D03 • General plot handling

D03.1 • Types of plots

The main Emeraude window can show 4 distinct types of plot:

Automatic plots

When new data is loaded or calculated, Emeraude automatically creates plots to display them. An automatic plot is created for each particular data type and mnemonic. On a given plot appear all the channels with the proper type and mnemonic – except those channels in the Data Store.

- Channels of the General Well Data are plotted with the same (editable) aspect; default is a white plain line.
- All channels in the Up/Down/Stationary passes of the active survey are plotted with a unique (editable) aspect initialized based on the index of the pass in its type (red=1, green=2, etc.). The default can be changed with the Display Settings option of the Settings panel.
- All reference channels in the active interpretation are plotted with the same (editable) aspect; default is a plain white line.
- The automatic reference channel plots and the match tracks are plotted with indexed colors if specified by the user in the settings panel.

Automatic scales are calculated to show all loaded or generated data points.
Note: All defaults for assigning aspects to the different elements can be customized using the Display Settings option of the Settings panel.
Note: Some channels of the General Well Data, and some interpretation results are not automatically plotted.

User views

User views can be created and attached to the current survey to display any combination of channels in the browser data tree. A user view can display together channels with different types/mnemonics. Each channel has its own aspect and horizontal scale. The aspect is either indexed or is kept as the parent channel. This is user selected in the Display Settings option.
Because they simultaneously display different channels/properties, user views have some specific options for horizontal scale. In the horizontal scale dialog, and the scale toolbar, a drop list is added to select the desired modification: Active channel, All channels, All channels of same type. These options apply not only to interactive measure change but also dynamic change. It is possible to invert a user view's scale in the Log Pop-Up menu: Horizontal scale. You can also select a log horizontal scale.
For each channel the header of the user view indicates the scale, the aspect, and a name constructed with the same convention as used in the data browser. User view headers can be condensed to a drop list. This option is given in the Log title option of the Log Pop-Up menu accessed by a right click in any plot.
In a user view, one channel is active at a time and its legend appears in bold characters. When the mouse is moved inside a user view, the horizontal coordinate displayed in the status bar at the bottom of the screen pertains to the active channel. The active channel is by default the last one dropped in the view. One can

change the active channel by clicking on the corresponding legend line in the user view header. When the user view header is condensed, the active channel corresponds to the current selection in the header drop list.
The log title of user views with at least one filled area can display the area rather than channel legends (see Log title).

A particular type of user views is a cumulative user view, displaying successive sums of the constituting channels: when dropping channels A, B, and C on a cumulative user view, Emeraude calculates and displays: A, A+B, A+B+C.

Interpretation views

Among the interpretation views are for a PL interpretation the rate views, the reference channel view, and the match views. For a PNL interpretation, there are the Pore Volume Analysis, and Bulk Volume Analysis views. Those views are created automatically, their content is pre-defined, and no channel can be added to them manually. Interpretation views other than rate views (Q, QZT, QZI) share the following characteristics:

- They have a behavior analogous to that of user views for aspects, titles, scale options, etc.
- Their creation is optional: specific checkboxes are given the interpretation Infos/New dialog.

Despite their similarity with user views, interpretation views do not appear in the browser as individual user view nodes. Also, their content is pre-defined and cannot be modified. In order to delete interpretation views the user has to de-check the corresponding option in the Interpretation Infos/New dialog.

Image view / Well view

Image views are used with multiple probe tools to give a representation of the holdup or bubble distribution within the wellbore. Well views are used to plot the well trajectory, diameter, and possibly holdups. Both types are special user views inheriting some standard user view behavior, together with some restrictions and additions dedicated to some specific processing/options. Image views and well views are described in details in Chapter D05: Browser.

Volume of Fluids view

This view gives a representation of the bulk volumes of fluids: hydrocarbon, moved hydrocarbons, and residual water. The view is automatically created upon the presence of some specific channels in the General Well Data container. The default bulk volume aspect for each type of fluid can be set in the Job Information dialog ("Saturation colors" page) accessed from the Document control panel (Chapter D07).
The channels required for the creation of the view are listed in the table next page:

Definition	Mnemonic	Bulk volume From / To	Default aspect color/pattern
Porosity (Total or Effective)	PHIT or PHIE	Hydrocarbon PHIT or PHIE / XWAT	
Invaded water volume fraction	XWAT or VOL_XWAT	Moved Hydrocarbon XWAT / UWAT	
Residual water volume fraction	UWAT or VOL_UWAT	Water UWAT / 0	

When XWAT (VOL_XWAT) and/or UWAT (VOL_UWAT) are not available, the corresponding channels can be built dynamically as follow:

		Total Porosity, PHIT	Effective Porosity, PHIE
Total water saturation	SWT	UWAT = PHIT x SWT	n/a
Total flushed water saturation	SXOT	XWAT = PHIT x SXOT	n/a
Effective water saturation	SWE	n/a	UWAT = PHIE x SWE
Effective flushed water saturation	SXOE	n/a	XWAT = PHIE x SXOE

D03.2 • Display

The log can be scrolled using the scroll bar on the right of the screen. By default the scroll is complete: all channels scroll together. The **Fast scroll** option, accessible in the “Display” menu, “Scroll” can also be used. In this mode, only the depth scale and the zone visualisation, Z plots are scrolled continuously. The other channels are only updated when the scroll is over, i.e. when the mouse button is released.

When scrolling, channels using symbols or pen styles other than plain may leave unwanted traces on logs. Those traces can be removed by selecting the Refresh option of the Log popup menu (current track only) or the  icon of the display toolbar.

Splitting the display



At the top of the scroll bar is a thin rectangle, the splitter handle: when the handle is dragged down, the screen is split in two so as to view two parts of the log at the same time. To remove the splitter, drag the handle to the top or bottom of the scrollbar or double click on the splitter. It is possible to have up to 16 splits simultaneously.

Resizing a plot



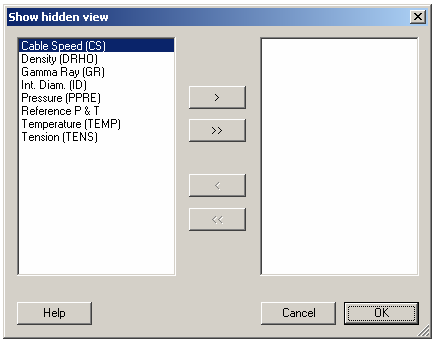
The horizontal splitter, displayed when the cursor is on one of the separators between the plots, allows the width of each plot to be adjusted by dragging. Note that when the plots are tiled it is not possible to enlarge anyone of them as there is no available space. In this situation make room by hiding/reducing another plot first.

Maximizing a plot

Double click on a plot header to maximize this plot and temporarily hide the others. A second double click returns to the original situation.

Hiding/Moving a plot

A plot is selected when the left mouse button is clicked with the cursor in the log title. The cursor changes to a hand. Dragging this hand above (outside) the plotting area hides the plot. Dragging the hand to another position changes the position of the selected view. A hidden plot can later be retrieved from the display toolbar inside the hidden plot list. Note that if you press Ctrl while accessing this list, a dialog appears where you can select to retrieve several tracks simultaneously.



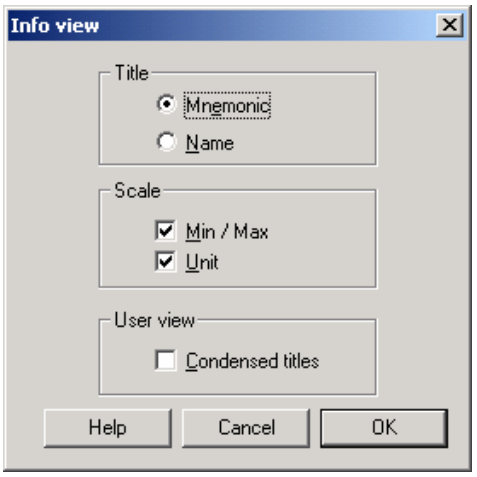
Plot coordinates in the status bar

When the mouse is moved inside a particular plot, the cursor coordinates in user units are displayed in the status bar. For a user plot, as there are multiple horizontal scales, the coordinates pertain to the active channel in the plot.

D03.3 • Log title

Accessed in the Log popup menu or in the **Display** option of the main menu bar.

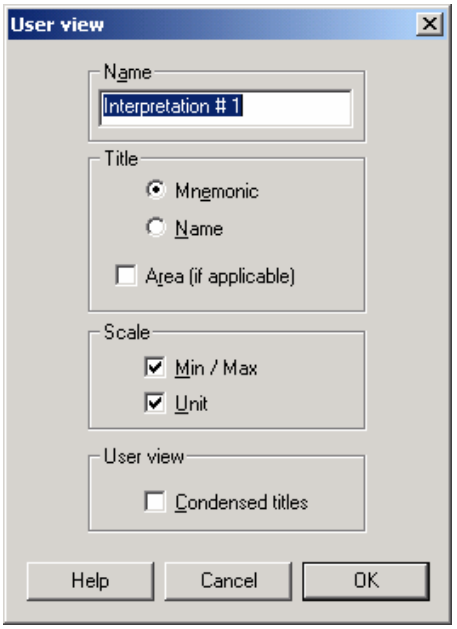
Automatic plot (and rate views: Q, QZT, QZI, QZTR)
Toggle between the log title in the log header (the mnemonic) and the name of the data type with the mnemonic in parenthesis. Display of the maximum and minimum values of the (horizontal) scale and/or units can be toggled on/off.



Other views

One can choose to condense/expand the log headers in all user views. The user view log title can be changed to a user-defined name (this is done in the Browser by changing the name of the user view node). As for automatic plots, display of the maximum and minimum value of the (horizontal) scale and/or its units can be toggled on/off.

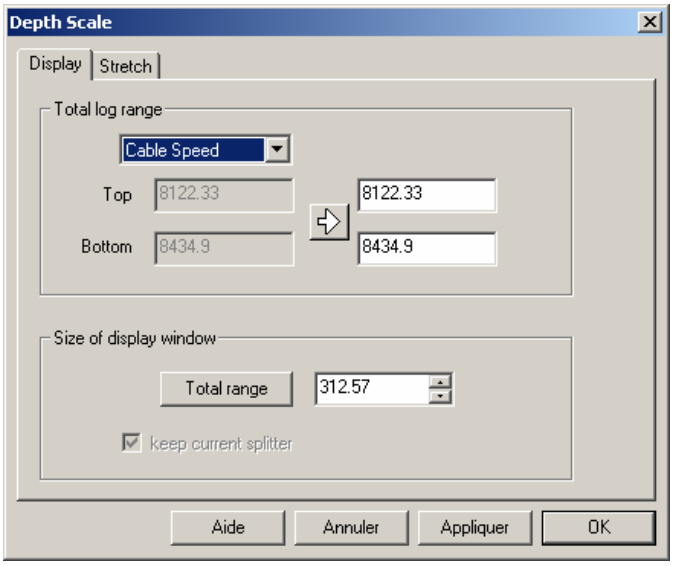
When the view contains at least one filled area the log title can be changed to display a legend of the areas. In this case Min Max values are indicated which are the ones for the first channel on the view. If there are different min-max and a fortiori different properties, a warning icon will appear in the header.

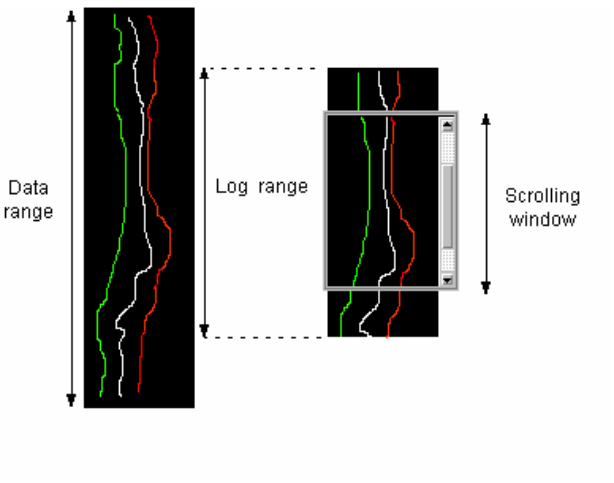


By condensing a User view or an Interpretation view which contains more than one log (channel) the log name (or mnemonic), the aspect, the scale and the unit are placed in a drop list with only the active channel visible. The active channel is changed by selection in the drop list. In developed mode, the active channel is changed by clicking on the desired name in the view header.

D03.4 • Depth scale

Accessed in the Log popup menu or the button of the Scale toolbar.





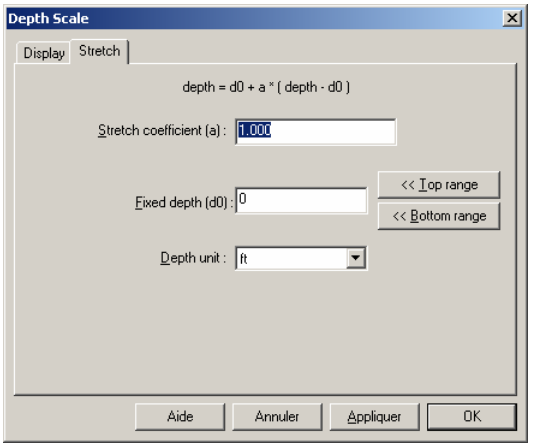
Log range

The log range can be set to the data range of a selected type using the button.

Display window

The size of the display window must be within the log range. It can be set to the entire log range by clicking “Total range”. Alternately, a range can be typed in the box, or pre-defined values selected in the associated list.

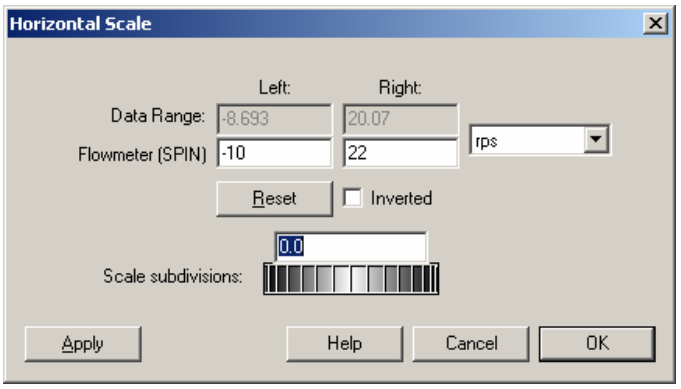
D03.5 • Depth stretch dialog



Accessed in the Log popup menu or the button of the Scale toolbar. Click on the “Stretch” tab to bring up the Stretch dialog.
The stretch is global and applies to all Log Data in the active survey (see Data Structure). It is defined by a fixed depth **d0** and a stretch coefficient **a**.
A given ***Depth*** is then changed into: **d0 + a (*Depth* - d0)**
The stretch can be also be defined interactively in the Survey panel, see section D08.4.

D03.6 • Horizontal scale

Automatic plots (and rate views: Q, QZI, QZT)
The data range and the current range are displayed. The current range can be set manually or “Reset” to the default values based on the data range. Automatic limits take into account the changes made to the plotted channels. For instance, when reverting spinners, calling Reset after the reversal will use with adequate limits to show all data.

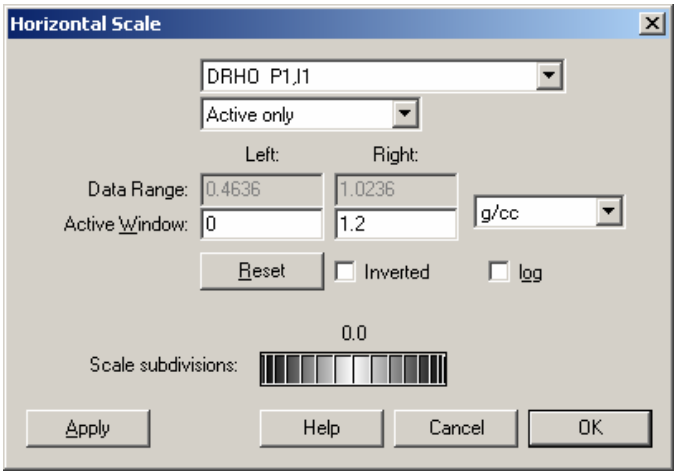


The data range can be inverted and a log scale can be selected if appropriate for the data channel.

A thumbwheel control allows you to add vertical lines to the plot (“Show grid lines on screen” option must be checked in the “Display Settings”, section D06.2). A double click on the thumbwheel activates an edit box for setting the value.

User views and interpretation views

A drop list contains all plotted channels (the first selection is the active channel of the plot). One can toggle from one to the others and view the data range, set the scale manually or reset for each channel.



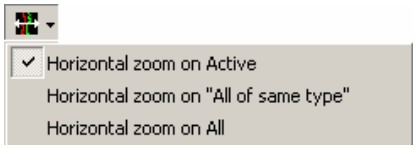
The data range can be inverted and a log scale can be selected if appropriate for the data channel.

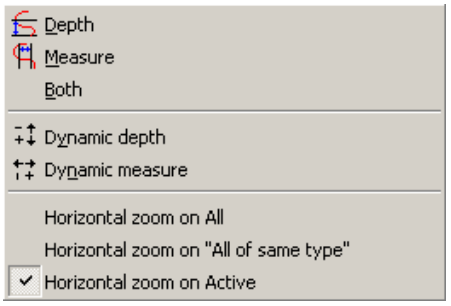
A drop list is used to indicate if the current modification applies to the active channel only, all the channels of same type, or all the channels on that view.

The thumbwheel control described above is also available.

Special case of user views

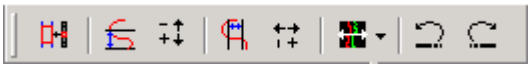
When using the interactive zoom options, one can use the drop list below (located in the scale toolbar) to select the desired type of modification:





D03.7 • Zoom options

Accessed from the Log popup-menu or the Scale toolbar



Options are from left to right:

- **Depth scale**: change the log range or scrolling window range manually.
- **Interactive zoom on depth**: redefine the scrolling window range by click and drag. After selecting this option click in any plot for the top limit, drag down to the desired bottom limit, and release the mouse button.
- **Dynamic zoom on depth**: the scale changes dynamically with the mouse displacements.
- **Interactive zoom on measure**: As above but applies to the horizontal scale. When this option is used on a user view only the Y-scale of the active channel is modified.
- **Dynamic zoom on measure**: As above for the horizontal range.
- **User view horizontal scale settings** (option of the Zoom toolbar): on user views, this option of the Zoom toolbar allows to set beforehand whether the modification will affect only the active channel, all the channels of the same type, or all the channels on the view.
- **Undo** last zoom operation.
- **Redo** last undone zoom operation.

D03.8 • Channel aspect on automatic plots

General Well Data channels

These channels appear on automatic plots with the aspect associated with the General Well Data (plain white line by default). This can be changed by selecting the General Well Data node in the browser, and clicking on the  option of the browser toolbar (see section D05.2, Browser options).

Log data channel

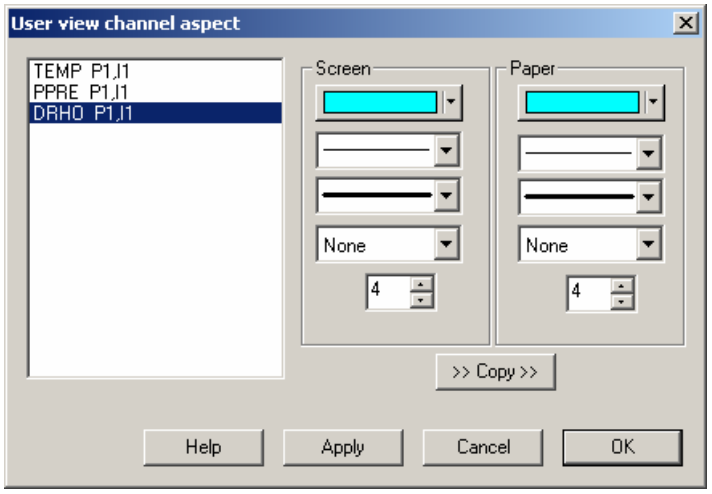
Displayed on automatic plots with the aspect of the pass. The pass aspect can be changed with the button in the Pass toolbar and selecting the “Aspect” tab in the subsequent dialog. Alternatively select the desired pass inside the browser and use the button in the browser toolbar. The default aspect for Up/Down passes is a solid line with a default color assigned as a function of the pass number. Stations use the same coloring convention, but their channels are plotted using circles, with a size equal to 4.

Interpretation channel

Interpretation channels (except rates) are shown on automatic plots with a common aspect. This aspect can be changed in the data browser by first selecting the interpretation node and then the button of the browser toolbar. Rate channels are plotted with a color associated with the phase (red=gas, green=oil, blue=water).

Some channels are not plotted automatically (roughness, deviation) but can be displayed on user views.

In the aspect dialogs, different aspects for screen and paper can be defined, these include color, line thickness, symbol, symbol size. It is possible to define for each channel, different screen and paper aspects.



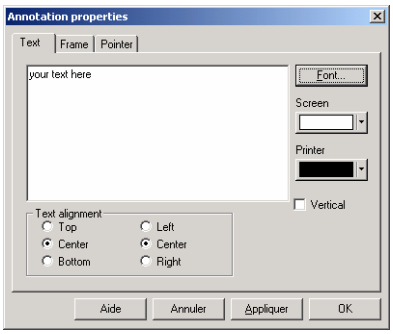
Also, the default color association for future documents (e.g. General Well Data=white, Pass1 = red, etc) can be re-defined in the “Display” option of the “Settings” panel.

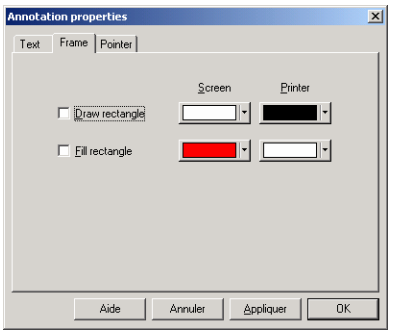
D03.9 • Channel aspect on user views

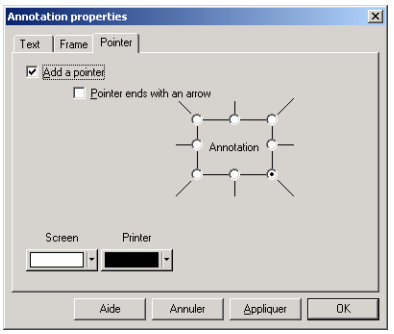
Accessed in the Log popup menu, only enabled when by a right-click in the user view. When a channel is first dropped on a user view, its aspect is either based on the parent color (same behavior as on automatic plots) or else, based on its position on the view. The choice of behavior is made in the “Display” option of the “Settings” panel. All aspect settings can be changed on a particular user view, namely color, line thickness, symbol, symbol size.

D03.10 • Plot annotation

Annotations can be made on any log, automatic or user defined, with the “Annotate” option of the log popup menu.







An annotation is defined by:

- Annotation text
- text color
- text alignment (left, right, center)
- Text direction (horizontal or vertical)
- Frame rectangle style, color, and filling
- Pointer arrow style, color and direction

When exiting the dialog, the annotation appears on the plot, where the mouse cursor was originally clicked to access the Log popup menu. It is attached to the nearest channel curve and the annotation will be removed automatically if the corresponding channel is deleted.

Moving an annotation

Click on the annotation (left button), drag it to the desired location and release the mouse button.

Resizing an annotation rectangle

Click on the annotation (left button) to activate: the rectangle handles appear in white. Click and drag the handles to resize the rectangle.

Note: The annotation size for printing is defined automatically so that the plot and the annotation sizes ratio remains the same between the screen and the print outputs.

D03.11 • Clipboard copy

It is possible to copy one/all the visible log tracks to the clipboard in either Windows Metafile Format (WMF) or Bitmap. The subsequent images, when pasted for instance inside Microsoft Word. *Note that X-Y plots can be copied in the same manner.* Note that with WMF the paper aspects of the plots are used so for instance gird lines will be copied. In bitmap format the screen aspects are used instead.

D03.12 • Refresh

Plots with aspects using symbols or line styles other than plain, as well as filled areas using patterns will not scroll continuously. When scrolled, the channel typically leaves “unwanted” traces in the portion of the logs that is updated. To avoid an automatic refreshing of the views that would slow down the display, it is left to the user to refresh one, or all the tracks manually. The **Refresh** option of the log pop up menu redraws the track where the mouse was clicked only. The  icon of the Display toolbar redraws all the visible tracks.

There are some channels for which only symbols are viable: station channel or zoned simulated channels. For other channels, it is a good practice to restrict the use of symbols and special line styles to the paper outputs. Each channel can have different screen/paper aspect.

D03.13 • X-Y Plots

The following X-Y plots are found in Emeraude:

- PVT (fluid properties vs pressure – or temperature)
- Spinner calibration
- Zone rate (density tool response - or holdup - vs. heavy phase superficial velocity)
- Capacitance calibration
- SIP
- Pulsed Neutron cross-plots

Click the right button with the mouse cursor in the X-Y plot area to access the scaling options:

Zoom In: define the new plot window by clicking on one corner and drag the mouse to the opposite corner of the desired window.
Zoom Out: multiplies the X and Y ranges by 2, keeping the center.
Zoom Reset: return to the default scale
Zoom Manual: keyboard edition of the display limits
Zoom toolbox: displays a floating toolbox where the above options are directly accessible: **Zoom In**, **Out**, **Reset**, **Manual**





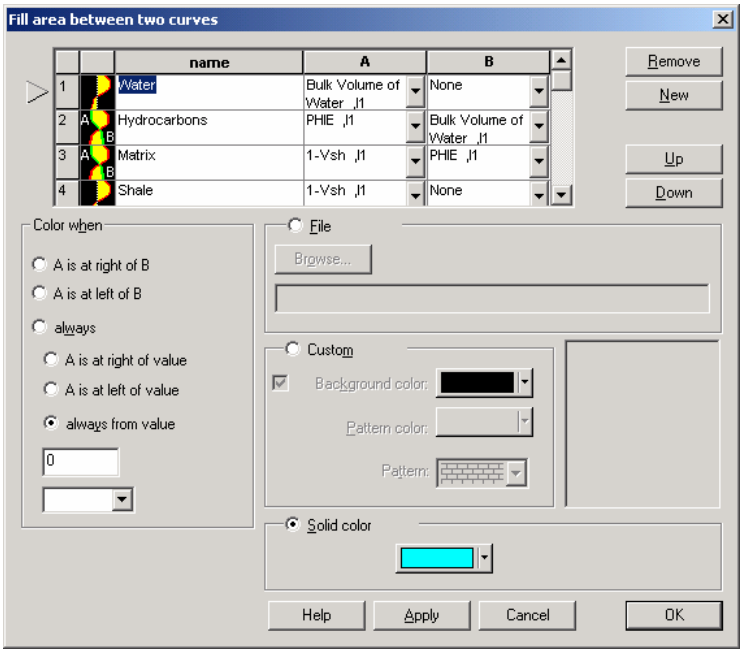
Copy to clipboard

The copy uses the Windows Metafile Format (WMF). The subsequent image, when pasted for instance inside Microsoft Word can thus be resized/edited.

D03.14 • Fill area

The Fill area option can be accessed from the Log popup menu or the  button in the display toolbar. The Fill area is functional for user views and interpretation views (except rate views: Q, QZT, QZI). Note that if you select the option from the toolbar, you then need to click on the desired user view.

The Fill area dialog is used to create / edit areas. An area is defined either between two curves, or a curve and a value. In both cases, a number of additional controls are given to specify the applicability.



The options are:

Fill between curve A and curve B:
- When A is right of B
- When A is left of B
- Always

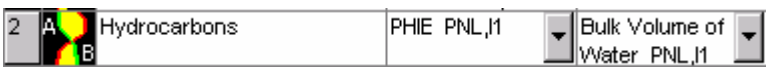
Fill between curve A and a value:
- When A is right of value
- When A is left of value
- Always

Remove/New

Use those buttons to remove the active area or create a new one.

Active area

When several areas exist the active one appears with an arrow in front of it. The user can change the active area by clicking the left mouse button on the corresponding header button. All controls in the lower part of the dialog apply to the active area.



Name / curve A / curve B

For a user view with at least one filled area, the log title can be toggled to display area legends. This is what the name is used for. Curves A and B can be selected by clicking in the appropriate drop lists. When the user wants to fill the area between a curve and a value, curve A should define that curve, and curve B should be set to none.

Highlight

The active area can be highlighted on the screen by pressing the arrow in front of the corresponding line.

Aspect

A filled area can be defined either by:
- A solid color
- A background color + a pattern and pattern color
- A bitmap loaded from a file.

While in the Fill area dialog, note that you can make changes and click the Apply button to see the changes on the screen.
Specific type of plots in Emeraude use predefined fill area aspects whose defaults can be modified in the Job/Information dialog on the Document panel (Chapter D07).

Up/Down
These buttons can be used to change the position of the active area in the list. Ordering areas may be required as the order defines overlapping.

