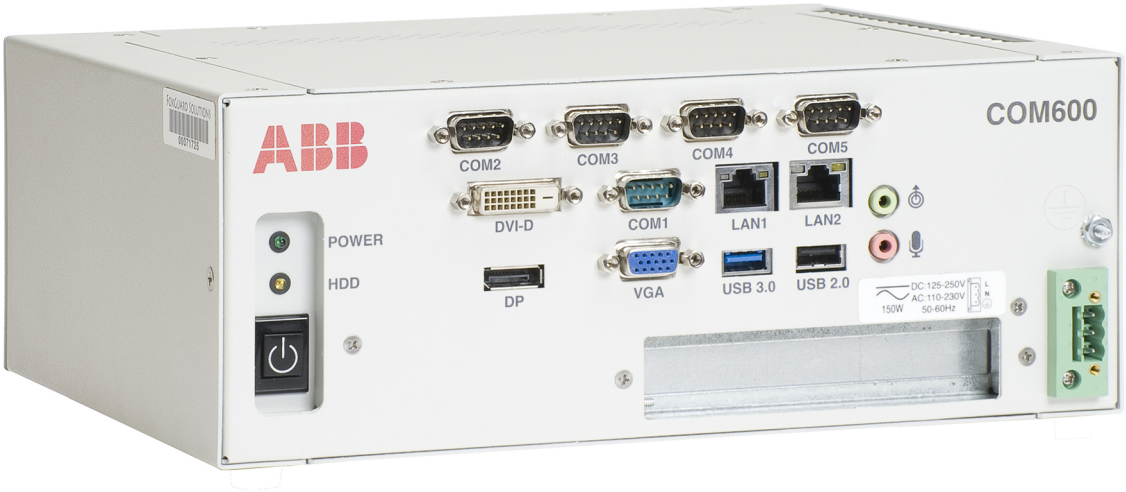
COM600 series, Version 5.1

Data Historian Operator's Manual



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1.3. General information

The COM600 Data historian is a relational database designed and optimized for process information management and extensive history recording. It combines the benefits of an easy-to-use relational desktop database with industrial reliability, performance, and real-time functionality to provide an excellent platform for process information management.

Data historian can be used for accurate process performance monitoring by following process and equipment performance calculations with real-time and history values.

This manual provides thorough information on COM600 Data historian and the use of the Vtrin user interface.

1.4. Document conventions

The following conventions are used for the presentation of material:

- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the space bar, comma key, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press ESC E C indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click **OK**.
- The names of menus and menu items are boldfaced. For example, the **File** menu.
  - The following convention is used for menu operations: **MenuName** > **MenuItem** > **CascadedMenuItem**. For example: select **File** > **New** > **Type**.
  - The **Start** menu name always refers to the **Start** menu on the Windows taskbar.
- System prompts/messages and user responses/input are shown in the Courier font. For example, if you enter a value out of range, the following message is displayed:

```
Entered value
is not valid. The value must be 0 to 30.
```

- You may be told to enter the string MIF349 in a field. The string is shown as follows in the procedure:

  MIF349
- Variables are shown using lowercase letters:

  sequence name

1.5. Use of symbols

This publication includes warning, caution, and information icons that point out safety-related conditions or other important information. It also includes tip icons to point out useful information to the reader. The corresponding icons should be interpreted as follows.

The electrical warning icon indicates the presence of a hazard which could result in electrical shock.

The warning icon indicates the presence of a hazard which could result in personal injury.

The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.

The information icon alerts the reader to relevant facts and conditions.

The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

1.6. Terminology

The following is a list of terms associated with COM600 that you should be familiar with. The list contains terms that are unique to ABB or have a usage or definition that is different from standard industry usage.

Term	Description
Alarm	An abnormal state of a condition.
Alarms and Events; AE	An OPC service for providing information about alarms and events to OPC clients.
Data Access; DA	An OPC service for providing information about process data to OPC clients.
Data Object; DO	Part of a logical node object representing specific information, e.g., status or measurement. From an object-oriented point of view a data object is an instance of a class data object. DOs are normally used as transaction objects; i.e., they are data structures.
Data Set	The data set is the content basis for reporting and logging. The data set contains references to the data and data attribute values.
Device	A physical device that behaves as its own communication node in the network, e.g. protection relay.
Event	Change of process data or an OPC internal value. Normally, an event consists of value, quality and timestamp.
Intelligent Electronic Device	A physical IEC 61850 device that behaves as its own communication node in the IEC 61850 protocol.
Logical Device; LD	Representation of a group of functions. Each function is defined as a logical node. A physical device consists of one or several LDs.

Term	Description
Logical Node; LN	The smallest part of a function that exchanges data. A LN is an object defined by its data and methods.
OPC	Series of standards specifications aiming at open connectivity in industrial automation and the enterprise systems that support industry.
OPC item	Representation of a connection to the data source within the OPC server. An OPC item is identified by a string <object path>:<property name>. Associated with each OPC item are Value, Quality and Time Stamp.
Property	Named data item.
Report Control Block	The report control block controls the reporting processes for event data as they occur. The reporting process continues as long as the communication is available.
SPA device	Protection and/or Control Product supporting the SPA protocol version 2.5 or earlier.
Substation Configuration Language; SCL	XML-based description language for configurations of electrical substation IEDs. Defined in IEC 61850 standard.

1.7. Abbreviations

The following is a list of abbreviations associated with COM600 that you should be familiar with. See also 1.6, Terminology.

Abbreviation	Description
WebHMI	Web Human Machine Interface
RTDB	Real Time Database. A database designed by ABB Oy for storing process information.
SAB600	Station Automation Builder 600

1.8. Related documents

Name of the manual	MRS number
COM600 User’s Manual	1MRS756125
COM600 Operator's Manual	1MRS756705
COM600 HMI Configuration Manual	1MRS756740

1.9. Document revisions

Document version/date	Product revision	History
A/13.2.2009	3.3	Document created
B/06.11.2009	3.4	Document revised
C/30.6.2011	3.5	Document revised
D/31.5.2012	4.0	Document revised
E/13.3.2015	4.1	Document revised
F/24.5.2017	5.0	Document revised
G/28.3.2018	5.1	Document revised

2. Introduction

2.1. Overview of COM600

COM600 provides gateway functions for mapping signals between protection and control IEDs in industrial or utility substations and higher-level systems. It further includes an optional WebHMI that provides data and information from the substation to the users.

COM600 gathers data from protection and control IEDs and from process devices using different communication protocols. The supported protocols can be combined freely in one station computer, limited only by the number of hardware interfaces and the license. COM600 uses web technology to display data to different users in a professional and user-friendly manner. The web technology is further used to transfer information to a network control centre (NCC) or distributed control system (DCS).

COM600 benefits from the potential of the IEC 61850 standard by using the IEC 61850-6 substation configuration language (SCL) and IEC 61850 -7 communications modeling regardless of protocol used. As the IEC 61850 data modeling is used for all communication protocols the gateway cross-reference is done in the same way regardless of the protocol, for example IEC 61850-8-1 or DNP3.

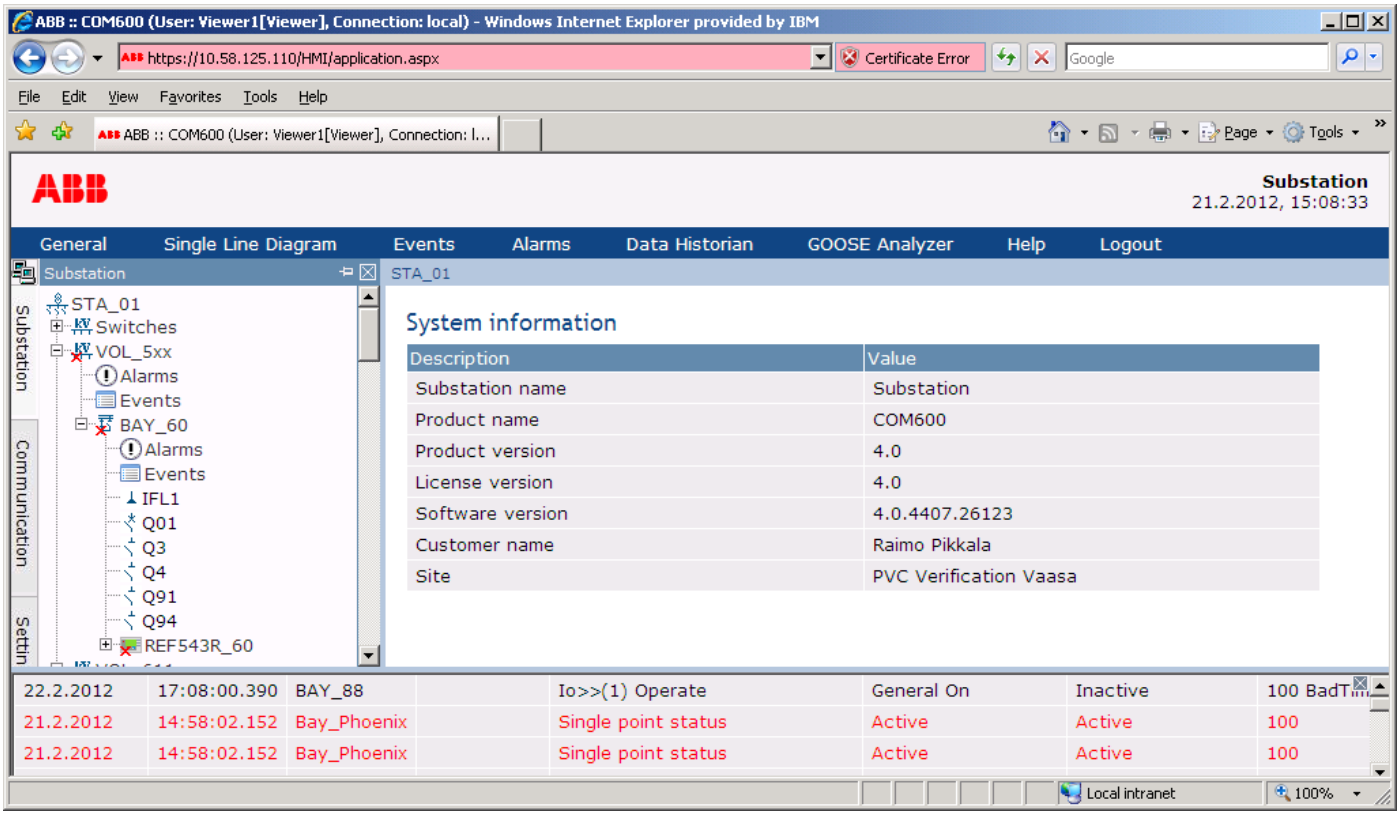
COM600 can be used for efficient substation visualization, monitoring and control with the optional WebHMI. Measured values from process devices are displayed on the WebHMI. Single-line diagrams can be used to view any available measured values from the process devices.

Microsoft Internet Explorer or Google Chrome (with the ClickOnce extension) is required for displaying data historian information using the WebHMI.

3. Getting started with COM600 Data historian

The COM600 data historian is a relational database designed and optimized for process information management and extensive history recording.

Vtrin is a user interface client that connects to RTDB database (cpmPlus History database) in the COM600 computer. History values can be displayed in graphical form, for example as trends. Vtrin is started from COM600 WebHMI.



HMI_Data_Historian_menu.png

Figure 3-1 Data Historian menu item shown in COM600 WebHMI

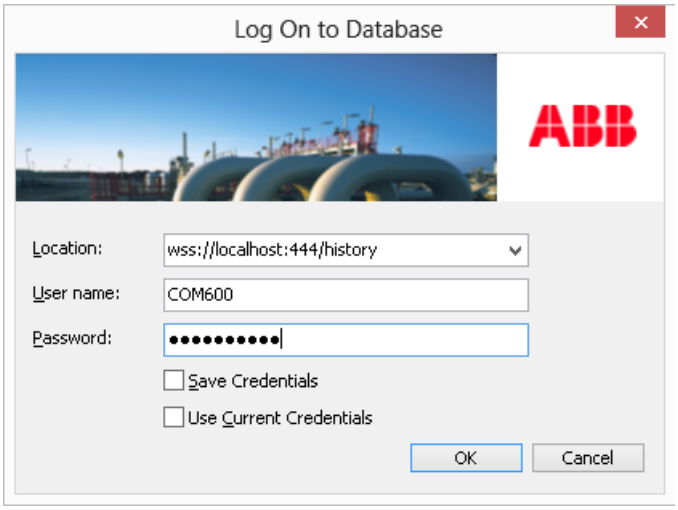
3.1. Logging on/connecting to the database

1. Click the Data Historian tab in WebHMI.
   On the first logon, the Vtrin client is installed.
2. Click **Run** in the security warning dialog.

Security_warning.jpg

Figure 3.1-1 Security warning dialog

The logon window opens:



Vtrin_login.png

Figure 3.1-2 Log On to Database dialog

3. In the **Location** drop-down menu, select the RTDB-COM600 you want to connect to. The database name consists of the name of the computer or the IP address and the database in the following format: TCP://computer or IP/RTDB-COM600.
4. For normal operation, login with the same user name and password as to the COM600 WebHMI. Enter your user name in the **User name** field and your password in the **Password** field.
5. If you want to use the credentials that you use for logging into Windows, select **Save Current Credentials**.
6. Connect by clicking **OK** or cancel the connection by clicking **Cancel**.

3.2. Logging off from Vtrin

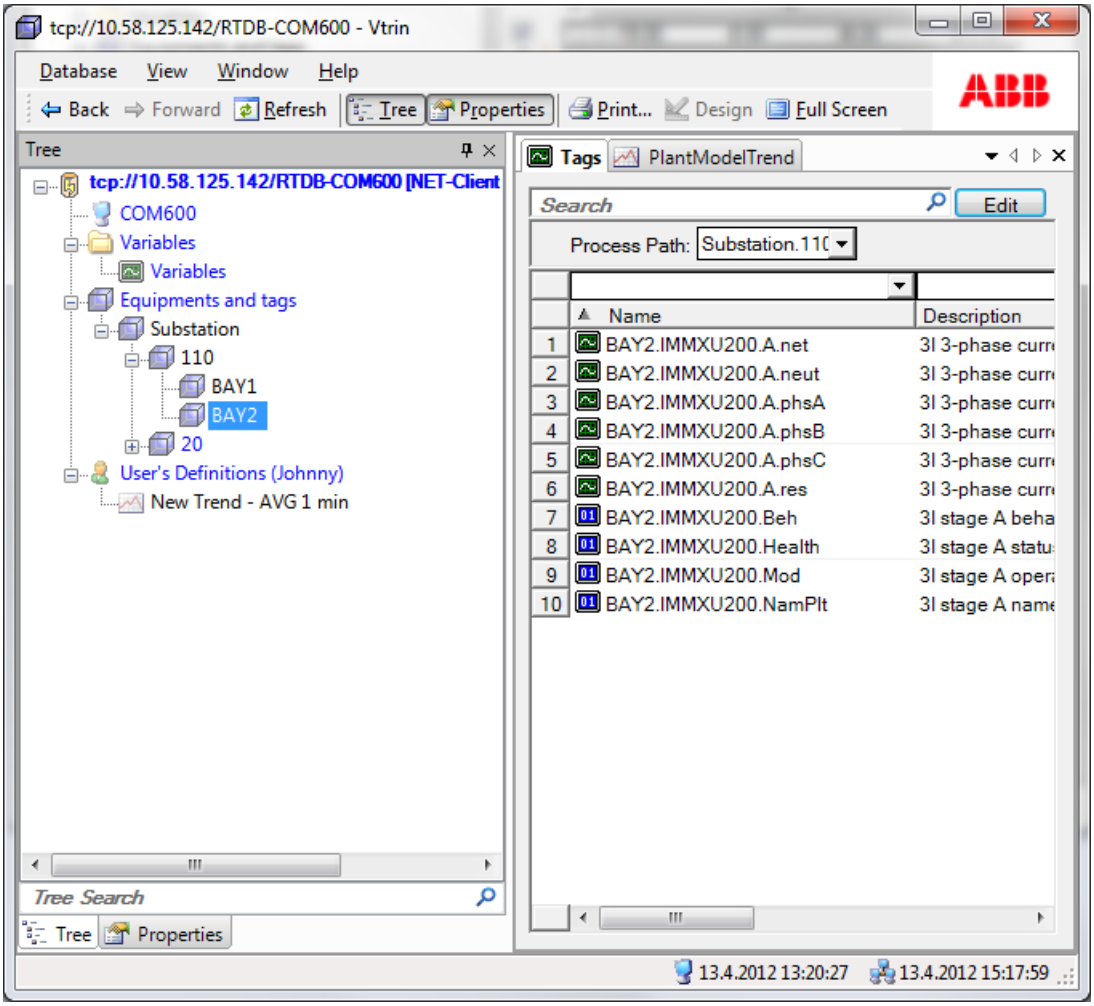
1. Click Vtrin's title bar OR select **Exit** from the **Database** menu.
2. When logging off from Vtrin, you are prompted to save the changes in each open window.

3.3. General overview of Vtrin user interface

When logging in, depending on the user rights, available tools are visible in the Tree view on the left. The tree contains folders, which, in turn, include other folders (sub-folders) and windows. The windows display lists, tables, charts, process diagrams, and reports.

The charts in the tree are displayed in the window area on the right. By default, they open on top of each other in the size of the full area. The titles of the windows are displayed in tabs at the top of the area.

For a normal Vtrin user, User's Definitions and Variables are shown. User's Definitions is empty by default at first login and Variables contains the variables that the administrator has created with SAB600 and added to the database.

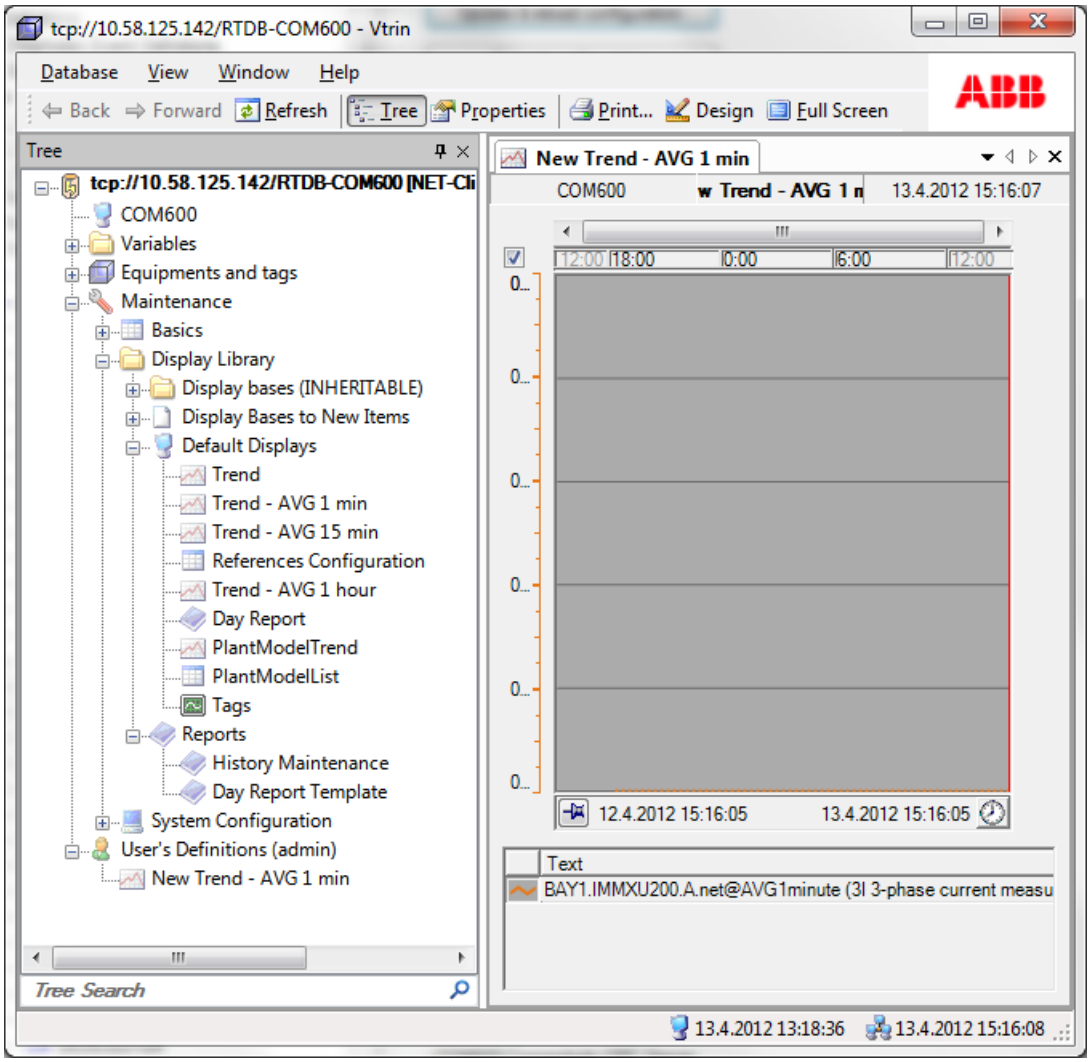


Workspace.png

Figure 3.3-1 Vtrin workspace for a normal Vtrin user

The administrator's Tree view contains Maintenance tools, such as templates for various trends, and report templates.

Vtrin administrator defines what is shown for normal users, for example, predefined tai preconfigured trend views.



WorkspaceAdminView.png

Figure 3.3-2 Vtrin workspace for a Vtrin administrator user

Detailed information about the Vtrin user interface is found later in the following chapters of this manual.

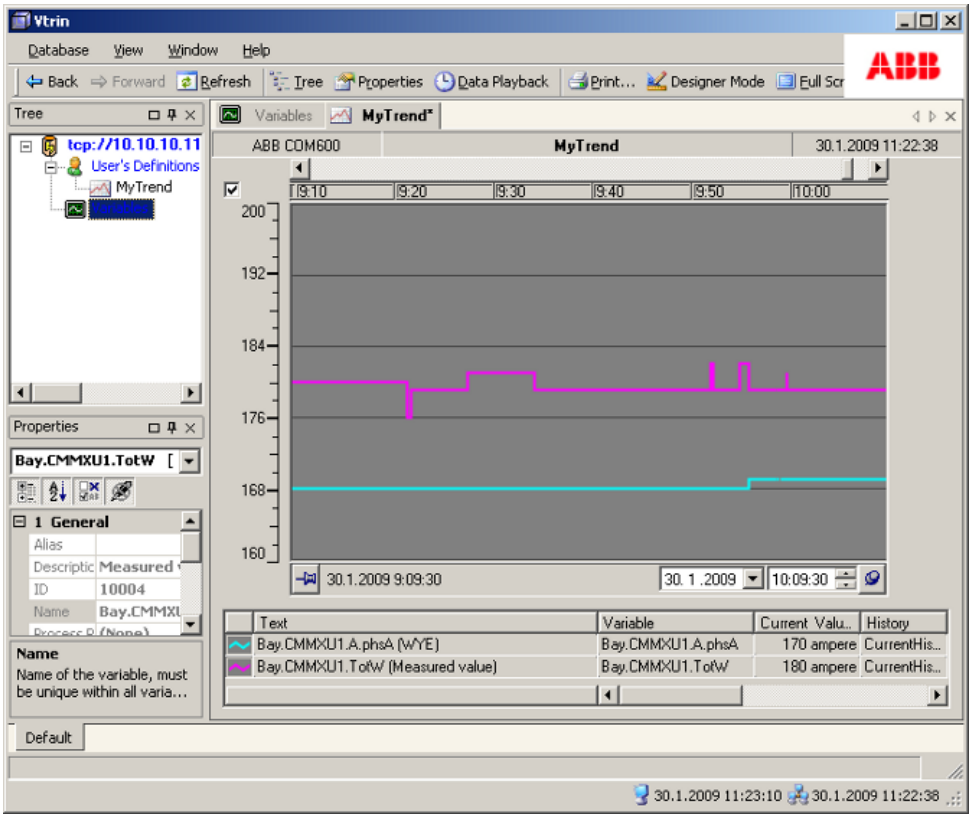
3.4. Quick start for creating trend views

To create a new trend view:

1. Right-click **User's Definitions** in the tree view and select **New Tree Item -> Trend**. New Trend object is created to the tree.
2. Rename the object with a descriptive name.
3. Open the trend view by selecting it in the tree.
   When the trend view is opened for the first time, it is empty.
4. To assign variables to the trend view, select **Variables** from the tree.

The variable list opens with the variables (such as process measurements), which have been configured with SAB600 for the Data historian function.

5. Drag and drop variables from the list to the trend view.
   There are several settings to customize the trend view. For example, by default all variables have individual scaling and limits on the view. If you want variables to share same scaling and limits, right-click a variable on the bottom of the view and select **Properties** from the context menu. In the **Properties** dialog, select the **Advanced** tab and unselect the **Individual limits** check box.



Vtrin_trend_view1.bmp

Figure 3.4-1 Example trend of COM600

For more information about the settings, see Chapter 5, Charts.

6. After you are ready with the changes, save them via the **Database** menu.

An alternative way to create new trend views from the Variables list:

1. Select the variables (hold Ctrl key to select several variables).
2. Right-click the context menu and select **Send to trend**.
   A new trend view is created.
3. From the **Database** menu, select **Save as**. Navigate in the **Save** dialog to the **User's Definitions** object and enter a new name for the trend.

Non-administrator users can only create objects (for example trend views) below their own User's Definitions node in the

tree. Administrator users can create objects to other levels as well. For example, to create a trend view available for all users, the administrator user can create it below the root object in the tree.

In the tree view, the **Equipment and Tags** node has a structure of the substation with voltage level and bay objects. To open a trend view containing all variables related to an object, right-click the object and select **Send to -> Trend of all tags**.

3.5. History collection cycles and lengths

By default history values are collected from the variables with following cycles and history length.

Table 3.5-1 History collection cycles and lengths

CurrentHistory	5 second default sampling cycle	History stored for 8 days
AVG1minute	1 minute average values	History stored for 8 days
AVG15minute	15 minute average values	History stored for 6 months

4. Vtrin workspace

The following table lists the elements in the Vtrin user interface.

Table 4-1 Vtrin user interface elements

Title bar	Window's heading
Menu bar	See 4.1, Menu bar
Tree window	See 4.5, Tree window and 4.7, Tree window and the Properties dialog
Tab	See 4.9, Window area
Custom toolbar	See 4.3, Custom toolbar
Toolbar	See 4.2, Toolbar
Properties dialog	See 4.6, Properties dialog
Window area	See 4.9, Window area
Status bar	See 4.4, Status bar

Table 4.10-1 lists the most common icons in Vtrin.

4.1. Menu bar

The menu bar is located under the title bar.

Row_menu_bar.jpg

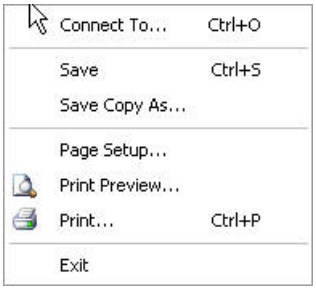
Figure 4.1-1 Vtrin menu bar

The menu bar includes the following Vtrin menus:

Table 4.1-1 Vtrin menu bar elements

Database	See 4.1.1, Database menu
View	See 4.1.2, View menu
Window	See 4.1.3, Window menu
Help	See 4.1.4, Help menu

4.1.1. Database menu



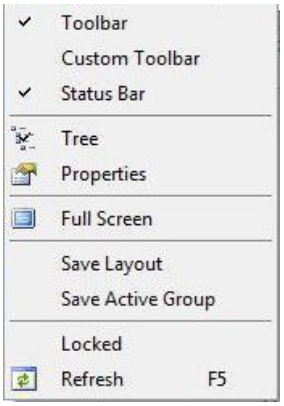
Menu_database.jpg

Figure 4.1.1-1 Database menu

Table 4.1.1-1 Database menu items

Item	Description
Connect to...	Opens a connection to another database. Displays a logon window as described in 3.1, Logging on/connecting to the database.
Save	Saves the active window in the directory tree, if you have changed the window properties.
Save copy as	Saves the active window in the selected directory in the directory tree under the selected name.
Page Setup	Sets the page settings for printing. For further information, see Windows help.
Print Preview	Allows the user to preview the page before printing. For further information, see Windows help.
Print...	Opens the **Print...** dialog that allows you to print the content of the active window to the selected printer. For further information, see Windows help.
Exit	Closes Vtrin. See also 3.2, Logging off from Vtrin.

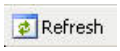
4.1.2. View menu



View_menu.jpg

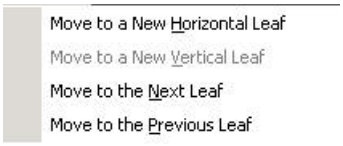
Figure 4.1.2-1 View menu

Table 4.1.2-1 View menu items

Item	Description
Toolbar	Displays the toolbar by default under the menu bar, see 4.2, Toolbar. Selected by default.
Custom Toolbar	Displays the custom toolbar by default under the Vtrin toolbar, see 4.3, Custom toolbar. Selected by default. You can change the order of the toolbars or put them in one row.
Status Bar	Displays the status bar at the bottom of Vtrin, see 4.4, Status bar. Selected by default.
Tree	Displays the tree in the **Tree** window, see 4.5, Tree window. Selected by default.
Properties	Displays the **Properties** dialog, see 4.6, Properties dialog. Selected by default.
Data Playback	Not yet supported.
Full Screen 	Switches Vtrin to full screen, leaving only the menu bar and window area (including tabs) in view. To return to the normal view, click the command again or click **Close Full Screen** on the right side of the menu bar.
Save Layout	Saves the workspace layout.
Locked	Locks the appearance of the workspace, meaning that the relative relationships of the windows can no longer be changed. If you change the relative relationships after unlocking, the Tree window and Properties dialog, for example, will remember their new size the next time they are opened.
Refresh 	Refreshes the active window. You can also refresh the active window by pressing the F5 shortcut key for **Refresh**.

4.1.3. Window menu

The commands in the **Window** menu affect the active window in the window area. See also 4.9, Window area. Only the commands available for the active window are displayed in bold.



Menu_window.jpg

Figure 4.1.3-1 Window menu

Table 4.1.3-1 Window menu items

Item	Description
Move to a New Horizontal Leaf	Moves the active window to a new horizontal leaf.
Move to a New Vertical Leaf	Moves the active window to a new vertical leaf.
Move to the Next Leaf	Moves the active window to the next leaf.
Move to the Previous Leaf	Moves the active window to the previous leaf.

4.1.4. Help menu

Menu_help.jpg

Figure 4.1.4-1 Help menu

Table 4.1.4-1 Help menu items

Item	Description
Contents...	Not yet supported.
Index...	Not yet supported.
Search...	Not yet supported.
User's Reference Manual	Opens this manual on screen.
About Vtrin	Displays the version of Vtrin. Click **Ok** to continue.

about_vtrin.png

Figure 4.1.4-2 About Vtrin dialog

4.2. Toolbar

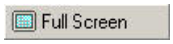
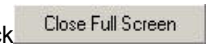
By default, the Vtrin toolbar is located below the menu bar.

Row_toolbar.jpg

Figure 4.2-1 Vtrin toolbar

Table 4.2-1 Toolbar elements

Button	Description
 **Back**	Steps backward through the window call path, activating the previous window.
 **Forward**	Steps forward through the window call path, activating the following window.
 **Refresh**	Refreshes the active window. You can also refresh the active window by pressing the F5 shortcut key for Refresh.
 **Tree**	Shows/hides the Tree window. See 4.5, Tree window and 4.7, Tree window and the Properties dialog.
 **Properties**	Shows/hides the Properties dialog. See 4.6, Properties dialog and 4.7, Tree window and the Properties dialog.

Button	Description
 **Designer Mode**	Changes the display to design mode.
 **Data Playback**	Not yet supported.
 **Print**	Opens the **Print** dialog that allows you to print the content of the active window to the selected printer. For further information, see Windows help.
 **Full Screen**	Enlarges Vtrin to full screen, leaving only the menu bar and window area in view. To return to the normal view, click  the right side of the menu bar.

4.3. Custom toolbar

The custom toolbar is located below the Vtrin toolbar. You can also move it to the Vtrin toolbar or change the order of the toolbars.

Row_custom_toolbar.jpg

Figure 4.3-1 Custom toolbar

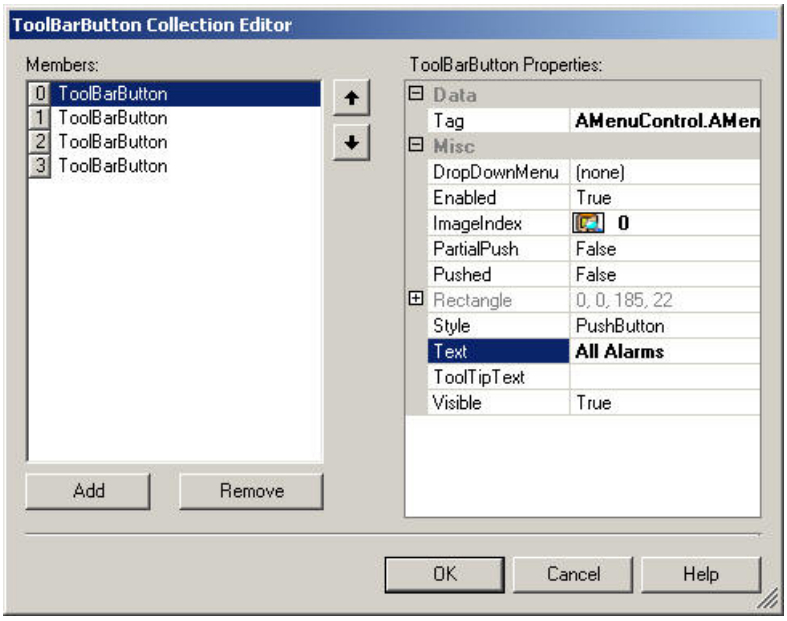
Table 4.3-1 Custom toolbar elements

Custom toolbar	User-specific: each user can customize a toolbar according to his or her needs, which are displayed whenever the user connects to the database. It is a good idea to place frequently used windows as buttons in this toolbar. The windows can then be easily opened by clicking the appropriate buttons instead of having to locate the windows in the tree.
Toolbar	See 4.2, Toolbar.

Adding, editing, and deleting custom toolbar buttons

To add a button to the custom toolbar:

- Drag the window icon from the tree to the custom toolbar. The new button appears on the right side of the custom toolbar.



Toolbarbutton_collection_editor.jpg

Figure 4.3-2 Toolbar button collection editor

Table 4.3-1 Toolbar button collection

Members	The buttons that have been defined to belong to the custom toolbar. The buttons are listed from left to right.
ToolBarButton Properties	Properties of the selected button.
Add	Add a new button.
Remove	Delete the selected button.

To delete a button:

1. Open the custom toolbar and right-click to open the menu. In the menu, select the **Edit** button.
2. To delete a button, select the button and click **Remove**.

To edit buttons:

1. Open the custom toolbar and right-click to open the menu. In the menu, select the **Edit** button.
2. You can edit the button properties and change the order of buttons:
   - To edit the button properties, change the information needed in the **ToolbarButton Properties** area. Click **OK** to submit the changes.
   - To change the order of the buttons, select the button you want to move and click  to move the button upwards or  to move the button downwards.

4.4. Status bar

The status bar is displayed at the bottom of Vtrin.

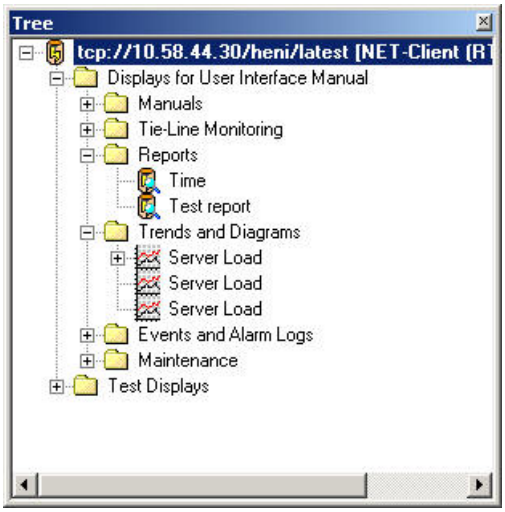
Row_status_bar.jpg

Figure 4.4-1 Status bar

It indicates the status of Vtrin (not yet supported) and time. The time on the user's PC is indicated by the ( ) icon and the time on the server by the ( ) icon at the right-hand end of the bar. If the system has an alarm log feature, you can set parameters for process area-specific indicators for active and unacknowledged alarms on this row. In this case, the area-specific priority icons indicate the priority of the alarm situation. If the icon is colored, the log contains active alarms, and if the icon is flashing, the log contains unacknowledged alarms.

4.5. Tree window

The **Tree** window shows the system's windows (charts) in a hierarchical tree structure.



Tree_window.jpg

Figure 4.5-1 Tree window

The tree contains folders, which, in turn, include other folders (subfolders) and windows. The windows display lists, tables, charts, process diagrams, and reports.

The procedures for opening and closing the **Tree** window, as well as moving it within the workspace, are described in 4.7, Tree window and the Properties dialog.

Opening folders and windows

To make the tree fully visible:

- If the tree is not fully visible, open it by clicking next to the database icon or by clicking the icon or name of the database.

To open a folder:

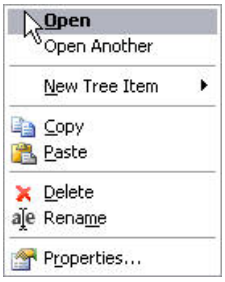
- Click next to the folder. You can also click the name of the folder. The symbol next to an open folder changes to when the folder is opened.

To close an open folder:

- Click . You can also double-click the icon or name of the folder.

- Open a window by clicking its node icon or name. (The tree can be defined so that the window can only be opened with a double-click.)

Table 4.10-1 shows some of the most common folder and window icons.



open_window.jpg

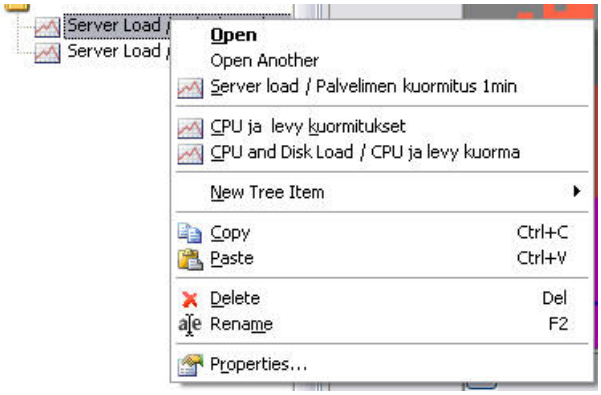
Figure 4.5-2 Open window

Table 4.5-1 Open window items

Item	Description
Open	Corresponds to opening a window in the tree. The command is not available for folders.
Open another	If the view in question is already open, you can open it in another view by selecting this command.
New Tree Item	
Copy	
Paste	
Delete	

Rename	Opens up the window name field for editing.  Changing the name of the window in the tree changes also the name visible in the window tab. In case of a trend, the default title of the trend is also changed. If the trend title is edited separately, changes in the window name field do not affect the edited title.
Properties...	

In some cases, the window is defined in such a way that right-clicking it displays the following menu. The windows shown in the menu can be opened by clicking them.



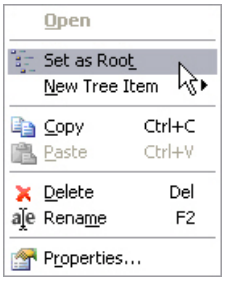
Menu_tree_open_right_click.jpg

Figure 4.5-3 Opening menu tree

You can display a tool tip by placing the cursor on a folder or a window. The tool tip includes additional information on the selected item, if the information has been defined.

4.5.1. Setting the root of the Tree window

Inside the tree, any folder with content can be set as the root of the tree structure. This cleans up the tree view for the user. Any unnecessary information, tree folders and nodes, can be hidden from the user. All folders above or on the same level with the selected folder are hidden leaving only the contents of the new root folder visible. The new root folder is set by selecting **Set as Root** from the pop-up menu of the desired folder.

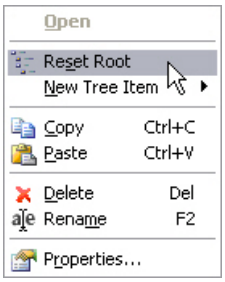


Tree_folder_menu_set_as_root.jpg

Figure 4.5.1-1 Setting content as root of the tree window

Menu item	Description
Set as Root	Sets the folder to act as a root of the tree. Only the contents of the folder are left visible.

The whole tree structure can be retrieved by selecting **Reset Root** from the popup menu of newly set root folder.



Tree_folder_menu_reset_root.jpg

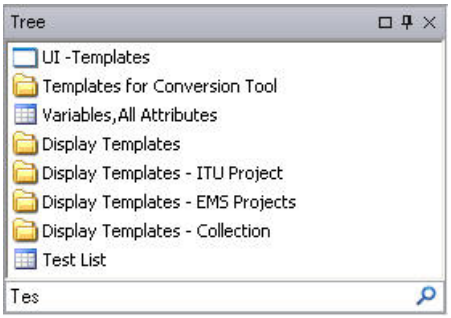
Figure 4.5.1-2 Resetting the tree structure

Menu item	Description
Reset Root	Restores the whole tree structure with the original root folder. The expansion state of the tree is not restored after the root has been reset - all folders are collapsed.

4.5.2. Searching in the Tree window

You can search for items matching your criteria inside the **Tree** window. The items are found based on the names of the nodes. The search is started by clicking into the **Tree Search** field under the **Tree** window.

Typing in the first letters narrows down the items visible in the tree.



Tree_search_tes.jpg

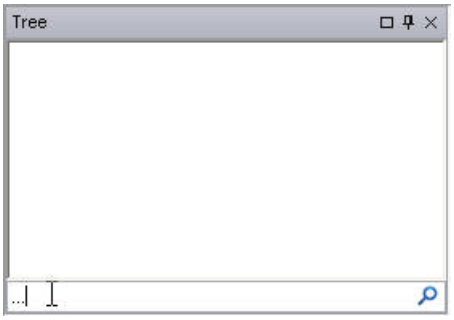
Figure 4.5-1 Searching in the Tree window

Any item names matching the search criteria are left visible in the **Tree** window, while others are hidden. Entering a longer or a more descriptive search phrase narrows down the visible items even more.

Tree_search_test.jpg

Figure 4.5-2 Search results in the Tree window

If no item matches the criteria, the tree is left empty.



Tree_search_empty_tree.jpg

Figure 4.5-3 The Tree window without matching search results

All items in the tree are retrieved by erasing the **Tree Search** field.

The tree search is case insensitive and uses partial matching criteria. So, for example, entering a single letter "T" in the search field returns a tree with all the items containing

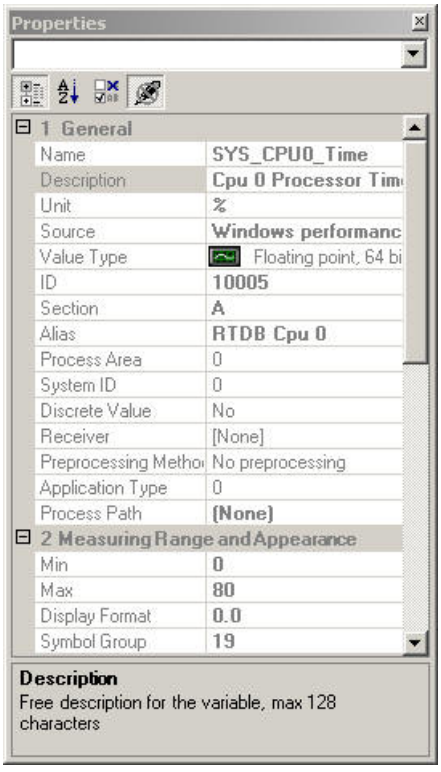
"t" or "T" somewhere in the item name. Also, the search phrase "Trend - avg" returns different results from "avg - Trend". This is because the whole search phrase is searched for, not a name containing all the words in the search phrase.

4.6. Properties dialog

The **Properties** dialog displays the properties of a selected element of certain kinds of windows in the window area. You can, for example, view the data of a variable selected from the variable list in a database table. The same information can also be viewed in the variable list, but the **Properties** dialog groups the data of a single variable in a vertical list and also provides an explanation for the data.

For information on how to display the **Properties** dialog and change its location, see 4.7, Tree window and the Properties dialog.

The way you select an element in a window and display its properties in the **Properties** dialog depends on the type of window. For example, to view the properties of a list item in the **Properties** dialog, click the item in the first column of the list.



Properties_dialog.jpg

Figure 4.6-1 Properties dialog

Clicking a row in the **Properties** dialog shows a description of the property in question at the bottom of the dialog.

Clicking the buttons at the top of the dialog allows you to select or deselect a data display option. When an option is selected the button is displayed in white (for example, ). When an option is deselected, the button is displayed in the same color as the background (for example, ).

For more detailed information, see 7, Lists.

4.6.1. Searching in the Properties dialog

The **Properties** dialog has a similar search tool compared to the **Tree**.

The search tool is located under the **Properties** dialog and functions similarly to the search tool for the **Tree** window. The property search retrieves properties whose names (first column on the list) match the search criteria and shows them on the property list. See 4.5.2, Searching in the Tree window for more details about using the search tool.

4.7. Tree window and the Properties dialog

The **Tree** window and the **Properties** dialog are located on the left side of the workspace. You can place the windows on top of each other as tabs. The names of the tabs are displayed at the bottom of the area. (The windows shown in the window area have their own tabs, see 4.9, Window area.) They can also be detached and displayed as individual windows or minimized into icons. The following sections provide a more detailed description of the handling of the **Tree** window and the **Properties** dialog.

Opening the Tree window and the Properties dialog

- Select **Tree** (**Properties**) from the **View** menu.

OR

- Click the toolbar button 
  ()

Closing the Tree window and the Properties dialog

- Select **Tree** (**Properties**) from the **View** menu.

OR

- Click the toolbar button 
  ()

OR

- Click the Close button in the title bar.

Enlarging and reducing the Tree window and the Properties dialog

- Click in the title bar if you want the window to cover the area of both the **Tree** window and the **Properties** dialog.
- Click in the title bar if you want to restore the window to its normal size.

Detaching the Tree window and the Properties dialog

To detach a window:

- Drag it from its title bar or double-click the title bar. You can freely resize a detached window and move it anywhere you want on the Windows desktop.

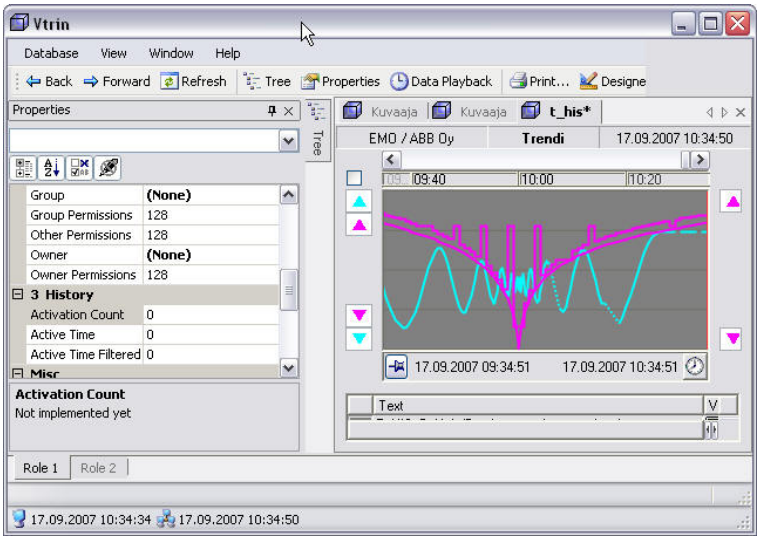
To restore the window to its previous fixed location:

- Double-click the title bar.

Reducing the Tree window and the Properties dialog into icons on the vertical bar

To reduce the window into an icon on the vertical bar:

- Click the title bar button .



Tree_window_as_icon.jpg

Figure 4.7-1 Tree window as icon

If the window does not open as shown in the following figure, widen the Vtrin on the screen. To position the window back on the bar, click anywhere outside the window.

To restore the window to its location, click or point to the Tree icon 

on the bar and then click in the title bar.

The button and the title bar are displayed in the active color, if you clicked the icon.

If the window does not open from the bar, first try widening the Vtrin on the screen.

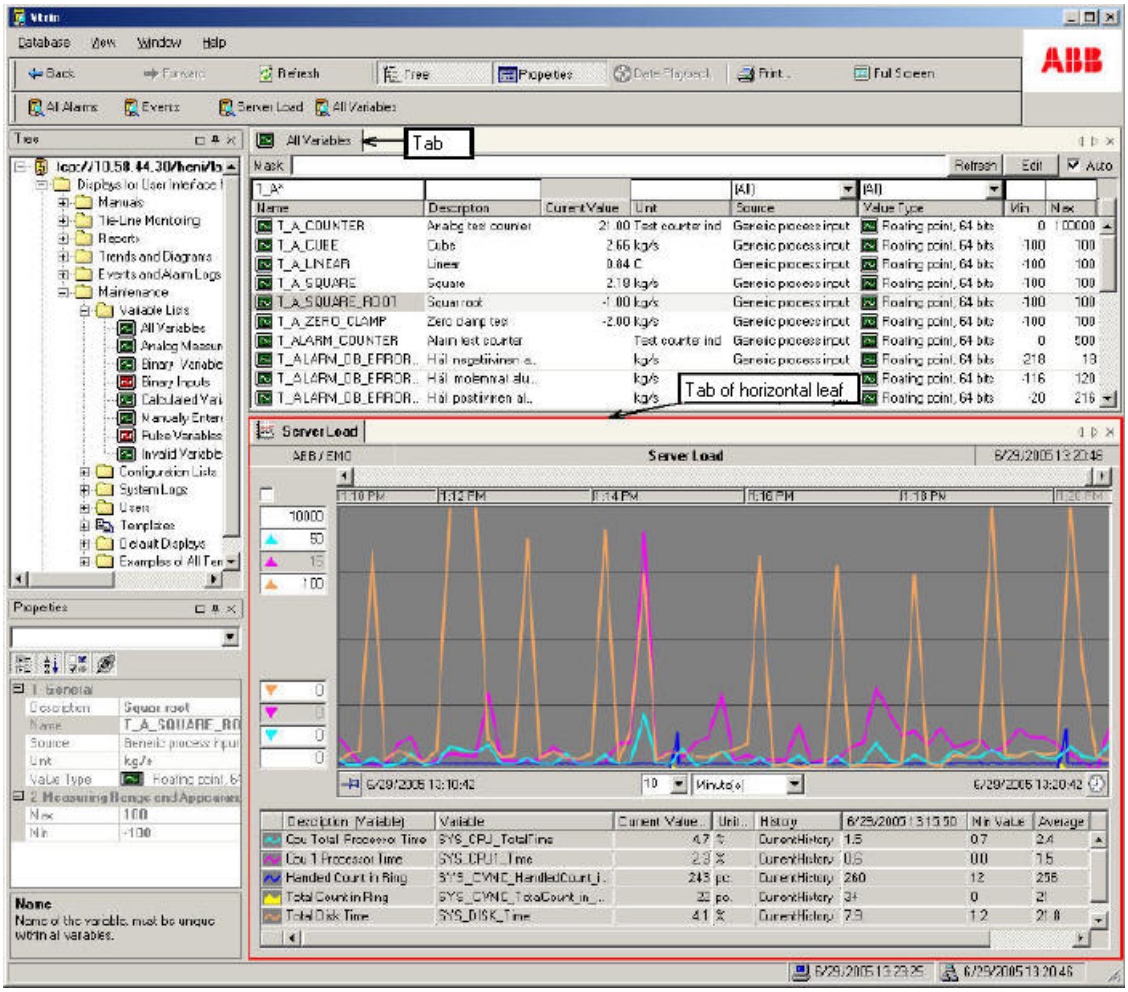
4.8. Browsing the Tree window history

The **Tree** window history can be browsed much like the folders in Windows file explorer or web pages with a web browser. Visited folders and nodes in the tree are accessible with the **Back** and **Forward** browsing buttons. Also the window tabs visited in the window area are retrievable in the order they were accessed.

The state of the tree is restored to corresponding state when browsing the history. The state of the tree means, for example, folders that have been expanded or collapsed while accessing different nodes. When the latest step of the browse history is accessed, the **Forward** button is dimmed.

4.9. Window area

The charts in the tree are displayed in the window area. By default, they open on top of each other in the size of the full area. The titles of the windows are displayed in tabs at the top of the area.



Window_area.jpg

Figure 4.9-1 Window area

Click the selected tab to activate a window and to display it on top.

4.9.1. Adjusting window placement and docking

If you want to view more than one window at a time, you can position the windows in several horizontal or vertical tabs.

Vtrin can only display either horizontal or vertical leafs, each with its own tab at the top of the area. In the previous figure, the lower of the two leafs is marked with a red line.

The window placement and docking can be changed either via the **Window** menu or via the window tab pop-up list. The list can be accessed by right-clicking the window tab.

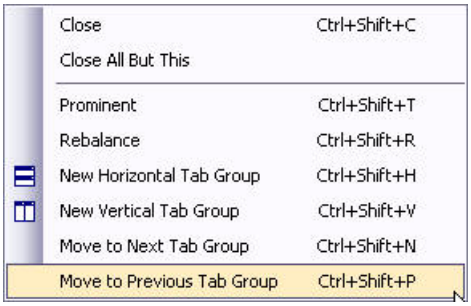
To move the active window to a new tab of horizontal (vertical) leaf using the **Window** menu:

- Select **Move to a New Horizontal Leaf** (**Move to a New Vertical Leaf**) from the **Window** menu. Other windows are also ordered in horizontal (vertical) tab groups.

To move the active window to the following (previous) horizontal or vertical tab using the **Window** menu:

- Select **Move to the Next Leaf** (**Move to the Previous Leaf**) from the **Window** menu.

Using the window tab pop-up list:



Window_docking_menu.jpg

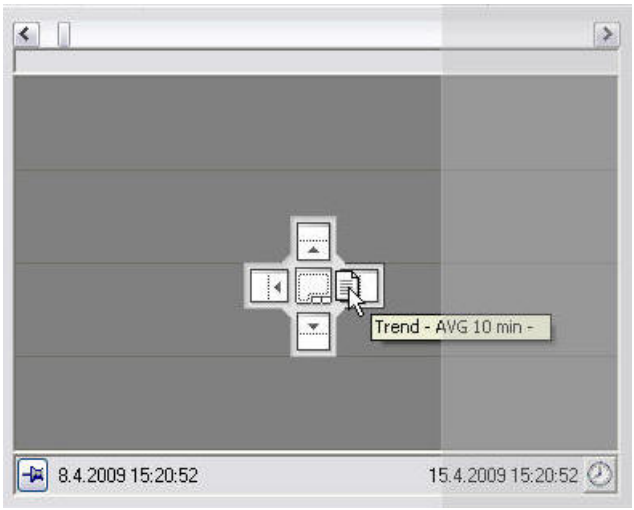
Figure 4.9.1-1 Moving the active window to a new tab using the pop-up list

Menu item	Description
Close	Closes the current window.
Close All But This	Closes all other windows excluding the current one.
Prominent	Shows only the current window on the whole window area. The tabs in the same tab group are left visible, whereas other tab groups are hidden. All tab groups are restored when **Prominent** selection is deactivated.
Rebalance	Resizes all visible windows. The window sizes are set equal within all rows and within all columns.
New Horizontal Tab Group	Creates a new horizontal tab group for the selected window. If the current tab group is horizontal, a new tab group is created under the current group. If the current tab group is vertical, the tab group is created inside the current window area, which is horizontally split in two.
New Vertical Tab Group	Creates a new vertical tab group for the selected window. If the current tab group is vertical, a new tab group is created beside the current group. If the current tab group is horizontal, the tab group is created inside the current window area, which is vertically split in two.

Menu item	Description
Move To Next Tab Group	Moves the window to the next tab group. If there are no more windows left in the former tab group, it will be dismissed.
Move To Previous Tab Group	Moves the window to the previous tab group. If there are no more windows left in the former tab group, it will be dismissed.

4.9.2. Changing window placement with drag and drop

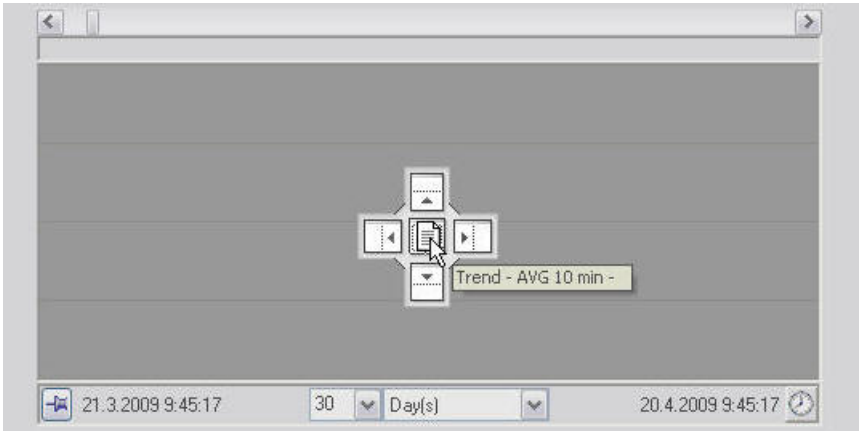
Any window can moved to another position on the window area by dragging it from the window tab. Place the mouse cursor on top of the window tab and move the mouse while holding down the primary mouse button. A docking helper will appear in the middle of the current view area.



Window_docking_helper.jpg

Figure 4.9.2-1 Docking helper

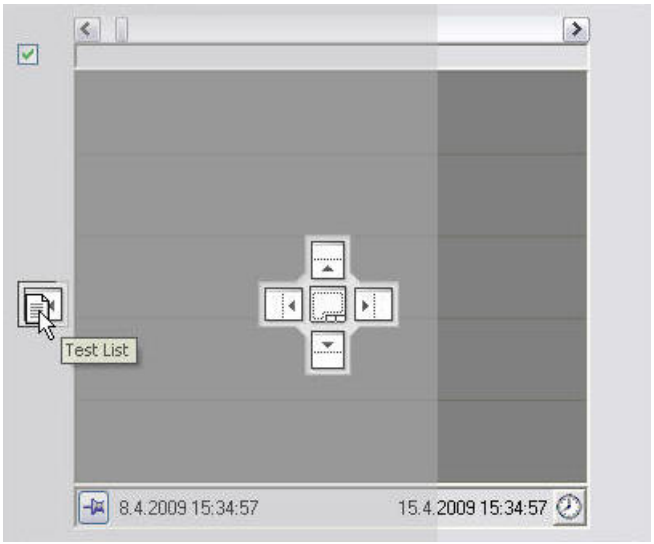
The figure above shows the docking helper, which is used to set a window to a new position. If the window is dropped on top of any of the four directional white rectangles, the dragged window is placed inside the target window area. The target window area is then split between the two windows in the desired direction and order.



Window_docking_helper_center.jpg

Figure 4.9.2-2 Dropping the window to the center of the docking helper

If dropped to the center area of the docking helper, the dragged window consumes the whole target window area and the replaced window is hidden under a tab.



Window_docking_helper_sidebar.jpg

Figure 4.9.2-3 Moving a window to a new tab group

Any window can also be moved into a new tab group. This is achieved by dropping the window onto any of the four docking helper rectangles on the far sides of the window area. A new tab group is created to the corresponding half of the window area with the contents of the dropped window.

4.10. Icons

The following table lists some of the most common folder and window icons found in the tree. Depending on the application, other icons can also be used.

Table 4.10-1 Tree icons

Icon	Description
	Equipment Model
	Maintenance
	Report
	History
	History of current values
	Stored procedures
	Table, List
	System Configuration
	SQL view
	Column chart
	Trend chart
	Process diagram
	Variable list
	Variable list, binary variable
	Variable list, integer variable
	Variable list, text variable
	User definition
	General icon for an open folder or window
	Display Bases to New Items

The icons of the variables indicate the variable type. Icons are used, for example, in the variable's **Status** window.

The following table lists the icons that are used for variables.

Table 4.10-2 Variable icons

Icon	Description
	Floating-point variable
	Binary variable
	Integer variable

Icon	Description
	Text Variable

The status icons and colors indicate the status of the variable's current value. The following table lists the icons and colors, as well as the icons depicting the direction of values.

Table 4.10-3 Status icons, status colors, and icons for the direction of values

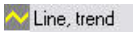
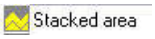
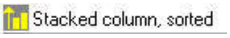
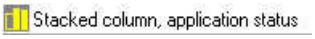
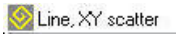
Icon	Description	Color
	The status icon flashes when the variable has an unacknowledged alarm	
	A critical alarm for the variable	
	A warning for the variable	**Yellow**
	A notification for the variable	**White**
	Invalid value	**Magenta**
	Questionable value	**Violet**
	Value substituted	**Blue**
	Value OK	**Green**
	Manually entered	
	Invalid source (reason for the invalid or substituted value)	
	Handling blocked (reason for the invalid or substituted value)	
	An increasing value, used in the variable's **Status** window	
	A decreasing value, used in the variable's **Status** window	
	A static value, used in the variable's **Status** window	

The chart item icons indicate the item type. They are used in the chart legend and in the **Properties** dialog for chart items. Chart items icons include the following:

Menu_chart_items.jpg

Figure 4.10-1 Menu chart

Table 4.10-4 Chart item icons

Icon	Description
 **Line, trend**	Icon for line plots. The color of the symbol in the icon corresponds to that of the plot and/or data point markers. The data point marker color is selectable.
 **Area**	Icon for area plots. The color of the symbol in the icon corresponds to that of the area and/or data point markers. The data point marker color is selectable.
 **Stacked area**	Icon for stacked area plots. The color of the symbol in the icon corresponds to that of the area and/or data point markers.
 **Stacked column**	Icon for stacked column series. The color of the icon corresponds to that of the columns.
 **Stacked column, sorted**	Icon for sorted stacked column series. The color of the icon corresponds to that of the columns.
 **Stacked column, application status**	Stacked column where the column color is based on application status. If application status is not available, the column color corresponds to that of the icon.
 **Application status**	Defines the color corresponding to application status.
 **Gantt**	Icon for Gantt charts. The color of the icon corresponds to that of the Gantt chart if no color condition has been defined or the condition is not fulfilled.
 **Gantt, status and color**	The color of a Gantt chart component when the color condition is fulfilled.
 **Line, XY scatter**	Icon for XY plots. The color of the symbol in the icon corresponds to that of the plot and/or data point markers. The data point marker color is selectable.
 **Info**	Icon for text rows. The icon background color is selectable.
 **Separator**	Icon for separator rows. The icon color is fixed.
 **Marker**	Marker icon. The marker for the data points is used as the icon and its color corresponds to that of the data points.

Icon	Description
 **Error indicator**	Shows that an error occurred when fetching chart item data.

The following table lists other icons used in Vtrin.

Table 4.10-5 Other icons

Icon	Description
	Vtrin
	User's PC
	Server
	Icon for the free start and end time of an interval, used, for example, in charts. Click the icon to lock the time.
	Icon for the locked start and end time of an interval, used, for example, in charts. Click the icon to unlock the time.
	Icon for the updated end time of a time span, used, for example, in charts. Click the icon to lock the time. The time changes into an updated pin by double-clicking.
	Iconizes the window that is displayed with the cursor.
	Closes the window.

The shape of the pointer depends on the task and, in the chart area, also on your selections.

The following table lists the pointer icons.

Table 4.10-6 Pointer icons

Icon	Description
	Pointer displayed in normal situations when you move the mouse or point at, for example, a current value or plot in charts. (Arrow selected)
	Pointer displayed in normal situations when you move the mouse or point at, for example, a current value or plot in charts. (Arrow and crosshair selected)
	Pointer displayed in normal situations when you move the mouse or point at, for example, a current value or plot in charts. (Crosshair selected)
	Pointer displayed when you point at a link in a chart.
	Pointer displayed when you copy or move an item by dragging.
	Pointer displayed when you drag an item over an area where it cannot be dropped.

Icon	Description
	Pointer displayed when you change the size of different areas on the screen.

5. Charts

The graphical information in Vtrin displays is shown in charts. Charts can contain various graphical elements, such as pictures, graphs, plots, value controls, and text blocks.

This chapter describes various properties of the chart display on a trend display template.

Description of charts

The chart window described here covers the chart shown in Figure 5-1. All charts do not include all the properties described here. The properties can also be located in different parts of the window.

Charts are located in application-specific tree folders. To open the chart window, click its icon or name of the tree node.

The chart window described here has the following parts:
- a tab
- a title bar
- a time scroll bar
- a time ruler
- scaling limits
- a plot area
- an interval row
- a legend

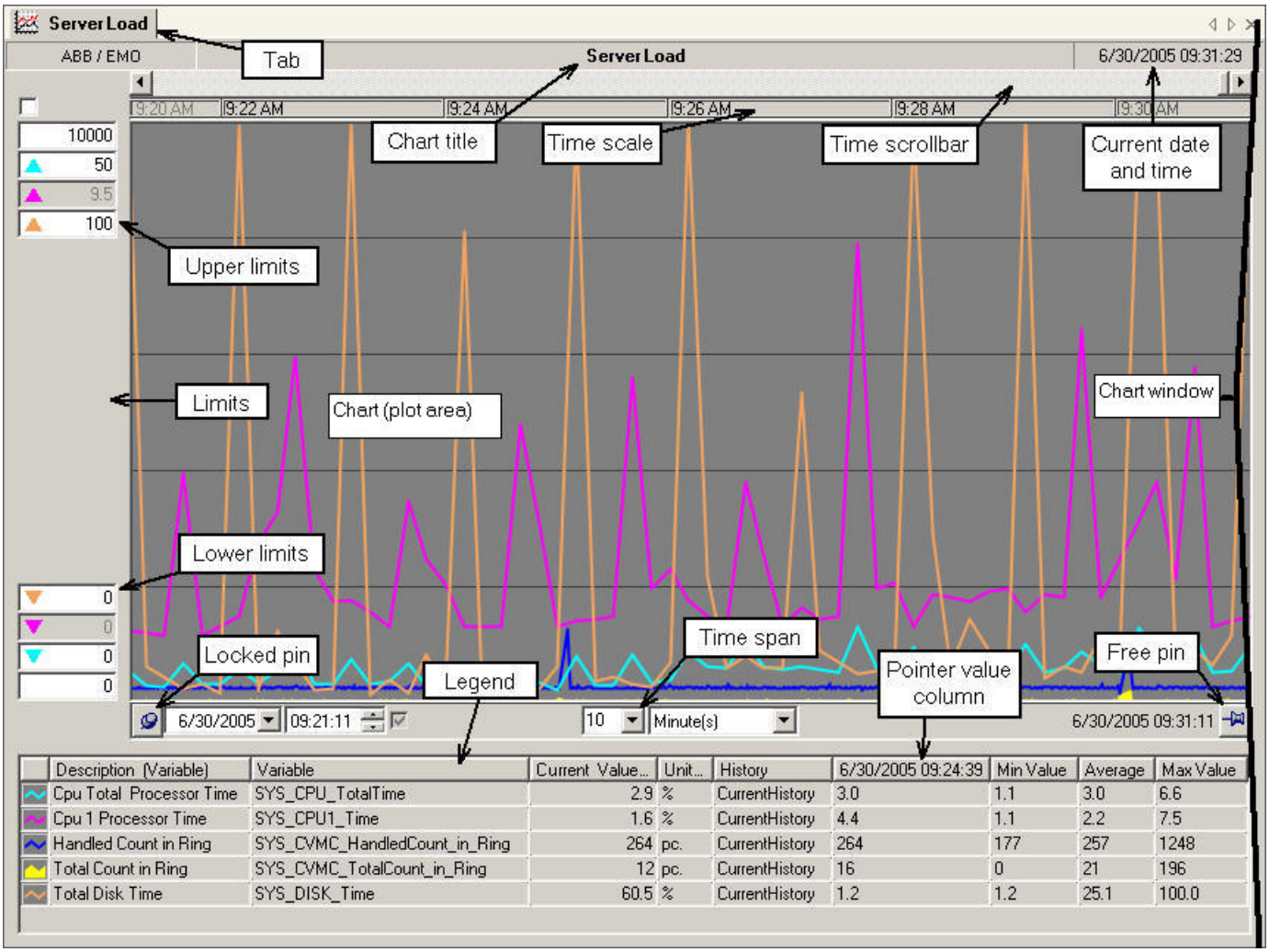
The tab displays the name of the chart window. When you point to the name, the program displays a tool tip that shows the location database of the chart and its call path. A close button with which you can close the active chart window is located at the right end of the tab row. The title bar of the chart window shows the company/department name, the chart title, as well as the current date and time. The chart author specifies the company/department name and the diagram title.

The plot area displays different kinds of trends and column graphs.

The legend contains rows displaying information on the variables in the plot area. It can also contain text and separator rows.

The scaling limits show the upper and lower limits of the graphs in the plot area.

Chart window



Chart_Window.jpg

Figure 5-1 Chart window

Chart window terms	Description
Tab	The text displays the name of the chart.
Plot area	See 5.1, Plot area.
Chart title	The default title of the chart window is the name that the chart has in the tree. You can edit the name in the title area, if you have sufficient rights.
Time ruler	See 5.6, Time scale.
Time scrollbar	See 5.5, Time scroll bar.

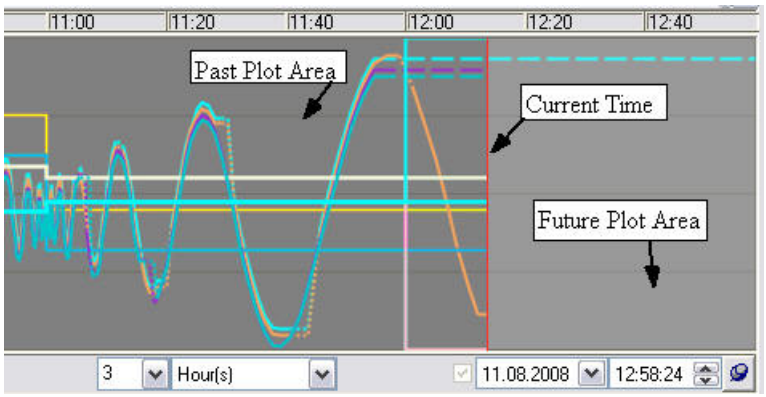
Chart window terms	Description
Current date and time	
Upper scaling limits	See 5.3, Scaling limits.
Scaling limits	See 5.3, Scaling limits.
Lower scaling limits	See 5.3, Scaling limits.
Locked pin	See 5.4, Time bar.
Legend	See 5.2, Legend.
Time bar	See 5.4, Time bar.
Time span	See 5.4, Time bar.
Pointer value column	See 5.1.3, Viewing trend values.
Free pin	See 5.4, Time bar.

5.1. Plot area

The plot area displays the graphs of variables, such as line plots, area plots, and column series, usually as a function of time.

Description of plot area

The plot area is located below the time scroll bar and the time ruler. A chart window can contain more than one plot area.



Past_and_Future_Plot_Area2.jpg

Figure 5.1-1 Past and future plot area

The plot area is divided into Past and Future areas, with the red line denoting the present. A plot area can also be limited to showing the past only, or the future only.

To view the values of the graph, place the pointer over the graph. The tool tip box shows the value, time stamp, and status of the data point closest to the left of the pointer (See 5.1.1, Viewing the value of the graph in the tool tip box).

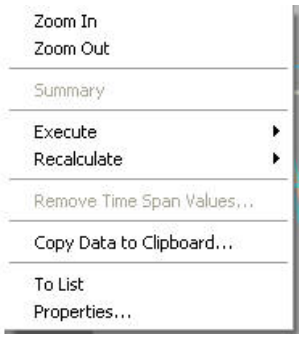
Moving the pointer in the plot area displays the time and all the calculated values of line and area plots in the pointer's location. The Pointer Value column must be selected in the legend (See 5.1.3, Viewing trend values).

You can also zoom in to view a certain part of the time span in more detail. Zooming in moves the left side of the selected time span to the left side of the plot area and the right side of the time span to the right side of the plot area. You can zoom in repeatedly.

Zooming out cancels the effects of zooming in, step by step. To return to the original view, zoom out as many times as you zoomed in.

With the chart pop-up menu you can also view summary values of the plots, view trend values, zoom the plot area, copy data to the clipboard, and change the chart format to list or graph.

Only those options that are possible for your selection are active.



Popup_menu.jpg

Figure 5.1-2 Chart pop-up menu

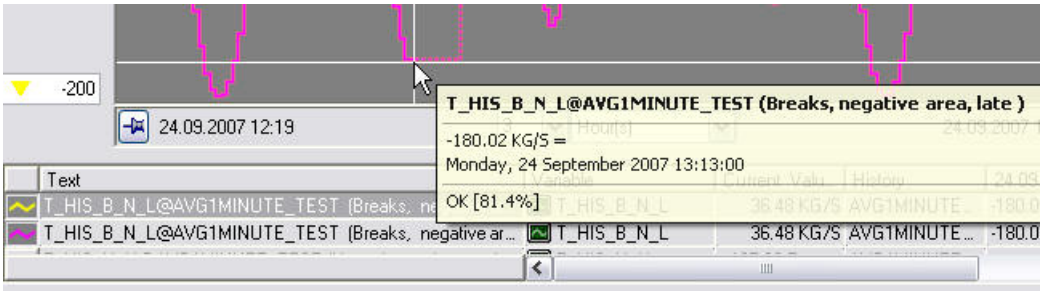
Table 5.1-1 Pop-up menu items

Item	Description
Zoom In	See 5.1.4, Zooming in.
Zoom Out	See 5.1.5, Zooming out.
Summary	See 5.1.2, Viewing summary values.
Execute	Startup of applications defined in the system.
Recalculate	Startup of applications defined in the system.
Copy Data to Clipboard	See 5.1.6, Copying data to clipboard

To List	Changes the chart from a graph to a list format. See 5.1.7, Converting chart to list or graph.
To Graph	Changes the chart from a list to a graph format. See 5.1.7, Converting chart to list or graph.
Properties...	Open chart definitions.

5.1.1. Viewing the value of the graph in the tool tip box

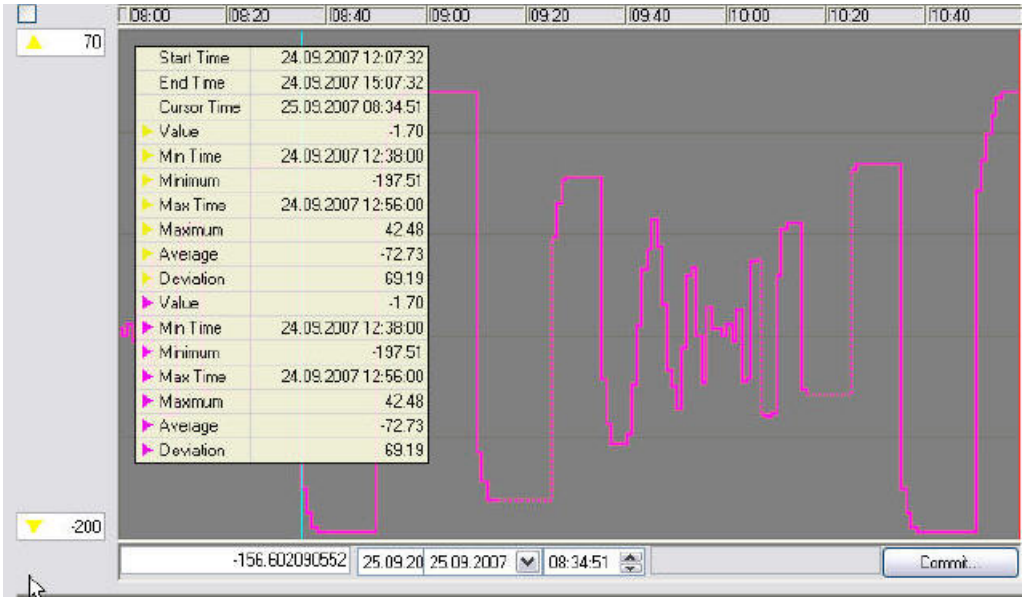
- Point to a part of the graph and wait for a moment. A tool tip, showing the content of the legend text column (usually a description of the variable) and the unit of the variable, as well as the retrieved history data (value, time and status), is displayed next to the pointer. The history data is the data of the data point closest to the left of the pointer.



Tooltip_and_trend_value_line.jpg

Figure 5.1.1-1 Tool tip and trend value line

5.1.2. Viewing summary values



Tooltip_summary_in_trend_2.jpg

Figure 5.1.2-1 Tool tip summary in trend

Click the mouse at the desired location in the plot area. A turquoise vertical trend value line is displayed in the location of the pointer. Its location is fixed in relation to the plots and it moves with the plots when they are refreshed.

Cursor time and value rows are refreshed automatically by clicking the mouse. For example Start time, End time, and Minimum, however, are caught from the data when the display is called or when the data is refetched by command. Thus they are not automatically refreshed.

Table 5.1.2-1 Summary items

Item	Description
Summary	Right-click in the plot area and select **Summary** from the popup menu. The window shown opens. It shows plot values at the trend value line for all plots on the screen, as well as the minimum, average, maximum, and deviation values calculated from the plot points.
Start time	Start time from the display call.
End time	End time from the display call.
Cursor time	Time corresponding to the desired location.
Value	Value corresponding to the desired location.
Minimum	Minimum during the time span between the start and end time.
Maximum	Maximum during the time span between the start and end time.

Item	Description
Average	Average during the time span between the start and end time.
Deviation	Deviation during the time span between the start and end time.

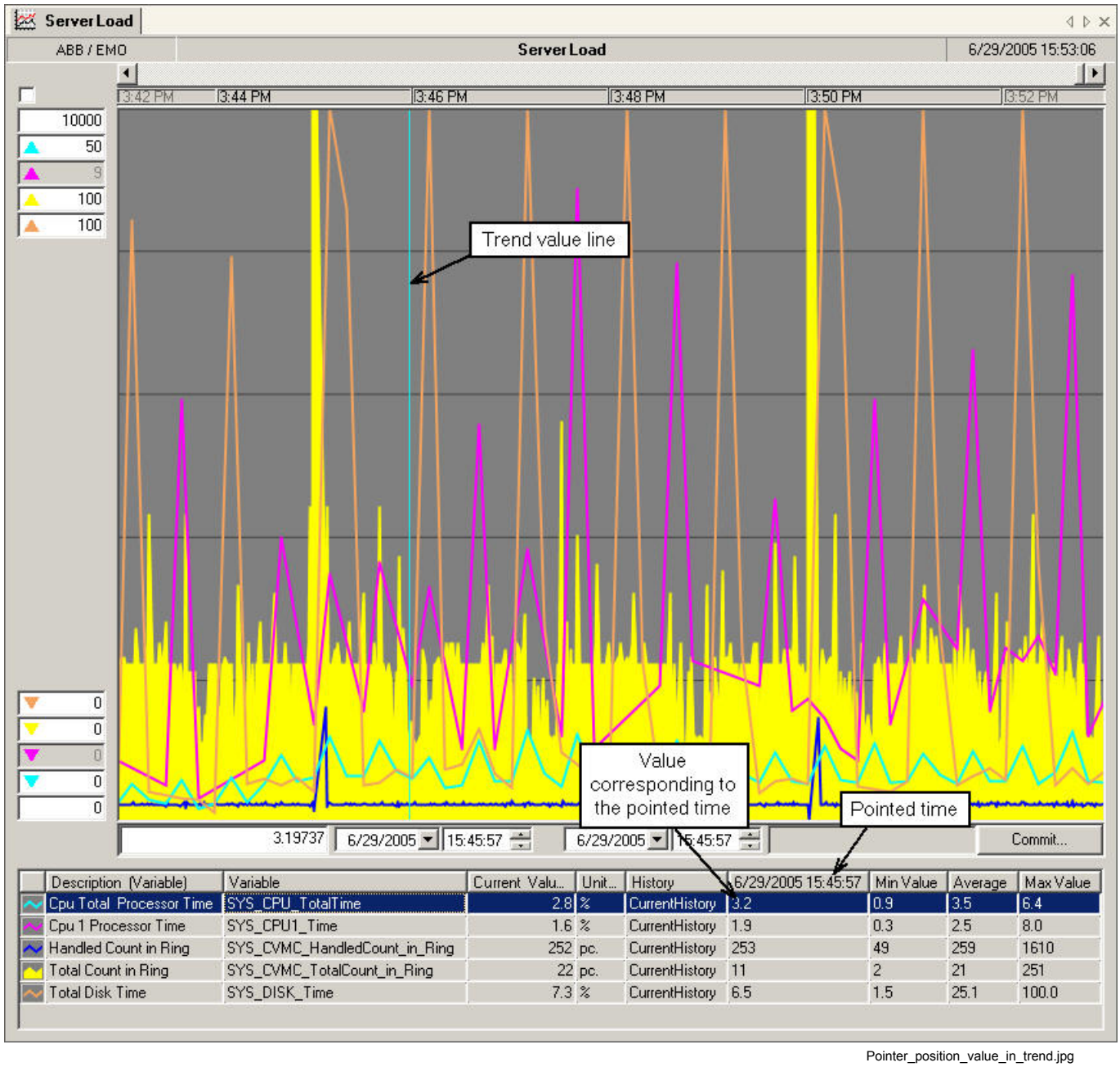
5.1.3. Viewing trend values

1. Place the pointer in the plot area and move it so that the vertical line of the crosshair pointer (assuming that the crosshair has been selected in the chart window) is in the spot you want to see. The location of the horizontal line is unimportant.
2. Click the mouse. A turquoise vertical trend value line is displayed in the location of the pointer. Its location is fixed in relation to the plots and it moves with the plots when they are refreshed. The time and values in the legend do not follow the pointer's movements, but instead show the data pertaining to the selected point.
   Clicking anywhere in the plot area makes the trend value line disappear. The data in the legend starts following the pointer movements again.
3. If you click again in the plot area, a new trend value line with time and variable values are displayed.

Viewing trend values in variable value points using arrow keys:

1. Select a variable from the legend.

2. Click on the chart to select time. Turquoise vertical line appears indicating the selection.
3. Left and right arrow keys move the turquoise line from one value point to another showing new trend value and time for each point.



Pointer_position_value_in_trend.jpg

Figure 5.1.3-1 Pointer position value in trend

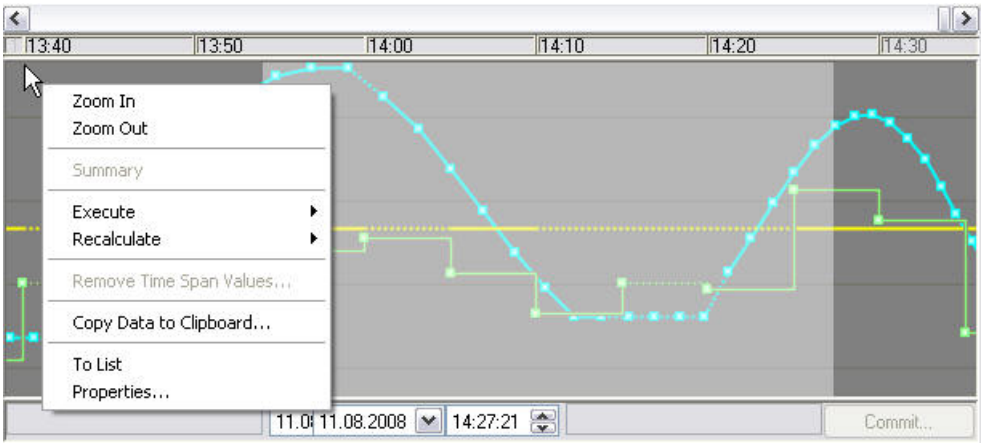
Table 5.1.3-1 Display items

Item	Description
Trend value line	The trend value line shows the values corresponding to the selected time.
Pointed time	The column shows the values corresponding to the selected time.
Value corresponding to the pointed time	The column shows the value at the time of the selected trend value line or, if the line has not been selected, the value at the time which the cursor points to.

5.1.4. Zooming in

To define the area you want to zoom in:

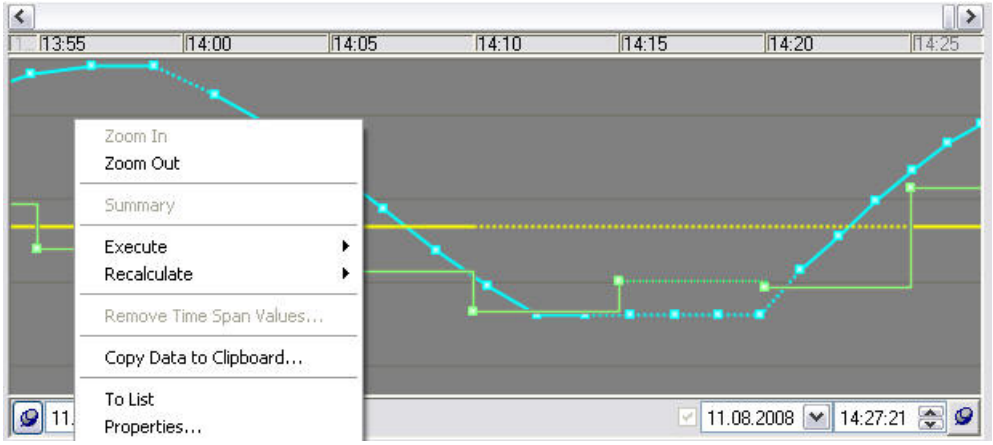
1. Place the pointer in the plot area, move it to the left side of the area and press and hold the mouse button.
2. Drag the pointer to the right side of the selected area. The selected area is highlighted.
3. Release the mouse button.
   If the text boxes displayed on the time span row show the start and end time of the selected area, the history update bar has been defined and you can change the start and end times.
4. Right-click in the plot area and select **Zoom In** from the pop-up menu. The selected time span now fills the entire plot area. The time span is locked, the pins are pushed down, and the interval and curves are no longer refreshed.



displayterms.jpg

Figure 5.1.4-1 Display terms

To refine the selection, modify the start and end times in the boxes. The highlighted area changes accordingly.



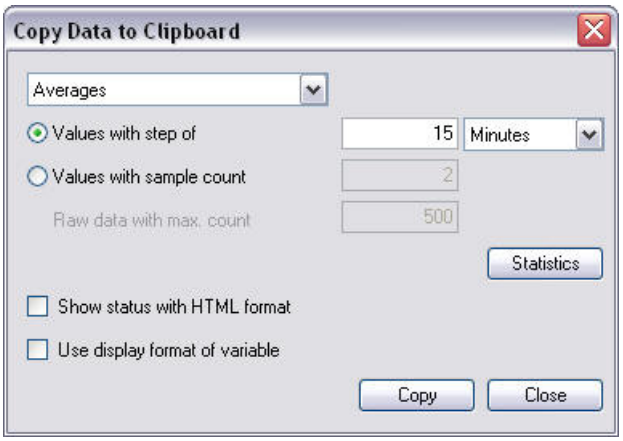
Zoom_out.jpg

Figure 5.1.4-2 Zoom out

5.1.5. Zooming out

1. Right-click in the plot area and select **Zoom Out**.
2. The **Zoom Out** command can be selected as long as the number of zooms in commands is larger than the number of zoom out commands. To return to the original state, zoom out until the **Zoom Out** command is disabled.
3. Release the time span by clicking pins ( ). This re-enables the refreshing of the time span and the graphs (at the end double-click, in which case the pin statuses on the updated display should be --).

5.1.6. Copying data to clipboard



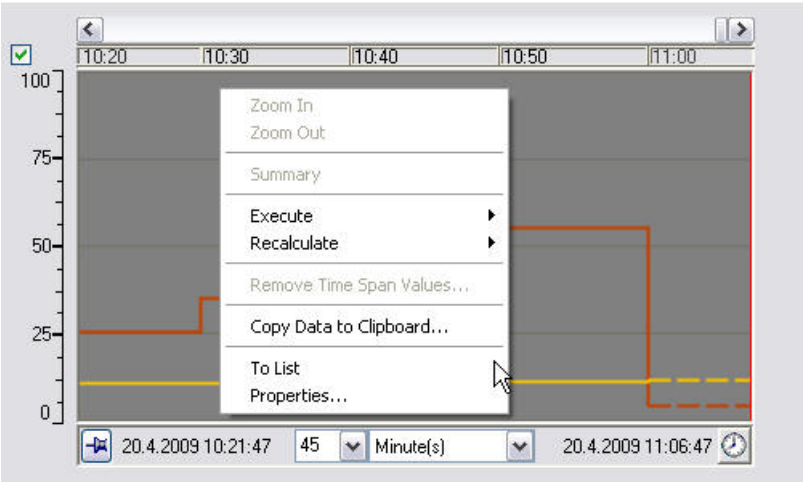
Copy_Data_to_Clipboard.jpg

Figure 5.1.6-1 Copying data to clipboard

Table 5.1.6-1 Clipboard actions

Action	Description
Copy Data to Clipboard	The Copy Data to Clipboard dialog is displayed with chart pop-up menu.
Averages	Picks the average values of the chosen intervals.
Begin values	Picks the values at the beginning of the chosen intervals.
Raw data	Picks a chosen number of sample values (with max. count only)
Values with step of	The number of retrieved data samples is defined based on a time interval (default) The samples are interpolated.
Values with sample count	The number of retrieved data samples is defined based on a sample count. The samples are interpolated.
Statistics	Exports the data to a statistical application (Not applicable to raw data).
Time value	The interval used to sample the variable. The default value is the "width of the column" defined in the display.
Time unit	The unit of interval.
Number of samples	The number of samples taken from the variable.
Show status with HTML format	No significance in the Statistical Tool (selected).
Use display format of variable	No significance in the Statistical Tool.

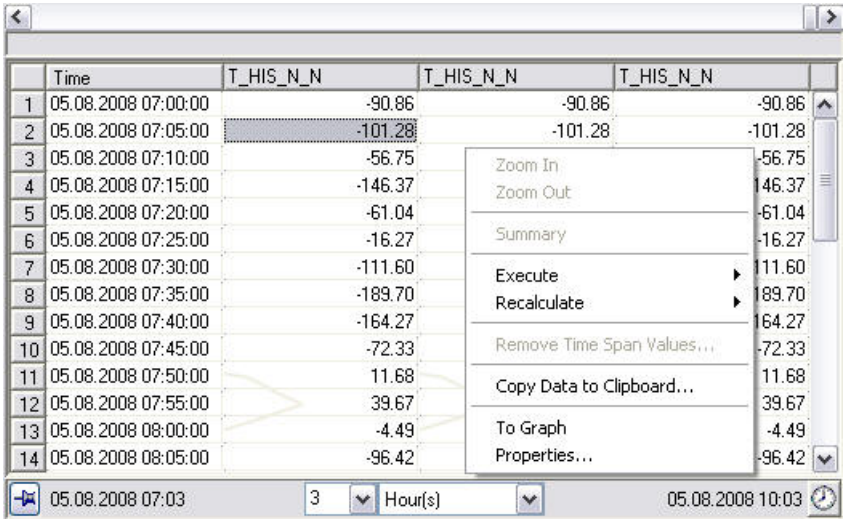
5.1.7. Converting chart to list or graph



Chart_to_list.jpg

Figure 5.1.7-1 From chart to list display

To List: In the chart pop-up menu, the To List -command converts the chart from a graphic format into a list format.



List_display.jpg

Figure 5.1.7-2 From list to chart display

To Graph: When in a list format, the To List -command is replaced by a To Graph -command. It converts the chart back into a graphic format.

The time interval for retrieving samples is determined in **Properties**.

5.2. Legend

The legend shows data related to variables displayed on the chart area. It can also show data for items without chart visualization.

Description of legend

The legend is located below or to the right of the chart area. There is always one legend for each chart.

For trend charts, the legend is usually located below the chart area. This positioning gives more space for multiple columns.

For column charts, the legend is usually located on the right side of the chart area. This gives more space for multiple rows.

The graphic type of the variable item is displayed as an icon in the first column of the legend. The color of the icon is the same as the color of the item in the graph. The icons are shown in Table 4.10-4.

The legend can be configured to display a variety of information on the variables, such as:
- variable names
- aliases
- IDs
- descriptions
- current values
- units of current values
- the names of the tables from which the values of past and future times are retrieved.

In the case of line and area plots, the legend can display the (trend) values in the pointer's location.

The legend can include text and separator rows:
- A text row presents variable data without a drawn graph.
- A separator row is a blank row.

The icons for text and separator rows are shown in Table 4.10-4.

You can change the following legend display settings:
- To display columns or item rows that do not fit in the screen area, scroll with the scroll bar at the bottom or on the side.
- To fit more columns on the screen, reduce the width of each column.
- Change the order of columns by dragging them.

This action does not apply to the icon column, since it has a fixed position.

- To hide a graph temporarily from the plot area, click the item type icon on the variable's row. You can display the graph again by clicking the icon again.
- Edit the variable of the plot in its column and/or in the history column.

You can select one or several variables for editing. If you select several variables, they must be located next to each other in the same column of the legend rows.

To select one variable:
- Click the variable column on the row. The selected variable row is now highlighted and the background color of the selected column is turned darker.

To select several variables:
- Click the outermost (lowest or topmost) variable column on the row you want to include in the selection. The selected variable row is now highlighted and the background color of the selected column is turned darker.
- Press SHIFT and click the other outermost variable column of your selection. All the selected rows are now highlighted.

You can now edit the variables in the column.

To edit a variable column:

- Select the variables in the column as instructed earlier. An arrow indicating a drop-down menu appears in the last row selected.
- Click the arrow to open the drop-down menu.
- Select a variable by clicking its name in the menu.
- All the highlighted variables are now changed into the variable you selected.

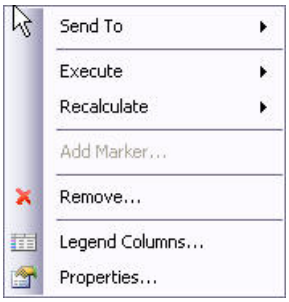
5.2.1. Pop-up menu

When editing selected variable items, you have the following options in the pop-up menu: **Send to**, **Execute**, **Recalculate**, **Remove**, **Legend Columns**, and **Properties**.

To edit a selected variable item or to execute a selected function:

- Open a pop-up menu by right-clicking the row.
- Select the desired option from the pop-up menu OR from the function buttons above the menu.

Only options that are possible for your selection are active.



Menu_legend.jpg

Figure 5.2.1-1 Legend menu

Table 5.2.1-1 Menu items

Item	Description
Send to	Opens a menu with variable specific displays defined in the system.
Execute	Startup of applications defined in the system, see 5.7.2, Scenario operations.
Recalculate	Startup of applications defined in the system, see 5.7.4, Activating recollection of all variables in a history table.
Add Marker	Opens a property dialog, where you can add a new marker to the chart items at a selected time.

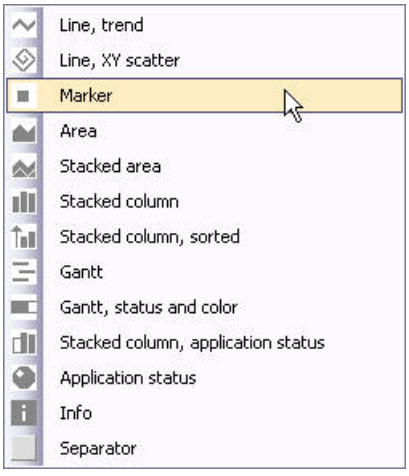
Item	Description
Remove...	Removes the chart items whose rows you clicked from the plot area and from the legend in question.
Legend Columns...	Opens the **Legend Columns** dialog, where you can define the data to display in the column and its order.
Properties...	Opens the chart item's **Properties** dialog where you can edit the item's properties.

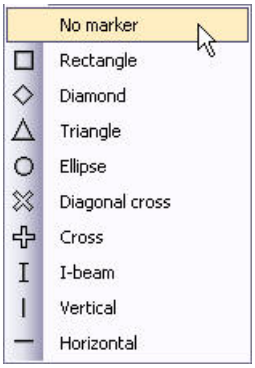
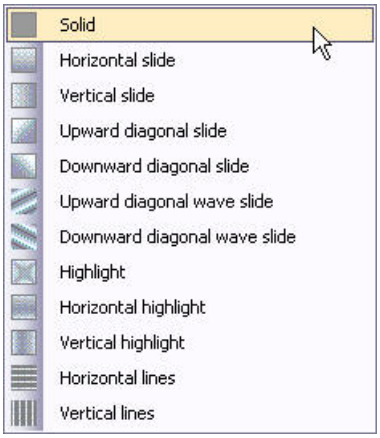
With the function buttons you can change the item visibility, item type, marker type, limit type, item fill style, and color settings.

Legend_menu_upper.jpg

Figure 5.2.1-2 Functions in the legend

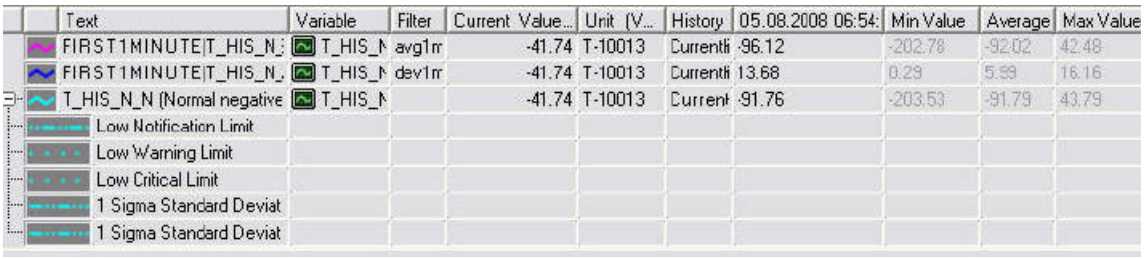
Table 5.2.1-1 Function buttons for adjusting the chart item properties

Button	Description
Buttons in the upper row	
	Item visibility Shows the status of visibility (on/off) currently in use. To change the status, click the button.
	Item type Shows the item type currently in use. To change the item type, click the button.
	Item type options • Line, trend • Line, XY scatter • Marker • Area • Stacked area • Stacked column • Stacked column, sorted • Gantt • Gantt, status, and color • Stacked column, application status • Application status • Info • Separator

	Marker type Shows the marker type currently in use. To change the marker type, open a pop-up menu from the right corner arrow.
	Marker type options • No marker • Rectangle • Diamond • Triangle • Ellipse • Diagonal cross • Cross • I-Beam • Vertical • Horizontal
	Scaling limit type Shows the scaling limit type currently in use. To change the limit type, open a pop-up menu from the right corner arrow.
	Scaling limit type options • Individual • Automatic • Common
	Properties Press Properties to open the Properties window.
Buttons in the lower row	
	Item fill style Shows the item fill style currently in use. To change the item fill style, open a pop-up menu from the right corner arrow.
	Fill style options The pop-up shows the fill style options and the icons related to these options. • Solid • Horizontal Slide • Vertical slide • Upward diagonal slide • Downward diagonal slide • Upward diagonal wave slide • Downward diagonal wave slide • Highlight • Horizontal highlight • Vertical highlight • Horizontal lines • Vertical lines

	Color information (Item color / Item secondary color / Chart background color) The three color boxes show the following information (from left to right): • Item color: the color in which the selected item is presented in the chart. • Item secondary color: • Chart background color: the color in which the background of the chart is presented.

5.2.2. Legend columns



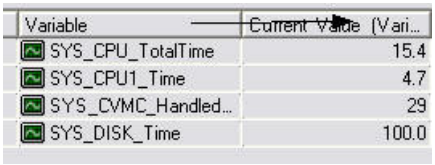
Legend2.jpg

Figure 5.2.2-1 Legend

The data available for the legend is determined by the data sources specified on chart definitions. The calculated data is available from RTDB process history only.

Changing the order of legend columns

You can change the order of columns by pointing a column heading and then dragging the column either to right or left in the table. Exceptionally the column of the item, icon, and the subcolumns for the limits and statistics are fixed.



List_sorting_titles.jpg

Figure 5.2.2-2 List sorting titles

The following tables describe the legend data associated with the data retrieved from the database via the chart. Different types of charts produce different default settings for the legend.

On a chart display, a single plot item can comprise the data of one or two past and future time parameters set, including, for example, the variable and history table from which

the variable data is retrieved. As the column headings are often the same, an additional attribute related to the heading is used to specify the data source as follows:

Table 5.2.2-1 Abbreviations used in the legend column headers

Abbreviations used in the legend column headers
F = Future
P = Past
I = Item

For general graph types, the headers of the columns related to the first history data (e.g. "Variable") and the headers of the respective calculated value columns (for example, "Average") are shown without any abbreviation ("P", "I"). The headers related to the first future data begin with the letter "F" (for example, "F Variable").

The second history data and the second future data are used only for the "XY-scales" and the "Ordered stacked column" graph types. The abbreviations in these cases are "P2" for the second history data headers and "I2" for the headers of the calculated value columns of the second history data. The abbreviation "F2" (for example, "F2 Description (Variable)") specifies the columns related to the second future data.

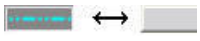
The columns that are typically used in a legend are related to the first history data and the respective calculated values (see Table 5.2.2-2).

Table 5.2.2-2 List of the generally used columns in the legend

Column header	Description
Item icon	The item’s type as an icon. The column position of this is fixed. The icons used are described inTable 4.10-4 in 4.10, Icons.
Text	The variable’s description in the database, if the data is retrieved from process history; otherwise the search specification (source and retrieved attributes) or a freely selected text created by the definer.
Description	A description text for the variable (or the history where the data is retrieved from).
Variable	The variable’s name in the database. You can change the active variable here.
Alias	The alias of the variable in the database.
Unit	The unit of the variable’s current value in the database.
History	The history table where the data is retrieved from. You can change the active history here.
Current value	The variable’s updated current value.

Column header	Description
Pointer value	If trend values have been requested for the chart, the time pointed to is displayed in the column heading and the column's rows show the corresponding calculated values. For linear plot styles, the trend value is created by interpolating. If step styles, the trend value is the actual value of the point. The unit of the trend value in the sum and integral tables does not equal the unit of the current value shown in the legend.
Lower limit	The individual lower scaling limit of the variable's plot area.
Upper limit	The individual upper scaling limit of the variable's plot area.
Average	The average of the values retrieved to the screen. This value is not refreshed automatically on the screen.
Deviation	The deviation of the values retrieved to the screen. This value is not refreshed automatically on the screen.
Minimum	The minimum of the values retrieved to the screen. This value is not refreshed automatically on the screen.
Maximum	The maximum of the values retrieved to the screen. This value is not refreshed automatically on the screen.
Filter	The filtering syntax currently applied to the variable. See 5.2.3, Using the filter functionality for more information.

Table 5.2.2-3 Activation buttons

Button	Description
	To temporarily hide an item and its subitems in the plot area, click its icon in the legend. The icon changes into the same color as the background while the item row is dimmed. Clicking the icon again displays the plot and the row is visible again.
	Subitem is a limiter statistic item associated with a main item. All its parameters are defined on the main item. The icon of the subitem shows its graph style in the plot area. To temporarily hide the subitem in the plot area click its icon in the legend. Clicking the icon again displays the plot.

Button	Description
	You can drag the legend's items (rows) to change their order. This also changes the order of curves in the plot. This is useful, for example, if the plot of a variable you want to view is behind other plots. You can also temporarily hide the plot that covers the one you are interested in or change the plot area limits of variable items.
	Buttons used to hide or reveal the 'Limits' and 'Statistics' items.

5.2.3. Using the filter functionality

The filter column provides a very flexible interface for modifying the display of any of the selected variables. The key principle is that the user can define a filter to perform the desired operations by typing in the keywords defined in the filter syntax. The syntax and keywords are described in the following paragraphs and tables.

The syntax consists of a filter selection part and the time period part. For example "AVG10MIN" calculates and shows the averages over ten minute time spans. Several filters can also be applied one after another. They are separated with the symbol "|", for example "AVG1MIN|MAX1H" produces the hourly maximum values from the one minute average values.

Vtrin automatically changes history tables, if this optimizes the search. You can set off this optimization by starting with an empty filter, that is, the "|" sign. For example, "AVG1MIN" is optimized while" |AVG1MIN" is not optimized.

To enter the desired filter syntax, double-click the filter field of the selected variable. This opens the field in editing mode. You can now type in the desired filter. A drop-down menu appears after the first character is typed showing all filter keywords beginning with the letter. Erase all letters typed to retrieve all available filter types.

To remove the filter press **Delete** or erase the field empty and press **Enter**.

If no time period is defined, the filter takes the whole visible time period as input. Thus, for example, "AVG" produces the average over the selected time period. To apply the filter with a selected time period append the filter syntax with a number and one of the pre-defined time identifiers. For example, "AVG10MIN" returns the ten minute averages for the selected time period.

Table 5.2.3-1 The set of available filters

AAVG	Arithmetic Average

ADEV	Arithmetic Deviation
ADEVP	Arithmetic Deviation of Entire Population
AMEDIAN	Arithmetic Median
AMODE	Arithmetic Mode
AVARIANCE	Arithmetic Variance
AVARIANCEP	Arithmetic Variance of Entire Population
AVG	Time Weighted Average
AVGRAW	Raw Time Weighted Average - ignoring the invalidity of values
CALC	User Defined Calculation. E.g. CALC(y*2) returns values doubled and CALC(y > 0 ? 10:20) returns 10 if y > 0, otherwise return 20. See the chapter below for supported constants and functions.
COUNT	Count of Samples Within Period
COUNTG	Count of Good Samples Within Period
COUNTI	Count of Invalid Samples Within Period
COUNTQ	Count of Questionable Samples Within Period
COUNTS	Count of Substituted Samples Within Period
CONVERT	Converts Values to User Specified Unit, for example CONVERT(hp) can be used to get horse powers out of kilowatts.
CUMSUM	Cumulative Sum
CUMSUMTO-DOUBLE	Cumulative Sum to Double Value
DELTA	Last Sample In Period minus First Sample In Period
DEV	Time Weighted Deviation
DUR	Duration = Period Length (changes only upon daylight savings or with month periods)
DURG	Good Duration as a TimeSpan Within Period
DURI	Invalid Duration as a TimeSpan Within Period
FIRST	First Value of a Period
FFT	Fast Fourier Transform of input data
HISTOGRAM	Histogram of input data
INTSEC	Time Integral in Seconds
INTMIN	Time Integral in Minutes
INTHOUR	Time Integral in Hours
LAST	Last Value of a Period
MAX	Maximum Value of a Period, TimeStamp is the Value Time
MAXPT	Maximum Value of a Period, TimeStamp is the Period Time
MIN	Minimum Value of a Period, TimeStamp is the Value Time

MINPT	Minimum Value of a Period, TimeStamp is the Period Time
OPTIME	Operating Time. Requires a parameter, e.g. OPTIME10MIN(>5) calculates the time the value has been greater than 5.
PERG	Percent of Good Samples (0-1)
PERI	Percent of Invalid Samples (0-1)
RANGE	Maximum Value Within a Period minus Minimum Value Within a Period
STABILITY	Stability Graph
STARTUP	Startup Count - requires a parameter. E.g. STARTUP5MIN(>5) calculates the number of occurrences the value has increased from less than or equal to five to greater than five
SUM	Sum of Values Within a Period
SUMRAW	Raw Sum - Ignoring the Invalidity of Values
SUMTODOUBLE	Sum of Values Within a Period Calculated to Double - Use If There is a Risk of Overflow
VARIANCE	Time Weighted Variance
WHEN	Conditional fetch of values. Returns requested values when given conditions are greater than zero. Syntax: *WHEN(Class=...;Property1=...;Property2=...; ...etc... PropertyN=...;xProperty=...;yProperty=...;Filter=...)* See Using the WHEN Filter for more detailed information.

Table 5.2.3-2 The set of available time identifiers

Time identifier	**Description**
TICKS, HUNDREDNANOSECONDS	Hundred nanoseconds
MICROSECOND, MICROSECONDS	Microseconds
MS, MSEC, MILLISECOND, MILLISECONDS	Milliseconds
S, SECOND, SECONDS	Seconds
MIN, MINUTE, MINUTES	Minutes
H, HOUR, HOURS	Hours, local time
H_UTC, HOUR_UTC, HOURS_UTC	Hours, UTC time
D, DAY, DAYS	Days, local time
D_UTC, DAY_UTC, DAYS_UTC	Days, UTC time

Time identifier	Description
MON, MONTH, MONTHS	Months, local time
MON_UTC, MONTH_UTC, MONTHS_UTC	Months, UTC time
Y, YEAR, YEARS	Years, local time
Y_UTC, YEAR_UTC, YEARS_UTC	Years, UTC time
PL, PLEN, PERIODLENGTH	Source data period lengths. E.g. if the source data is AVG5MIN, AVG2PLEN produces data that has been averaged over 10 minutes (AVG5MIN | AVG2PLEN equals AVG10MIN).

Supported constants and functions in the CALC Filter

Supported constants:
- y = the current y value
- x = the current x value
- PI = pi
- e = natural logarithmic base
- prevy = previous y value, for the first value in result set this is the same as y
- prevyz = previous y value, for the first value in result set this is zero
- prevx = previous x value, for the first value in result set this is the same as x
- prevcy = previous calculated y value (result of the calculation of previous values)
- periodlength = period length in 100 nanosecond units
- goodtime = time the value has not been invalid (representativeness affects too)
- meantime = x-prevx

Supported functions:
- abs(x) = absolute value of x
- acos(x) = arcus cosine of x
- asin(x) = arcus sine of x
- atan(x) = arcus tangent of x
- ceiling(x) = x rounded to next greater integer value
- cos(x) = cosine of x
- cosh(x) = hyberbolic cosine of x
- exp(x) = returns e raised to specified power
- floor(x) = x rounded to next smaller integer value
- log(x, y) = returns base y logarithm of the specified number
- log10(x) = returns base 10 logarithm of the specified number
- max(x, y) = if x > y, returns x, else y
- min(x, y) = if x < y, returns x, else y
- pow(x,y) = returns x raised to power of y
- rand(x) = returns a random number from 0 to x

- rem(x, y) = returns the remainder of x divided by y
- round(x) = rounds x to closest integer value
- rounda(x, y) = rounds x to y decimals, away from zero
- rounde(x, y) = rounds x to y decimals, to even
- sign(x) = returns 1 or -1 depending on the sign of the number
- sin(x) = sine of x
- sinh(x) = hyperbolic sine of x
- sqrt(x) = square root of x
- tan(x) = tangent of x
- tanh(x) = hyperbolic tangent of x
- truncate(x) = truncates the decimal part of the x away

Using the WHEN Filter

The **WHEN** Filter can be used for conditional fetch of values. The filter returns the requested values, when conditions given as arguments are greater than zero.

Syntax: *WHEN(Class=...;Property1=...;Property2=...; ...etc... PropertyN=...;xProperty=...;yProperty=...;Filter=...)*

No argument is compulsory. There can be 0-N properties of the given class used as conditions. Default value for "Class" is "ProcessHistory", which is used, if the "Class" argument is left empty. Available classes are the same as the sources for a trend. Properties are the same as the properties for the trend sources. For example, a first property can be "Variable" and a second property can be "History" for the "ProcessHistory" class. Filter can be any valid filter operation.

Example use 1:

WHEN(Class=ProcessHistory;Variable=SYS_CPU_TotalTime;xProperty=Time;yProperty=Value;Filter=CALC(y>20))

The clause above returns the "CPU Total time" variable's values when the value is greater than 20.

Example use 2:

WHEN(Variable=SYS_CPU_TotalTime;Filter=CALC(y>20))

Returns the same values as Example 1, as the only difference is the lack of default values.

Calculated Trend

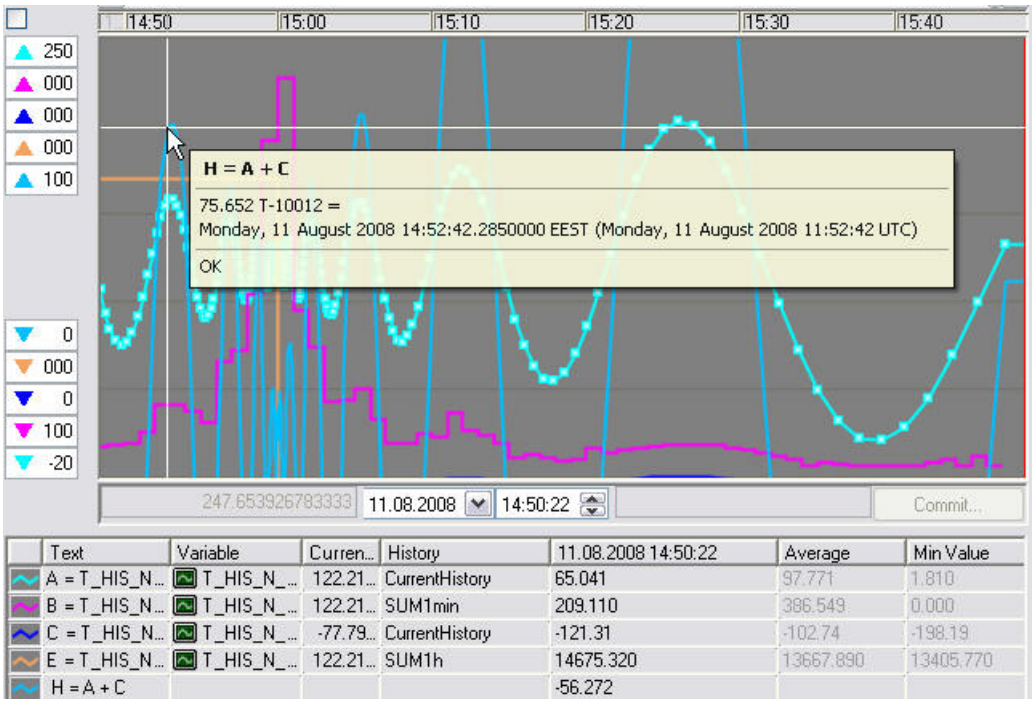


Figure 5-1 Calculated value

You can create new variable items that are calculated from the data of the existing variables. In our example, variable H is the sum of A and C.

If the time span contains both past and future, the calculated variable will not be displayed as a graph.

5.3. Scaling limits

The limits determine the scaling of plots.

Description of scaling limits

The scaling limits are displayed on the left side of the chart. If there are several charts, each has its own area for limits.

The scaling limits can be displayed in two ways: with the upper and lower limits of scaling displayed in the boxes, or by using scales whose end points correspond to the upper and lower limits.

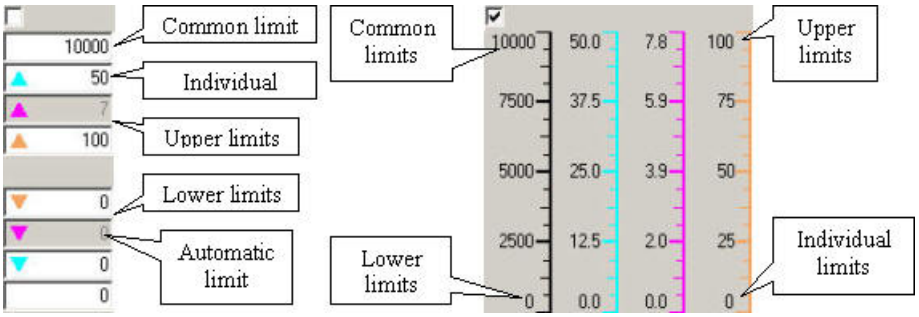
The graphs in the chart window can have either common or individual limits. For explanations, see Table 5.3-1.

Individual and common scaling limits can be changed by using boxes or at the ends of the scales.

The upper limits are located at the top and the lower limits at the bottom of the scale area. The values of variable items are scaled so that the value corresponding to the upper limit is drawn at the top of the plot area and the value corresponding to the lower limit is at the bottom of the area. If the curve exceeds the upper limit or falls below the lower limit at some intervals, the graph is not drawn on these intervals.

If scaling is depicted using scales, the common limits are displayed on a black scale. The scale for graphs with individual limits is shown in the same color as the graph.

Limit scales



Limits.jpg

Figure 5.3-1 Limit scales

The following table lists the limit scales.

Table 5.3-1 Limit scales

Field	Description
Upper limits	The upper scaling limits are located at the top.
Lower limits	The lower scaling limits at the bottom.
☐ ☑	Limit presentation option ☐ = upper and lower limits enabled ☑ = scale enabled

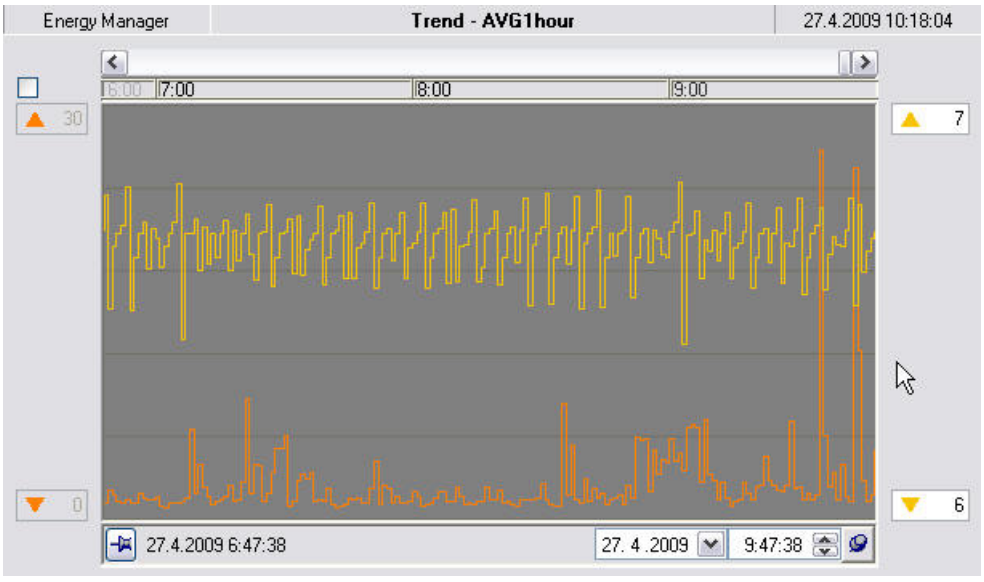
Field	Description
Common limit 	The common upper scaling limit is the highest upper limit, while the common lower scaling limit is the smallest lower limit. Common limits are only displayed if they are used in one of the graphs and if no individual limits have been defined for the plot. The common limit values can be changed by entering a new value in the box.
Individual 	The individual upper and lower scaling limit of the curve. Individual limits are marked in the boxes with a small triangle, the color of which is the same as that of the graph. To change the individual limit value, enter a new value in the box.
Automatic limit 	Automatically calculated individual upper and lower scaling limits of the plot. If automatic scaling is used for the variable, the variable's limits are calculated automatically and cannot be changed. The background color of the box for automatic limit is gray. Also common limits can be automatically calculated. When they are automatically calculated, the background color is gray and the values are defined with the help of the minimum and maximum values of the graphs. For uptime variables automatic and individual limits need to be used in order to get the correct time format visible in the limit indicators.

If several graphs are added to the same chart, the scale limits are displayed on both sides of the chart. The first is depicted on the left, the second on the right, the third on the left again, and so on. The following figure shows a chart with three graphs, each using individual and automatically set scaling limits.

Trend_scaling_limits_3_variables.jpg

Figure 5.3-2 Chart with three graphs

The following figure shows a chart with two graphs. The scales are now visualized with upper and lower limits only. The yellow graph uses manually set limits visible on the right side, whereas the orange graph uses automatic scaling, as the grey limit value boxes on the left reveal.



Trend_scaling_limits_upper_and_lower2.jpg

Figure 5.3-3 Chart with two graphs

5.4. Time bar

The time bar allows you to select the time range for displaying the plots of the variables.

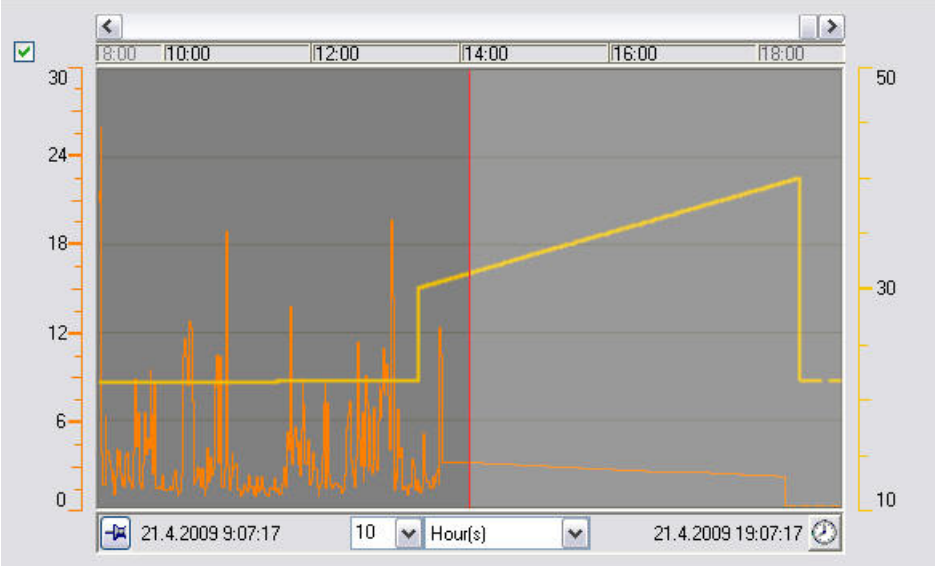
Description of time bar

The time bar is displayed under the plot area. It shows the start time of the time span at the left end of the row and the end time at the right. The length of the time scale of plots equals the difference between the start and end times.

The current time, which means the current time on the server, is located at the right end of the time span but can also be located in the middle or at the left end so that the time span stretches into the future.

The plot values displayed on the left of the current time are retrieved from the source table for history data. They can be average or current values. The plot values shown on the right of the current time are retrieved from the source table for future data, which is usually a prediction table. This requires that a prediction table has been configured into the system.

A red vertical line in the plot area signifies the current time (see Figure 5.4-1). The future area to the right of the line is highlighted by dimming the background.



Time_bar_current_time_indicator.jpg

Figure 5.4-1 Time bar display

Both ends of the time bar have a pin icon, which can have any of the following states:

	The time next to the pin is updated (only used at the right end)

	The time next to the pin is unlocked
	The time next to the pin is locked

The display's update mode is determined in the following way, depending on the left and right pin:

--	Normally updated display. If the time span is changed, the time scale and the time at the left end of the time span change accordingly and the display continues to be refreshed.
--	Unrefreshed display. If you change the time span, both times change by an amount equal to half of the modified time difference and the time scale changes.
-- or --	Unrefreshed display. If you change a locked time, the time scale moves by an amount equal to the modified time difference. If you change the time span, the unlocked time moves by an amount equal to the modified time difference and the time scale changes.
--	Unrefreshed display. If you change a locked time, the time scale changes by an amount equal to the modified time difference.
--	The display is updated and the time scale keeps expanding . If you maintain a locked time, the time scale changes by an amount equal to the modified time difference and the display continues to be updated.

The display causes a load on the system.

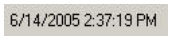
Time bar

Time_bar_row.jpg

Figure 5.4-2 Time bar

Table 5.4-1 Time bar display terms and buttons

Button	Description
1 Hour(s) **Time span**	The time span – that is, the difference between the start and end time – is displayed in the boxes in the middle of the time bar when at least one of the time span's ends is unlocked or updated. The value and unit of the interval are displayed in their own text boxes. To change the interval, change either the value and/or unit. An inexact interval is indicated in the following way: ≈1 Hour(s) The graphs are redrawn after each change.

Button	Description
 **Start time**	Free start or end time that cannot be changed.
 **End time**	You can change the locked start or end time to view the graph at different times and to use a longer or shorter time span. A locked start or end time that can be changed. The indicator for daylight saving time is displayed on the right side of the time. A check mark in the box indicates daylight saving time. Usually the indicator, either checked or unchecked, is disabled. When the time stamp falls in the one-hour interval during which we move from daylight saving time to standard time, the indicator box is not disabled, allowing you to specify whether the time stamp refers to daylight saving or standard time.
 **Updated pin**	To lock the time, click the pin.
Free pin	To lock the time, click the pin. Double-clicking moves time to the update status ().
Locked pin	To release the time, click the pin. Double-clicking moves time to the update status ().

5.5. Time scroll bar

The time scroll bar allows you to select the time for which the graphs of variables are presented in the chart.

Description of time scroll bar

The time scroll bar is located above the plot area. The location of the scroll bar indicates the location of the chart. Past time is to its left and future time to its right.

When the chart window is opened, the chart area on the left side of the scroll bar represents the available past time area, while the chart area on the right side represents the available future time area. The time areas correspond to the maximums of the past and future times of all the variable items in the chart based on the source tables defined for the variables.

To view the graphs at different times, move the scroll bar. The time span remains unchanged. Moving the scroll bar locks the end time, and the graphs are no longer refreshed. To return to the original chart view, unlock the end time in the time bar.

Time scroll bar

Figure 5.5-1 Time scroll bar

The following table lists the Time scroll bar buttons

Table 5.5-1 Time scroll bar buttons

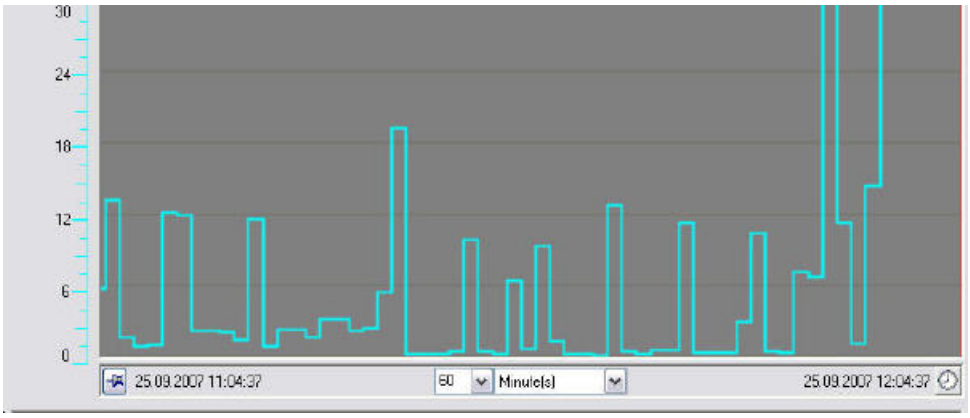
Button	Description
Scroll bar	The time span for which the curves are displayed moves backwards or forwards in time when you move the scroll box. The start and end times of the time span change to correspond to the new location of the chart in the available time area. The time span remains the same. The end time is locked, the pin is pushed down ( ) and the graphs are no longer refreshed. Double-clicking the pin to unlock an end time ( ) returns you to the original view. The pin is updated ( ), the scroll box moves to its original location and the graphs are refreshed again.

5.6. Time scale

With time scale you can set limits for the time span used in the chart.

Description of time scale

The time span setting area is located below the plot area. It consists of a start time indicator, drop-down menus with which you can set the time span used and an end time indicator.



Time_scale_whole_2.jpg

Figure 5.6-1 Time scale

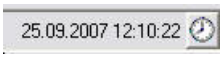
- Start time shows the earliest time the chart shows.

- The drop-down menus show the numerical value and the time span unit selected for the time span. You can change either the numerical value or the unit from the menus.

- End time shows the latest time the chart shows.

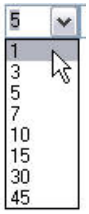
  

Setting time scale

You can set the time span from the two drop-down menus:

1. Set the numerical value that shows how many of the selected units are shown.

   To select a numerical value:
   - Select the correct value from the drop-down menu on the left.

     The options are: 

   - Select the desired option by clicking its row.
2. Select the unit (for example seconds, minutes).

   To select the correct unit:
   - Select the option you want from the drop-down menu on the right.

- Select the desired option by clicking its row.

If the selected numerical value does not match exactly with the selected unit, the numerical value is rounded to a matching value closest to the original.

5.7. History updating and recollection

Values in the history tables can be updated e.g. to correct possible errors or to insert missing values. To correct history data, you can update the values in history tables and activate so called recollection to compute the calculated variables and transformations. This propagates the changes to all affected history tables. You update the values of a variable in a history table for either a selected time span, single value or a single point in a chart window, that displays the variable values from the history table.

The updating functions are:
- adding new values
- replacing existing values
- deleting existing values

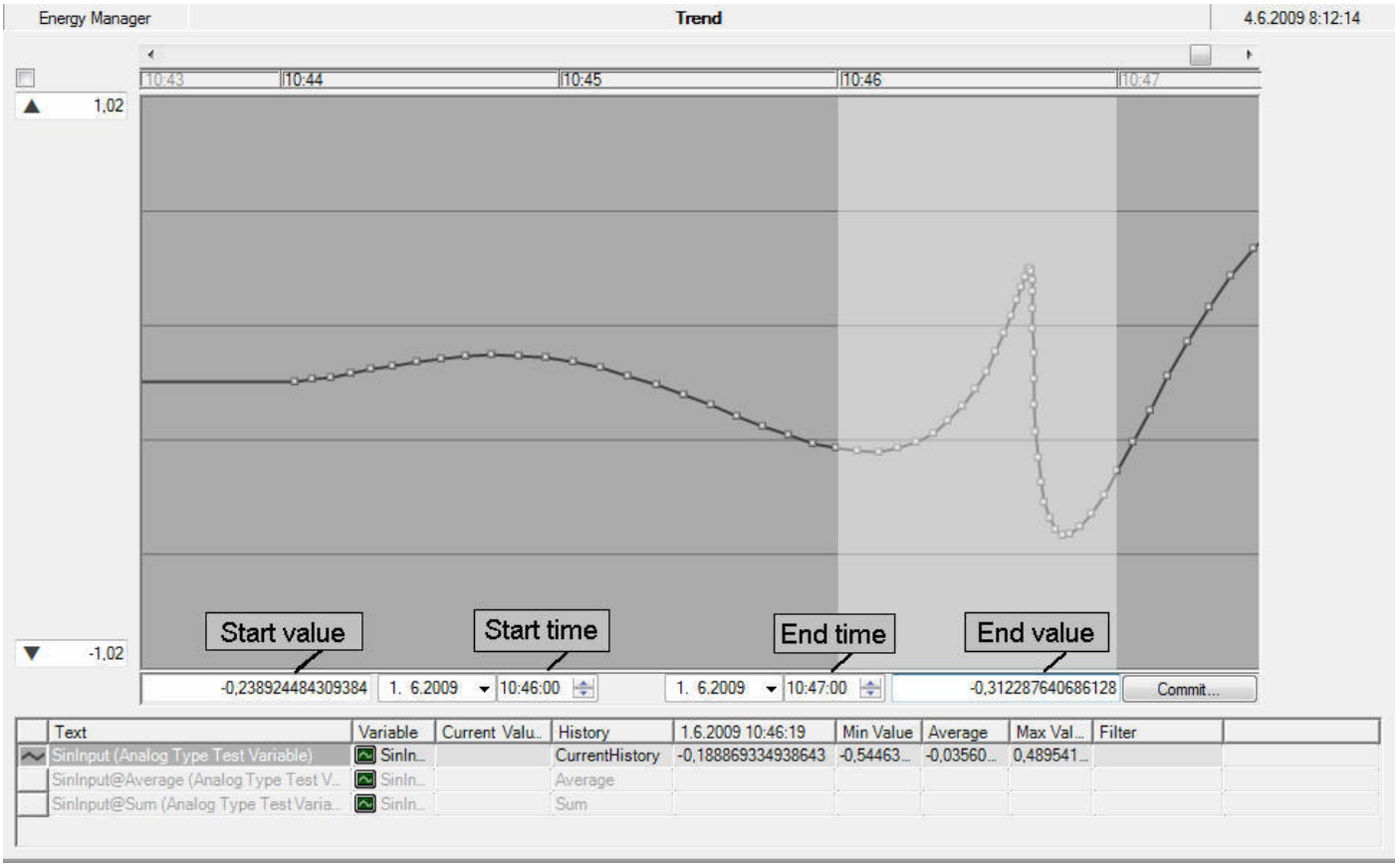
From history updating point of view, there are two kinds of history tables: periodic and nonperiodic. After you have updated the values of all variables you want to correct, you can activate recollection for all variables in the history table for this time span. This can be done in any chart window. Depending on the recollection definitions in the RTDB, the recollection may be cumulated for all higher-level history tables.

5.7.1. Updating values of a variable in a history table

- Open a chart window that presents values of the variable you want to update (in the example charts, the data points are marked for clarity).
- Click the variable in the legend to select it, and then select the time span you want to update. After the selections, the system shows the start and end values of the

selected time span as the default values. You see them in the value boxes next to the time span start and end times.

- If you change your selection, the value boxes show new default values.

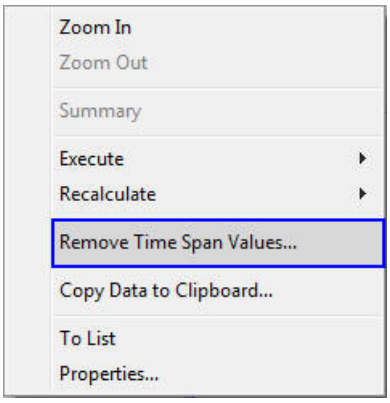


HistoryUpdating_CurrentHistoryTrend.jpg

Figure 5.7.1-1 Trend of a variable from a non-periodic table

Display term	Description
Start value	The value used as the start value for a time span based history value updating. Initialized with the value of the variable at the start time of the time span.
Start time	The start time of the time span.
End time	The end time of the time span.
End value	The value used as the end value for a time span based history value updating. Initialized with the value of the variable at the end time of the time span.

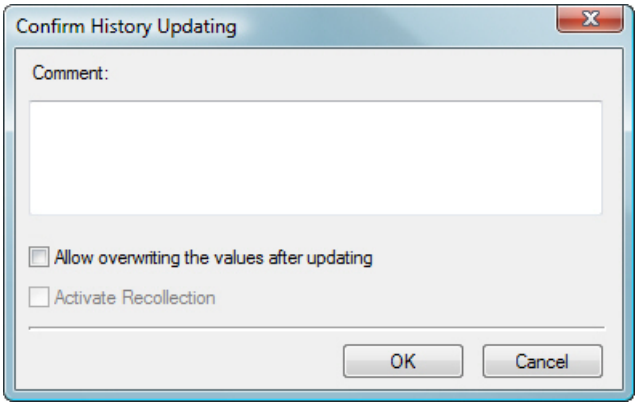
- If you want to change the values, enter new values in the value boxes.
- Clear the values from the value boxes, if you want to remove the history values. You can remove the values also from the Graph Area pop-up menu by the selection ‘Remove Time Span Values...’



GraphAreaPopUpMenu2.jpg

Figure 5.7.1-2 Graph Area pop-up menu

To activate the updating, click the **Commit** button. After pressing the button, the **Confirm History Updating** dialog box shows up with the following information:



ConfirmCurrentHistoryUpdating.jpg

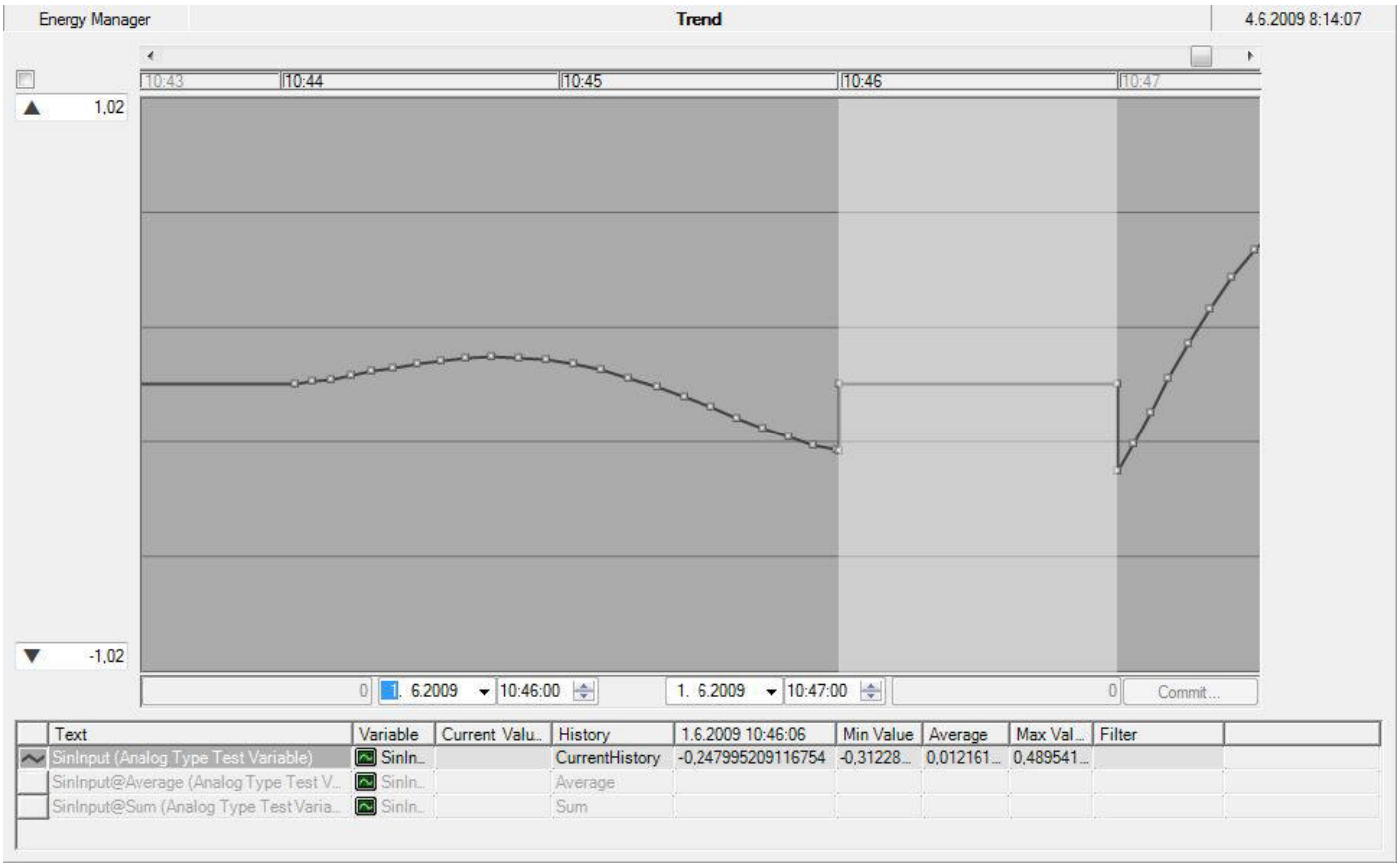
Figure 5.7.1-3 Confirm History Updating dialog

- Optional **Comment** is stored into the history update log. The maximum length for the comment is 80 characters.
- Check box **Allow overwriting the values after updating** controls the later handling of the updated values. If this option is selected, the transformations that will be calculated in this table will overwrite the values that you manually updated.
- Click **OK** to activate updating or **Cancel** to cancel it.

Updating non-periodic history values

Update or delete operation inserts new data points immediately before (-100ns) the start time and immediately after (+100ns) the end time of the time span and assigns them to the original values at those time positions, and then removes values that the time span covers. Updating then also adds the values specified in the value boxes.

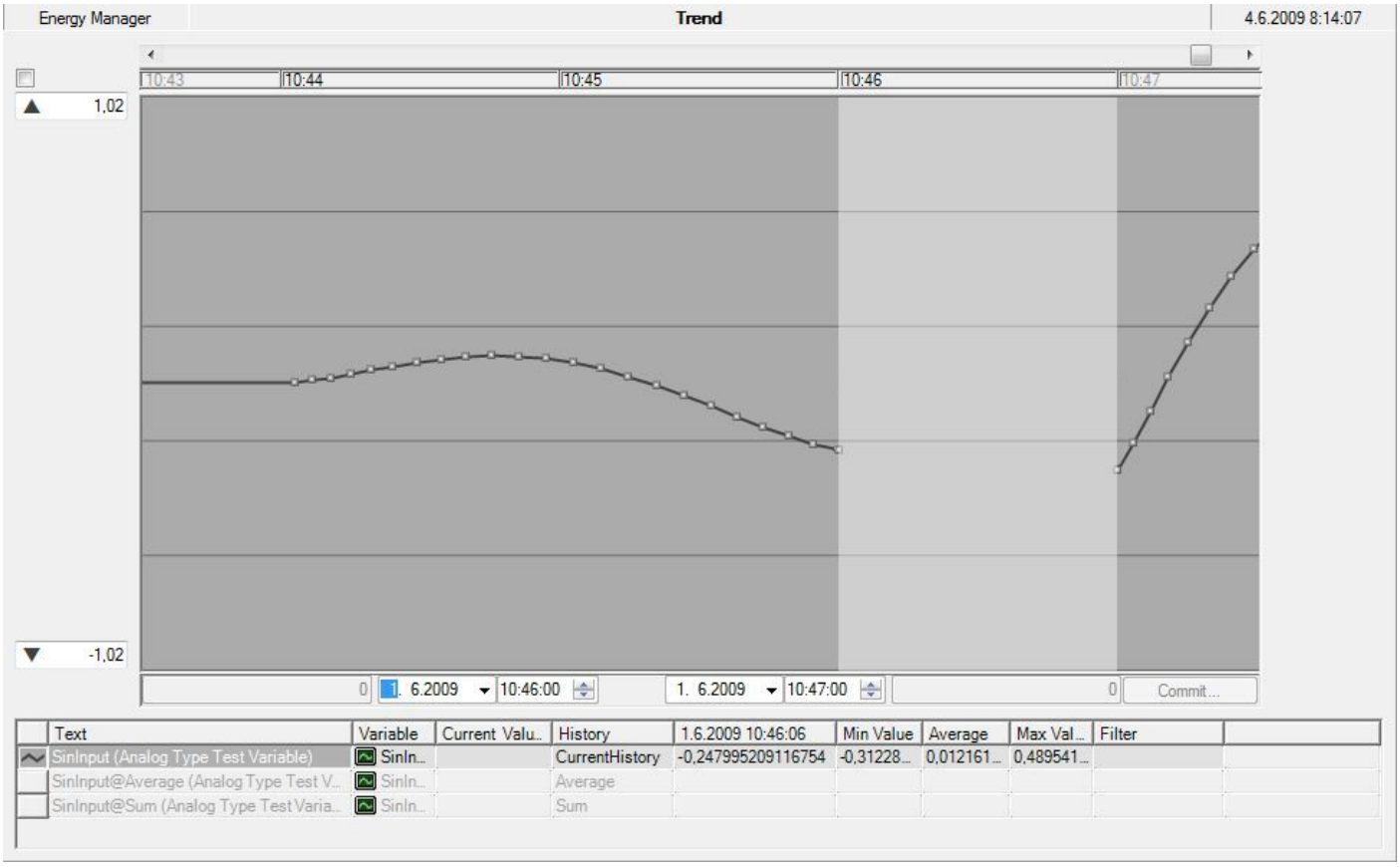
If the history table to be updated is **CurrentHistory** and the value to be inserted is newer than the newest history value of that variable, then the new value goes through the current value processing. Otherwise the values are put directly into the target table.



CurrentHistoryTrendAfterUpdating.jpg

Figure 5.7.1-4 Current history trend after updating

The effect of the history update is seen as a straight line from the start value to the end value and as the additional value points just before and after the selected time span.



CurrentHistoryTrendAfterDeletion.jpg

Figure 5.7.1-5 Current history trend after deletion

The effect of history value deletion is seen as an empty region from the left additional value to the right additional value. The highlighted area remains selected and you can update the values of another variable on the same time span. To do so, continue by selecting the desired variable from the legend.

In addition to the time span based updating there are two more ways to update history values:

- Inserting, replacing or deleting a single data value of a history table. These are initialized with a single click on a chart. The system responds by showing a vertical line on top of the chart. The time and the corresponding default value are shown on the time bar.
- Replacing or deleting a single data point of a history table. To initialize these options, set the cursor on a chart so, that the tool tip of the value to be updated becomes visible. Then hold down the Shift-key and click. The system responds by highlighting the range, which begins from the shown data value and ends just before the next data point of the variable or at the right end of the chart. The default value and the

corresponding time are shown in the time bar. In this case the update function replaces or deletes the value, which is in the beginning of the highlighted area.

Updating periodic history values

The update procedure for values in periodic type history tables is slightly different from the updating of a non-periodic table. The following figure shows an example of a periodic type average, a value table. The variable type is selected as before. However, while selecting the time span, the system expands the time span to cover full period lengths regardless of the original selection.

AverageTrend2.jpg

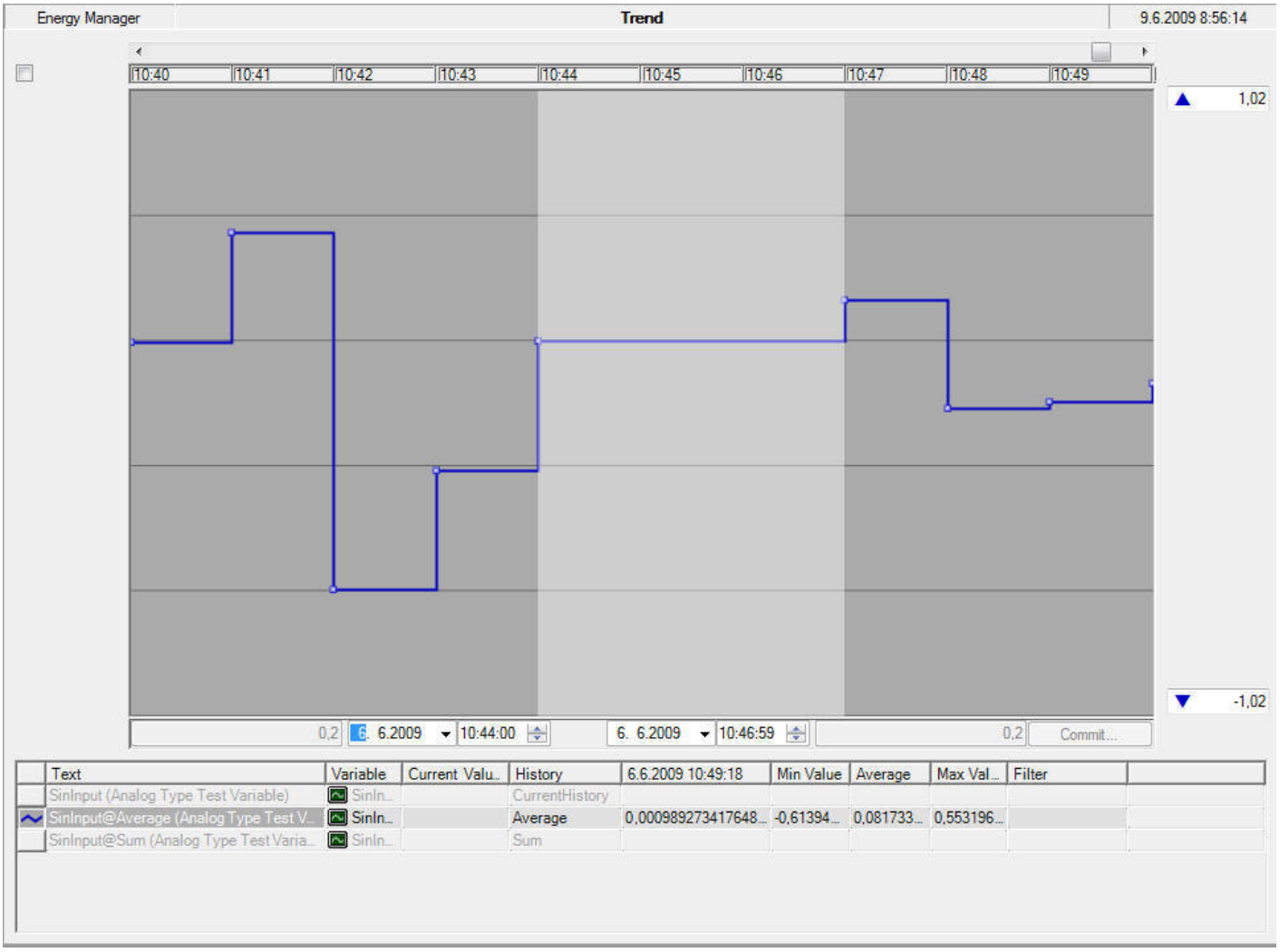
Figure 5.7.1-6 An average value table

If start and end values are different, the update function produces new values for every time period using interpolation.

AverageTrendAfterUpdating.jpg

Figure 5.7.1-7 An average value table after updating

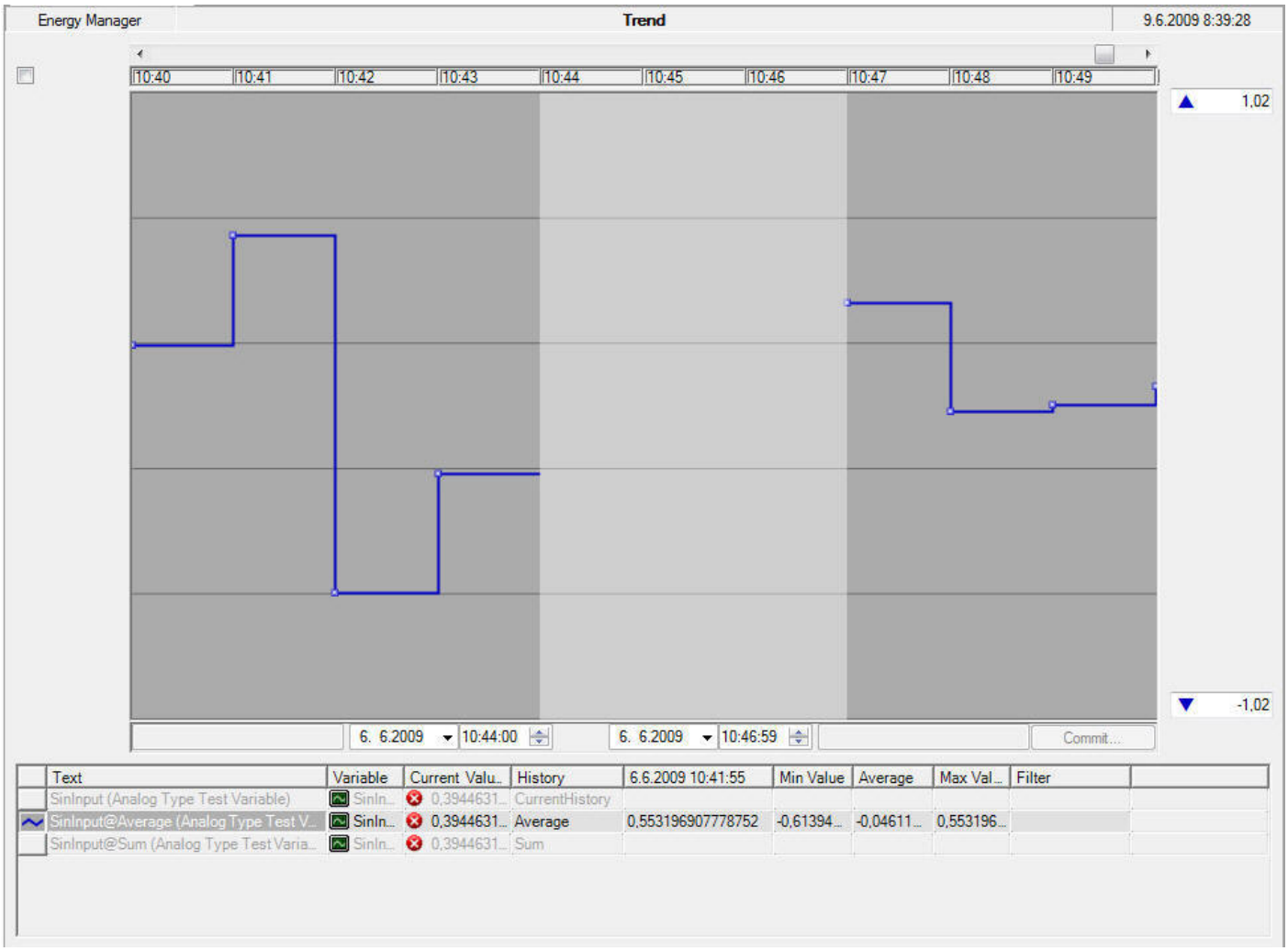
If start and end values are equal, the update function produces a value only to the beginning of the first period within the time span.



AverageTrendAfterUpdatingPacked.jpg

Figure 5.7.1-8 An average value table after updating with new values in the beginning of the time span

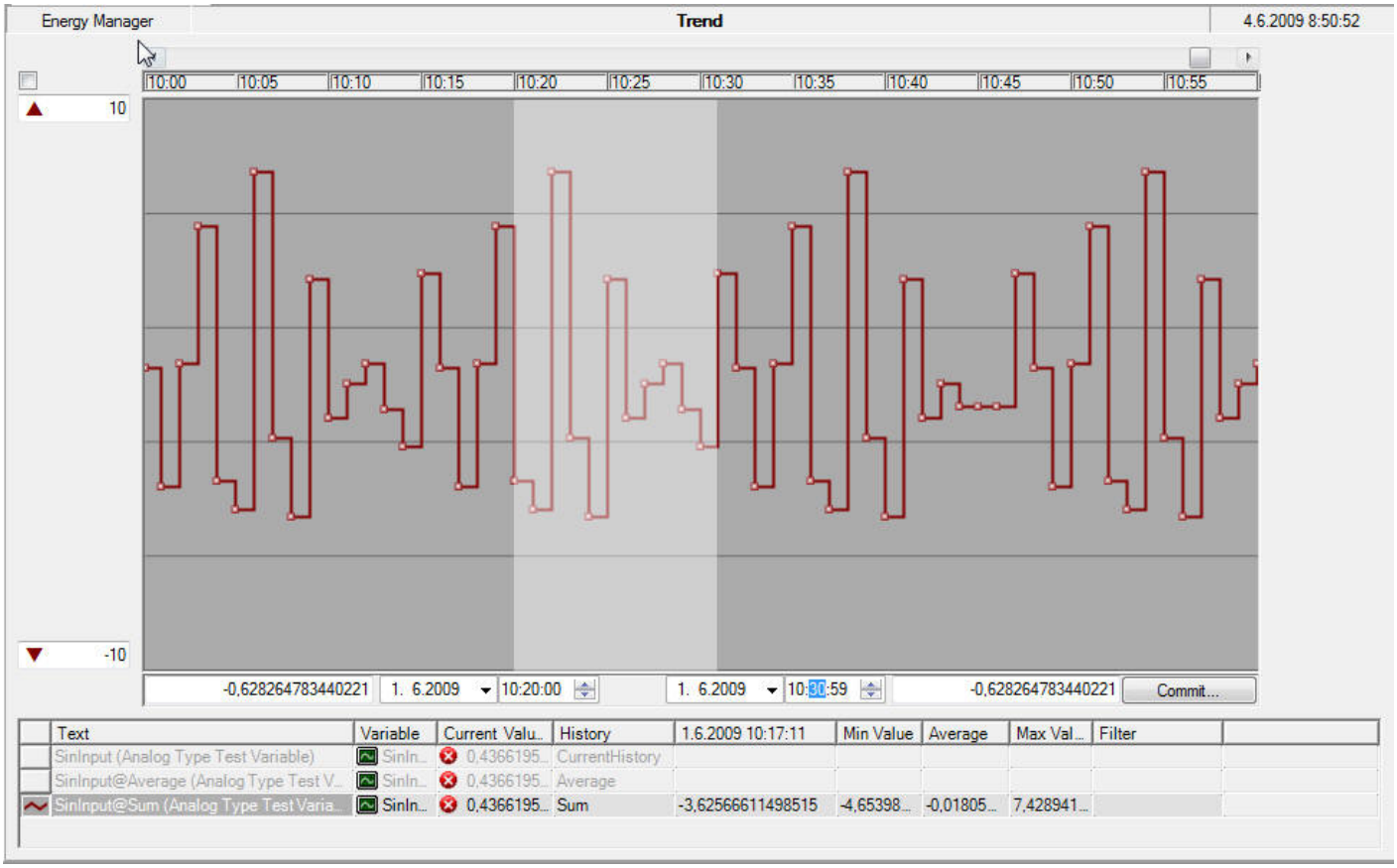
If a value is deleted, the update function removes the values covered by the time span.



AverageTrendAfterDeletion.jpg

Figure 5.7.1-9 An average value table after deletion

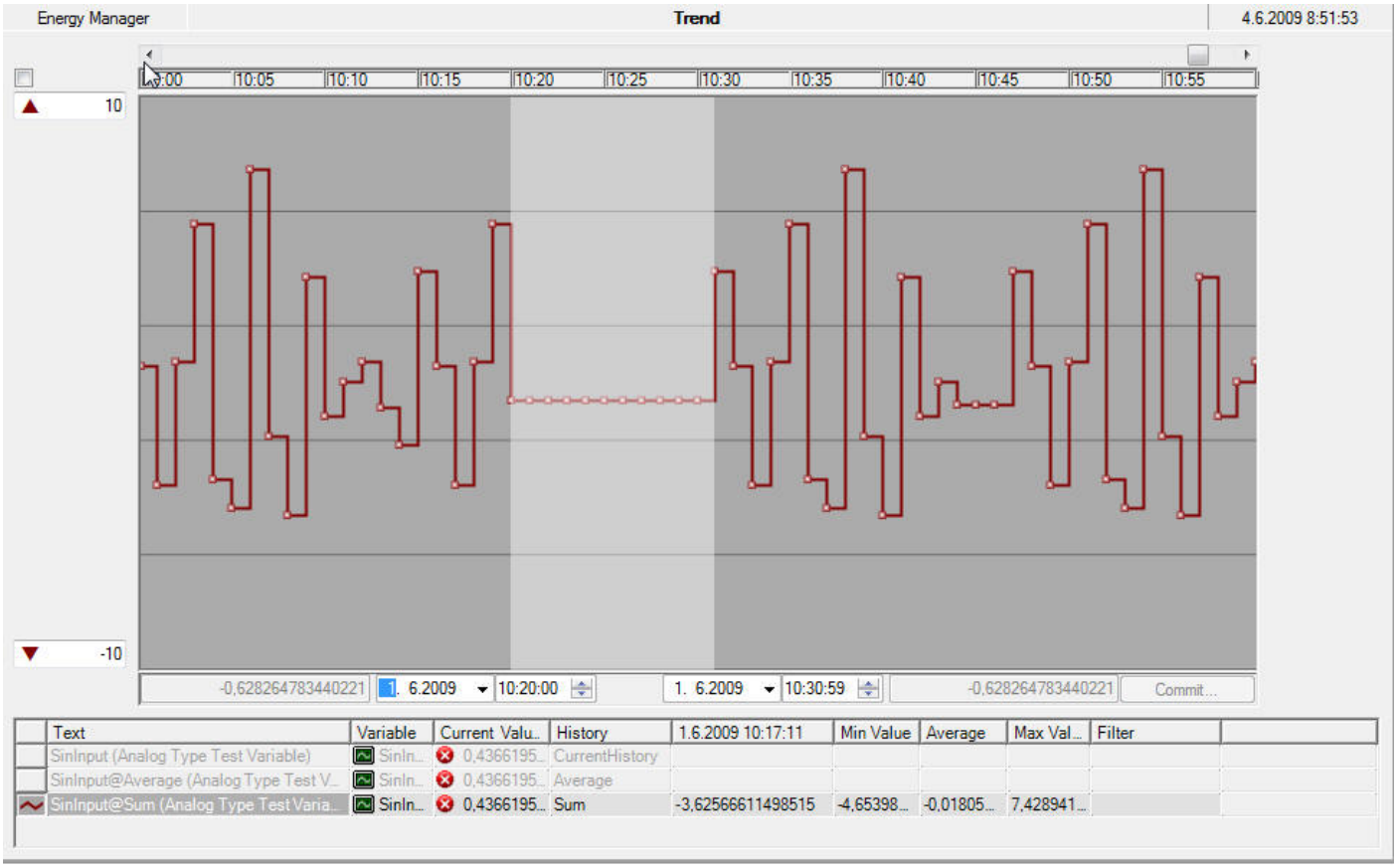
The following figure shows an example of a periodic type, the sum of values. The default values suggested by the system are equal in this case.



SumTrend.jpg

Figure 5.7.1-10 The sum of values

In case of sum of the values, the update function produces equal values every time period covered by the time span.

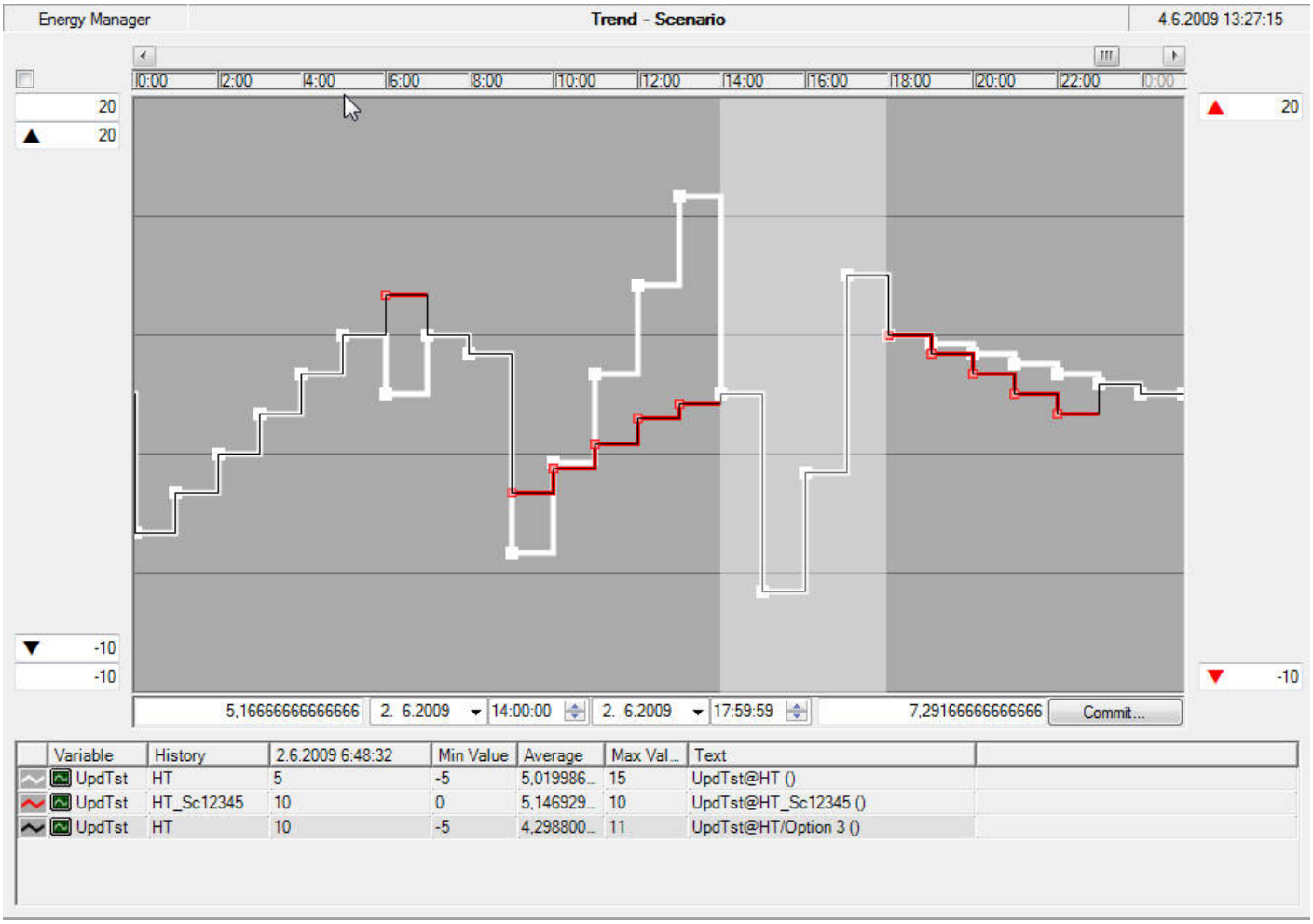


SumTrendAfterUpdating.jpg

Figure 5.7.1-11 The sum of values after updating

The following figure shows an example of updating a scenario table data. The example shows three trends for the same variable: one from the base table (white), one from the scenario table (red), and one which is combined from the previous two (black). The

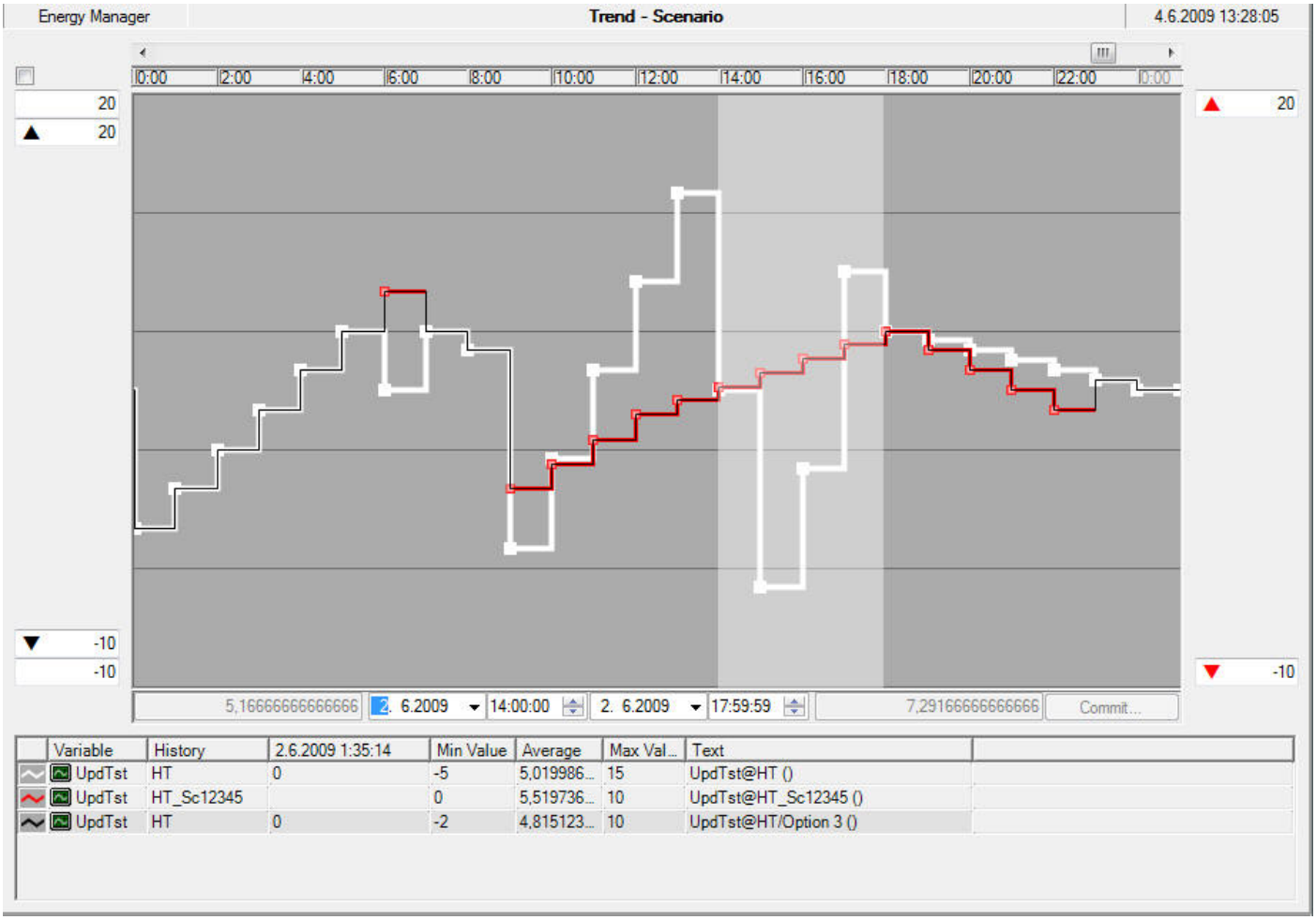
combination takes values primarily from the scenario table. If there is no value available, the value is taken from the base table, if available there.



ScenarioTrend.jpg

Figure 5.7.1-12 Scenario table data

Updating the combined trend always changes the values in the scenario table, as shown in the following figure. Deletion removes the values from the scenario table as well.



ScenarioTrendAfterUpdating.jpg

Figure 5.7.1-13 Scenario table after updating

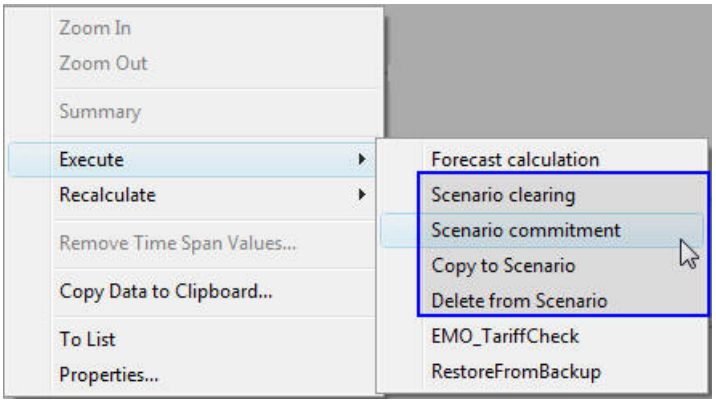
5.7.2. Scenario operations

In addition to scenario table updating, some scenario specific operations are available. A history table can have one or more scenario tables related to it, but a scenario table can be connected to only one history table. The name of a scenario table is the name of the history table with a scenario suffix as follows:

- name of the related history table: e.g. ‘HT’
- fixed scenario identifier: ‘_SC’
- scenario number: one or more numeric characters, e.g. ‘123’

The full scenario table name for this example according to this rule is: ‘HT_SC123’. There is also a separate table ‘Scenarios’ for scenario handling in the system. This table connects the scenario number to the scenario name which is shown on the legend rows and related dialog boxes.

The four scenario specific operations are available through the Legend Row or the Graph Area pop-up menu:



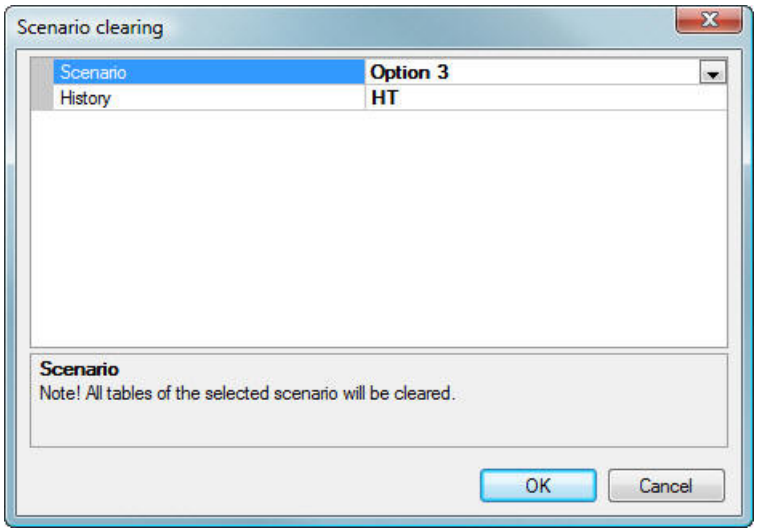
ScenarioOperations2.jpg

Figure 5.7.2-1 The Graph Area pop-up menu

These operations should be activated by right-clicking the legend row which has the appropriate scenario table and base table combination configured, i.e. base table with option. If activated elsewhere, the user has to set the scenario and base tables properly.

Scenario clearing

This operation completely clears all the scenario tables that have the same scenario number in their table name as the selected scenario table has (in the following example picture the scenario table related to Option 3 determines the scenario number).

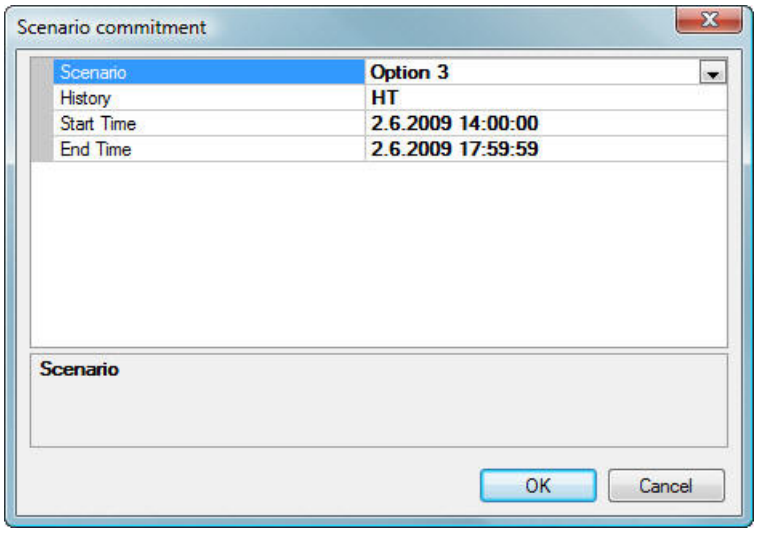


ScenarioClearing.jpg

Figure 5.7.2-2 Scenario clearing operation

Scenario commitment

This operation combines data from the defined scenario and base tables within the time span, and stores that data to the base table. The original data in the base table is removed. This operation concerns all variables.

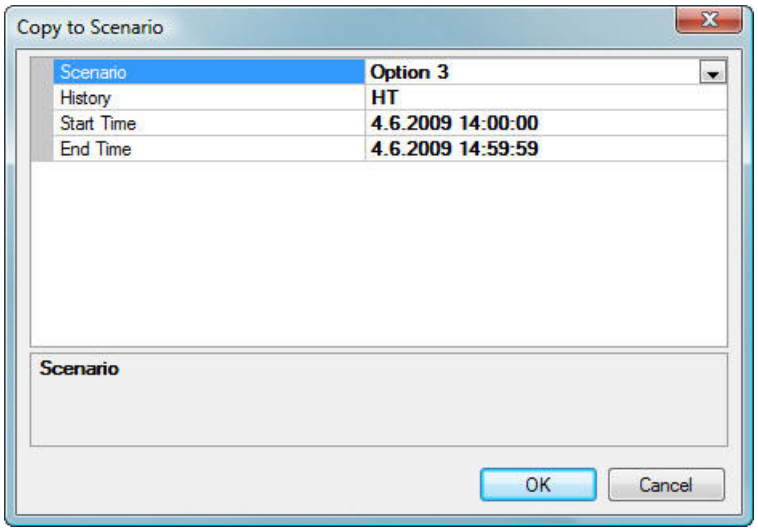


ScenarioCommitment.jpg

Figure 5.7.2-3 Scenario commitment operation

Copy to Scenario

This operation copies all rows of all variables within the time span from the base table to the scenario table. The original data in the scenario table is removed before copying.

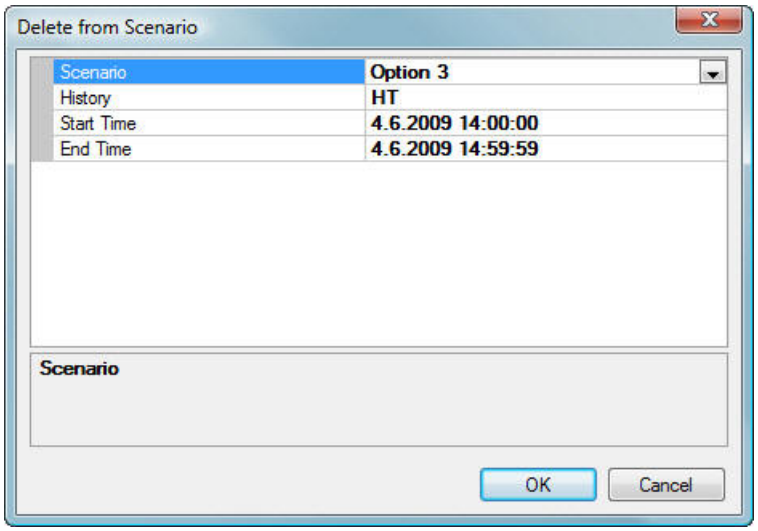


CopyToScenario.jpg

Figure 5.7.2-4 Copy to scenario operation

Delete from Scenario

This operation removes all rows of all variables within the time span from the scenario table.

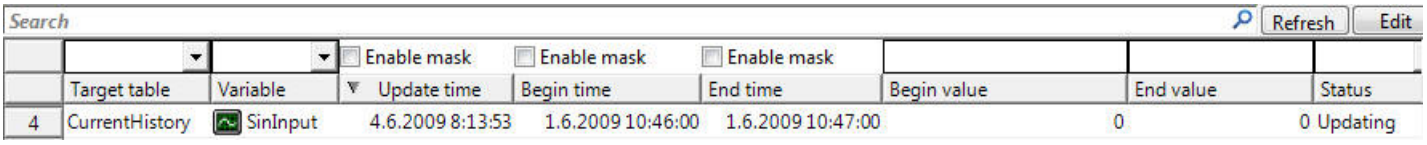


DeleteFromScenario.jpg

Figure 5.7.2-5 Deletion of all variables from the scenario table

5.7.3. History Update Log

Each update and deletion or scenario operation generates a new row to the **History Update Log** table. A row contains information about the target table and variable, updating time, time span and corresponding values, and what was the updating operation.



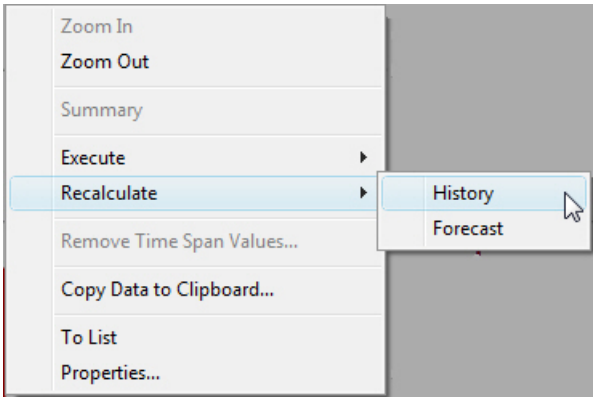
HistoryUpdateLogRow.jpg

Figure 5.7.3-1 History Update Log table

5.7.4. Activating recollection of all variables in a history table

Recollection (includes recalculation) is performed for all variables for a selected time span. Recollection requires that recalculation and recollection definitions have been specified in RTDB. They define which history tables are recollected. When the recollection is activated, you specify the history table and a time stamp indication where data has been updated. The recollection will then compute all variables and upper level history tables that depend on the defined source table. For example, when some source values in one hour average level have been modified, the one hour level recalculation will calculate the variables that depend on the source variables. After that, the one day average values are recollected from the one hour level values, and so on.

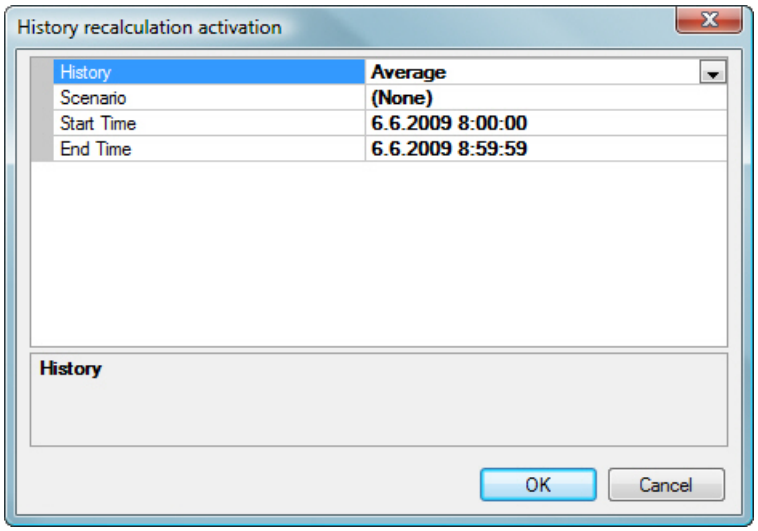
- Open a chart window that shows the time axis and the time span bar.
- Change the time span of the window so, that it covers the time span that will be recollected, if necessary.
- Select the part of the time span, that will be recollected
- Right-click in the graph area to open the Graph Area pop-up menu:



RecalculationActivation.jpg

Figure 5.7.4-1 The Graph Area pop-up menu

Click Recalculate on the menu to open the **History recalculation activation** dialog:



HistoryRecalculationActivation.jpg

Figure 5.7.4-2 The History recalculation activation dialog

- Select the history table from where (selected table included) the recollection is activated. If a variable was selected in the legend when you clicked **Activate Recollection…**, the source table for the past specified for that variable is shown as the default table. Depending on the RTDB definitions, the recollection may be cumulated to all higher level history tables.
- Click **OK** to activate the recollection or **Cancel** to cancel.

The recollection may take a while. RTDB has a diagnostic variable RTDB_HRQUEUELENGTH that indicates the length of the current recollection queue. When its value reaches zero, the recollection is ready (however, if other recollection requests are constantly being done, the value may never reach zero). The execution and completion of the recollection tasks can also be monitored through the MessageLog messages from the RTDB-Scheduler.

6. Process diagrams

Process diagrams present current and history values refreshed in the process-specific background as values, columns, symbols, or plots. Process diagrams are displayed in chart windows.

Description of process diagrams

Process diagram windows are usually located in the application-specific folders of the tree. To open the window, click its icon or name.

The process diagram window usually contains a tab at the top, the diagram's title row, and the actual process diagram.

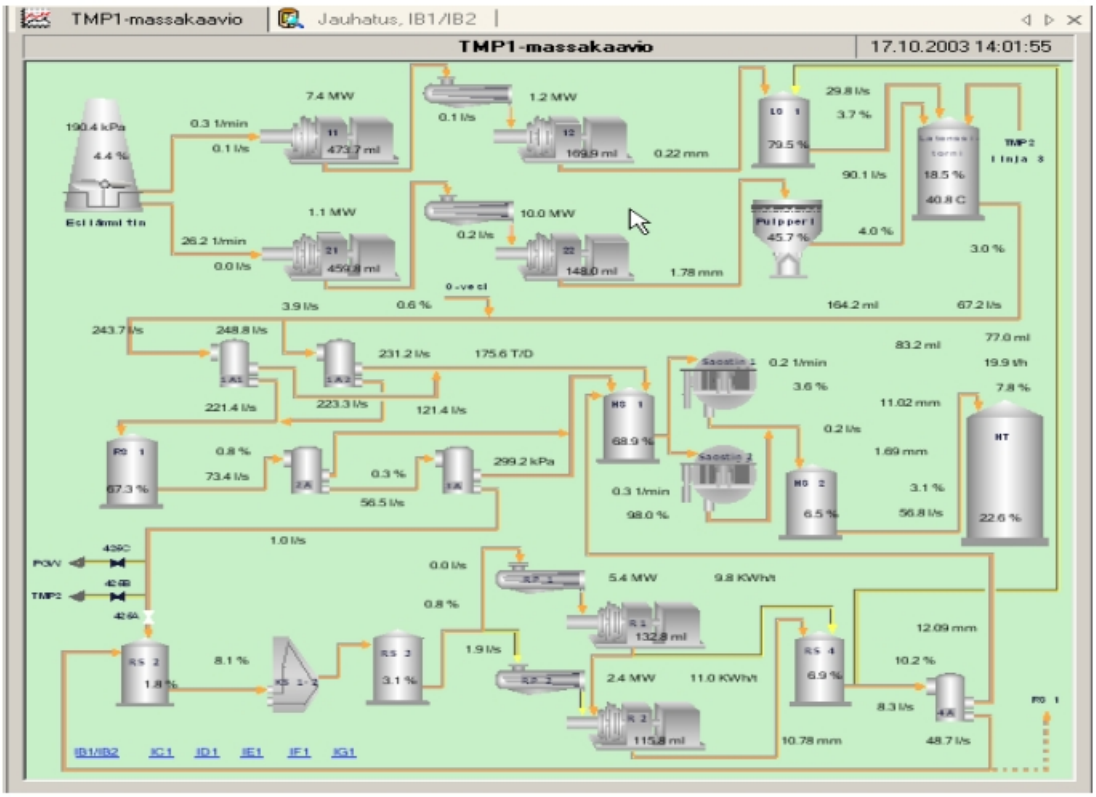
The tab displays the name of the chart node in the tree. When you point to the name on the tab, a ToolTip is displayed. It shows the location database of the chart node and its call path. A **Close** button used to close the active chart window is located at the right end of the tab row. The diagram's title bar shows the diagram's title, as well as the current date and time.

The process diagram area displays a fixed process background, as well as updated process data in the form of values, columns, symbols, or plots (as sub-diagrams). It may also contain links to other figures, either as an individual link text or linked to current values and symbols.

Sub-diagrams, values, columns, symbols, and links are presented in boxes, whose size can be modified.

For more information on the information displayed in the process diagram window, see the following chapters:

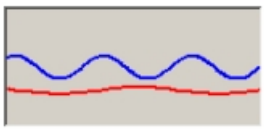
- **Sub-diagrams**: 6.1, Sub-diagrams
- **Values**: 6.2, Current values
- **Columns**: 6.4, Bars
- **Symbols**: 6.5, Symbols
- **Links**: 6.6, Links



Example_process_diagram.jpg

Figure 6-1 Sample process diagram

6.1. Sub-diagrams



G_sub_diagram.jpg

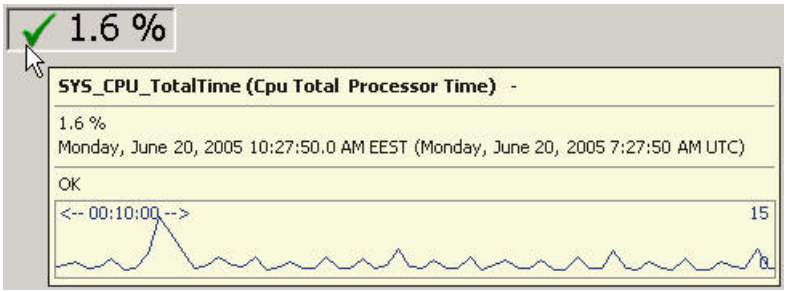
Figure 6.1-1 Sub-diagram

Sub-diagrams can contain a background, a refreshed line, and area plots or column series on top of it. The direction of time of the series can be defined right, down, up, or left.

6.2. Current values

The value field shows the current or history value of the variable. In addition to the value, you can indicate the unit of the variable's current value and value status with a status-specific color or icon, as well as the unacknowledged status of an alarm associated with

a current value with a flash. The icon can be displayed at all times or only when the status is not OK.



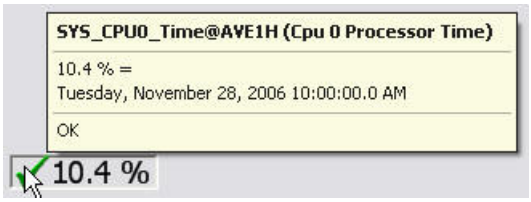
Current_value_and_tooltip.jpg

Figure 6.2-1 Current value

Pointing to the value displays a ToolTip. The ToolTip shows the description (or updated text) of the variable, the growth direction of the value (+/=/), the current value unit, time stamp, status, and short trend.

6.3. History values

There is no trend in a history value, because the data is only available from even periods. The unit is correct as averages, but not as sums. The end of the variable name is the name of the history table.

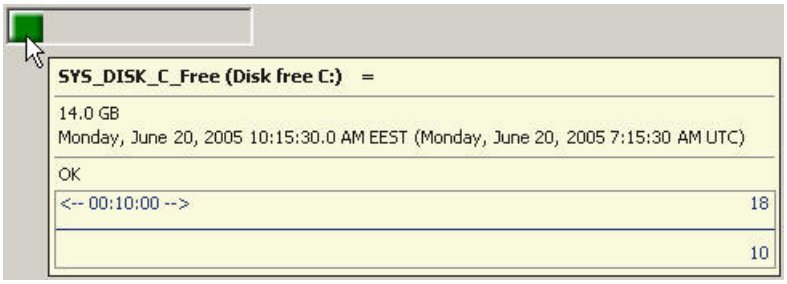


History_value_and_tooltip.jpg

Figure 6.3-1 History value

6.4. Bars

The bar shows the current or history value of the variable. In addition to the value, you can indicate the unit of the variable's value and value status with a status-specific color or icon, as well as the unacknowledged status of an alarm associated with a current value with a flash. The icon can be displayed at all times or only when the status is not OK.



Bar_graph_and_tooltip.jpg

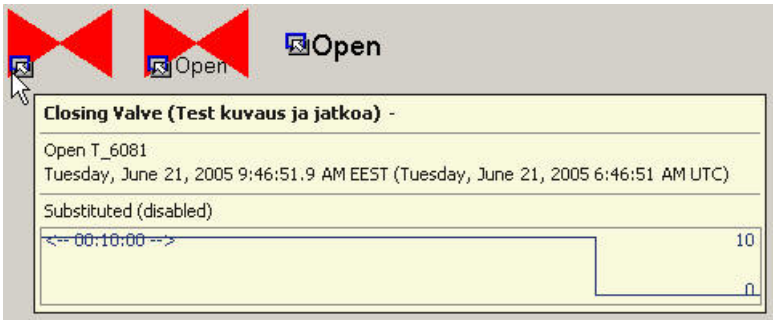
Figure 6.4-1 Bar with current history and variable of the value

Pointing to the bar displays a ToolTip. The ToolTip shows the description (or updated text) of the variable, the growth direction of the value (+/=/), the current value unit, time stamp, and status.

6.5. Symbols

Refreshed symbols are used to present binary variables. The form of the symbol represents the value (binary state) of the variable - for example, valve open/closed or pump on/off. Symbol groups can also be defined in the symbol library so that part of the symbol is shown in the color of the state (e.g. OK, invalid, replaced, alarming). In this case you can also define the state of the value to be indicated by a color or an icon (and also color). The state icon can be displayed at all times or only when the state is not OK. The unacknowledged status of an alarm associated with a current value is indicated with a flash.

Figure 6.5-1 shows different representations of the valve symbol and a ToolTip, which provides a description (or updated text), and information on the value, time stamp, and status of the variable.



Symbol_and_tooltip.jpg

Figure 6.5-1 Valve symbol and a tooltip

6.6. Links

The name of the window link is displayed in blue and underlined, assuming the color and underlining settings of the link have not been changed. When you point to the link, the pointer changes to one resembling a hand and displays a ToolTip that shows the location database of the window to be opened, call path and name. Clicking the link opens the window on screen.

Link_and_path.jpg

Figure 6.6-1 Link and a tooltip

7. Lists

List windows show database data (attributes) in list format. Examples of lists include the variable list, alarm log, event log, maintenance log, and user log. Basically all lists are viewed in the same way. Some lists, however, can contain more properties than others. This chapter uses the variable list as an example.

Description of lists

The list name is displayed on the tab. When you point to the list name, a tool tip that shows the location database of the list and call path are displayed. A search bar, an advanced search bar, and the column headings are displayed at the top of the list window, while scroll bars are displayed on the right and at the bottom. Depending on the list configuration, the search and advanced search bars can be visible or hidden.

The list area displays the list items. Examples of items include the variables of the variable list and events of the event log. The list has one row with columns for each item. Rows can be browsed with the scroll bar on the right and columns with the scroll bar at the bottom. If a row has been enabled, there is a number in front of it.

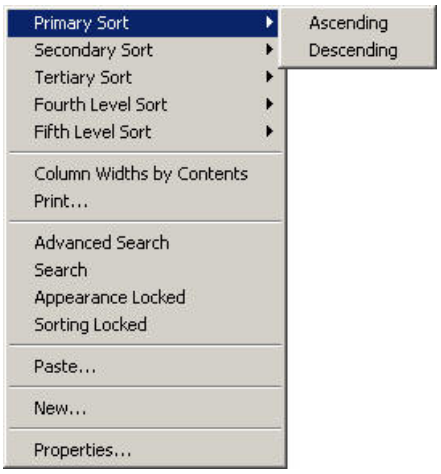
Column headings show the names of the columns in the list. You can sort the items based on the information on 1-5 columns (unless this has been prevented in the list configuration). A small triangle in the column heading indicates that the items have been sorted based on the column in question. The direction of the triangle indicates whether the items have been sorted in ascending (▲) or descending (▼) order. If the items have been sorted based on several columns, a number is shown next to the triangle. Number 1 indicates the column that the items have been first sorted by, number 2 the second column the items were sorted by and number 3 the last column that the sort is based on.

You can define the list to display either one item or a group of items by defining general string criteria for the search bar, and column-specific string, list and selection criteria for the advanced search bar. The list is refreshed when you click the refresh button. If the displayed list is extended, the refresh button begins to flash after changes have been made to search criteria.

You can modify column widths depending on how you want the data to be displayed on screen. You can change the order of columns by dragging.

These functions are only available if they have not been disabled in list configurations.

Right-clicking the column heading displays the following pop-up menu:



Menu_list_column.jpg

Figure 7-1 List menu

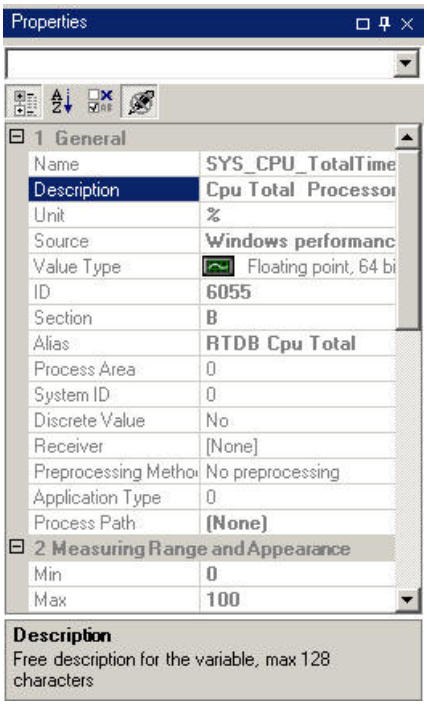
Table 7-1 List menu items

Item	Description
Primary Sort	The items are first sorted by the column you clicked to display the pop-up menu. Select an ascending or descending order. A triangle and the number 1 (▲1 or ▼1) is displayed in the column. The number is only displayed if the items are sorted by more than one column.
Secondary...Fifth Level Sort	The items are sorted in the second (or fifth) place by the column you clicked to display the pop-up menu. Select an ascending or descending order. A triangle and the number 2 (-5) (▲2 or ▼2) is displayed in the column.
Column Widths by Contents	Resizes the list column widths to the default column width.
Print	Opens the **Print** dialog that allows you to print all list pages (the list displays columns starting from the left according to the width of the paper).
Search	Enables the search bar. Selecting the command again disables the search bar.
Advanced Search	Enables the advanced search bar. Selecting the command again disables the advanced search bar.
Appearance Locked	Locks the appearance of the list. Only the Primary Sort is active and the order of the columns changes.
Sorting Locked	Locks the sorting configuration of the list, and you can no longer change the column that the sort is based on by clicking a column. However, you can still sort items using the options in the pop-up menu. Selecting the command again releases the lock.
New	Creates a new item. This option is only displayed in lists that allow items to be added.

Item	Description
Properties	Displays the **Properties** dialog, where you can change the appearance and functions of the list.

You can view and, with sufficient authorizations, change (in Edit mode) item data directly in the list or in the general **Properties** dialog by clicking the item.

The data for one item, displayed in a list row, is presented in a row of its own in the **Properties** dialog.



List_Properties_dialog_box.jpg

Figure 7-2 List properties

You can select how the information is presented in the window. The options are shown in the following table.

Table 7-2 Properties dialog icons

Icon	Description
	**Grouping** Click the **Grouping** button to turn grouping on/off. When grouping is on, the information is presented categorized under group titles. When grouping is off, the information is presented in a list format without any titles.

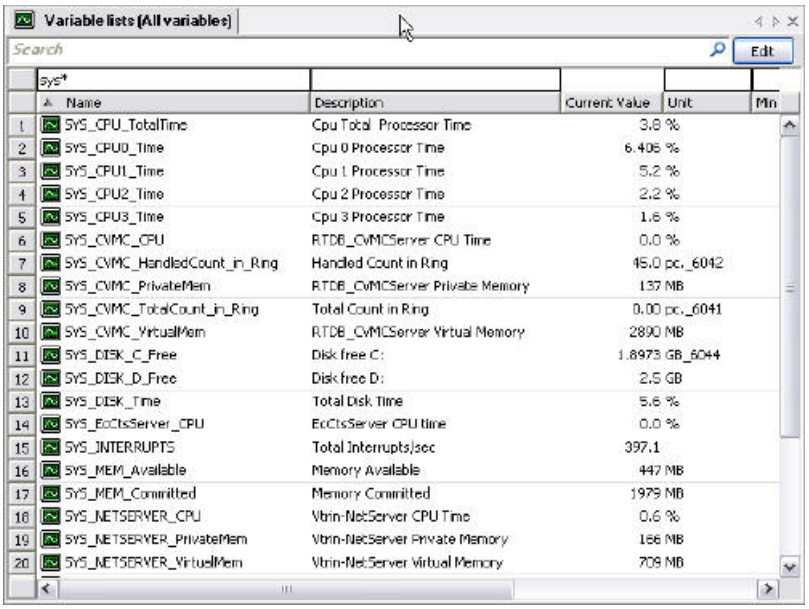
Icon	Description
	**Alphabetical order** Click the **Alphabetical order** button to turn alphabetical order on/off. When alphabetical order is on, the information is shown in an alphabetical order, from a to z. When alphabetical order is off, the information is shown in the same order as in the chart columns.
	**Selected only** Click the **Selected only** button to show the selected / all information. When the selected only is on, only items selected to be viewed in the chart columns are shown in the **Properties** window. When the selected only is off, all items are shown in the **Properties** window, even those that are not shown in the chart columns.
	**Include read-only** Click the **Include read-only** button to include/exclude the information that has a read only status. When the read-only information is included, you can view also items that cannot be edited. When the read-only information is excluded, you can only view items that can be edited.

When you click a row in the **Properties** dialog, the explanation of the data on the row (and in the corresponding column) is displayed at the bottom of the window.

For more information about the **Properties** dialog, see 4.6, Properties dialog.

7.1. List screen

Sample list view



Example_list_small.jpg

Figure 7.1-1 Sample list view

Table 7.1-1 List view fields and activation buttons

Field / button	Description
Row Numbers	The row numbers are optionally shown in the beginning of the row.
Search bar	String criteria that are compared with text in all columns. The criteria can contain several query strings. A query string can include wildcards. For further information, see Selection of items.
Advanced Search bar	The row under the *Search* bar is an advanced search bar where you can define column-specific selection criteria. Depending on the column, the criteria can consist of string, list, yes/no, or time span condition.
(All) **Advanced Search bar list box**	An advanced search bar list box for columns that can only include certain values. Select the criteria from the list. Only the items that meet the selected criteria is accepted. Most lists with restrictions on the amount of data retrieved (but not, for example, the event log, where the amount of data is unrestricted) allow you to enter string masks like the one on the *Search* bar.

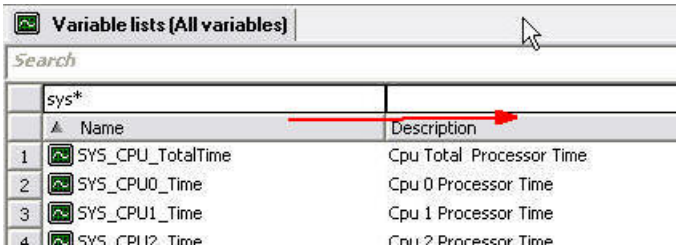
Field / button	Description
Advanced Search bar text box	A text selection box for text and figure columns. Enter a string mask like the one used in the *Search* bar in the text box. **String mask**: Enter a string mask that is compared with the column texts. The properties of string masks are explained in the search bar description Selection of items.
	Yes/no criteria: Used for columns whose value is yes or no. Click to change the criteria. Each click changes the criteria to the following one. The criteria include the following: • : All items accepted (value Yes or No). • : Only items whose value is Yes are accepted. • : Only the items whose value is No are accepted.
Enable mask **Enable mask**	Checkbox for time columns. If the checkbox has been selected, the bottom of the list displays a time bar where you can select criteria for the time span. The time span is selected as described in 5.4, Time bar. The left side of the interval row displays the column that the criteria are linked to.
Column headings	The descriptions of column headings are displayed at the bottom of the **Properties** dialog. For more information, see 4.6, Properties dialog.
Order indicator	Indicates the column based on which the items are sorted. The list can be sorted by a maximum of five columns. A number displayed next to the triangle indicates the order in which the column is used in the sorting. The direction of the triangle indicates which of the following ways the items have been sorted by: Normal order: Ascending order = depending on the type of data in the column, an alphabetical, or numerical order from smallest to largest (for example, A-Z, 0-9). Reverse order: Descending order = depending on the type of data in the column, an alphabetical, or numerical order from the largest to smallest (for example, Z-A, 9-0). For information about sorting items by clicking the column headings of a single column, see Sorting list items using column headings. For information about sorting the items by several columns and by using the commands in the pop-up menu, see Sorting the list items using a popup menu.
Refresh **Refresh**	Refreshes the list data. In bigger lists, automatic refresh has been blocked. These list screens display a Refresh button that begins to flash when search criteria have been changed. In these cases, list refresh is activated with the Refresh button.
Edit **Edit**	Moves the list into editing mode where you can add and delete items and edit their information, depending on the list.

Field / button	Description
⇹	Click the right side of the column heading with the ⇹ pointer to change the column width to accommodate the longest text in the column.

Changing the order of columns

You can change the order of columns by clicking a column heading and then moving the column either to the right or the left in the table.

If the row number is shown, it is in the beginning of the row.



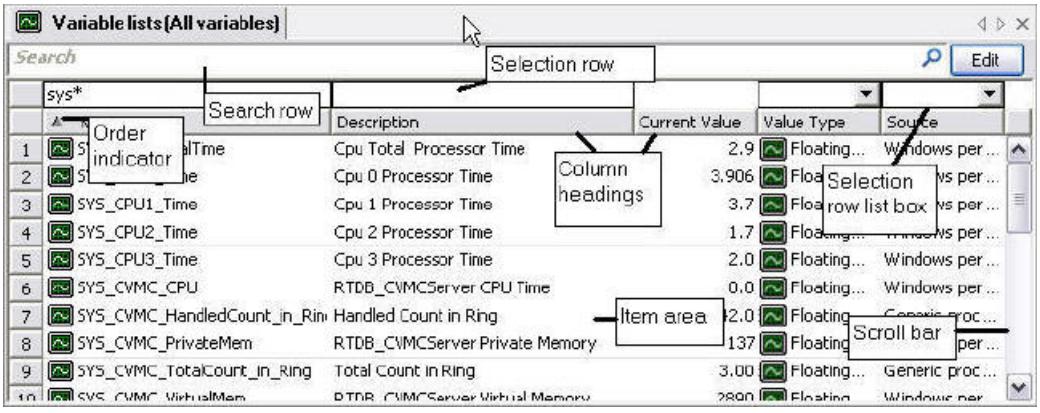
List_sorting_titles2.jpg

Figure 7.1-2 Sorting of titles

Sorting list items using column headings

Click the column heading to sort the items based on a single column.

- Click the heading of the column by which you want to sort the items - for example, Name.
  The sort indicator (▲)) is displayed in the heading, and the items are resorted. When you select the column for the first time, the items are sorted in normal order (▲).



Example_list.jpg

Figure 7.1-3 Sample list

- Click the same column again if you want to sort the items in reverse order ( ).

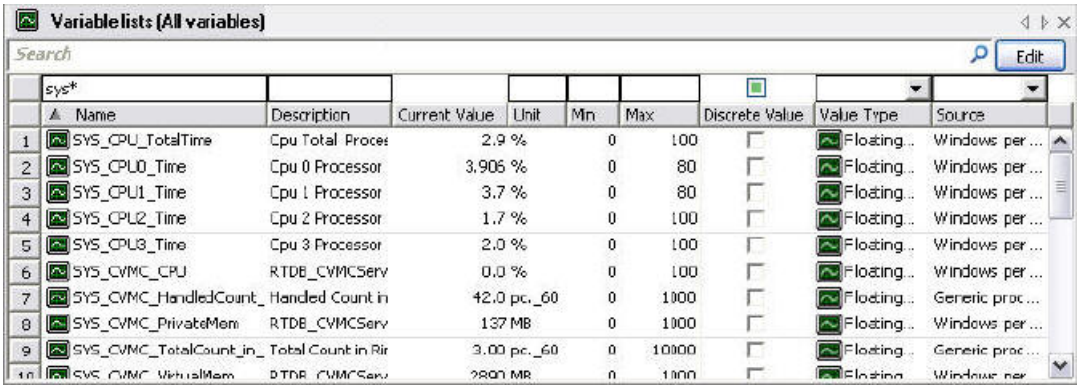
Sorting the list items using a popup menu

- The primary sort (default sort) is always selected in the list. If you want to sort the items by more than one column, select the following columns in numerical order - first the **Secondary Sort**, then the **Tertiary Sort** option, and so on.

To change the column used for a (primary, secondary) sort:
- Right-click the heading of the new column, and select the sort option (**Primary Sort** / **Secondary Sort**) and direction.
- You can also change the column used for primary sort by clicking the new column.

To change the sort direction of the column:
- Select the same sort option and a new direction.
- You can also change the direction of the sort column by clicking the column.

To delete a sort order:
- Click the column. If you click any column other than that used for primary sorting, the column becomes the primary sort column, other columns are preserved and the number of sort columns decreases by one (if you click the primary sort column, only the sort direction changes).



Example_list_plain.jpg

Figure 7.1-4 Sample list plain

Selection of items

Use the search and the advanced search bars to reduce the number of items displayed and to view only selected items. You can search for a single item or an item group depending on the string criteria you enter, the criteria you select in a list or other type of criteria. Only the items that meet all the criteria of the search and advanced search bars are displayed.

Different criteria on search and advanced search bars:

-  **Search bar**: Defines the string mask that is compared with the texts in all columns. The string mask can consist of several query strings.

The query string has the following properties:

- The ? wildcard replaces one character.
- The * wildcard replaces zero or more characters. If you have enabled automatic refresh, you can reduce the number of variables (rows) displayed by entering more characters in the query string between the two asterisks.
- If you enter an asterisk (*) as the first and last character in the query string, the string that meets the criteria can appear anywhere in the column. Otherwise, the string must be at the beginning and/or end of the column.
- When limiting numeric data, characters can be used to limit numbers based on values.

  These characters include:
  - equals (=)
  - bigger than (>)
  - smaller than (>)
  - bigger than or equal (>=)
  - smaller than or equal (<=)
- Vtrin does not add an asterisk at the end of the query string.
- You can search for column texts that end in specific characters.
- The query string is case-insensitive.
- The string mask can include several query strings that have to or cannot be included in the displayed items. Use commas (,) to separate query strings. You can only use exclusive query strings in the advanced search bar. If you use them on the search bar, the string must be found in all columns to limit off a row .
  - If you do not want the query string to be included in the search results, use an exclamation mark (!) or minus sign (-) in front of it and add it to the string mask. Exclusive query strings can also include asterisks.
  - The items selected are those that include one or all the "positive" search criteria (the ones that do not begin with an exclamation mark or minus sign) and no "negative" criteria (the ones that begin with an exclamation mark or minus sign).
  - For example, the string mask string1,string2,!string3,!string4 means that string1 and/or string2 must be included, while string3 and string4 cannot be included in any of the displayed items.
  - The following characters cannot be searched for - that is, you cannot use them in the query string: "*", "?" and "," .The following characters can be used in a query string but not as the first character: "!" and "-".
  - To avoid automatic refresh from causing too large of a load on the system, each keystroke is followed by a short delay before the system initiates a search. This allows you to enter the entire string mask before the search begins.

- **Advanced Search Bar**: Includes string, list, yes/no, or time span conditions related to the column below. All the criteria in the selection boxes and the string criteria in

the search bar are combined with an AND operator, that is, the displayed items must meet all the criteria listed in 7.1, List screen

To use the search and advanced search bars:

1. Enter the string mask in the search bar.
2. Enter the string mask in the string mask fields in the advanced search bar (

) above the column names.
3. Select the required options for columns from the list criteria boxes on the advanced search bar (

) above the column names.
4. Select the required options for columns from the yes/no boxes on the advanced search bar () above the column names.
5. Select the required time spans for time columns by first selecting **Enable search** above the columns and then selecting the time spans from the time bars displayed at the bottom of the list.
6. If the list to print is short, Vtrin continuously monitors items as you enter string criteria and select options, and only displays the items corresponding to the criteria and options. When the refresh button is flashing, click 

Refresh to activate the selections and view the results.
7. When you close the list window, you can save the content of the advanced search bar and the appearance of the window (for example, column width). The content of the search bar is not saved.
8. This enables you to create a variable list that displays all floating-point variables for department X. When you open the variable list, you can, for example, select to only view variables with the character ‘z’ in some column by entering string mask *z* in the search bar. Closing the window does not change the original list.

You can save the content of the advanced search bar when you close the list window. The contents of the search bar are never saved.

7.2. Variable list

The variable list displays the database variables, which you can sort based on various data and search using different criteria. You can also create, rename, and delete variables, if you have sufficient rights for that.

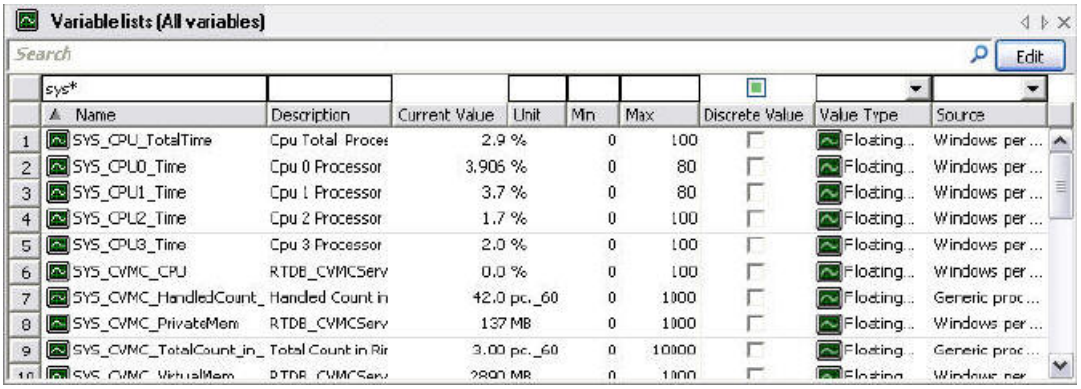
Description of variable list

Open the variable list from the tree. You can also create your own variable lists by editing the basic variable list and placing the variables anywhere in the tree. The default variable list, however, remains in the **Variable lists** folder inside the **Maintenance** folder. This folder contains pre-configured lists for different types of variables.

The information displayed in the list depends on the customer. To view the meaning of columns, click the variable in any column of the list (the current value column does not open). This displays the variable information (columns) one below the other in the **Properties** dialog. Clicking a row in the **Properties** dialog displays the explanation of the information (column) at the bottom of the dialog. For more information, see 4.6, Properties dialog.

Section 7.1, List screen explains how to sort the variables by different data fields and search them by different criteria.

Variable list



Example_list_plain.jpg

Figure 7.2-1 Variable list

Table 7.2-1 Variable list

Field	Description
	For descriptions of common list boxes (for example, **Search**) see 7.1, List screen.
Column headings	The descriptions of column headings are displayed at the bottom of the **Properties** dialog. For more information, see 4.6, Properties dialog.
Current value	The variable's current value and its status icon. These are not displayed in the **Properties** dialog because they are a combination of different database attributes. Status icons are described in 4.10, Icons.

Activation buttons	Description
	For descriptions of common buttons, see 7.1, List screen.

7.3. Event and alarm tables

The system can have two types of event and alarm tables:

- Events and alarms related to the system variable are collected in the alarm table. In the alarm table, the events are in the order of arrival and consist of event activity

and alarm acknowledgement information. Alarm table printouts are described in 7.4, Alarm and event lists.
- Event table displays the system events that do not have variables in the database. In this case, the event row contains all the information available to the user. Event table printouts are described in 7.4.1, Event log.

7.4. Alarm and event lists

Alarm and event lists provide different views of the same alarm table.

The alarm list is used to acknowledge new alarms and it shows all active and unacknowledged process alarms triggered by the system. You can sort the alarms based on various data and search them using different kinds of criteria.

As an option, you can enable a talking alarm for newly specified alarm types. (Currently available in Finnish only).

The event list displays the alarms and events triggered by the system. You can sort the events based on various data and search them using different kinds of criteria.

Description of alarm and event lists

You can open an alarm or event list in the tree or by clicking an alarm list icon configured on the status bar. You can also create your own lists by editing the basic list and place them anywhere in the tree. The default lists, however, are located in the **Events and alarms** folder.

The alarm list shows all active (not deactivated) and unacknowledged (including deactivated) alarms in the order of arrival. An alarm is removed from the alarm list when it has been deactivated and acknowledged.

The event list shows all events, including alarms, in the order of arrival (default).

The information (columns) displayed in the list are defined specifically for each customer. The available columns are shown in Table 7.4-1. To see the meaning of a column, click the list row: this will display row information (columns) one under the other in the **Properties** dialog. Clicking a row in the **Properties** dialog will display the explanation of the information (column) at the bottom of the dialog. For more information, see 4.6, Properties dialog. You can group the lists into ordered lists based on alarm priority or process area.

You can select the alarms/events shown in the list from the alarm table information based on the following criteria:
- Event time (the time span for which alarms/events are shown)
- Priority (all; alarms; warnings; notifications; events [event list only])

- Process area (grouping variables by process area)
- Variable-specific identifications

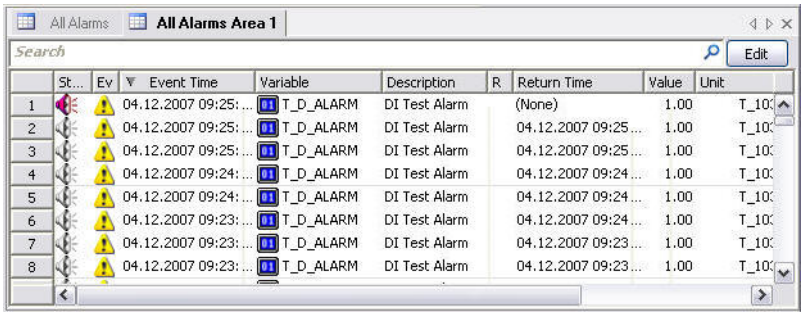
You can sort the alarms/events shown in the list based on the following criteria (see Chapter 7, Lists for more information on how to sort the alarms by different data fields and search them using different criteria):

- **Event time** (normal)
- **Priority**
- **Variable-specific identifications**

Acknowledge the alarms in the alarm list by first selecting the alarm rows you want to acknowledge and then by sending an acknowledgement message.

As an option, you can enable a talking alarm for newly specified alarm types. (Currently available in Finnish only). Talking alarm is implemented with the server's sound card.

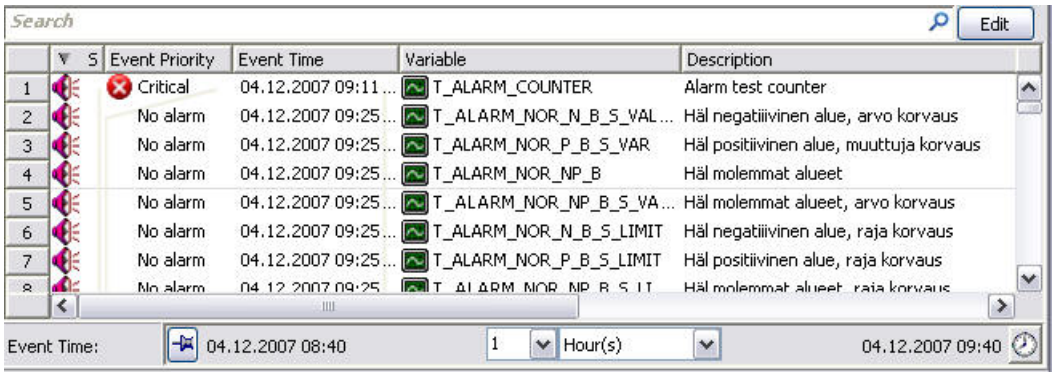
Alarm list



Alarm_list.jpg

Figure 7.4-1 Alarm list

Event list



Event_list.jpg

Figure 7.4-2 Event list

Table 7.4-1 Available alarm and event list columns

Alarm and event list columns	Description
	For descriptions of common list boxes (e.g. **Search** and **Advanced Search Bar**, see 7.1, List screen.
Column headings	The descriptions of column headings are displayed at the bottom of the **Properties** dialog. For more information, see 4.6, Properties dialog.
Columns available for the lists	
Event priority   	The priority of an alarm/event can be: • A critical alarm • A warning • A notification • An event (event list only).
Alarm status    	The Alarm status icon indicates the current status of the row: • Active unacknowledged alarm • Active acknowledged alarm • Passive unacknowledged alarm or an event list event • Passive acknowledged alarm or an event list event.
Event time	Event time is the effective time of the alarm/event, which is the time stamp of the variable's current value when the status becomes effective. In the case of a measurement, the time stamp is normally generated by the measurement system, and in the case of a calculated variable by the calculation program.
Return priority	Return priority indicates the priority of the alarm at the moment it was removed.
Return time	Alarm/event return time is determined in the same manner as event time.
Trigger and limit value	Trigger and limit value indicate the cause of the alarm/event. This can, for example, be going below or above a current value limit.
Value	Value indicates the variable's current value at the time the alarm/event was generated.
Duration	The period for which the status was valid. Updated when the status is changed.

Alarm and event list columns	Description
Variable identification data	The variable is identified in the row with the following information: • **Variable** • **Description** • **Unit** • **Area** • **Process** • **Alias**

Alarm list button	Description
Area icons	Area icons can be configured in the status bar. Each icon indicates the types of alarms occurring in each process area in the following order of priority: • Active unacknowledged (flashing) • Active • Deactivated unacknowledged (flashing)

Acknowledging alarms

To acknowledge alarms:

1. Select the rows you want to acknowledge from the alarm list.
   - Select a single row by clicking it. The color of the row changes when it is selected.
   - Select several rows by clicking a row on one side of the desired area and then by clicking on the other side of the desired area with the Shift key held down. The selected rows change color.
2. Acknowledge the selected rows by right-clicking and choosing Send To and then Acknowledge from the popup menu. The mouse must be clicked in the selected area, otherwise you will acknowledge the row under the mouse instead of the selected area.
3. Click anywhere outside the selected area to deselect it.

Viewing the alarm list

7, Lists explains how to sort the alarms by different data fields and search them by different criteria. The columns of the alarm list are shown in the table on the previous page.

7.4.1. Event log

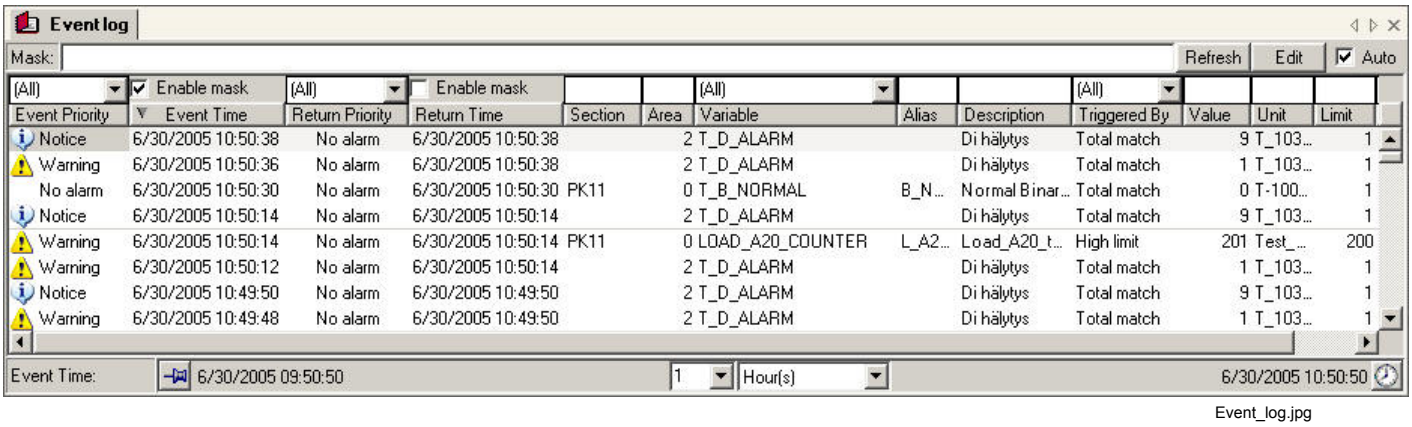
The event log shows system events. You can sort the events based on various data and search them using different kinds of criteria.

Description of event log

Open the event log in the tree. You can create your own event logs by editing the basic event log and place them anywhere in the tree. The default event log, however, will remain in the **Maintenance** folder.

The data displayed in the event log depends on the customer. To see the meaning of columns, click the event in the first column of the list. This will display the event information (columns) one under the other in the **Properties** dialog. Clicking a row in the **Properties** dialog will display the explanation of the information (column) at the bottom of the dialog. For more information, see 4.6, Properties dialog.

7, Lists explains how to sort events by different data fields and search them using different criteria.



Event_log.jpg

Figure 7.4.1-1 Event log

Column heading	Description
	For descriptions of common list boxes (e.g. **Search** and **Auto**) see 7.1, List screen.
Column headings	The descriptions of column headings are displayed at the bottom of the **Properties** dialog. For more information, see 4.6, Properties dialog.

8. Status window

The variable's **Status** window displays the current value of the selected database variable. You can also remove the variable from current value processing in the **Status** window and replace the variable with a different value.

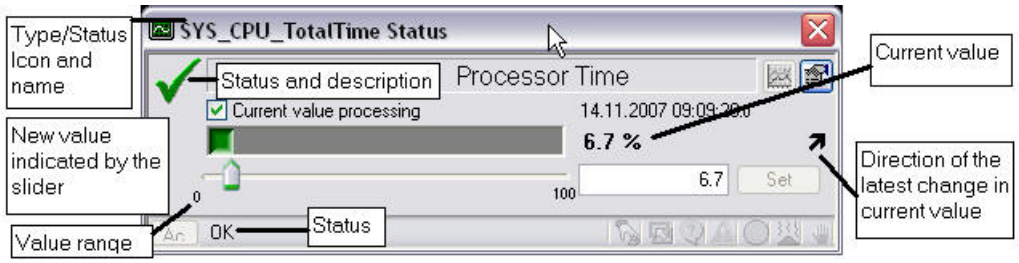
Description of status window

The window displays the variable's name, description, current value and status, unit, time stamp, and status both as an icon and as text. The title bar displays an icon corresponding to the variable's type when the status is OK, and a status icon in other cases.

You can remove the variable from current value processing and give it a new current value. To define a floating-point variable, move the slider to the required value or enter a figure in the box. For binary variables, select a value from the list.

Click  to open the variable's **Properties** dialog.

Display



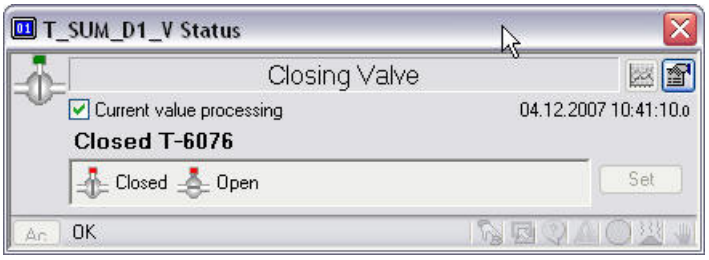
Status_window_analog.jpg

Figure 8-1 Status window analog

Status_window_binary.jpg

Figure 8-2 Status window binary

If there are only two values, they are placed side by side, instead of a list.



t_sum.jpg

Figure 8-3 T_SUM status

Table 8-1 T_SUM status fields

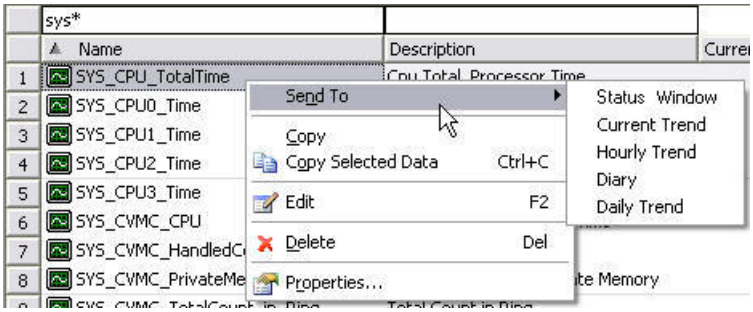
Field	Description
Type icon	A variable-type icon on the left of the title bar, if the variable's status is OK.
Status icon	Icon representing the variable's status. Displayed on the left of the description. If the status is not OK, the status icon is displayed on the left of the title bar, which otherwise displays the variable's type icon. Status icons are described in 4.10, Icons. If binary variables, the window displays the symbol of the binary state, which is defined so that its color indicates the (quality) status and its form the value.
Name	Name of variable. Displayed in the title bar.
Description	Description of variable. Displayed below the title bar.
Current value processing	If selected, the value from the process is used for the variable. If not selected, the value is used for the variable.
Time	Time stamp for the current value.
Value	Current value. If binary variables, the binary state as text.
Unit	The engineering unit of the value in the database.
➔	Indicator of the direction of change. The arrow indicates the direction of the latest change in the current value of the floating-point variable: ↗: Increasing value ↘: Decreasing value ➔: Unchanged value
	The new value of the floating-point variable indicated by the slider. You can provide a new value either by moving the slider or by entering a figure in the box. The left end of the line represents the minimum value in the range, and the right end the maximum value. The range is also displayed as a tool tip text when you position the pointer in the slider area.
	New value for floating-point variable as a figure. You can provide a new value either by moving the slider or by entering a figure in the box.
	or binary variables. Select a new value from the list.
	Acknowledged/unacknowledged = a variable has an unacknowledged alarm)
Status	The variable's status in text format. Displayed at the bottom of the window.

Field	Description
Status icons	The variable's valid states are displayed at the bottom of the window using colored icons. Status icons are described in 4.10, Icons.

Table 8-2 T_SUM activation buttons

Button	Description
	Not yet supported.
	Displays the **Properties** dialog of the variable.
	Makes the new value displayed in the box (floating-point variables) or in the list (binary variables) the variable's current value.

Opening the Status Window



Menu_open_status_window_from_list.jpg

Figure 8-4 Opening the status window

- Right-click any other column than the current value or the alarm list variable column on the variable's row in the variable list or chart window legend.
- Select **Send To** and then Status Window.
  OR

Menu_open_status_window_from_current_value.jpg

Figure 8-5 Opening the status window

- Right-click a current value (value, symbol, or column) in the process diagram and then select status window.

Table 8-1 Status window items

Item	Description
Send To	Opens a variable specific pop-up menu from which you can select a display type.
Status Window	The status window of a selected variable.
Diary	A diary, if such is configured into the system.
Current Trend	The default current trend of a selected variable.
Hourly Trend	Hourly average values of a selected variable (if collected).
Copy	Copies the basic information of a selected variable.
Copy Selected Data	Copies the selected piece of information of a selected variable.
Delete	Deletes the selected variable from the database.
Properties	Opens the **Properties** window of a selected variable

Setting the value of a process variable or a calculated variable

1. Remove the variable from current value processing in the **Current value processing** checkbox.
2. Select a new value for the floating-point variables by using the slider or by entering a new value in the box. If binary variables, select a new value from the list.
3. Set the value as the current value by clicking Set **Set**.
4. The variable's status changes to replaced. The new value remains the variable's value until you manually set a new value or allow current value processing in the **Status** window. The variable begins to receive values from the process or the spreadsheet application.

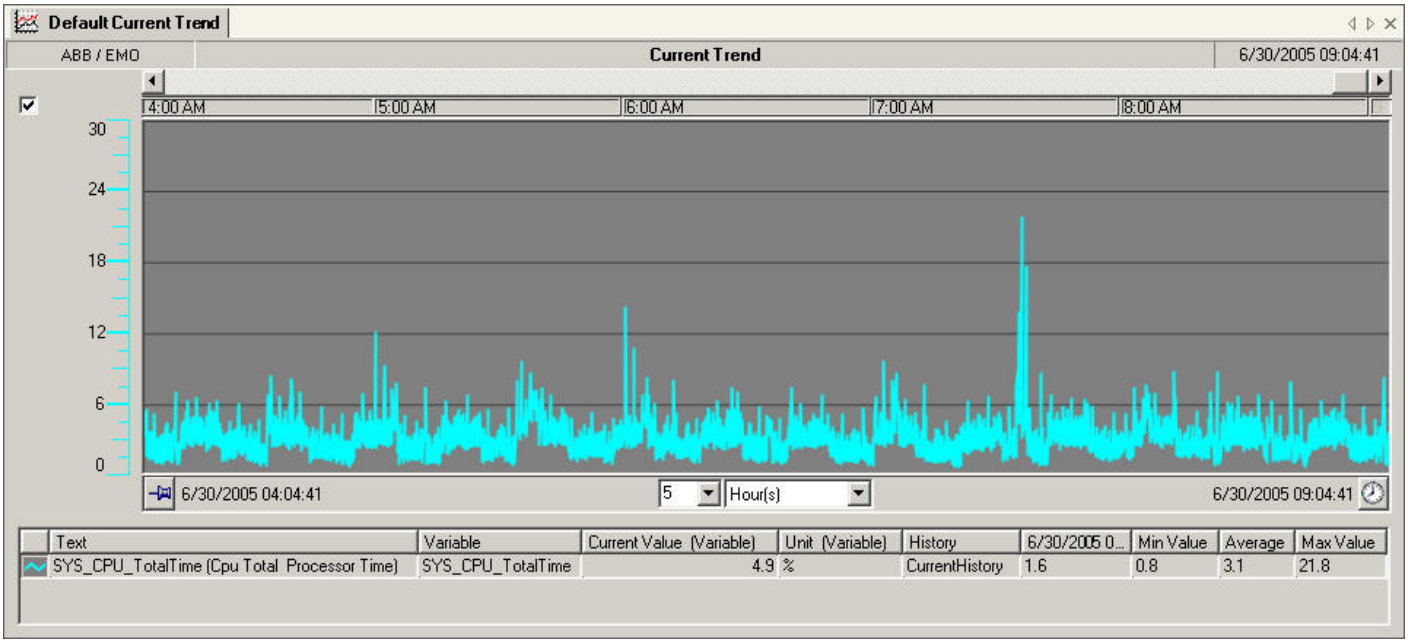
9. Default trends

The variable's default trend enables you to, for example, use the variable list to open a chart window displaying the variable's plot.

Description of default trends

The default trend is a chart window defined for the variable, which displays the variable's plot. A variable can have several default trends that retrieve the information for plots from different time levels - for example, from the current value or one-minute average value history.

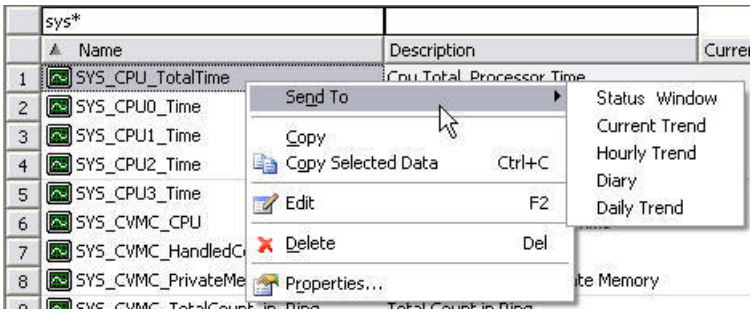
Default trend



Default_trend_display.jpg

Figure 9-1 Default trend display

9.1. Opening a default trend



Menu_open_status_window_from_list.jpg

Figure 9.1-1 Opening a default trend

To open a default trend:

1. Right-click any column other than the current value or the alarm list variable column on the variable's row in the variable list or the legend in the chart window.
2. Select **Send to** and the required default trend.

OR

- Right-click a current value (value, symbol, or column) in the process diagram and then select the desired default trend.

Do not replace the default trend so that the original default trend is not lost.

10. Templates

A template contains certain properties and the layout of a chart window. Using the appropriate template to create a chart window enables you to quickly create a functional window complying with the agreed standard by simply adding the required graphs.

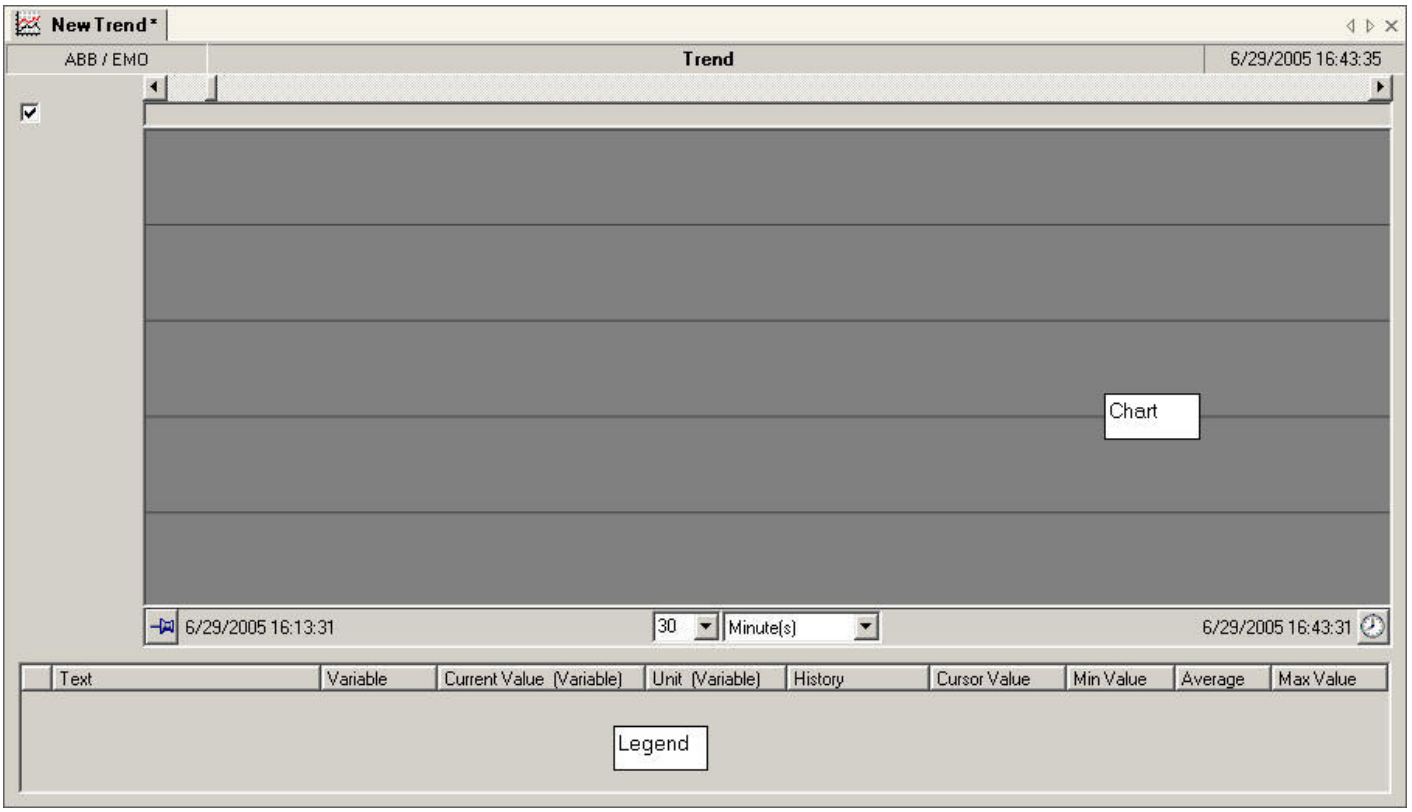


Figure 10-1 Display template

Using templates

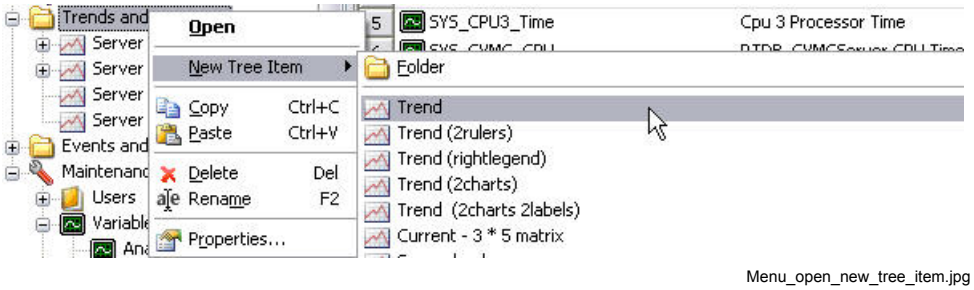
To create a new template-based chart window:

1. Using an appropriate template, create a chart window in the tree's folder and open it.
2. Open the variable list or another chart window that displays the variable rows in its legend (the two methods lead to slightly different results).
3. Drag the required variables from the variable list or from the legend of the chart window to the legend or chart of the new window.

For more detailed instructions, see 10.1, Creating a chart window using a template.

10.1. Creating a chart window using a template

Right-click the tree's folder in which you want to create a chart window. Select **New Tree Item** and the required template.



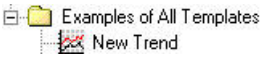
Menu_open_new_tree_item.jpg

Figure 10.1-1 Creating a chart window using a template

Table 10.1-1 Templates

Template	Description
Trend and diagrams	Select the folder into which you want to create a chart.
New Tree Item	Opens the template pop-up menu.
Trend	Select a template you want to use.

The folder displays a new chart window item, with the name **New** and the name of the selected template. Enter an appropriate name for the window.



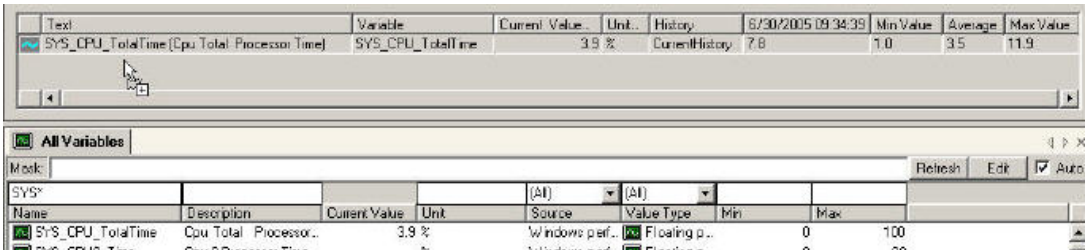
Open the new chart window. The window displays the name you entered.
Add graphs to the chart by dragging a variable from the variable list or a variable row from a legend of another chart window. In terms of the determination of plot configurations, these two methods differ in the following way:
When you drag variables from the variable list, the graph definitions comply with the template defaults and the graph color with the order of addition. When you drag variable rows from another chart window, the graph definitions comply with the original graph.

When dragging a variable or variable item from another database, the default definitions are not copied along with the variable. In this case the history table for the new item has to be updated from the Properties dialog.

To add graphs from a variable list:

1. Open the variable list. To simultaneously view both the list and the chart window, move the variable list to a new horizontal tab by opening the **Window** menu in the menu bar and selecting **Move to a New Horizontal Leaf**.

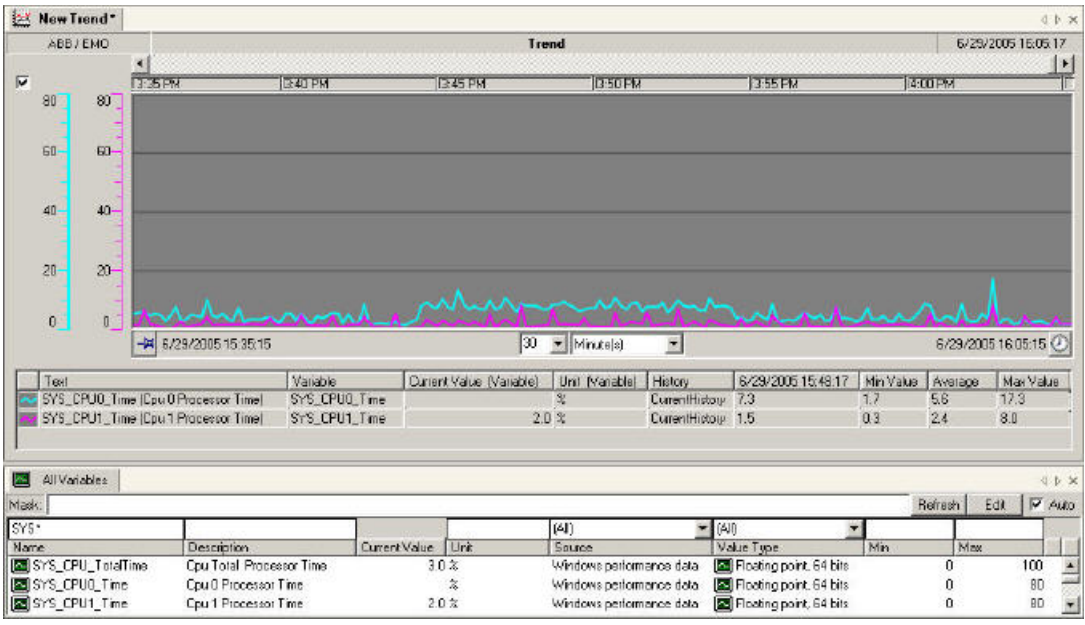
2. In the variable list, locate the variables that you want to add to the chart. The easiest way to find variables is by using search criteria in the search bar and in the selection boxes. For more information, see 7, Lists, Selection of items.
3. Select the variable row (by clicking) and drag it to the chart window's legend or the chart (plot area).
4. You can also select several variables one by one by pressing the CTRL button and holding it while selecting variables.



Add_new_variables_from_list.jpg

Figure 10.1-2 Adding graphs from a variable list

5. Add the rest of the graphs in the same way. The graph definitions comply with the default settings of the template.



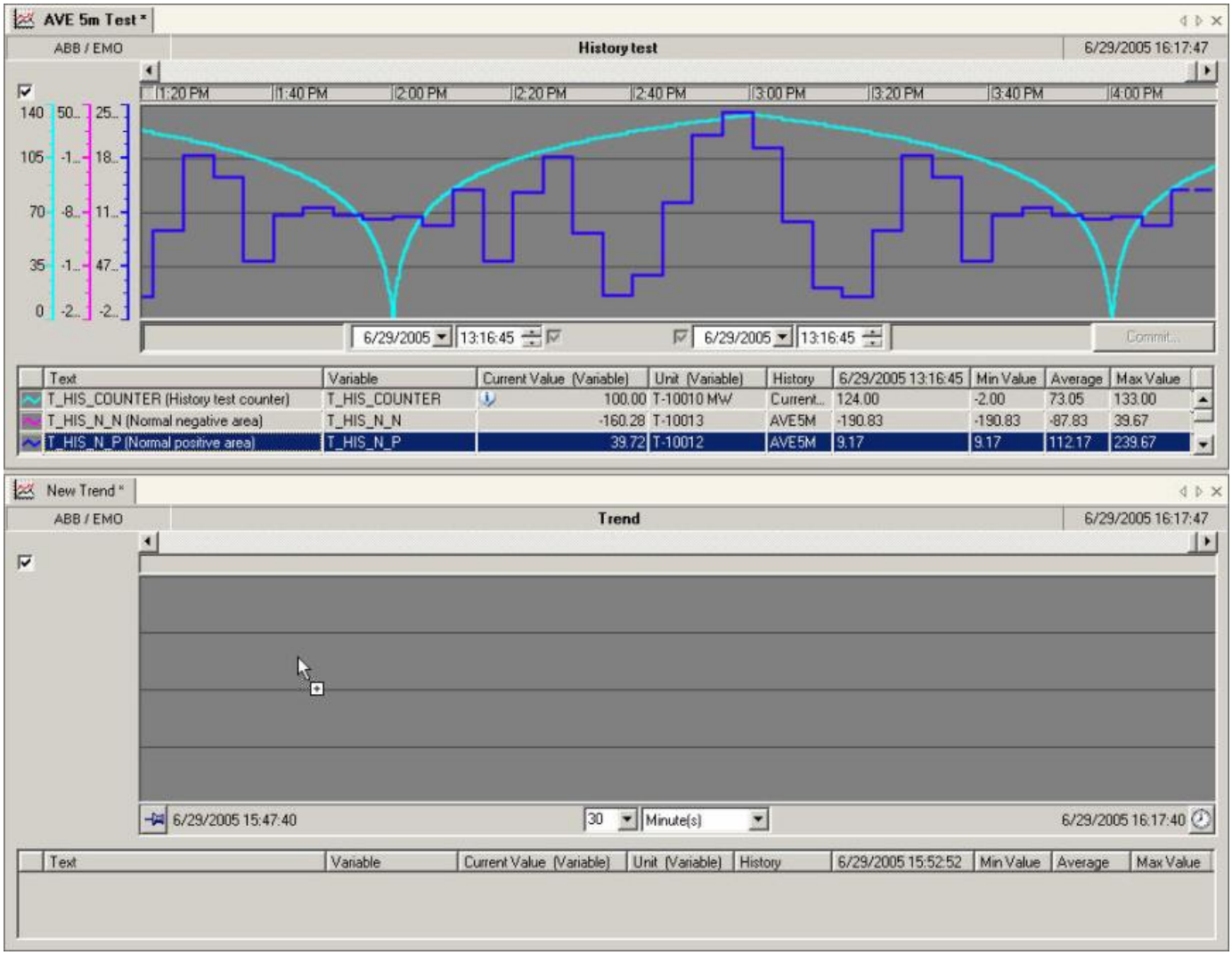
New_variables_from_list.jpg

Figure 10.1-3 Adding new variables from list

Adding graphs from the legend of the chart window:

1. Open the chart window where the properties of the graphs are displayed in the legend rows. To simultaneously view both the list and the new chart window, move the chart window to a new horizontal tab by opening the **Window** menu in the menu bar and selecting **Move to a New Horizontal Leaf**.

2. Drag the variable row from the chart window's legend to the legend or the graph area of the new chart window.

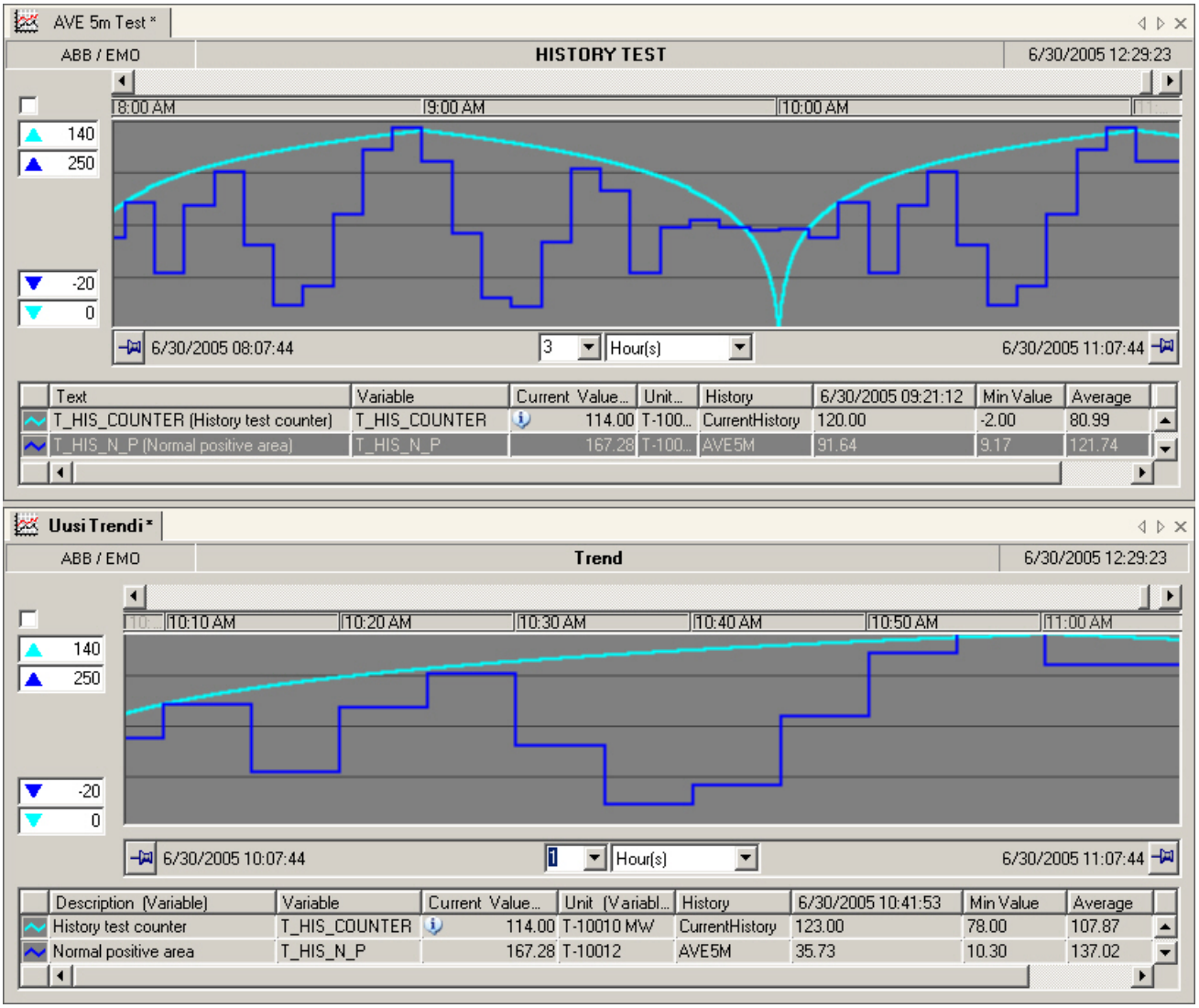


New_variables_from_chart_window.jpg

Figure 10.1-4 Adding graphs from the legend of the chart window

3. Add the rest of the graphs in the same way. You can also add graphs from several chart windows. The definitions of the added graphs (for example, the color and the table [if the table has been identified, the default table is changed] where the history

values are retrieved from) is like those of the chart they originated from. The addition of graphs does not affect the chart window interval.



New_variables_from_different_time_span_chart_window.jpg

Figure 10.1-5 Adding new variables

If you want to change the properties of the graphs added to the chart of the new window, such as the colors and graph styles, do this in the chart's **Properties** dialog.

4. Save the chart window when prompted to save changes.

11. Data historian backup and restore functions

11.1. Taking a backup of the Data historian

Ensure that the actions below are done from administrator command prompt.

To backup Data historian :

1. Log into the COM600 computer operating system.
2. Open the command prompt window (**Start** > **Run** > **cmd**).
3. Set the path to the backup media where the backup is to be stored by setting the `ABB_BACKUP_ROOT` environment variable.
   For example, backup path can be set to `D:\RTDB_BACKUP`
   `SET APP_BACKUP_ROOT=D:\RTDB_BACKUP.`
4. Start the creation of backup with command `APP_PrepareDatabaseForOnlineBackup.`
5. Wait until the backup script is finished.
6. Close the prompt window.

11.2. Taking a Data historian online backup

You can take a backup of the Data Historian application either manually using a bat file or automatically by setting the Windows task scheduler to take an automatc backup at certain intervals.

You can take a manual backup by using the COM600RTDBBackup.bat script. The script is located at **C:\Program Files\COM610 GW SW\Common\bin** folder in the COM600 computer.

Note that you need admin rights to the computer run the script and perform the backup successfully.

The script takes an input parameter, which indicates the folder of which the backup is taken. When the input is valid, the script launches the **APP_PrepareDatabaseForOnlineBackup.bat** script, which makes an online backup of the Data Historian application.

The script also sets up the `APP_BACKUP_ROOT` system environment variable, that is used for the Data Historian backup.

Ensure that the actions below are done from administrator command prompt.

To manually backup Data Historian application:

1. Log into the COM600 computer operating system.
2. Open the Command Prompt by choosing **Start**>**Run**>**cmd**. Make sure that you have logged in as an administrator.
3. Change the runtime directory to **C:\Program Files\COM610 GW SW\Common\bin**. For example, **cd "C:\Program Files\COM610 GW SW\Common\bin"** .
4. Launch the **COM600RTDBBackup.bat** script and verify the intended backup location. For example, **COM600RTDBBackup.bat "C:\RTDB Backup"**
5. Wait until the backup script is finished.
6. Close the command prompt window.

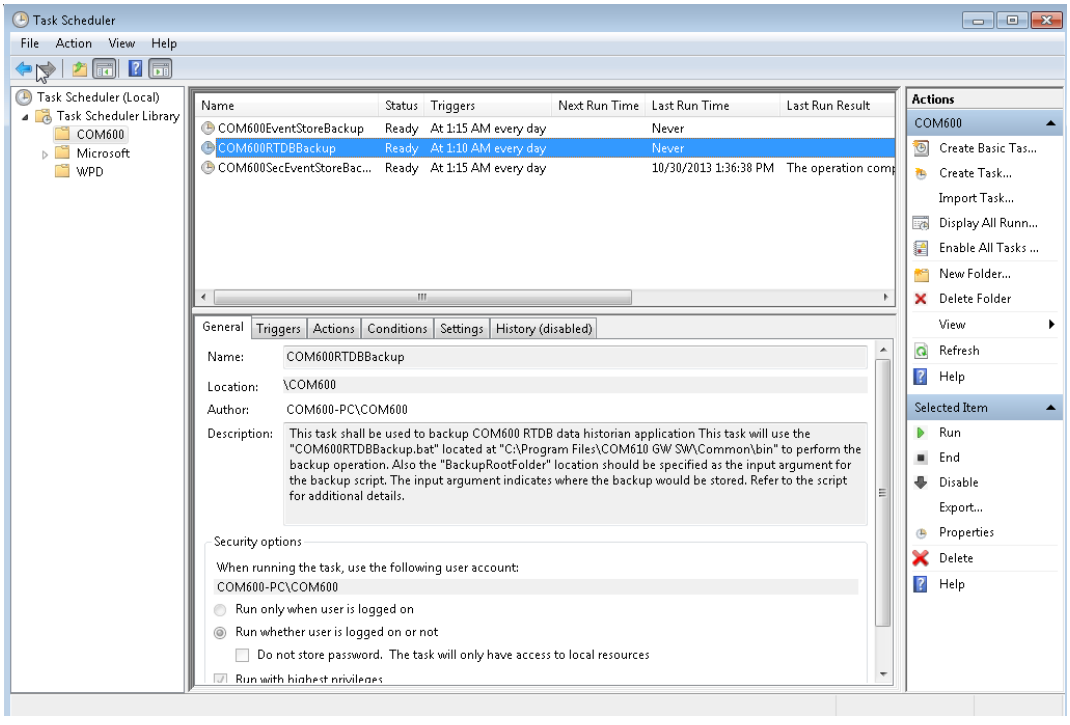
To make the backup automatic, you can set the Windows task scheduler to automatically perform the backup function at certain intervals.

The task is named **\COM600\COM600RTDBBackup** in the Windows task scheduler. It is disabled by default.

When enabled, the task launches the **COM600RTDBBackup.bat** script with the intended backup location as the input parameter.

To automatically backup Data Historian application:

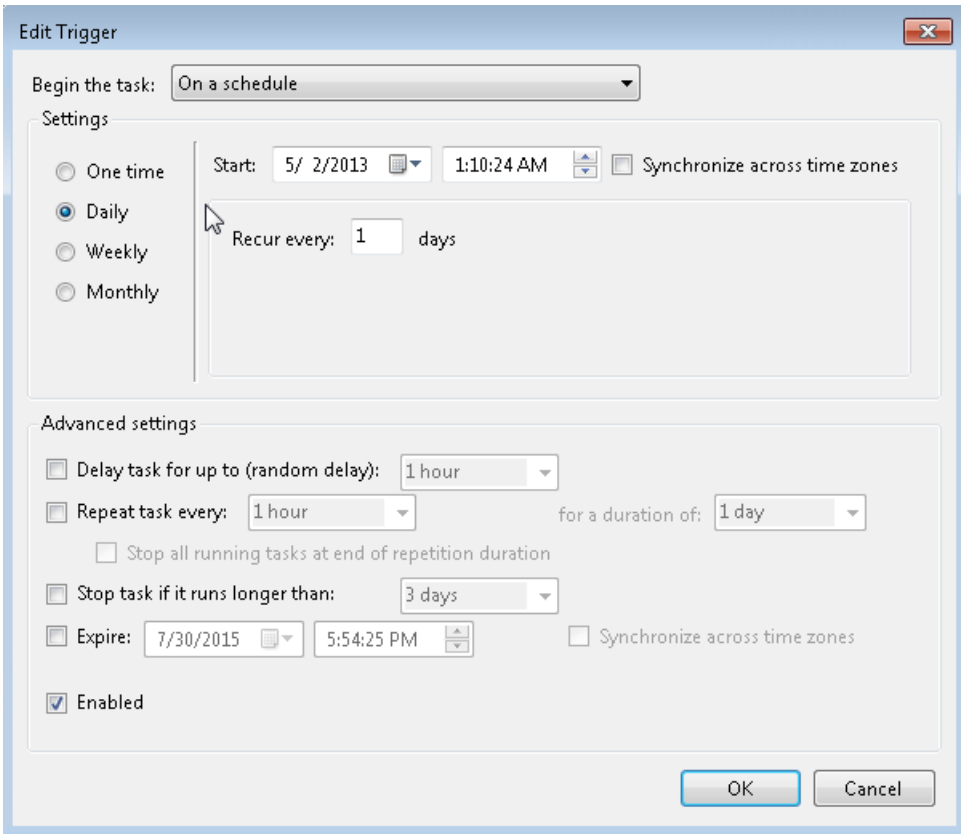
1. Log into the COM600 computer operating system.
2. Launch Windows Task Scheduler from **Control Panel**>**Administrative Tools**.
3. Locate the **COM600RTDBBackup** task as shown in the picture below



Data_Hist_Task_Scheduler.png

Figure 11.2-1

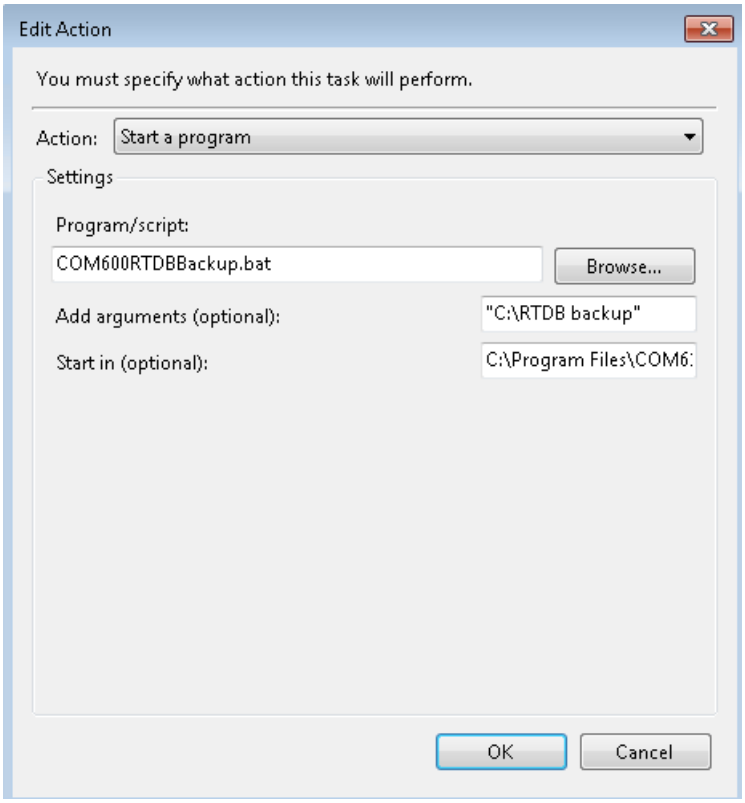
4. Right click the **COM600RTDBBackup** task and select **Properties** to enable the task and set the time interval for task execution.
5. In the following **COM600RTDBBackup Properties** dialog, select the **Triggers** tab.
6. Double click on the **Daily Trigger** entry to setup time interval for task execution and click **Ok**. Make sure to check the **Enabled** check box to enable the task.



Data_Hist_Edit_Trigger.png

Figure 11.2-2

7. To edit the backup location for the task, choose the **COM600RTDBBackup Properties** dialog and select the **Actions** tab.
8. Double click on **Start a Program** action item to launch the **Edit Action** dialog.



Data_Hist_Edit_Action.png

Figure 11.2-3

9. Edit the textbox for **Add arguments (optional)** to change the intended backup location. Then click **Ok**.
10. Click **Ok** in the **COM600RTDBBackup Properties** to confirm the changes made to the properties of the task.
11. Run the COM600RTDBBackup task. Check the backup result in the Windows event log using Windows Event Viewer tool. You can open it by choosing **Control Panel** > **Administrative Tools**.

11.3. Restoring Data historian backup

To restore Data historian backup:

1. Log into the COM600 computer operating system.
2. Open the command prompt window (**Start** > **Run** > **cmd**).
3. Stop the Data historian services with command `APP_STOP_RTDB`
4. In Windows Explorer, delete or rename the existing `C:\RTDB Backup\Onlinecopy` directory.
5. Copy the backed up `Onlinecopy` subdirectory from the backup media to directory `C:\RTDB Backup`.
6. Start the restore function with command `APP_RestoreRtdbFromOnlineBackup`.
7. Wait until the restore function is finished and restart the COM600 computer.

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ABB Distribution Solutions
Distribution Automation
P.O. Box 699
FI-65101 Vaasa, Finland
Phone: +358 10 22 11

ABB Distribution Automation
4300 Coral Ridge Drive
Coral Springs, Florida 33065
Phone: +1 954 752 6700

www.abb.com/mediumvoltage
www.abb.com/substationautomation