 3 Objectives

- Recognize effects of Multi-Pass Processing.

- Create Running Total fields.

- Create Conditional Running Totals

- Use a Running Total to Summarize a Group

Scenario for Workshop 3A

You've had a long day. You're beat. You're heading to your car in the parking lot. Willie Loman is in the smokers' area chomping on a big cigar. He sees you, waves, and comes running over and puts his arm around your shoulder.

> "Hey Babe, Penny Pincher's been on my case about customers not paying their bills. I need a report, listing customers and how much they owe, with some kind of running total. You know what I mean.
>
> "Can you get me something tomorrow morning, oh by 9 AM. It shouldn't take you long; you're such a wiz with these reports. Do this one for me kiddo, and I'll treat you to lunch. You know you're one of my favorite people here."
>
> You nod wearily, cough from the cigar smoke, and head back into work.

You report should look similar to the one below.

7/11/2009		**Customer Status Report**			1
ACCOUNT NO	**CUSTOMER NAME**	**INVOICE DATE**	**INVOICE NUMBER**	**AMOUNT**	**RUNNING TOTAL**
211030518901	NEAL ARMSTRONG	6/24/05	23345	$4,445.00	$4,445
		1/4/05	00101	$3,455.55	$7,901
		1/9/05	56342	$1,112.00	$9,013
		2/7/05	55544	$4,546.00	$13,559
		5/6/05	45646	$3,334.00	$16,893
		4/4/05	44456	$2,223.00	$19,116
		3/19/05	44455	$4,523.00	$23,639
		8/13/05	77777	$254.33	$23,893
		7/15/05	23433	$6,667.00	$30,560
		1/12/05	88844	$4,545.00	$35,105
		4/11/05	00205	$222.00	$35,327
		3/26/05	00204	$7,777.00	$43,104
		2/18/05	00203	$5,666.00	$48,770
		1/14/05	00202	$5,565.00	$54,335
		4/3/05	00104	$7,776.00	$62,111
		3/23/05	00103	$4,567.00	$66,678
		2/6/05	00102	$222.44	$66,900
		12/2/04	33347	$8,889.00	$75,789
				$75,789.32	
211050404402	R.L.HENDERSON	2/19/05	00378	$444.00	$444
		2/2/05	00987	$5,556.00	$6,000
		2/25/05	00999	$4,454.00	$10,454
		1/12/05	00345	$3,333.00	$13,787
				$13,787.00	
211050405601	CEMENT PRODUCTS,INC.	5/4/05	01234	$4,545.00	$4,545
		7/2/05	01235	$3,434.00	$7,979
		7/23/05	01236	$3,453.00	$11,432
		2/18/05	01245	$3,453.00	$14,885
				$14,885.00	

Pre-processed vs. Running Totals

All totals created up to this point are pre-processed or summary, which means the totals are calculated before the report is printed. Crystal makes at least two passes through the data to create a total. The first pass accumulates the pre-processed total; the second pass actually prints the totals.

A pre-processed total is calculated on the first pass and is based on all records. As a result, accurate totals can be placed in the Group Header/Footer or Report Header/Footer sections. The advantages of pre-processed totals are 1) a selection can be based on a group sum, 2) groups can be sorted on a total field and 3) they can be place anywhere. Invoices and credit card statements typically use pre-processed totals when a total is printed before the detailed information.

A running total differs from a pre-processed total in that a running total is calculated on the second pass. The total increases as each selected record is processed. Running totals are used for counts, enumerations and running balances.

Discussion - Multi-Pass Reporting

A "pass" is the process that Crystal uses each time the data is read and manipulated. Depending on the complexity of the report, Crystal will make 1, 2 or 3 passes over the data to generate a finished report.

Pass #1 – After parameters and constants (formulas or text that have the same value for the entire report) have been evaluated, the first pass over the data includes:

WHILE READING RECORDS:
      Retrieving database table records
      Recurring formulas-(uses database fields only)
      Applying record selection
      Grouping, sorting, and pre-processed totals
      Generating a Cross-Tab
      Saving the data so far

Pass #2 – After ordering the groups for TopN or Hierarchical grouping, the second pass through the saved data is used to format the pages and includes:

WHILE PRINTING RECORDS:
      Grouping Selection formulas
      Running totals
      Print-time and "While Print Records" formulas
      Charts and maps
      Subreports
      Generating pages on demand

Pass #3 – The third pass determines the total page count.

When to use a Running Total

Problem: Grand Totals, subtotals and summaries can be incorrect if the report has a group selection formula. This is because pre-processed totals are calculated on the first pass and before group selection formulas, which are evaluated on the second pass.

Solution: Use a running total that evaluates and resets on a change of a record, a field, a group subtotal, or a grand total. You can even use a running total that never resets for a grand total. A **Running Total** field can be inserted just like a database field; however, placement of a running total affects the value that appears on the report.

Section	Action
Report Header	Returns the value for the first record of the report.
Page Header	Creates a running total up to and including the first record of the current page.
Group Header	Creates a running total up to and including the first record of the current group.
Details	Creates a running total for every record.
Group Footer	Creates a running total up to and including the last record of the current group.
Page Footer	Creates a running total up to and including the last record of the current page.
Report Footer	Creates a grand total that includes all records.

You can access Running Totals two ways:

1.   Click on the **Field Explorer** [icon] icon, then select **Running Total Fields**, and

click the **New** [icon] icon in Field Explorer toolbar.

- OR -

2.   Select a field in the report such as **the INVOICES.AMOUNT FIELD** in the Details Section, right click, and choose **Insert | Running Total**.

Explanation of a **Running Total** dialog box:
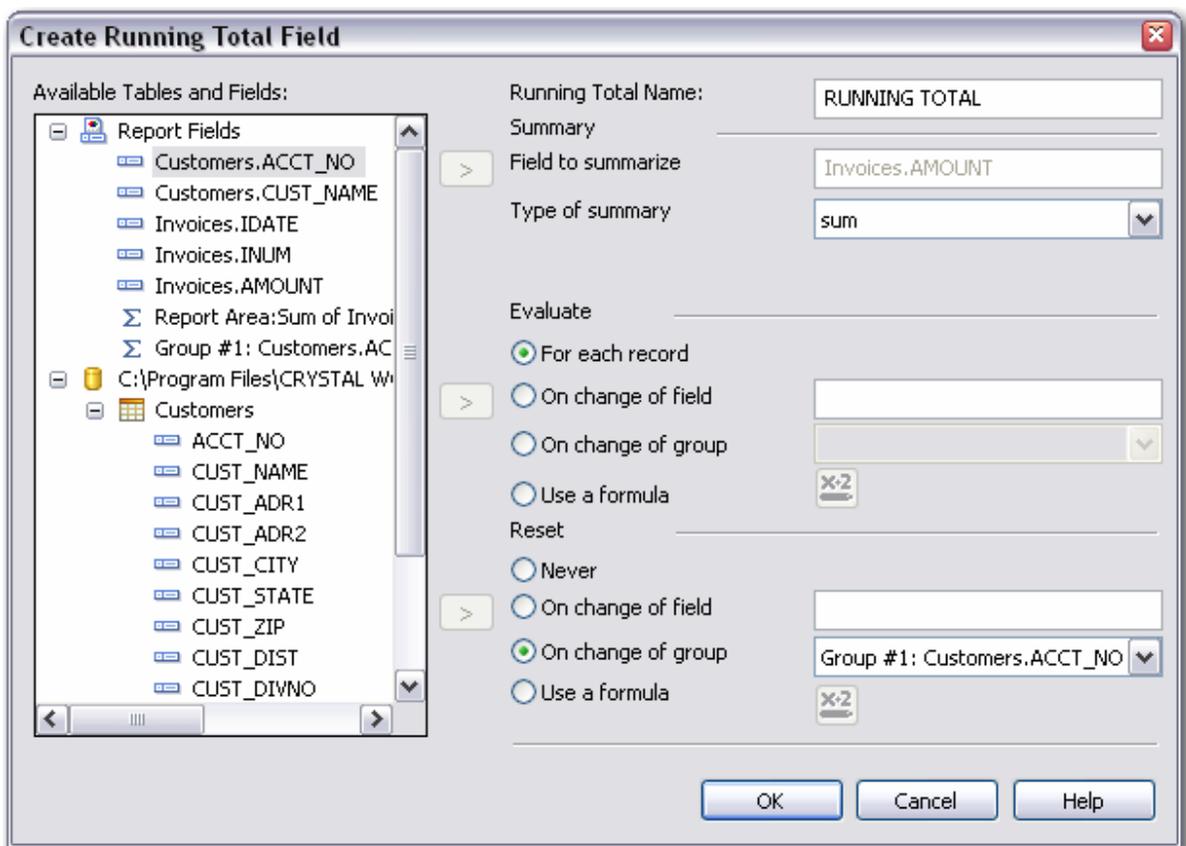
Available Tables and Fields – A Listing of all fields, formulas, and Group Name Fields.

Running Total Name – The name of the running total field. This can contain mixed-case characters and spaces. The running total's name is preceded by a pound sign (#) when inserted into the report. You can enter a unique name for the running total, or let Crystal do it for you. Crystal will call the field "RTotal" followed by a number. The first running total will have a zero, the next the number 1, and so on.

Field to Summarize – Specifies the field, formula, or group name field upon which the Running Total will be based.

Type of Summary – Choose the calculation from the drop-down list. The choices vary depending on the type of field selected. Null values in a field will NOT increase incremental counts.

Evaluate – Specifies when the records will be incremented or added. You can add each record to the previous record, add on change of a field (selected from the list on the left), on change of a group, or by a formula (see Tip on page 3-15).

Reset – Specifies when, if ever, the Running Total accumulation to start over or reset to zero (0).

Workshop 3A – Add a Running Total Field

You have a starter report in the C:\CRYSTAL WORK 11\LEVEL 2 directory that uses the Customers and Invoices tables from the SALES.mdb.

- Open Running Total Starter.rpt in the **C:\crystal_work_12\LEVEL 2** directory.

- It will look like the report shown below.
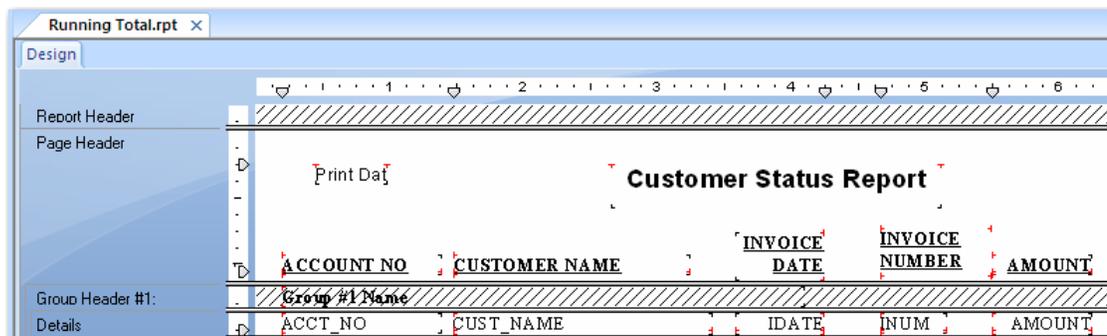
- Save as **Running Total.rpt.**

- Select **ACCT_NO** and **CUST_NAME** in the **Details** section and format as **Suppress if Duplicated**.

- **Format** the **IDATE** field to eliminate the time portion, if necessary.

- Since the **ACCT_NO** is in the Details section, you don't need to see it in the Group #1 Header section too. Suppress Group #1 Header section.

- Clean up Headings and add the title "Customer Status" to the Page Header.

- Add a Print Date and Page Number to the Page Header.

- Insert a Grand Total and Subtotal for Invoices.AMOUNT.

- Select Invoices.AMOUNT in the report again, right-click, and select **Insert | Running Total** from the pop-up menu.

- **Create Running Total** field as follows:

Running Total Name:	=	**RUNNING TOTAL**
Field to summarize:	=	Invoices.AMOUNT (preselected)
Type of summary:	=	Sum (default)
Evaluate:	=	For each record (default)
Reset:	=	On change of Group #1 Customers. ACCT_NO. (default is Never)

See **Page 3-5** for screenshot of Running Total dialog box. If you insert a Running Total for a specific field, the Field to Summarize will be pre-selected.

- Click **OK** to close the **Create Running Total Field** dialog box.

Because you inserted the **Running Total** from the Invoices.AMOUNT field, the **#RUNNING TOTAL** field is placed in the **Details Section** next to Invoices.AMOUNT. If you add a **Running Total** from the Field Explorer, the field will not be automatically inserted into the report.

- Suppress the **Page Footer**.

- Format RUNNING TOTAL and Amount Subtotal with dollar signs.

- Save the report again as **Running_Total.rpt**.

211050404402	R. L. HENDERSON	2/19/05	00378	$444.00	$444
		2/2/05	00987	$5,556.00	$6,000
		2/25/05	00999	$4,454.00	$10,454
		1/12/05	00345	$3,333.00	$13,787
				$13,787.00	

The subtotal for each Customer will match the last total in the Running Total field.

Scenario for Workshop 3B

You sent the report you finished last night up to Willie Loman's office first thing this morning. You figure now you'll have time to clean up your desk and get a few other housekeeping tasks done. You start throwing out a stack of outdated reports piled up in the corner, when you get a phone call from Penny Pincher.

> Hello,
>
> W. L. sent me a copy of the Customer Status report this morning. I like that Running Total you put in there, but the report doesn't show me what's been paid on any of these Invoices.
>
> I want to see how much each customer paid, and how much they still owe.

Your finished report should look something like this.

| 7/11/2009	Customer Amount Due			1
ACCOUNT NO	**CUSTOMER NAME**	**AMOUNT BILLED**	**AMOUNT PAID**	**AMOUNT DUE**
211030518901	NEAL ARMSTRONG	$75,789.32	$32,391.00	$43,398.32
211050404402	R. L. HENDERSON	$13,787.00	$4,200.00	$9,587.00
211050405601	CEMENT PRODUCTS, INC.	$14,885.00	$600.00	$14,285.00
211070640201	THAYER COGGIN	$4,941.00	$500.00	$4,441.00
213060135304	DAN JARDINE	$19,936.82	$4,088.00	$15,848.82
213130232501	ASK MR. FOSTER	$267.89	$267.89	$0.00
214120325061	ELECTRO PLATING	$5,000.00	$1,300.00	$3,700.00
216120435042	IDEAL GLASS COMPANY	$6,000.00	$3,100.00	$2,900.00

You won't be able to use a running total of every record in this report like you did in the last one, because you have a one to many relationship between the Invoice record (one) and the Payments records (more than one). That makes the Invoice record repeat for every Payment record, and your totals will not be correct.

To solve this problem, you need to create a report showing the total amount invoiced, how much was paid, and how much is still due.

Workshop 3B – Using a Running Total to Summarize a Group

- Open **Running Total.rpt** if it is not already open and Save as **Running Total2.rpt.**

- In the Database Expert add the **Payments** table from the SalesDB.

- In the **Links tab**, join the Payments table to Invoices as shown.

- Payments.REF contains the same data as Invoices.INUM.
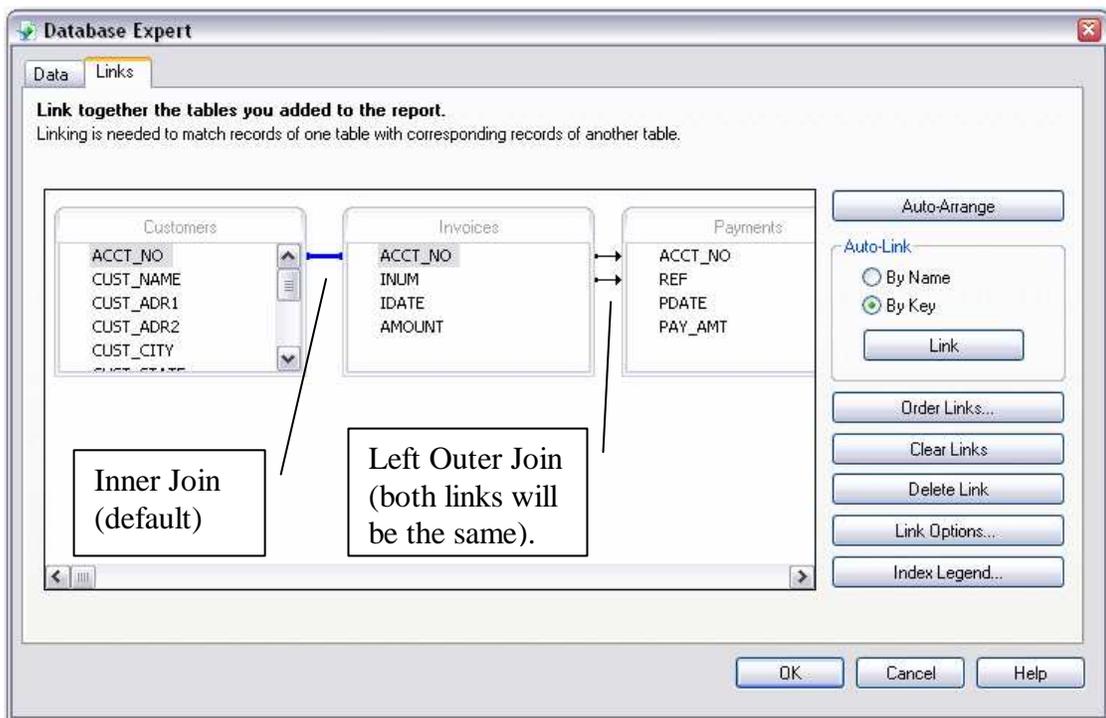
- Keep the link from Customers.ACCT_NO to Invoices.ACCT_NO, with the default Join Type of Inner Join. This will retrieve only Customers with Invoices.

- Link two fields from Invoices to two fields in Payments: Invoices.ACCT_NO to Payments.ACCT_NO Invoices.INUM to Payments.REF.

ACCT_NO fields are joined so that records in the INVOICE table match those in the PAYMENTS table. INUM and REF are joined so that the Invoice Number matches the Payment's Reference Number. These both use a **Left Outer Join**, so that all Invoices are retrieved whether they have payments or not.

- Click on one of the two lines (either one is ok), to activate **Link Options** [Link Options...] button.

- Click on **Link Options** and change Join Type to Left Outer.

- Click **OK**.

- Click on the other line and **Link Options**. You will see that it is also Left Outer Join. If more than one field is linked between two tables, the Join Types must be the same. Click **OK** to close Link Options.

- Click **OK** to exit Database Expert.

- **Refresh** report if prompted.

- Delete **#RUNNING TOTAL** from the Details Section.

- Insert the field Payments.PAY_AMT where **#RUNNING TOTAL** was.

- Preview report.

- Find the listing for Customer DAN JARDINE, INVOICE NO 66666. What happened?

213060135304	DAN JARDINE	8/12/04	66666	$19,936.82	900.00
		8/12/04	66666	$19,936.82	700.00
		8/12/04	66666	$19,936.82	900.00
		8/12/04	66666	$19,936.82	888.00
		8/12/04	66666	$19,936.82	700.00
		Subtotal		**$99,684.10**	

Dan Jardine had one Invoice, #66666, for $19,936.82. He made five payments on this Invoice. Each payment caused the Invoice to repeat in the Detail section. The Subtotal makes it look like Jardine owed $99,684.10. Therefore you can't get an accurate total by summing the Detail lines. You must use a Running Total instead.

- In the Design Window **Insert Group** for Invoices.INUM.

- Suppress everything except the Page Header and Group Footer #1.

- Move ACCT_NO and CUST_NAME from the details into the Group Footer #1.

- Create a new Running Total as shown below:
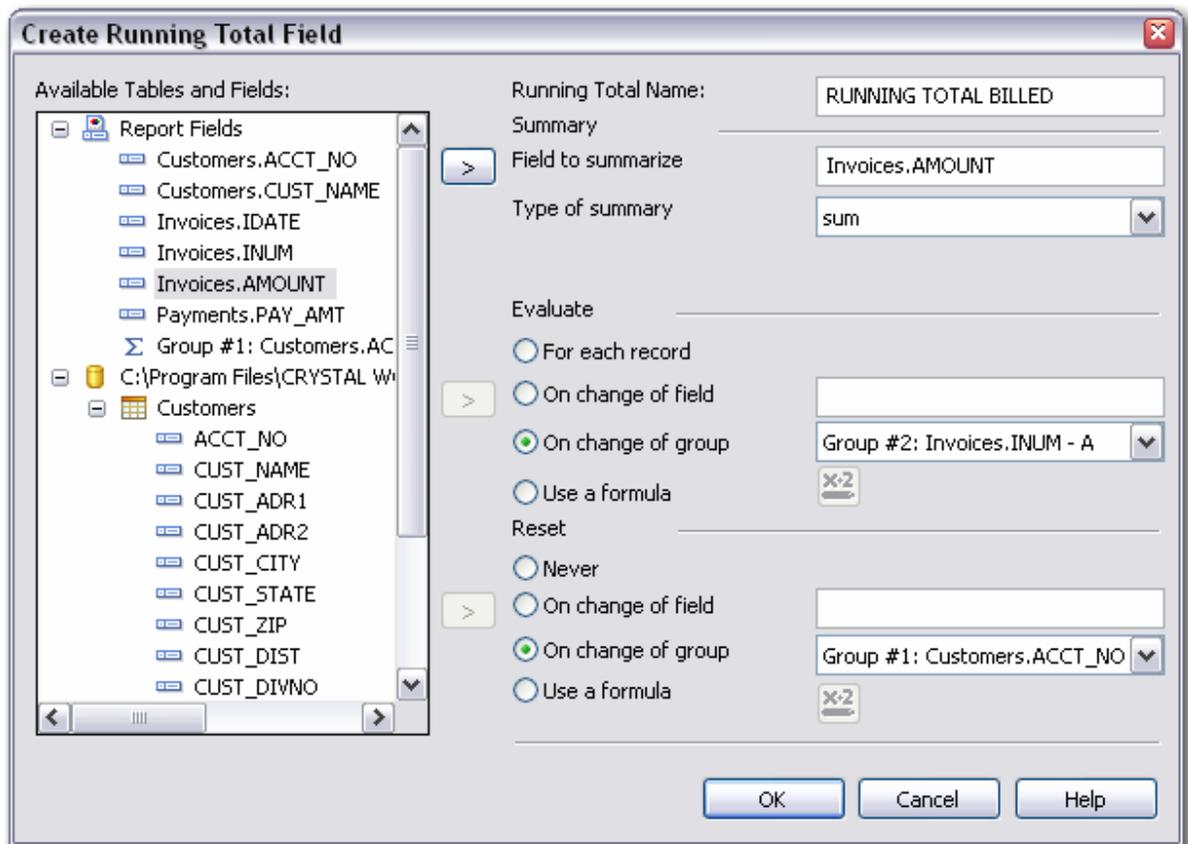
- Click **OK.**

- Delete the Sum of Invoices.AMOUNT from the Group Footer #1.

- Place the #RUNNING TOTAL BILLED into the Group Footer #1 under AMOUNT.

- Format #RUNNING TOTAL BILLED with $, comma, and decimal places.

- Insert a Summary for PAY_AMT in the Group Footer #1. Format appropriately.

- Create a Formula to calculate the AMOUNT DUE by subtracting the Sum of PAY_AMT from #RUNNING TOTAL BILLED, as shown below
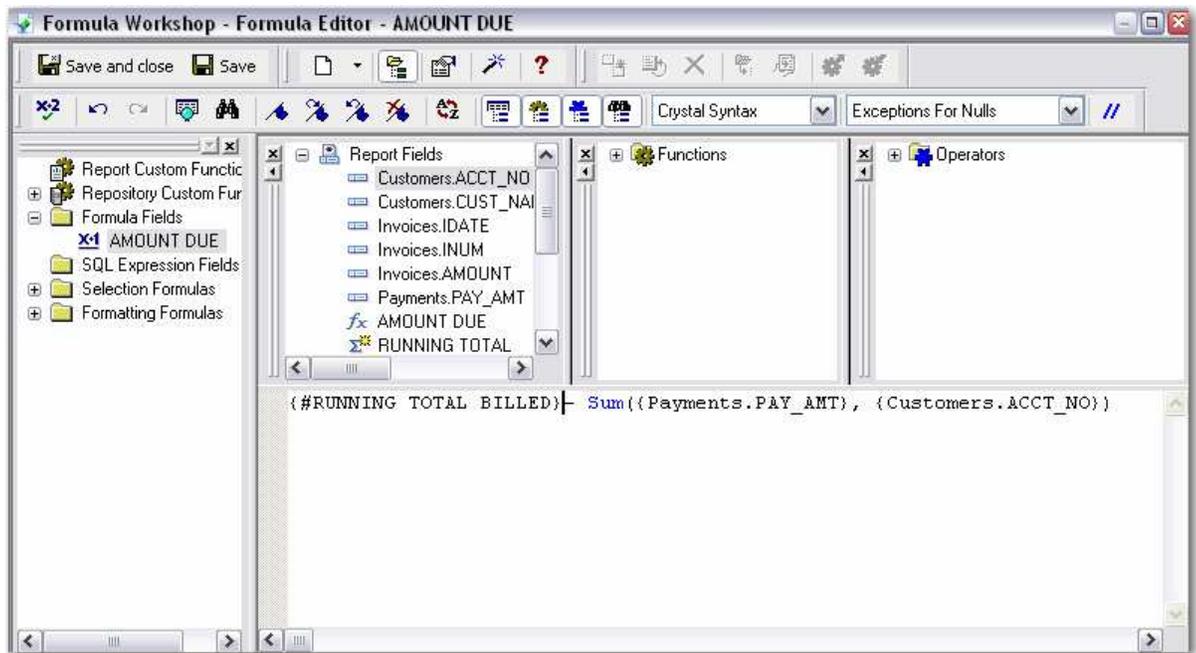
- **Save and Close**.

- Delete headings for INVOICE DATE and INVOICE NUMBER and slide AMOUNT and PAYMENT AMOUNT left to make room for @AMOUNT DUE.

- Put the @AMOUNT DUE formula to the right of PAY_AMT, and format appropriately.

- Add a Text Object heading for AMOUNT DUE.

- Clean up other field headings.

- Change the Report Title to "Customer Amount Due"

- Save the report again as **Running Total2.rpt**.

Scenario for Workshop 3C

Willie Loman will be getting back to you to develop a Statement form, but you've got some time now to finish cleaning up your office. Then the phone rings. It's Mr. Bossy.

Remember that report you did for me awhile back, the one with salaries for men in one column and women in another. I want to see how many Men and Women in each Job Level. You can leave out the Job Code and Description.

I. M. Bossy, CEO

Workshop 3C – Conditional Running Totals

- Retrieve **Formula Columns.rpt** from C:\CRYSTAL WORK 2008\student files level 2\answers\.

- Save as **Conditional Running Totals.rpt.**

- Create running totals for men in each Job Level and women in each Job Level.

#RUNNING MALES
Field to Summarize: GENDER
Type of Summary: Count
Evaluate: on formula GENDER = 'M'
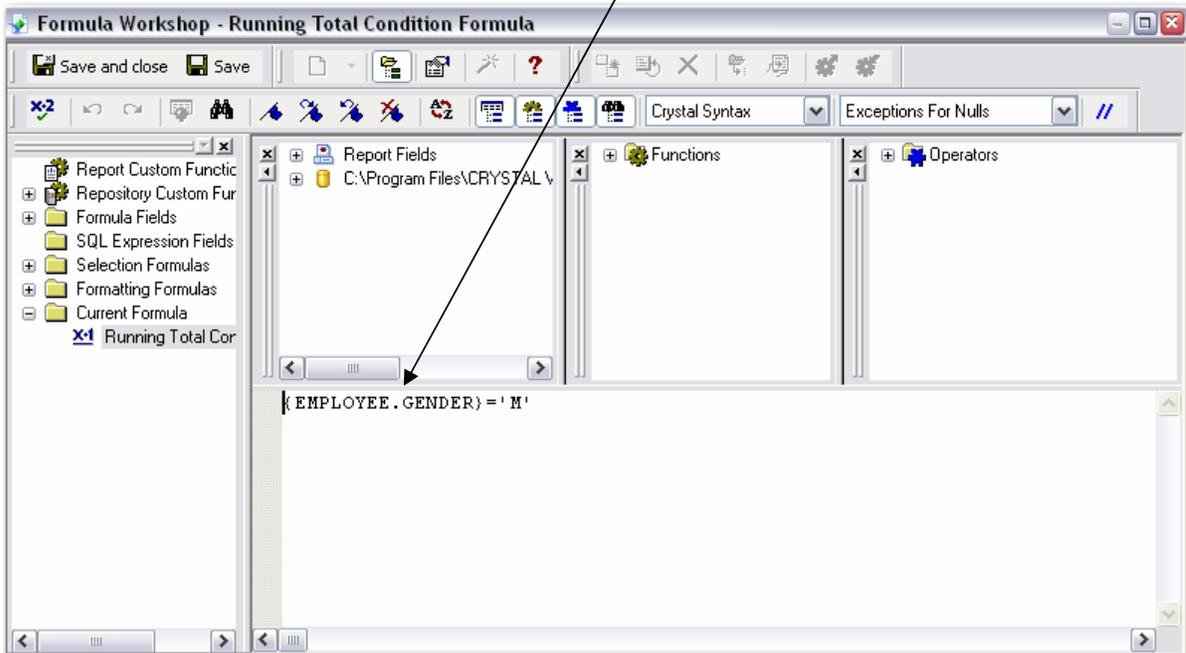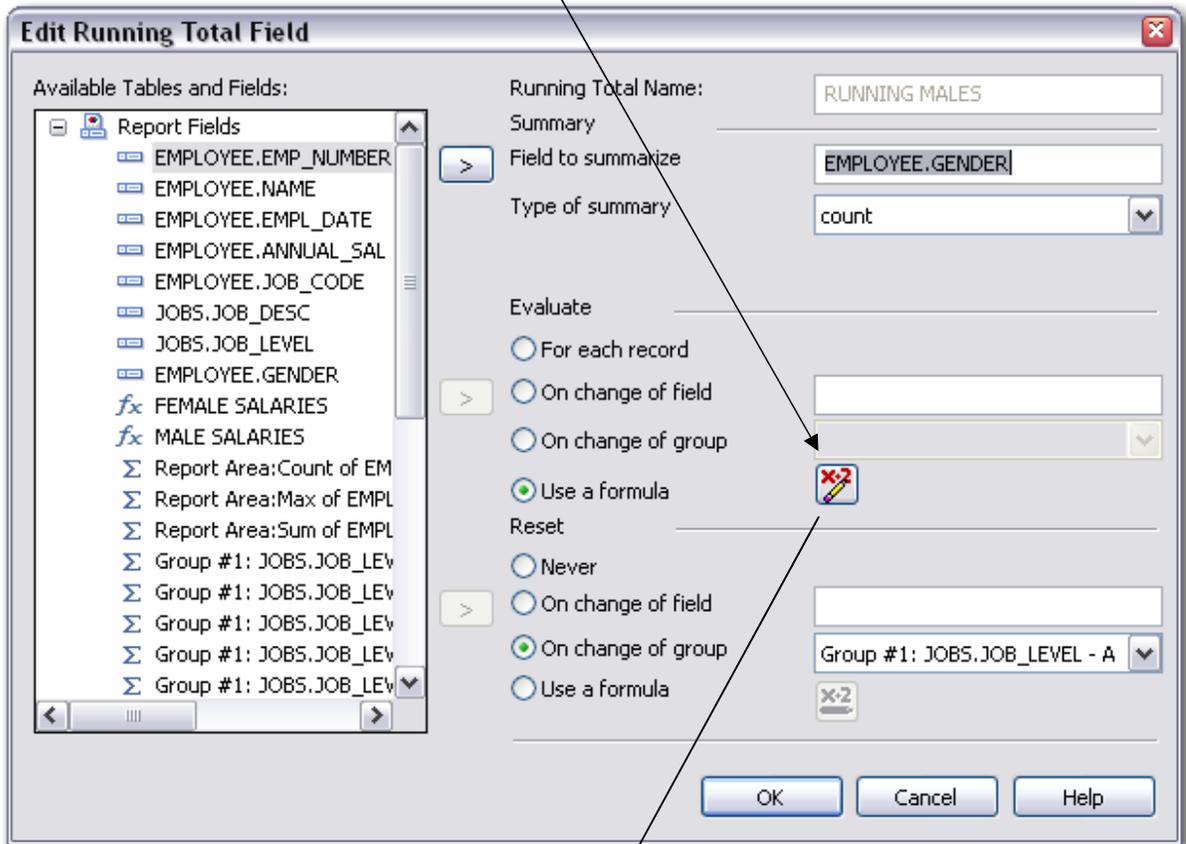**Reset:** on Change of Group GROUP #1

#RUNNING FEMALES
Field to Summarize: GENDER
Type of Summary: Count
Evaluate: on formula GENDER = 'F'
Reset: on Change of Group GROUP #1

- These require a formula in the Evaluate section.

Tip from Databaseman:

When you select the **Use a Formula** radio button and then click on the Conditional icon, you MUST enter a Boolean formula that evaluates as True.

(Expression Example: **EMPLOYEE.GENDER = "F"**, which will increment the running count field as long as the expression evaluates as True.)

- Stretch the Text Object in **Group Footer #1** to add another line of text.

- Type the following text at the bottom of the Text Object. Leave 3 spaces between words as shown to insert Group #1 Name and Running Totals.

  In Job Level   there are   male(s) and   female(s).

  ```
  Employees in Job Level {Group #1 Name}  = {Count of
  EMPLOYEE.NAME}
  Total Salaries for Job Level {Group #1 Name} = {Sum of
  EMPLOYEE.ANNUAL_SAL}
  Average Salaries for Job Level {Group #1 Name} = {Avg of
  EMPLOYEE.ANNUAL_SAL}
  In Job Level  {Group #1 Name} there are {#RUNNING MALES} Male(s) and
  {#RUNNING FEMALES} Female(s)
  ```

- Save report again as **Conditional Running Totals.rpt.**

Summary

In this chapter you have learned how to:

1.   Recognize Multi-Pass Processing options.

2.   Create Running Total fields.

3.   Use a Running Total to summarize a group.

4.   Create conditional Running Totals.

This page is for your notes.