Chapter 12
Creating Queries

Introduction

This chapter explains how to use Database $\Rightarrow$ Query to select the composite records that will be included in a report. With this command, you can define a set of selection rules called a *query*, which is saved with your report. Each time you run the report, R&R will include only those records that meet the selection criteria.

The explanation of Database $\Rightarrow$ Query is presented in the following sections:

❑ Query Structure
❑ Developing and Modifying a Query
❑ Query Techniques

Query Structure

Each query consists of one or more *selection rules* that instruct R&R to retrieve data selectively based on criteria that you establish. To build a rule, you select or enter elements using the Selection Rule dialog box explained in the next section. Each selection rule consists of three elements:

❑ A field from the composite record structure;
❑ A comparison operator such as "equal to" (see Figure 12.1);
❑ A comparison value, which can be a field, value, list of values, or range to which the value of the first field is compared.

Operator	Field Is
equal to	Equal to entered value or selected field's value
not equal to	Not equal to entered value or selected field's value
greater than	Greater than entered value or selected field's value
greater than or equal to	Greater than or equal to entered value or selected field's value
less than	Less than entered value or selected field's value
less than or equal to	Less than or equal to entered value or selected field's value
in the range	Between two entered values or equal to either
not in the range	Not between two values and equal to neither
in the list	Equal to one of the listed values (up to 10 values)
not in the list	Not equal to any listed values (up to 10 values)

Figure 12.1 Comparison Operators

For example, the following query consists of two selection rules telling R&R to select the records for all cities in California with a population greater than 5000.

> Include all records where
> (STATE is equal to "CA")
> **and** (POPULTN is greater than "5000")

Because the selection rules are joined by "and," R&R will retrieve records that satisfy the requirements of *both* rules. If these rules were joined by "or" instead, R&R would retrieve all records that satisfy *either* rule; that is, records in which the value of STATE is "CA" *or* the value of POPULTN is 5000 or higher.

Note that the list of comparison operators depends on which field you select from the Field list box. For example, if you select a logical field, only "equal to" and "not equal to" are displayed in the Comparison list.

Comparison Values

Depending on the field and operator you have previously selected, the comparison value can be:

❑ A field of the same data type as the first field you selected.

❑ A constant value such as a number or character string. Enclose character strings in quotation marks (double or single) or square brackets; enclose date constants in curly braces — for example, {12/01/1995}.

❑ If you have selected "equal to," "not equal to," "in the list," or "not in the list," a character string that defines a pattern using * and/or ? as wildcard characters (see the section in this chapter on query techniques).

❑ A list of constant values, any of which can be a character string including wildcards (see query techniques). Separate items in the list with commas.

❑ A pair of constant values that define a range.

Note that the comparison value can have a maximum of 530 characters. If you have selected an equality comparison ("equal to," "not equal to," "in the list," "not in the list"), you must enter the exact value you want to match. For example, AL matches AL, not Alabama and Alaska. For approximate matching, use wildcards as described in the section on query techniques later in this chapter.

Entering Values in a List

If you have selected "in the list" or "not in the list" as the comparison operator, you can enter multiple comparison values. Separate the items in the list with commas.

Defining a Range of Values

If you have selected "in the range" or "not in the range" as the operator to define a range of comparison values, separate the values with a comma. Neither value can be blank.

Connectors

Selection rules can be joined with the connectors "and" and "or." Joining two or more selection rules with "and" means that records must meet the criteria established by *all* selection rules in order to be included in the report. Joining selection rules with "or" means that records must meet the criteria for at least one of the selection rules in order to be included in the report.

When R&R processes a query, connectors are evaluated left to right. You can change this order of evaluation by using parentheses as described in the following section.

Parentheses

You can use parentheses to indicate the order for evaluating connectors in a query. The connectors within parentheses are evaluated first, from the innermost level of parentheses outward, and from left to right within any set of parentheses. Without parentheses, connectors are evaluated left to right.

For example, in the following query, "or" is evaluated before "and":

Include all records where
(DEPARTMENT is in the list "sales", "engineering", "software")
and ((HIREDATE is greater than {1/1/90})
or (SALARY is greater than "40000"))

The result is that the report lists only those employees in the Sales, Engineering, and Software departments who were *either* hired after January 1, 1990 *or* who earn a salary over $40,000.

If the parentheses were eliminated from this query, the resulting report would be different, since the "and" operator would be evaluated first. The report would list employees in the selected departments who were hired after January 1, 1990. But it would also list *all* employees who earn over $40,000, regardless of date of hire or department.

To place parentheses in a selection rule, place the edit cursor in the left or right parentheses edit box and type one or more parentheses.

Developing and Modifying a Query

If no query exists for a report, the Insert Selection Rule dialog box is displayed when you select Database ⇒ Query (see Figure 12.2). Using this

dialog, you build a query by telling R&R which records or range of records to retrieve for a report.
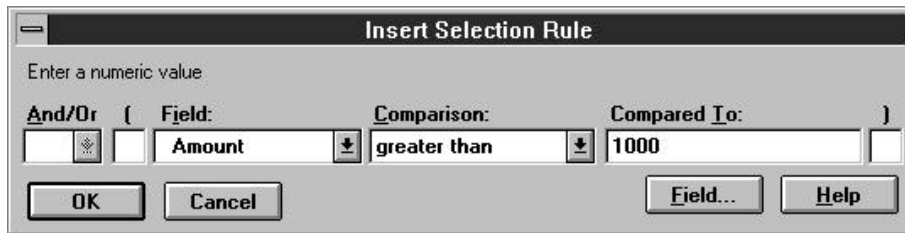
Figure 12.2   Insert Selection Rule Dialog

After you've developed a query for a report, selecting Database ⇒ Query displays the Query dialog box. The selection rules that make up the query are shown in the order in which they were defined. Using the buttons at the bottom of the Query dialog, you can modify the query by editing, inserting, appending, and/or deleting individual selection rules. Figure 12.3 summarizes the purpose of each of these buttons.

| *Use*	*To*
Insert	Insert a rule above the currently highlighted one
Edit	Modify the currently highlighted rule
Append	Add a selection rule below existing rules
Delete	Delete the currently highlighted rule

Figure 12.3   Explanation of Query Dialog Buttons

Defining Selection Rules

To define one or more selection rules of a query, do the following:

1. Select Database ⇒ Query to display the Insert Selection Rule dialog. Since you are defining the first selection rule, the And/Or box is disabled.

2. If you are developing a multiple-rule query, you can type one or more left parentheses in the edit box to the left of the Field list box as necessary. You can use left and right parentheses to change the order in which R&R evaluates connectors in a multiple-rule query.

3. Open the Field list box. This box lists all fields from the composite record structure that can be used in a query. Select a field from this list.

4. Open the Comparison list box. The comparison operators listed here depend on the data type of the field you initially selected. Choose the appropriate operator from the list.

5. Enter or select a comparison value in the Compared To box. You can enter or select a field name, a constant, or a list or range of fields or values. To display a list of fields to choose from, select the Field button.

6. If necessary, enter one or more right parentheses in the box to the right of the Compared To box.

7. Select OK to close the Selection Rule dialog box and display the Query dialog. To confirm that you have correctly defined the rule, select Verify.

8. Insert and append other selection rules as necessary. Note that although each rule can be modified independently, changes to one rule may require other changes as well (such as selection of a different connector or insertion or removal of parentheses).

9. When you have defined all selection rules, select OK to save the query and return to the report layout.
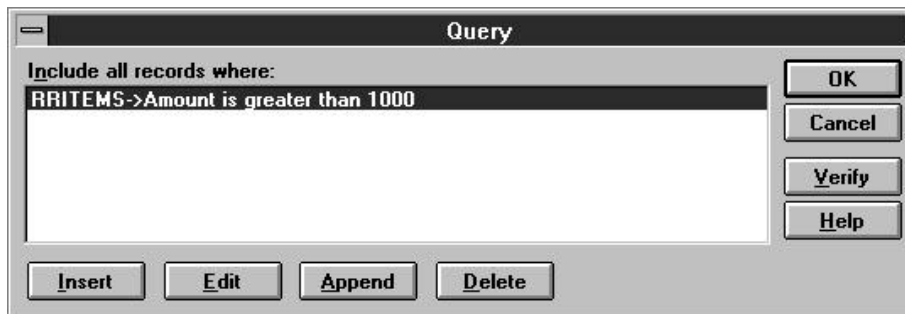
Figure 12.4   Query Dialog Box with One Selection Rule Defined

Editing a Query

You edit a query by modifying existing selection rules and/or adding new selection rules using Insert or Append.

Editing an Existing Selection Rule

To modify a selection rule, do the following:

1. In the Query dialog box, either double-click on the rule you want to modify or highlight the rule and select Edit.
2. Modify the connector, parentheses, Field choice, Comparison operator, and/or Compared To value as necessary.
3. Select OK to complete the definition and return to the Query dialog. Select Verify to confirm that you correctly defined the rule.

Inserting a Selection Rule

Select Insert in the Query dialog box to insert a new selection rule before the currently highlighted rule. Then define the rule as necessary. When you insert a rule as the first selection rule in a multiple-rule query, the rule that was originally first on the list is placed second and is given a default connector of "and." If necessary, you can edit the second rule and select "or" as the connector.

Appending a Selection Rule

To add a selection rule at the end of a query, select Append. Select a connector from the And/Or list box. Define the selection rule by specifying a field, comparison operator, and comparison value.

Deleting a Selection Rule

To delete a selection rule, highlight it in the Query dialog box and select Delete. The selection rules below the rule you deleted will then move up. You may have to edit the connector for the rule that was below the one you deleted.

Query Techniques

In addition to selecting records that match specified database field values, R&R queries can select records that match character or date patterns, total field values, and calculated field values. The following sections explain these query techniques.

Pattern-Matching with Wildcard Characters

A pattern-matching query selects all records where the value in the selected character or date field matches (or doesn't match) a pattern you enter using special characters called wildcard characters. For example, to select all

records where the value in the CITY field starts with the letter H, you can create the query:

"Include all records where (CITY is equal to "H*")"

The asterisk (*) in this query is a wildcard character that stands for any group of characters, like the asterisk in the DOS command DIR H*.DBF.

Figure 12.5 lists the wildcard characters used to define patterns in R&R queries.

Character	*Meaning*
?	In a character or memo query, matches any single character in the same position in the field.
*	In a character or memo query, matches any group of characters (including no characters). In a date query, matches any value in that part of the date (for example, {1/*/95}).
@	In a date query, matches any value that corresponds to that part of the system date (for example, {@/*/95}).

Figure 12.5 Wildcard Characters

Note that wildcards cannot be used with numeric or logical fields.

Wildcards in Character Field Queries

If the comparison you have selected is an equality comparison ("equal to", "not equal to", "in the list", or "not in the list"), you can use the wildcard characters * and ? to select records with character values that match the pattern you enter. Several examples are given in Figure 12.6.

To Include all Records	Enter
Starting with xyz	xyz*
Ending with xyz	*xyz
Starting with, ending with, or containing xyz	*xyz*
Consisting of the letter x followed by any character followed by the letter z	x?z
Containing the letter x followed by any character followed by the letter z	*x?z*

Figure 12.6 Wildcards for Character Queries

Wildcards in Date Queries

You can use the * and/or the @ wildcard character to enter special date selection rules. Use * in place of any part of the date, as in 12/* /95 meaning "any day in December 1995." Use @ to signify a part of the current system date at time of printing, as in @ /15/95 meaning "the 15th of this month in 1995." It is useful to think of @ as *this* month, day, or year and * as *any* month, day, or year.

Note that the order of month, day, and year in the date value you enter must conform to the month, day, and year order specified in the Windows International Short Date format (see your Windows documentation for more information about International Date settings). For example, if MDY is the Short Date format specified in Windows, you would enter December 5, 1995 as {12/05/95}.

Examples:

1. To select any date in 1995, enter {* /* /95}

2. To select any date in June of any year, enter {06/* /* }

3. To select the first day of any month, enter {* /01/* }

4. To print a report for all those in a group whose birthdays occur this month, you would use the following selection rule:

    (BIRTHDATE is equal to {@ /* /* })

    This rule would include in the report only those records in which the BIRTHDATE field had a value of this month, any day, and any year.

5. To print a report of all new customers that you have signed up for the month, you would use the following selection rule:

(SIGNUP is equal to { @ /* /@ })

This rule would include in the report only those records in which the SIGNUP field had a value of this month, any day, this year.

6. To print a report of all customers who signed up in a selected year (such as 1995), you would use a selection rule like this:

(SIGNUP is equal to {* /* /1995})

This rule would include in the report only those records in which the SIGNUP field had a value of any month, any day, in 1995.

Wildcards in Memo Field Queries

R&R also allows you to use wildcard characters with query equality comparisons ("equal," "not equal," "in the list," and "not in the list") to search for and select records based on text in a memo field. However, the * character must be the first and/or last character of the selection value.

For example, to include records that contain text starting with the word "Software" in the PROD_NOTES memo field, enter the selection rule:

(PROD_NOTES is equal to "Software*")

Note that memo field queries are based only on the text of the memo field itself, not on any values contained in data fields embedded in the memo.

Querying for Wildcard Characters

You can use the backslash (\) escape character with query equality comparisons ("equal", "not equal", "in the list", and "not in the list") to select character strings that contain either the asterisk (*) or question mark (?) wildcard characters. Entered before the wildcard character in the data-entry field, the backslash tells R&R to treat the wildcard character literally (that is, not as a pattern indicator).

For example, to match records that have a value in the NAME field consisting of a question mark only, create the following query:

Include all records where
(NAME is equal to "\?")

Note that since the backslash is also used as a special character in query rules, you must select character strings containing backslashes in the same way. For example, * will match any string starting with a backslash.

Querying on Total Values

R&R allows you to select records based on total field values. However, the types of total queries that are allowed depend on whether your report includes any totals that have been designated as pre-processed with the Processing setting on the New/Edit Total dialog (accessed by selecting Options on the dialog). See Chapter 9, "Creating and Using Totals," for information about this setting.

❑ Reports without pre-processed totals can include total-related queries only on grand running sums and counts.

❑ Reports with one or more pre-processed totals can include total-related queries only on pre-processed totals that reset on the highest level (most inclusive) group field for which a pre-processed total has been defined.

Running v. Pre-Processed Totals

In order to create effective total field queries, you need to understand the difference between running and pre-processed totals.

Any total field you create is by default a running total; R&R calculates its value cumulatively as it reads each record that contributes to the total. You can create queries using running counts and sums with a "Grand" reset level, but these queries may be difficult to formulate since only records that meet the query condition contribute to the total. In addition, since R&R tests the current record against the query before computing the running total for that record, the query will be applied based on the total value as of the previous record.

Many total fields you create can be modified to make them pre-processed totals, fields whose final values are calculated before the records in the report are printed. Queries on pre-processed total fields are much easier to formulate, since all records that contribute to the total will be read before the query is applied. The only restriction on such queries is that they can use only those pre-processed totals that reset at the highest (most inclusive) group level at which a pre-processed total is defined. For example, you cannot query on a pre-processed group total if your report contains a pre-processed grand total (your pre-processed grand total would be invalidated by excluding records based on the pre-processed group total).

Queries Involving Pre-Processed Totals

In reports that contain pre-processed totals, you can query on any pre-processed total that resets at the highest group level at which a pre-processed total has been defined. You cannot query on any running totals or on any other pre-processed totals in the report.

For example, in an invoice report in which each invoice total is a pre-processed, order-number group total, you could create a query that selects only those invoices with totals of $500 or more. In an order list grouped by customer number and containing a pre-processed, customer-number group total, you could create a query that selects only those customers with 10 or more orders. Because of the way in which R&R accumulates pre-processed totals, none of the running totals in these reports would be available for querying. In addition, the queries on the pre-processed order and customer totals would be invalid if either report contained higher level pre-processed totals. An error message will notify you of invalid queries when you try to display or print such a report.

Queries Involving Running Totals

In reports that contain no pre-processed totals, you can query on grand running sums and counts. However, the total for the current composite record will not have been calculated before the query is applied. Therefore, R&R's decision as to whether to include the record will be based on the total value as of the previous composite record.

For example, when you query on a running count, the count for the current composite record will not have been calculated before the query is applied. In order to use the query to select the first *n* records, you must specify that the count field value be less than *n* rather than less than or equal to *n*.

To select the first three records using the COUNTER running total field, which counts the NAME field, specify the following query rule:

> (COUNTER is less than 3)

Without the query, the report would include the following contributors, sorted by contribution in descending order:

NAME	CONTRIBUTION
Warren	150
Clark	125
Mortimer	120
Smith	100
Jones	50

With the query, the records selected for the report would be:

NAME	CONTRIBUTION	COUNTER
Warren	150	1
Clark	125	2
Mortimer	120	3 (value of COUNTER field for this record not calculated until after query is applied)

Querying on Calculated Fields

R&R allows you to select records based on calculated field values *except* those that:

❑ Use the PAGENO( ), RECNO( ), or QUERY( ) function

❑ Use totals that cannot be queried on (see the section entitled **Querying on Total Values** earlier in this chapter)

Comparing a Field to an Expression

You can compare a field to an expression by using a calculated field in a query. For example, to define a query that selects all records where the value in the Amount field equals the value of the expression Discount * Rate, create a calculated field named DiscRate whose expression is Discount * Rate.

Then select DiscRate( ) as the value in the query:

> Include all records where
> (Amount is equal to DiscRate( ))