



# MicroSCADA Pro SYS600 9.4

## Operation Manual

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**ABB**

Trace back information:  
Workspace Main version a50  
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## Contents

<b>1 Copyrights .....</b>	<b>7</b>
<b>2 Introduction .....</b>	<b>9</b>
2.1 This manual .....	9
2.2 Use of symbols .....	9
2.3 Intended audience .....	9
2.4 Related documents .....	10
2.5 Document conventions .....	10
2.6 Document revisions .....	10
<b>3 Overview .....</b>	<b>11</b>
3.1 Getting started .....	11
3.1.1 Login .....	11
3.1.2 Logout .....	12
3.1.3 Time based logout .....	12
3.1.4 Time-based logout after inactivity .....	12
3.2 Application displays .....	13
3.3 Process Displays .....	14
3.3.1 Controlling the process .....	15
3.3.2 Adding Process Display Notes .....	16
3.3.3 Adding a comment to an object .....	19
3.3.4 Renaming Process Display .....	21
3.4 Monitor Pro layout .....	21
3.4.1 Specifying toolbars .....	22
3.4.2 Changing application layout .....	23
3.4.3 Resetting Layout .....	31
3.5 Using process lists .....	31
3.6 Using reports and trends .....	32
<b>4 Process controlling .....</b>	<b>33</b>
4.1 Navigating .....	33
4.2 Zooming .....	34
4.3 Find .....	37
4.4 Station Local/Remote control .....	38
4.5 Bay Local/Remote control .....	41
4.6 Switch control .....	44
4.6.1 Blockings .....	45
4.6.2 Forced operations .....	46
4.6.3 Simulation .....	49
4.6.4 Alarms .....	50
4.6.5 Auto-reclose .....	51
4.6.6 Operation counters .....	52

Operation Manual

---

4.6.7	Dial-up .....	54
4.6.8	Tagout .....	57
4.6.9	Operator Place .....	60
4.7	Transformer voltage control .....	61
4.8	Measurement control .....	67
4.9	Alarm indicator control .....	75
4.10	Color Setting Tool .....	77
4.11	Network topology coloring .....	78
<b>5</b>	<b>Event Display .....</b>	<b>81</b>
5.1	Event Rows .....	84
5.2	The Event Display User Interface .....	85
5.2.1	Using the Event Display User Interface .....	85
5.2.2	Using Filters .....	85
5.2.3	Locating Signals .....	87
5.2.4	Blocking Signals .....	88
5.2.5	Customizing the column layout .....	89
5.2.6	Color Settings .....	90
5.2.7	Exporting Data .....	94
5.2.8	Indicating Daylight Saving Time .....	94
5.3	Handling events .....	94
5.3.1	Event Display Settings .....	94
5.3.2	Event Comments .....	96
<b>6</b>	<b>Alarm Display .....</b>	<b>99</b>
6.1	Alarm rows .....	101
6.2	The Alarm Display User Interface .....	103
6.3	Handling alarms .....	103
6.3.1	Alarm Display Settings .....	105
6.3.2	Acknowledging alarms .....	106
<b>7</b>	<b>Blocking Display .....</b>	<b>107</b>
7.1	Blocking Rows .....	109
7.2	The Blocking Display User Interface .....	109
7.3	Handling Blockings .....	109
7.3.1	Blocking Display Settings .....	110
<b>8</b>	<b>User Activity Log Display .....</b>	<b>113</b>
<b>9</b>	<b>Trends Display .....</b>	<b>115</b>
9.1	Starting Trends Display .....	116
9.2	The Trend Basket .....	116
9.2.1	Add and remove Trends .....	117
9.2.2	Trend settings .....	118
9.2.3	Clearing Trend data .....	119

---

9.3	The user interface .....	119
9.3.1	Trends Display toolbars .....	119
9.3.2	Trends Display menus .....	120
9.3.3	Using Trend curves .....	122
9.3.4	Time range .....	123
9.4	Graphical view .....	123
9.5	Tabular view .....	134
9.6	Preconfigurations .....	138
9.7	Exporting Trends .....	139
9.8	Printing Trends .....	140
9.9	Authorizing .....	140
<b>10</b>	<b>Measurement Reports .....</b>	<b>141</b>
10.1	Starting Measurement Reports Display .....	141
10.2	The user interface .....	142
10.2.1	Measurement Reports Display toolbars .....	142
10.2.2	Measurement Reports Display menus .....	145
10.2.3	Measurement Reports Display header .....	147
10.3	Graphical view .....	147
10.4	Tabular view .....	149
10.5	Preconfigurations .....	155
10.6	Exporting Reports .....	156
10.7	Printing Reports .....	156
10.8	Authorizing .....	156
10.9	Quick Reports .....	156
<b>11</b>	<b>System Self Supervision .....</b>	<b>159</b>
11.1	Supervision application objects .....	160
11.2	Supervision monitoring symbols and control dialogs .....	160
11.2.1	Supervision symbols .....	160
11.2.2	Symbol appearance .....	160
11.2.3	Supervision control dialogs .....	162
11.2.3.1	Common characteristics .....	162
11.2.3.2	Application supervision .....	164
11.2.3.3	Communication Node supervision .....	165
11.2.3.4	Communication Line supervision .....	166
11.2.3.5	SNMP supervision .....	167
11.3	Supervision events and alarms .....	168
11.4	Supervision logging .....	170
11.5	Supervision Log Viewer .....	170
<b>12</b>	<b>Sequence Executor .....</b>	<b>173</b>
12.1	Launching the tool .....	173
12.2	User Interface .....	174
12.2.1	Menu bar .....	175
12.2.2	Toolbar .....	175

12.3	User Authorizations .....	176
12.4	Executing a Sequence .....	176
12.5	Statuses and Outputs .....	177
12.6	Sequence Queue .....	178
12.7	Controllability Check .....	179
<b>13</b>	<b>Using Calendar .....</b>	<b>181</b>
13.1	Opening Calendar .....	181
13.2	Making selections .....	182
13.3	Adding day type to group of days .....	183
13.4	Setting day type attributes .....	183
13.5	Saving attributes .....	183
13.6	Changing current time .....	183
13.7	Setting day attributes .....	184
13.8	Changing calendar properties .....	186
<b>14</b>	<b>Terminology .....</b>	<b>191</b>
<b>15</b>	<b>Abbreviations .....</b>	<b>193</b>
	<b>Index .....</b>	<b>195</b>

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## 2 Introduction

### 2.1 This manual

This manual describes how to supervise and control the power process with the SYS600 Monitor Pro user interface. The supervision and control is done by means of Process Displays, event/alarm displays, trends, measurement reports and so on. The manual also describes the basic customizing possibilities of the user interface.

### 2.2 Use of symbols

This publication includes warning, caution and information symbols where appropriate to point out safety-related or other important information. It also includes tips to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:



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



Caution icon indicates important information or a 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/property.



Information icon alerts the reader to relevant factors and conditions.



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

Although warning hazards are related to personal injury, and caution hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warnings and caution notices.

### 2.3 Intended audience

This manual is intended for installation personnel, administrators and skilled operators to support installation of the software.

## 2.4

### Related documents

Name of the manual	Document ID
DMS600 4.4 Operation Manual	1MRS757319
SYS600 9.4 Application Design	1MRS758122
SYS600 9.4 Process Display Design	1MRS758088
SYS600 9.4 Installation and Administration Manual	1MRS758086

## 2.5

### 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 dialog, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for file names.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the CTRL key. Although the Enter and Shift keys are not labeled they are written in capital letters, e.g. press ENTER.
- 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 the user must hold down the CTRL key while pressing the C key (in this case, to copy a selected object).
- Press ALT E C indicates that the user presses and releases each key in sequence (in this case, to copy a selected object).
- 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: **Menu Name > Menu Item > Cascaded Menu Item**. For example: select **File > Open > New Project**.
  - The **Start** menu name always refers to the **Start** menu on the Windows Task Bar.
- System prompts/messages and user responses/input are shown in the Courier font. For example, if the user enters a value that is out of range, the following message is displayed: **Entered value is not valid**.  
The user 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

## 2.6

### Document revisions

Version	Software revision number	Date	History
A	9.4	16.5.2014	New document
B	9.4 FP1	3.6.2015	Document updated

## 3 Overview

This chapter introduces the SYS600 user interface functions. All application areas and functions described in this manual are not necessarily covered by every customer's application. Likewise, this manual may not describe every application functionality a customer may have, because the functionality of individual applications is designed according to the needs of each customer.

### 3.1 Getting started

Start a Monitor Pro session by launching the SYS600 Monitor Pro program. The Login dialog is displayed when Monitor Pro is started, see Figure 3.1.



Figure 3.1: Monitor Pro login dialog

Clicking **Close** in the Login dialog closes the Login dialog, but leaves the Monitor Pro still running.

#### 3.1.1 Login

To login, select an application from the Application drop-down list or click on the Process Display view if Monitor Pro is running. Type the user name and password into the corresponding fields and click **Login**.

Each user is associated with a certain user profile defined by the system manager. For more information, see SYS600 Application Design.

## Operation Manual

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If the user name and the password do not match or the user name does not exist, the Login dialog is displayed again and login may be attempted again. Each attempt to login is registered by the system, even those that fail.

If login is successful, the first display is shown on the screen (if one has been defined in the Application Settings dialog). All the operations subsequently performed on the Monitor Pro are related to the authority profile associated with the user name. The user name is also included as an identifier in the event register when certain manual operations are performed.



In order to prevent unauthorized usage of a user name and authority profile, always logout when leaving the control room.

### 3.1.2 Logout

In Monitor Pro, logout means that the current user name and user authority are cleared.

The options for logout are:

- Selecting **Main > Logout**.
- Closing the Monitor Pro by selecting **Main > Exit**.
- Automatic time based logout executed by Monitor Pro.
- Changing the SYS600 application state from HOT to WARM or COLD.
- The SYS600 OPC DA server or service is stopped.

### 3.1.3 Time based logout

An automatic logout is done after a certain time period (for example 8 hours). The logout duration is defined in the User Account Management tool. The values are application specific. After time based logout, the user must login again via the Login dialog.

### 3.1.4 Time-based logout after inactivity

Users with appropriate permissions can set a timeout threshold for idle sessions. If there is no interaction between the user and the product on application level (no user activity or commands) for the configured time, the session is discarded and the user must re-authenticate before the next interaction.

Logout duration after inactivity can be configured in the User Account Management tool.

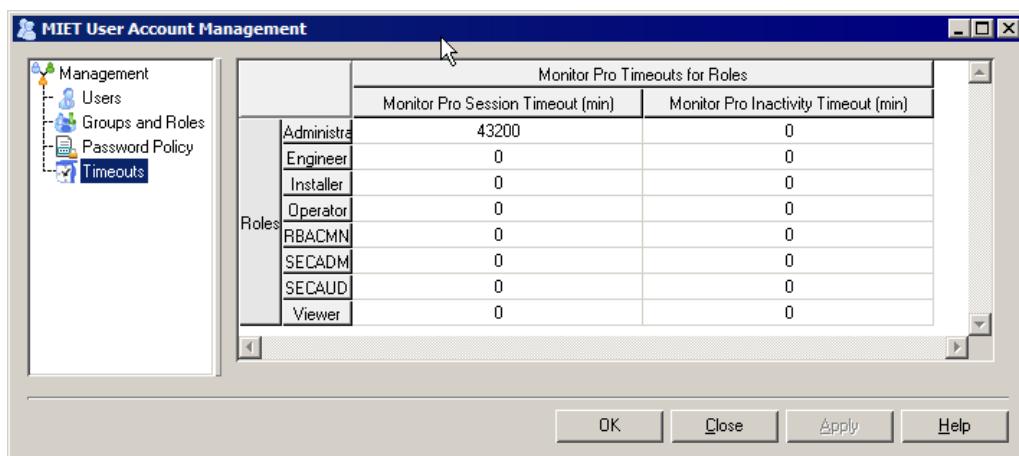
**Operation Manual**

Figure 3.2: The User Account Management timeouts tab

The same definitions are available for logout duration after inactivity as for logout duration (notify messages/closing Monitor Pro when logout occurs).

### 3.2

## Application displays

There are many different types of application displays: Process Displays, System Supervision Displays, Alarm Display, Event and Blocking Displays, Measurement Reports Display and Trends Displays. Figure 3.3 illustrates an example of application display.

## Operation Manual

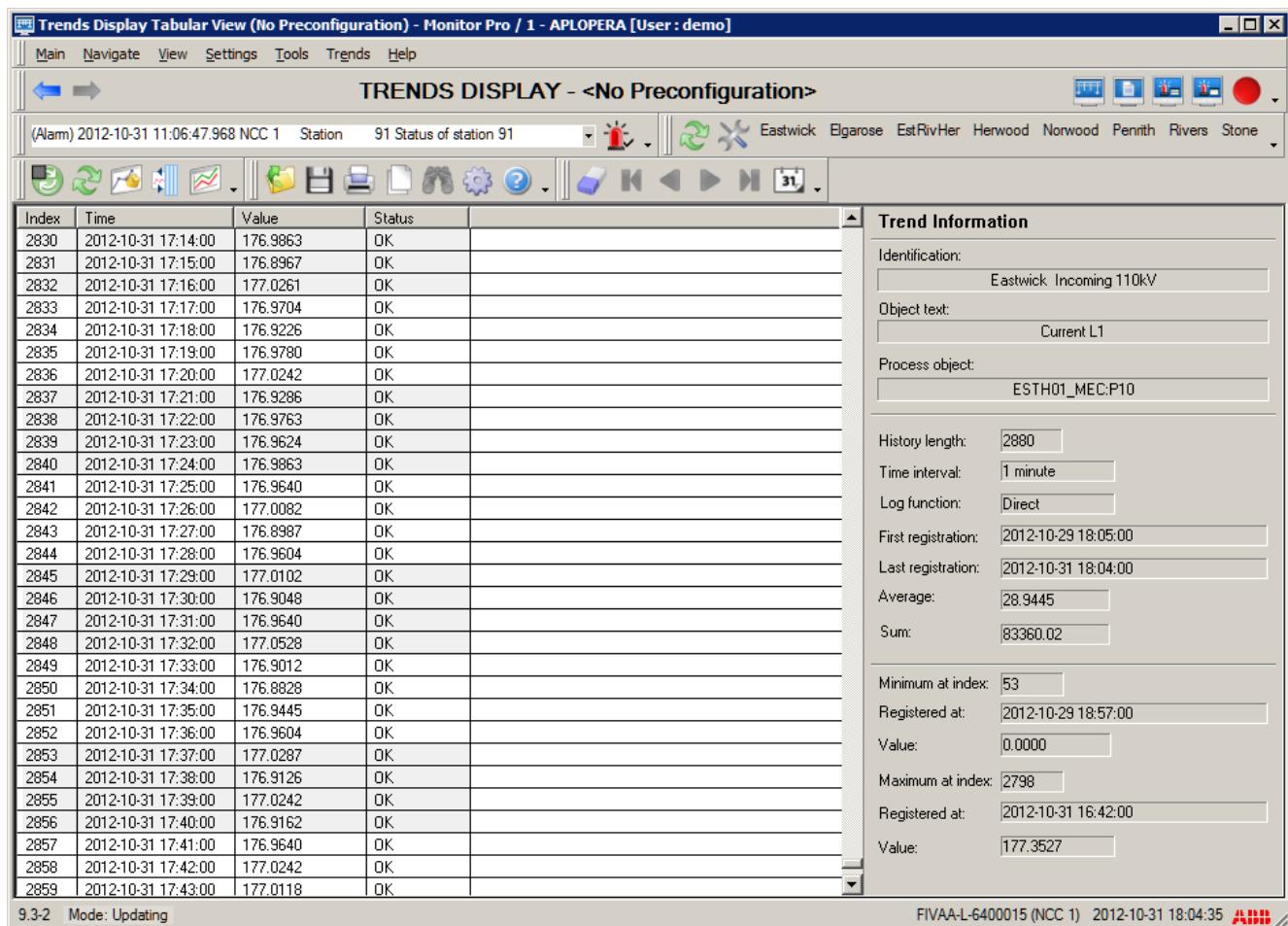


Figure 3.3: Example of Trends display

### 3.3

## Process Displays

The Process Displays contain information on objects with dynamic behavior on the system process in graphical form, see Figure 3.4. Process Displays contain functions for zooming, panning and de-cluttering displays.

The display name, the application's name and number as well as the login user are presented on the title bar of the Process Display.

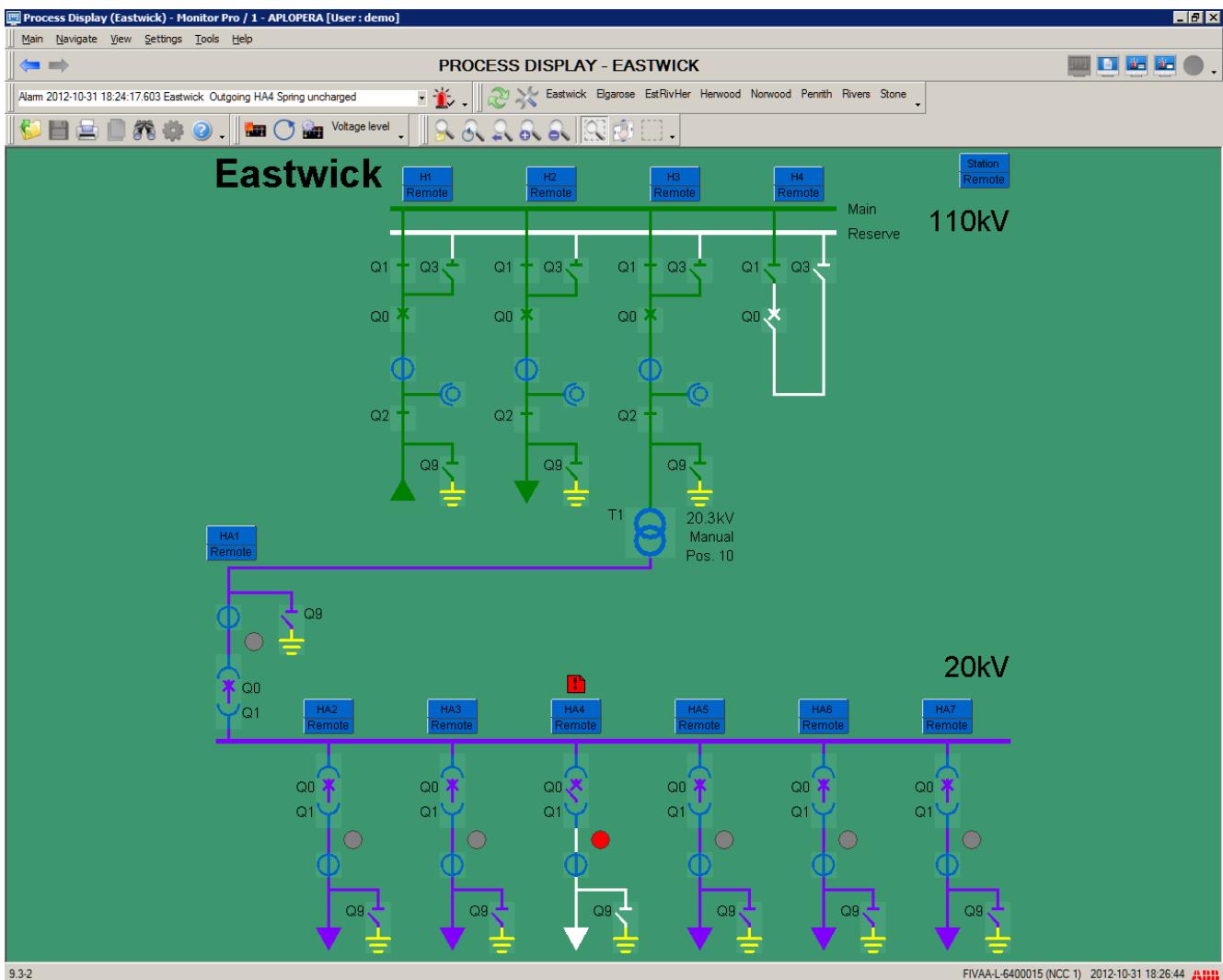


Figure 3.4: Station Process Display

### 3.3.1

### Controlling the process

Figure 3.4 is an example of a station Process Display in a single line diagram form. The power processes can generally be shown in the Process Display in different presentations. The presentation to be used is selected when the Process Displays are configured. For more information about the colors used in Process Display, see Section 4.10 Color Setting Tool and Section 4.11 Network topology coloring.

The primary devices can be interacted through the control dialogs accessed from the Process Display, see Figure 3.5. Only users in certain user groups are allowed to execute control operations.

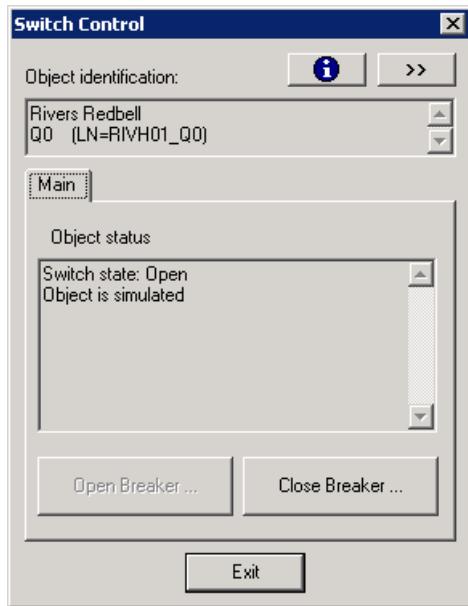


Figure 3.5: Main display of a Control dialog



The user can switch between the main view and the advanced view by clicking the >> and << buttons in the upper right hand corner of a Control dialog.

### 3.3.2 Adding Process Display Notes

A Process Display Note can be added to a Process Display to point out important information, for example a line that is under construction. The Process Display Note comments can be freely edited (i.e. added, deleted, moved) without it affecting the actual process.

To add a Process Display Note, select **Tools > Notes** and select the color for the comment. The colors should be used according to the importance of the comment.

Operation Manual

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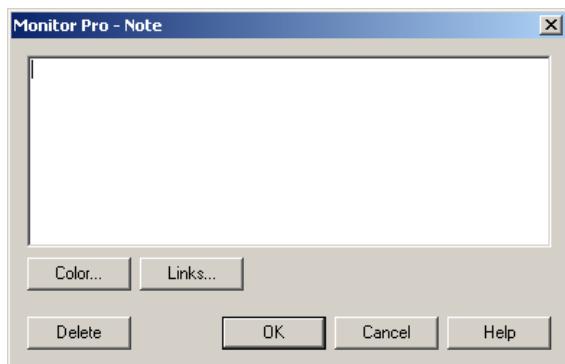


Figure 3.6: Process Display Note

The available colors are:

- Symbol 1 (Yellow)
- Symbol 2 (Red)
- Symbol 3 (Green)
- Symbol 4 (Magenta)
- Symbol 5 (Cyan)

To change the color of the Process Display Note, click **Color** in the Process Display Note dialog. The Process Display Note Color dialog opens, see Figure 3.7. Select a color for the Process Display Note and click **OK**.

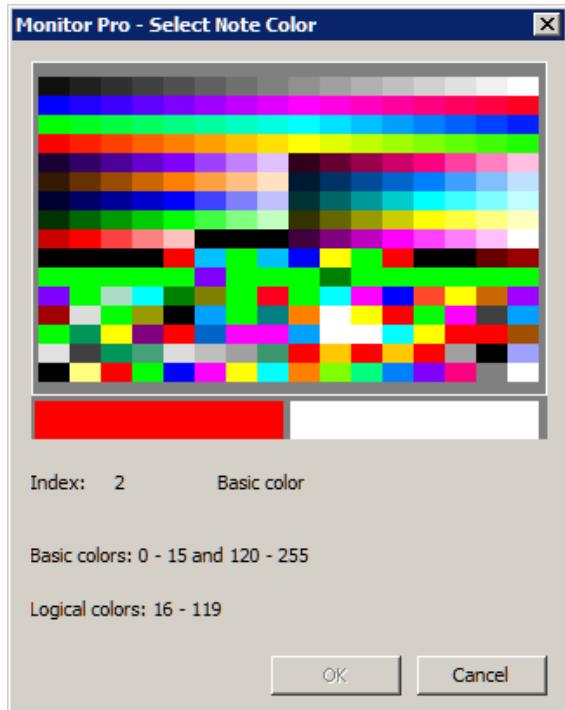


Figure 3.7: Changing the Process Display Note color

## Operation Manual

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The Process Display Note object is created on the center of the visible display. It can be moved into the right place with the mouse.

To write a comment:

1. Click the Process Display Note object. A Process Display Note dialog is displayed.
2. Type a comment to the Note box.
3. Click OK.

### **Deleting Process Display Note**

Delete a Process Display Note object by opening the Process Display Note dialog and selecting **Delete**. Monitor Pro confirms the operation by displaying a warning dialog. The comment information is removed and the Process Display Note object is deleted from the display.

### **Moving Process Display Note**

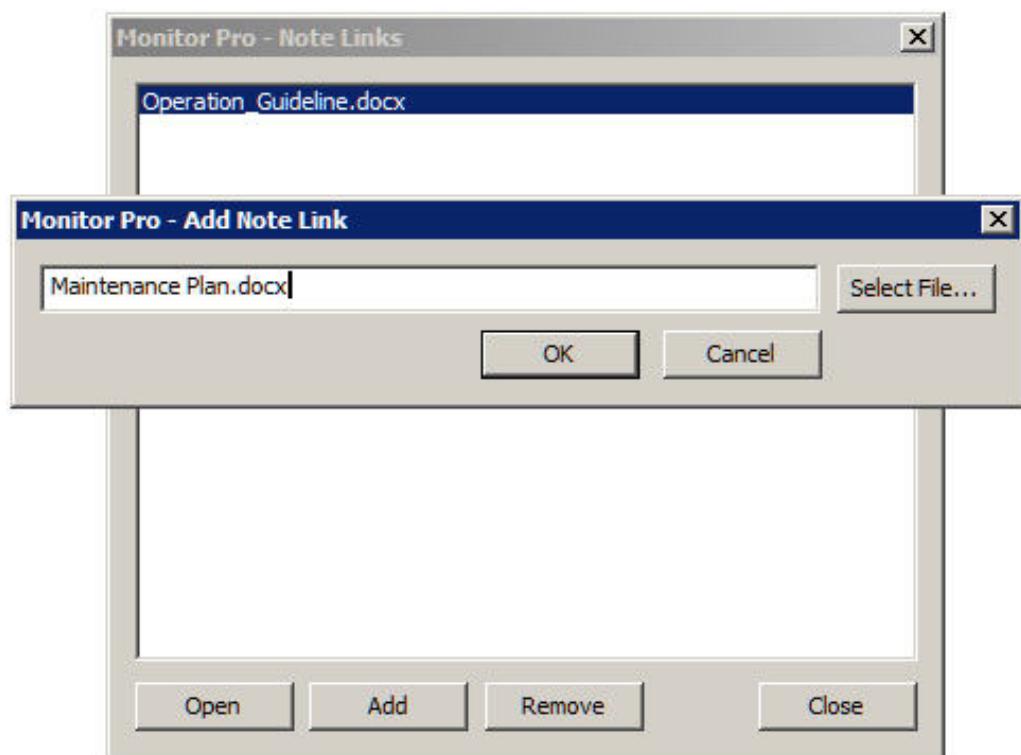
Move the Process Display Note by dragging it with the mouse.

### **Resizing Process Display Note**

Resize Process Display Notes by holding down the right mouse button and moving the cursor up or down. Moving up the cursor increases the Process Display Note and moving down decreases the Process Display Note.

### **Adding Process Display Note links**

Create links to files on the server or on a local computer by selecting **Links** from the Process Display Note dialog. A Process Display Note Links dialog is displayed.



*Figure 3.8: Process Display Note Links*

Add new links by browsing the file should be linked to the comment. Click **Open** to open the linked file. For example, if the linked file is a .txt file, it is opened from the Process Display Note Links dialog in Windows Notepad.

Remove the links by selecting the corresponding link and clicking **Remove**....

### 3.3.3

### **Adding a comment to an object**

A comment can be written for an object, for example a circuit breaker. The comment is displayed for all users who open the control dialog of the same object. The comment is independent of the display file where the object is presented. User name and edit time are also stored for the comment.

If a comment has been added to an object, it is displayed when the control dialog is opened, see Figure 3.9.

Operation Manual

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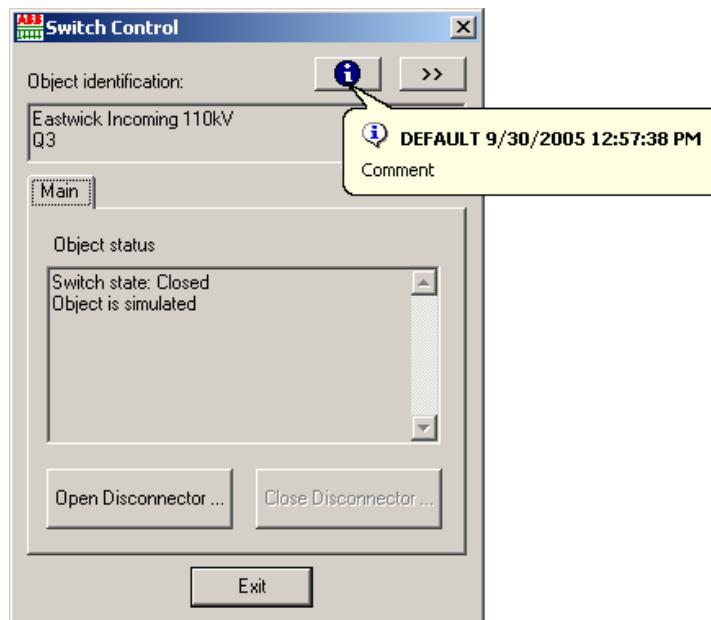


Figure 3.9: Comment in the control dialog

To add a comment:

1. Click the information symbol (i) in the control dialog to open the dialog, see Figure 3.10.



Figure 3.10: Adding comment to control dialog

2. Write the comment.
3. Click **OK**.

### 3.3.4

### Renaming Process Display

A Process Display can be renamed through the Customize dialog:

1. From the main menu, select **Settings > Customize** to open the Customize dialog.
2. Right-click the Process Display name.
3. Select **Name** and enter a new name for the Process Display Figure 3.11.

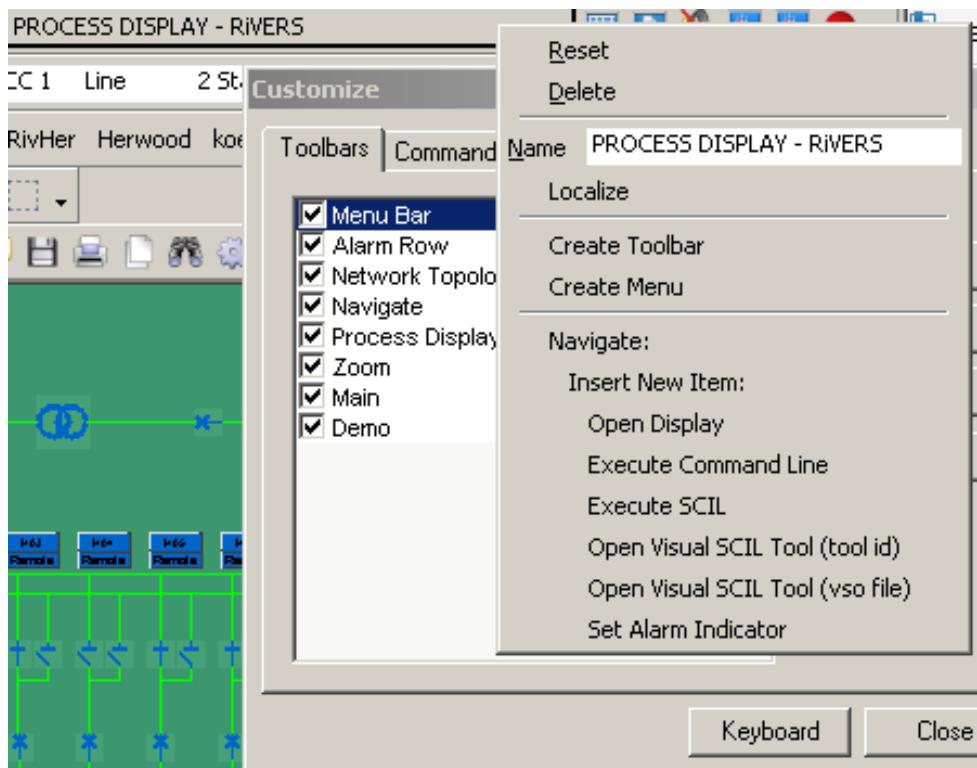


Figure 3.11: Renaming the Process Display

The Customize dialog can also be opened by right-clicking the Process Display name, and selecting **Customize** from the context menu.

## 3.4

## Monitor Pro layout

Default Monitor Pro layout contains the following components:

1. Process Display name, application number, application name, user name
2. Main menu bar
3. View Info
4. Latest unacknowledged alarms
5. Shortcut to displays
6. Network Topology Coloring toolbar
7. Process Displays

8. Application display area
9. Status bar
10. Customization tool
11. Handle for moving toolbars

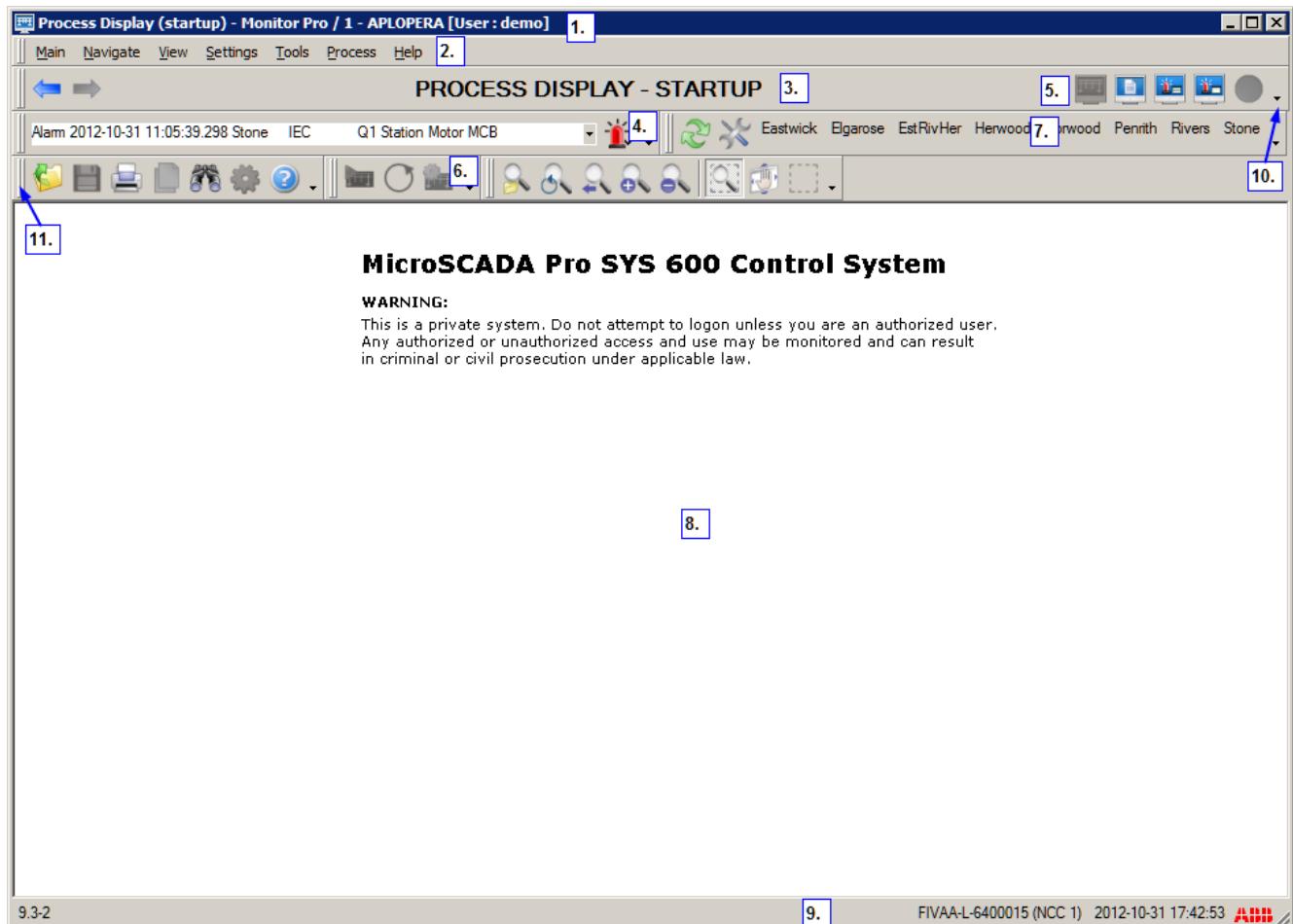


Figure 3.12: Monitor Pro default layout after the login

### 3.4.1

### Specifying toolbars

Toolbars can be added and removed by right-clicking the existing toolbar, docking area or standard menu, and selecting or clearing the checked commands from the context menu.

By default, Monitor Pro has just a small set of visible prebuilt toolbars. Each user can modify the layout of Monitor Pro to correspond to their requirements. The layout modifications are saved at logout. At the next login, the user's default layout is loaded in the application. By default, Monitor Pro loads and hides some of the toolbars and menus depending on the current display. For example, if the Event Display is displayed, both the Event Display menu and Event Display toolbars are loaded.

---

Toolbar visibility and position are display specific. For example, if the user moves the alarm row to a certain position in Process Display, it will not affect the alarm row position in Event Display.



**Reset Toolbars** Resets the toolbar positions. User-specific customizations are not lost. Shortcut key:  
**CTRL+ALT+SHIFT+T**.

### 3.4.2

### Changing application layout

Display the Customize dialog by double-clicking any empty space on the toolbar area of Monitor Pro. The little arrows in the toolbars can also be used to customize toolbars, commands or options. The Customize dialog can also be selected in **Settings > Customize** (see Figure 3.13).

The Customize dialog can be used to:

- Add, reset, rename and delete custom toolbars. Old menu items can be deleted and renamed, but new ones cannot be added. Some menu items (for example the ones in **Process Display** menu) and some toolbars (for example the buttons in application specific toolbar) are not customizable because their contents is dynamic. For example, the contents of Process Display Toolbar are generated based on the files found in a certain folder.
- Change the Command Context menu's caption and style. The Command Context menu is another way to customize. It is displayed when the Customize dialog is open and the toolbar is right-clicked. The styles can be changed to:
  - **Default Style:** Contains both text and icon, if available
  - **Text Only:** Only text (caption of tool) is shown
  - **Image Only:** Only the icon is displayed, if available
  - **Image and Text:** Contains both text and icon, if available
- Categorize the action tools and drag-and-drop commands to any toolbar, menu or submenu.
- Change the icon size in Monitor Pro.
- Create keyboard shortcuts.

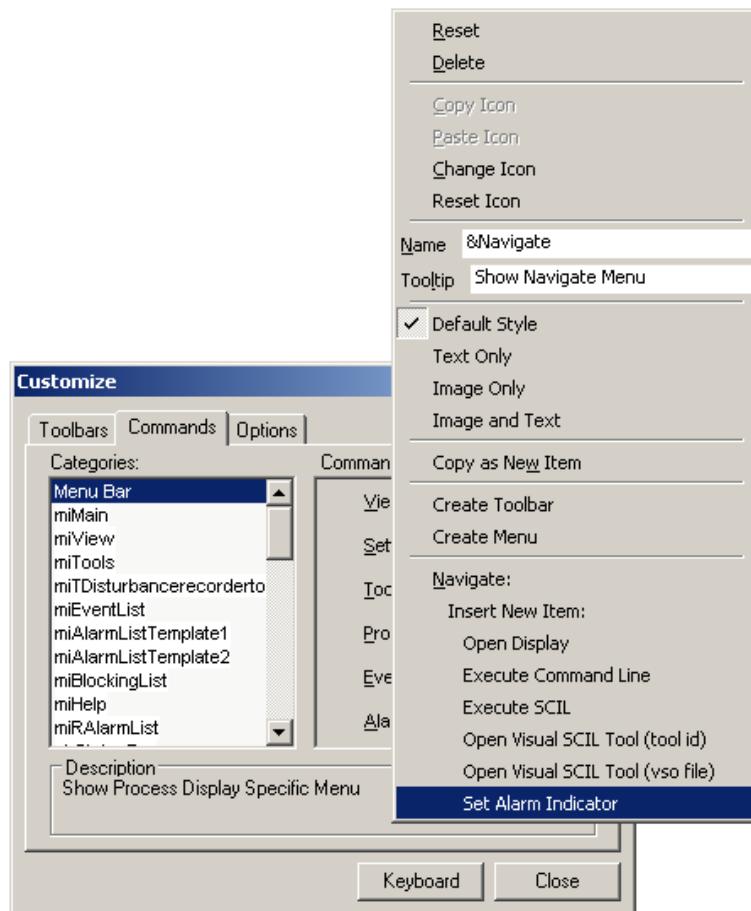
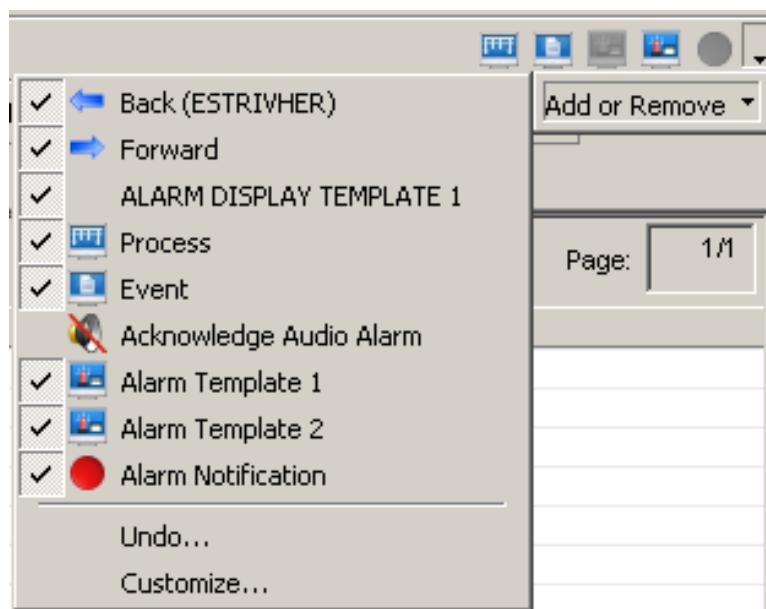


Figure 3.13: Command context menu while the Customize dialog is open.

When the Customize dialog is open, the toolbar buttons and menu items can be moved around. If the CTRL key is held down while moving the tool, the tool is copied.

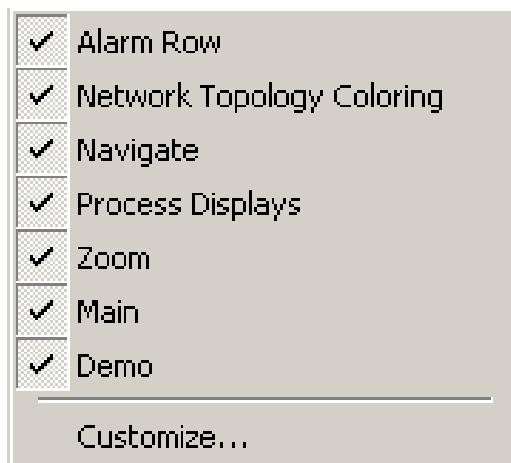
The last button on the right of each toolbar is a little arrow button. This quick customization shortcut allows the user to show or hide tools from the toolbar without opening the Customize dialog (see Figure 3.14).

**Operation Manual**

*Figure 3.14: Adding and removing tool*

The buttons can also be moved between toolbars without opening the Customize dialog. This can be done by holding down the ALT key and dragging the buttons to another location. Buttons can be deleted by dragging them away from the toolbar. Pressing CTRL+ALT while moving the button copies the button. This function is not possible for menu items without the Customize dialog.

All the toolbars and menus can be shown or hidden without the Customize dialog by right-clicking the main menu bar and selecting or deselecting the toolbars (see Figure 3.15). The user has access to different toolbars according to the display in use (see Table 3.1). For the Process Display, Alarm Display, Event Display, Blocking Display or Trends Display and full screen mode there are different configurations depending on which toolbars are shown.



*Figure 3.15: Showing and hiding toolbars*

**Table 3.1: Toolbars according to different displays**

Display	Toolbars
Process	Menu Bar Alarm Row Network Topology Coloring Navigate Zoom
Event	Menu Bar Alarm Row Event Display Navigate Process Displays Main
Alarm	
Template 1	Menu Bar Alarm Row Alarm Display Template 1 Navigate Process Displays Main
Template 2	Menu Bar Alarm Row Alarm Display Template 2 Navigate Process Displays Main
Blocking	Menu Bar Alarm Row Blocking Display Navigate Process Displays Main
Trend	

## Operation Manual

Display	Toolbars
Graphical View	Menu Bar Alarm Row Trends Display Trends Graphical Mode Navigate Process Displays Zoom Main
Tabular View	Menu Bar Alarm Row Trends Display Trends Tabular View Navigate Process Displays Main
<b>Measurement Reports</b>	
Graphical View	Menu Bar Alarm Row Measurement Reports Display Measurement Reports Graphical View Navigate Process Displays Zoom Main
Tabular View	Menu Bar Alarm Row Measurement Reports Display Measurement Reports Tabular View Navigate Process Displays Main

To create a new toolbar:

1. Select New from the Customize dialog.
2. Type a new name for the toolbar.
3. Click **OK**. A new toolbar is shown in the Toolbars tab.

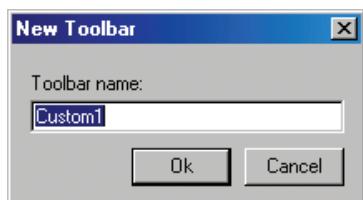


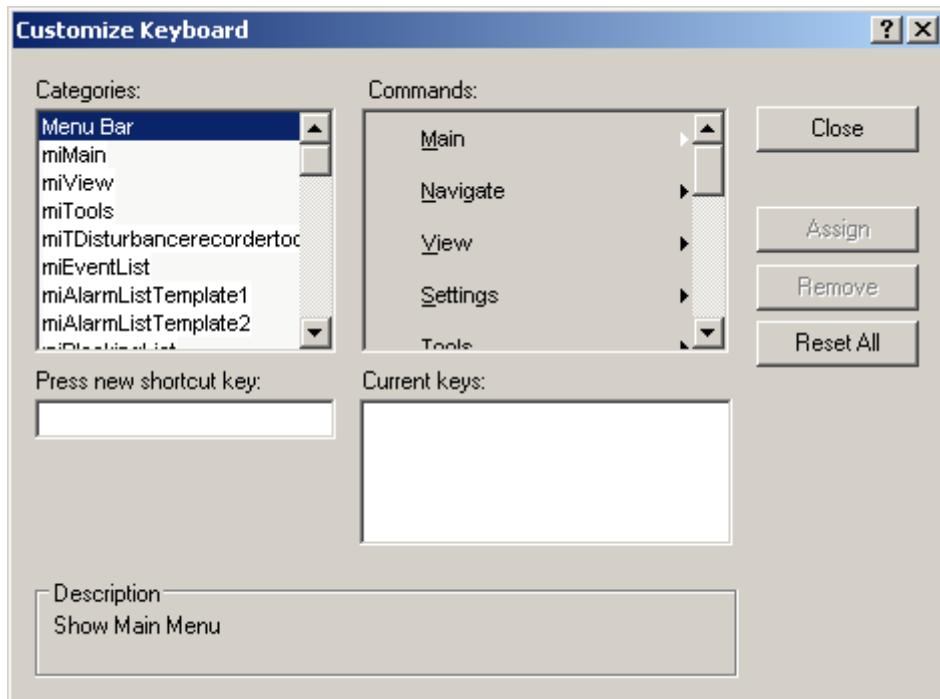
Figure 3.16: New Toolbar dialog

When the user selects a toolbar they have created, the **Rename** and **Delete** buttons become active. The created toolbar can be renamed or deleted. Clicking the **Undo** button loads the last saved layout.

## Operation Manual

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By clicking **Keyboard** in the Toolbars tab a Keyboard dialog is displayed (see Figure 3.17).



*Figure 3.17: The Customize Keyboard dialog*

New keyboard shortcuts can be added for menu items and toolbars seen in the Categories section.

### Categories:

- Built-in Menus: All the top-level menus
- Start with characters mi: All menus that have sub-menus
- Start with characters tb: All toolbars (except the user defined toolbars created with Customize dialog)

### Commands:

- Sub menu items and buttons of the selected category

To assign a new value to the tool (menu item, button in the toolbar):

1. In the Categories section, select the category in which the menu item or toolbar buttons are located.
2. In the Commands section, select the command (menu item, buttons in the toolbar).
3. Click the New shortcut key box so that the mouse cursor blinks in it and press the new shortcut key combination. The key combination is displayed in the box.
4. Click **Assign**, and the shortcut key appears in the Current Keys section.

## Operation Manual

The shortcut key can be deleted by clicking **Remove...**. Clicking **Reset All** resets the shortcut keys.

In the Commands tab of the Customize dialog, categories and commands are the same as in Toolbars tab (see Figure 3.18).

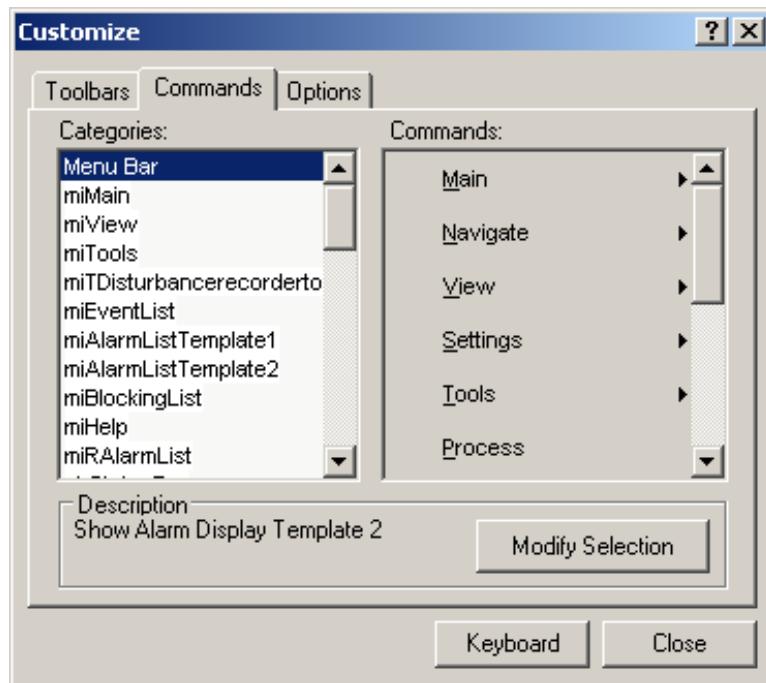


Figure 3.18: Commands tab of Customize dialog

The Commands can be moved around the same way as on the Toolbars tab. Clicking **Modify Selection** corresponds to the function when a toolbar button or menu item is right-clicked (when the Customize dialog is open) and a similar context menu is displayed. The **Modify Selection** button becomes active when a tool is selected either from the menu or from the toolbar.

Personalized menus can be selected into use in the Options tab (see Figure 3.19).

## Operation Manual

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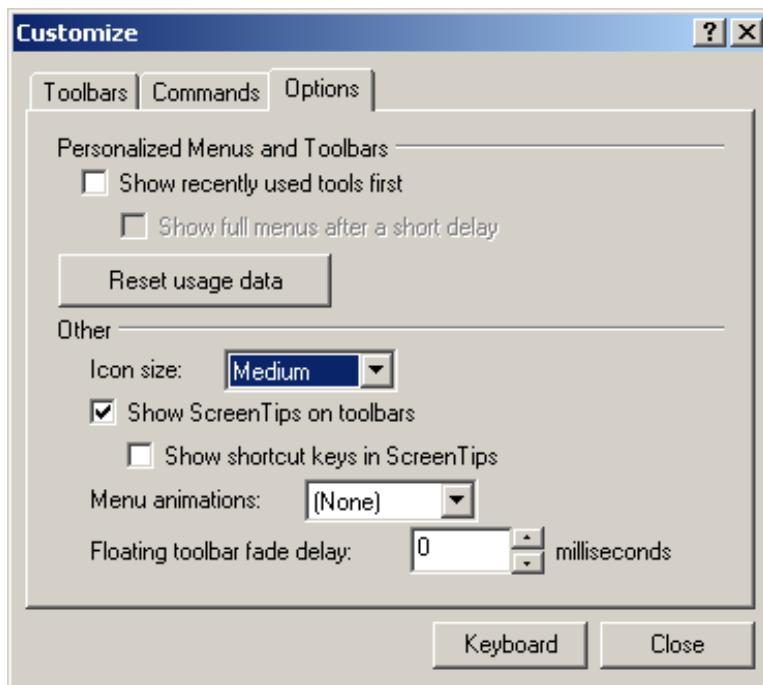


Figure 3.19: Option tab of Customize dialog

Only the most recently used menus are visible. The memory of the menu usage can be cleared by clicking **Reset usage data**. Menu animations can be selected or the size of icons changed in the Other field.



If another option than None is selected in the **Menu animations** box, automatic menu command activations can occur when the pointer is moved over the menus.

### Alarm row

The Alarm row provides a quick notification of an alarming event in the system. The advantage is that it can be noticed easily, and it also instantly tells the operator what has happened and where. With the alarm row the alarms can easily be acknowledged. Display the alarm row by selecting it on the Toolbar tab.



Figure 3.20: Alarm row

The alarm row shows all the unacknowledged active and inactive alarms in the system. The latest alarm is shown on the top of the list. Any of the alarms shown on the list can be selected to be acknowledged.

The user authorization level has to be at least Control (1) before alarms can be acknowledged (the Alarm row uses authorization group ALARM\_HANDLING). For more information, see SYS600 Application Design.

On the Alarm row, active and inactive alarms are separated by showing the alarm text in parentheses (Alarm) if the alarm is inactive. Thereafter, the date and time of the alarm and the object text of the alarming object are presented.

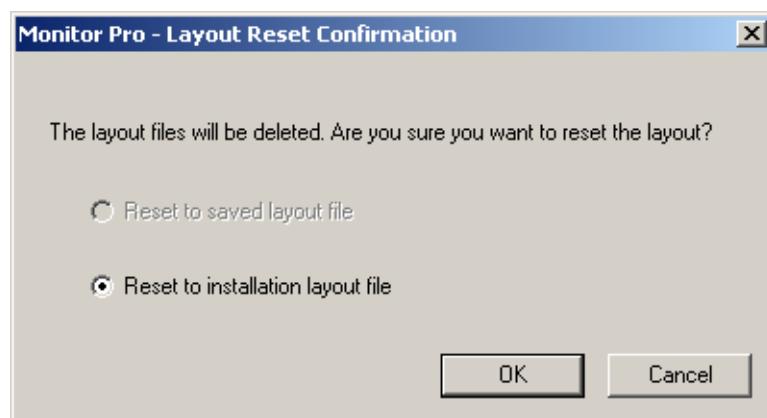
### **Status bar**

The Status bar shows the SYS600 version number, Base system Node Name, (system name) and the current date and time.

#### **3.4.3**

### **Resetting Layout**

To reset the layout, select **Settings > Reset Layout**. This action restores the layout from either the previously saved layout or the installation default layout, see Figure 3.21.



*Figure 3.21: The Layout Reset Confirmation dialog*

#### **3.5**

### **Using process lists**

There are three types of process lists:

- Alarm Display, presents the actual alarm state in the process data base.
- Event Display, presents all events reported to the system.
- Blocking Display, presents the blocking situation in the process data base. Some typical blockings are alarm, event and control blocking.

These lists are all described in separate chapters, see Chapters Chapter 5 Event Display, Chapter 6 Alarm Display and Chapter 7 Blocking Display.

### 3.6

### Using reports and trends

Reports can be used for analyzing sampled measurements. Collected data can be presented in a graphical or numerical form.

Typical reports are energy, currents, process disturbance reports (for example trippings, earth-faults, overcurrents, auto-reclosures). These reports can be used for analyzing fault situations, for improving service and maintenance, as well as for normal supervision.

Trends can be used for trend analyses and showing measured values in a graphical or numerical form.

The reports and trends are described in separate chapters, see Chapter 10 Measurement Reports and Chapter 9 Trends Display.

**4**

## Process controlling

This chapter describes the generic control dialogs in SYS600 Power Process Library. These dialogs provide fast and easy access to the device status and to the single devices in a substation. The Control dialog combines different kinds of information, depending on the object.

Control dialogs interact with standard objects created with Object Navigator by using the Power Process Library (SA\_LIB) standard functions. Control dialogs are generic and they have the same user-interface appearance, independent on the IED and the communication protocol defined in standard object configuration. The available functionality and access rights for a user can be limited using authorization levels.

**4.1**

### Navigating

The user can flexibly navigate between the Process Displays and within a Process Display.

Navigate between the different Process Displays by:

- selecting **Main > Open**
- clicking a shortcut on the Process Displays toolbar.
- clicking **Go to Previous Display** or **Go to Next Display** in the View Info toolbar.
- clicking elements in a Process Display.

When a certain element in a Process Display is clicked, a predefined area of a different Process Display is shown.

- using menu commands and toolbar buttons.

Define the needed menu commands and toolbar buttons for navigating to a predefined area of a different Process Display.

- locating an object in the Event, Alarm or Blocking display.

To locate the object, right-click on a selected line to open a shortcut menu and select **Locate object in Monitor Pro** or **Locate object in Monitor Pro - new window**.

Navigate within displays by:

- using the Save/Restore Zoom dialog.

Use this dialog for zooming to predefined locations.

- clicking elements in a Process Display.

When a certain element in a Process Display is clicked, a predefined area of the same Process Display is shown.

- using menu commands and toolbar buttons.

Define the needed menu commands and toolbar buttons for navigating to a predefined area of the same Process Display.

- using the mouse to grab and pan the view by clicking **Select Panning** button on the Zoom toolbar.

- using Flicks with touch screen.

By default with Back and Forward Flicks the navigation of Displays occurs. The defaults can be changed in Windows Control Panel – Pen and Touch.

The **Navigate** menu shows 5 of the previously used displays (with a preconfiguration). This information is stored to the user-specific ini-file and is available on next login.

## 4.2 Zooming

Zoom Monitor Pro by selecting **Navigate > Zoom...**. The zooming options are displayed as a submenu of the Zoom command, see Figure 4.1.

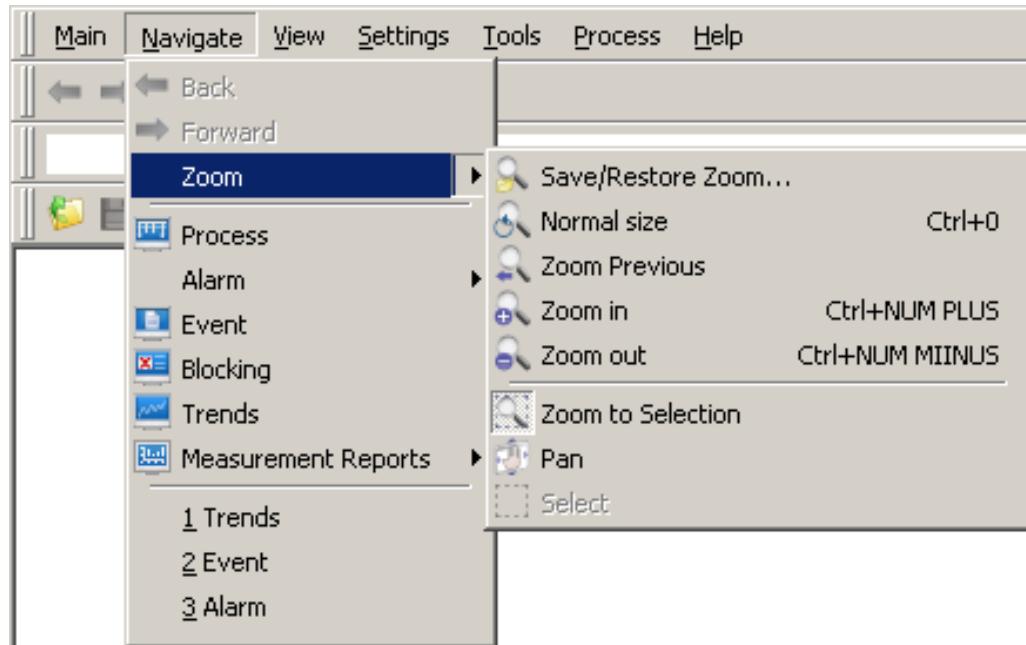


Figure 4.1: Zoom submenu

**Table 4.1: Zoom commands**

Command	Shortcut key	Description
Save/Restore Zoom	-	Opens the Save/Restore Zoom dialog.
Normal size	CTRL + ALT + space	Zooms to the normal size.
Zoom Previous	-	Returns to the previous Zoom level.
Zoom in	Rotate the mouse wheel forward or press CTRL and click the left mouse button. Zooming in with touch screen is handled by entering two fingers in contact with the screen at the same time and moving fingers together along an axis.	Zooms in.

## Operation Manual

Command	Shortcut key	Description
Zoom out	Rotate the mouse wheel backward or press CTRL + SHIFT and click the left mouse button. Zooming out with touch screen is handled by entering two fingers in contact with the screen at the same time and moving fingers apart along an axis.	Zooms out.
Zoom to Selection	Press CTRL, click the left mouse button and select the zoom area.	Zooms in the selected area.
Pan	Click the mouse wheel and move the mouse. Panning in touch screen is handled by entering one or two fingers in contact with the screen and dragging while keeping the fingers in the same position relative to each other.	Moves the graphic with the mouse.
Step Left	Press arrow left key on the keyboard	Moves the zoomed area to the left.
Step Right	Press arrow right key on the keyboard	Moves the zoomed area to the right.
Step Up	Press arrow up key on the keyboard	Moves the zoomed area up.
Step Down	Press arrow down key on the keyboard	Moves the zoomed area down.

It is possible to save application and user specific zoom areas with the **Save/Restore Zoom** dialog, see Figure 4.3. Open the **Save/Restore Zoom** dialog either by clicking the icon in the Zoom tool bar, see Figure 4.2 or from the main tool bar, select **Navigate > Zoom > Save/Restore Zoom**, see Figure 4.1.

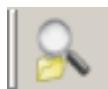


Figure 4.2: *Save/Restore Zoom icon*

Open the **Save/Restore Zoom** dialog, enter a name for the zoom in the **Save zoom** field, select either the **Application** or **User** radio button and click **Save**.

The user can also:

- create a new folder in the tree structure
- delete a folder in the tree structure
- rename items in the tree structure
- drag and drop items in the tree structure
- define filters for specific items to be displayed

Operation Manual

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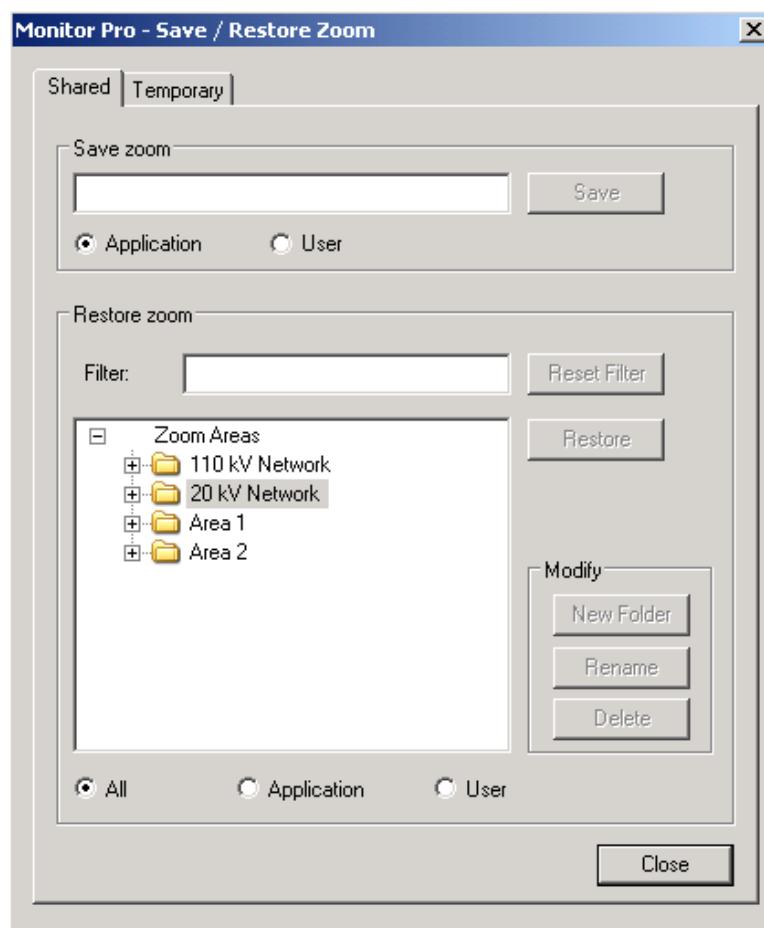


Figure 4.3: Save / Restore Zoom dialog

The saved zoom can be seen in the **Restore zoom** field. The list of saved zooms can be filtered using the **All**, **Application** and **User** radio buttons.

To restore a saved zoom, select the zoom name the **Restore zoom** field, and click **Restore**.

To delete a zoom, select the zoom name the **Restore zoom** field, and click **Delete**.

To save zoomed views for the current session, select the **Temporary** tab, at the top of the **Save/Restore Zoom** dialog. All zooms saved here will be lost on closing the current session.

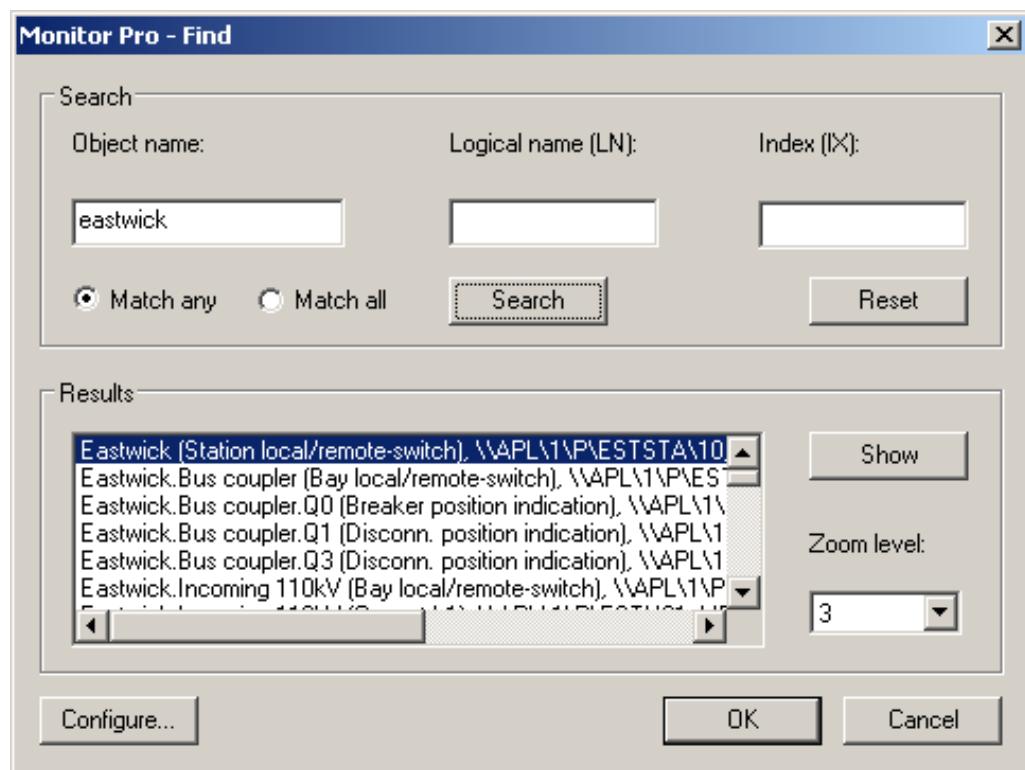
**Operation Manual****4.3****Find**

Objects within the display can be found and zoomed in on using the **Find** function on the toolbar, see Figure 4.4.



*Figure 4.4: Find tool*

Searches can be made using the **Object name**, or part of it, the **Logical name (LN)** or **Index (IX)**. Select the required object from the search result and *click Show* to display. To change the zoom level, *select* the value from **Zoom level**, then *click Show* to display the object, see Figure 4.5.



*Figure 4.5: Find process objects*

## 4.4

## Station Local/Remote control

The station control shows the operator location information of the substation, that is, whether the control is authorized from the station locally or from an external control center. The state can be set to Station or Remote in the Station L/R Switch dialog.

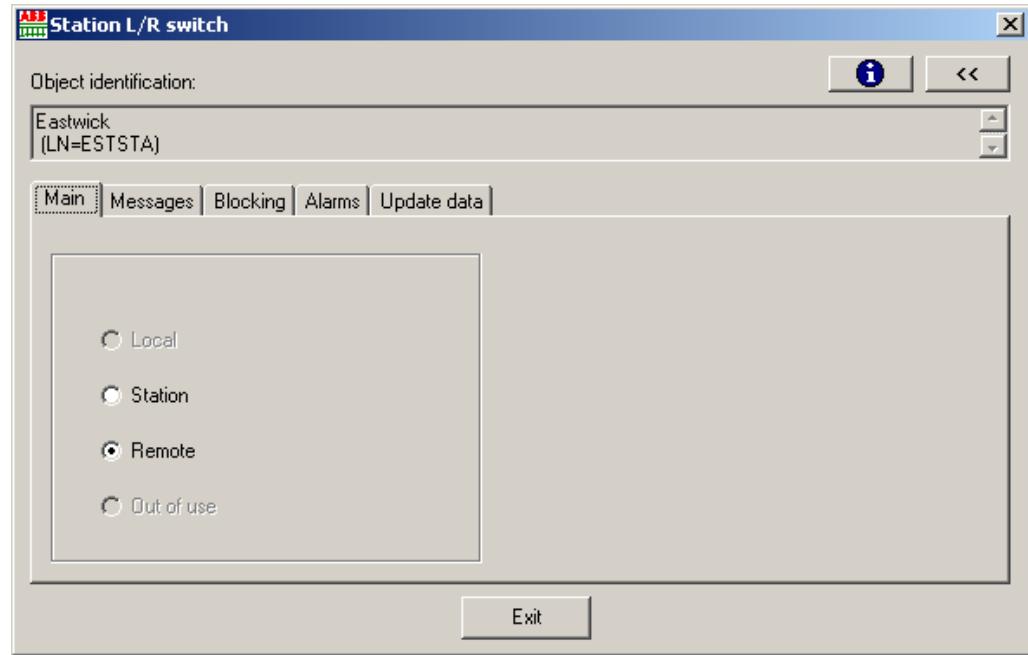


Figure 4.6: The Main tab of the Station Local/Remote switch dialog

The Main tab of the dialog shows the object name and the selection for operator location. Select the operator location by selecting the right option button. The available options depend on the object configuration. Unavailable options are dimmed.

Select the corresponding option for operator location (for example Remote). Close the control dialog by clicking the **Exit** button.

The Messages tab (Figure 4.7) shows different messages concerning the object. A message is shown, for example, if the object is simulated or the information of the physical local/remote key position is unknown.

## Operation Manual

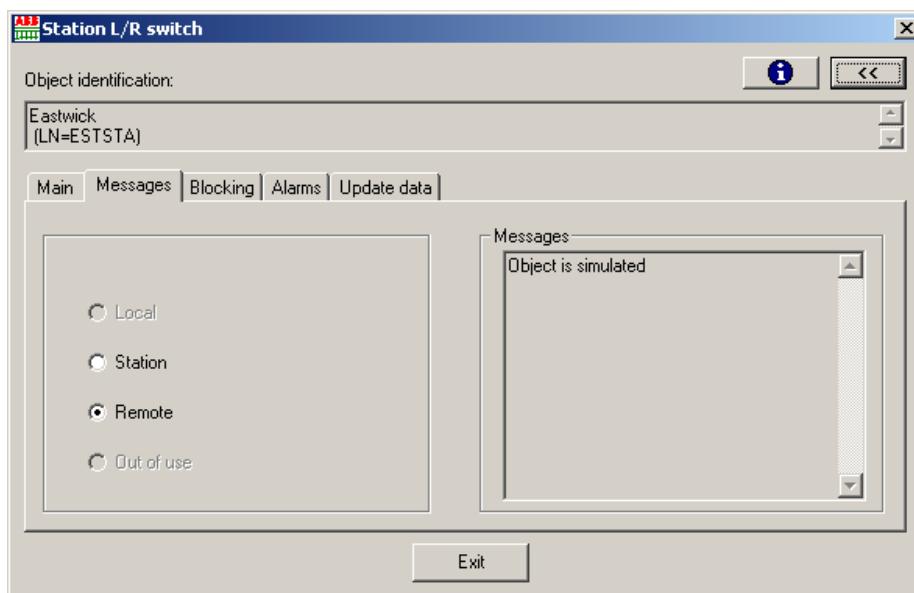


Figure 4.7: The Messages tab of the Station L/R switch dialog

Different blockings concerning the process object that belong to the station are shown and controlled in the Blocking tab, see Figure 4.8.

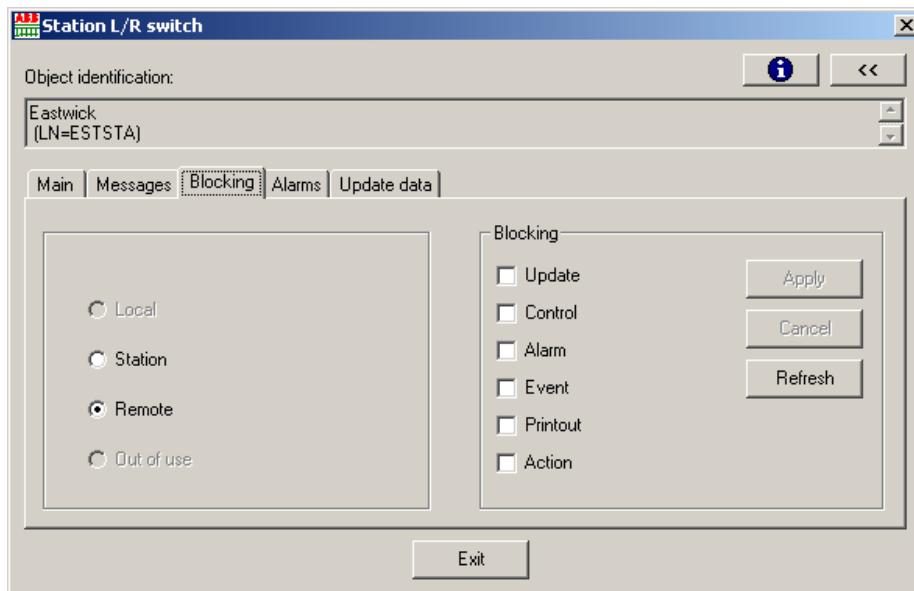


Figure 4.8: The Blocking tab of the Station L/R switch dialog

After selection (multiple selections allowed), click **Apply** for making the changes. Click **Cancel** to discard the changes made in this dialog. Click **Refresh** to update the blocking status in case it has been changed elsewhere in the system.

## Operation Manual

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The alarms are shown on the Alarms tab, see Figure 4.9. To acknowledge alarms click **Ack. All** or **Ack. selected**. Click **Refresh** to update the alarm status.

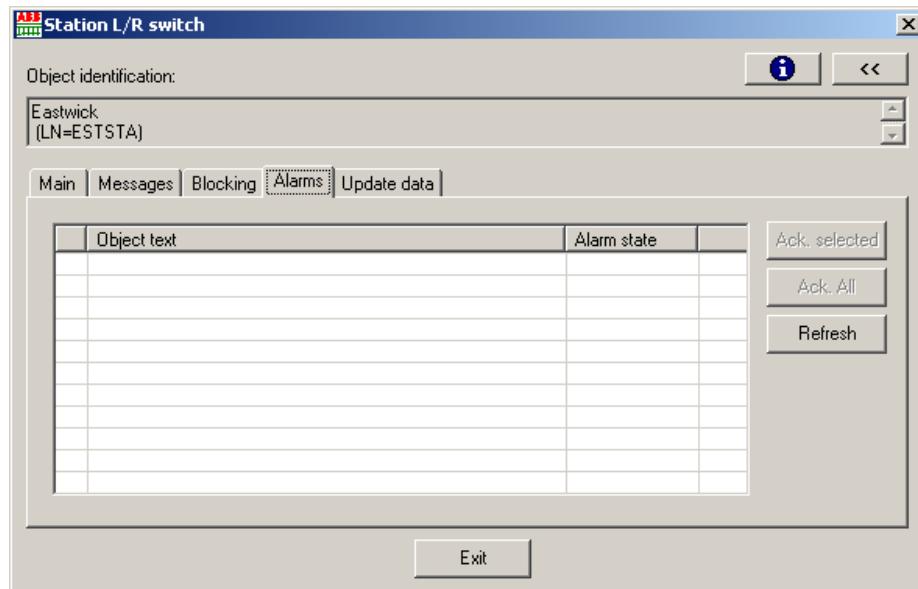


Figure 4.9: The Alarms tab of the Station L/R switch dialog

The Update data tab is aimed for updating the database from the actual process within the selected station, see Figure 4.10. The **Update Process Data...** button can be used to initialize the substation after a system restart, or to verify database consistency.

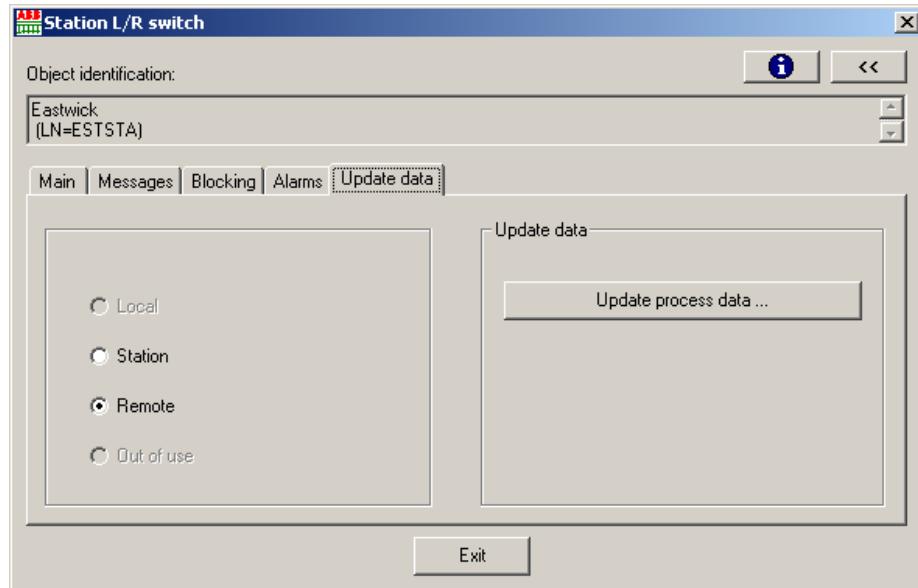


Figure 4.10: The Update data tab of the Station L/R switch dialog

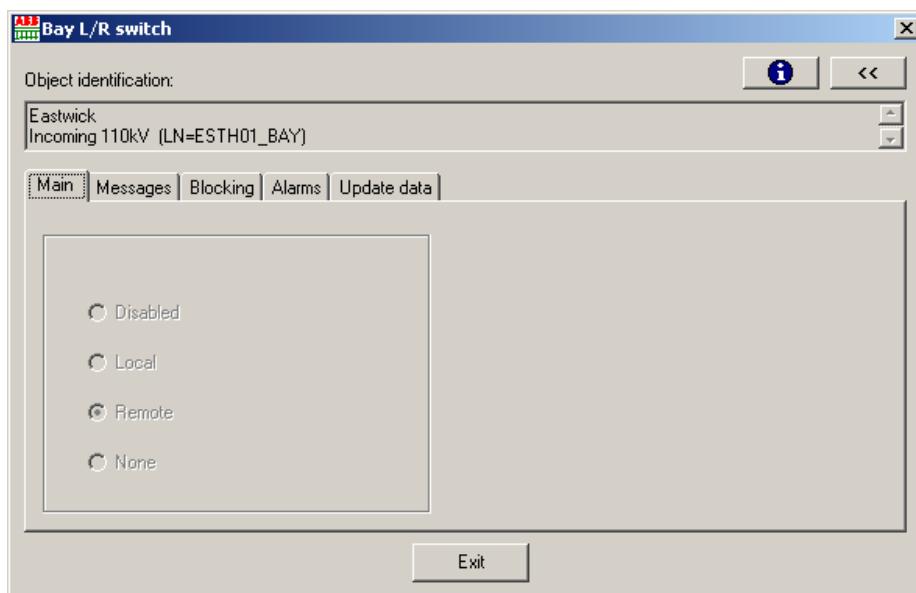
**4.5****Bay Local/Remote control**

The Bay L/R control shows the operator location information of a bay in a substation, that is, whether the control is authorized from the bay unit locally or remotely over a communication link (for example station HSI).

If the Bay L/R switch is remotely controllable, it is possible to change the switch state from the control dialog.

The Main tab of the Bay L/R Switch dialog (Figure 4.11) shows the object name and the selection for the operator location. Select the operator location by selecting the corresponding option. The available options depend on the object configuration, unavailable options are dimmed.

Select the corresponding option for operator location (for example Remote). Close the control dialog by clicking **Exit**.



*Figure 4.11: The Main tab of the Bay L/R switch dialog*

In Operator place tab (Figure 4.12) it is possible to set the authorized control location for each bay separately.

For operator place handling there are two different principles

1. MicroSCADA Internal model
2. IEC 61850 model

### **MicroSCADA Internal model**

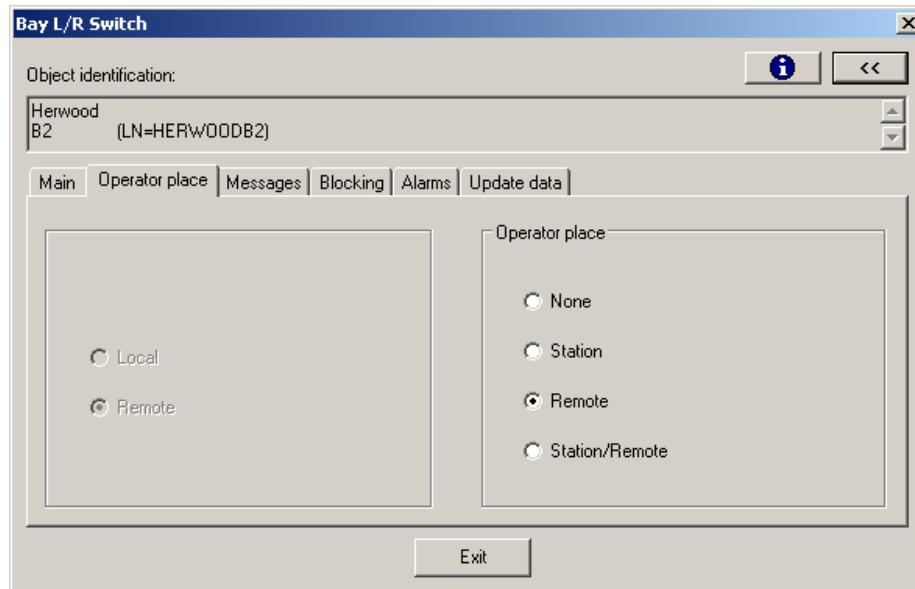
The operator place switch has meaning, if the IED L/R switch is in remote position. In this case the operator place can be the following

## Operation Manual

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- None, control is prevented both from Station and NCC
- Station, control is allowed from station level if system is defined as Substation Control System (SCS).
- Remote, control is allowed from remote level if system is defined as Network Control Center (NCC).
- Station/Remote control is allowed both from SCS and NCC

System location (SCS/NCC) is defined in Application Settings Dialog. If process object for Operator place switch does not exist in process database, this tab is not shown.



*Figure 4.12: The Operator place tab of the Bay L/R switch dialog*

### IEC 61850 model

IEC 61850 model is the same for bay as for device level objects, like breaker. For more information Section 4.6.9 Operator Place

The Messages tab shows the different messages concerning the selected object. A message is shown, for example, if the object is simulated or the information of the physical local/remote key position is unknown.

Different blockings concerning the process objects that belong to the bay are shown and controlled in the Blocking tab, see Figure 4.13.

## Operation Manual

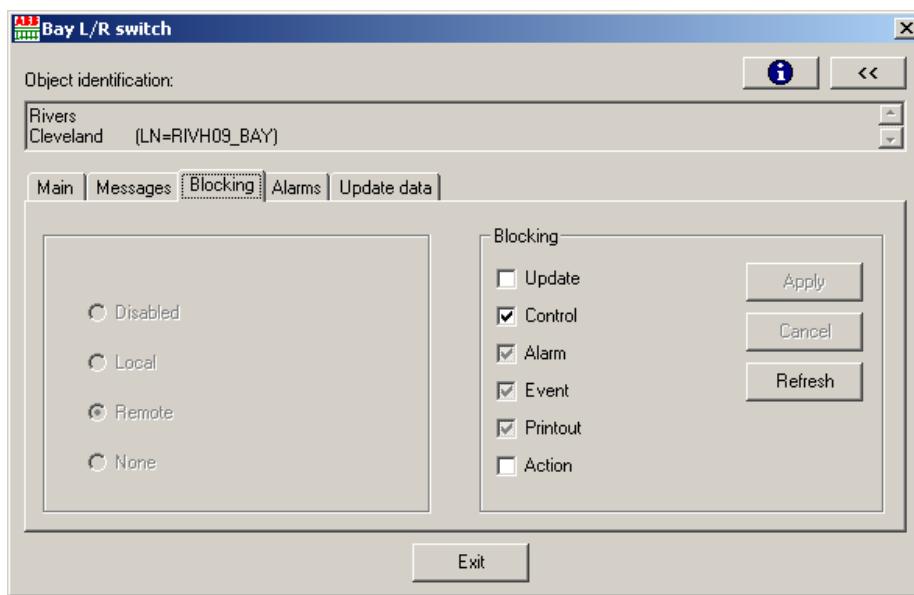


Figure 4.13: The Blocking tab of the Bay L/R switch dialog

After selection (multiple selection allowed) click **Apply** to make the changes. Click **Cancel** to restore the changes made. Click **Refresh** to update the status of the blocking in case it has been changed elsewhere in the system.

The alarms are shown on the Alarms tab, see Figure 4.14. To acknowledge alarms click **Ack. All** or **Ack. selected**. Click **Refresh** to update the alarm status.

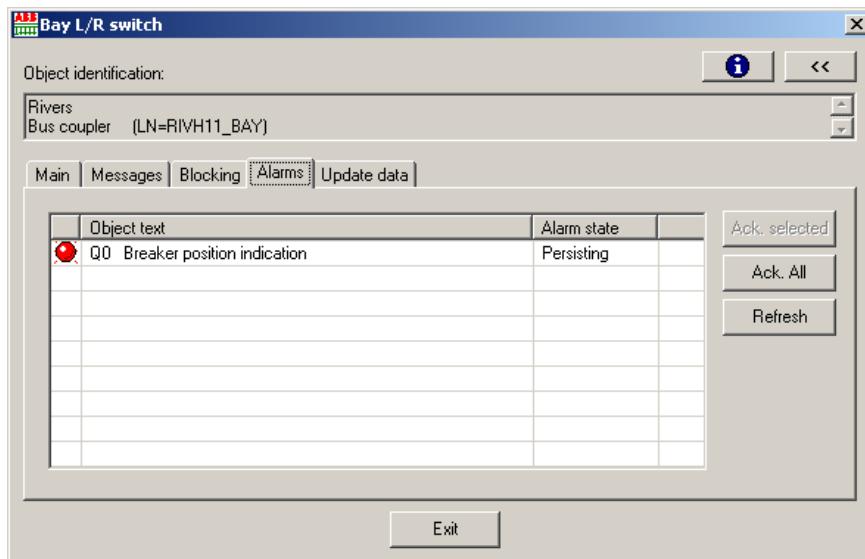


Figure 4.14: The Alarms tab of the Bay L/R switch dialog

The Update Data tab is aimed for updating the database from the actual process within the selected bay.

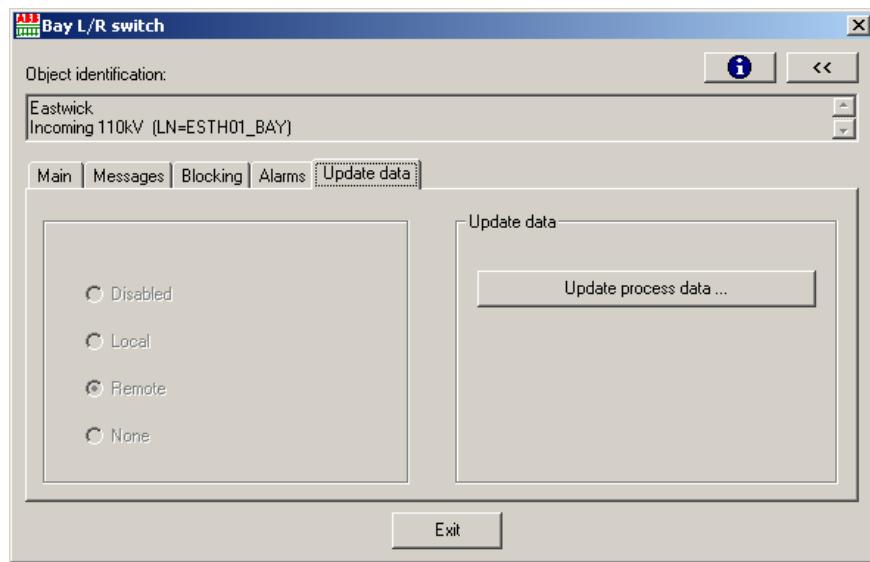


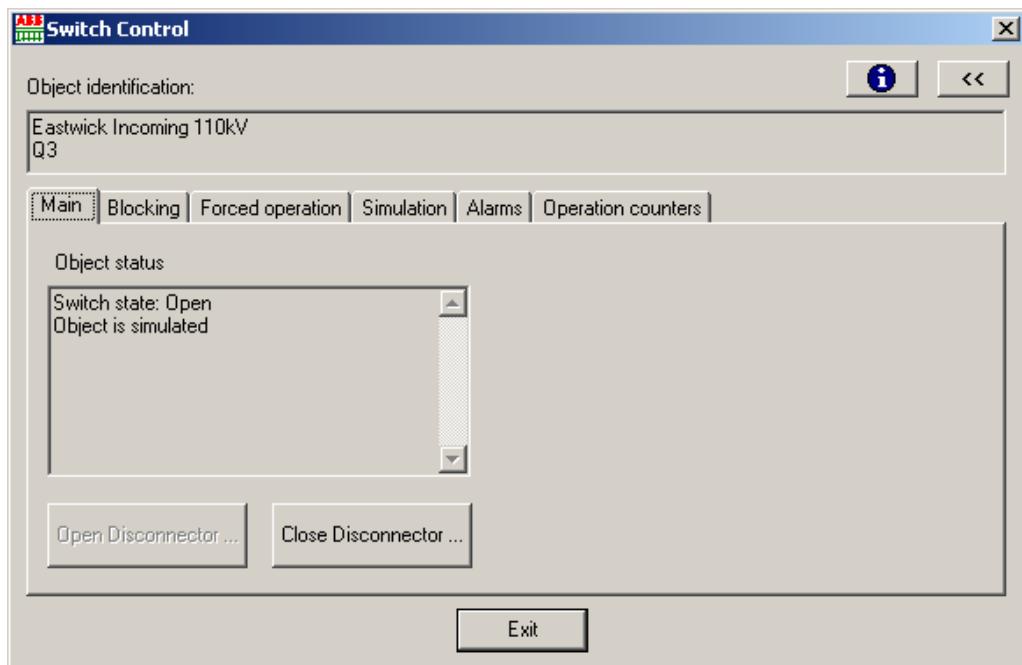
Figure 4.15: The Update data tab of the Bay L/R switch dialog

## 4.6 Switch control

Switch Control dialog can be used to show current state and status of a switch device object. It is also used for operating the switch device. Open the Switch Control dialog by clicking the objects. The same dialog operates with breakers, disconnectors and earthing disconnectors. The available functions are based on the configuration definition of the corresponding Power Process Library standard object.

There are several tab pages on this dialog. The object identification (station, bay and the object) are located above the tab pages. The tab pages in the Switch Control dialog are divided into the main display and the advanced display. In the main display, it is only possible to open and close the switch. Open the advanced display by clicking the >> button in the upper right corner of the Switch Control dialog.

Object status is shown on the Main tab. The object status can be, for example, authorization, blocking information and reservation information, as well as potential problems on the communication link acquiring the correct status. Possible errors during the operation appear in the Object Status field of the Main tab. Close the dialog by clicking Exit, pressing ESC key on keyboard or clicking the button on the upper-right corner of the dialog.



*Figure 4.16: The Main tab of the Switch control dialog*

If the switch device is opened or closed, the text "Object is selected for operation" is displayed in the Object Status field and the program asks the user to verify the control operation. In case of an error in selection, the error message is shown in the Object Status field.

If controlling is possible, the **Open Disconnector** or **Close Disconnector** buttons are active. Note that once the selection of the control command is done, it may include several steps on the process to be controlled (for example interlocking conditions are checked). These depend on the actual configuration of the process devices.

In the advanced display, there are tabbed pages for blockings, forced operation, simulation, alarms and operation counters.

#### 4.6.1

#### Blockings

In the Blocking tab of the Switch Control dialog (Figure 4.17), the different blockings concerning the process objects that hold information about switch state are shown and controlled. After selection (multiple selection allowed), click **Apply** to make the changes. Clicking **Cancel** discards the made changes. To update the status of the blocking (in case it has been changed elsewhere in the system), click **Refresh**.

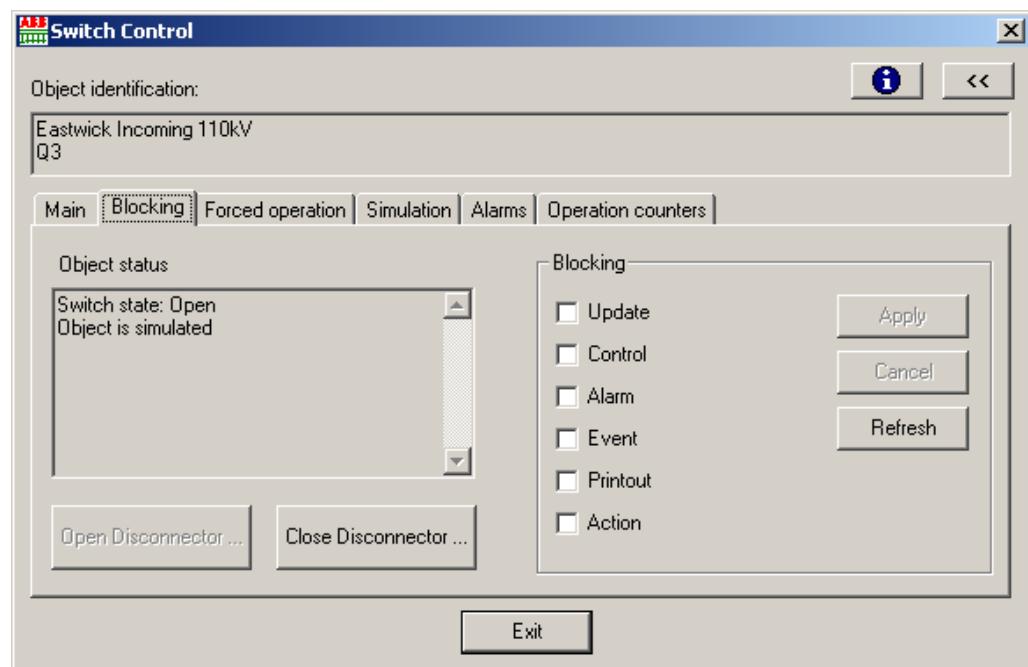


Figure 4.17: The Blocking tab of the Switch Control dialog

#### 4.6.2 Forced operations

On Forced operation tab (Figure 4.18), the internal blockings of SYS600 and Power Process Library control blockings can be bypassed. The user can force objects to operate on their command even if another user is connected to them or the function is normally not permitted. However, this does not disable any interlockings or other IED measures, that is, no special bypass messages are sent to the IEDs.

## Operation Manual

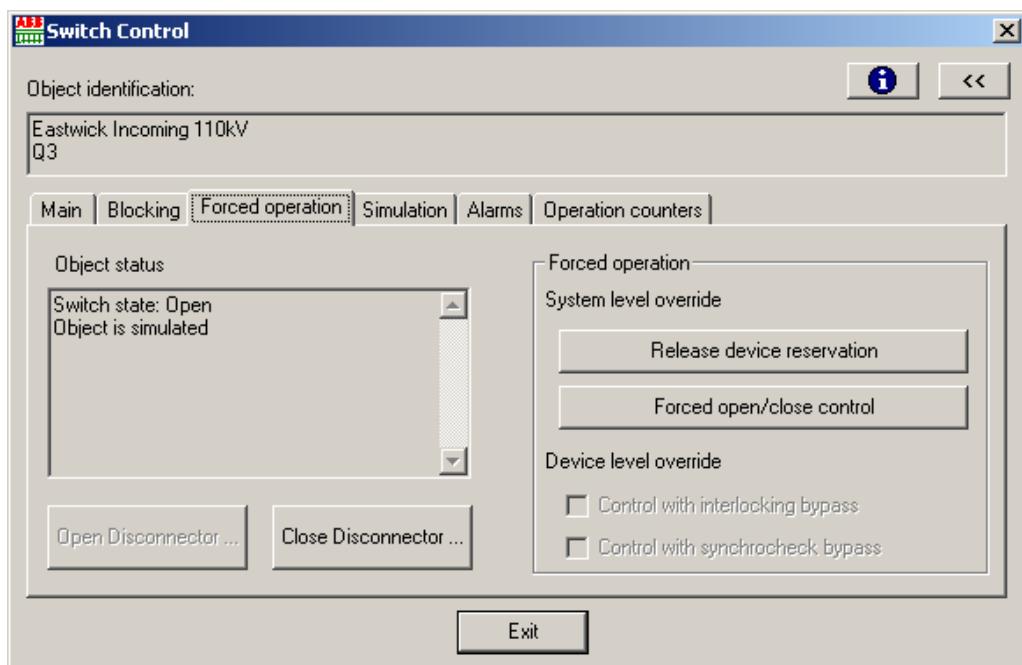


Figure 4.18: The Forced operation tab of the Switch Control dialog

If an object is selected on another display or it is under command and the user wants to have the control, click **Release device reservation**. When this is done, Control dialogs disappear from other operators. Releasing of command reservation is possible only if the process object for switch device command event is simulated in the MicroSCADA process database.

**Open Disconnector** and **Close Disconnector** buttons may be inactive for various reasons, for example, the switch is in the middle position. The **Forced open/close control** button can be used for enabling the buttons for actual control. In this case the controlling is as normal control without bypassing options.

There are two different device level overrides available in the control dialog. When the controlling is done with interlocking bypass/synchrocheck bypass option, the bypass command is sent/and handled in actual IED.



The interlocking and synchrocheck bypass functions can only be used with IEC 61850 protocol.

If the switch device is interlocked or synchrocheck inhibits the control, select the corresponding check box and control the switch device in a normal way with the **Open Disconnector** and **Close Disconnector** buttons. The Event Display shows that controlling was done with the bypass option.

The following table presents the control type for the switch device:

## Operation Manual

**Table 4.2: ABBCommandBitmask**

Name	Type	Value/Value range	M/O/C	OPC Data Type
NormalControl NormalControl: true = normal operation, false = inverse operation (for example On/Off)	1bit	FALSE (0)   TRUE (1)	M	0
InterlockOverride InterlockOverride: true = interlockcheck > false	1bit	FALSE (0)   TRUE (1)	M	1
Synchrocheck-Override SynchrocheckOverride: true = syncrocheck > false	1bit	FALSE (0)   TRUE (1)	M	2
TestCommand TestCommand: true = test command	1bit	FALSE (0)   TRUE (1)	M	3
Originator Originator: Command originator (= Originator.orCat)	4bit	not-supported (0)   bay-control (1)   station-control (2)   remote-control (3)   automatic-bay (4)   automatic-station (5)   automatic-remote (6)   maintenance (7)   process (8)	M	4-7
ControlValue	nbit		M	8-31

1. NormalControl: true = normal operation, false = inverse operation (for example On/Off)
2. InterlockOverride: true = interlockcheck > false
3. SynchrocheckOverride: true = syncrocheck > false
4. TestCommand: true = test command
5. Originator: Command originator (= Originator.orCat)

#### 4.6.3

#### Simulation

The state of the switch object can be simulated on the Simulation tab (Figure 4.19). The state is then indicated on Process Displays with blue color and appropriate messages on control dialogs. Simulation cannot be deactivated if there is no process communication for the corresponding process object.

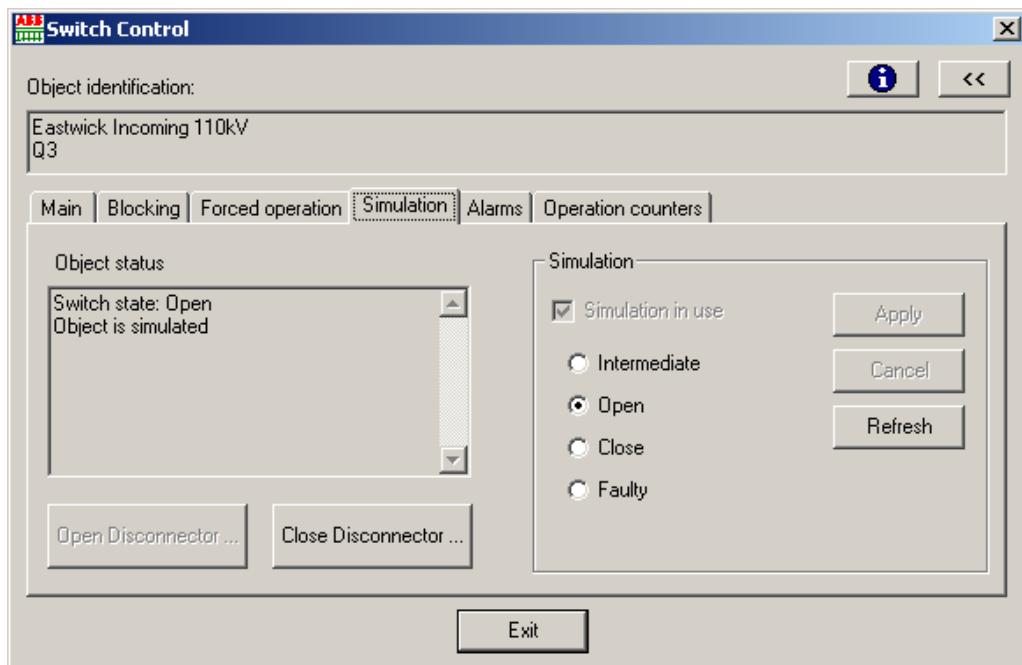


Figure 4.19: Simulation tab of the Switch Control dialog

After the selection, click **Apply** to apply the changes. Clicking **Cancel** discards the made changes. By clicking **Refresh**, the status of the simulation is updated in case it has been changed elsewhere in the system.

#### 4.6.4 Alarms

The alarms are shown on the Alarms tab (Figure 4.20). To acknowledge alarms click **Ack. All** or **Ack. selected**. Click **Refresh** to update the alarm status.

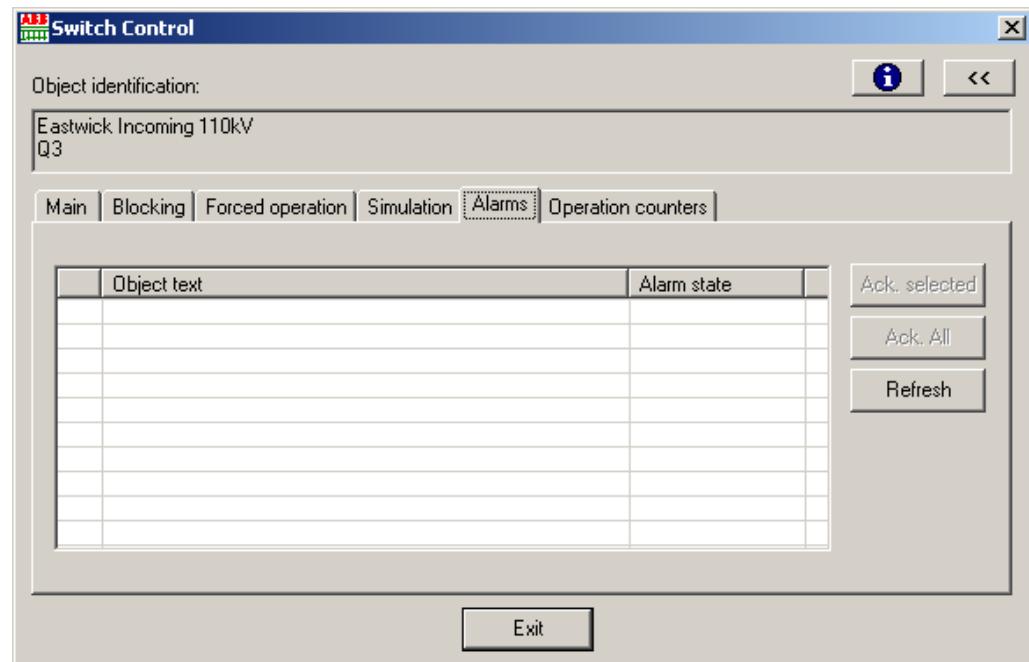


Figure 4.20: The Alarms tab of the Switch Control dialog

#### 4.6.5 Auto-reclose

In case auto-reclose function is configured for the switch object, the messages from the function is shown in the Object Status box of the Reclosing tab (Figure 4.21). Interrupt an ongoing sequence by clicking **Interrupt AR sequence**. This button is dimmed if the corresponding function is not available.

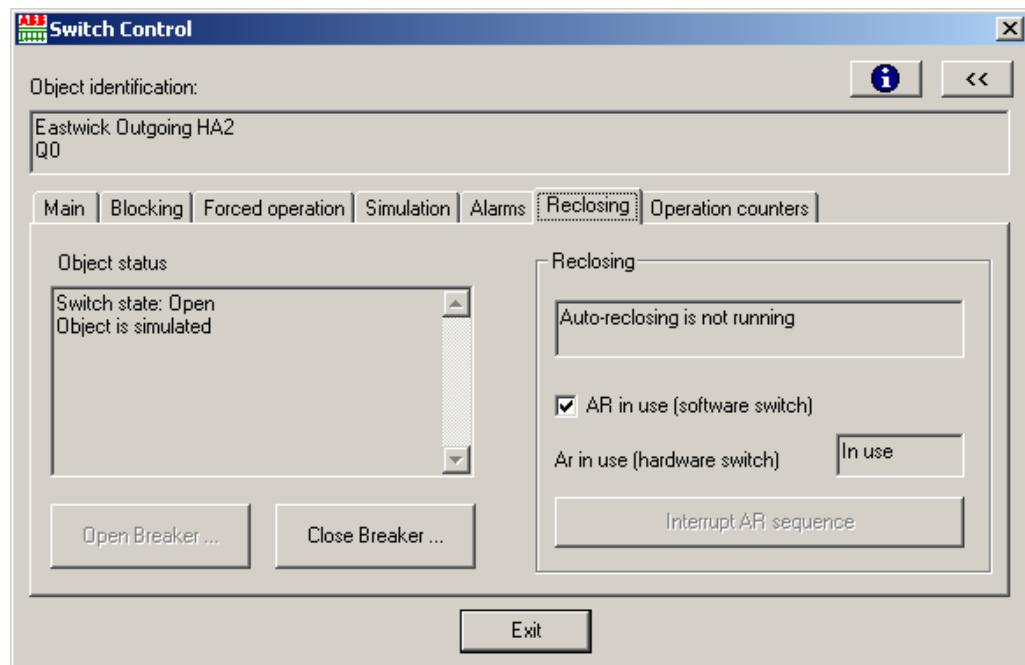


Figure 4.21: The Reclosing tab of the Switch Control dialog

## Operation Manual

### 4.6.6 Operation counters

When the switch is closed with the **Close Disconnector** button in the Switch Control dialog, the number in the **Operation counter value** field is incremented.

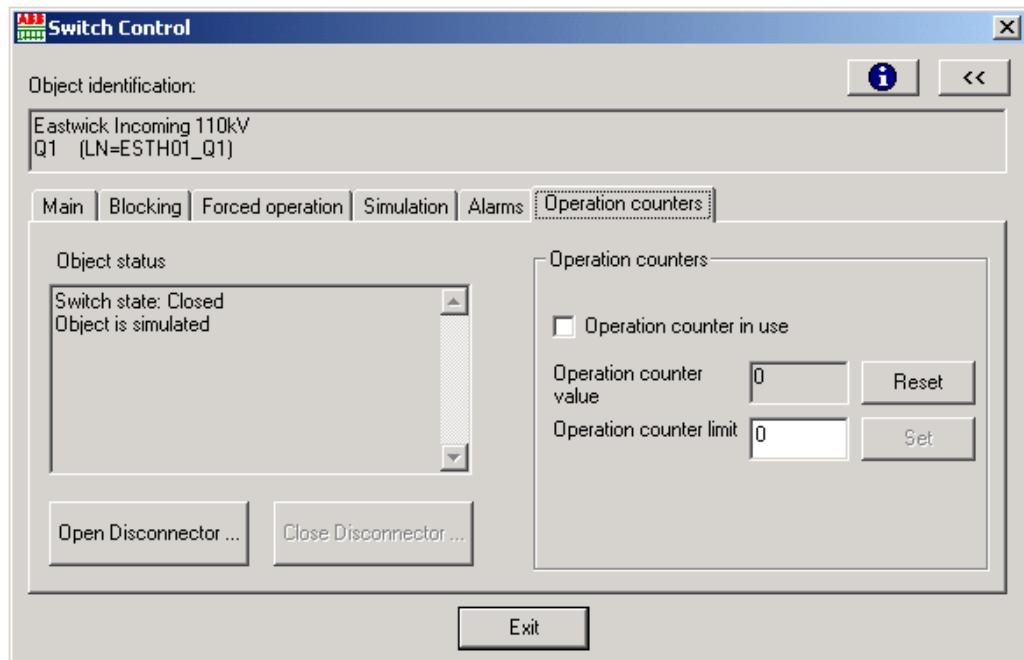


Figure 4.22: The Operation counters tab of the Switch Control dialog

When the operation counter value reaches the limit defined in the Operation counter limit field, a message "Operation counter limit reached" is displayed on the Operation counters tabbed page.

Operation Manual

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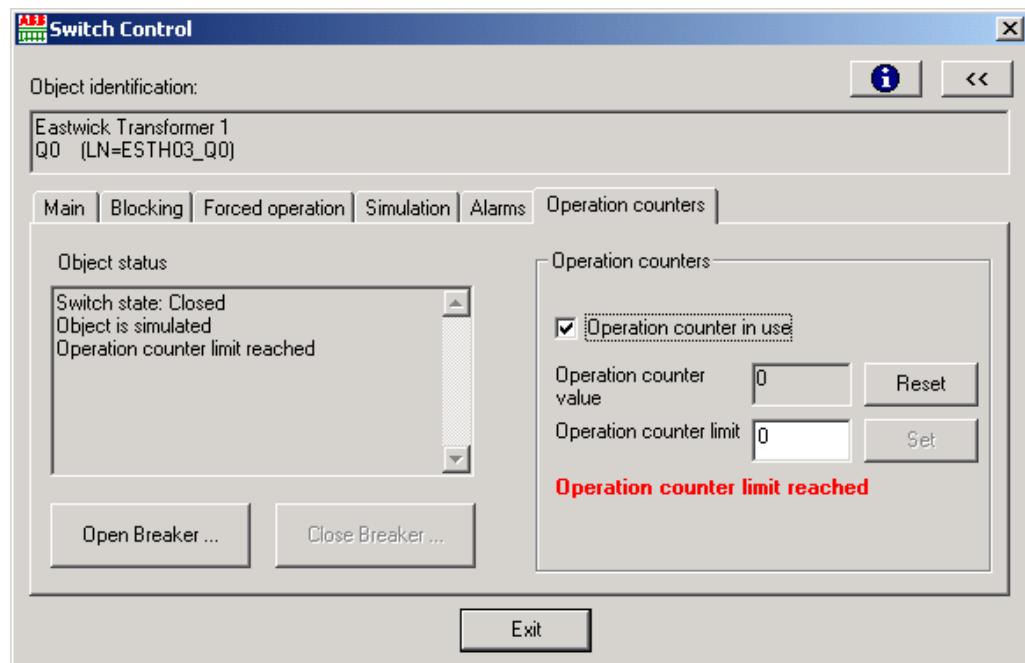


Figure 4.23: The Operation counter limit reached

To reset the operation counter value, click the **Reset** button next to the Operation counter value field. To reset the operation counter limit value, click the **Set** button next to the Operation counter limit field and enter a new value.

To switch off the operation counter, clear the **Operation counter in use** check box. When the operation counter is not in use, the counter value is not increased when the switch device is closed.

#### 4.6.7 Dial-up

If a switch device is connected to the system via an autocaller line (a modem with functions for automatic dial-up), Control dialog detects this configuration. When the Control dialog is opened, the autocaller state is displayed in the Object Status field of the Dial up tab. Autocaller can have the following states:

- IDLE: ready to make a call
- CONNECTED: transmission is activated
- BUSY: for example dialling
- INITIAL: uninitialized
- CONFIGURE: the IU attribute of the line is set to 0

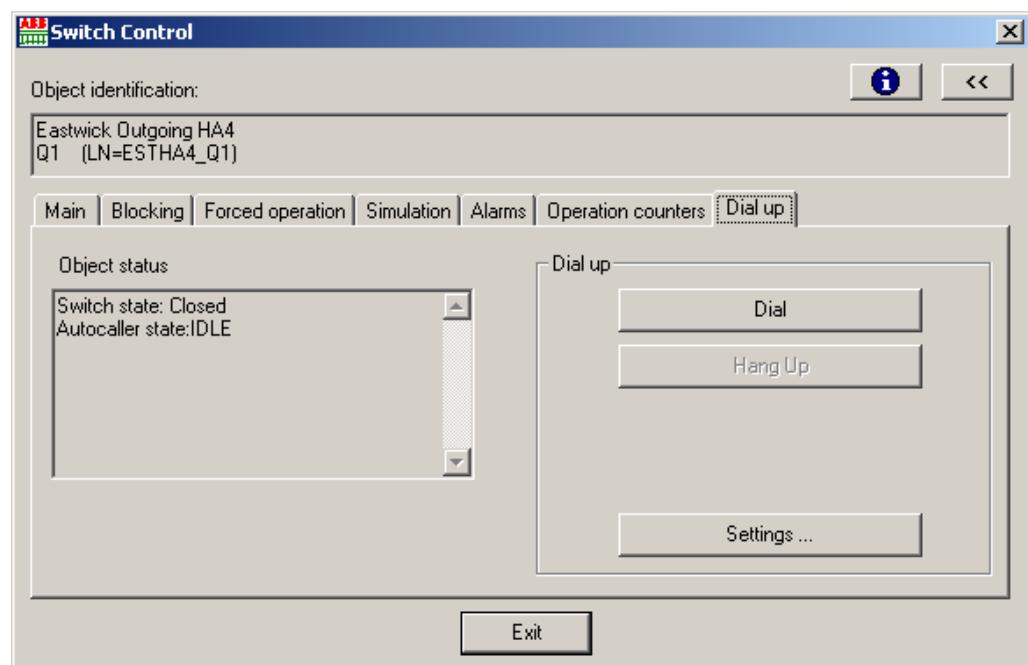


Figure 4.24: The Dial up tab

If the autocaller state is idle, the Dial up tab is automatically displayed. Depending on the configuration, the following options are available in the Dial up tab:

- **Dial** opens the connection to the device. When making a call to the device, the Object Status field indicates the progress of the call with the autocaller state and a raising counter.

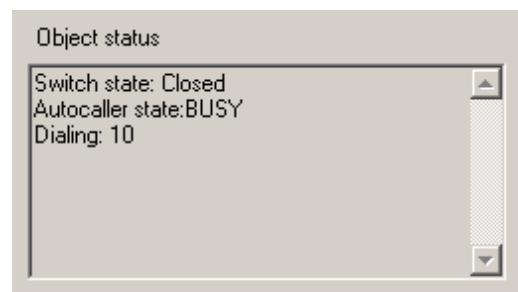


Figure 4.25: The Autocaller state is busy

When the object is configured so that Synchronize and/or Update Data commands are automatically sent to the device, it is also shown in the status field.

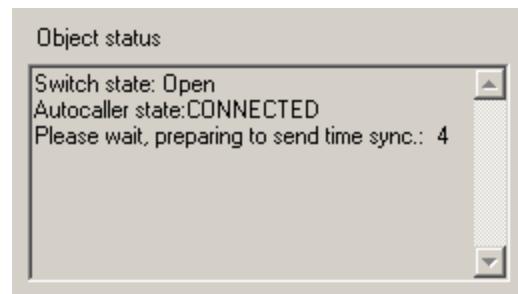


Figure 4.26: The Synchronize command is sent to the device

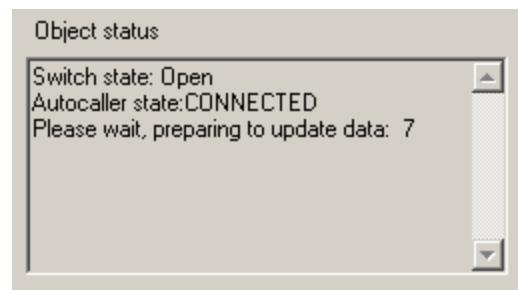
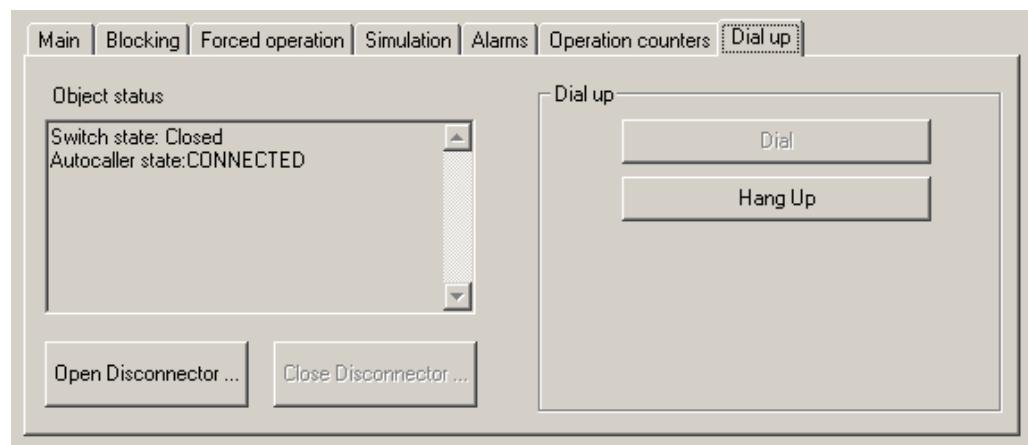


Figure 4.27: The Update Data command is sent to the device

Control buttons are available after the connections are ready:

## Operation Manual

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*Figure 4.28: The autocaller state is connected*

- **Hang Up** closes the connection.
- **Synchronize** sends the time synchronization command to the device. An object can be configured so that the Synchronize command is automatically sent to the device when the connection is ready.
- **Update Data** updates the process data from the device. An object can be configured so that Update Data command is automatically sent to the device when the connection is ready.
- **Settings** opens the Dial-up settings dialog.

### Dial-up settings



*Figure 4.29: Dial-up settings*

The Settings dialog can be opened if an object is not yet configured for dial-up and/or the user has engineering privileges for process control.

The Settings dialog has the following options:

- **Automatically call:** automatically opens the connection when the control dialog is opened.
  - **Automatically synchronize:** automatically sends the time synchronization command when the connection is ready.
  - **Automatically update data:** automatically sends the update process data command when the connection (and time synchronization) is ready.
  - **Automatically Hang up:** automatically closes the connection when the control dialog is closed.



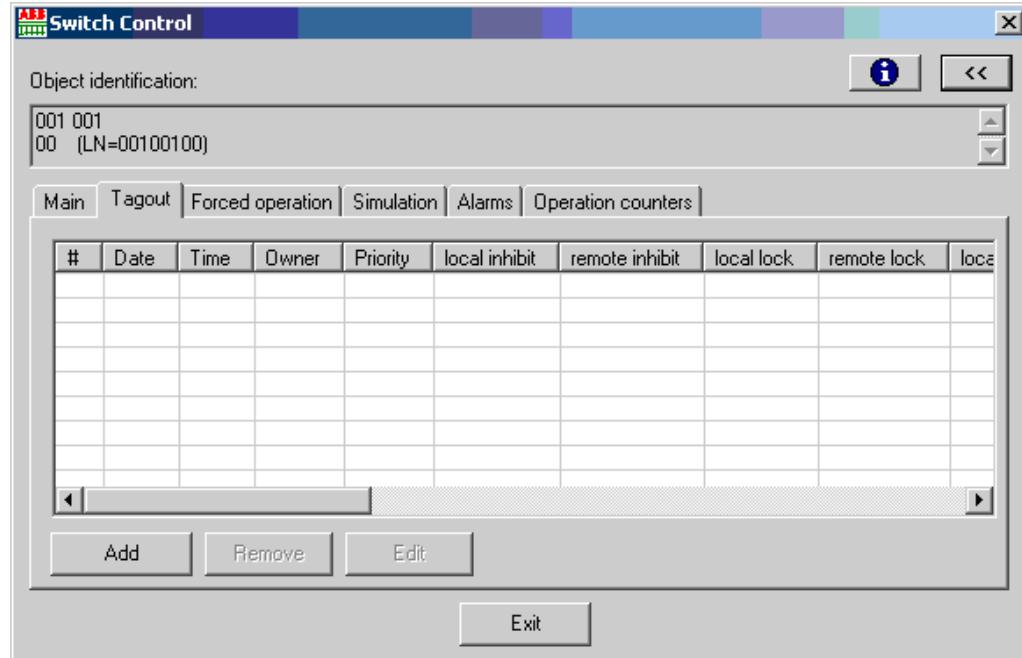
The indication process object has to be connected to process (UN>0, OA>0), in order to have the Dial-up functionality in the Control dialog.

#### **4.6.8**

## Tagout

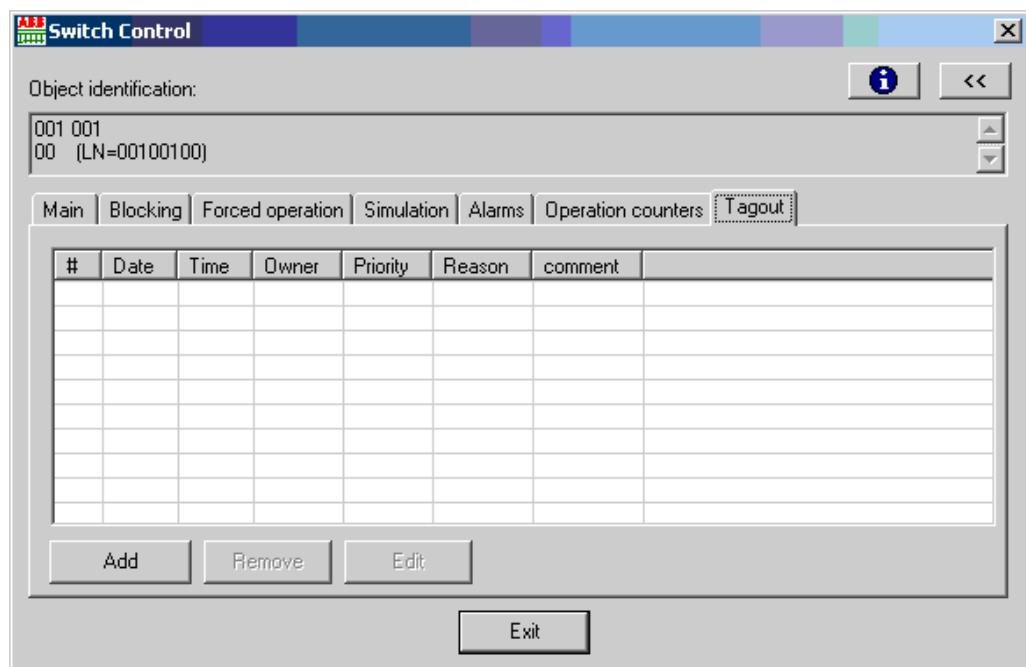
If the Tagout function is configured for the switch device, the status of the function is shown in the Tagout tab (Figure 4.30).

The Tagout tab position depends on the active Tagout class. If the class contains also the blocking functionality, the Blocking tab will be replaced with the Tagout tab. If the active Tagout class does not contain the blocking functionality, the Tagout tab appears last in the dialog Figure 4.31.



*Figure 4.30: The Tagout tab with blockings of the Switch Control dialog*

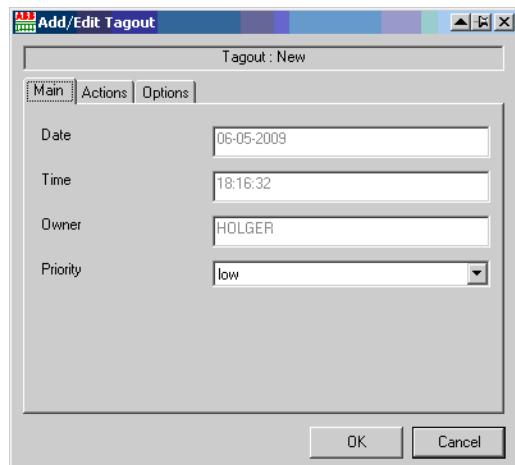
## Operation Manual



*Figure 4.31: The Tagout tab without blockings of the Switch Control dialog*

The properties and the view of the Tagout tab can be adjusted with the Tagout Class Editor.

To add a tagout, click **Add**. The Add/Edit Tagout dialog opens.



*Figure 4.32: The Add/Edit Tagout dialog*

The Add/Edit Tagout dialog contains several tabs. The title and the position of the tabs can be adjusted with the Tagout Class Editor.

## Operation Manual



Only the owner of the tagout can edit and remove active tagouts.

To remove a tagout:

1. Select a tagout from the list of active tagouts
2. Click **Remove...**
3. The Remove Tagout confirmation dialog opens

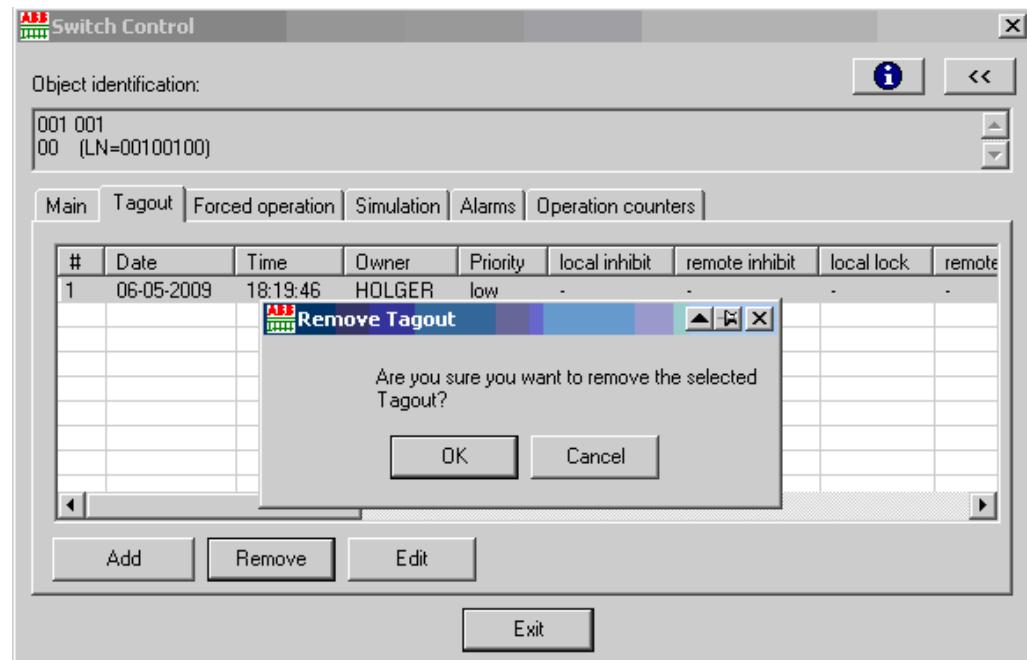


Figure 4.33: The Remove Tagout confirmation dialog

To edit a tagout:

1. Select a tagout from the list of active tagouts
2. Click **Edit** or double-click the tagout
3. The Add/Edit Tagout dialog opens

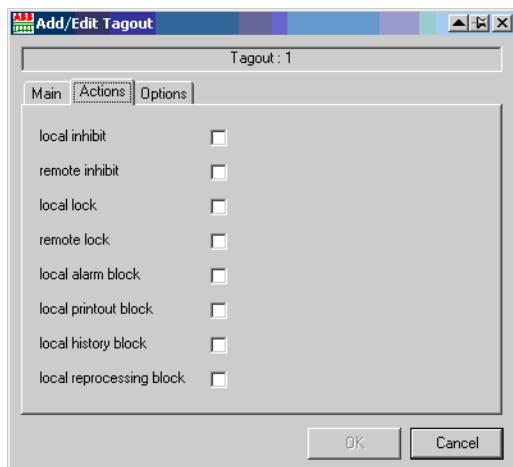


Figure 4.34: The Add/Edit Tagout dialog

#### 4.6.9

#### Operator Place

When the operator place checking is configured to an object, The Operator Place tab indicating the current state switches appears.

#### Multilevel switching authority allows control

Indication only. When this option is enabled, both Station level and NCC level are authorized operator places for the object

#### Device Level Control

Indication only. The state of the device level L/R switch. Local means that control authority is in the front panel of the device. Remote means that control can be done via remote communication.

#### System Level Control

This option is enabled if Device Level control is in Remote position. The control authority of the device can be switched between Station and NCC

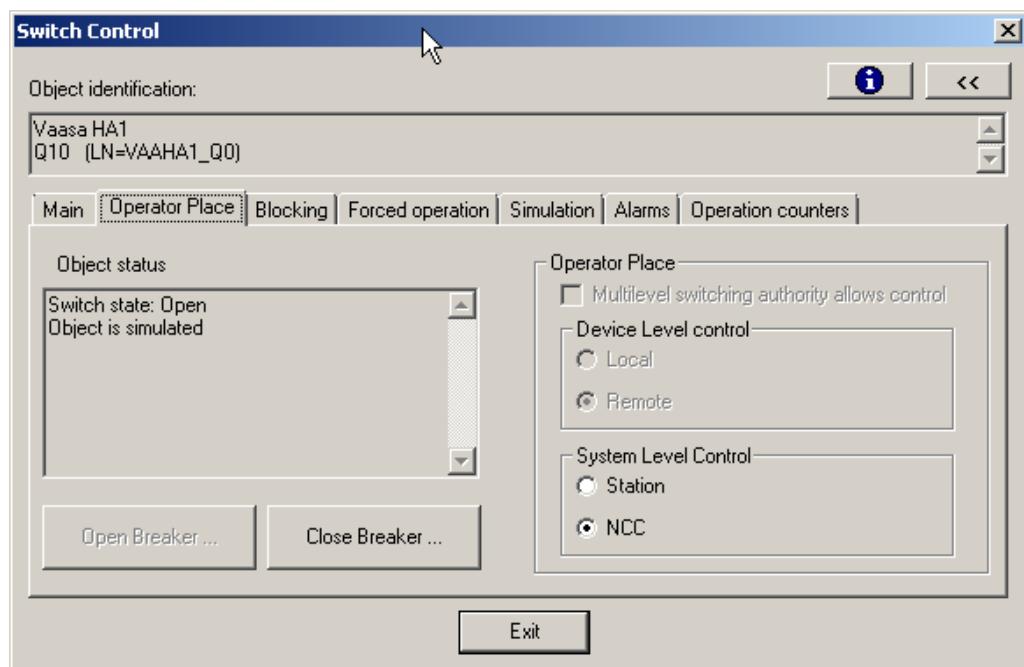


Figure 4.35: The Operator Place tab of the Switch Control Dialog

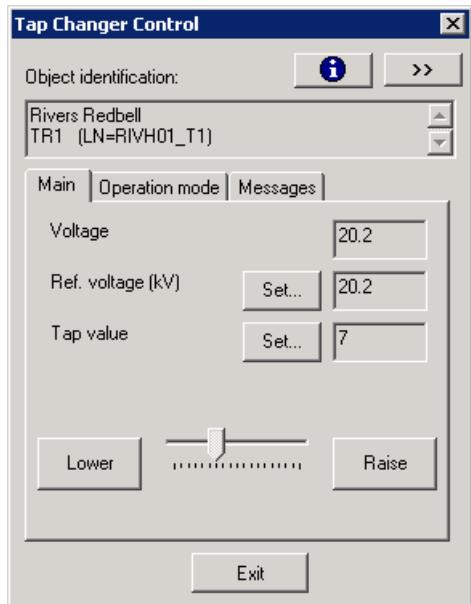


The view in the Operator Place tab is dynamic depending on the object configuration. If the indication does not exist in the process database, also the functionality is hidden in the tab.

## 4.7 Transformer voltage control

Tap changer control dialog shows the current state of the transformer voltage controller, and can be used for operating it as well. The available functions are based on the configuration definition of the corresponding Power Process Library standard object.

The identification information (station, bay, object) is shown in the box on the Main tab, see (Figure 4.36). Set the control operation mode by clicking the corresponding option under the Operation mode. The options are available depending on object configuration, the unavailable options are dimmed. Confirm the selection by clicking the **Execute** button. Cancel the selection by clicking **Cancel**. The symbol buttons are presented in the beginning of Chapter 4 Process controlling.

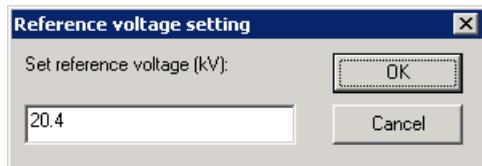


*Figure 4.36: The Main tab of the Tap changer control dialog*

Voltage or tap positions can be controlled if the configuration and status allow it. Control the voltage and tap values by using the **Lower** and **Raise** buttons. In the Main tab, the current tap position and voltage values can be set as well.

To set Reference voltage:

1. Click **Set** and the Reference voltage setting dialog opens
2. Type a new value in kilovolts to the New reference voltage box
3. Click **OK**



*Figure 4.37: The Reference voltage setting dialog*

The unit changes dynamically according to the unit defined in the ST attribute of the reference voltage process object.

Reference voltage setting requires the following:

- Process object to set reference voltage value (command object)
- Process object for indication of reference voltage
- User interface support for setting the reference value

To set Tap value:

## Operation Manual

1. Click **Set** and the Tap value setting dialog opens



Figure 4.38: The Tap value setting dialog

2. Type a new value in kilovolts to the Tap value settings box
3. Click **OK**

Tap value setting requires the following:

- Process object to set reference tap value (command object).
- Process object for indication of tap value.
- User interface support for setting the tap value. This can be implemented in control dialog by adding a text box where numerical tap value can be written.

The **Set** is not visible if numerical command object does not exist.

The Messages tab shows different messages concerning the object, for example if the object is simulated, or the information of the voltage controller is unknown.

On the Operation tab the operation mode can be selected (Figure 4.39).

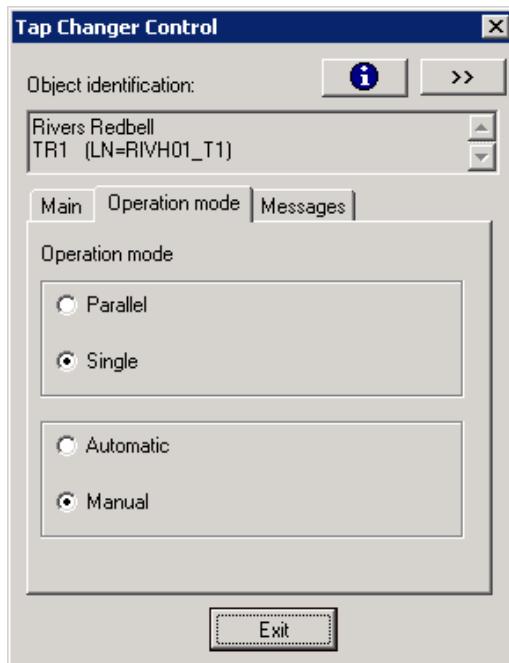


Figure 4.39: The Operation mode tab of the Tap changer control dialog

## Operation Manual

Different blockings concerning the process objects holding information about the voltage controller are shown and controlled in Blocking tab (Figure 4.40). After selection (multiple selections allowed), click **OK** to apply the changes. Clicking **Cancel** discards the made changes. Click **Refresh** to update the status of the blocking in case it has been changed elsewhere in the system.

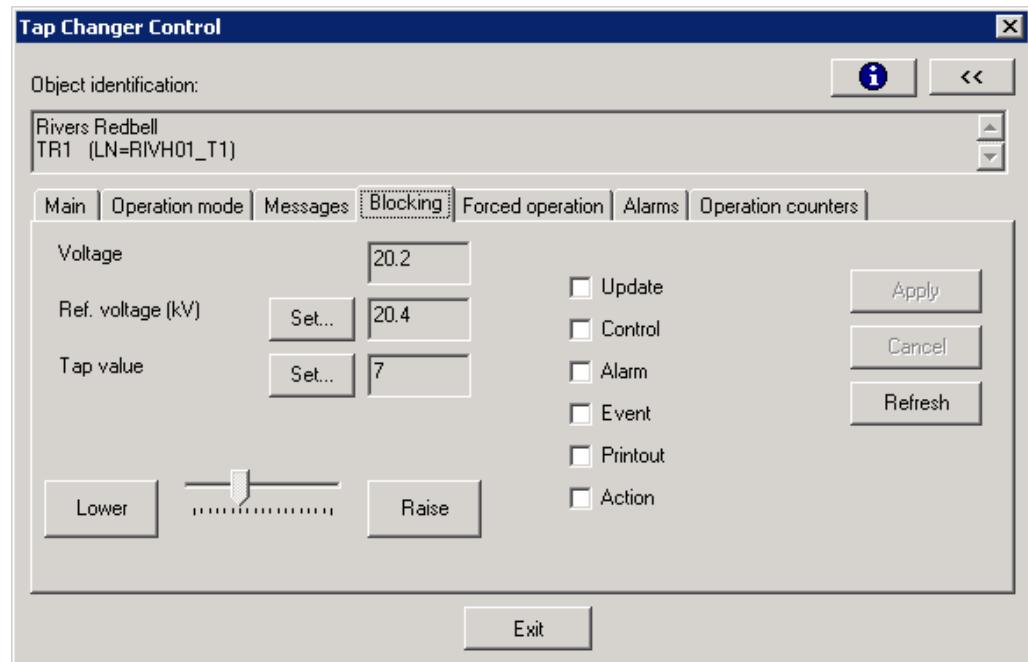


Figure 4.40: The Blocking tab of the Tap changer control dialog

If an object is selected on the current or on another monitor, clicking Release device reservation resets the selection and the user has the authority for controlling the object.

## Operation Manual

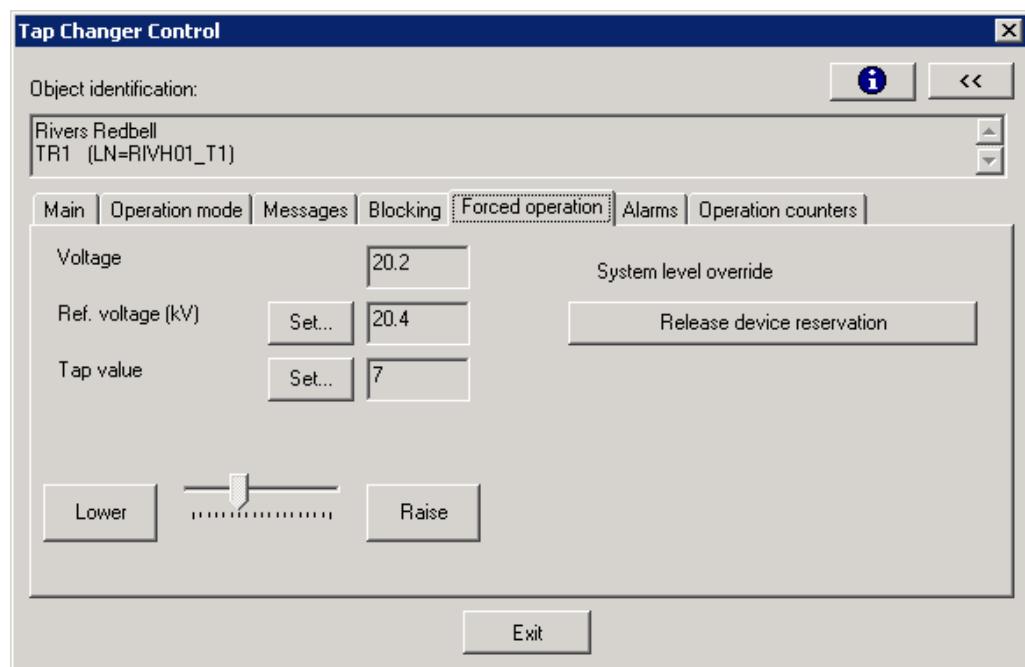


Figure 4.41: The Forced operation tab of the Tap changer control dialog

When a control operation, that is a change the tap position either with **Raise** or **Lower** buttons is made in the Tap changer control dialog box, or with direct setting of the tap value with the **Set** button in the Switch Control dialog box, the number in the Operation counter value field is incremented.

The Operation counter value field can be found in the Operation counters tab of the Tap changer control dialog box.

## Operation Manual

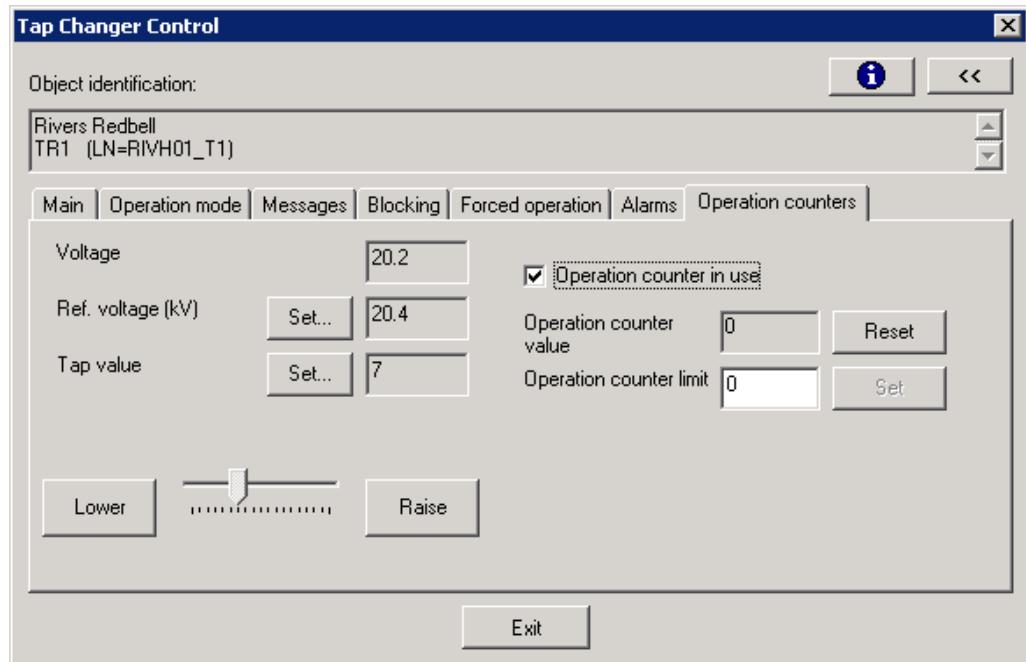


Figure 4.42: The Operation counters tab of the Tap changer control dialog

When the operation counter value reaches the limit defined in the Operation counter limit field, a message Operation counter limit reached is displayed on the Operation counters tab.

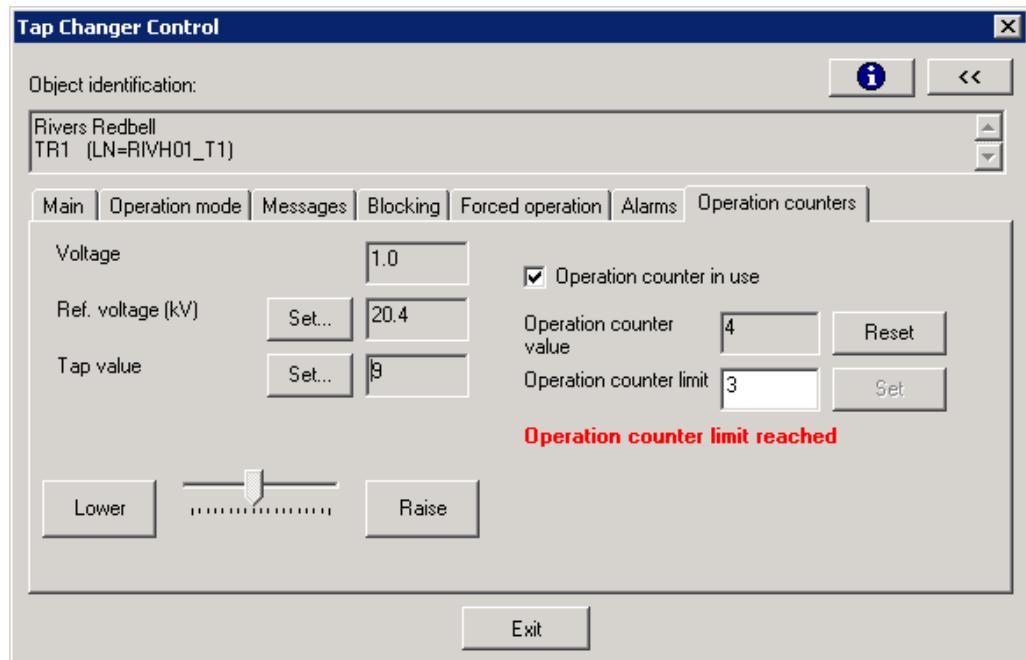


Figure 4.43: Operation counter limit reached

## Operation Manual

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To reset the operation counter value, click the **Reset** button next to the Operation counter value field. To reset the operation counter limit value, click the **Set** button next to the Operation counter limit field and enter a new value.

To switch off the operation counter, clear the check box Operation counter in use. When the operation counter is not in use, the counter value is not increased when the tap value is changed.

### 4.8 Measurement control

View the measured values in numeric and bar graph presentations in the Measurement dialog. The values and bar graphs are colored based on the state and status of the measured signal.

Show and hide the bar graph presentation by clicking the  button in the Measurement dialog (Figure 4.44).

Open the advanced display by clicking the >> button in the upper right corner of the Measurement dialog. The number of shown measurands depends on the configuration of the measurement object (Figure 4.45).

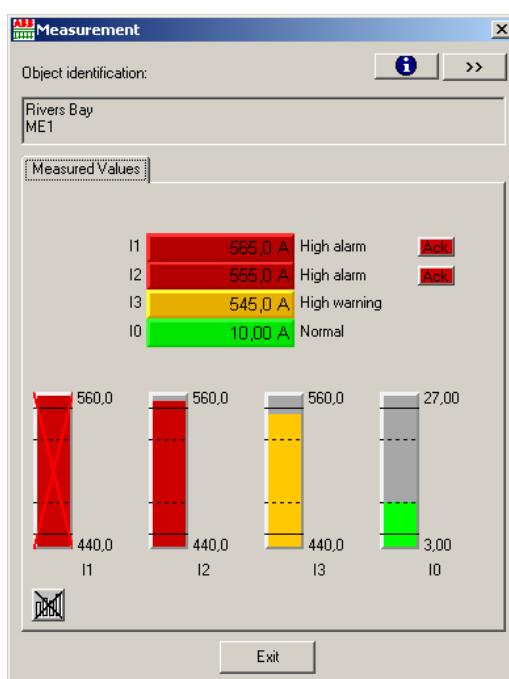


Figure 4.44: Normal display with bar graphs

In the Measurement dialog the following can be monitored:

- 1 to 4 measurement values including measured values and unit information
- 1 to 4 state and/or status indicators (text and coloring)

## Operation Manual

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- 1 to 4 alarm acknowledgement buttons (blinking button, visible if the measurement has an unacknowledged alarm, confirmation dialog for acknowledgement of the alarm)
- 1 to 4 optional bar graphs (The bar graph is not shown, if a measurement does not have alarm or warning limits, for example, it is a pulse counter)
- The advanced display includes tabbed pages for measured values, limits, zero deadband supervision, blocking, object messages and alarms.

If the information on the tab is related to only one measurand, the option buttons to select the measurand become visible (Figure 4.45). Otherwise the option buttons are hidden.

The different colors on the dialog are based on definitions made for the used color scheme.

The reserved space for the maximum value of the bar graph is high alarm limit + 10% of the difference between high and low alarm limits. The reserved space for the minimum value of the bar graph is low alarm limit - 10% of the difference between high and low alarm limits. If the measured value is above high alarm limit or below low alarm limit, the 10% space reservation is added to or subtracted from the measured value.

If the limit supervision is handled by IED or if the limit supervision is not in use (all alarm and warning limits have been set to same value), the bar graph does not display limit lines.

In the Measured Values tab of the Measurement dialog it is possible to:

- See the selected measured value and timestamp
- Reset the min value and timestamp
- Reset the max value and timestamp
- Reset the frozen value and timestamp
- Simulate a value
- Check that the simulated value is valid

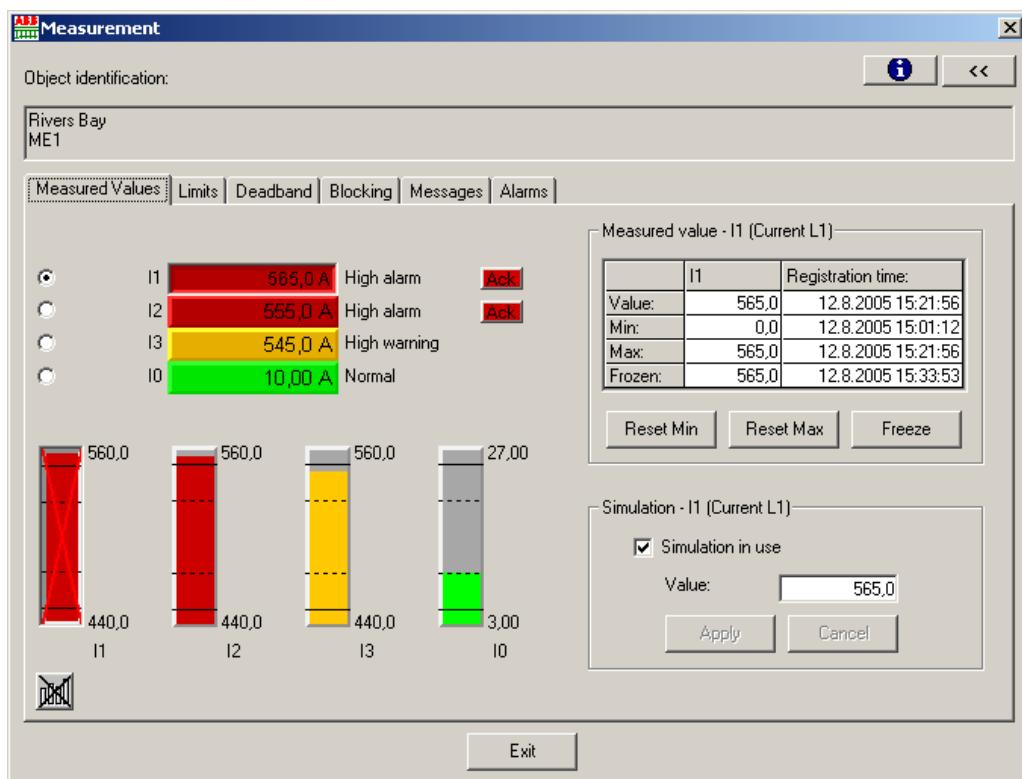


Figure 4.45: Advanced display with measured value and simulation

The simulated value entered is validated at first. If the simulated value is not valid, the Value box is displayed in red color (Figure 4.46).

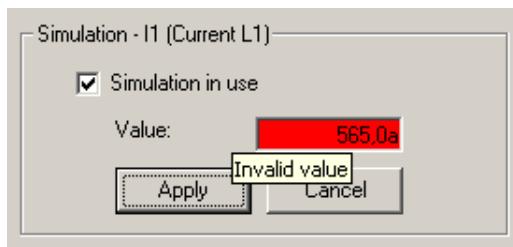


Figure 4.46: Invalid simulated value

On the Limits tab it is possible to:

- Set the high and low alarm and warning limit values. The maximum and minimum values are calculated like in the bar graphs (the limits cannot be set, for example, for pulse counters).
- Copy and paste the limit values by right-clicking on the limits frame.

A warning message will be shown if the limits in the process have been changed during the edition of the new limits in the Measurement dialog.

## Operation Manual

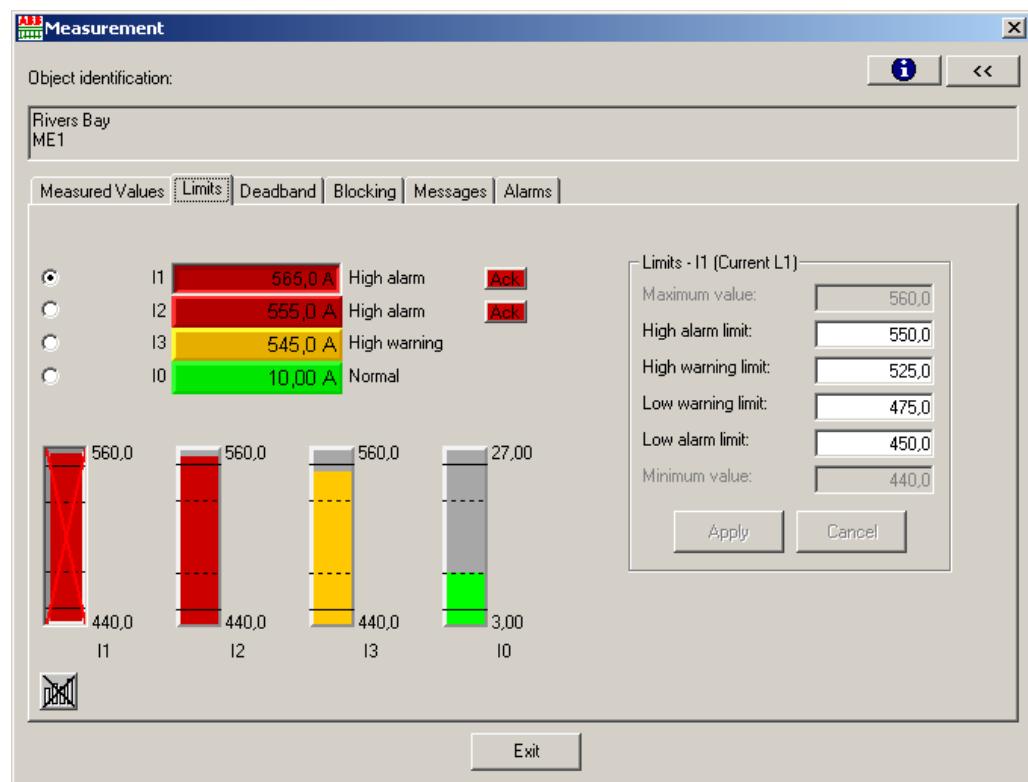


Figure 4.47: The Limits tab of the Measurement dialog

The limit values entered are validated at first. If, for example, the high warning limit is bigger than the high alarm limit, the inappropriate limits are shown in red color (see Figure 4.48).

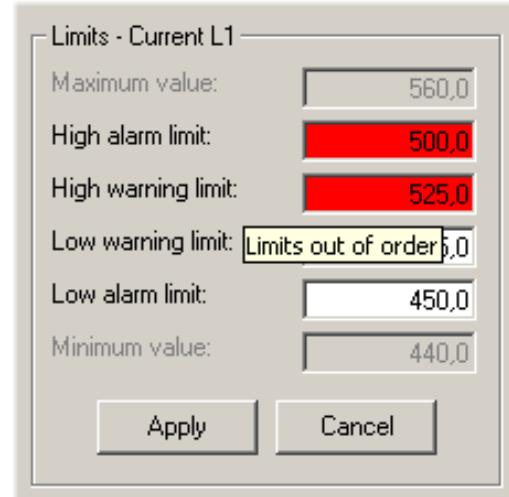
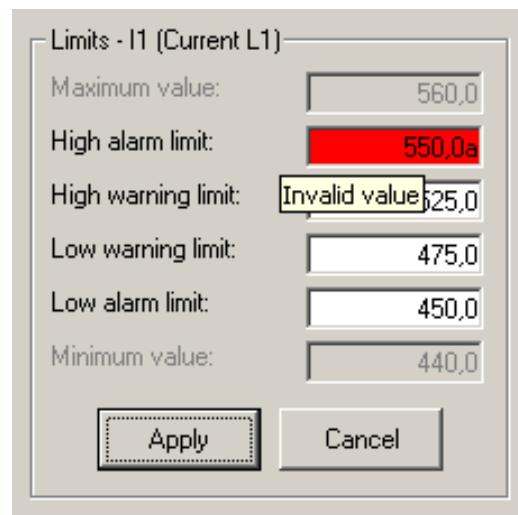


Figure 4.48: Inappropriate limits

**Operation Manual**

If a limit is not a number, the invalid limit is shown in red color (see Figure 4.49).



*Figure 4.49: Invalid limit value*

The zero deadband supervision can be set on the Deadband tab.

A warning message is shown if the deadband value in the process is changed during the edition of the new setting value in the Measurement dialog.

## Operation Manual

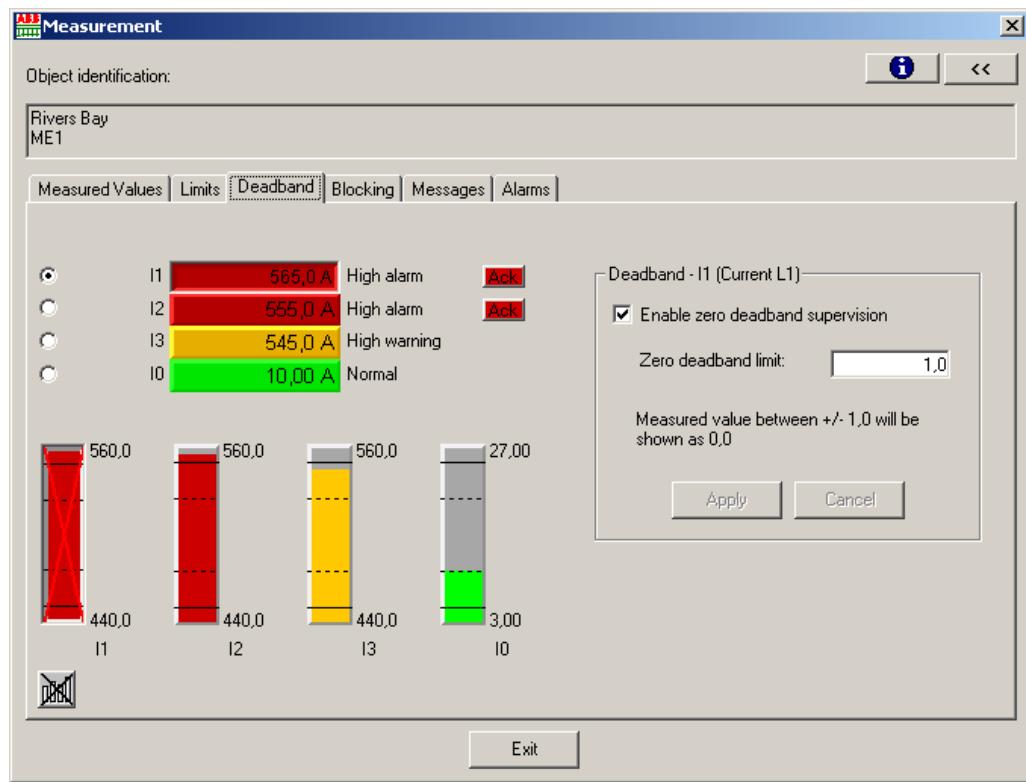


Figure 4.50: The Deadband tab of the Measurement dialog

The deadband limit value entered is validated at first. If an invalid deadband value is set, the invalid limit is shown in red color (see Figure 4.51).

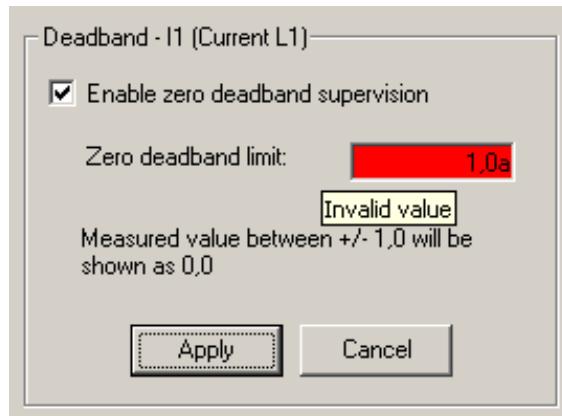


Figure 4.51: Invalid deadband setting value

On the Blocking tab the measurements can be blocked.

## Operation Manual

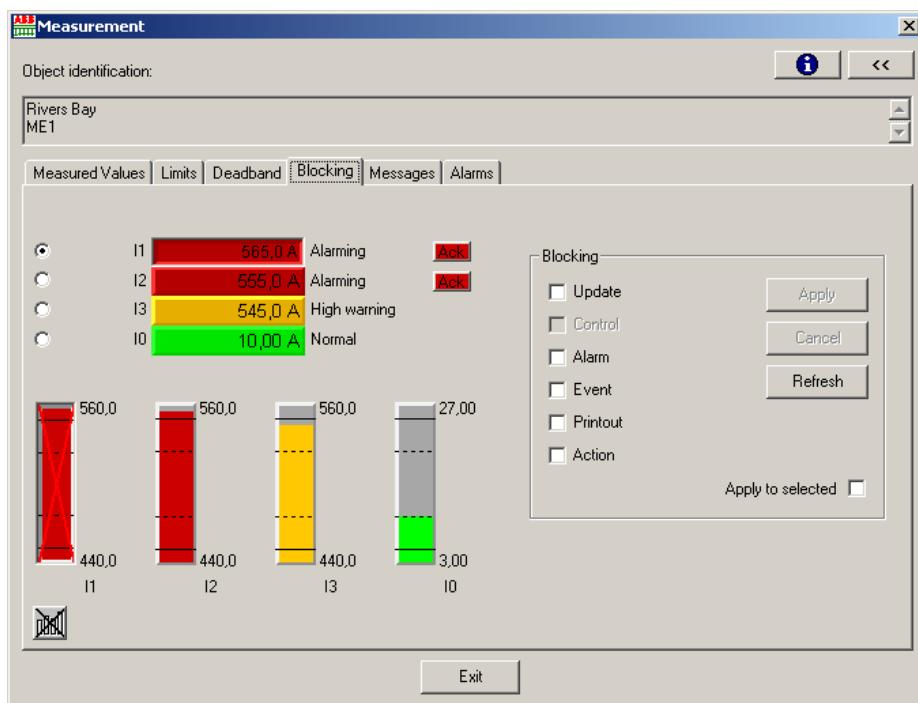


Figure 4.52: The Blocking tab of the Measurement dialog

The condition of the Blocking check box shows its status:

- checked, respective measurements are blocked (**Alarm** in Figure 4.53).
- unchecked, respective measurements are not blocked, (**Event, Printout** and **Action** in Figure 4.53).
- grayed out, some but not all measurements are blocked (**Update** in Figure 4.53).
- disabled, blocking cannot be applied to the function in question (**Control** in Figure 4.53).

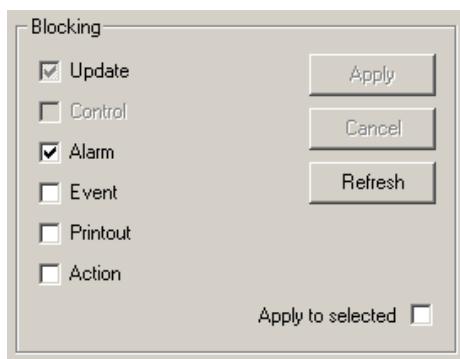


Figure 4.53: Example of condition on Blocking check boxes

When **Apply to selected** is checked, the blocking will affect only to the single measurement selected by the radio button to the left of the dialog.

## Operation Manual

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On the Messages tab the object messages of a selected measurand can be seen.

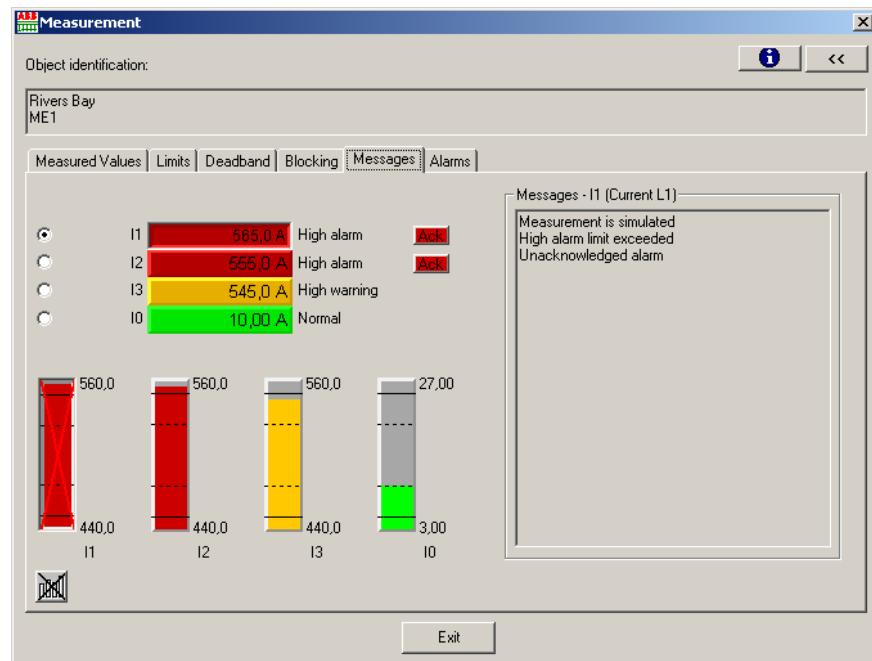


Figure 4.54: The Messages tab of the Measurement dialog

On the Alarms tab the alarms of the measurand can be seen.

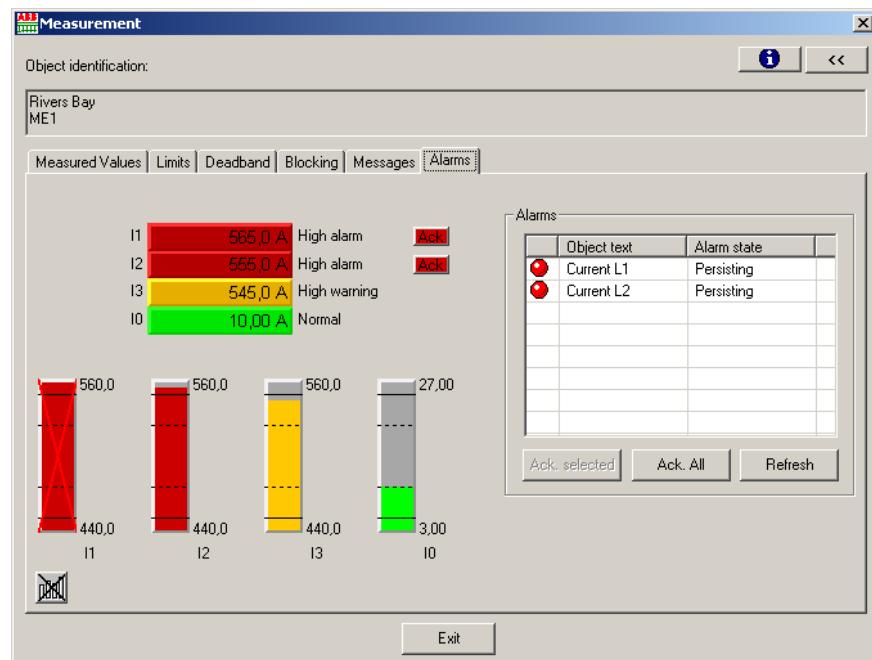
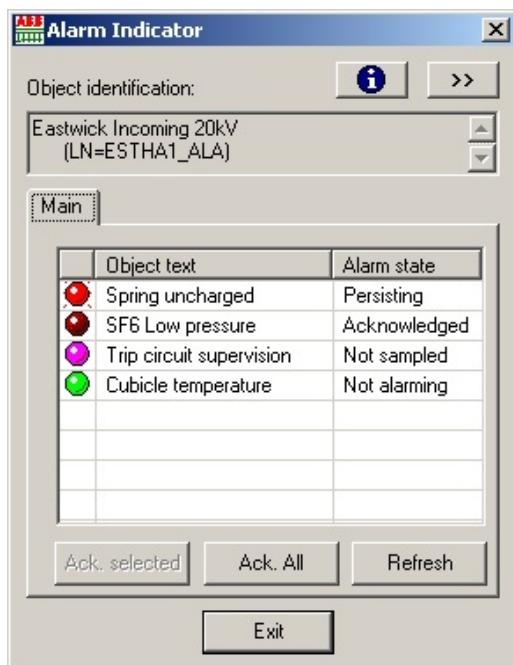


Figure 4.55: Extended display with alarms

**4.9****Alarm indicator control**

The Alarm Indicator control is used to monitor the alarm state of input signals. The status of each signal is indicated in the Alarm indicator control dialog shown in Figure 4.57.



*Figure 4.56: The Alarm indicator control dialog*

The Alarm indicator symbols and their meaning are explained in Table 4.3.

**Table 4.3: Alarm indicators**

Symbol	Meaning
	Not sampled or uncertain
	Alarm, active unacknowledged
	Alarm, fleeting unacknowledged
	Alarm, active acknowledged
	Substituted
	Blocked
	Manually entered
	Normal

## Operation Manual

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In addition to the symbols above, the alarm state is also shown in textual form. In the Alarm state column, each signal can have the following explanation:

- Persisting
- Fleeting
- Acknowledged
- Not sampled
- Not alarming

Different blockings concerning the process object that belong to the alarm indicator are shown and controlled in the Blocking tab, see Figure 4.57.

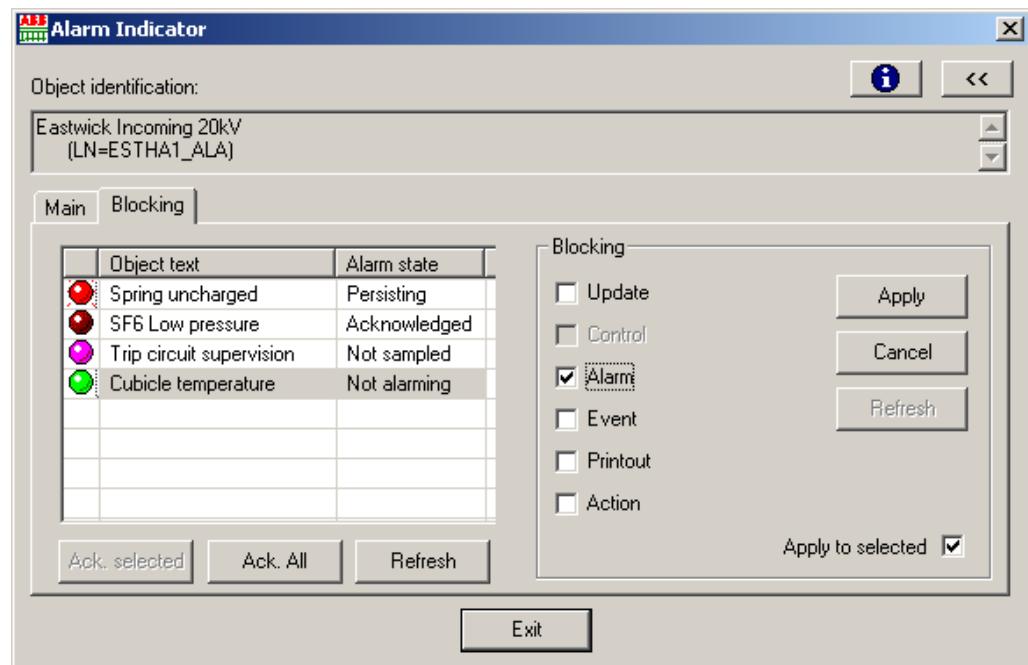


Figure 4.57: The Alarm indicator control dialog, the Blocking tab

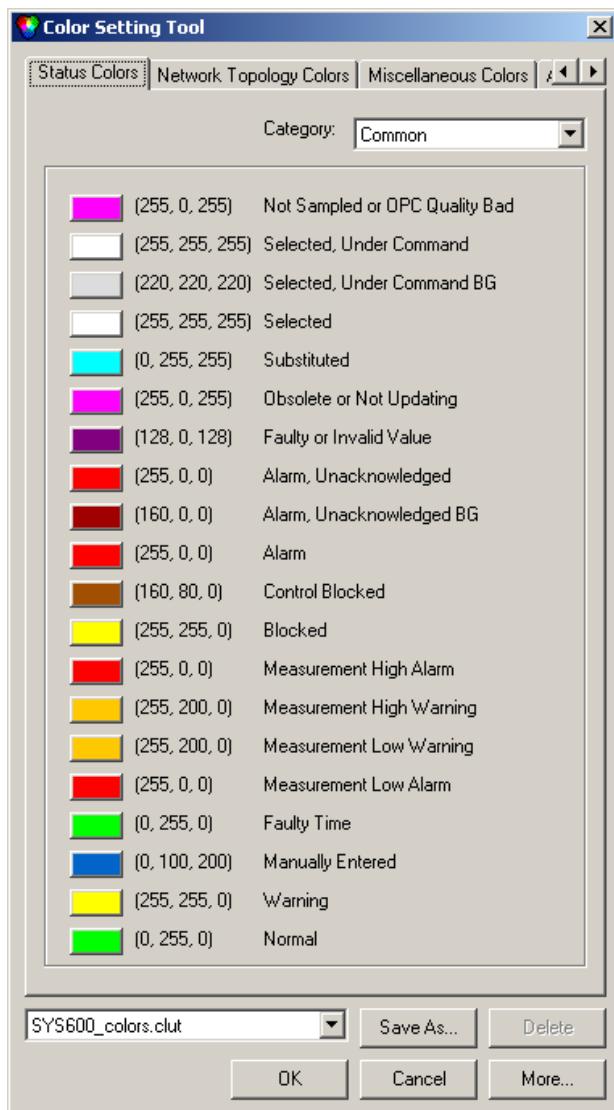
The blocking can be done to either all signals or to one signal only. To block all signals related to alarm indicator, select Blockings and click **Apply**.

In order to block only one signal, select the signal from the list, check

"Apply to selected" and click **Apply**.

**4.10****Color Setting Tool**

Color Setting Tool is used to change the RGB values of logical colors. The tool contains tabs for status colors, network topology colors and miscellaneous colors, which are related to the Process display. There are also dedicated tab sheets for the rest of the displays (Alarm / Event / Blocking / Trends / Measurement Reports display).



*Figure 4.58: Color Setting Tool*

## 4.11

### Network topology coloring

The network topology coloring in SYS600 Monitor Pro can be used to indicate the status of line segments in several different ways. It can indicate which line segments are powered, unpowered or in certain other states, or more accurately which voltage level each line segment has. Alternatively, each voltage source type can have a color that is used for line segments they are connected to. Network topology coloring may also be used to indicate situations where two or more voltage sources form a loop.

To define the network topology coloring settings, select **Settings > Network Topology Coloring...** The Network Topology coloring dialog is displayed in

Figure 4.59 shows how the network topology coloring settings can be used in the current monitor. Save the settings to be used as default by clicking **OK**. Restore the factory settings by clicking **Factory defaults**.

When the coloring is disabled, static coloring is used for line segments. When Use status colors setting is enabled, objects are colored using only their status color.

The user can also specify what kind of color is to be used for the powered network objects, for example, line segments and switching devices. There are three modes:

- One color mode
- Voltage level mode
- Voltage source mode

One color mode uses the same color for all powered network objects. In Voltage level mode, the color is specified for the voltage source (generator, transformer, line indicator) according to voltage level. In Voltage source mode, the same color is used for all network objects that are fed by some voltage source type.

Different voltage source types can be prioritized in the Colors tab. The colors used for the voltage levels and voltage source types can be set using the Color Setting Tool.

There are two modes to color sources (line indicators). In Adjacent line segment color, the color is taken from the line segment connected to the source. External color handling uses a color from some external origin, for example DMS 600.

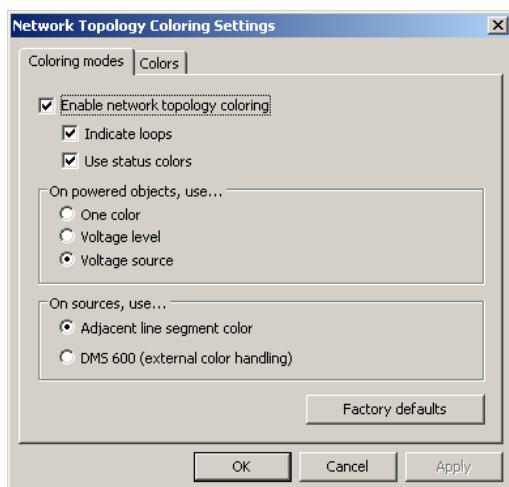
**Operation Manual**

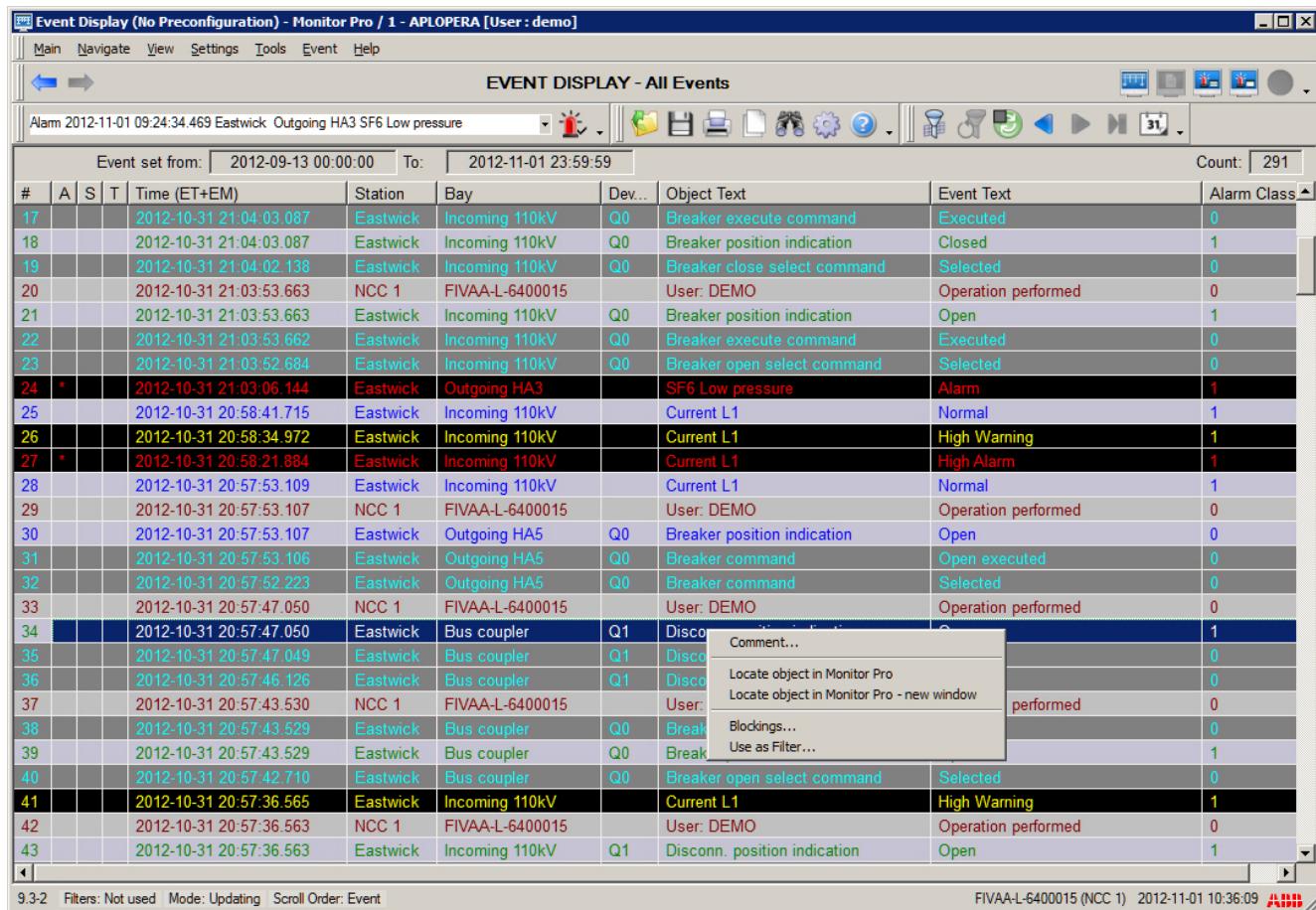
Figure 4.59: Network Topology Coloring Settings dialog

The priority of the voltage source colors can be ordered with the Colors tab. The device of the highest priority is on top of the list. To change the priority order, select a device from the list and click the arrow buttons on the right to change the order. Priority setting is only applicable if the user has selected to color powered line segments according to voltage source type in Coloring modes tab.



## 5 Event Display

With the Event Display, the information about events occurring in the system can be monitored. Thus, the user can make the right decisions and verify that taken measures have been successfully performed. The user can also receive information about activities carried out by other users, operations of objects, acknowledging of alarms, editing of limit values, logging in, and all other type of events which can occur.



#	A	S	T	Time (ET+EM)	Station	Bay	Dev...	Object Text	Event Text	Alarm Class
17				2012-10-31 21:04:03.087	Eastwick	Incoming 110kV	Q0	Breaker execute command	Executed	0
18				2012-10-31 21:04:03.087	Eastwick	Incoming 110kV	Q0	Breaker position indication	Closed	1
19				2012-10-31 21:04:02.138	Eastwick	Incoming 110kV	Q0	Breaker close select command	Selected	0
20				2012-10-31 21:03:53.663	NCC 1	FIVAA-L-6400015		User: DEMO	Operation performed	0
21				2012-10-31 21:03:53.663	Eastwick	Incoming 110kV	Q0	Breaker position indication	Open	1
22				2012-10-31 21:03:53.662	Eastwick	Incoming 110kV	Q0	Breaker execute command	Executed	0
23				2012-10-31 21:03:52.684	Eastwick	Incoming 110kV	Q0	Breaker open select command	Selected	0
24	*			2012-10-31 21:03:06.144	Eastwick	Outgoing HA3		SF6 Low pressure	Alarm	1
25				2012-10-31 20:58:41.715	Eastwick	Incoming 110kV		Current L1	Normal	1
26				2012-10-31 20:58:34.972	Eastwick	Incoming 110kV		Current L1	High Warning	1
27	*			2012-10-31 20:58:21.884	Eastwick	Incoming 110kV		Current L1	High Alarm	1
28				2012-10-31 20:57:53.109	Eastwick	Incoming 110kV		Current L1	Normal	1
29				2012-10-31 20:57:53.107	NCC 1	FIVAA-L-6400015		User: DEMO	Operation performed	0
30				2012-10-31 20:57:53.107	Eastwick	Outgoing HA5	Q0	Breaker position indication	Open	0
31				2012-10-31 20:57:53.106	Eastwick	Outgoing HA5	Q0	Breaker command	Open executed	0
32				2012-10-31 20:57:52.223	Eastwick	Outgoing HA5	Q0	Breaker command	Selected	0
33				2012-10-31 20:57:47.050	NCC 1	FIVAA-L-6400015		User: DEMO	Operation performed	0
34				2012-10-31 20:57:47.050	Eastwick	Bus coupler	Q1	Disco	Comment...	1
35				2012-10-31 20:57:47.049	Eastwick	Bus coupler	Q1	Disco		0
36				2012-10-31 20:57:45.126	Eastwick	Bus coupler	Q1	Disco		0
37				2012-10-31 20:57:43.530	NCC 1	FIVAA-L-6400015		User:	Locate object in Monitor Pro Locate object in Monitor Pro - new window	performed
38				2012-10-31 20:57:43.529	Eastwick	Bus coupler	Q0	Break	Blockings... Use as Filter...	0
39				2012-10-31 20:57:43.529	Eastwick	Bus coupler	Q0	Break		1
40				2012-10-31 20:57:42.710	Eastwick	Bus coupler	Q0	Breaker open select command	Selected	0
41				2012-10-31 20:57:36.565	Eastwick	Incoming 110kV		Current L1	High Warning	1
42				2012-10-31 20:57:36.563	NCC 1	FIVAA-L-6400015		User: DEMO	Operation performed	0
43				2012-10-31 20:57:36.563	Eastwick	Incoming 110kV	Q1	Disconn. position indication	Open	1

Figure 5.1: Event Display main view

The Event Display presents the data in a structured way for the user's convenience. Each event is one row in the display. With default settings, Event Display rows consist of a time stamp, object identification, a signal text and a text indicating the status.

The Event Display contains the following features and options:

- Configurable layout: columns, fonts, toolbars, coloring, and so on
- Configurable coloring of events
- Configurable modes: log/event order, latest at top/bottom

## Operation Manual

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- Updating/Frozen modes
- Easy navigation through scrolling, go to date, time filters, and so on
- Extensive filtering that can be stored and easily called up later
- Find
- Sorting by column
- Copy/Paste of events to other applications
- Printouts
- Commenting of events

The event activation and consequential actions are defined in the process database separately for each individual object.

Typical examples on events are:

- Changes in or updating of an object value
- Changes of an alarm and a warning state
- Changes of the alarm definition, alarm blocking, acknowledgement, and so on

When an event occurs in the system, the operator wants to receive an answer to the following questions (answers provided below each question):

1. What happened?
  - A change in the state of the object or an executed operation.
2. Where did it happen?
  - A descriptive text (object identification, OI and object text, OX) comprising of, for example, a device notation and the type of object or operation.
3. When did it happen?
  - The point of time when the event occurred. If the event originates from a station providing a time stamp, this time stamp will be used. Depending on the station, the time is on a second or a millisecond level. In other cases, the time stamp is the SYS600 system time with an accuracy of 10 milliseconds.

The following functions can be activated by an event:

- Automatic printout. Like alarms, events can cause automatic printouts on the event and alarm printer.
- Activation in the report database, for example automatic control operations, registration, report printout, and so on.

Depending on how crucial an object is, the following events in the object may activate an event printout, a registration in the history buffer, or an activity in the report database (from the least crucial to the most crucial object):

- No activation
- An alarm is activated and deactivated
- The alarm or warning state changes
- The object value changes
- The object value is updated, although it is not changed

There are two ways to access the Event Display: selecting **Navigate > Event** or by clicking **Event Display** on the toolbar.

**Operation Manual**

The **Event** menu contains the following commands:

**Filters:** Opens a Filter Settings dialog, where filters can be selected and edited.

**Reset Filter:** Resets filters.

**Comment:** Opens a Comments dialog, which is used for writing comments to events.

**Keep Updating:** Sets the Event Display to the updating mode. When changing to Event Display, the mode is by default set to updating mode, provided there is a user logged in.

**Stop Updating:** Sets the Event Display to the frozen mode. When changing to Event Display, the mode is by default set to frozen mode if no user is logged in.

**Show Info Fields:** Displays/hides the info fields.

**Show Headers:** Displays/hides the list headers.

**Previous Event Set:** Displays the list of previous events.

**Next event set:** Displays the list of next events.

**Last Event:** Displays the list of last events.

**Select Day:** Opens a Day select dialog.

**Export:** Exports the current view in CSV file format.

The toolbar is a shortcut that can be used in parallel with the drop-down menu.



*Figure 5.2: Event Display toolbar*

The buttons in the toolbar from left to right are:

- Show Filters
- Reset Filter
- Switch to Updating or Frozen Mode
- Go to Previous Event Set
- Go to Next Event Set
- Go to Last Event
- Go to Selected Day

The toolbar buttons can be added or removed in the same way as in applications in general, see Section 3.4.2 Changing application layout.

If the Event Display is in updating mode, the list will be updated when a new event occurs in the system. When the list is in frozen mode (non-updating), a message will be

displayed informing the user to proceed to the last events and to change the mode to the updating mode.

## 5.1

## Event Rows

With default settings an event row contains the following information:

- Status sign
- Time stamp
- Object identification
- Signal name
- Event text

The first column always shows the row number in the list. With default settings, the next three columns are status columns. The Date and Time columns present the time stamp of the event. The Station, Bay and Device columns present the Object Identifier (OI), and the following column the Object Text (OX). The Event Text (MX) column present the event message information.

It is also possible to use only one column to show the object identification. In that case station, bay and device names are shown in one column. The column is labeled as Object Identifier.

### Alarm symbol

The alarm symbol is the first status column shown in the beginning of the event row. If the object is alarming, the symbol \* is displayed.

### Object status symbol

The second status column shows the signal status. If the object status differs from normal, the status symbol is displayed as follows:

**Table 5.1: Object status symbols**

Status	Color	Symbol
Faulty value	Magenta	F
Obsolete value	Red	<
Faulty time	Red	T
Not sampled	Magenta	?

### Object comment symbol

The object comment symbol is the third status column shown in the beginning of the event row. When a comment is added, the exclamation point (!) is displayed.

## 5.2

# The Event Display User Interface

The information presented on the screen consists of several elements, which will be described in the following section.

### 5.2.1

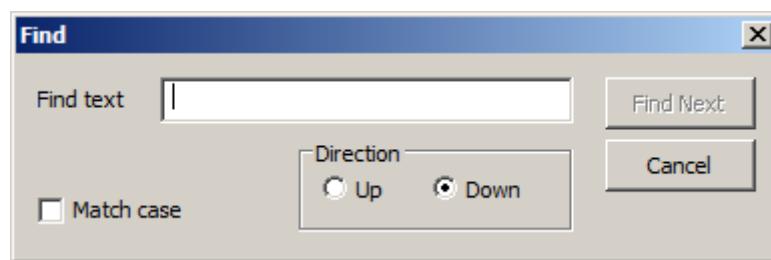
## Using the Event Display User Interface

### Sorting Rows

Rows can be sorted by clicking a column header. If the same column is clicked twice, the sorting order is reversed.

### Finding

Rows can be searched for using the Find function by going to **Main > Find** or by clicking the  icon.



The Find dialog box searches the list from start to end. If an event row contains the desired text, it is selected. A message appears when the end point of the search has been reached or when the searched text is not found.

### Printing

List can be printed (**Main > Print** or the  icon). The user can print either all rows, selected rows, or a page range. The font size in the print is automatically adjusted so that all the data fits into the page. If the text does not fit into the page, the rest of the columns are printed to following pages.

### Copying List Rows

Selected rows from the list can be copied. Rows are copied as tab separated values. Time attributes are copied in standard format.

### 5.2.2

## Using Filters

A list can be filtered. Only the rows that match the filter are shown.

## Operation Manual

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Filters are defined by selecting **Filters** from the menu bar. The Filter dialog contains standard filters that can be selected by the user. The Filter dialog provides at least the following standard filters: all events, event time, per substation, per bay and per device.

It is possible to change the existing filters or to add new filters that can be stored and reused by other operators. The Filter dialog contains a specification form where new filters can be created or the existing filters can be changed.



The filter can also be defined by right-clicking on a row in a list, and by selecting Use as Filter. This uses a part of the rows OI as the filter.

In Alarm Display and Event Display on the upper part of the Filter dialog, there are two options that specify whether the Lower Time Limit or Upper Time Limit is used. If the Lower Time Limit is not in use (off), the alarms or events will be presented from the latest backwards. If the Upper Time Limit is not in use, the alarms or events will be presented up to the latest. Only when a time limit is in use, the corresponding date and time limits can be defined. Clicking the drop-down menu in the time limit field opens the date selector, by which the time limit can be defined (Figure 5.3). Whether the Lower Time Limit or Upper Time Limit is defined, the date selector opens the related time limit below indicating which time limit is edited.

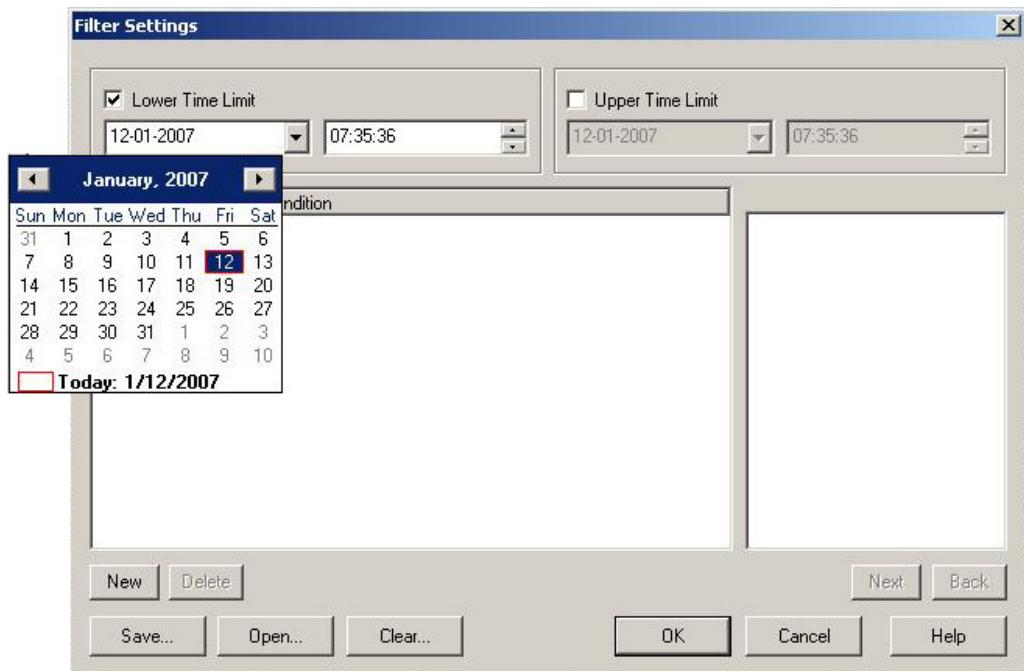


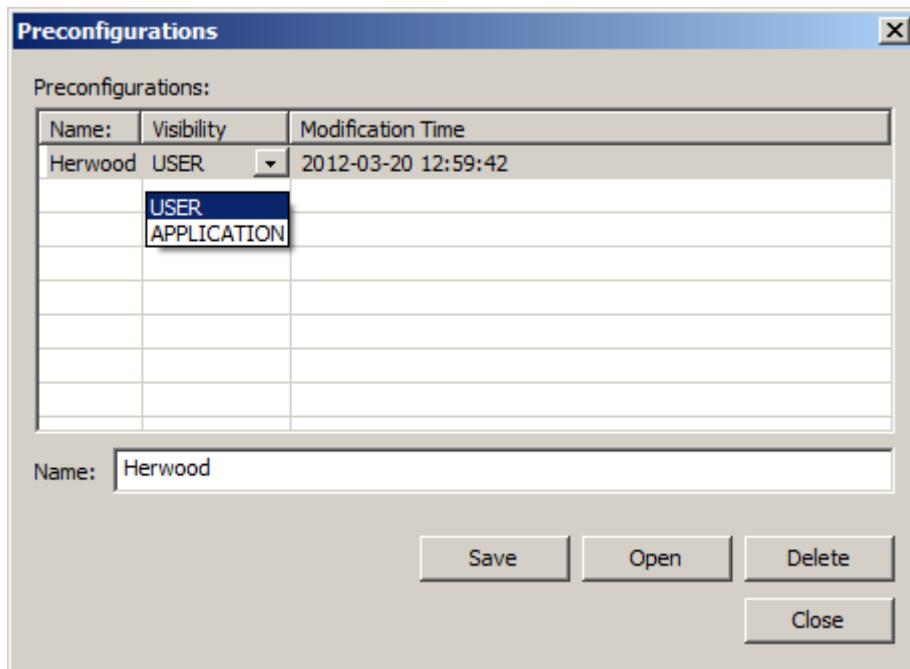
Figure 5.3: Edit Upper Time Limit

To save the active filter settings, select **Preconfigurations...** in the **Filter Settings** dialog. The Preconfigurations dialog is opened, in which the name for the preconfiguration can

## Operation Manual

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be defined. Define the location of the preconfiguration in the Visibility field. When selecting the **Application** option, the preconfiguration becomes accessible for all the users of the application, see Figure 5.4. Click **Save** to save the preconfiguration file. Click **Close** to close the dialog without saving.



*Figure 5.4: Visibility definition*

To load preconfigured filter settings, select **Preconfigurations...** in the Filter Settings dialog. Sort preconfigurations by name, visibility setting or modification time. When clicking **Open**, the preconfiguration file is loaded and set as an active filter. Clicking **Close** closes the dialog without opening any files. To activate the filter, click **OK** in the main filter dialog.

### 5.2.3 Locating Signals

Right-click a line row to open a context menu. In this menu, **Locate object in DMS**, **Locate object in Monitor Pro**, or **Locate object in Monitor Pro - new window** can be selected.

## Operation Manual

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Time	Station	Bay
09-10-22 09:26:22.394	NCC 1	APL
09-10-22 09:26:50.394	NCC 1	MWS829
09-10-22 09:27:20.507		Comment...
09-10-22 09:27:20.547		Locate object in DMS
09-10-22 09:27:24.012		Locate object in Monitor Pro
09-10-22 09:27:30.822		Locate object in Monitor Pro - new window
09-10-22 09:27:30.822		Blockings...
09-10-22 09:27:30.832		Use as Filter...
09-10-22 09:27:33.015		
09-10-22 09:27:37.422		

Figure 5.5: Locating object

**Locate object in DMS** displays the process point according to the logical node and the index (LN and IX) attributes. This function is provided together with DMS 600. For more information, see DMS 600 Operation Manual.

**Locate object in Monitor Pro** opens a Process Display and zooms into the symbol that presents the same object that produced the row, and marks it with a highlighted symbol.

**Locate object in Monitor Pro - new window** opens a Process Display in a new window, zooms into the symbol that presents the same object that produced the row, and marks it with a highlighted symbol.

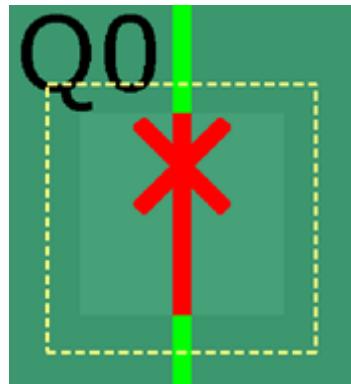


Figure 5.6: Highlighted symbol

### 5.2.4

#### Blocking Signals

Signal blocking states for each signal in the list can be viewed and modified. For more information on blockings see Section 7.3 Handling Blockings.

Signal blocking state dialog is accessed through a context menu that appears by right-clicking a row, see Figure 5.7.

Operation Manual

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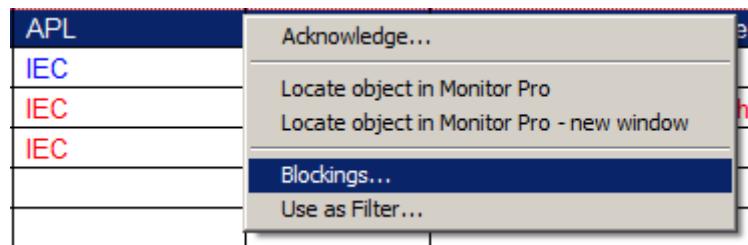


Figure 5.7: An access to Blockings

Blockings can be set with option buttons, see Figure 5.8. If some of the blockings are not allowed to a signal, the option button is disabled.

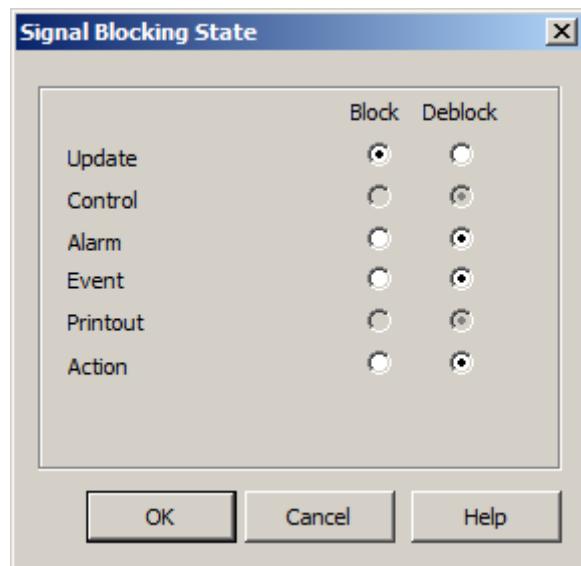


Figure 5.8: Signal Blocking State dialog

### 5.2.5

### Customizing the column layout

The layout settings can be configured by selecting **Settings > Display Settings... > Layout Settings**. The dialog is shown in Figure 5.9.

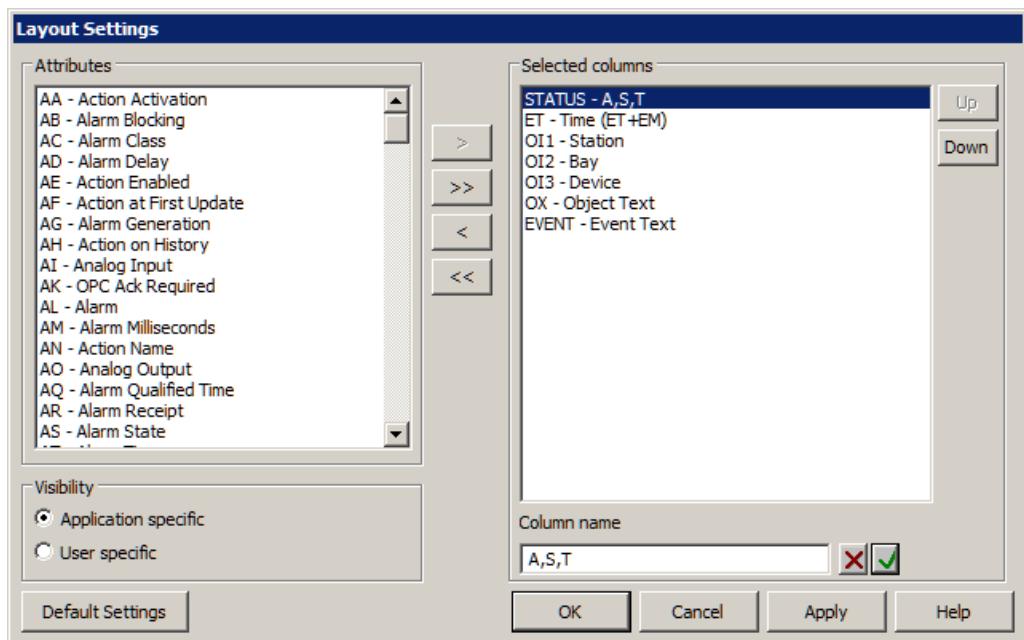


Figure 5.9: Layout settings

All the available attributes are shown in the Attributes box. Selected Columns is a list of currently selected columns. Add attributes to Selected Columns list by clicking >. Clicking >> adds all the attributes to Selected columns list.

Remove selected attributes from the Selected Columns list by clicking < or remove all attributes from Selected columns list by clicking <<.

Change the order of the columns by selecting a column and clicking **Up** or **Down** buttons.

**Default Settings** restores the settings to an installation defaults for specific display type.

### Renaming the Columns

The column headers can be defined. Select the column from the list of selected columns.

Enter the new name to the column name field and click the icon.

In Event Display, there is a special STATUS column, which is displayed as three consecutive columns in the list. Names for these can be given separated by a comma, as shown in the Figure 5.9.

#### 5.2.6 Color Settings

It is possible to configure certain events to use different colors in the list display. This improves the possibility to locate certain system events. For example, important events, which cause alarms in the system, can be defined to use the red color in the Event Display. For more information, see SYS600 Application Design.

## Operation Manual

To use the color settings, the authorization level Control (1) is required. The Color Setting tool is in the read-only mode, if the authorization level is lower than Engineering (2) in the TOOLS authorization group. If the TOOLS authorization group is not found, the authorization group GENERAL is used.

The Color Settings dialog is used when the list display is customized with different colors for rows on the list display. The coloring of a row in a list is defined with one or multiple conditions defined in the Color Settings dialog, see Figure 5.10.

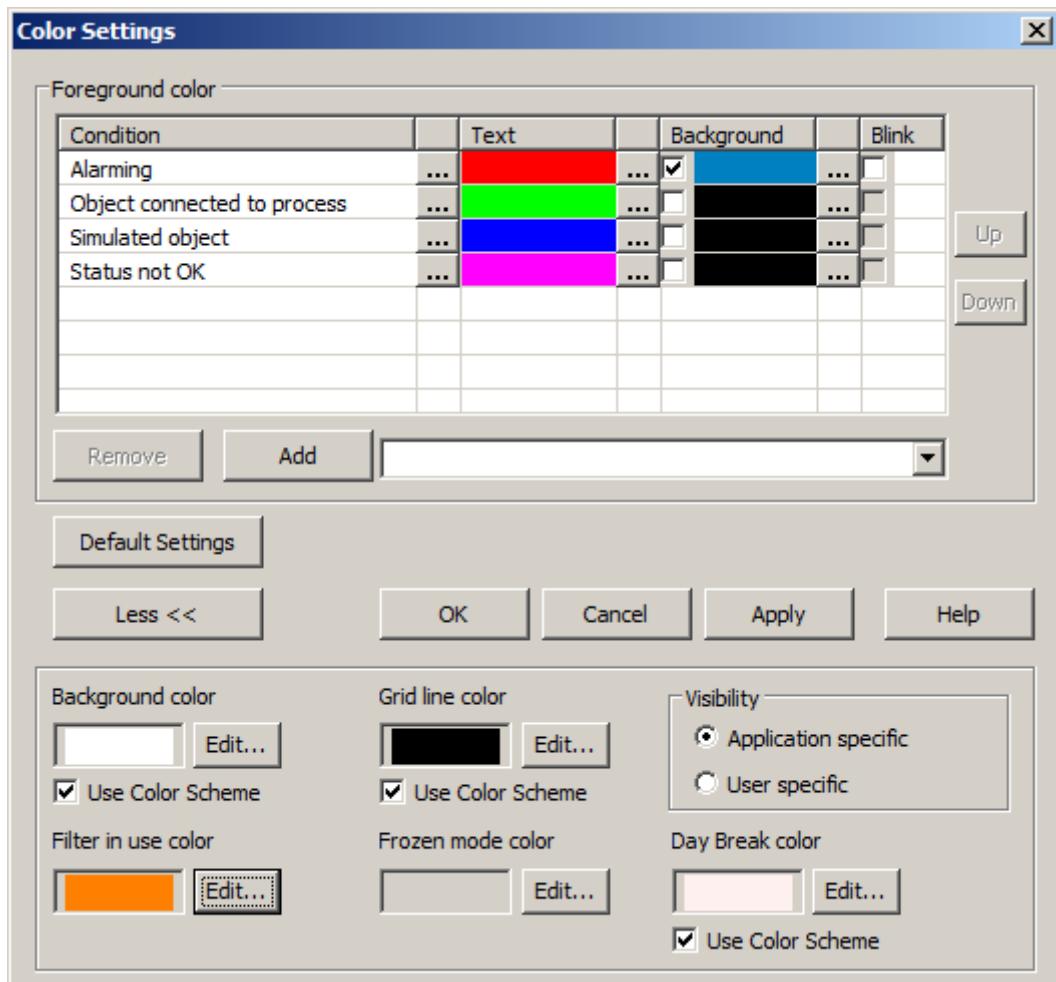


Figure 5.10: The Color Settings dialog.

To add a new coloring rule to the list, click **Add**. Remove the selected coloring rule from the list by clicking **Remove....** The position of the selected row can be changed by clicking the **Up** or **Down** buttons. Coloring rules are prioritized according to their order in the list and the first rule matching the criteria is used.

## Operation Manual

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The background color of every display can be changed. The Color settings dialog has **Edit** buttons to open the **Color** dialog, where the color selection is done. The selected color is displayed as a colored box.

**Default Settings** button reverts the color settings.

There are some predefined color rules. A predefined color rule can be added to the list by selecting it from the drop down list and clicking the **Add** button. Unused predefinitions are shown in the drop-down list. When a preconfigure color rule is removed, it is returned to the drop down list.

User Activity Log Display uses Event Display color settings definitions. Only color rules can be defined specific to the User Activity Log Display.

Frozen mode color and Filter in use color are used in markers in the Monitor Pro application window to highlight that the appropriate mode is used.



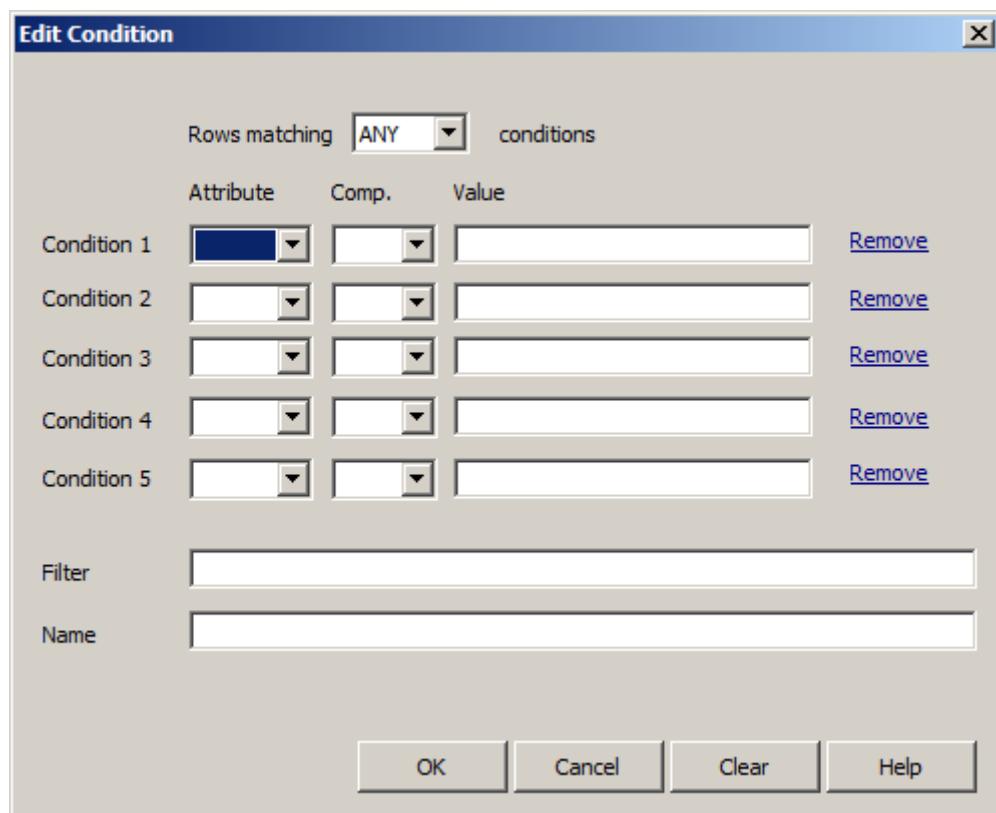
Figure 5.11: Frozen mode color

Day Break color is used on event display. When events are sorted by the time column, every other day uses day break color as background color.

### Color conditions

The condition of when a coloring rule is applied is defined with edit condition dialog. Conditions can be entered either by using conditions rows or by hand in the filter field. The condition is a simple logical expression such as  $AL = 1 \text{ AND } AR = 0$ . Conditions can also contain parenthesis. A name can be given to each condition.

## Operation Manual

*Figure 5.12: Edit Condition dialog*

The available operators for the conditions are described in Table 5.2.

**Table 5.2: Condition operators**

Operator	Function
<code>== or =</code>	Equal than
<code>&lt;</code>	Less than
<code>&gt;</code>	Greater than
<code>&lt;=</code>	Less or equal than
<code>&gt;=</code>	Greater or equal than
<code>&lt;&gt;</code>	Not equal to

The Value field contains the value that is compared to the selected attribute by using the selected comparison operator. It is possible to use the wildcard characters % and \* when defining the value of the Value field, but, in that case, the only allowed operators are = and <>. For example, a value 5\* means that the first character in the value must be 5 but the rest of the value can contain any number of arbitrary characters. Character % means any character.

## 5.2.7

### Exporting Data

It is possible to save the data shown in event, alarm and blocking lists to a file in CSV format. The separator between the columns is the List Separator character defined in operating systems Regional Settings. If the List Separator is defined to be '.' (full stop), it is replaced with ';' (semicolon) character.

To export data:

1. Select **Export...** from list specific menu. The Save As dialog opens.
2. Specify the folder and the file name for CSV export file.
3. Click **Save** button to export the data.

The exported text file contains the header information, the export creation time, and the events data. To open the export file with e.g. Microsoft Excel, select **Format > Cells > Text** in the Category list to display the format correctly.

## 5.2.8

### Indicating Daylight Saving Time

Lists have a setting for Daylight Saving visualization. The setting is accessed via the lists' **General Settings** dialog. If the setting is enabled, lists will indicate Daylight Saving times in each list column having timestamp information. Daylight Saving timestamps are suffixed with '\*' (asterix) character.

## 5.3

### Handling events

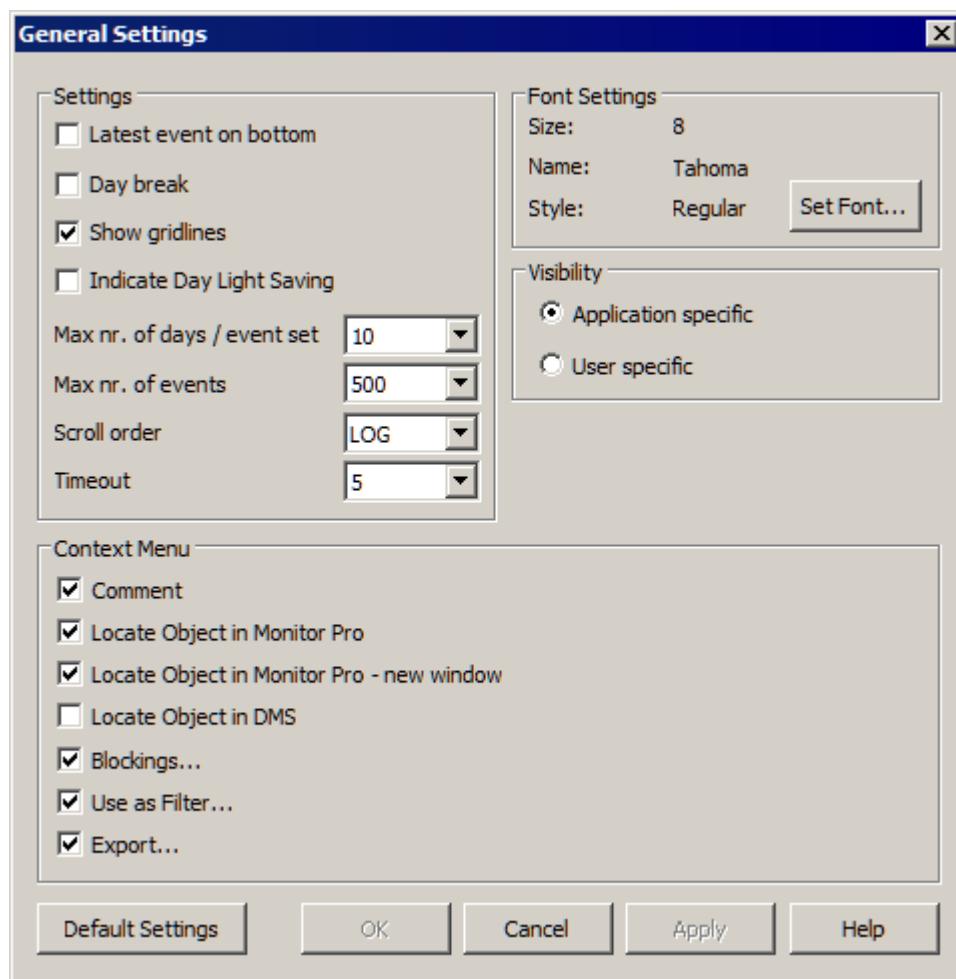
Events in SYS600 system are stored in the history database (HDB). There are two types of events: process events and internal events. Process events are events that belong to supervised processes such as indications, protecting events, alarm limits for measurements, tripped breakers, and so on. Internal events are events that indicate disturbances in the supervision system. They are normally initialized by the system.

When an event occurs in the system, it is instantly printed on the event printer and stored in the history database. The history database consists of history database files, of which each contains the events for one day. The files are named according to the date as APL\_yymmdd.PHD. For example, the file APL\_040630.phd contains the events logged on 30-Jun-2004. The files are stored in the directory /SC/APL/nnn/APL\_, where nnn is the name of the application.

## 5.3.1

### Event Display Settings

To configure Event Display settings (see Figure 5.13), the authorization level Control is required. The Settings dialog is used when customizing the list.



*Figure 5.13: Settings dialog*

To configure the Event Display, the following settings can be specified:

- In the Max nr. of days / event set drop-down list the maximum number of days that will be included in one event set can be set.
- In the Max nr. of events drop-down list the maximum number of events that will be included in one event set can be selected.
- In the Scroll order drop-down list the sorting order of the events in the frozen mode can be defined.
- In the Timeout drop-down list the maximum amount of time for the history database query can be specified.
- Selecting the Day break option the user can define if a light blue background will be presented between the events that have time stamps from different days.
- Selecting the Latest event on bottom option the user can specify the location of the latest event on the list.
- Selecting the Show Grid lines option shows the gridlines in the events list.
- Under the Font Settings the font style and size can be defined.

## Operation Manual

The following items can be selected to be shown in the Context Menu:

- Comment
- Locate object in Monitor Pro
- Locate object in Monitor Pro - new window
- Locate object in DMS
- Blockings...
- Use as Filter...
- Export...

Locate object in DMS option is available only if DMS 600 is installed.

The scroll order setting defines the time attribute used in the list. If the setting is LOG the registration time (RT) is used. If the setting is event, the event time (ET) is used.

### 5.3.2 Event Comments

Comments can be used for making remarks to events. The comments are available to all Event Display users. Comments can also be removed.

The Comments dialog can be opened by right-clicking an event row with or without the comment marker and selecting Comment in the context menu. Events with comment markers are shown in Figure 5.14.

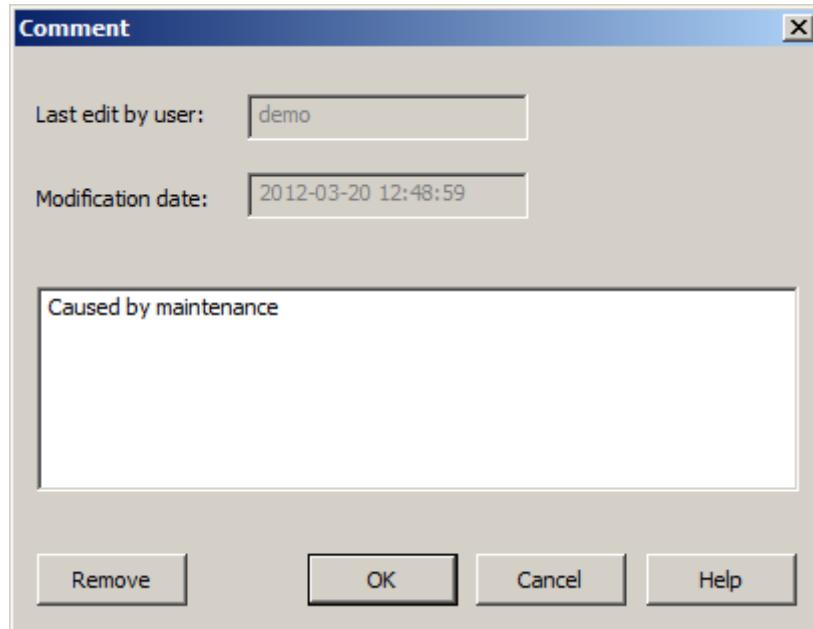


Figure 5.14: Comments dialog

To add a comment:

1. Open the Comments dialog.
2. Write the comment to the dialog and click **OK**.

- 
3. Press Enter after each line. If no comment text is given, no comment mark will be displayed in the Event Display.

Open the Comment dialog to read the comment. To remove the comment, click **Remove Comment**. The **Last Edit by User** and **Modification date** fields show the name of the user that last edited the comment, and the time and date of the modification.

The length of the comment is limited. If the comment is too long, the **OK** button is disabled.



**6****Alarm Display**

The Alarm Display shows a summary of the present alarm situation of the supervised process. Each alarm is normally presented as an alarm text row, which describes the cause of the alarm in the process. With default settings the alarm text row normally has a time stamp, an object identification, an object text and text indicating the alarm status. See Figure 6.1 for Alarm Display Template 1 and Figure 6.2 for Alarm Display Template 2.

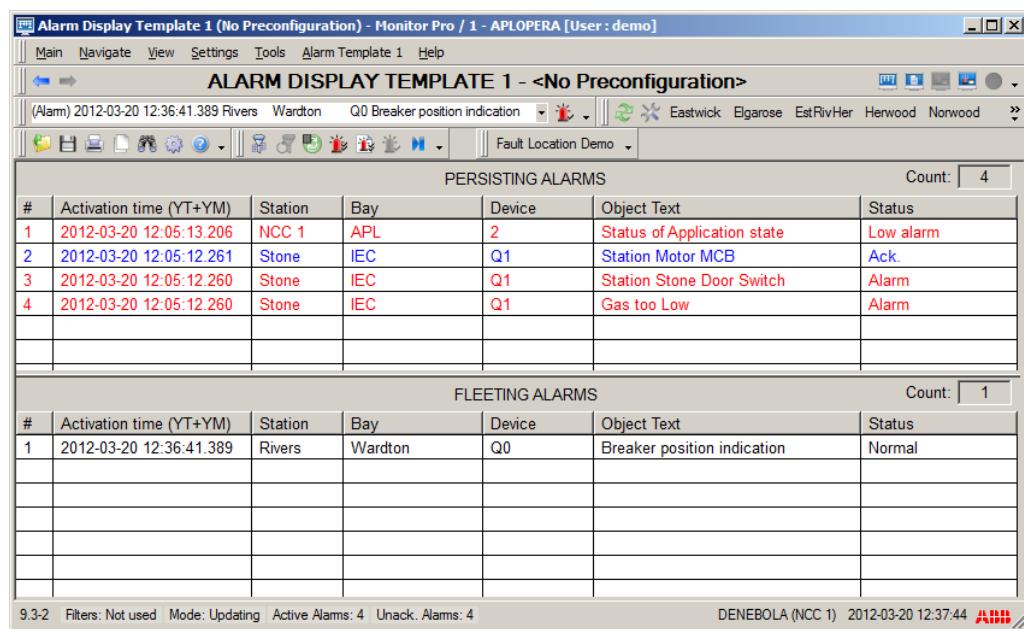


Figure 6.1: Alarm Display Template 1

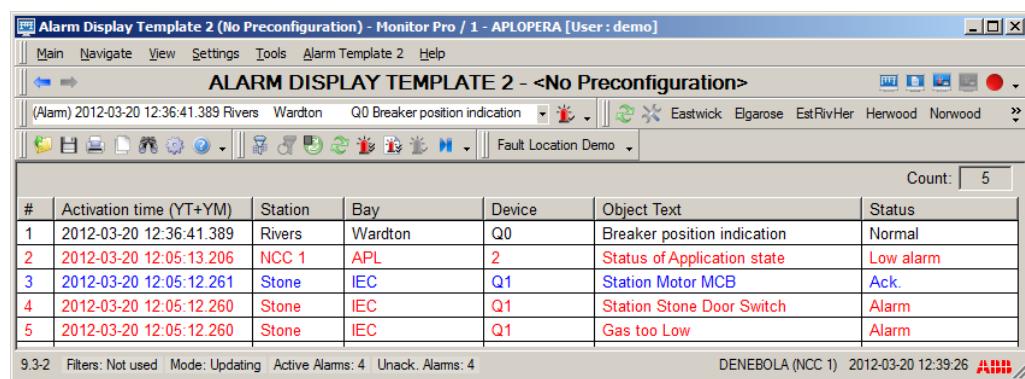


Figure 6.2: Alarm Display Template 2

The Alarm Display contains the following features and options:

## Operation Manual

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- Two types of Alarm Display templates
- Filters
- Alarm Display setting tool for colors and text layout
- Updating/Frozen modes
- Alarm acknowledgement
- Alarm reset function
- Authorization support
- Help in all dialogs (The complete manual will be opened from Help)
- Visible Alarm Class
- Locate object in DMS
- Locate object in Monitor Pro
- Column sort
- Find

Template 1 and Template 2 also have other features than those described above.

These templates include:

- Fields indicating the number of active and unacknowledged alarms
- A field indicating the use of filters
- A field indicating the current mode
- Alarm count indication on both lists.

The Alarm Display is started by selecting **Navigate > Alarm**. By default, the two templates are included in the Alarm menu.

When the filters are defined, only those alarms matching the filter configuration are displayed. When the filter is defined, the text "Filters:Used" is displayed on the Monitor Pro application window. By default, the filters are not used.

An alarm is activated in the following situations:

- An incoming binary signal (BI type process object) changes to an alarming state.
- A double indication (DB type process object) changes to an alarming state, for example a breaker middle state due to a faulty operation.
- An analog measured value (AI type process object) exceeds the alarm limits (the preset upper and lower limits).
- An object is marked faulty by a process device.
- A system error or communication failure occurs.

If the process object has an alarm function and the alarm is not blocked, information on the alarming process object will be displayed in the alarm list.

The **Alarm Display Template 1** and **2** menus contain the following commands:

**Filters:** Opens a dialog, where filters can be selected and edited.

**Reset Filter:** Resets filters back to the default settings.

**Keep Updating:** Sets the Alarm Display to the updating mode. When changing to Alarm Display, the mode is by default set to updating mode if a user is logged in.

**Stop Updating:** Sets the Alarm Display to the frozen mode. When changing to Alarm Display, the mode is by default set to frozen mode if no user is logged in.

**Operation Manual****Acknowledge...:**

**All:** Acknowledges all the alarms on the list. A confirmation dialog is opened to confirm the operation.

**Page:** Acknowledges all the alarms on the current pages (both lists). A confirmation dialog is opened to confirm the operation.

**Show Info Fields:** Displays/hides the info fields.

**Show Headers:** Displays/hides the list headers.

**Last Alarm:** Scrolls the list to show the latest alarm and sets the mode to updating.

**Export:** Exports the current view in CSV file format.

The toolbar provides a shortcut to the commands in the menus. The toolbars in the Alarm Display Template 1 and Alarm Display Template 2 can be modified separately.



*Figure 6.3: Toolbar of Alarm Display*

The buttons in the toolbar of Alarm Display are from left to right:

- Show Filters
- Reset Filter
- Switch to Updating or Frozen Mode
- Acknowledge All
- Acknowledge Page
- Acknowledge Selected Alarm
- Go to Last Alarm

Add or remove buttons on the toolbar the same way as in applications in general, refer to Section 3.4.2 Changing application layout.

The list can be set to two different modes: frozen and updating. When the list is in the frozen mode, it is not updated, and the alarm information can be read easily. If alarms are changed while the Alarm Display is in the frozen mode, the operator is notified with an informative text on the display area. When in the updating mode, the Alarm Display is updated when alarms are changed. The current mode is indicated in the Monitor Pro application window.

**6.1****Alarm rows**

Each alarm is presented as a single alarm row.

Different alarm templates list alarms in different states. The states are shown in Figure 6.4. With default settings, the different states are colored differently. The default colors are the background colors in the figure.

## Operation Manual

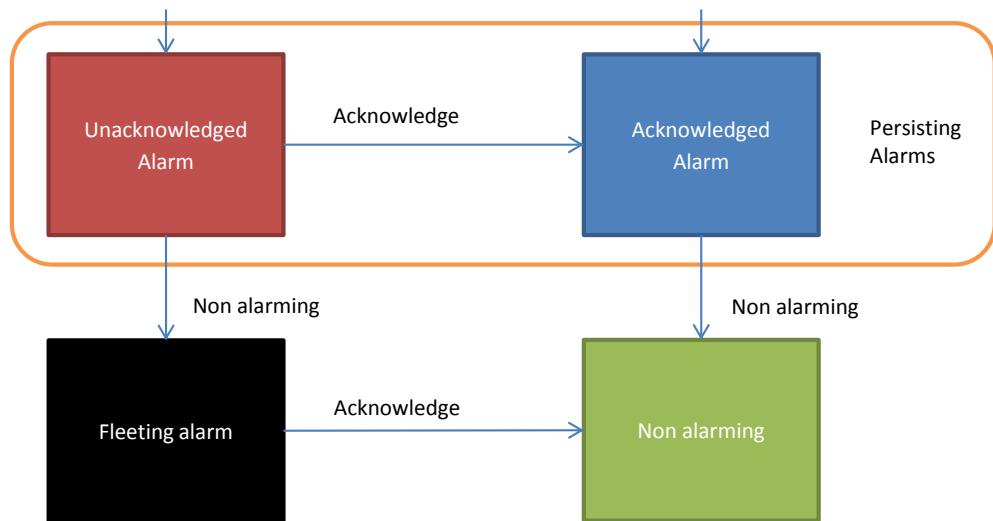


Figure 6.4: Alarm states

When a new alarm is created, it can either be unacknowledged or already acknowledged. On Template 1, these are shown in the upper list. If a signal leaves the alarming state but the alarm was unacknowledged, the alarm becomes a fleeting alarm. Fleeting alarms are shown on the lower list on Template 1. When a fleeting alarm is acknowledged, the signal enters non-alarming state. Template 1 does not show non-alarming signals.

On Template 2, unacknowledged, acknowledged, and fleeting alarms are always shown. With default settings, non-alarming signals are shown in the list, if the state of the alarm is changed when the list is visible. When the list is refreshed, the non-alarming signals are removed. If Remove fleeting alarm is set, non-alarming signals are not shown on the list at all.

The values for status column and default colors are explained in Table 6.1.

**Table 6.1: Default colors and status texts of the alarm types**

Alarm type	Default color	Status text	Explanation
Active unacknowledged <sup>a</sup>	Red	Alarm High alarm <sup>b</sup> Low alarm <sup>b</sup>	An alarm has been reported, but it has not been acknowledged.
Active acknowledged <sup>a</sup>	Blue	Ack High alarm Ack <sup>b</sup> Low alarm Ack <sup>b</sup>	An alarm has been reported, and it has been acknowledged.
Inactive unacknowledged <sup>a</sup>	Black	Normal	The state has been alarming, but it is no longer alarming.

- a. included in persisting alarms
- b. shown with analog values
- c. included in fleeting alarms

In the Alarm Display Template 2, the inactive acknowledged alarms can also be kept on the list. Due to this, Template 2 functions as a sort of alarm log. The inactive acknowledged alarms are erased from the list when the Alarm Display is closed. The same can be done by selecting **Alarm Display Template 2 > Refresh** from the menu.

All alarms are displayed on a single list. A flashing character \* indicates all unacknowledged alarms, both active and inactive. Template 2 is presented in Figure 6.2.

Table 6.2 provides an explanation for the different alarm types.

**Table 6.2: Alarm types**

Alarm Type	Explanation
Active unacknowledged	An alarm has been reported, but it has not been acknowledged.
Active acknowledged	The alarm has been inactivated (the state is normal again).
Inactive unacknowledged	The state has been alarming, but it is no longer alarming.
Inactive acknowledged	An alarm has been reported, and it has been acknowledged.

## 6.2

### The Alarm Display User Interface

The alarm display works in the same way as the event display, see Section 5.2 The Event Display User Interface. In the alarm display Template 1, there are two separate lists in the display. All configurations on the list affect both of the lists.

## 6.3

### Handling alarms

The process database is the part of the base system where all the registration of incoming and outgoing process data takes place. The process database also supervises the current alarm situation of the various process objects by storing information of process objects with an alarm generating state into a special alarm buffer. The interface for alarm handling is the application process database, which is project specific, but the main functionality of the process database is always the same.

#### Process alarms

Process alarms are alarms that are related to the supervised process, for example, measurement values exceeding or going below the preset alarm limits, breakers tripping or getting into a faulty position and so on.

#### Internal alarms

Internal alarms are alarms caused by the network control system itself. Reasons for these alarms contain communication problems between a communication unit and substation, printer device errors, substation getting suspended, and so on. These kinds of erroneous

## Operation Manual

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states are detected and converted from internal system messages to alarms by the System Self Supervision function of SYS600.

### **System alarm**

A system alarm is an alarm generated by an external module supervising the Base System. The external module is working as a Watch Dog for the base system and it generates an external alarm if the base system stops. It is not possible to include this alarm in the Alarm Display.

### **Alarm activation time**

An activation time shows the time when the alarm was activated. The Time (AT attribute) and Activation time (YT attribute) columns are the same for active alarms. The column shows the time when the alarm was activated. For fleeting alarms, the Time (AT attribute) column shows the time when the object is changed back to normal state. The Activation time (YT attribute) column shows the time the alarm was activated.

### **Alarm acknowledgement**

An acknowledgement of an alarm is a way to show that the operator has registered and identified the alarm. Generally, acknowledging an alarm does not affect the alarm state. An unacknowledged alarm remains in the alarm buffer until it is acknowledged, even if the alarm state has passed. A required acknowledgement can be set individually for each process object (RC attribute).

### **Alarm blocking**

Alarm blocking blocks a signal in such a way that it cannot generate an alarm. (The same applies to history blocking, printout blocking and action blocking). Since the alarm is blocked, it is not registered in the process database when the process object gets into an alarm generating state. The other types of blocking are history blocking, printout blocking and action blocking.

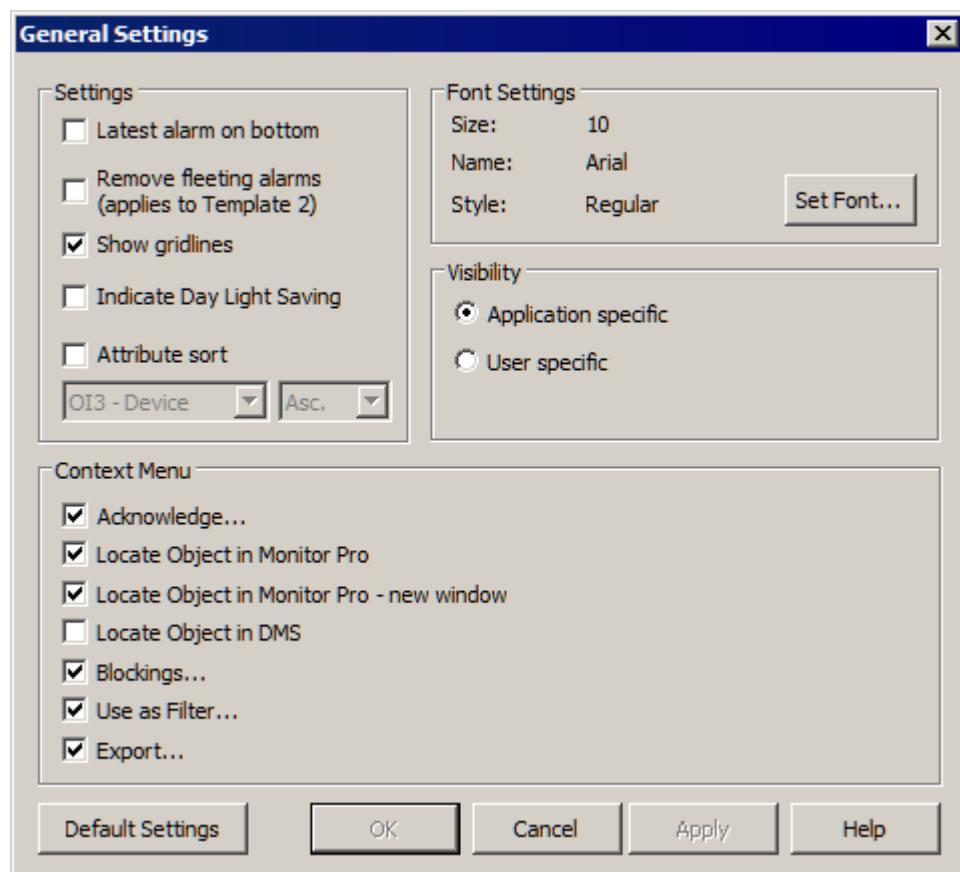
It is not possible to block features that has not been activated, for example alarms, history, printouts and action features. Alarm blocking is set individually for each process object (AB attribute).

### **Alarm classes**

The term alarm class means that the alarms can be grouped into seven equally significant alarm classes. This feature can be used when the user wants to group alarms caused by process objects with common properties, for example object location. From the base system's point of view, there is no internal priority between the different alarm classes. The alarm classes can also be used when searching alarms from the alarm buffer. By setting the alarm class to 0, the alarm function of a process object is set off. The use of alarm classes is user-defined.

**Operation Manual**

Function and alarm class lists differ from the object lists in that they are not editable. This is to simplify modifications. The number of the selected alarm class refers directly to the alarm class of the alarms to be shown in the Alarm Display. Any combination between these two lists is possible.

**6.3.1****Alarm Display Settings**

*Figure 6.5: Settings dialog*

The Settings dialog (see Figure 6.5) includes general settings, Font Settings, Visibility settings and context menu settings. The Latest alarm on bottom specifies whether the latest alarm is presented in the Alarm.

Display on the top or at bottom of the list. By default, the latest alarm is on the top. In the font settings the font size, name and style can be specified. The visibility settings include the options Application specific and User specific. The following items can be selected to be shown in the context menu:

- Acknowledge...
- Locate object in Monitor Pro
- Locate object in Monitor Pro - new window

## Operation Manual

- Locate object in DMS
- Blockings...
- Use as Filter...
- Export...

### 6.3.2

#### Acknowledging alarms

Acknowledge a single alarm by selecting the alarm row from the Latest Alarms dialog, see Figure 6.6.



Figure 6.6: Latest Alarms dialog

If the selected alarm is unacknowledged, the Acknowledgement dialog in Figure 6.7 can be opened by selecting **Acknowledge All** from the context menu. The same can be achieved by double-clicking an unacknowledged alarm row in the list.

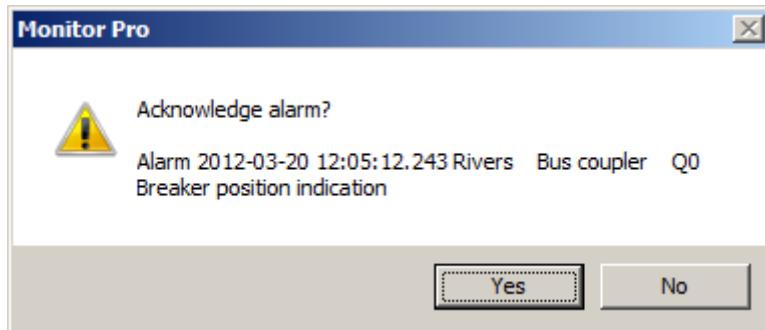


Figure 6.7: Acknowledge alarm dialog

In the dialog, the alarm text row (except for the status text) is shown to ensure that the right alarm is acknowledged. If **OK** is clicked, the alarm will be acknowledged, the dialog closed, and the Alarm Display will be updated. Clicking Cancel closes the dialog and returns the Alarm Display. All alarms on the list can be acknowledged at the same time by selecting **Alarm Display Template 2> Acknowledge All** from the menu or by clicking the appropriate button on the toolbar. The alarms currently visible on the list can be acknowledged by selecting **Alarm Display Template 2 > Acknowledge Page** or by clicking the appropriate button on the toolbar.

## 7

## Blocking Display

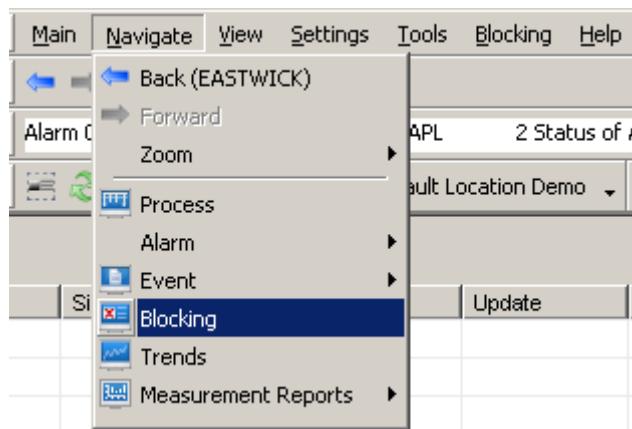
The Blocking Display summarizes the present blocking situation of signals in the supervised process. Each signal is presented as a signal row, which describes the signal in the process. The signal text row normally consists of a signal text and a group of check boxes indicating the blocking state. Figure 7.1 shows the Blocking Display main view.

Figure 7.1: The Blocking Display main view

The Blocking Display contains the following features and options:

- Selection of signal(s) for blocking/deblocking
- Blocking Display setting tool for the view layout
- Printout of blocking situation
- Event and printout enabling/disabling
- Authorization support
- Possibility to copy contents on the clipboard of the operating system
- Help in all dialogs (the complete Operation Manual will be opened)
- Locate object in DMS
- Locate object in Monitor Pro
- Column sort
- Find

The Blocking Display can be started by selecting **Navigate > Blocking** (see Figure 7.2).



*Figure 7.2: Starting the Blocking Display*

All the tools can be used either by clicking the shortcuts on the toolbar or by selecting the corresponding items in the **Blocking** menu.

The Blocking menu contains the following commands:

- Filters:** Opens a Filter Settings dialog, where filters can be selected and edited.
- Reset Filter:** Resets filters.
- Refresh:** Updates the blocking information.
- Show All Signals:** Loads all signals to the display despite of their blocking status.
- Show Info Fields:** Displays/hides the info fields.
- Show Headers:** Displays/hides the list headers.
- First Blocking:** Shows the first blocking.
- Last Blocking:** Shows the last blocking.
- Export:** Exports the current view in CSV file format.

The toolbar is a shortcut that can be used in parallel with the drop-down menu.



*Figure 7.3: Toolbar of the Blocking Display*

The buttons in the toolbar from left to right are:

- Filters
- Reset Filters
- Show All Signals
- Refresh

- First Blocking
- Last Blocking

## 7.1

## Blocking Rows

There are six different types of blockings: alarm, update, control, event, printout, and action blocking. Each blocking type has a condition that is defined when the particular blocking can be used. Alarm blocking can be done only if the signal has a defined alarm class. Update blocking is only applicable for input signals and control blocking is only applicable for output signals. Event blocking can be done if events are enabled for the signal. Printout blocking can be used if the signal has a printer defined. Action blocking is available if actions are enabled for the signal. Different blocking types are described in Table 7.1.

**Table 7.1: Blocking types and their attribute values**

Blocking type	Header in printout	Attribute values	Condition
Alarm blocked	AB	AB = 1	AC > 0
Update blocked	UB	UB = 1	Input signal
Control blocked	CB	UB = 1	Output signal
Event blocked	EB	HB = 1	HE = 1
Printout blocked	PB	PB = 1	LD > 0
Action blocked	XB	XB = 1	AE = 1

## 7.2

## The Blocking Display User Interface

The blocking display works in the same way as the event display. See Section 5.2 The Event Display User Interface. By default, the list contains only signals that are blocked. By selecting **Blocking > All Signals** all the signals can be seen.

## 7.3

## Handling Blockings

The SYS600 provides a wide range of blocking attributes, which are included in the Blocking Display. To provide a blocking handling mechanism in a more clear and rational way, the following blocking types are provided by the Blocking Display:

**Alarm blocking:** alarms are not raised, regardless of the object state.

**Update blocking:** indications are not updated by the process.

**Control blocking:** operation commands are not sent to the process.

**Event blocking:** event registrations are not made, events are not shown in the Event Display.

**Printout blocking:** events are not sent to the printer.

## Operation Manual

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**Action blocking:** event channel activation is blocked.

The blocking activity must be expanded to the signal level. The reason for this is that, for example, in case of an oscillating signal, the user must be able to block it but leave the other signals (related to the device in question) unblocked to minimize the information loss. Blocking is possible either by setting the blocking state for each signal presented on the list or by fetching any signal from the database and setting its blocking.

When a signal is update-deblocked, its state in the database is not necessarily up to date, since the state of the process device may have changed while the signal has been update-blocked. Therefore, the state of each signal must be updated from the process when the signal is update-deblocked.

Blocking Display is not automatically updated when a blocking signal has changed. A Refresh function is provided to enable updating of the blocking information. The Blocking Display is refreshed by selecting **Blocking > Refresh** or by clicking the appropriate toolbar button.

### Setting signal blocking state

The blocking state of the signal can be set by clicking the selection box for the signal in question. Since a signal can be either of indication or of control type, the selection boxes corresponding to either one of the blocking types is unset and unavailable, depending on the signal.

An alternative way to set the blocking states for the signals is to use the copy-paste function. The selected signal's blocking states are copied by pressing CTRL-C and the blocking states can be set to another signal by pressing CTRL-V. Multiple signals can be blocked or deblocked by selecting multiple rows and selection Block/Deblock from the context menu.



If all the blockings are deblocked, the signal will be removed from the Blocking Display after next view refresh. If a non-internal signal is in the update-deblocked mode and it is connected to a process, its state will be updated.

#### 7.3.1 Blocking Display Settings

The settings part of the Blocking Display functions consists of two main parts: view and event/printout settings. The user can concentrate on one or more blocking types by excluding the other blocking types from the list with the view part of the Blocking Display Settings dialog (shown in Figure 7.4).

There are settings for enabling event generation and printout on a change of blocking. Events and printouts are enabled/disabled regardless of the attributes (HE and PB) of the target signal.

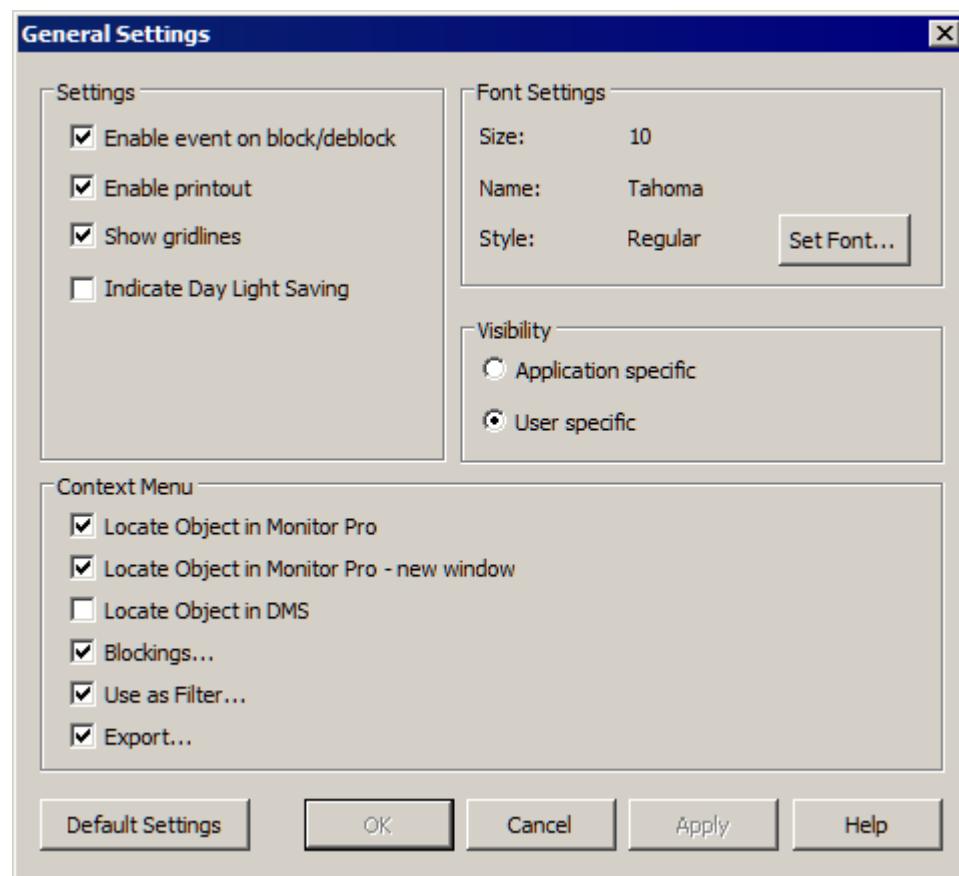
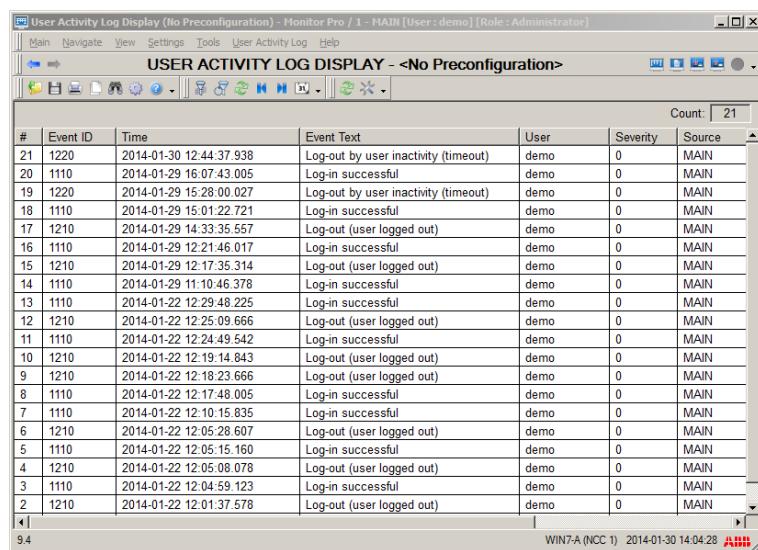
**Operation Manual**

Figure 7.4: The Blocking Display General Settings dialog



**8****User Activity Log Display**

With the User Activity Log Display the information about all user activity related events can be monitored and analyzed. Typical user activity related events are user login and logout events.



The screenshot shows a software window titled "User Activity Log Display (No Preconfiguration) - Monitor Pro / 1 - MAIN [User: demo] [Role: Administrator]". The window has a toolbar with icons for Main, Navigate, View, Settings, Tools, User Activity Log, and Help. Below the toolbar is a menu bar with File, Edit, View, Settings, Tools, User Activity Log, and Help. The main area is titled "USER ACTIVITY LOG DISPLAY - <No Preconfiguration>". It contains a table with the following columns: #, Event ID, Time, Event Text, User, Severity, and Source. The table lists 21 rows of log entries. The last entry in the table is row 21, which is highlighted.

#	Event ID	Time	Event Text	User	Severity	Source
21	1220	2014-01-30 12:44:37.938	Log-out by user inactivity (timeout)	demo	0	MAIN
20	1110	2014-01-29 16:07:43.005	Log-in successful	demo	0	MAIN
19	1220	2014-01-29 15:28:00.027	Log-out by user inactivity (timeout)	demo	0	MAIN
18	1110	2014-01-29 15:01:22.721	Log-in successful	demo	0	MAIN
17	1210	2014-01-29 14:33:36.557	Log-out (user logged out)	demo	0	MAIN
16	1110	2014-01-29 12:21:46.017	Log-in successful	demo	0	MAIN
15	1210	2014-01-29 12:17:35.314	Log-out (user logged out)	demo	0	MAIN
14	1110	2014-01-29 11:10:46.378	Log-in successful	demo	0	MAIN
13	1110	2014-01-22 12:29:48.225	Log-in successful	demo	0	MAIN
12	1210	2014-01-22 12:25:09.666	Log-out (user logged out)	demo	0	MAIN
11	1110	2014-01-22 12:24:49.542	Log-in successful	demo	0	MAIN
10	1210	2014-01-22 12:19:14.843	Log-out (user logged out)	demo	0	MAIN
9	1210	2014-01-22 12:18:23.666	Log-out (user logged out)	demo	0	MAIN
8	1110	2014-01-22 12:17:48.005	Log-in successful	demo	0	MAIN
7	1110	2014-01-22 12:10:15.835	Log-in successful	demo	0	MAIN
6	1210	2014-01-22 12:05:28.607	Log-out (user logged out)	demo	0	MAIN
5	1110	2014-01-22 12:05:15.160	Log-in successful	demo	0	MAIN
4	1210	2014-01-22 12:05:08.078	Log-out (user logged out)	demo	0	MAIN
3	1110	2014-01-22 12:04:59.123	Log-in successful	demo	0	MAIN
2	1210	2014-01-22 12:01:37.578	Log-out (user logged out)	demo	0	MAIN

Figure 8.1: The User Activity Log Display main view

Each user activity event is one row in the display. With default settings, User Activity Log Display rows consist of event identifier, a time stamp, event text, user name, severity of the event and the source application of the event.

The User Activity Log Display contains the following features and options:

- Configurable layout: columns, fonts, toolbars, coloring, and so on
- Configurable coloring of user activity events
- Configurable mode for presenting latest event at top/bottom
- Easy navigation through scrolling, go to date, time filters, and so on
- Extensive filtering that can be stored and easily called up later using preconfigurations
- Find
- Sorting by column
- Printouts

The User Activity Log Display is accessed by selecting **Navigate > User Activity Log**.

The **User Activity Log** menu contains the following commands:

**Filters:** Opens a Filter Settings dialog, where filters can be selected and edited.

**Reset Filter:** Resets filters.

**Refresh:** Updates the User Activity Log information.

## Operation Manual

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**Show Info Fields:** Displays/hides the info fields.

**Show Headers:** Displays/hides the list headers.

**Go to First:** Shows the first user activity event.

**Go to Last:** Shows the last user activity event.

**Select Day:** Opens a Day select dialog.

**Export:** Exports the current view into CSV file format.

The toolbar is a shortcut that can be used in parallel with the drop-down menu.



*Figure 8.2: User Activity Log Display toolbar*

The buttons in the toolbar from left to right are:

- Show Filters
- Reset Filter
- Refresh User Activity Log
- Go to First User activity
- Go to Last User activity
- Go to Selected Day

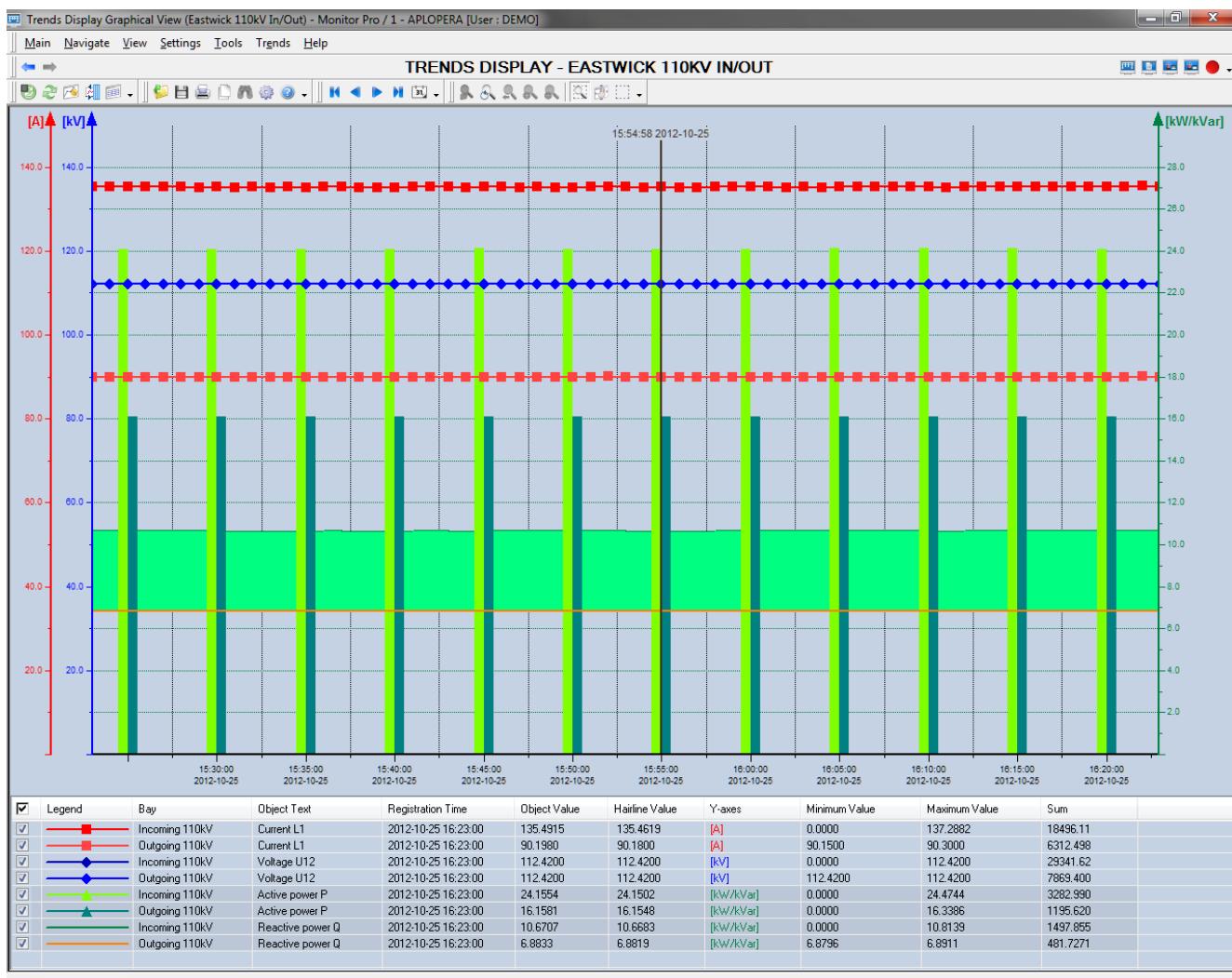
The toolbar buttons can be added or removed in the same way as in applications in general, see Section 3.4.2 Changing application layout.

The User Activity Log Display is not automatically updated when new user activity events occur in the application. New user activity events can be fetched by Refreshing the display or by pressing F5.

## 9 Trends Display

The Trends Display is used for trend analyses and for showing measured values in the form of a curve or a table.

A trend is a time related follow-up of process data. All types of process objects, for example in and out data and binary, analog and digital data can be illustrated as trends.



9.3-2 Mode: Updating

FIVAA-L-6400015 (SYS600) 2012-10-25 16:23:32 ABB

Figure 9.1: The Trends Display

The Trends Display contains the following features:

- Graphical or tabular view
- Zooming mode
- Scrolling with scroll bars and panning

## Operation Manual

- Configurable axes and line properties
- Using legend
- Using hairline
- Update interval options from 10 seconds to 10 minutes
- Calculation formulas; direct, mean, sum, integral and difference
- Clearing trend data by the user
- Save, Open and Delete preconfigurations
- Printout option
- Update/Frozen modes
- Authorization support
- Copy to clipboard
- Export to CSV file

Trend display configuration includes a set of parameters such as colors, fonts, and so on, which are called trend preconfigurations. For more information on preconfigurations, see Section 9.6 Preconfigurations.

### 9.1

## Starting Trends Display

The Trends Display can be started by selecting **Navigate > Trends** (see Figure 9.2).

To open the basic Trends Display, select **Navigate > Trends > No Preconfiguration**. For more information about saving the preconfiguration, see Section 9.6 Preconfigurations.

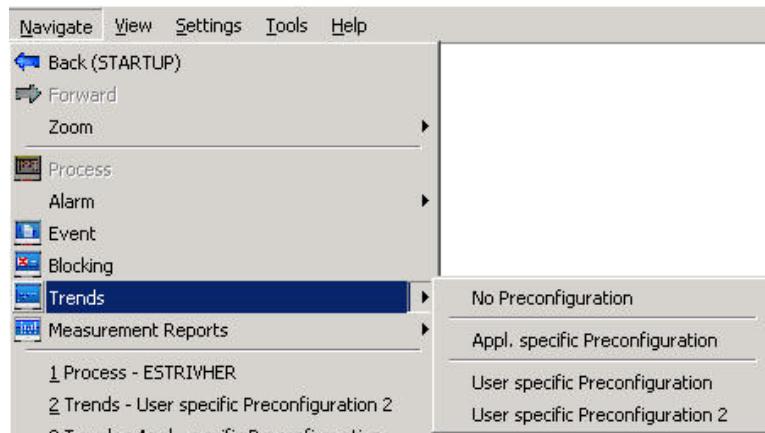


Figure 9.2: Trends navigation menu

### 9.2

## The Trend Basket

The Trend Basket is a link between the process data and the Trend display. With the Trend Basket dialog the user can select data from the process database to be logged and shown in the Trend display.

## Operation Manual

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The Trend Basket dialog can be opened by selecting **Trends > Trend Basket**, or by

clicking the corresponding button  in the toolbar. The Trend Basket dialog lists the system objects and lets the user pick the objects to be shown in the trend.

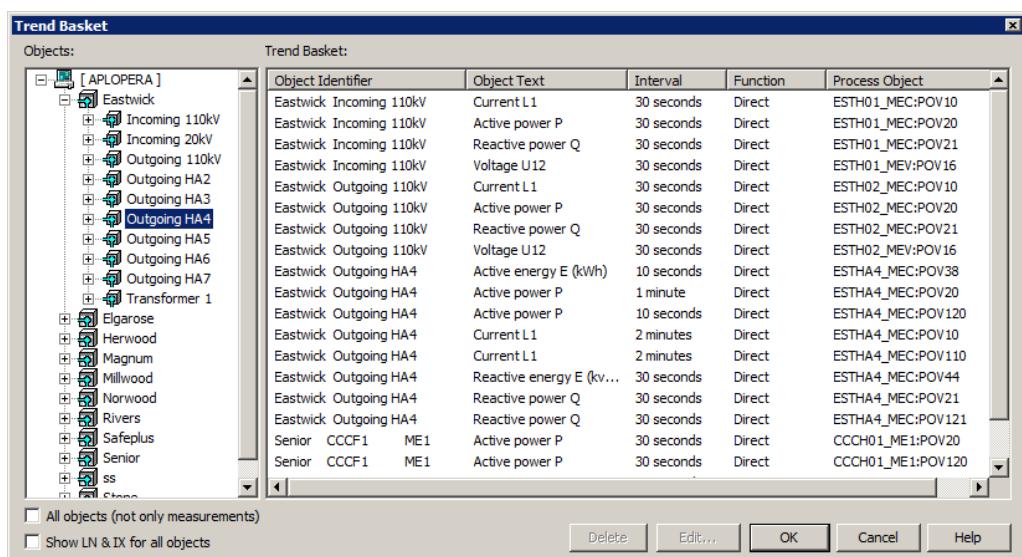


Figure 9.3: The Trend Basket dialog

By default, only measurement objects are shown. If the **All Objects (not only measurements)** option is selected, the Trend Basket object tree displays all the objects from the process database.

### 9.2.1 Add and remove Trends

The available objects are presented on the left side of the dialog. In the object tree's lowest level objects which will be included into the Trend Basket list can be selected one at a time.

There are three ways to add objects to the Trend Basket from the object list:

1. right-click the object and select the **Add to Trend Basket** command from the context menu. Added objects are shown on the right side in the Trend Basket.
2. drag an object from the available object list and drop it into the Trend Basket list on the right side.
3. double-click the object to add it to the Trend Basket list.

To remove selected object from the Trend Basket:

1. right-click the object in the Trend Basket list and select **Remove Log** from the context menu.
2. press the **Delete** key from the keyboard.
3. click **Delete** button in the dialog.



Check from the **Show/Hide Trend curves** dialog that the related trend items are included in the active preconfiguration.

### 9.2.2

#### Trend settings

The Trend Basket dialog will also be used to configure individual trend parameters. The **Trend Setting** dialog for the selected trend can be opened by double-clicking an object, selecting the corresponding **Log Settings...** item from the context menu or by clicking the **Edit...** button.

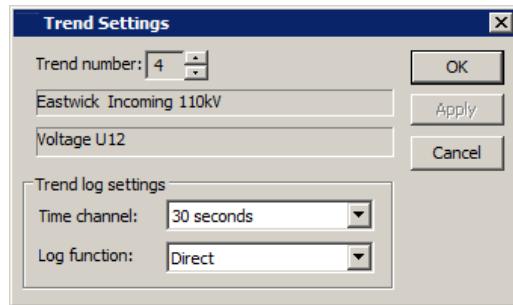


Figure 9.4: The Trend Settings dialog

The following Trend properties can be changed:

- Time channel (10, 30 seconds; 1, 2, 5 or 10 minutes)
- Logging function (Direct, Sum, Mean, Integral or Difference), see Table 9.1.



Change the Log function will cause the lost of all existing data for the selected Trend.

**Table 9.1: Log functions**

<b>Log time</b>	<b>Data</b>	<b>Log function</b>				
		<b>Direct</b>	<b>Sum</b>	<b>Mean</b>	<b>Integral</b>	<b>Difference</b>
T-1	0	0	0	0	0	0
T0	1	1	1	1	0	1
T+1 min	2	2	3	1.5	60	1
T+2 min	3	3	6	2	180	1
T+3 min	5	5	10	2.75	360	2
T+4 min	4	4	14	3	660	-1

## 9.2.3

### Clearing Trend data

Clearing the Trend data for the selected Trend can be done by right-clicking an item in the Trend Basket and selecting **Clear log data** from the context menu, or by clicking the corresponding button  from the Trends tabular view toolbar.



Access to this functionality requires at least ENGINEERING level (2) access rights. Otherwise, the appropriate functions are unavailable.

## 9.3

### The user interface

The Trend data can be presented in a tabular or in a graphical view. These two views share the same Trend database.

Both views also share some of the toolbars and the Trends Display menu.

#### 9.3.1

#### Trends Display toolbars

The Trends Display has four toolbars. Three are used for both views and one dedicated for the graphical view.

When the Trends Display is started for the first time, all the three toolbars are visible. Show or hide the toolbars by selecting **Settings > Customize**. Add or remove buttons on the toolbars the same way as described in Section 3.4.2 Changing application layout.



Figure 9.5: Main toolbar

**Table 9.2: Main toolbar functions**

Function	Description
Open Preconfiguration	Opens the Open Preconfiguration dialog.
Save Preconfiguration	Opens the Save Preconfiguration dialog.
Print	Prints the selected report to a network printer or a specified output file.
Copy to Clipboard	Copies the selected visible trend data to the operating system clipboard.
Find	This function is disabled for the Trends display.

## Operation Manual

Function	Description
Display Settings	Opens a sub-menu with the following items: <ul style="list-style-type: none"> <li>• General Legend Settings...</li> <li>• Graph Settings...</li> <li>• Legend layout Settings...</li> </ul>
Help	Opens the Help dialog

The Trends Display toolbar buttons and drop-down lists from left to right are as follows:

- Switch updating/frozen mode
- Refresh
- Open Trend Basket
- Show or hide trend curves
- Switch tabular/graphical view



Figure 9.6: Display toolbar

**Table 9.3: Display toolbar functions**

Function	Description
Switch between updating and frozen mode	 indicates the update mode as active mode. Clicking this button will change to the frozen mode.  indicates the frozen mode as active mode. Clicking this button will change to the update mode.
Refresh	Forces a display refresh.
Show/hide trend curves	Open the Show/Hide dialog, where the user can select which curves to show in the current view.
Switch tabular/graphical view	 The graphical view is active. Clicking this button will change to the tabular view.  The tabular view is active. Clicking this button will change to the graphical view.

### 9.3.2 Trends Display menus

The toolbar commands can also be selected from the Trends menu (see Figure 9.7 and Figure 9.8). Some of the menu items are active for graphical view only.

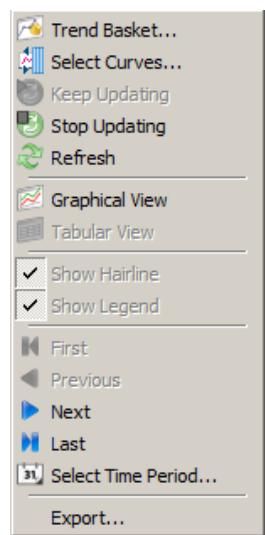


Figure 9.7: Trends Display menu for tabular view

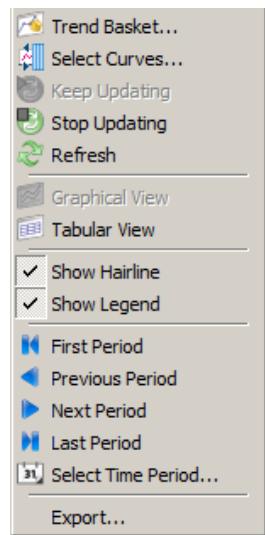


Figure 9.8: Trends Display menu for graphical view

In addition to the toolbars the following functions are available from the menu:

- Show/Hide Hairline
- **Show/Hide Legend**
- Export...

### 9.3.3 Using Trend curves

Show and hide the trend curves by selecting **Trends > Select Curves**, or by clicking the

corresponding button  in the Trends Display toolbar. The **Show/Hide Trend curves** dialog displays the items the Trend Basket contains. These items can be included in or excluded from the selected preconfiguration by selecting or clearing the corresponding checkbox. It is also possible to select all or clear all of the items by using the appropriate commands from the context menu, or by using the command buttons.

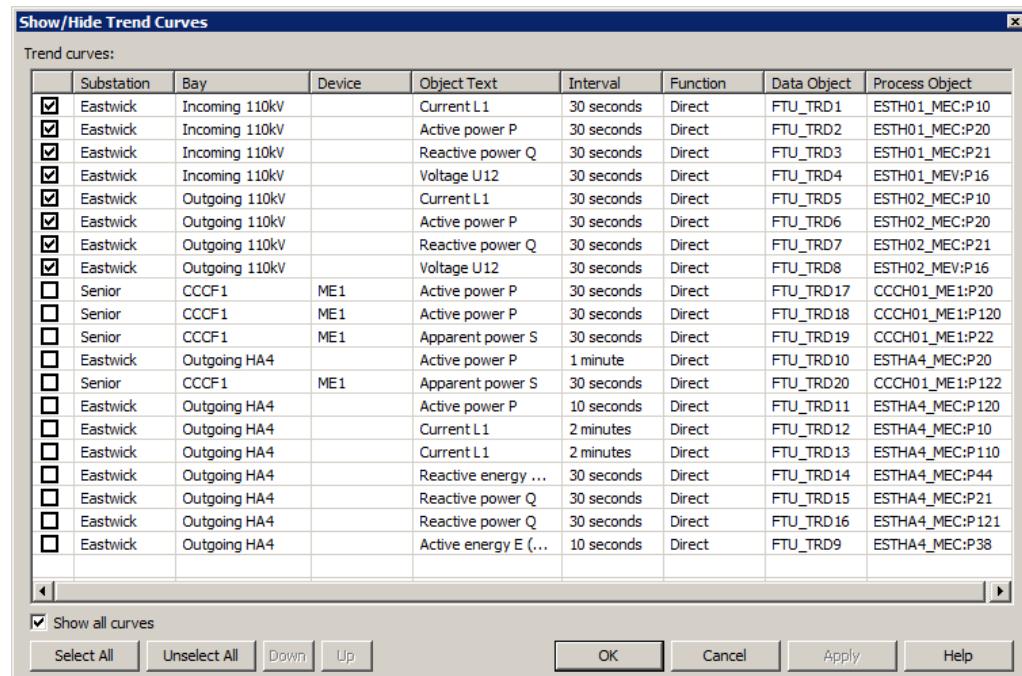


Figure 9.9: Show/Hide Trend Curves dialog

By default, all the added items in the Trend Basket are automatically included and displayed in the trend curves as well. View the detailed information about the trended items in preconfiguration in the **Show/Hide Trend curves** dialog.

With the **Show All Curves** check-box all Trend curves not used for the selected preconfiguration can be hidden.

To change the Trend curve position within the preconfiguration, select one curve and use the corresponding **Down** or **Up** button. This will also change the position in the curve legend. After changing the position, the preconfiguration must be saved to keep the position change.



Up to 20 Trend curves can be viewed for the graphical and tabular view.

### 9.3.4

#### Time range

The time period used in tabular and graphical view can be changed with the **Select Time**

**Period** dialog, which can be opened from the **navigation toolbar**

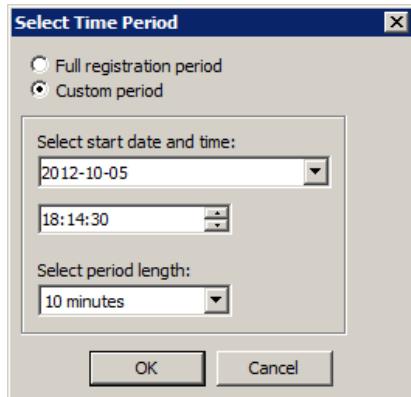


Figure 9.10: Select Time Period dialog

By default, the Full registration period is applied. This means that all the samples are shown on the graphical view, and the accuracy of the registration time is scaled accordingly. When Custom period is selected, it is possible to select a start date and time for the detailed information. The first registration time is shown on the X axis. Additionally, the length of the period is defined to one of the following alternatives: 30 days, 5 days, 1 day, 1 hour, 10 minutes or 1 minute.

### 9.4

#### Graphical view

In the graphical view, up to twenty measurements can be presented on a two-dimensional coordinate system that consists of a horizontal time (X) axis and a vertical value (Y) axis. The curves can be panned both in the X and Y directions and the parameters of the Y axis can be changed. All the curves can be hidden from the view with the dialog.

The horizontal (X) axis of the graphical view represents the registration time of the measurement, and the vertical (Y) axis represents the value of the measurement. The X axis is divided into intervals specific to the selected time range. The time of every interval point is labeled below the X axis. The amount of the shown interval points depends on the zooming level.

The Y axis is automatically divided into intervals according to the registered values. Note that the graphical view does not recognize any units or scales, only the values registered in the trends database.

## Operation Manual

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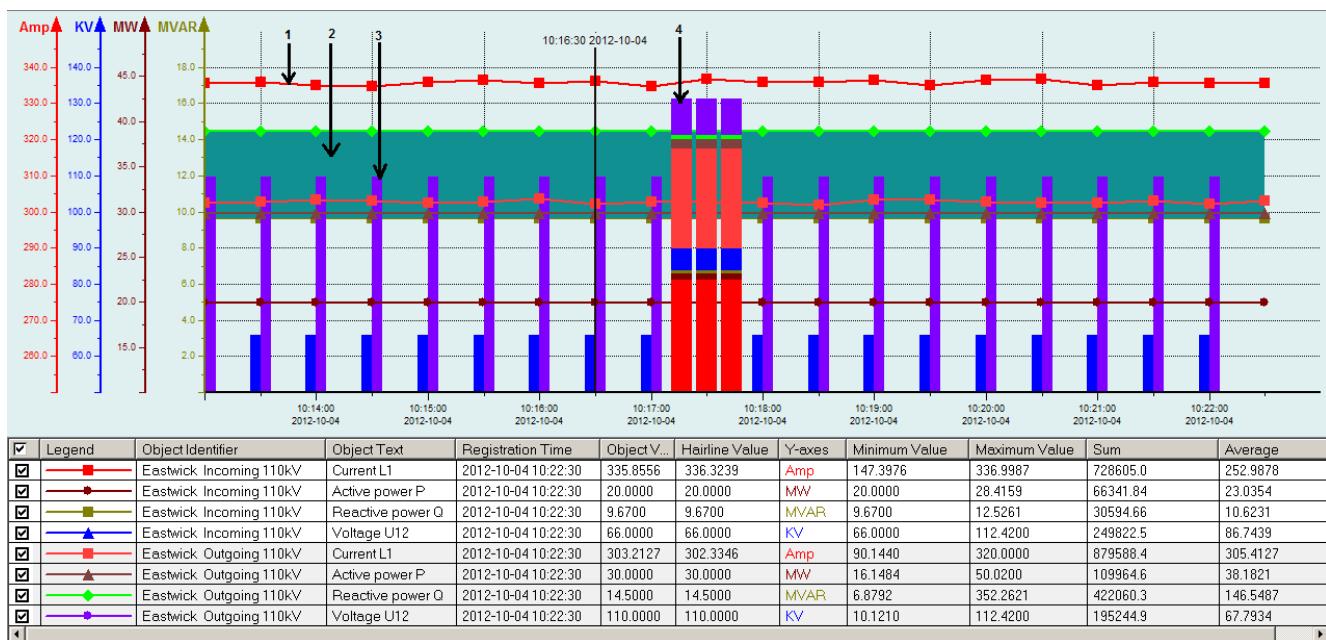


Figure 9.11: Graphical view of Trends

The graphical view has the following functional areas:

- The plot area where the trended data will be shown.
- The legend area shows selected curve properties, hairline values and summary information.

For the plot area, the following curve types can be chosen:

1. Plot (default)
2. Area (fills the area between two selected curves or between a curve and the X or Y axis)
3. Bar or group of bars
4. Stacked bar

The curve type can be configured with the dialog.



Not all data are always available for the curve type Bar and Stacked bar. The amount of displayed bars or groups of bars depends on the zooming level.

The legend position can be changed with the dialog or the Legend Control context menu.

The legend show up can be disabled with the dialog or from the Trends menu.

## Navigation

The Navigation toolbar buttons from left to right are as follows:

**Operation Manual**

- Go to First Period
- Go to Previous Period
- Go to Next Period
- Go to Last Period
- Select Period

*Figure 9.12: Navigation toolbar***Table 9.4: Navigation toolbar functions**

<b>Function</b>	<b>Description</b>
Go to First Period	Shows the data for the first time period in the selected time range.
Go to Previous Period	Shows the data for the previous time period in the selected time range.
Go to Next Period	Shows the data for the next time period in the selected time range.
Go to Last Period	Shows the data for the last time period in the selected time range.
Select Period	Opens the dialog to enter the start time and the time range.

**Scrolling, panning and zooming**

Select the zooming mode to outline the area that needs to be zoomed in the graphical view. Scroll to the zoomed curve by using the scroll bars.

By selecting the panning mode the user can drag the curve with the mouse. Panning is only possible after zooming in.

For more information about zooming, see Section 4.2 Zooming.

The Trends Display **Zoom** toolbar buttons from left to right are as follows:

- Save/Restore Zoom, disabled for Trends display graphical view
- Reset zoom to normal
- Zoom Previous, disabled for Trends display graphical view
- Zoom In, disabled for Trends display graphical view
- Zoom Out, disabled for Trends display graphical view
- Select zooming mode
- Select panning mode
- Select selection area for copy selected area data to the clipboard



Figure 9.13: Zoom toolbar

The **Save/Restore Zoom...**, **Zoom Previous**, **Zoom in** and **Zoom out** buttons can be removed, because they are not used for the graphical view of the Trends Display.

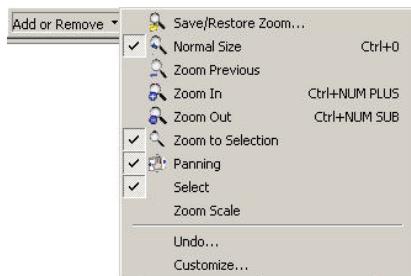


Figure 9.14: Removed buttons from the zoom toolbar

### The Hairline function

Hairline provides more accurate information on the graphical view. It is related to certain time and it is relating values for Trend data in the configuration.

To view the hairline on the graphical view, select **Show Hairline** from the **Trends** menu.

Place the hairline into another location by dragging it horizontally. New time information is displayed above the hairline.

By using the left or right arrow key the hairline will be snapped to the previous respectively next valid curve value.

The values for the Trend curve items are displayed in the legends hairline value column.

Instead of placing the hairline by dragging, any point in the plot area can be selected. Select the **Show Hairline Here** item from the context menu. The hairline will be placed at that point.

### Graph Settings

The dialog can be opened either by clicking the appropriate Main toolbar button or by right-clicking inside the plot area and selecting the **Graph Settings...** item.

Authorization level has to be at least Control (1) to be able to change these properties.

After modifying the settings in the dialog, save it as a preconfiguration if the changes need to be permanent.

#### 1. Common Settings

## Operation Manual

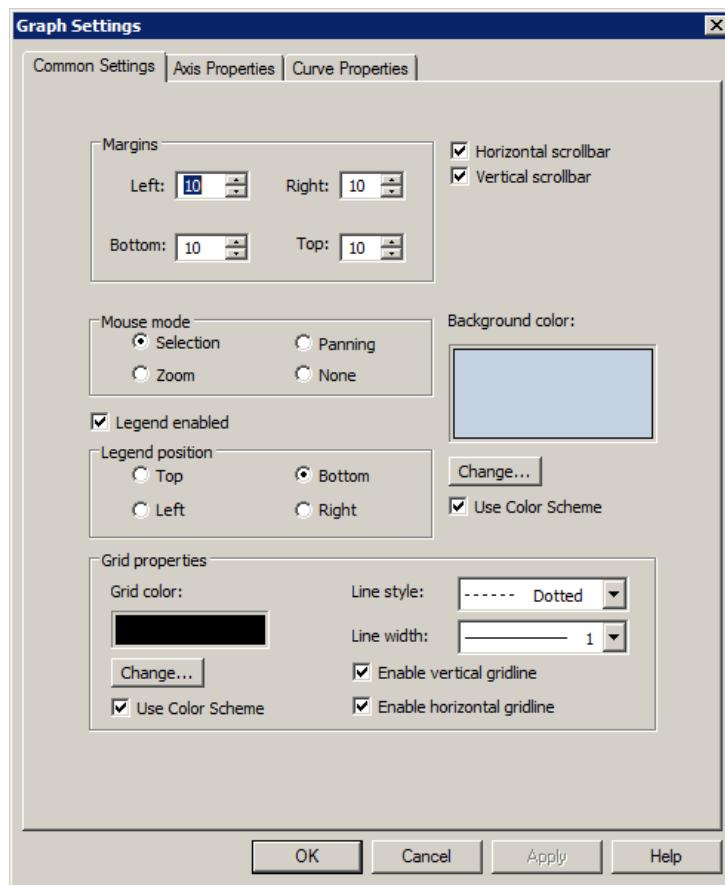


Figure 9.15: The Graph Settings dialog, Common Settings

Table 9.5: Graph Settings, Common Settings

Setting	Description
background color	If "Use color scheme" is enabled, the background color from the active color scheme will be used. If not, the user can freely choose any color with the color chooser.
Grid color	If "Use color scheme" is enabled, the background color from the active color scheme will be used. If not, the user can freely choose any color with the color chooser.
Mouse mode	If the Mouse mode "Selection" is active, area selection with the mouse can be used to copy the data from the selected area to the clipboard.

## Operation Manual

## 2. Axis properties

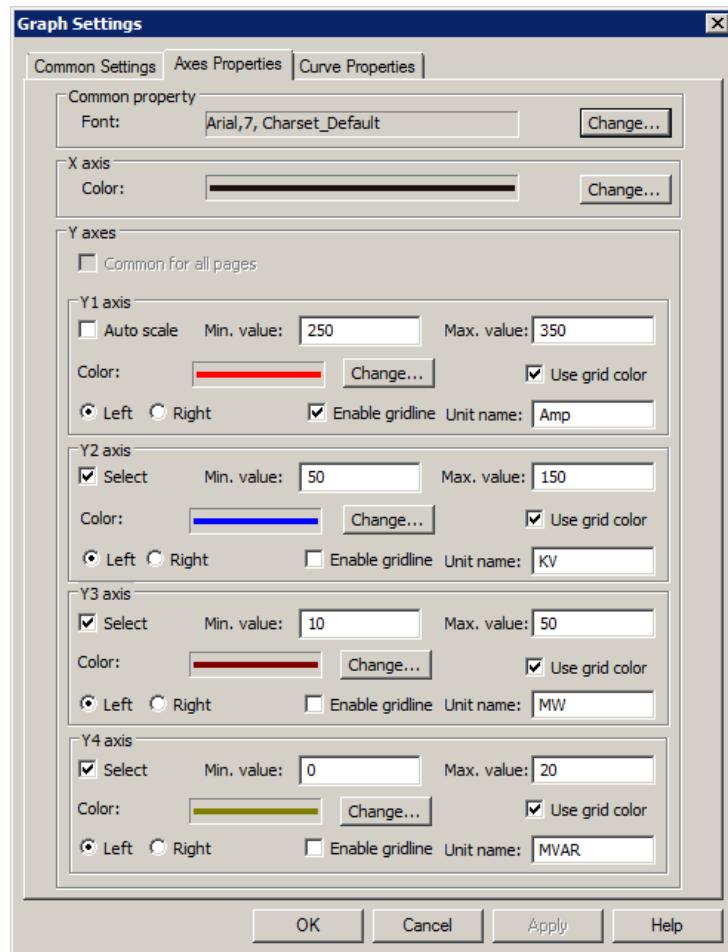


Figure 9.16: The Graph Settings dialog, Axis Properties

**Table 9.6: Graph Settings, Axis Properties**

Setting	Description
Font	Font for the Axis annotation
Color (all Y axes)	Axis line color
Y axes common for all pages	If checked the current Y axes configuration will be used for all existing report pages. If not checked different Y axes properties can be defined for every selected page. This option is disabled for reports having only a single page configured.
Select (Y2 .. Y4 axes)	Show/hide selected Y axis (By default it will be hidden)
Auto scale (Y1 axis)	The scaling is based on the minimum and maximum values for the complete time range, not only for the selected time range.

## Operation Manual

Setting	Description
Use Grid color (all Y axes)	If enabled, the dedicated Y axis gridline color will be used. Otherwise the gridline color from global color setting tool will be used.
Left or right selection (all Y axes)	Y axis placement
Enable gridline (all Y axes)	If enabled, horizontal gridline corresponding with Y axis will be shown.
Unit name (all Y axes)	Display unit name of Y axis, default value is Y1, Y2, Y3, Y4.

## 3. Curve properties

The **Curve Properties** tab can be used to change individual curve settings. First the correct report curve must be selected from the drop-down list.

The **Curve Properties** dialog can be also opened via the curve right mouse click context menu in the graphical area or the legend.

Selecting the **All Curves** option helps to change the curve type for all available curves.

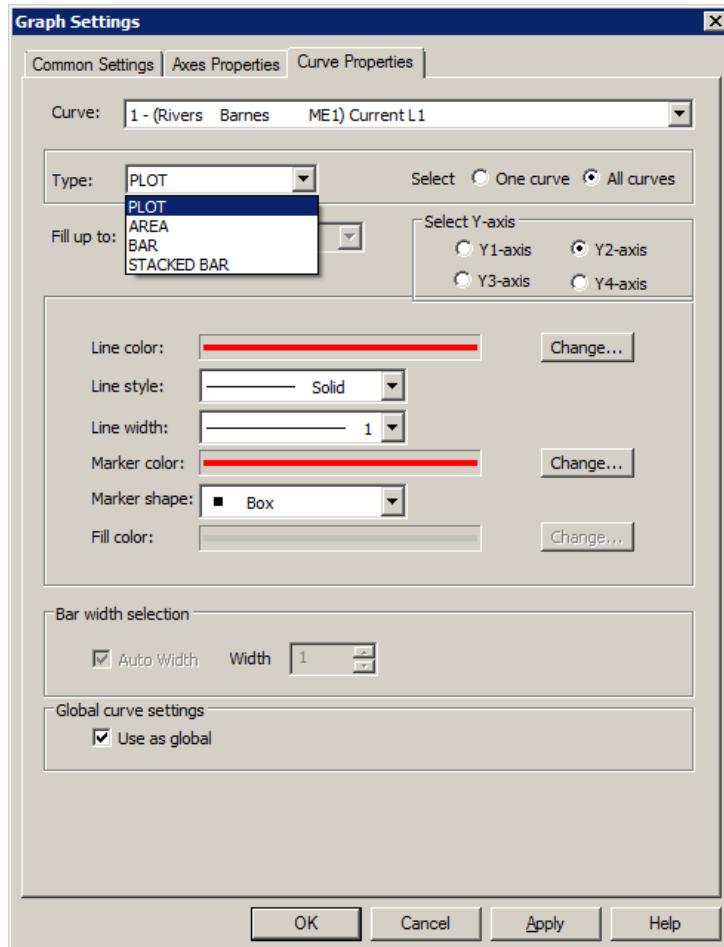


Figure 9.17: The Graph Settings dialog, Curve Properties

**Table 9.7: Graph Settings, Curve Properties**

Setting	Description
Curve type	The curve types plot, area and bar can be chosen for each individual trend. The stacked bar type can only be used for all enabled trend curves.
Bar width selection	Either the automatic bar width calculation or manually entered value can be chosen. This setting is only available for the curve type Bar or Stacked bar.
Select Y axes	Maps Curve to selected Y axis.
Marker color	If the curve data has a none normal status the corresponding color from the color setting tool will be used as marker color.
Use curve settings as global	If this option is selected the current curve settings will be stored as global settings. Every time the same curve object will be added to some preconfiguration this global settings will be used. To be able to use different settings this option needs to get unchecked. In case use as global is checked and the current properties will be changed, e.g. new line color selected, the stored global settings will be overwritten. Curve settings defined as being global will be stored in a separate file and not in the selected preconfiguration. Changed global curve settings will be saved with OK or Apply button selection.

## Configuring and mapping Multiple Y-axes

It's possible to use 4 different Y axes to accumulate four different ranges of curve values. Curves from Trends display can be mapped with any Y axis.

The following steps are required to configure and map Y axes:

1. Open **Graph Settings... > Axes Properties**
2. Select (Enable) particular Y-axes
3. Provide Min. and Max. value for selected axes
4. Set the axes color
5. Select Enable/Disable gridline
6. Select Curve Properties tab
7. Select curve
8. Map enabled Y-axes with selected curve
9. Apply Changes

## The Legend

The Legend shows selected curves attributes, the hairline values and summary information in a tabular form.

## Operation Manual

	Legend	Object Identifier	Object Text	Registration Time	Object V...	Hairline Value	Y-axes	Minimum Value	Maximum Value	Sum	Average
<input checked="" type="checkbox"/>		Eastwick Incoming 110kV	Current L1	2012-10-05 10:32:00	335.4447	336.4446	<b>Amp</b>	0.0000	336.9987	963030.1	334.3855
<input checked="" type="checkbox"/>		Eastwick Incoming 110kV	Active power P	2012-10-05 10:32:00	20.0000	20.0000	<b>MW</b>	0.0000	20.0000	57320.00	19.9028
<input checked="" type="checkbox"/>		Eastwick Incoming 110kV	Reactive power Q	2012-10-05 10:32:00	9.6700	9.6700	<b>MVAR</b>	0.0000	9.6700	27714.22	9.6230
<input checked="" type="checkbox"/>		Eastwick Incoming 110kV	Voltage U12	2012-10-05 10:32:00	66.0000	66.0000	<b>KV</b>	0.0000	66.0000	189156.0	65.6792
<input checked="" type="checkbox"/>		Eastwick Outgoing 110kV	Current L1	2012-10-05 10:32:00	302.8358	303.6592	<b>Amp</b>	0.0000	303.9998	868409.1	301.5309
<input checked="" type="checkbox"/>		Eastwick Outgoing 110kV	Active power P	2012-10-05 10:32:00	30.0000	30.0000	<b>MW</b>	0.0000	30.0000	85980.00	29.8542
<input checked="" type="checkbox"/>		Eastwick Outgoing 110kV	Reactive power Q	2012-10-05 10:32:00	14.5000	14.5000	<b>MVAR</b>	0.0000	14.5000	41557.00	14.4295
<input checked="" type="checkbox"/>		Eastwick Outgoing 110kV	Voltage U12	2012-10-05 10:32:00	110.0000	110.0000	<b>KV</b>	0.0000	110.0000	315260.0	109.4653

Figure 9.18: Legend area

Main Legend features are:

- Show curve properties, identifier, current, calculated and hairline values
- Show/hide all or selected curves
- Locate function via context menu
- Configurable legend position and column layout
- Highlight the selected curve if enabled

**Legend show up and position**

The legend can be shown/hidden by selecting the appropriate item from the Trends menu or in the Common settings tab from the dialog.

The legend position can be changed either from the legend context menu or in the Common settings tab from the dialog.

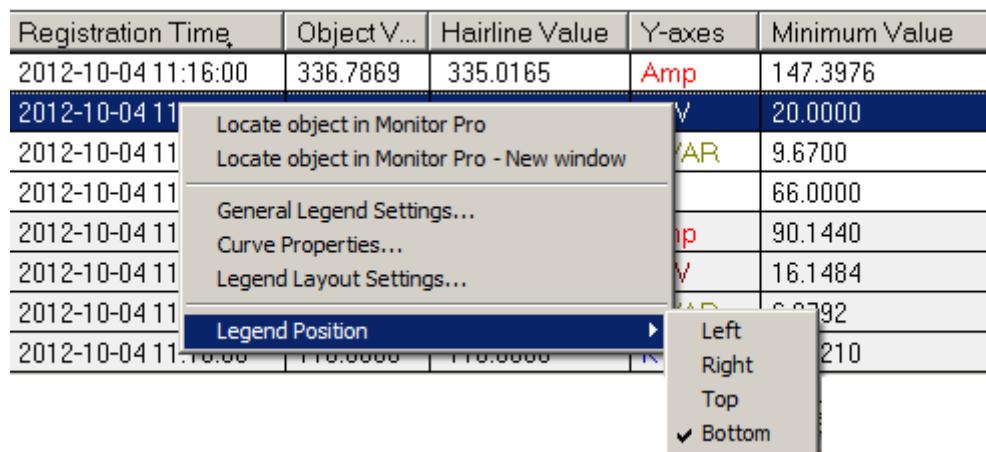


Figure 9.19: Legend context menu

**Legend layout settings**

The Legend layout settings can be configured by selecting **Settings > Display Settings > Legend layout Settings...** or from the Legend context menu.

The Attributes box shows all available attributes which can be added to the layout. The Selected columns box shows the list of already selected attributes.

## Operation Manual

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Clicking > adds the selected attributes to the Selected columns list. Clicking >> adds all attributes to Selected columns list. Clicking < removes the selected attributes from the Selected columns list. Clicking << removes all attributes from the Selected columns list.

The column position within the Legend table can be changed by moving the selected column upwards or downwards using the Up/Down buttons.

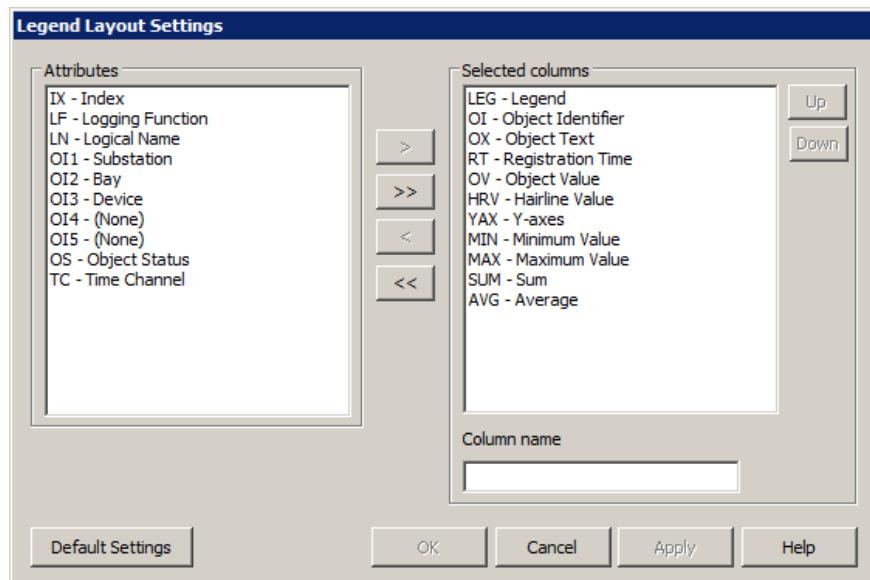


Figure 9.20: Legend layout settings dialog

- **Default Settings** restores the default installation settings.
- **OK** applies all the pending changes and closes the dialog.
- **Cancel** discards all the pending changes and closes the dialog but does not cancel or undo changes that have already been applied.
- **Apply** applies all the pending changes but leaves the dialog open.
- **Help** opens the help window.

### Renaming the column header

Select the column from the list of selected columns. Enter the new name to the column name field and click the icon.

Select the **OK** or **Apply** button to activate all modifications.

### General Legend settings

The general Legend settings can be configured by selecting **Settings > Display Settings > Legend General Settings** or from the Legend context menu.

## Operation Manual

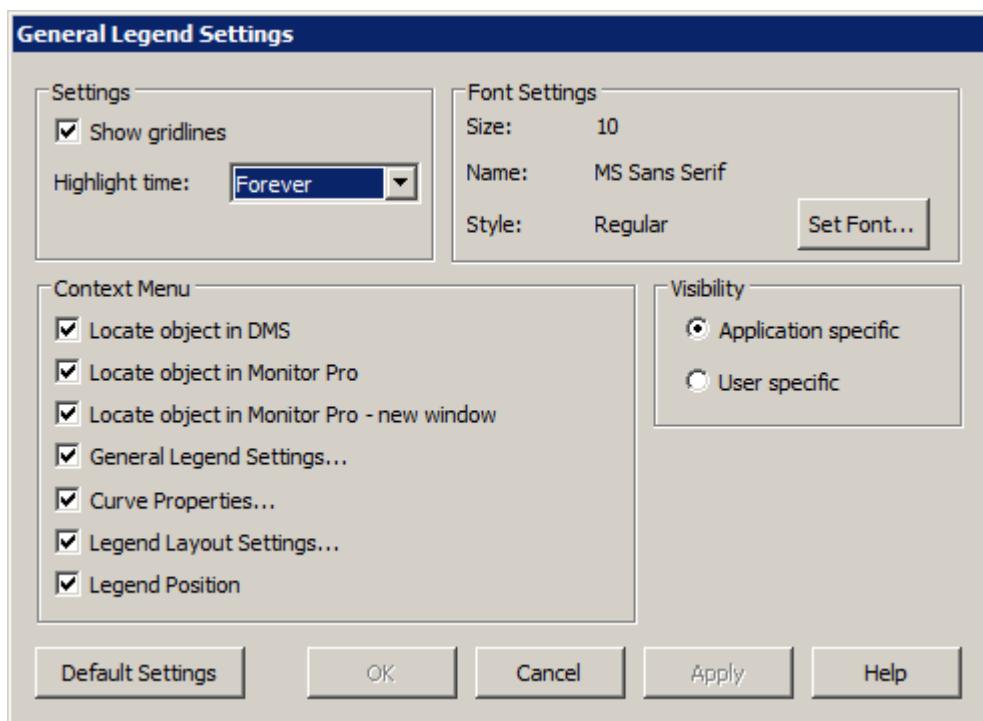


Figure 9.21: General Legend settings dialog

**Table 9.8: General Legend settings**

Settings	Description
Show gridlines	Enable/Disable gridlines for Legend area
Highlight time	The time a selected curve gets highlighted. Selectable options are: never, forever or defined time in steps of 5 seconds in the range from 5 to 60 seconds.
Set Font	Font style and size used for the Legend area
Context menu items	Configure the context menu items for the legend area
Visibility	Visibility is configured to be either Application or User specific

**Copying selected data to clipboard**

Selected Trend data from the graphical view can be copied to the clipboard of the operating system.

Activate the selection mode  from the Zoom toolbar.

Select the desired Trend data area with the mouse. After the mouse button is released, a dialog confirms that the data has been copied to the clipboard.



Figure 9.22: Copy to clipboard confirmation

If an empty area is selected, the following dialog is shown.



Figure 9.23: No data available for copy to clipboard

When the selection is pasted to the clipboard, the data is divided into several sections, where each section has a header and contents of each selected Trend data.

## 9.5

### Tabular view

Up to twenty Trends can be presented in the tabular view at the same time.

Each Trend is shown in a separate page.

The tabular view contains the following columns:

- Index column
- Time column
- Value column
- Status column

## Operation Manual

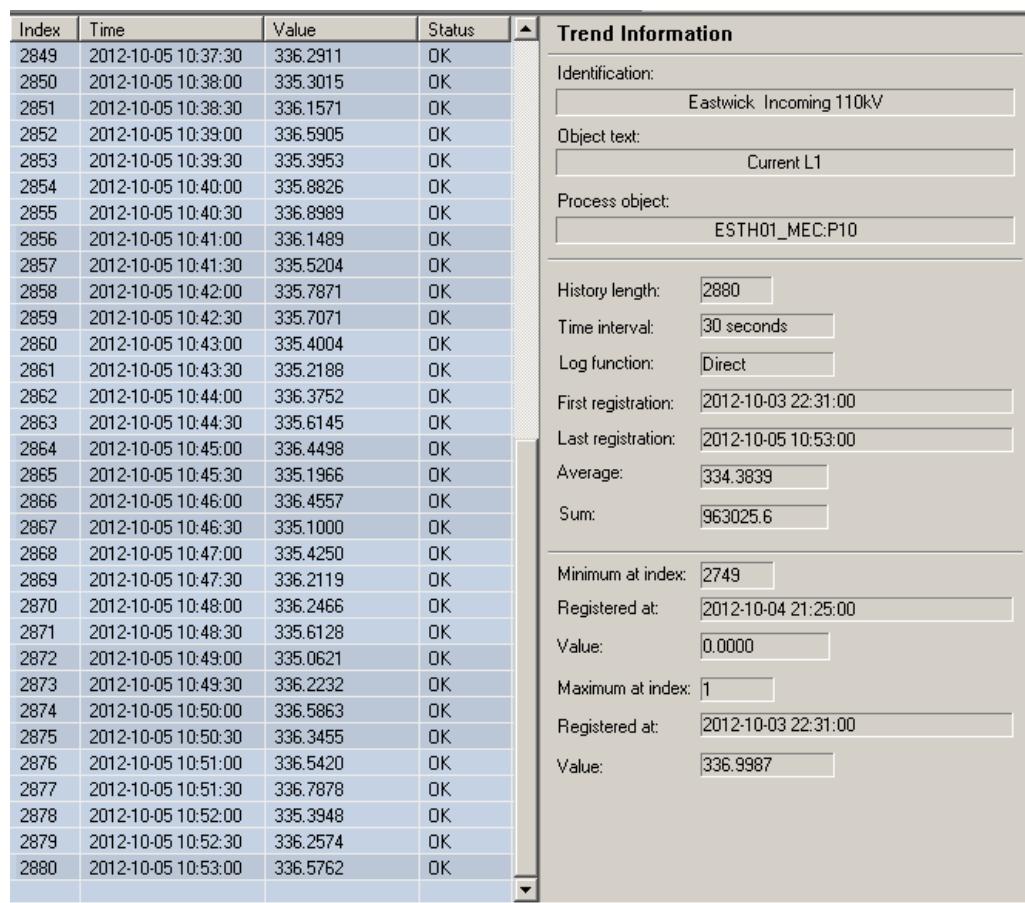


Figure 9.24: Tabular view of Trends

Trend values, registration time and status are shown on the list. Other Trend parameters, for example object text, time interval, logging function and statistics, are shown on the right side.

The Status column provides a clear text description for the status of the trended data.

**Table 9.9: Tabular view, status column**

Status column	Description
OK	The Trend data has been registered under good conditions.
Suspicious	The source of the Trend data has been marked as suspicious, e.g. if the input card has some failure.
Obsolete	The source of the Trend data has been marked as obsolete (not up to date), e.g. if the connection to the data collection device has been lost.
Faulty time	The source of the Trend data has an inaccurate time stamp because of time synchronization.
Man. Entered	This Trend data has been manually entered by an operator.

Status column	Description
Not sampled	The source of the Trend data never had a valid value, e.g. after system start before the connection with data collection device is established.

## General settings

The **General Settings** dialog can be opened either by clicking the appropriate Main toolbar button  or by selecting **Settings > Display Settings**.

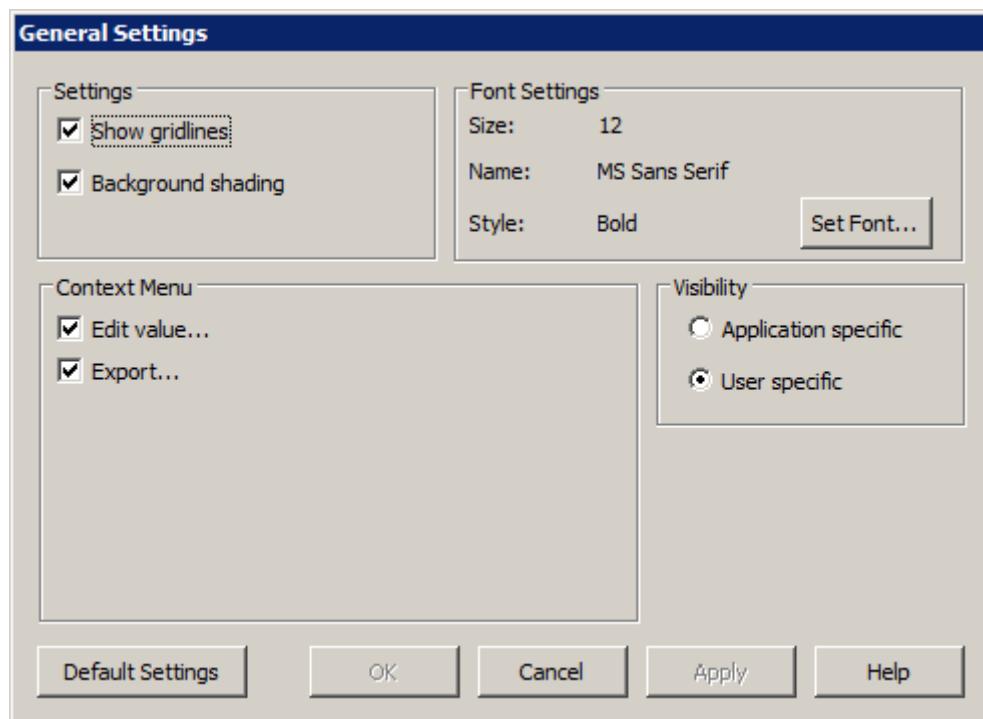


Figure 9.25: General Settings

Table 9.10: Tabular view, General Settings

Settings	Description
Show gridlines	Enable/Disable gridlines for tabular data area
Background shading	Enable/Disable the row shading effect
Set Font	Font style and size used for the tabular data area
Context menu items	Configure the context menu items for the tabular data area
Visibility	Visibility is configured to be either Application or User specific

## Navigation

The **Navigation** toolbar buttons from left to right are:

## Operation Manual

- Clear Current Trend Log
- Shift to First
- Shift to Previous
- Shift to Next
- Shift to Last
- Select Day Period

*Figure 9.26: Navigation toolbar***Table 9.11: Navigation toolbar functions**

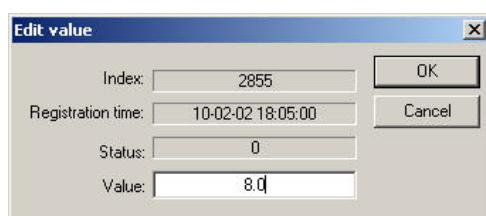
Function	Description
Clear Current Trend Log	Removes all data from the selected Trend. The sampling of new values restarts.
Shift to First	Shows the data for the first Trend.
Shift to Previous	Shows the data for the previous Trend.
Shift to Next	Shows the data for the next Trend.
Shift to Last	Shows the data for the last Trend.
Select Day Period	Opens the dialog to enter the start time and the time range.

**Editing values**

When the tabular view is active, it is possible to enter a specified Trend value manually.

To enter the value manually:

1. Right-click the specified value and select **Edit value** from the context menu or double-click the value that needs to be edited. The **Edit Value** dialog is displayed.

*Figure 9.27: Edit value dialog*

2. The text fields of this dialog show the index, registration time, status and current value of the selected registration. Type a new value into the **Value** field.
3. Click **OK** to change the new value to the Trend. To leave the value unchanged, click **Cancel**.



The Status column text is changed to "Man. Entered".

### Copying selected data to the clipboard

The data selection can be done by using one of the three methods:

1. To select the successive values, click the first row of the reported item to be selected, press the SHIFT key down and click the last row of the reported item.
2. To select the specific values, click the first row of the reported item to be selected, press the CTRL key down and click more specific rows of the reported items.
3. To select all, press CTRL+A.



When the selection is done, select the appropriate button from the **Main** toolbar or press CTRL+C.

When pasting the selection to the clipboard, the data is divided into several sections, where each section has a header and contents of each selected report item.

## 9.6

### Preconfigurations

The current Trend settings can be saved in a preconfiguration (see Figure 9.28). The following properties will be saved:

- Background color of the graphical form
- Colors and styles of the X and Y axes
- Text fonts of the axes
- Trend curve colors and styles
- Trend curve marker colors and styles
- Trend curve title fonts
- Visibility and position of the legend in the graphical view
- Visibility of the Trend curves
- Auto scaling of Y axes
- Type of the curves in the graphical view
- Legend settings
- Curve properties from global settings selection

Saving the current Trend settings can be done by selecting **Main > Save**, or by clicking the appropriate Main toolbar button . The **Save Preconfiguration** dialog is displayed, see Figure 9.28.

To create a new preconfiguration, a new name must be entered in the **Name** field and it must be saved.

To replace an existing preconfiguration with the current Trend settings, the existing preconfiguration name must be selected and **Save** button clicked.

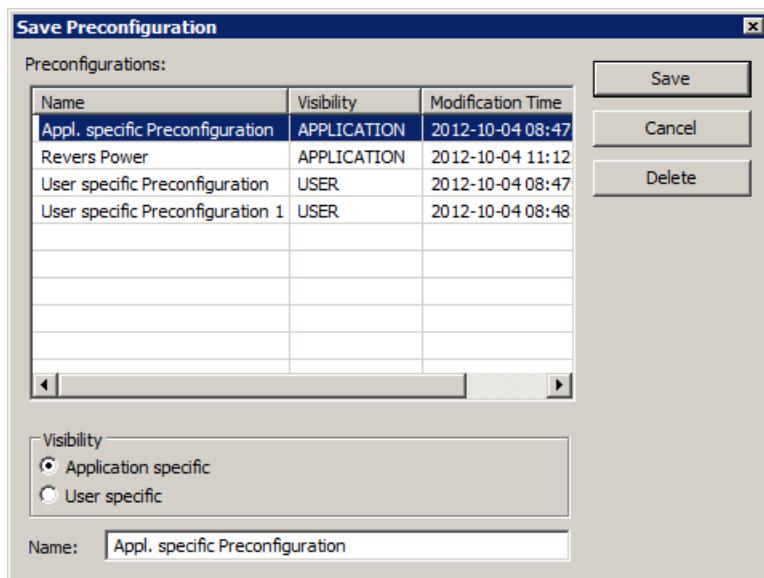


Figure 9.28: Save Preconfiguration dialog

All the saved application specific preconfigurations are available for all users working with a certain application. Each user can save individual preconfigurations by selecting the **User specific** preconfiguration visibility checkbox.

The Monitor Pro Menubar item **Navigate > Trends** shows all available preconfigurations.

All the application and user specific preconfigurations are displayed as a submenu of this command. User specific preconfigurations are only visible for the creator of the preconfiguration.

Additionally, it is also possible to open preconfigurations using the appropriate button



from the **Main** toolbar. The **Open Preconfiguration** dialog is displayed. On appropriate preconfiguration name selection and clicking the **Open** button the preconfiguration is loaded and all the parameters are applied to the Trends Display.

To delete an existing preconfiguration the name must be selected in the **Save Preconfiguration** or **Open Preconfiguration** dialog. Clicking the **Delete** button will remove the preconfiguration.

## 9.7

## Exporting Trends

It is possible to save the selected Trend data to a file in .CSV format. In .CSV format, the separator between the columns is retrieved from the system settings. It can be changed in Windows control panel > Region and Language > Additional settings... > Customize Format numbers tab > List separator.

To export data:

## Operation Manual

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1. Select **Export** item from the Trends menu or from the right-click context menu.  
The **Save As** dialog opens.
2. Select a folder and file name for the selection.
3. Click the **Save** button to export the data.

The exported text file contains the header information, curve statistics and curve values. A curve value includes an index, the time, value, and status.

To open the export file with e.g. Microsoft Excel, select **Format > Cells > Text** (in the Category list) to display the format correctly.

## 9.8

### Printing Trends

Printing the Trend data either in the tabular view or in the graphic view can be done by selecting **Main > Print** from the menubar or by clicking the appropriate button from the **Main** toolbar. The current Trend registration values are printed as shown on the left side list of the tabular form. The Trend information from the right side of the tabular form will be printed on the last page.

When printing from the graphic view, the printout is exactly the same as shown in the graphical view at that moment. The legend information will be printed on the last page.

## 9.9

### Authorizing

Trends Display follows the authorization concept of MicroSCADA Pro. The authorization level is checked from the authorization group TrendS. If this authorization group does not exist, the authorization level of the group GENERAL is used.

The following functions in the Trend views require at least Control (1) authorization level:

- Changing Graph Settings
- Manually entering values



To be able to clear the Trend data, the Engineering level (2) is required.

## 10

# Measurement Reports

Measurement Reports provide an interface for showing measured values for further data analysis in the application. It can be used for monitoring time related follow ups of the process as well as measured or calculated data. It shows the history of these values and the entering values. The reports are meant for various types of time related reports, for example hourly, daily, weekly, monthly and yearly reports.

Generally, all types of data can be illustrated as reports. All data for the reports is calculated and stored in real time. The report data is collected and calculated cyclically. The most common method is to collect raw data from the process, refine it and store it in the report database. Measurement Reports can be used, for instance, in reporting the following:

- Energy (active, reactive)
- Current (for example bay level)
- Voltage (for example bay level)
- Frequency
- Temperature
- District heating

All data values in the report can be presented either in tabular (numerical) or in a graphical view. The contents and the reprocessing of data has been defined during the configuration of the Measurement Reports, which is described in the Application Design manual. During runtime, the collected data may be updated due to the following reasons in the application:

- At predefined time intervals
- As a calculation result

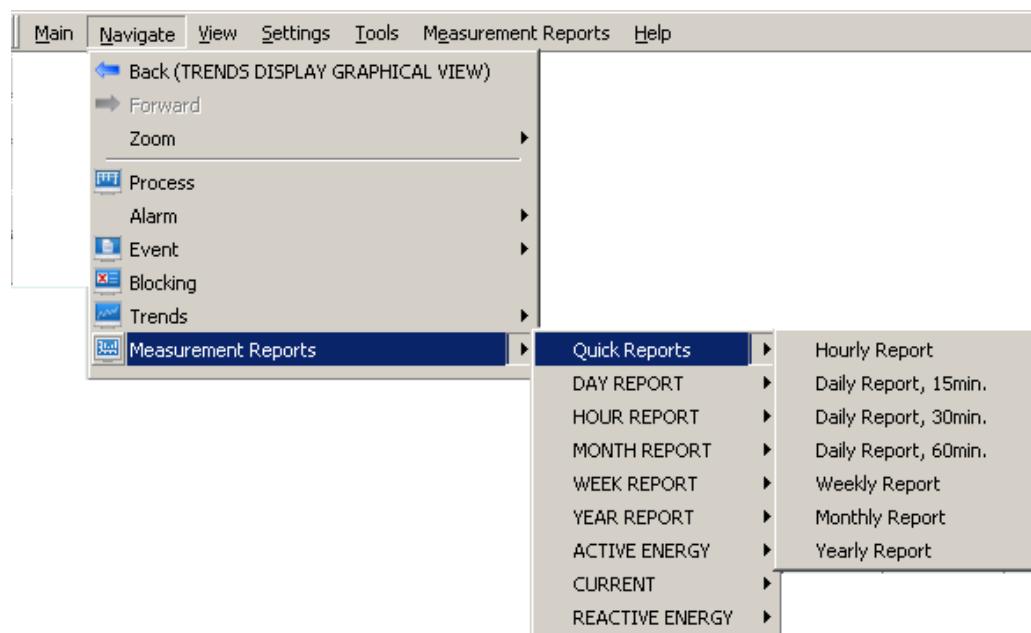
Measurement Reports contain the following features:

- All types of process objects illustrated as reports
- All types of process objects illustrated as reports- demo
- Graphical or tabular view modes
- Zooming mode
- Scrolling with scroll bars and panning
- Configurable axes and line properties
- Using legend and hairline
- Report types with different time resolution (hourly, daily, weekly, monthly, yearly)
- Quick report type with different time resolution (hourly, daily weekly, monthly, yearly)
- Load duration curves
- User specific and application specific preconfigurations

### 10.1

## Starting Measurement Reports Display

Start Measurement Reports by selecting **Navigate > Measurement Reports** and select the appropriate report type (see Figure 10.1).



*Figure 10.1: Default opening of the Measurement Reports displays*

The Measurement Reports menu structure is dynamic and application/customer specific. It may differ from the example shown in Figure 10.1.

## 10.2

### The user interface

The report data can be presented in a tabular or in a graphical view. These two views share the same report database. Both views also share some of the toolbars and the Measurement Reports menu. In addition, some basic information about the selected Measurement Report display will be shown in both views.

#### 10.2.1

##### Measurement Reports Display toolbars

Measurement Reports has four toolbars. Three toolbars are used for both views and one is dedicated for the graphical view.

With the first Measurement Reports start all toolbars are visible. Toolbars can be shown or hidden through the **Settings > Customize** mode. It is possible to add or remove buttons on the toolbars the same way as described in Section 3.4.2 Changing application layout.

The Measurement Reports Main toolbar buttons from left to right are as follows:

- Open Preconfiguration
- Save Preconfiguration
- Print Display
- Copy to Clipboard from Selected Display
- Find in Selected Display

**Operation Manual**

- Show Display Settings
- Show Help

*Figure 10.2: Main Toolbar***Table 10.1: Main Toolbar functions**

Function	Description
Open Display Preconfiguration	Opens the <b>Open Preconfiguration</b> dialog.
Save Preconfiguration	Opens the <b>Save Preconfiguration</b> dialog.
Print	Prints the selected report to a network printer or a specified output file.
Copy to Clipboard	Copies the selected visible report data to the operating system clipboard.
Find	This function is disabled for the Measurement Reports views.
Display Settings	Opens a sub-menu with the following items: - General Legend Settings... - Graph Settings... - Legend layout Settings...
Help	Opens the Help dialog.

The Measurement Reports display toolbar buttons and drop-down lists from left to right are as follows:

- Switch updating/frozen mode
- Refresh
- Show/hide report data
- Switch tabular/graphical view
- Select report page
- Select time interval

*Figure 10.3: Display Toolbar*

## Operation Manual

**Table 10.2: Display Toolbar functions**

Function	Description
Switch between updating and frozen mode	 indicates the update mode as active mode. Clicking this button will change to the frozen mode.  indicates the frozen mode as active mode. Clicking this button will change to the update mode.
Refresh	Forces a display refresh.
Show/hide report data (curves)	Open the show/hide dialog, where the user can select which data to show in the current view.
Switch tabular/graphical view	 The graphical view is active. Clicking this button will change to the tabular view.  The tabular view is active. Clicking this button will change to the graphical view.
Select report page	The items to select with this drop-down list are different depending on the selected Report display type. For configured standard Report pages: contains all existing and configured pages for the selected Measurement Report display. For Quick-Reports pages: contains all existing Quick-Report preconfigurations for the selected Quick Report display. The * character indicates the default configuration used in the selected Quick Report display.
Select time interval	This drop-down list is only enabled for the hourly base Quick Report display. It contains a list of all used sampling time intervals.

The Measurement report Navigation toolbar buttons from left to right are as follows:

- Go to first available period
- Go to previous period
- Go to next period
- Go to last available period
- Select period

**Figure 10.4: Navigation toolbar**

***Table 10.3: Navigation toolbar functions***

Function	Description
Go to first available period	Navigates to the first available period in the report. If the current period is already the first, the button will be dimmed.
Go to previous period	Navigates to the previous period in the report. If the previous period is outside the history area, the previous period button will be dimmed.
Go to next period	Navigates to the next period in the report. If the next period is outside the history area, the next period button will be dimmed.
Go to last available period	Navigates to the last available period in the report. If the current period is already the last, the button will be dimmed.
Select period	Opens the Select Date dialog from which the target period for the report can be selected.

Browse backwards and forwards in time by one hour, day, month or year at a time. The browsing interval is related to the time relation of the report type. To browse backwards, click the previous hour/day/week/month (arrow left). To browse forward, click the next hour/day/week/month (arrow right). The same selections can be made from the menu bar. The values from the previous or next interval are fetched and displayed.

Select a specific hour, day, month or year in the Select Period dialog. The selection is related to the time relation of the report type. To open the Select Period dialog, click the date sheet symbol.

## 10.2.2

### Measurement Reports Display menus

The toolbar commands can be selected from the Measurement Reports menu (see Figure 10.5 and Figure 10.6). Some of the menu items are active only for the graphical view.

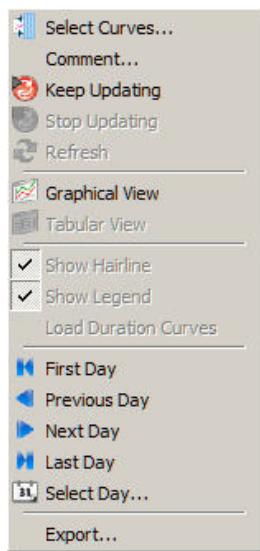


Figure 10.5: Measurement Reports menu for the tabular view

The menu for the tabular view contains the same commands as the toolbars.

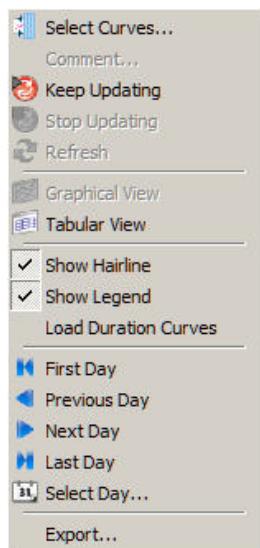


Figure 10.6: The Measurement Reports menu for the graphical view

In addition to the toolbars, the following functions are available from the menu:

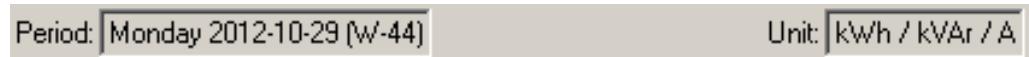
- Show/Hide Hairline
- Load duration curves
- Export...

For more information about the commands, see Section 10.3 Graphical view.

**10.2.3****Measurement Reports Display header**

The header contains the following information fields from left to right:

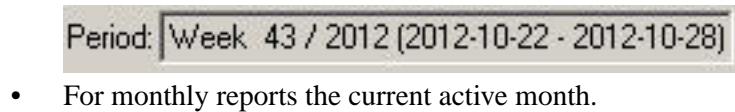
- Period field
- Measurement Unit information



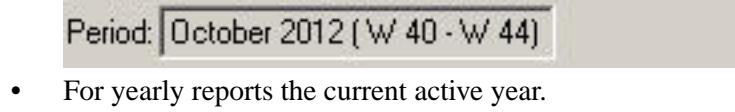
*Figure 10.7: Measurement Reports header*

The Period field gives information about the date/time range for the current visible data. The field content depends on the current active report type:

- For hourly and daily reports the current active day, as shown in Figure 10.7.
- For weekly reports the current active week.



- For monthly reports the current active month.



- For yearly reports the current active year.

**10.3****Graphical view**

In the graphical view, up to twenty measurements can be presented on a two dimensional coordinate system that consists of a horizontal time (X) axis and a vertical value (Y) axis. The curves can be panned both in the X and Y directions and the parameters of the Y axis can be changed. All the curves can be hidden from the view with the dialog.

The horizontal (X) axis of the graphical view represents the time of the measurement, and the vertical (Y) axis represents the value of the measurement. The X axis is divided into intervals specific to the related period. The time of every interval point is labeled below the X axis. The amount of the shown interval points depends on the zooming level.

The Y axis is automatically divided into intervals according to the registered values. The quarter point values of the Y axis are marked on the left side of the Y axis.

## Operation Manual

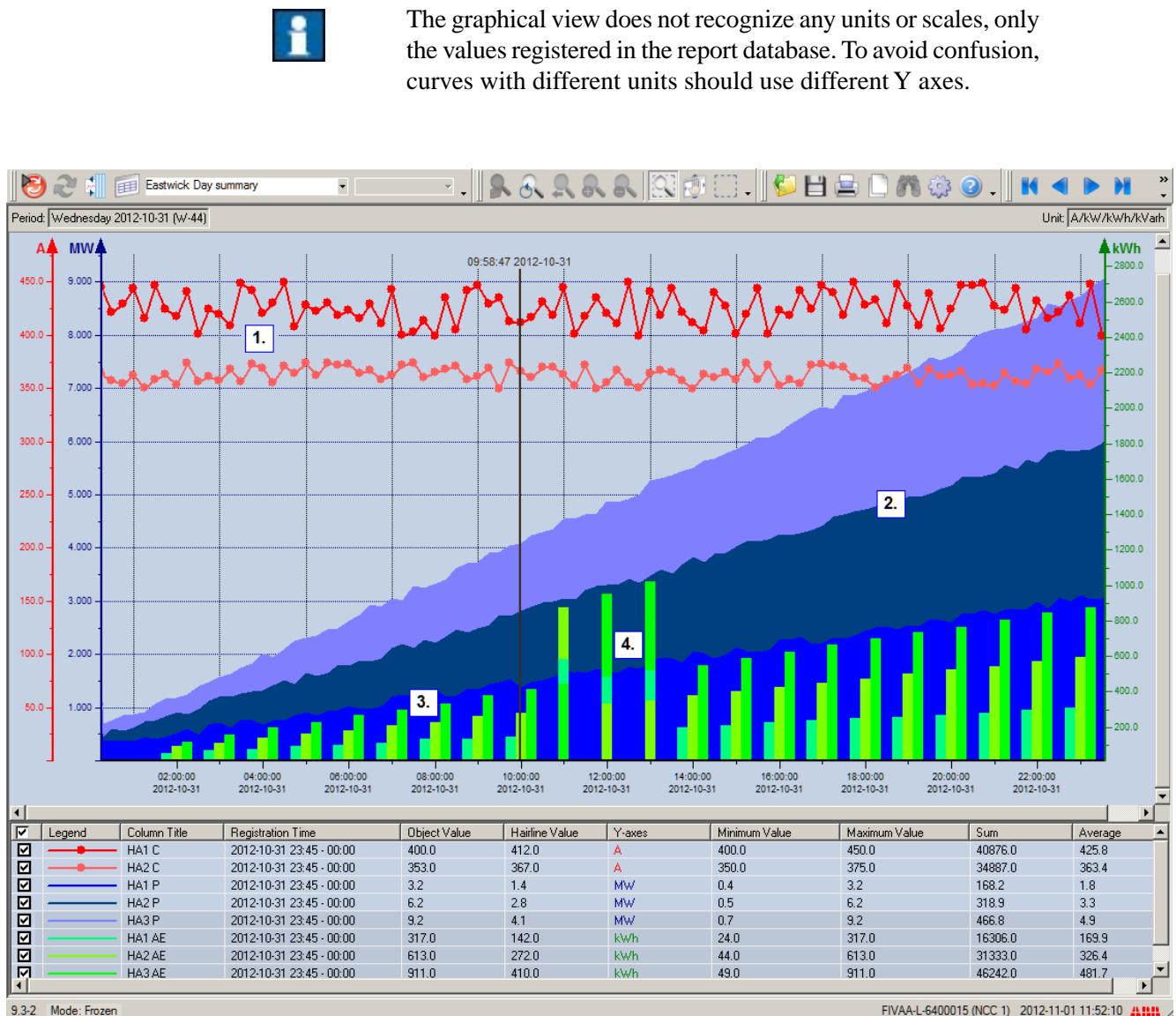


Figure 10.8: Graphical view

The graphical view has the following functional areas:

- The plot area where the report data will be shown.
- The legend area shows part of the visible curve properties (optional, can be hidden with the dialog).

For the plot area, the following curve typesFigure 10.8 can be chosen:

1. Plot (default)
2. Area (fills the area between two selected curves or between a curve and the X or Y axis)
3. Bar
4. Stacked bar

The curve type can be configured with the dialog.

The legend show up can be disabled with the dialog or from the Measurement Report menu. The legend area shows for all visible curves the following default information:

- Column title (Report object name)
- Line color
- Marker shape
- Registration time and value for the last available from the selected view
- Hairline value
- Selected Y axis for enabled curves
- Summary information as e.g. minimum and maximum value.

The legend position can be changed with the dialog or in Help of the legend context menu.

The graphical view has the same main functionality as used for the Trends Display.

Information about:

- Scrolling, panning and zooming
- The Hairline function
- The Graph settings
- The Legend

can be found in Section 9.4 Graphical view.

### **Load duration curves**

It is possible to toggle between load curves and load duration curves in the graphical form. The Load Duration Curves mode can be enabled from the Measurement Reports menu.

## **10.4**

### **Tabular view**

In the tabular view, up to fifty measurements can be presented at the same time. Recommendation is to not use more than twenty. Each measurement is shown in an individually configured report column.

The tabular view contains the following columns:

- Comment column
- Time column
- A set of report data columns
- A set of summary information columns

The default accuracy of the report columns is two decimals, but it may be individually set for each column during the report configuration.

If a measurement data registration has an uncertain or an obsolete status, the corresponding cell is represented with the character "?" (see 1. in Figure 10.9). Manually entered values are indicated with the character "m" (see 2. in Figure 10.9).

## Operation Manual

If a measurement data registration is not sampled or has an erroneous status, there is no value available (see 3. in Figure 10.9).

Time (Note)	Incoming HA1	Outgoing HA2	Outgoing HA3	Outgoing HA4	Outgoing HA5	Outgoing HA6	Outgoing HA7
00:00 -	322.48	68.63	0.00	0.00	93.78	59.74	100.33
00:15 -	322.06	68.50	0.00	0.00	93.63	59.68	100.25
00:30 -	321.92	68.46	0.00	0.00	93.60	59.67	100.20
00:45 -	321.56	68.32	0.00	0.00	93.48	59.62	100.14
01:00 -	321.33	68.29	0.00	0.00	93.40	59.58	100.05
01:15 -	322.53	68.64	0.00	0.00	93.79	59.75	100.34
01:30 -	322.11	68.52	0.00	0.00	93.66	59.69	100.24
01:45 -	321.96	68.45	0.00	0.00	93.62	59.68	100.22
02:00 -	321.55	2. 68.55 m	0.00	0.00	93.48	59.62	100.11
02:15 -	322.27	68.56	0.00	0.00	93.70	59.71	100.30
02:30 -	322.93	68.73	0.00	0.00	93.92	59.80	100.47
02:45 -	322.70	68.69	0.00	0.00	93.85	59.77	100.39
03:00 -	1. 322.42 ?	68.59	0.00	0.00	93.73	59.74	100.36
03:15 -	322.11	68.52	0.00	0.00	93.66	59.69	100.24
03:30 -	321.93	68.42	0.00	0.00	93.62	59.68	100.22
03:45 -	321.55	68.35	0.00	0.00	93.48	59.62	100.11
04:00 -	322.59	68.45	3.	0.00	93.81	59.76	100.36
04:15 -	322.86	68.69	0.00	0.00	93.92	59.80	100.44
04:30 -	322.70	68.69	0.00	0.00	93.85	59.77	100.39
04:45 -	322.34	68.55	0.00	0.00	93.73	59.72	100.33
05:00 -	322.11	68.52	0.00	0.00	93.66	59.69	100.24
05:15 -	321.85	68.42	0.00	0.00	93.58	59.66	100.19
05:30 -	321.55	68.35	0.00	0.00	93.48	59.62	100.11
05:45 -	322.59	68.66	0.00	0.00	93.81	59.76	100.36
06:00 -	322.77	68.69	0.00	0.00	93.85	59.79	100.44
06:15 -	322.70	68.69	0.00	0.00	93.85	59.77	100.39
06:30 -	322.27	68.52	0.00	0.00	93.73	59.72	100.30
06:45 -	322.11	68.52	0.00	0.00	93.66	59.69	100.24
07:00 -	321.77	68.39	0.00	0.00	93.55	59.65	100.19
07:15 -	321.55	68.35	0.00	0.00	93.48	59.62	100.11
07:30 -	322.91	68.73	0.00	0.00	93.93	59.80	100.45
07:45 -	322.70	68.69	0.00	0.00	93.85	59.77	100.39
Mean	322.26 ?	68.55 m	0.00 ?	0.00	93.71	59.71	100.29
Min	321.33 ?	68.29 m	0.00 ?	0.00	93.40	59.58	100.05
Max	323.22 ?	68.80 m	0.00 ?	0.00	94.04	59.85	100.53

Figure 10.9: The Tabular view

The measured column shows the report data as defined in the Report Page Configuration. The measurements can be based on the measurements of the process, manually entered or calculated values.

## General settings

The **General Settings** dialog can be opened either by clicking the appropriate Main toolbar button  or by selecting **Settings > Display Settings**.

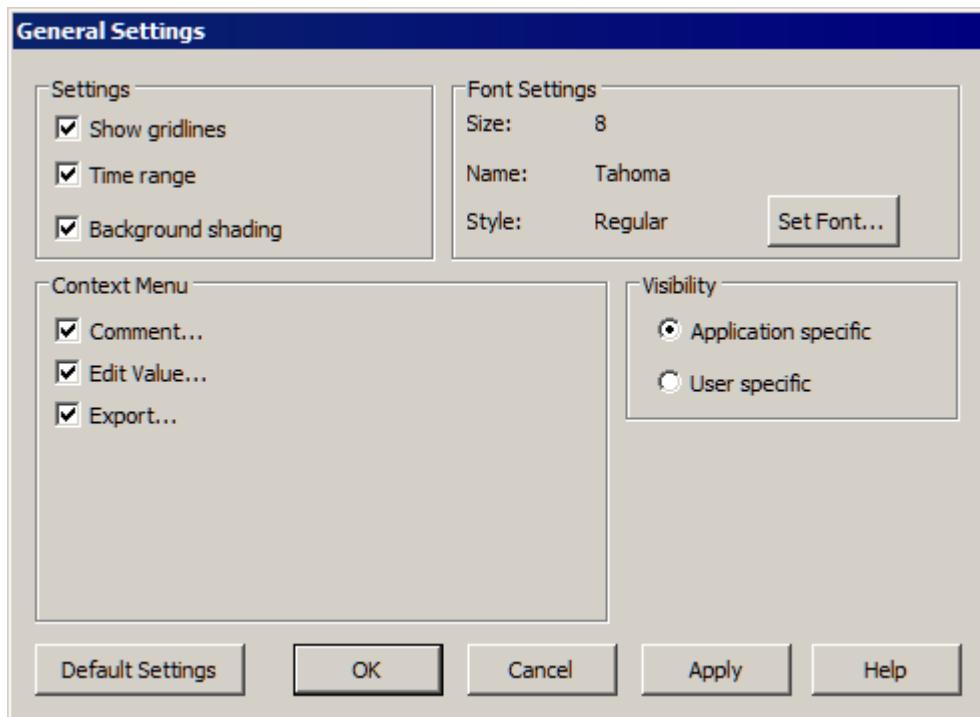


Figure 10.10: General Settings

**Table 10.4: Tabular view, General Settings**

Settings	Description
Show gridlines	Enable/Disable gridlines for tabular data area
Time range	If selected the period start and end time will be shown in the time column else only the period start time
Background shading	Enable/Disable the row shading effect
Set Font	Font style and size used for the tabular data area
Context menu items	Configure the context menu items for the tabular data area
Visibility	Visibility is configured to be either Application or User specific

## Daylight saving leap hour data

All data sampled and calculated during the one hour transition from daylight saving time to standard time will be stored on a separate location and made available in all DAY reports as shown in below figure.

Operation Manual

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Period: Sunday 2013-10-27 (W-43)					
Comment	Time	Min	Max	Mean	Sum
	02:00 - 02:15	2702.01	2702.01	2702.01	2702.01
	02:15 - 02:30	2702.16	2702.16	2702.16	2702.16
	02:30 - 02:45	2702.31	2702.31	2702.31	2702.31
	02:45 - 03:00	2702.46	2702.46	2702.46	2702.46
	03:00 - 03:15	316.00	316.00	316.00	316.00
	03:15 - 03:30	317.00	317.00	317.00	317.00
	03:30 - 03:45	318.00	318.00	318.00	318.00
	03:45 - 04:00	319.00	319.00	319.00	319.00
	03:00 - 03:15	2703.01	2703.01	2703.01	2703.01
	03:15 - 03:30	2703.16	2703.16	2703.16	2703.16

Figure 10.11: Leap hour data presentation

The data from that extra hour are also included in the summary information calculation.

**Operation Manual****Time column**

The following figures show and explain the different time column formats based on the selected Report Display base type.

**Hour report, time interval 3 minutes**

11:00 -	-343
11:03 -	-689
11:06 -	-343
11:09 -	-686
11:12 -	-343

The indication in the time column is shown as time, for example 11:03 or 11:06.  
The time indicates the period begin.  
In the example to the left, "11:00 -" indicates the period from 11:00 to 11:03.  
The sampling time for this period was at 11:03.

**Day report, 15 minutes period**

00:00 -	321.63
00:15 -	322.31
00:30 -	322.93
00:45 -	322.88
01:00 -	322.39

In the daily reports, the time resolution is 15, 30 or 60 minutes.  
The indication in the time column is shown as time, for example 00:00 or 00:15.  
The time indicates the period begin.  
In the example to the left, "00:00 -" indicates the period from 00:00 to 00:15.  
The sampling or calculation time for this period value was at 00:15.

**Week report**

Monday	-222474
Tuesday	-221783
Wednesday	-222662
Thursday	-223209
Friday	-223114

In the weekly reports, the indication in the time column is the day of the week, for example Monday or Tuesday.

**Month report**

1	-223.246
2	-223.208
3	-223.200
4	-223.111
5	-221.922

In the monthly reports, the indication in the time column is the day of the month, for example 1, 2 or 3.

## Operation Manual

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### Year report

January	332.85
February	330.77
March	330.22
April	330.13
May	329.75

In the yearly reports, the indication in the time column is the name of the month, for example January or February.

For hour and day reports, the time column can be configured in a way that the start and the end time of each period will be shown. This can be done in help of the "Time Range" parameter in the General Settings dialog.

### Editing values

Data included in the measurement reports can be edited in the tabular view with the Edit Value dialog, if an appropriate command is accessible in the user's authorization.

Manually edit value is only possible in Day report displays where the interval is equal to the Report Object base period. If, for example, Report Object base period is 15 min, then editing is only enabled in Day report displays with a 15-minute interval time.

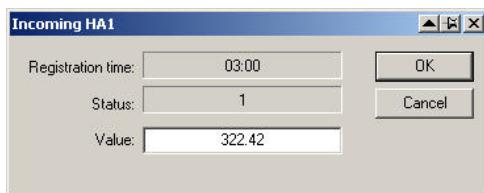
The edited values are stored into the report database, and other values, for example calculated values that depend on it, are automatically recalculated using the new value.

To enter the data registration manually:

1. Right-click the item in the report column and select Edit value from the context menu. The Edit Value dialog is displayed.



2. The text fields of this dialog show the registration time and status, and the existing value of the selected registration. Type a new value in the Value field.



3. Click OK to change the new value to the measurement report. To leave the value unchanged, click Cancel.



The color of the measurement and status field is changed to indicate that the data registration has been manually entered.

## Adding comments

A comment can be added or removed with the Comment dialog. The comment is attached to one row.

To open the Comment dialog, click the time column in the tabular format. The comment is saved to a file and the note is indicated with an exclamation mark next to the time column.

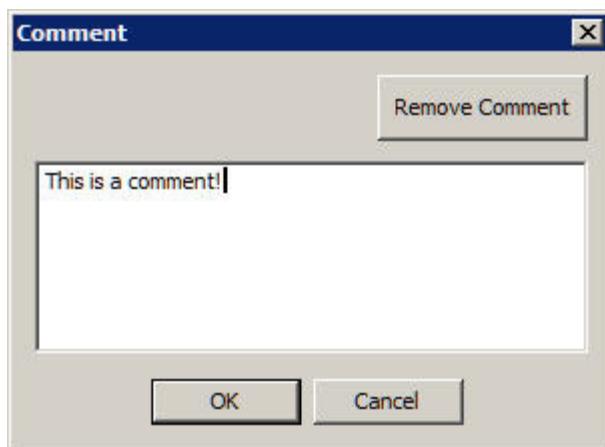


Figure 10.12: The Comment dialog

## Copying selected data to the clipboard

See Copying selected data to the clipboard, on page 138.

## 10.5

## Preconfigurations

The current Measurement Report settings can be saved in a preconfiguration. The following properties will be saved:

- Background color of the graphical view
- Colors and styles of the X and Y axes
- Colors and styles of the measurement curves
- Visibility of the legend in the graphical view
- Visibility of the measurement curves
- Auto scaling of the Y axes
- Type of the measurement curves in the graphical view
- Column widths of the tabular view
- Legend settings

Clicking the **Default** button in the Open Preconfiguration/Save Preconfiguration dialog will load the default graph, legend and legend layout settings.

Otherwise the preconfiguration handling for Measurement Reports works in a same way as for Trends, see Section 9.6 Preconfigurations.

## 10.6

### Exporting Reports

The selected report page can be saved to a file in .CSV format.

It is possible to save the selected Trend data to a file in .CSV format. In .CSV format, the separator between the columns is retrieved from the system settings. It can be changed in Windows control panel > Region and Language > Additional settings... > Customize Format numbers tab > List separator.

1. Select Export from the Measurement Reports menu. The Save As dialog is opened.
2. Specify the folder and the file name.
3. Click Save to export the data.

The exported text file contains the header information, the report time period, the unit information and the report data. When opening the export file with Microsoft Excel, select **Format > Cells > Text** (in the Category list).

This way the time format will be displayed correctly.

## 10.7

### Printing Reports

Printing the Report data either in the tabular view or in the graphic view can be done by selecting **Main > Print** from the menu bar or by clicking the appropriate button from the **Main** toolbar. The summary information from the bottom of the tabular form will be printed on the last page.

When printing from the graphic view, the printout is exactly the same as shown in the graphical view at that moment. The legend information will be printed on the last page.

## 10.8

### Authorizing

Measurement reports follow the authorization concept of MicroSCADA Pro. The authorization level is checked from the authorization group REPORTS. If this authorization group does not exist, the authorization level of the group GENERAL is used.

The following functions in the Report views require at least authorization level 1:

- Add, remove or edit comments
- Manually enter values

## 10.9

### Quick Reports

Quick Report is essentially a report browser, which is able to show all the report objects defined within the report application. The objects to be shown at a time can be selected through the Show/Hide Curve dialog.

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The current Quick Report configuration can be saved with a unique name and is available from the report page selection box.

Quick Reports are available on hourly, daily, weekly, monthly and yearly basis. The report data can be viewed both in tabular and in graphical form.



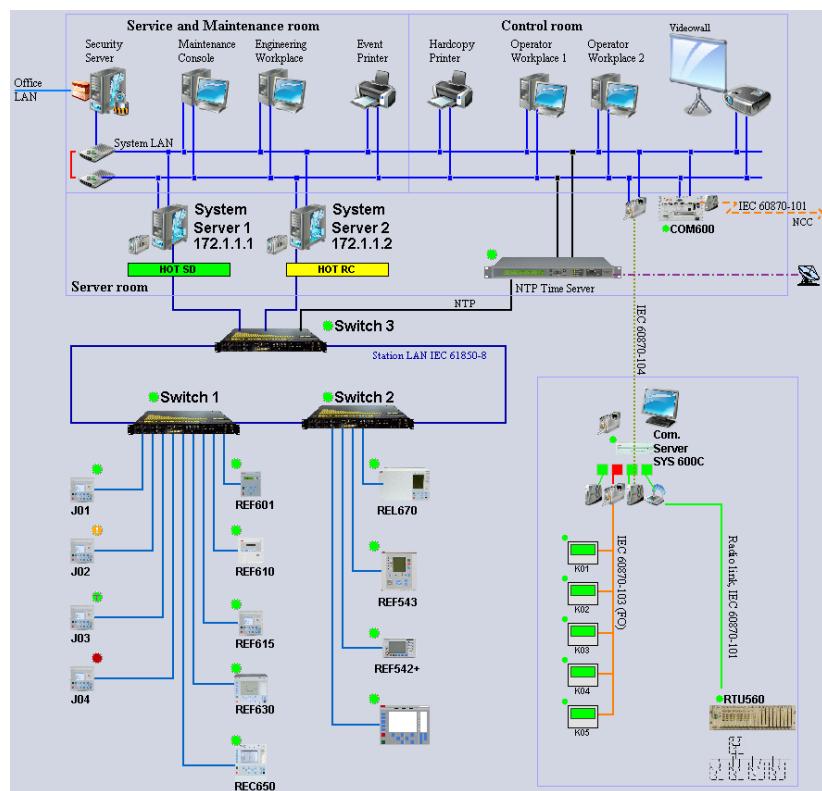
**11****System Self Supervision**

System Self Supervision (SSS) is used in MicroSCADA Pro systems for supervising and monitoring the system. It provides status information of hardware and software using the supervision symbols of SYS600.

The System Self Supervision consists of:

- supervision application objects
- supervision monitoring symbols and control dialogs
- supervision events and alarms
- supervision logging

The supervision application objects provide the source for supervision state and status information. The supervision information is shown in the Event and Alarm lists. Typically, additional system supervision display has been designed for MicroSCADA Pro system supervision purposes. Figure 11.1 shows the System Self Supervision dedicated symbols and statuses, which can be found from such a system supervision display. The supervision information is displayed in the supervision display by supervision monitoring.



*Figure 11.1: An example of a typical system supervision display*

## 11.1

### Supervision application objects

The main function of the supervision application objects is to provide the information source for the objects to be supervised. These application objects provide information for supervision monitoring symbols, appearance of information as events and alarms in the appropriate lists. Additionally, these application objects are involved in supervision logging.

## 11.2

### Supervision monitoring symbols and control dialogs

The main function of supervision monitoring is to provide the visual information about the supervised objects in a user friendly way. Supervision symbols are reflecting the states and statuses based on usage of coloring. For example, green color typically indicates a good object status, whereas red color indicates a failure status. The alarming supervision symbols are indicated by a blinking red color.

#### 11.2.1

##### Supervision symbols

About 50 symbols have been designed for system supervision purposes. These symbols are updated either as event based or time based manners by the runtime logic of supervision application objects. This way, the supervised object gets visualized by the real world object state and status in the system.

For example the following supervision symbol categories are available:

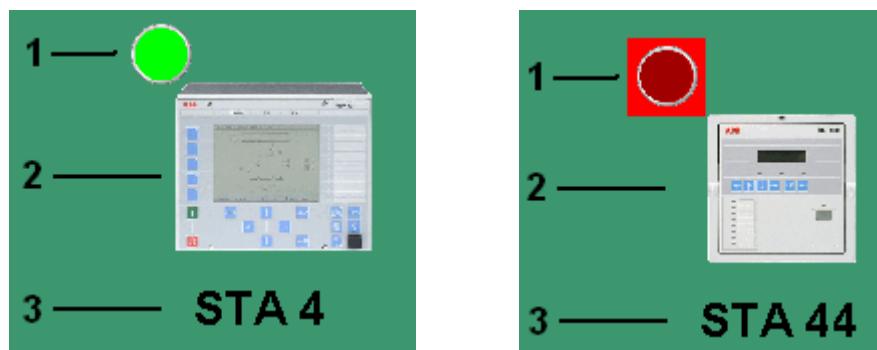
- System server
- Application
- Communication unit
- Station (IED)
- Workplace
- Computer accessories
- Network equipment
- Status

These supervision symbols are installed into the system supervision display using Display Builder. For information on the characteristics of all supervision symbols, see SYS600 Process Display design manual.

#### 11.2.2

##### Symbol appearance

Principles for supervision symbol visual design are general and used for all supervision monitoring symbols. Some supervision symbols have both the dynamic and static appearance as indicated in Figure 11.2.



*Figure 11.2: Dynamic and static appearance of supervision symbols*

A supervision symbol contains these appearances:

1. Dynamic state (circle) and status (rectangle) color indicators.
2. Static identification drawing of an object.
3. Dynamic identification text of an object.

The dynamic appearance contains both the state and status indicator of an object.

Supervision state is indicated by a green or red circle. The rectangle part of the dynamic indicator shows the status of the supervision symbol. For example, a blinking red color indicates an alarm, which has not yet been acknowledged by the operator. The following table lists the typical states and statuses that may appear for supervision symbols.

**Table 11.1: States and statuses for supervision symbols**

State and Status Indicator	Description
	Good status In good status the symbol is static green.
	Failure status with non-alarming In failure status the symbol background is blinking red. The cause for the failure status should be analyzed and corrective actions should be taken.
	Good status with Invalid Time In good status the symbol is static green.
	Unknown status In unknown status the symbol is static magenta. The cause for the unknown status should be analyzed and corrective actions should be taken.
	Warning status (warning limit has been exceeded) In warning status the symbol is static yellow. The cause for the warning status should be analyzed, because over time this object may change to failure status.
	Good status with unacknowledged alarm Symbol has been in the alarming state, but not anymore. Acknowledgement of alarm will change the symbol to Good status.

## Operation Manual

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	Failure status with unacknowledged alarm Symbol is generating an alarming state, which is still active. Acknowledgement of alarm will not change the symbol to good status. The cause for the failure status should be analyzed and corrective actions should be taken.
	Failure status with acknowledged alarm Symbol is generating an alarming state, which is still active. Alarm has already been acknowledged, but the cause for the failure status should be analyzed and corrective actions should be taken.

Association to the real world object is achieved with the static part of symbol. For example, for Station supervision, there is a variety of IED products available. Additionally, it is possible to include a Station symbol, if needed. The available supervision symbols for IED products are shown in Figure 11.3.



Figure 11.3: Supervision symbols for IED products

### 11.2.3

#### Supervision control dialogs

Supervision control dialogs are opened when the appropriate symbol in the supervision display is clicked. These dialogs have been designed to provide more information about the selected supervision object. Additionally, it is possible to perform the supervision related control operations, for example, sending general interrogation command to Station (IED) or activating the take over in HSB system. Supervision control dialog contents and authority handling for control operations can be configured.

For example, the following control dialogs are available:

- Base System Supervision
- Application Supervision
- Communication Node Supervision
- Communication Line Supervision
- Station Supervision
- SNMP Supervision

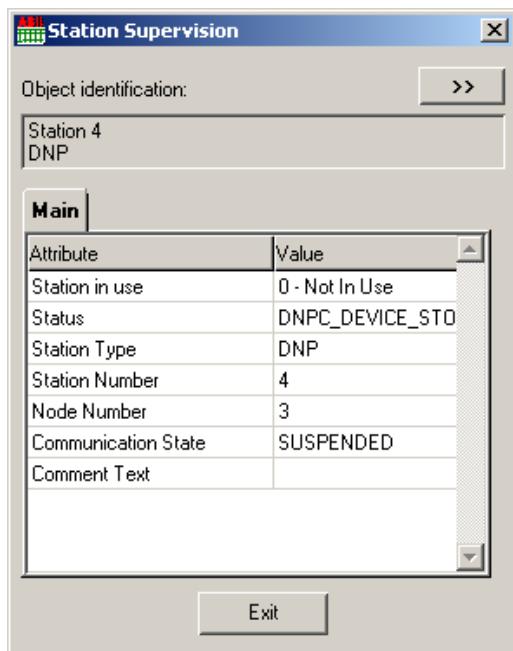
### 11.2.3.1

#### Common characteristics

Supervision control dialogs have common characteristics, such as the Power Process control dialogs. An example of Station Supervision is shown in Figure 11.4. By default, dialog shows the **Main** tab. The selected supervision object is indicated in the dialog

## Operation Manual

title and the **Object Identification** field. Detailed attribute information is shown in **Attribute** and **Value** columns. The dialog can be expanded by using the **>>** button.



*Figure 11.4: An example of a supervision control dialog*

When the dialog is expanded, additional tabs appear, see Figure 11.5. By using the tabs, it is possible to perform supervision control operations, especially in the **Control** tab. The supervision alarms for the selected object are listed in the **Alarms** tab. In this tab, it is possible to acknowledge selected or all alarms. Also other tabs may exist, for example **Diagnostics**, where typical operations are resetting the counter values with the appropriate buttons.

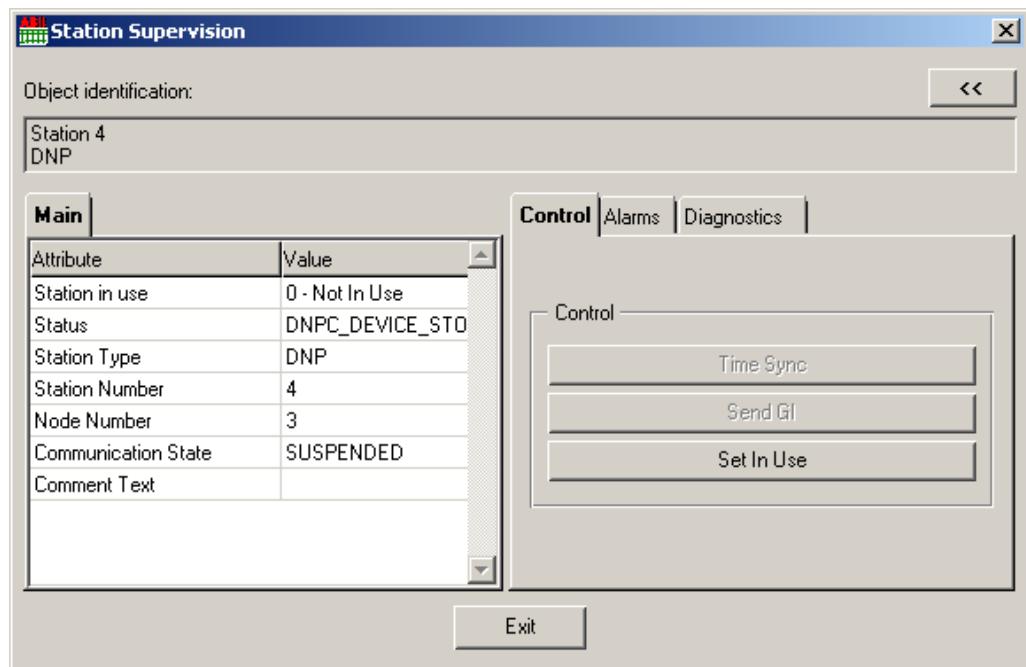
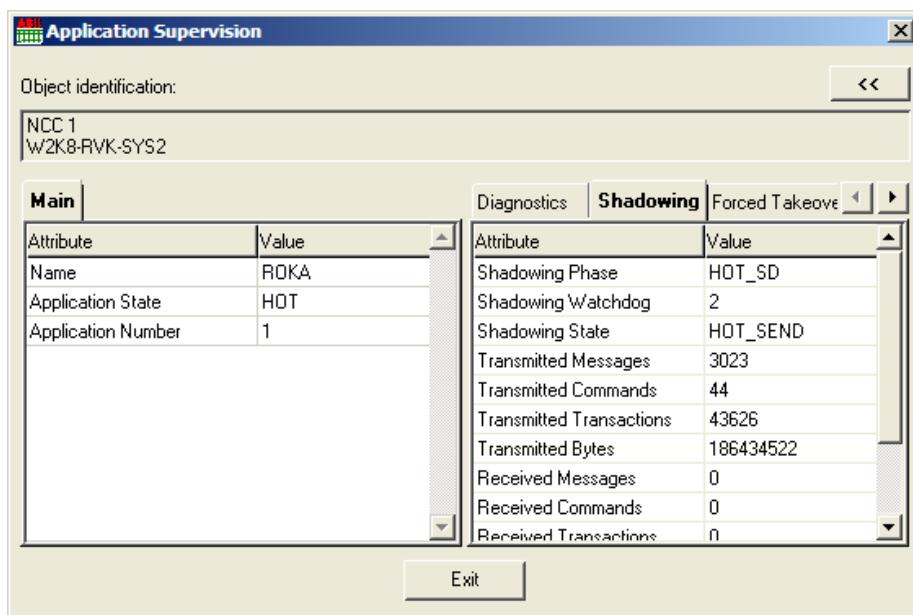


Figure 11.5: Expanded station supervision control dialog

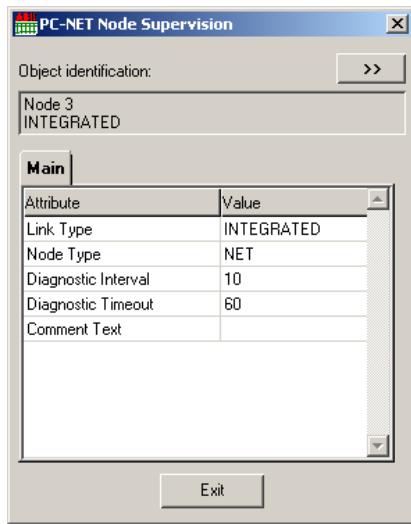
#### 11.2.3.2 Application supervision

The appearance of the control dialog for application supervision depends on the type of system. The **Main** and **Diagnostics** tabs are shown only for the single system, whereas the **Shadowing** and **Forced Takeover** tabs appear for a redundant system.

The **Diagnostics** and **Shadowing** tabs provide more detailed information about the application counters. In the **Forced Takeover** tab it is possible to activate the forced takeover.

**Operation Manual***Figure 11.6: Application supervision control dialog***11.2.3.3****Communication Node supervision**

There are control dialogs available for both PC-NET and IEC 61850 nodes. By default, the same attribute information is shown in the **Main** tab. Additionally, for PC-NET communication nodes, it is possible to expand the dialog to get details of each communication line.

*Figure 11.7: Communication node supervision control dialog*

### 11.2.3.4

### Communication Line supervision

Communication lines for PC-NET are shown when the PC-NET Node Supervision control dialog is expanded. Attributes for communication lines configured for selected PC-NET node are shown in separate tabs with attribute and value descriptions (for example, the **Line 5** tab).

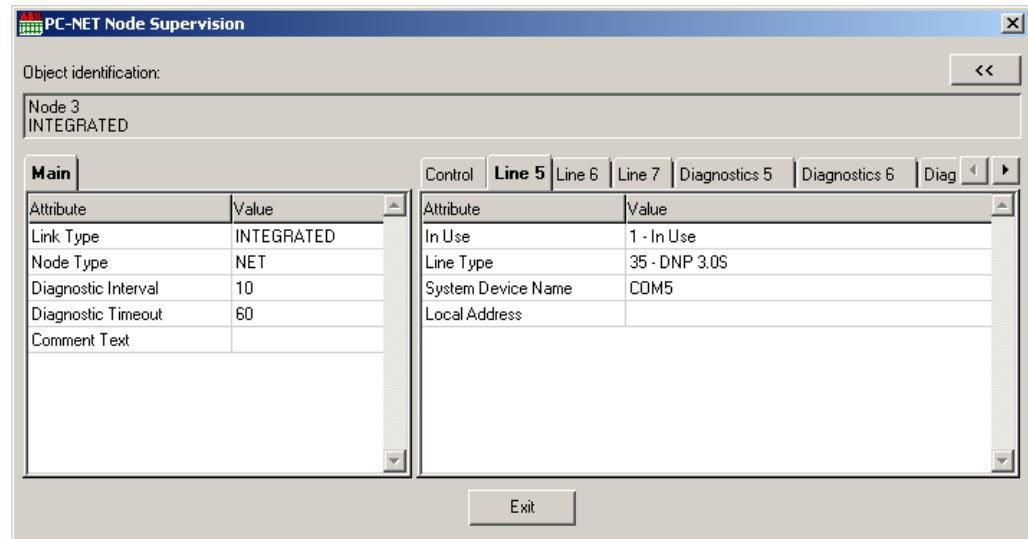
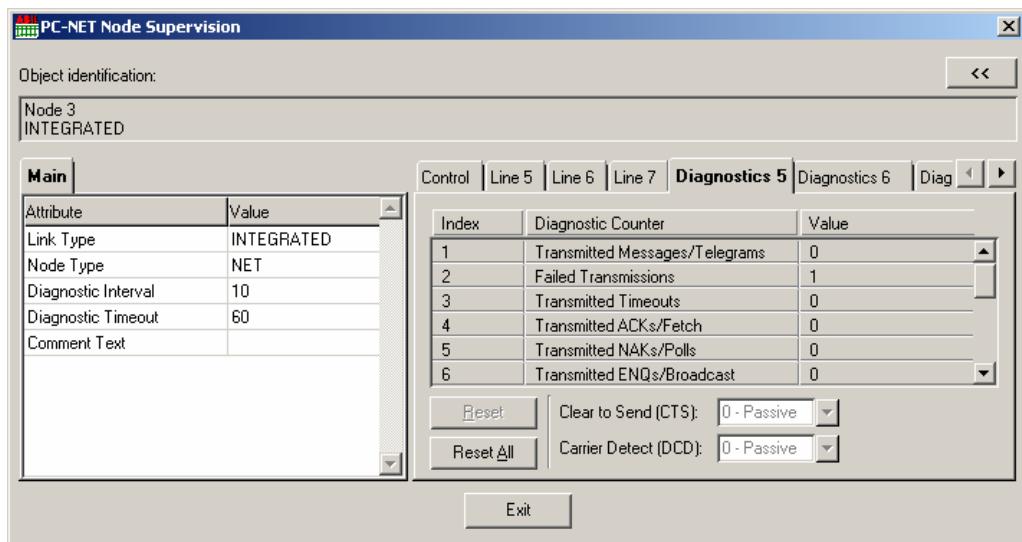


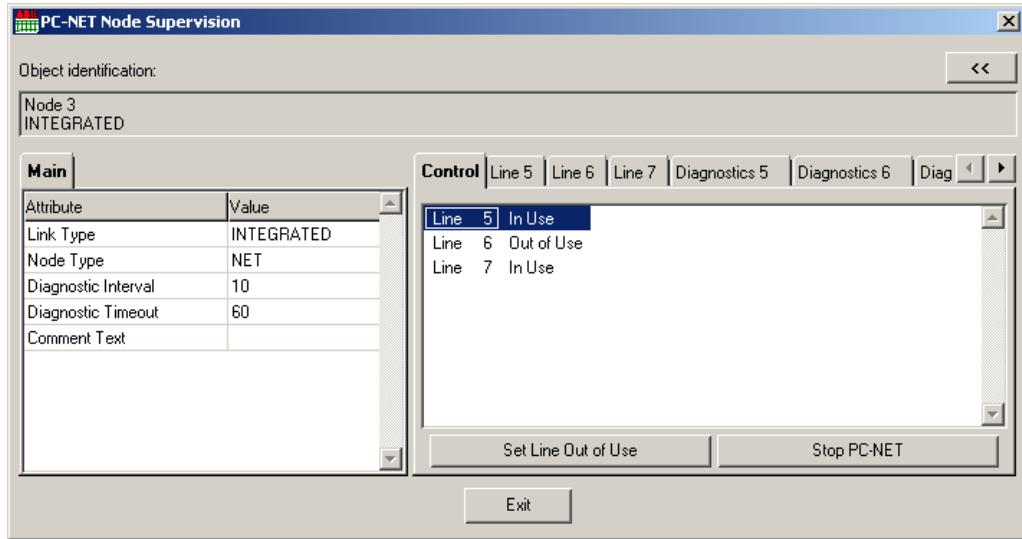
Figure 11.8: Communication line attributes

Communication line diagnostics can be monitored on the dedicated tabs, for example the **Diagnostics 5** tab. This tab shows Index, Diagnostic Counter and Value information for the selected communication line. Clicking **Reset** or **Reset All** clears the value information either for the selected diagnostic counter or all counters at the same time. **Clear to Send** and **Carrier Detect** items indicate the communication status for serial communication lines. These items are not visible to the TCP/IP communication lines. All information shown in this tab is cyclically updated.

## Operation Manual

*Figure 11.9: Communication line diagnostics*

In the **Control** tab it is possible to set communication lines either out of use or in use. It is also possible to stop or start the PC-NET Node communication from that tab, too. See Figure 11.10 for details.

*Figure 11.10: Communication line control***11.2.3.5****SNMP supervision**

The appearance for SNMP supervision control dialog depends on the type of the SNMP device. Simple Network Management Protocol devices are able to provide information about them in the internet protocol network via network management protocol. Such

## Operation Manual

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devices are: servers, printers, hubs, switches and routers. An example of Network Switch with 8 ports is shown in Figure 11.11. When the dialog is expanded, the alarms for the device are shown and control operations can be performed by using the **Ack. selected** and **Ack. All** buttons.

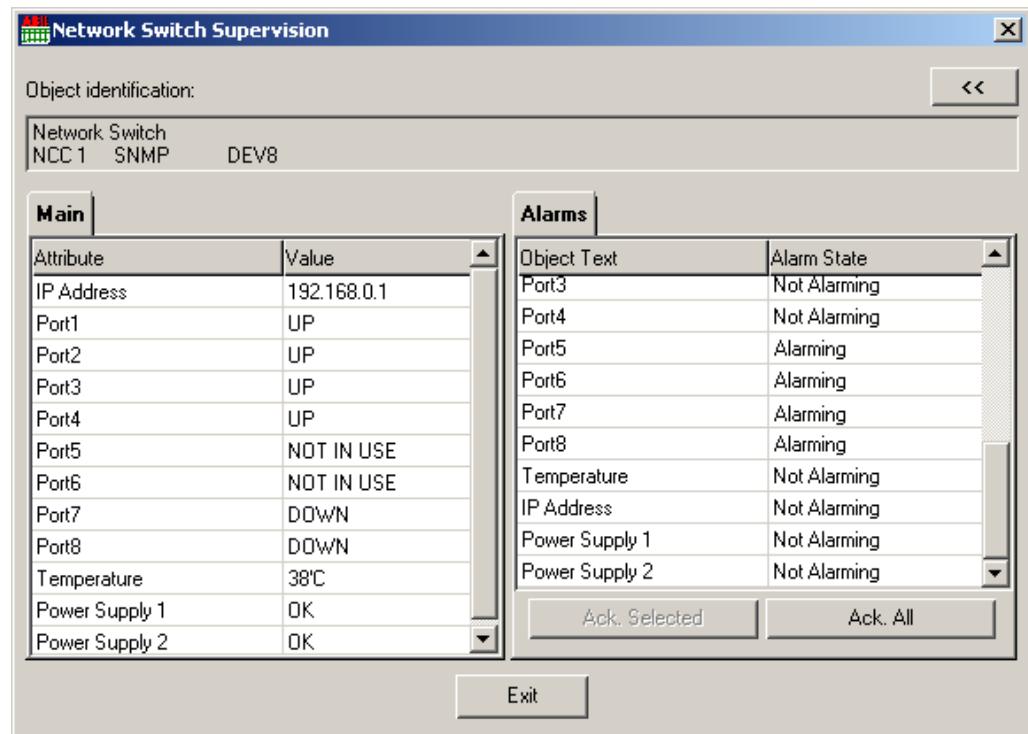


Figure 11.11: Network switch supervision control dialog

The appearance of attributes shown for the SNMP device is configured via device templates. For more information, see SYS600 Application Design manual. By default, the following device templates are found:

- Network switch
- GPS
- Computer
- Printer

### 11.3

### Supervision events and alarms

System Self Supervision events and alarms in the system can be monitored in the Event and Alarm Displays. Events and alarms of each supervised object are generated according to the supervision event filtering specified during the configuration. For more information about the filtering, see SYS600 Application Design manual.

## Operation Manual

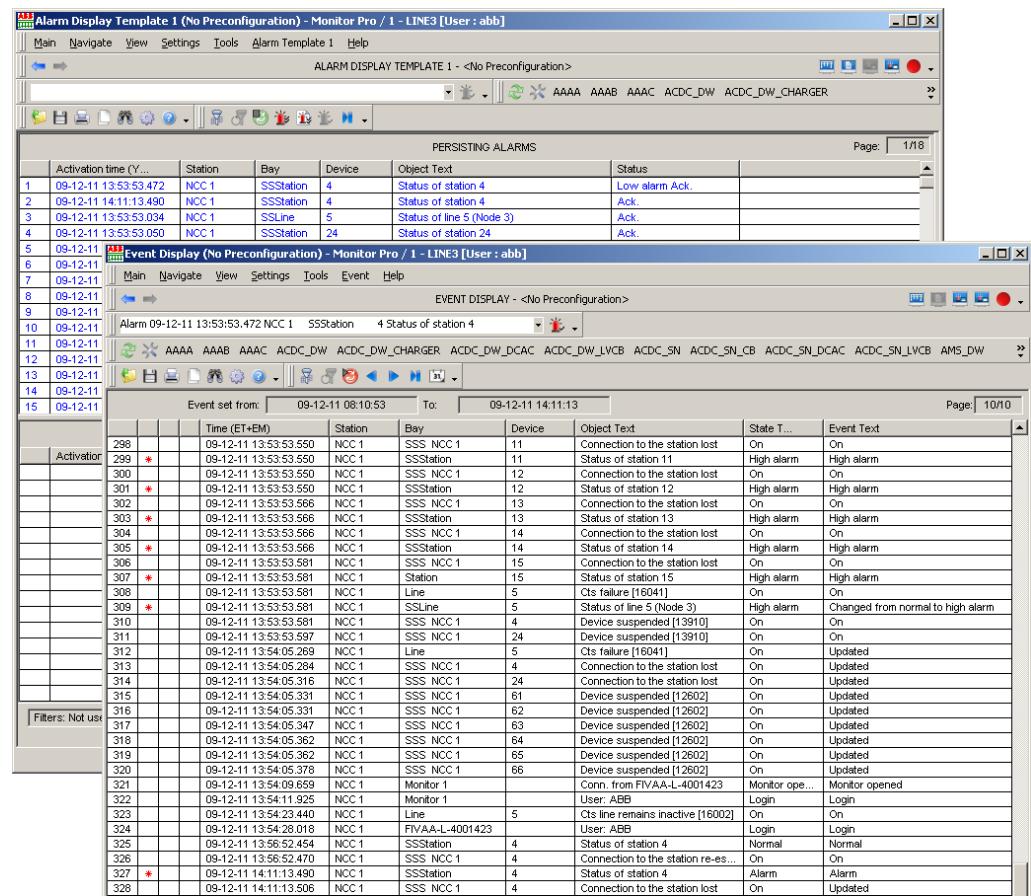


Figure 11.12: Supervision events and alarms

In case of an alarm, the supervised object causing an alarm can be found from the Alarm Display. This alarm indicates the existing state of the supervised object and it gets changed to the normal value as the supervised object receives the normalized event. The reason for causing the alarm in system can be found from the Event Display, for example Device stopped [13918].

### Filtering supervision events and alarms

It is possible to define a filter condition that filters out all other events and alarms except the supervision related events and alarms shown in Alarm and Event Displays. In Event Display, selecting **Event > Filters** opens the Filter Settings dialog. Define the settings as shown in Figure 11.13. Click **OK** to apply the filter definition and close the dialog window.

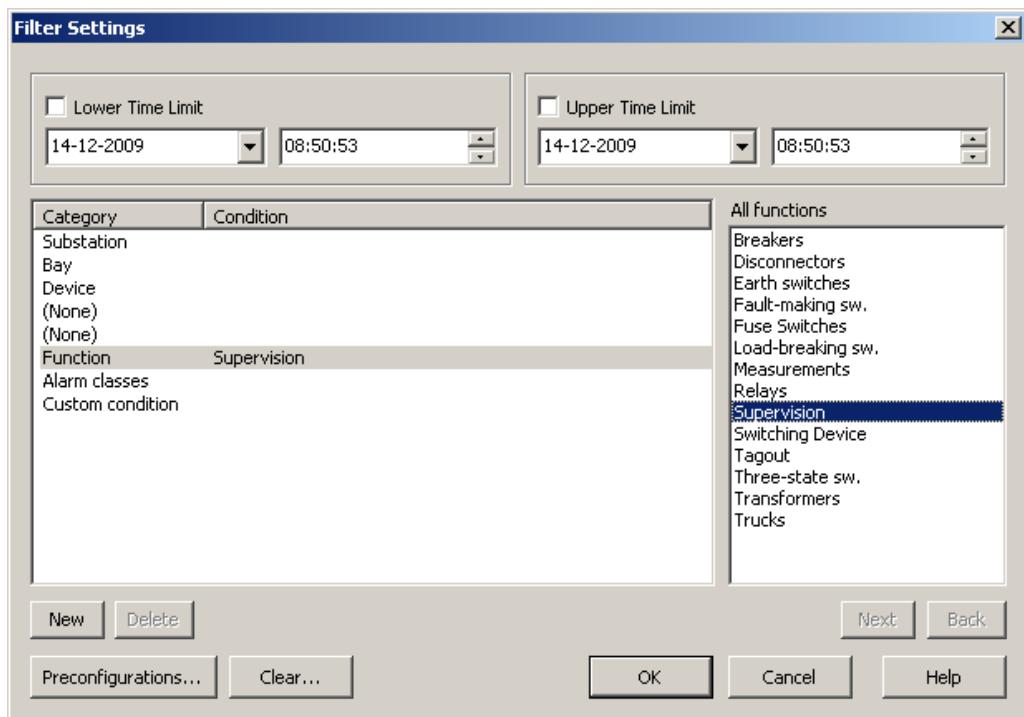


Figure 11.13: Filter Settings for Supervision information

## 11.4

### Supervision logging

In addition to the supervision information appearance in the Event and Alarm Displays, each supervision object event can be logged into the supervision log file. These events are collected according to the supervision event filtering configuration and stored in the file system. For more information about the configuration for supervision event filtering and logging parameters, see SYS600 Application Design manual.

In addition to the Event and Alarm Displays, the supervision information can also be found from Supervision Log Viewer, when configured accordingly in MicroSCADA Pro system.

## 11.5

### Supervision Log Viewer

Supervision Log Viewer is used for monitoring the supervision information logged into different log files. These files contain information about the supervision events related to the system software and hardware.

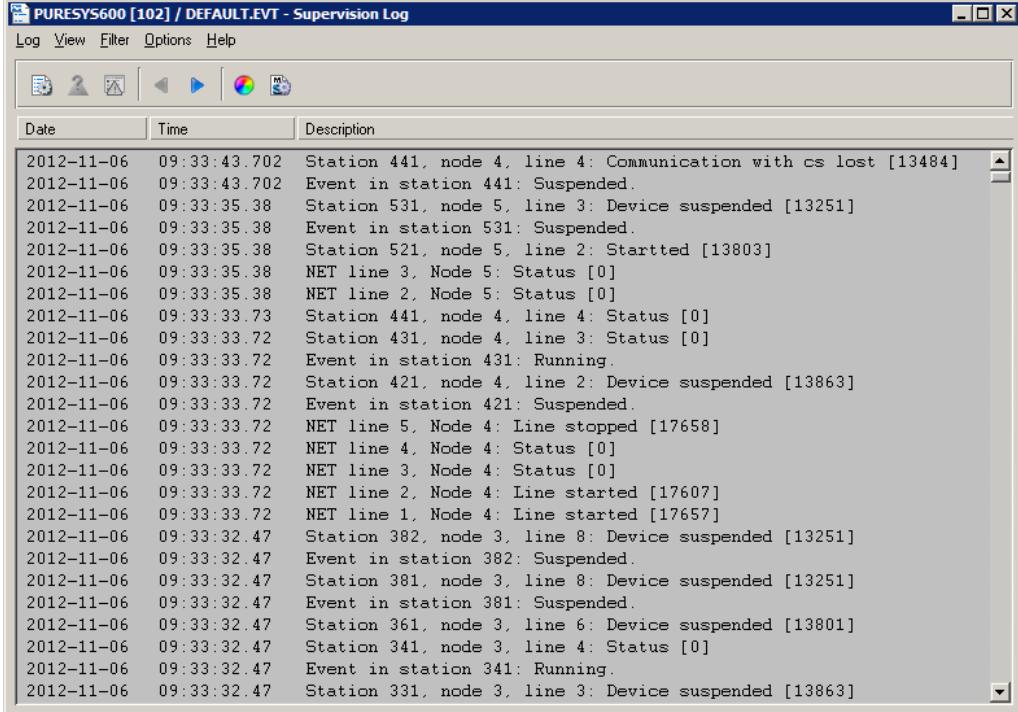
Supervision Log Viewer contains the following features:

- viewing common system messages of MicroSCADA Pro system
- viewing unknown process object messages of MicroSCADA Pro system
- viewing Windows Operating System events

## Operation Manual

**Starting tool**

Supervision Log Viewer can be started from the menu bar by selecting **Tools > Supervision Log**. When the tool gets started, it shows the contents of logged information at that moment. To update the view, select **View > Refresh** to get the tool reflected by the latest collected information. An example of the Supervision Log Viewer main view is shown in Figure 11.14.



The screenshot shows a software window titled "PURESYS600 [102] / DEFAULT.EVT - Supervision Log". The window has a menu bar with "Log", "View", "Filter", "Options", and "Help". Below the menu is a toolbar with icons for file operations. A table lists log entries with columns for Date, Time, and Description. The log entries show various system events and device status changes over November 6, 2012.

Date	Time	Description
2012-11-06	09:33:43.702	Station 441, node 4, line 4: Communication with cs lost [13484]
2012-11-06	09:33:43.702	Event in station 441: Suspended.
2012-11-06	09:33:35.38	Station 531, node 5, line 3: Device suspended [13251]
2012-11-06	09:33:35.38	Event in station 531: Suspended.
2012-11-06	09:33:35.38	Station 521, node 5, line 2: Startted [13803]
2012-11-06	09:33:35.38	NET line 3, Node 5: Status [0]
2012-11-06	09:33:35.38	NET line 2, Node 5: Status [0]
2012-11-06	09:33:33.73	Station 441, node 4, line 4: Status [0]
2012-11-06	09:33:33.72	Station 431, node 4, line 3: Status [0]
2012-11-06	09:33:33.72	Event in station 431: Running.
2012-11-06	09:33:33.72	Station 421, node 4, line 2: Device suspended [13863]
2012-11-06	09:33:33.72	Event in station 421: Suspended.
2012-11-06	09:33:33.72	NET line 5, Node 4: Line stopped [17658]
2012-11-06	09:33:33.72	NET line 4, Node 4: Status [0]
2012-11-06	09:33:33.72	NET line 3, Node 4: Status [0]
2012-11-06	09:33:33.72	NET line 2, Node 4: Line started [17607]
2012-11-06	09:33:33.72	NET line 1, Node 4: Line started [17657]
2012-11-06	09:33:32.47	Station 382, node 3, line 8: Device suspended [13251]
2012-11-06	09:33:32.47	Event in station 382: Suspended.
2012-11-06	09:33:32.47	Station 381, node 3, line 8: Device suspended [13251]
2012-11-06	09:33:32.47	Event in station 381: Suspended.
2012-11-06	09:33:32.47	Station 361, node 3, line 6: Device suspended [13801]
2012-11-06	09:33:32.47	Station 341, node 3, line 4: Status [0]
2012-11-06	09:33:32.47	Event in station 341: Running.
2012-11-06	09:33:32.47	Station 331, node 3, line 3: Device suspended [13863]

Figure 11.14: Main view



## 12

# Sequence Executor

SYS600 Sequencer offers creation, execution and monitoring of switching device command sequences in MicroSCADA Pro. Sequencer has two separate tools one for creation and configuration of sequences (Sequence Configurator) and another tool for execution of sequences (Sequence Executor). This chapter describes sequence execution and monitoring using Sequence Executor. More details regarding Sequence Configurator tool can be found from SYS600 Application Design Manual.

A sequence is a collection of one or more steps (commands) for switching devices. Currently, the supported commands for sequence executions are switching device open or close commands and a custom message to display. For instance, opening a circuit breaker can be considered as one step in a sequence.

### 12.1

#### Launching the tool

Sequence Executor can be launched directly from Monitor Pro by selecting **Tools > Sequencer** as shown in Figure 12.1

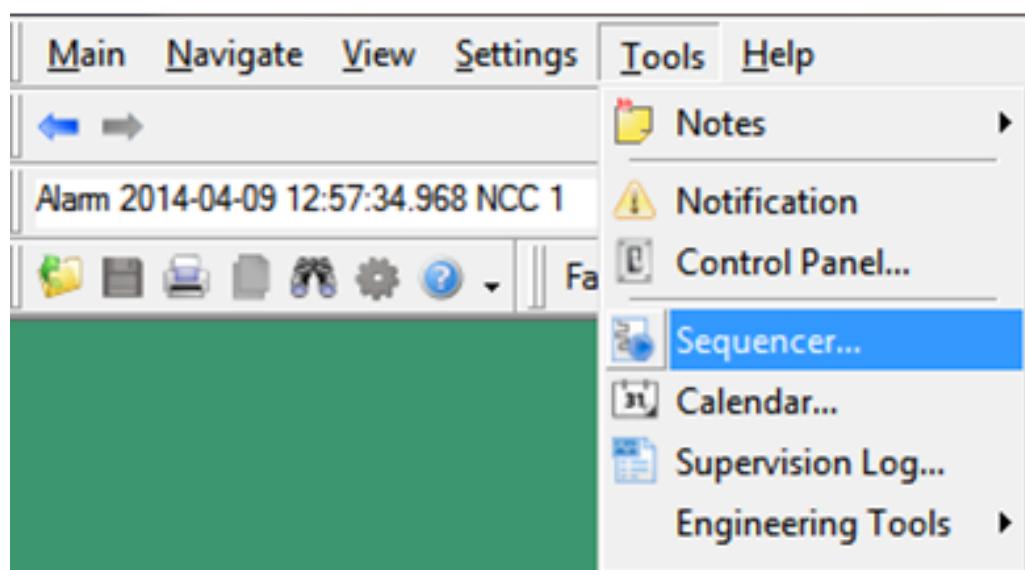


Figure 12.1: Launching Sequence Execution Tool in Monitor Pro

Note! **Sequencer** menu item is not shown in the menu if the sequencer is missing or not enabled in the applied license or the sequencer package is not installed.

## 12.2 User Interface

By default, Sequence Executor shows an empty view with no sequence selected. A pre-configured sequence can be selected from the Sequence drop down menu to view the sequence steps and execute a sequence.

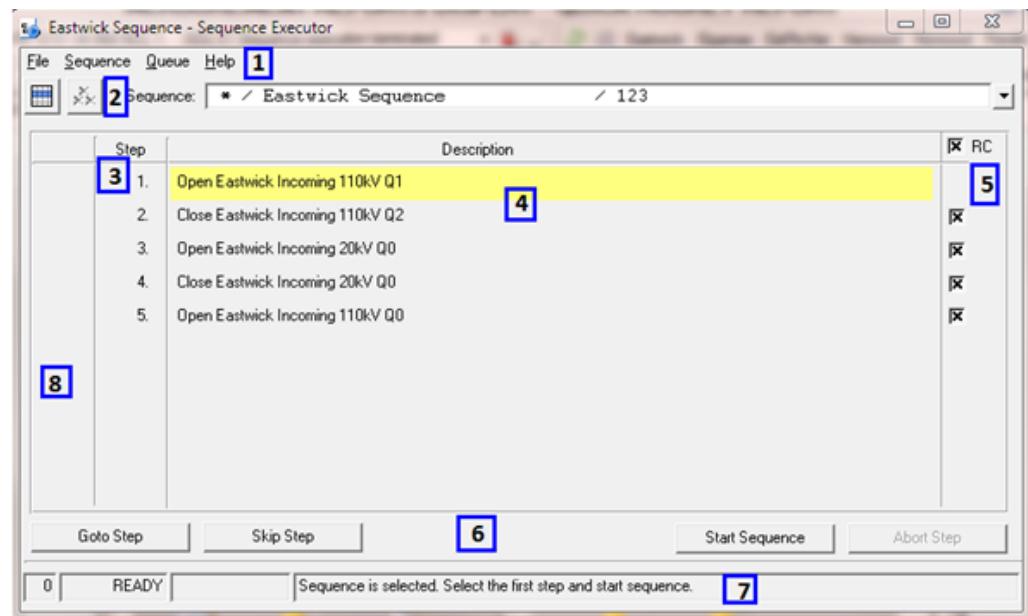


Figure 12.2: Sequence Executor showing the tool's layout and an opened sequence

Description of the tool layout shown in Figure 12.2 are described in Table 12.1

Table 12.1: Description of Sequence Executor Tool layout

Or- der	Item Name	Description
1	Menu bar	Contains the tool menus
2	Toolbar	Contains the toolbar buttons of sequence executor
3	Step numbers	Shows the step numbers in order
4	Descriptions of steps	Describes the steps as configured using Sequence Configurator tool
5	RC (Require Confirmation)	Checkboxes for selecting or deselecting user confirmation during step executions
6	Operation buttons section	Contains buttons that are used for sequence execution, step selection, skipping a running step and aborting a sequence
7	Status bar	Contains buttons that are used for sequence execution, step selection, skipping a running step and aborting a sequence
8	State of steps	Shows the states of the step executions using the symbols described in Figure 12.5

## 12.2.1

### Menu bar

The menu bar in Sequence Executor consists of different menus including the commands/functions in the toolbar. The menus are shown in Figure 12.3 below and the menu and menu items are described in detail in Table 12.2



Figure 12.3: Sequence Executor's Menu bar

**Table 12.2: Sequence Execution Tool's menu bar functions**

Menu	Function	Description
File	Exit	Exits Sequence Configurator Tool
Sequence	Controllability Check	Executes controllability check to make sure that each switching device included in the sequence can be controlled (See Controllability Check Section)
	Execution Log	Shows detailed log or report of the last sequence execution (See Status and Outputs Section)
Queue	Queue State	Opens Queue State dialog that shows the tabular summary of sequences running or waiting in the execution queue
	Stop All	Aborts the running sequence and removes all waiting sequences from the execution queue. If aborted by an INT user, all sequences triggered by other triggers will also be stopped
Help	About	Information about the tool and system

## 12.2.2

### Toolbar

Sequence Executor toolbar, shown in Figure 12.4, consists of three different functions.

The descriptions of the toolbar functions are described in Table 12.3 below.



Figure 12.4: Toolbar in Sequence Executor

**Table 12.3: Sequence Execution Tool's Toolbar functions**

Function	Description
Queue State	Opens Queue State dialog that shows the tabular summary of sequences running or waiting in the execution queue

Function	Description
Queue/Stop All	Aborts the running sequence and removes all waiting sequences from the execution queue. If aborted by an INT user, all sequences triggered by other triggers will also be stopped.
Sequence Selection	Enables users to select a sequence from a list of configured sequences. After selecting a sequence from the drop down list, the following information is shown on the text field: <OI of the bay>/<The name of the sequence>/<Sequence number> If the sequence consists of steps from different bays, <OI of the bay> will be substituted by <*>.

## 12.3

### User Authorizations

Execution of sequences requires at least Level 2 Authorization Level. However Level 1 is enough for View Only rights for a running sequence.

## 12.4

### Executing a Sequence

Sequences execution may require user confirmation. If the sequence steps are configured to require user confirmation the user has the possibility to choose one of the following actions after each step:

- Continue Sequence from next step
- Skip step
- Go to step to continue the execution from specified step
- Abort Sequence

#### To execute a sequence:

1. Select a sequence from Sequence drop down list in the toolbar.  
The sequence opens with a list of steps having sequence number, description and RC (Require Confirmation) checkboxes. An empty Sequence drop down list shows that there is no sequence to execute.
2. Select/Clear the checkboxes in RC column (Optional)  
By default the RC checkboxes are set according the sequence configuration. To toggle whether the user confirmation is required for the step, select/clear the checkboxes in RC column. You can also select/clear all the checkboxes in the column by selecting/clearing the RC checkbox in the column header.  
Steps are executed without user confirmation when the checkboxes are clear. A selected checkbox shows that the step requires an interactive user confirmation.
3. Click on **Start Sequence** button to start sequence execution from the beginning/from the first step.
4. To start from a step other than the first step, click on GOTO STEP button and select a step to begin with. Press START SEQUENCE to start sequence execution from the selected step.

**Operation Manual**

After sequence execution starts, the active step (the step under execution) is highlighted in yellow

5. Click on **Abort Sequence** button to abort/cancel sequence execution

Note! In addition to an interactive user, sequences can be started from internal and external triggers. Internal triggers include event channel and Schedule function of the MicroSCADA Pro Calendar. Using external triggers, the sequences can be started from an NCC via COM500i functionality or from DMS600.

**12.5****Statuses and Outputs**

Sequence states are shown in the status bar indicated by number 7 in Figure 12.2

The tool shows the following sequence status information:

- Number of sequences in the execution queue
- State of sequence execution in status bar: Disabled, Ready, Running, Paused
- Current selected sequence with their ID (ID\_APL) and name
- Description for every sequence step

The states of each step during sequence execution are indicated with different symbols. These symbols are located in front of each step (see section 8, State of steps, in Figure 12.2).

The description of the state of steps and the corresponding symbols are shown in Figure 12.5

<b>State</b>	<b>Symbol</b>
Success	✓
Fail	✗
Skip	—

*Figure 12.5: State of Step and corresponding symbols*

**Sequence Execution Log**

Sequence Execution Log dialog shows the detailed log or report of the last sequence execution. The log includes the following information regarding the sequence:

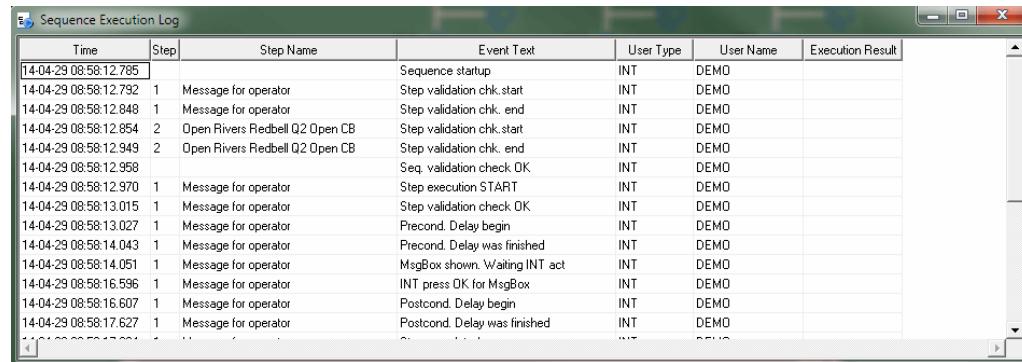
- Time stamps
- Step number
- Step names
- Event texts for each step
- User Type

## Operation Manual

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- User names
- Execution result (E.g. successful/unsuccessful completion of sequence execution or error)

Select **Sequence>Execution Log** from the tool's menu to open the Figure 12.6 as shown below



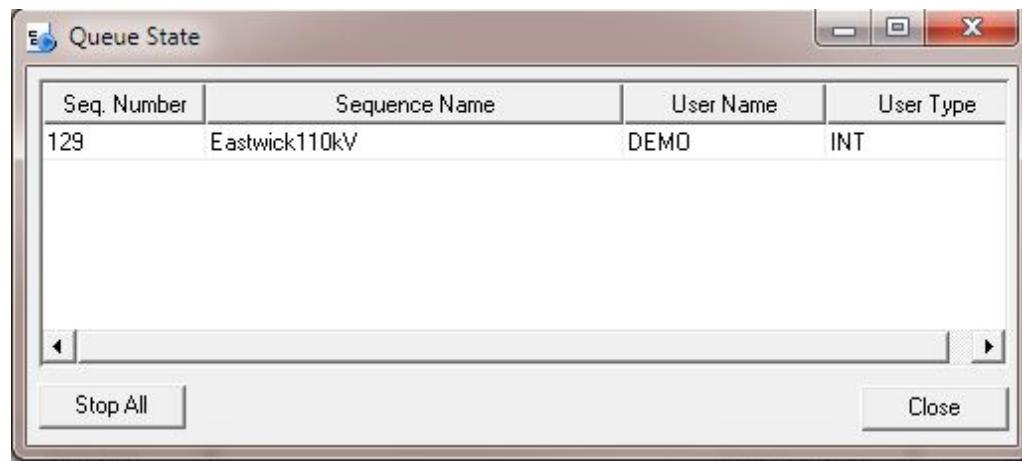
Time	Step	Step Name	Event Text	User Type	User Name	Execution Result
14-04-29 08:58:12.785			Sequence startup	INT	DEMO	
14-04-29 08:58:12.792	1	Message for operator	Step validation chk. start	INT	DEMO	
14-04-29 08:58:12.848	1	Message for operator	Step validation chk. end	INT	DEMO	
14-04-29 08:58:12.854	2	Open Rivers Redbell Q2 Open CB	Step validation chk. start	INT	DEMO	
14-04-29 08:58:12.949	2	Open Rivers Redbell Q2 Open CB	Step validation chk. end	INT	DEMO	
14-04-29 08:58:12.958			Seq. validation check OK	INT	DEMO	
14-04-29 08:58:12.970	1	Message for operator	Step execution START	INT	DEMO	
14-04-29 08:58:13.015	1	Message for operator	Step validation check OK	INT	DEMO	
14-04-29 08:58:13.027	1	Message for operator	Precond. Delay begin	INT	DEMO	
14-04-29 08:58:14.043	1	Message for operator	Precond. Delay was finished	INT	DEMO	
14-04-29 08:58:14.051	1	Message for operator	MsgBox shown. Waiting INT act	INT	DEMO	
14-04-29 08:58:16.596	1	Message for operator	INT press OK for MsgBox	INT	DEMO	
14-04-29 08:58:16.607	1	Message for operator	Postcond. Delay begin	INT	DEMO	
14-04-29 08:58:17.627	1	Message for operator	Postcond. Delay was finished	INT	DEMO	

Figure 12.6: Sequence Execution Log

## 12.6 Sequence Queue

Only one sequence can be executed at a time. The maximum numbers of sequences that are allowed to be in a queue for execution are five. See Figure 12.7 Queue State Dialog

Note! Only the non-interactive execution of sequences are queued. It is not possible to queue interactive user sequence execution.



Seq. Number	Sequence Name	User Name	User Type
129	Eastwick110kV	DEMO	INT

Figure 12.7: Queue State Dialog showing three pending sequences

To view the queued sequences:

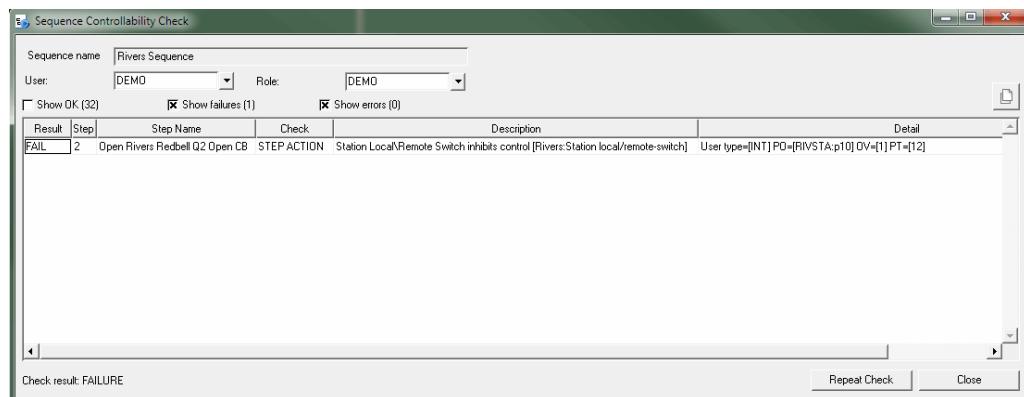
1. Click on **Queue State** button in the tool bar or Select **Queue > Show State** from the menu to open the Queue State dialog.  
The queue state dialog shows all sequences in the queue with their number , user name and user type..
2. Click on **Stop All** button to abort all the active and pending sequences in queue.

## 12.7

## Controllability Check

Every step in a sequence must be controllable beforehand. Before any sequence execution is started, the sequencer function executes controllability check to make sure that each switching device included in the sequence can be controlled. The controllability check is repeated for each particular step command of the sequence. The progress of the sequence execution can be monitored and controlled in Sequence Executor. Controllability of steps is also checked when opening a new sequence. The Sequence Controllability Check dialog opens if one or more steps are not possible to be executed/controlled. See Figure 12.8

Sequence Controllability Check dialog can also be launched by selecting **Sequence > Controllability Check** from the main menu.



*Figure 12.8: Controllability Check Dialog showing a failure due to station local/remote switch inhibition of control*



**13****Using Calendar**

Calendar is a tool for defining features or activities that depend on time.

Time periods can be applied, for instance, to define day and night tariffs, to specify contracts that are in force, general holidays, and so on. Calendar data can then be utilized by other functions, for example by the measurement reports.

It is possible to use the Calendar to define command procedures which are to be run on a defined day or on all days that are marked as a certain type of day. Default day settings are available either for all days or for workdays and Sundays separately.

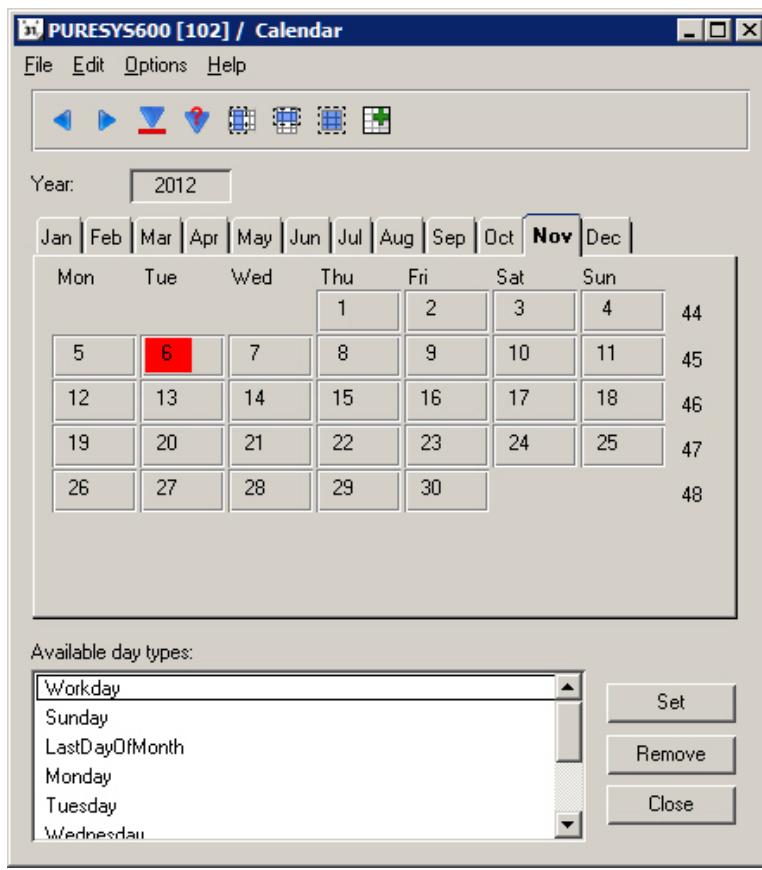
Settings that determine the operations or properties which will take place at a certain moment of time, are defined in a day specific graphical attribute list. The attribute list is maintained by using an attribute tool that is integrated into the calendar. Each attribute has a graphical user interface of its own on the list.

Individual days can be configured independently with the attribute tool to have day specific attributes. The attribute list can also be defined for the day type. The day type is a logical name that can be used for connecting an attribute list to a day. All attributes defined for a day type are then applied to all days that have a link to the day type. Fast modifications can be performed simultaneously for several days by using the predefined day types. New day types can be created freely.

**13.1****Opening Calendar**

Calendar can be started in the application main picture. Select Calendar in the Tools menu.

The main calendar view is used for browsing general calendar information. The calendar is divided into 12 months, one in every tabbed page. A month can be selected by clicking the corresponding tab. The current day is marked with a red box (see Figure 13.1).



*Figure 13.1: The Calendar tool*

There are shortcuts in the toolbar for the most used commands. The commands are from left to right:

- Previous Year
- Next Year
- Go to Today
- Go to Year X
- Select Day of the Week
- Select Week
- Select Month
- Add Day Type

## 13.2

### Making selections

Multiple selections can be made when the Attribute dialog is not open. Close it before making a multiple selection.

- Click a day in the Calendar to add the day into the selection.
- To deselect days, single-click the day label again. The current label state can also be changed by pressing the Space bar. Opening the Attribute dialog by

- double-clicking a day label also removes all other days selected except the current day.
- Selection can be expanded by using the selection buttons in the toolbar.
  - Any day type can be added to the selection.
  - Any day type setting can be removed from the selection.

### 13.3

### **Adding day type to group of days**

When a selection is made, a day type can be added to the day group. Select a day type on the day type list and click **Set**. When the button is clicked, all the selection marks disappear and the number fonts of the selected day change to bold to indicate that they are provided with the relevant settings. If the day color is set on the day type attribute list, all the days are marked with that color.

To remove a day type setting from a day, make a multiple selection, select the day type to be removed and click **Remove...**. Another way to remove a day type setting is to open the Edit day attributes dialog and to delete the corresponding day type block from the attribute list.

### 13.4

### **Setting day type attributes**

To set a day type attribute, double-click the day type item on the list containing the day type names. This opens the Attribute dialog.

The day type attributes are defined in a similar way as the day attributes. The only difference is the text box in the upper part of the dialog where the type name is displayed. This name is also visible on the list of the main calendar view.

Changes made in the day type attributes are applied to all the days defined as that day type.

### 13.5

### **Saving attributes**

Save the attributes by clicking **Apply**. Not clicking **Apply** before selecting another day will delete all the blocks containing invalid data. It is recommended to click **Apply** to check the data validity before moving to another day or closing the dialog.

Saving is also done when **Go to Today** is clicked. This is the most recommended way to save changes to the day or to day type attributes. When the Attribute dialog is closed, data validity is checked and valid data is saved.

### 13.6

### **Changing current time**

To step one year forward, click **Next Year** on the toolbar. Similarly, to move to the previous year, click **Previous Year**. To move to any year between the years 1978–2045, click the **Go To Year** and type the year into the Input dialog.

## 13.7

## Setting day attributes

Set the day and the day type attributes by double-clicking the day label (day number). The Edit day attributes dialog is then displayed (see Figure 13.2).

To add a new day attribute:

1. Click **Outage New** from the Edit day attributes dialog. A new block is added to the attribute list.
2. New attributes can be added into the day profile by clicking **Outage New**. In the subsequent dialog box, the type of the new attribute can be selected.
3. Click **Apply** after having edited the day attributes. The program checks the validity of the data and saves the changes. If data is not valid, an error message will be displayed.

**Delete** removes all the marked blocks. After having saved the attributes, the dialog can be closed by clicking **Close**.

**Help** displays the attribute tool help text.

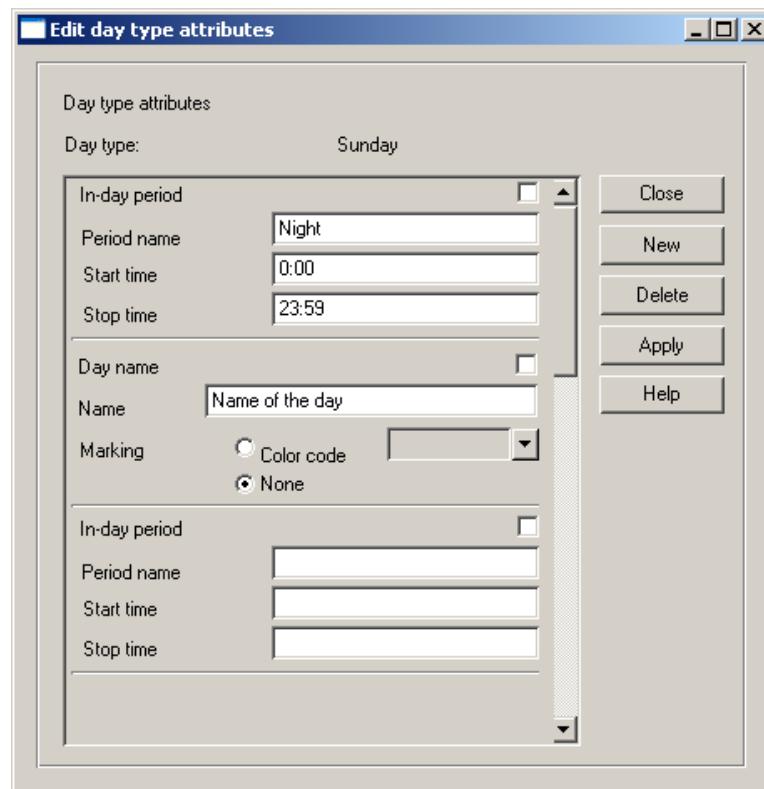


Figure 13.2: The Edit day type attributes dialog

A maximum of 10 attributes per day (or per day type) is allowed.

## Available attributes

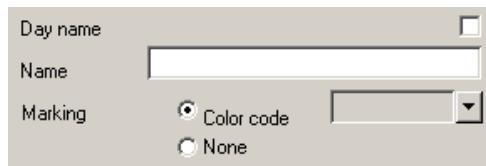
The following attributes are used in the attribute tool. Some of the blocks are available only for the day attribute list. Every block has a check box in the upper right corner. It is used for selecting the block.

1. **Assign type:** Inserting this block into the attribute list of a day connects the day to a day type. All the settings made for the named day type are then applied to the current day. This block is available only for a day, not for a day type. All the day types that are defined in the Options tool are visible in the drop-down list.



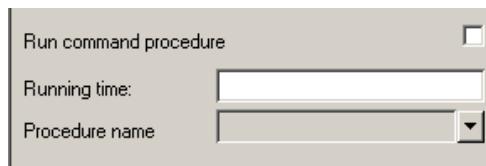
*Figure 13.3: The Assign type dialog*

2. **Day name:** A day is named with a given text string. The day color in the main calendar view is selected with the help of the drop-down list. The block is available both for days and day types.



*Figure 13.4: The Day name dialog*

3. **Run command procedure:** It executes a command procedure at a given time of day. The running time is given with the time resolution of 1 minute. This block is available both for days and for day types.



*Figure 13.5: The Run command procedure dialog*

4. **Time period start/stop:** This block is used to define periods which are in effect for several days. The block is available only for days.



Figure 13.6: The Time period start/stop dialog

5. **In-day period:** The block defines a period that starts and ends during the current day 0:00-23:59. Time resolution is 1 minute. This block is available both for days and day types.



Figure 13.7: The In-day period dialog

## 13.8

### Changing calendar properties

Open the Calendar Properties dialog from the **Options > Tool Properties...** menu. The dialog consists of three tabbed pages:

- General options
- Procedures
- Day types

### General calendar options

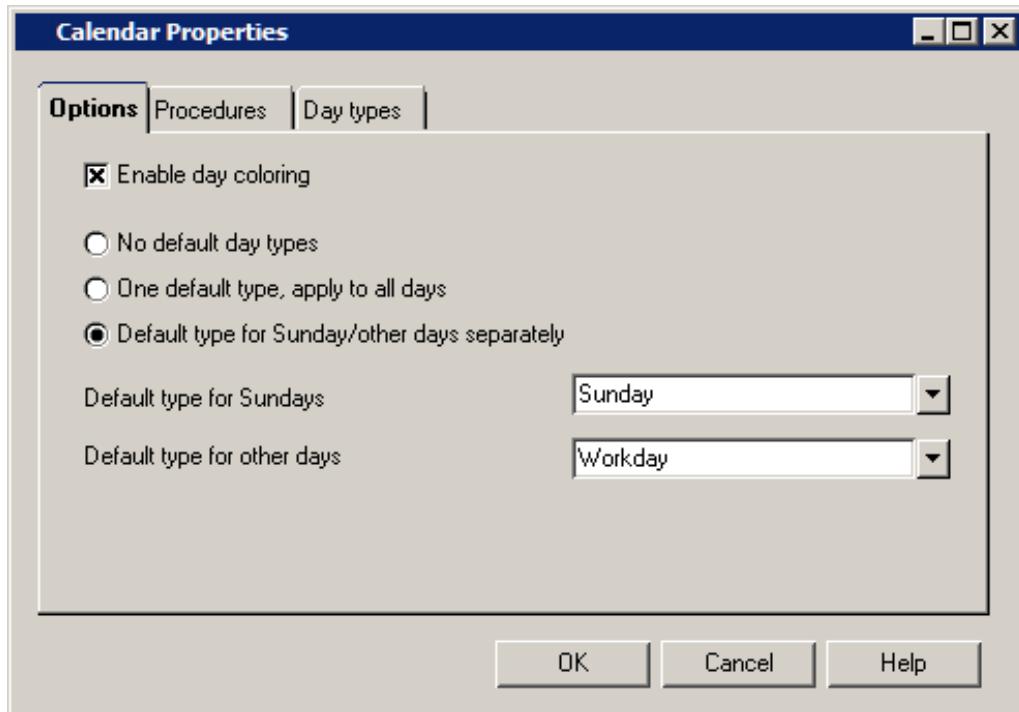


Figure 13.8: General calendar options

**Table 13.1: Available default day types**

No	Type
1	No default types
2	One default type which is applied to all days
3	Default types for Sundays and other days separately. Default types are selected from the drop-down list where all the available day types are visible. The default type of an individual workday can be overridden by assigning it to Sunday type. Likewise, Sunday settings can be overridden with the day type of workday. If the default type of an individual day is to be overridden, select the day from the calendar's main view and assign it to an appropriate day type.

To add more day types into the combo box, select the Day types tab and add new types on the list.

## Procedures

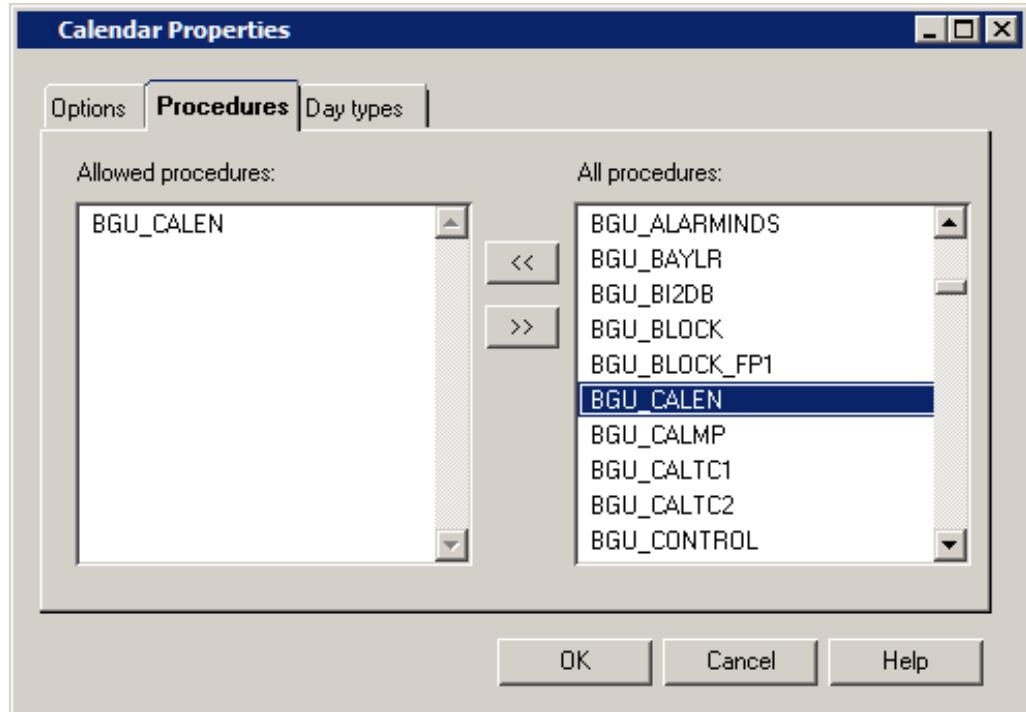


Figure 13.9: Allowed procedures

Allowed procedures can be defined in the Procedures tab of the Calendar Options dialog. On the right side of the Procedures tab are all the command procedures that exist in the system, on the left side are the command procedures that are allowed in the calendar.

To add new procedures to the list of allowed procedures, select a procedure from the All procedures list and click the << button. To remove a procedure from the list of allowed procedures, select a procedure and click the >> button.

Allowed procedures are used by the Run command procedure calendar attribute. Only allowed procedures are included in the combo box of the attribute (see Figure 13.5).

At least Engineering authorization level (2) is required to be able to modify the list of allowed procedures. The list is initially empty but it will be filled according to the user's above mentioned actions.

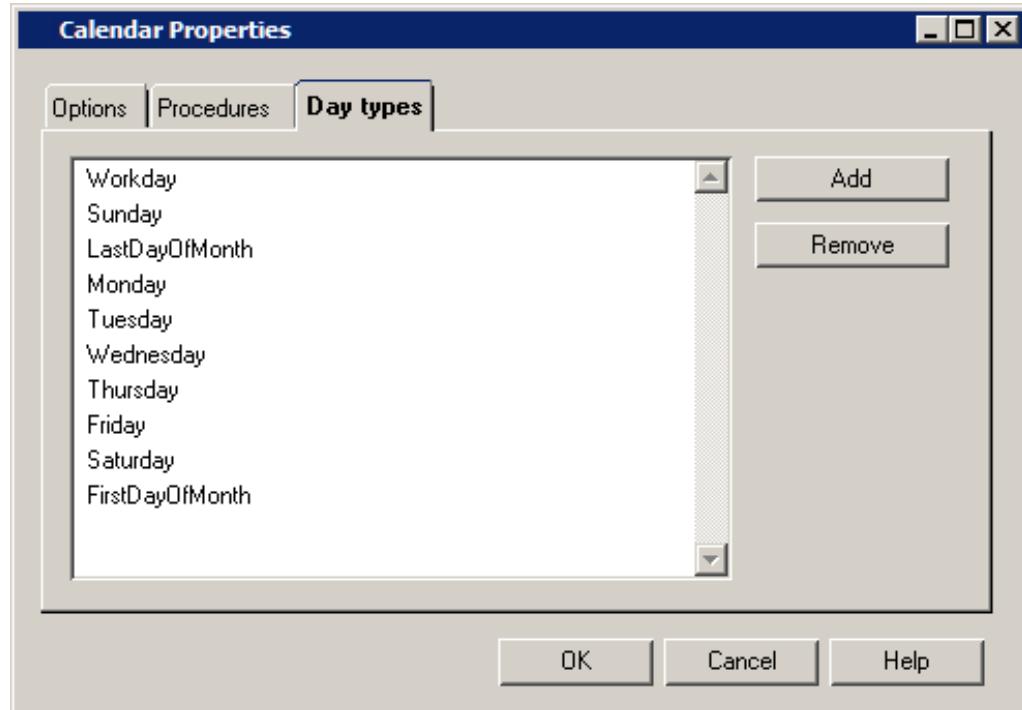
**Day types**

Figure 13.10: Day type tab

To add a new day type:

1. Click the **Add** button.
2. Type a name for the day type. The day type is displayed on the list.
3. Save the changes by clicking **OK**.

To remove a day type, select a day type from the list and click **Remove....**



If a day type is removed, all references to that day type are deleted from the calendar database.



**14****Terminology**

Term	Description
Application	All the processes and views included in an application. Normally an application consists of an overview or a login dialog and several Process Displays and application views.
Application display	An application display gives the user an overview of the application. A Process Display is a picture, which shows a specific process in a station. In a very small application they can all be the same.
Attribute	Attributes contain the settings and definitions for the properties of the picture functions. They are stored in the process data base.
Authorization	Different users can have different access rights to the same picture functions and processes.
Authorization group	Picture functions and application pictures can be grouped into authorization groups and thereby require a certain user authorization level.
Authorization level	Different levels of authorization give the users different types of access (view, control operations, system manager and so on.).
LIB 500	LIB 500 contains the needed base functionality for installing support packages like LIB 510, LIB 5xx... LIB 500 also provides functions like Event Display, Alarm Display, and Network topology coloring.
LIB 510	LIB 510 is a support package, which contains the library functions for using for example MV process functions, Trends Displays, SPACOM Relay Setting Tool, RED Relay Setting Tool, DR-Collector Tool.
Library function	A library function is a function in a software package that is ready made and only needs configuration of the attributes.
Menu item	The available options that are listed when opening a drop-down menu.
MicroSCADA session	The whole operation from starting up the system, performing login, running the system with its customer application to ending the session.
MV process	Medium Voltage functions like Circuit breaker, Transformer, Three state switch, Station, Bay, and so on. Used as picture functions in the Process Displays.
Picture function	The functionality is built in with the application picture presented on the monitor. However, the application picture can contain one or several different picture functions, as well as several similar ones (disconnectors, transformers, and so on.).
Process Display Specific area	An area where process specific functions are presented.
Process database	A database, which contains the individual process objects and related attributes.
Process object	One signal in the Process database (for example a disconnector position indication).
Process Display	A type of an application picture containing process objects (for example MV Process Display functions), which are connected to the processes. In the Process Display, for example measurements, the states of disconnectors and breakers are normally updated and switching devices can be operated.

**Operation Manual**

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Representation symbol	The symbol used for a picture function, for example a circuit breaker, transformer, measurement, and relay. The representation symbol is selected during the configuration of the picture function.
Switching device	Devices in the MV process that can be operated (for example circuit breakers, three-state switches, and transformers).

**15****Abbreviations**

The following is a list of abbreviations the user should be familiar with. See also the terminology table.

<b>Abbrevi- ation</b>	<b>Description</b>
Clut	Color LookUp Table: a file where Display Builder saves the RGB (Red, Green, Blue) values for each color in color palette.
DMS	Distribution Management System
HDB	History Database
HSI	Human System Interface
IED	Intelligent Electronic Device
MV	Medium Voltage
NCC	Network Control Center
SA	Substation Automation
SCS	Substation Control System
SSS	System Self Supervision



## Index

### A

Acknowledge	
All .....	101
Current page .....	101
Acknowledgement Dialog .....	106
Activation .....	82
Active acknowledged alarms .....	102
AI type process object .....	100
Alarm blocking .....	104
Alarm buffer .....	103–104
Alarm classes .....	104
Alarm row .....	30
Alarm text line .....	99
Allowed procedures .....	188
Analog measured value .....	100
Assign type .....	185
Attribute list .....	181
Authorization level .....	156
Available attributes .....	185

### B

BI type process object .....	100
Blocking Display toolbar .....	108

### C

Calendar .....	181
Color settings .....	90
Command procedures .....	181
Communication failure .....	100
Current alarm situation .....	103

### D

Day color .....	183, 185
Day name .....	185
Day type .....	182, 187, 189
Day type setting .....	183
DB type process object .....	100
Default day settings .....	181
Defining filters .....	86
dialog	
Color Setting Tool .....	77
DMS .....	193
Double indication .....	100

### E

Event activation .....	82
Event Display line .....	81

### F

Filters .....	85, 101
settings .....	87

### G

Graphical view .....	147
Graphic view mode .....	123

### H

History Database (HDB) .....	94
------------------------------	----

### I

Incoming binary signal .....	100
Incoming process data .....	103
In-day period .....	186
Internal events .....	94

### L

Latest Alarm .....	101
Logout .....	12
automatic logout after inactivity .....	12
time based logout .....	12

### M

Measurement Reports .....	141
Display Toolbar functions .....	120, 143
Main Toolbar functions .....	142
menu .....	145
toolbars .....	142
Measurements Reports	
display header .....	145
Multiple selection .....	182

### N

Navigation toolbar .....	145
--------------------------	-----

Operation Manual

---

Navigation toolbar functions ..... 125  
Network topology coloring ..... 78

**O**

Outgoing process data ..... 103

**P**

Persisting alarms ..... 102  
Preconfigurations ..... 155  
Printout ..... 82  
Process database ..... 103  
Process events ..... 94  
Process list types ..... 31  
Process object ..... 100

**Q**

Quick Reports ..... 156

**R**

Registration ..... 82  
Report data  
  exporting ..... 156  
Run command procedure ..... 185

**S**

Setting Calendar options ..... 186

Signal ..... 107  
Starting  
  Alarm Display ..... 100  
Station (process) picture ..... 14–15  
Status bar ..... 31  
SYS600  
  Monitor Pro ..... 78  
System error ..... 100

**T**

Tabs  
  Colors tab ..... 79  
Tabular view ..... 149  
  Add comments ..... 155  
  Edit value ..... 154  
  Time column ..... 153  
Tagout ..... 57  
  adding ..... 58  
  editing ..... 59  
  removing ..... 59  
Template 1 ..... 100  
The Day type list ..... 189  
time based logout ..... 12  
Time period start/stop ..... 185  
Trends Display ..... 115

**U**

Unacknowledged alarms ..... 104



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