Advanced Query Builder

The purpose of the Advanced Query Builder manual is to explore the complexities of report building. Combined with the basic reporting manual, it will give you the full scope of what is possible in the Query Builder short of knowing and implementing SQL language.

eMaint Advanced Reporting Course Topics Include:

Understanding the Query Process

Reporting is selecting and outputting a specific set of data to suit your interest. When you select data it is referred to as a query. A query is the question that is asked of all the available data. The query narrows down and specifies exactly what data you are targeting. After the data is selected by the choices you make in a query, it can be displayed. In the set up of the report, you control how you want the data to be displayed.

The Query Builder is designed to allow access to a virtual table of data. This table represents the category of data you are seeking. The table is a collection of fields (can be thought of as columns) and records (can be thought of as rows). Each record holds a complete set of related data. The record is constructed of many fields which each hold one piece of data making up a complete set.

An example of this concept is work orders. Work orders are a category of data that exists. When you select the Work Order Table, you access a virtual table of data related to work orders. Each record (row) in this table represents a work order and all the related data associated with a work order. Each field (column) on the record makes up the individual items of that set. Some of the fields that make up a work order record are work order number, type, scheduled date, completed date, and work description.

When you build a query you select which fields you wish to see from the selected table(s) for all the records that will be viewed. When you run the query, only those fields will be placed into a smaller version of the table of data; that smaller table will be displayed on your screen. The order in which you view the selected fields can be modified after the fields are selected. You order the records by selecting which field(s) in the table should organize the data.

Usually, when building a query, you are only interested in seeing a small portion of the records in a table. Filtering is the concept of allowing or disallowing certain records to be viewed. To filter, you specify what data must be contained in a field to allow the record into the query. The records that meet the filter conditions will be brought into the query (added to the smaller table). Next, those records will be arranged into the order you specified. The resulting table will display only the fields you selected. This table will appear on your screen in different ways depending on the file output you select.

Query Header

The Query Header can be accessed for modification from the properties icon on the main Query Builder list screen and also from the detail of the query itself.   The information entered here controls the background of the report: the basic way in which the information will appear on the report.


- **Description** – The name of the report.

- **Owner** – This will default to the user logged in creating the report.

- **Type** – You can categorize your reports any way you wish. The most typical categorization would be by the section of the system you are querying. For example: work order reports would be type WORK, but reporting on work order charges would be CHARGES.

- **Public** – If you would like all users to have access to this report, make this field 'True.'

- **Read Only** – To prohibit anyone but the owner from editing this report, set this field to 'True.' A 'read only' report will allow users to run the report but prohibit any changes to the report properties, tables, or fields.

- **Comments** – Enter any description here which will aid users in identifying what this report queries. If your description is clear enough, you may not need to enter anything here.

- **Display grid lines?** – To separate your report information with grid lines for easier reading, set this field to 'True.'

- **Display runtime criterias?** – Setting this option to 'True' will show you all the report filters in the header of the report after it is run.

- **Alternate row color?** – Set this option to 'True' if you would like to have alternate colors on the rows. Then use the Alternate color fields to select the colors.

- **Alternate color** – You may type in a basic color name in these fields. You may also use the color palette to choose a color or type in an HTML color code.

- **Display record count?** – If you would like to see a total indicating the number of records the report returned, make this 'True.'

- **Display links?** – Setting this to 'True' will allow you to link directly to an item from its key field.

- **Specify sort at runtime?** – If you need to change the sorting of your report frequently, you can set this option to 'True.' You will then choose the sorting criteria each time you run the report.

- **Autogenerate?** – If you would like this report to run at a particular interval and be emailed to an email address or addresses, set this field to 'True.' You will then need to indicate the email address and time interval for the report in the following fields: **Email Address** & **Hour Interval**.

- **Output Type** - The type of file output selected for the report shows here. The file type is chosen on the detail page of the report.

- **Last Run Date** - Shows the last date this report was auto-generated.

- **Next Run Date** – Shows the next date the report will be auto-generated based on the **Hour Interval** selected.

You only need enter the information which you feel will give your report the look and features you want. The most important field is the Description. Without it, your users will have no idea what the report is. The other fields are optional and allow either ease of reading or use. This information can be modified at any time either from the main query page or from within the detail of the report itself.

Joining - Adding Additional Tables

In order to run a report you must have at least one table from which the information for the report is being drawn. But you can also add additional tables if more information is needed to complete your report. This process is called Joining. To join a table to the main table, you must click the plus sign in the 'Joins' column of the report detail.
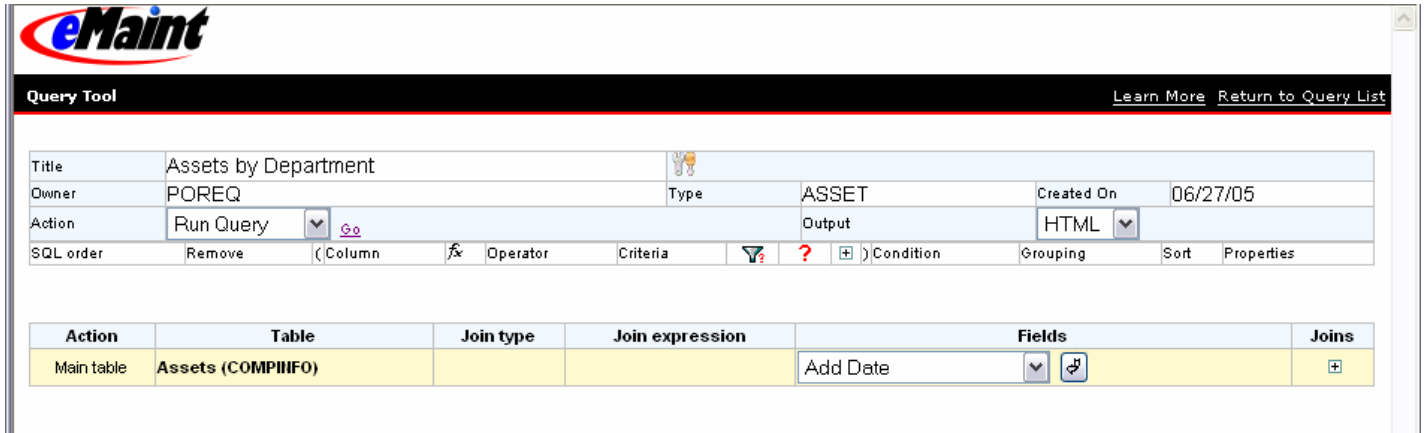
The tables available to join will be based on the main table that was chosen. Each table is related to others in the system based on certain fields which they share. This relationship is predefined and only those tables which are related to the main table will show as possible "join" tables when you click the plus sign.
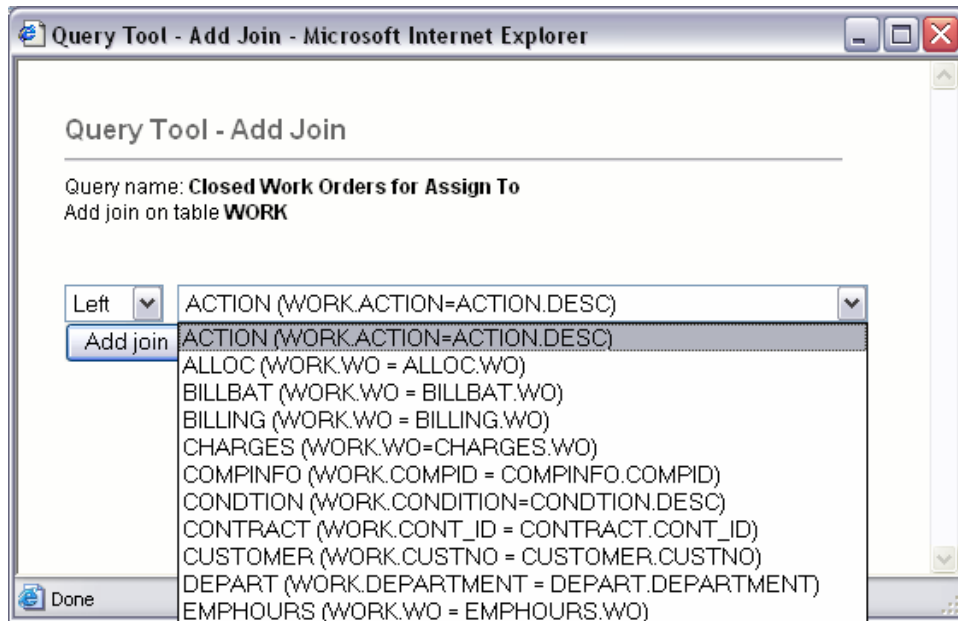
The join screen will display the related tables along with the field name which establishes the relationship. You will also be able to select a different join type when you select the table. (Join Types are explained below.)

Any join will show beneath the main table. Unlike the main table, joins can be added at any time and can also be removed from the report if you either chose the wrong table or no longer need its information.

Join Types

There are four types of joins available when adding tables to a report.

Left Outer Join = All of the records in the first (left-hand) table are included even if there are no matches in the second (right-hand) table. This is the default join type.

Right Outer Join = All of the records in the second (right-hand) table are included even if there are no matches in the first (left-hand) table.

Full Outer Join = All of the records in both tables are included.

Inner Join = All of the records from both tables which have matching values in the fields on which the tables were joined are included.

It is always better to choose the correct main table and add additional tables than try to compensate for choosing the wrong table by adding tables and modifying the join.

Sorting Data

The sort fields are chosen the same way that the grouping fields are chosen. Go to the column labeled Sort and click the properties icon on any field. Once you have chosen and saved the sort order, you will see not only white boxes in the sort column but also arrows next to those boxes.

The arrows indicate whether the field is being sorted in ascending order (up arrow) or descending order (down arrow). Initially all sorts are in ascending order. Click the arrow icon to reverse the order.

*NOTE*: Sorting is required for using the Group Band feature.

Grouping Data

Grouping data means to have one record of data represent others that belong in its group. If more than one record falls into a similar group of records, only one of those records will be used in the result table. That single record will represent the group of records it belongs to.

An example of the use of grouping would be creating a report about the cost of purchase orders in your system where you do not want to see each individual item on each PO. You would group the report on PO# so that you would only see one line for each PO.

To group items, click the properties icon on any field in the Grouping column. The box displayed is similar to the one used for SQL order. Here, however, the fields are all listed in the drop-down 'Available fields for SQL Select List.' Select the fields you wish to group by.

NOTE: You can group fields within other groupings. The grouping will be based on the order in which the fields are listed. For example a report that groups all work orders by Building and the WO Type would show a listing of each Building with one record for each WO Type entered for that Building.
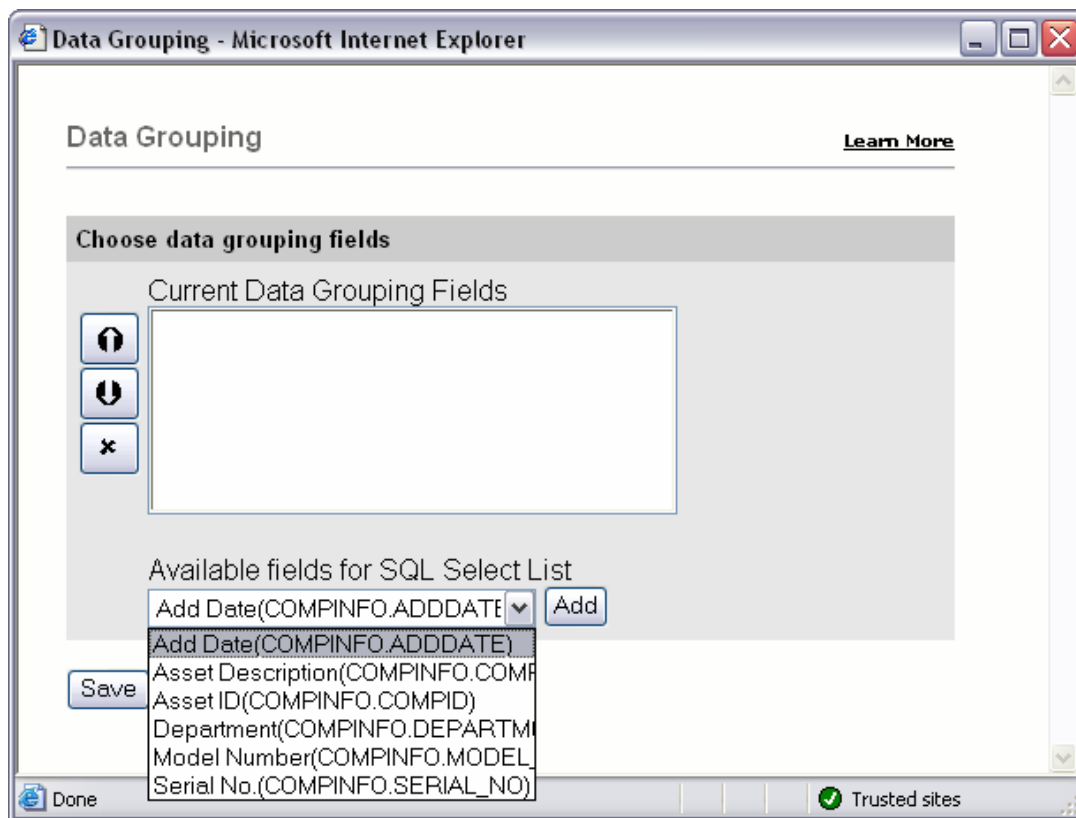
Once you choose the grouping criteria, save and close this window. Each field chosen for grouping will have a box in the Group column with a number indicating its place in the grouping order. To modify or remove the grouping, simply return to the Group properties and either add or remove the fields from the grouping box.

Properties

The Properties column allows you to fine-tune the behavior and look of the specific fields. To modify the properties for a field, you must click on the icon for that specific field. When you do, you will see a screen similar to the one below. The header of the form tells you the name of the current report and also the name of the field whose properties you are modifying.

The properties available to modify vary depending on the type of field (text, numeric, memo, Logical, or date) chosen to modify. To change the value for one of the properties, click the button to the right of the property.

Field Properties

Query name: **Assets by Department**

Column: **Asset Description (COMPINFO.COMP_DESC)**

Name	Value	
Display Field?	☑	...
Left Parenthesis	☐	...
Right Parenthesis	☐	...
Display Font	Arial	...
Font Size	9	...
Font Color	Black ■	...
Column Width	225	...
Group Band	False	...
Display Function		...

Close window.

- Display field? – Does the field show on the report? A check mark in this box indicates that this field will show on the report form. You can remove this check from the properties screen or by removing the field from the SQL order.

- Left and Right Parenthesis – Used to group filters. Both of these options will never be checked on the same properties form. The left parenthesis is for the beginning of a join expression and the right is for the end. (See page 14 for a complete explanation.)

- Display Font – Choose the font type for this field. You will need to know the font family before entering this option. Font families can be accessed in any Microsoft text editing program.

- Font Size – Choose the size of font for this field.

- Font Color – Choose the color for this field. Both color names and HTML color code values are accepted in this option.

- Column Width – Change the width of the column to better see the information contained in it.

- Group Band – Works in conjunction with 'Display record totals' on the report header to display a totals band by section instead of simply seeing a total at the end of the report. The band will only function for the first field in the sort order.

- Display Function – Defines what function will be performed on this field when the report is generated. This function automatically groups the report information around the field chosen. If you place the display function 'AVG()' on the field Downtime, the report will show you one representative record with the average amount of downtime listed in the Downtime field.

Filtering

The column with the funnel at the top is for applying filters.

Each field has a funnel icon in this field. If the icon is very light it means that there is no filter in place on that field. If the icon is dark, then a filter is in place. You can see the criteria for that filter by looking under the Operator and Criteria columns. If you set the filter to ask for a value at the time the report is run, there will be a red question mark in the column with a **?** in its heading.

To apply a filter, click the funnel icon for that field. The following screen – Update Criteria - will display:

Here you can see the name of the current report and the name of the field to which you are applying a filter. There are three pieces of information which need to be entered here: an operator, the criteria, and the time the filter should be run.

-- Operator

Operators are selected by clicking on the drop-down list next to Operator. A brief explanation of the available operators is provided below. When a NOT is contained in an operator, it reverses the way the selected operator is evaluated.

Equals:

The value entered must be an exact match to the value contained in the field.

Greater than:

Tests for a value in the data field alphanumerically higher than the comparison value. In a test for alphabetic entries, such as WO Type, a higher value is one that comes after the entered value; a value that is later in the alphabet. When the data field's value is alphanumerically higher than the comparison value, the record is selected.

Less than:

Tests for a value in the data field alphanumerically lower than the comparison value. In a test for alphabetic entries, such as WO Type, a lower value is one that comes before the entered value: a value that is earlier in the alphabet. When the data field's value is alphanumerically lower than the comparison value, the record is selected.

Less than or equal to:

Tests for a value in the data field alphanumerically equal to or lower than the comparison value.

Greater than or equal to:

Tests for a value in the data field alphanumerically equal to or higher than the comparison value.

Like:

Like differs from Equals by the way it evaluates the data field. Like tests for a value in the data field that starts with the comparison value. If the characters of the comparison value match the starting characters in the data field, the record is selected.

Value is contained in:

Tests for the existence of the comparison value anywhere within the data field. If the data field contains the comparison value, the record is selected.

Value is in a range:

Tests for a value in the data field alphanumerically between the two comparison values. For example if you wanted to see all of the work orders created in May of 2004, the range is 05/01/2004 through 05/31/2004.

Not:

Not included in any operator reverses the way the selected operator is evaluated. When the data field and the comparison value match, the record is not selected.

-- Criteria

There are two options for entering the criteria: entering a value or entering an expression. The first, entering a value, will have an *fx* next to it, and the expression field will have a pencil next to it. These two icons are for switching from one mode to the other. *If you are not familiar with SQL code, do not attempt to use the expression builder.*

When entering the criteria, you will either have a blank line in which to type the value or a lookup from which to select it. The choice will depend on how that field is configured in the system.

An example of the SQL expression option is shown below. For the WO Date the report is being asked to only look at dates which occur within the last 60 days. This is accomplished by setting the operator to greater than and combining it with an expression for the current date minus 60.

You can see other uses of the criteria expression on the Overdue PM's report in your system (the same report from which the example above was drawn).

-- Ask at runtime

If you would like to change the value of the filter for this field each time this report is run, click the 'Ask at runtime' box. There is no need to enter Criteria when using this option, only an Operator. You will enter the criteria when you run the report.

Saving the Filter

Once you have chosen the filter information, you must click 'Update' to save the filter. If you would like to change the information you entered, click 'Reset' instead. Reset will erase all the information you entered on the filter and allow you to start again.

fx

This column allows for some additional functions to be applied to the filter criteria. These functions include but are not limited to the following:

Upper   Forces all characters to upper case
Lower   Forces all characters to lower case
Proper   First letter is upper case and the rest is lower case
RTrim   Removes spaces from the right of the operand
LTrim   Removes spaces from the left of the operand
AllTrim   Trim all spaces from both sides of the operand
Empty   Checks to see if the field is empty
DTOS   Changes a date to a character field
Transform   Takes a value and turns it into a string

Some of these functions are only valuable to those conversant in SQL, but others can be quite helpful to an average user.

For instance, your employees are entering values for Building, and you have not placed a lookup on the field which would limit the values. If you are looking the Building MAIN, you may have that value entered as MAIN, Main, and main. You can set the *fx* option to Upper, and set the filter to Building = MAIN. This function/filter combination will force the system to consider all values matching MAIN in the field Building regardless of the case.

NOTE: For the *fx* to work, there must be a filter in place on the field. *fx* always works in conjunction with a filter, never in isolation. The one exception is the Empty function which will use the filter operator and ignore the criteria value.

Conditions

Conditions determine the way in which filters interact with each other and the report as a whole. There are two conditions: AND & OR. Conditions are set by using the magnifying glass in the condition column of the filter.


The condition AND means that both expressions must be true in order for the record to be placed in the report. For instance if you want to see all open work orders, you would have to join the filter for STATUS = OPEN to the report with the AND condition. If you want to see a report for all open work in a particular department, you would also use the AND condition to join both filters to the report. In order for records to make it onto the report, they must be both open and part of the department chosen.

The OR condition is mostly used within filter groups (see next page) to indicate how fields within the group should be treated. OR says that either expression can be true for a record to be added to the report. For instance, if you wanted to see all work orders for two departments out of the ten in your system, you would set up the group filter with the condition OR. This way if either department is on a record, that record will show on the report.

Filter Grouping

Filters can be programmed to act as one through grouping. Grouping is accomplished by using the left and right parenthesis in the field properties column and specifying the condition of the filter combination.

- Once the first filter is placed on the field, you can add a second filter by clicking on the **+** which is located to the right of the filter icon on the field. This will open a second line under the field which will have a filter icon but will not have a field name because it shares the same field name as the one above it.
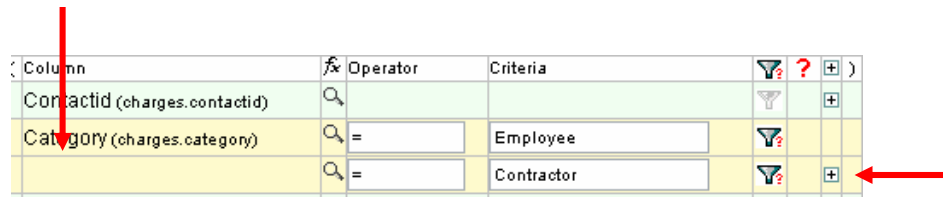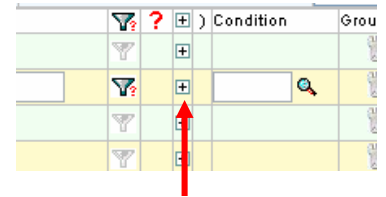
- Click the filter icon on this new line and set the next filter. Repeat this process until you have added all of the filter criteria for this field.

- Now that the filter criteria for the field have been added, you must group the filters so that they will act as one expression. Go to the properties icon of the first filter and select the left parenthesis option. Once that is saved, go to the properties icon of the last filter and select the right parenthesis.

The last step in establishing a group is to indicate what condition should be used between the fields in the filter group and between the filter group and the other fields on the report.

- If the filter group you have created consists of filters on a single field, you must choose the OR condition within the filter group as it is impossible for a field to be equal to more than one value at a time.

- Use the AND condition to connect the filter group to the report as a whole.

NOTE: The condition within the filter group falls within the parenthesis, while the condition which connects the filter group to the report occurs just outside of the right parenthesis which ends the filter group.

Calculated Fields

Calculated fields are fields you create based on a calculation of other fields in your system. In the picture below, you can see two calculated fields available in the Inventory table. REORDER is an addition of the ONHAND and the ONORDER while VALUE is a multiplication of the ONHAND and the COST. When selected on a parts report, these fields will allow you to see the result of the calculation produced.

- To create a calculated field, you must be within the detail of a report.
- Click the 'Calculated Fields' link available just above the Main Table.
- Click the 'here' link at the top of the Calculated Fields form.
- The screen below will open to allow you to fill in the field information. The picture above shows how an expression is entered.

Field Table – Table where the calculated field should reside.

Field Name – System name for the calculated field. Must be unique.

Field Description – User name for the field.

Field Expression – Exact entry of the mathematic expression to be done on the fields.

NOTE: Each field in the Calculated Fields form is vital. If you are unsure of how to create a field in eMaint X3 or how to enter a mathematic expression, contact eMaint before trying to use this feature.

Last updated 9/13/2006